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PREFACE

A Word from the Editor

Agriculture has played a key role in the development of human civilization. Agriculture is also central in the current debate on sustainable development. In fact, agriculture development is essential for the achievement of many Sustainable Development Goals (SDGs) in the context of the 2030 Agenda for Sustainable Development.

Development and diffusion of agricultural techniques in the last century (cf. Green revolution) has steadily increased agricultural productivity with positive impacts in terms of food security and rural development. A remarkable shift in agricultural practices – and consequently agricultural/farming systems as well as food systems – has occurred in response to introduction of new technologies. The last century has seen the intensification, concentration and specialization of agriculture; agriculture increasingly depends on new technologies and inputs such as chemicals (e.g. fertilizers, pesticides), mechanization, irrigation and plant breeding (hybrids and GMOs).

The agricultural sector is called nowadays to adapt to climate change while increasing efficiency and reducing negative externalities (e.g. water pollution). Therefore, there is a transition towards sustainability in agriculture to address concerns related to socio-economic justice, resources conservation, environment protection, etc. Science and innovation are crucial to address these new sustainability challenges. Recent trends would indicate that the incorporation of scientific knowledge (e.g. principles of ecosystem management and agro-ecology) into farming practices can enhance productivity and allow achieving 'sustainable intensification' in all agriculture subsectors (crop production, animal production, forestry, fisheries).

In your hands is the Book of Abstracts of the 9th International Scientific Agricultural Symposium "AGROSYM 2018", which I hope you will find useful in your research, education and professional activities. Symposium themes cover all branches of agriculture and are divided into seven sections: 1) Plant production, 2) Plant protection and food safety, 3) Organic agriculture, 4) Environmental protection and natural resources management, 5) Animal Husbandry, 6) Rural Development and Agro-economy, and 7) Forestry and agroforestry.

The aim of AGROSYM 2018 is to make an important contribution to agriculture science and practice in the Balkan region and beyond. This Book of Abstracts encompasses 1206 contributions from about 1200 participants representing 85 countries. Full texts of the submitted communications will be available in electronic form (CD and web: http://agrosym.ues.rs.ba).

AGROSYM 2018 was made possible through the commitment and contributions of a wide range of partners and sponsors. Many thanks to all the authors, reviewers and colleagues for their help in editing this Book of Abstracts. Special thanks go to all co-organizers for their unselfish collaboration and comprehensive support.

East Sarajevo, 1st October 2018
Prof. Dušan Kovačević, PhD
Editor in Chief

CONTENT

1. PLANT PRODUCTION

STUDY ABOUT SOME ECOLOGICAL ASPECTS OF GRAIN OAT CULTIVARS (AVENA SATIVA L.) IN ALBANIAN CONDITIONS

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Abstract

Concentrate oat is a very important such as forage crop for animals and food for people. It is a plant with a very wide spreading range and with a high degree of eligibility to ecological conditions. Oat is a crop with high protein content, carbohydrates, fats, vitamins and other mineral elements, which make it a high-value biological food especially for animals but also for humans. It compose the food base for many ruminant animals as there is a balanced content of the main nurient elements. But recently it is being successfully used as human food by replacing other cereals and this has actually become a tradition as it is a healthy, balanced, and high-value biological food. The oat represent a high agronomic performance compare to many other cereals till it is a plant that plays an important role in cereals cultivation technology, such as plant rotation, plant mixtures and as the main single crop cultivation. It is a resistant plant to biotic and abiotic stresses and as such exhibits good adaptability to climate and soil conditions and to climate change. Today when society has become more vulnerable to environmental problems, a change in the situation of the agriculture sector and sustainability is more than required. An important factor in actual situation is the change in the structure of cultivars. But despite the importance of this crop, the collection of cultivars in production in Albania is relatively poor, although a large number of hybrids with high production potential have entered from other countries. The objective of this study was to compare differnet oats cultivars as "Këmishtaj" and "Lushnja x Kamza", native cultivars and some other cultivars coming from some Western countries as "Mansholt I", "Makte Haver Oversalt", "Torpan" and "Bendo" (Holland); "Abed Minor" (Denmark) and "Argus" (Sweden), which are widespread in production in these countries and have been successful in various environmental conditions for their biomorphological aspects, food quality, production levels, adaptation abillity, resistance and resilience. This study evidence that the "Këmishtaj" cultivar has yielded an average of 2,55 t/ha^{-1}, the "Torpan" cultivar 2,5 t/ha^{-1} and "Argus" and "Abed Minor" yielded respectively 2,3 t/ha^{-1} and 2,1 t/ha^{-1}, which shows that they are well adapted to the conditions of Albania and can be successfully used in the production.

Keywords: *oat (Avena Sativa L.), cultivars, productivity, hybride, adaptation.*

QUALITY OF NECTARINE FRUIT IN HERZEGOVINA REGION

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Abstract

The aim of our work was to research the influence of agro-ecological factors on quality of nectarine during 2015 and 2016. We conducted research on three different locations in Herzegovinian area. On the locations Stolac, Mostar and Čapljina, we researched plantations of two nectarine cultivars *Big Top* and *Caldesi 2000*. The content of ash, dry matter, total acidity and the content of total sugar in nectarine fruit showed statistically important differences compared with years and locations of studied cultivars. The cultivar *Big Top* had the highest value of dry matter and total acidity on the location of Stolac (15,14 and 0,72%, respectively) The highest content of ash was on the location of Mostar (1,61%), and the highest value of total sugar was registered on the location of Čapljina (11,99%). The values of all the tested parameters were higher in 2015 compared to 2016. The sort *Caldesi 2000* had the highest value of dry matter on the location of Stolac (12,92%). The highest value of ash and the total sugars were registered on the location of Mostar (0,66 and 10,6%, respectively). The highest value of total acidity was registered on the location of Čapljina (1,2%) and the highest value of the total sugar was registered on the location of Mostar (10,6%). As far as the location is concerned, the Caldesi 2000 cultivar is more suitable for the Mostar area. At locations of Stolac and Čapljina both cultivars are suitable for breeding.

Key words: *nectarine, fruit quality, Big Top, Caldesi 2000.*

INFLUENCE OF PRODUCTION SYSTEM ON THE CONTENT OF LYCOPENE IN TOMATO FRUIT AT VARIOUS AGRO-ECOLOGICAL CONDITION

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Abstract

Tomato is the second most consumed vegetable in the EU and a major dietary source of many nutrients, vitamins and antioxidants.Tomato is a rich source of lycopene, β-carotene, α-tocopherol, phenolic components, the necessary minerals, primarily potassium and carboxylic acids including ascorbic, citric, maleic, fumaric and oxalic in human diet. Demand for organic tomatoes is increasing due to its nutritious value.Lycopene concentration of in tomato samples was determined by spectrophotometric method. The results showed that the lycopene content of in the Matias hybrid ranged between 5.42 mg/100g (conventional production) to 5.55 mg/100g (integrated production).The lycopene content in the Sakura hybrid ranged in between 6.30 mg/100g (conventional production) to 6.56 mg/100g (integrated production).The results obtained showed significant statistical differences in lycopene content of Matias varieties which was higher on the ones grown at the location Pocitelj brdo(6.17mg/100g) compared to Butmir(5.48mg/100g). Variety Sakura also had significantly higher values determinetaed the location Pocitelj brdo(6.80 mg/100g) compared to the same variety at the location Butmir(6.43mg/100g).

Keywords:*Tomato,Lycopene, Production systems, Agro-ecological conditions.*

GROWTH PARAMETERS OF TOMATO TRANSPLANTS CULTIVATED BY THE FLOATING CONTAINERS TECHNOLOGY

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Abstract

Commercial production of tomato is based on the use of transplants with a substrate lump around the root, which is also the most expensive transplant production method. In order to explore the possibility of growing transplants using a more cost-effective, innovative hydroponic technology applicable on family farms, a two-factor trial was set according to the method of completely randomized design (CRD). The research factors, term of putting the containers on nutrient solution, and substrate volume of a seeding place, were analysed through three levels. The transplants were grown on substrates of individual seeding place volumes of 27, 37 and 47 ml in containers placed on nutrient solution immediately after sowing, after previous germination and when the plants were in the stage of development of cotyledon leaves. For each type of container, transplants were also grown using the classic method, which was the control variant. The percentage of well-developed tomato transplants was greater for the cultivation on nutrient solution in the containers with previously germinated seeds in comparison with conventionally grown transplants. Also, the transplants grown on nutrient solution had higher values of analysed growth parameters in comparison with classic growing. Each of the tested variants had a highly significant effect on stalk length, diameter and the number of leaves of tomato transplants, while a highly significant interaction of individual variants was also established for stalk length. The research results indicated that high-quality tomato transplants could be produced using the growing technology in floating containers on nutrient solution, which would certainly help in reduction of transplant production costs for smaller commercial vegetable producers.

Keywords: *transplants, tomato, floating containers, nutrient solution*

INFLUENCE OF THE SELECTED VARIETIES OF LETTUCE *(LACTUCA SATIVA L.)* ON YIELD AND NITRATE CONCENTRATIONS

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Abstract

Lettuce (*Lactuca sativa L.*) is a highly valued vegetable in human nutrition not only for its richness in minerals and vitamins but also for the fact that nowadays it is produced all year round, and consumed fresh so that all the ingredients stay intact. Taking into consideration the fact that lettuce is the most commonly grown vegetable in the world, there is a large selection of varieties. The aim of the research was to distinguish and to measure the differences in productive characteristics and contents of nitrates in the there the most planted lettuce varieties in greenhouses of Bosnia and Herzegovina. The research was implemented during the growing season 2016/2017. in greenhouse sized 200 m^2. Lettuce was planted 7.12.2017. The research was conducted on lettuce samples of the types butterhead (Shangore and Nantes) and batavia (Funly). At technological maturity lettuce samples were collected for analyses. The productive parameters which showed significant differences between varieties are average mass of the formed head (0,261-0,372 kg/head) and yield (3,56-5,948 kg/m^2). On the other side, a significant influence of variety was not proved statistically in the case of nitrates content in lettuce heads. The contents of nitrates were ranged (1200 to 2500 mg/kg).

Key words: *lettuce, variety, mass of the formed head, yield, nitrates content*

COMPARATIVE VALUE OF GRASS AND LEGUMES PROTEIN YIELD AT DIFFERENT CUTTING REGIMES IN TEMPORARY GRASSLANDS

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Abstract

The production of bulk feed, with high protein contents, is one of the most important tasks of livestock production. Apart from pure legume crops, high yields of good quality bulk feed can also be achieved by grass-legume mixtures. In practice, temporary grasslands commonly known as grass-clover mixtures, usually comprise various types of grasses and legumes. Given that the quality of forage primarily depends on the botanical composition and stage of the development of plants at the time of grazing or cutting, the aim of this investigation was to determine the influence of the cutting regime on raw protein yield in different species of grasses and legumes in the plant community. A two-year study on protein yield showed that the cutting regime was a very important factor for obtaining high protein yields per unit of surface, since cutting at the flowering stage of legumes in all mixture variants resulted in a statistically significantly higher yield compared with those obtained at other cutting regimes. The maximum two-year protein yields at the cutting regime involving the flowering and budding phases of legumes were obtained by the S2 variant (3084 kg ha^{-1} and 2579 kg ha^{-1}, respectively), with high percentage of bird's-foot trefoil, while at the cutting regime involving the grazing imitation phase, the highest protein yield was obtained by the S3 mixture (2238 kg ha^{-1}) with equal representation of red clover and bird's-foot trefoil (20% each at sowing).

Key words: *temporary grassland, cutting regime, protein yield.*

DIVERSITY OF *IN SITU* WILD PEAR (*PYRUS COMMUNIS* L.) POPULATION IN THE LOCALITY OF KOZARA (BOSNIA AND HERZEGOVINA)

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Abstract

The Balkan Peninsula is considered a secondary centre of genetic diversity of wild pear. To this point, the population of wild pears in Bosnia and Herzegovina (B&H) has not been the subject of comprehensive research. Certain areas are characterized by a large variety of wild pears, one of which is Kozara mountain. The aim of these researches is the morphological characterization of *in situ* populations of wild pear on Kozara mountain, Previja locality (B&H) and the separation of the accessions with certain positive characteristics for selection of varieties and rootstocks. In Bosnia and Herzegovina and in many European countries the wild pear is the main seedling rootstock for grafting cultivated pears. There are nine (9) accessions inventoried in the locality of Previja. The morphological characterization of the vegetative organs of the selected pear trees was performed during two-year period (2012 and 2014) and the following parameters were analyzed: tree trunk characteristics (vigour and habit), characteristics of one-year-old shoots (bark colour, lenticels appearance, length of internodes) and leaf characteristics (leaf blade length and width, petiole length and the appearance of the stipule on the petioles, the shape of the apex and the base of the leaf blade, the shape of the leaf blade). The pomological characterization of the fruits of the selected accessions was carried out during 2012 and 2016 years with the following characteristics: fruit weight, height and width and fruit shape index, number of seeds in fruit, length and thickness of the stalk. The fruit trees had weak to medium vigour with the upright position of branches in most of the analyzed trees. The average weight of fruit of all the accessions in 2012 (15.12 g) was lower than in 2016 (21.01 g). The KP3 accession is distinguished by the number of seeds in the fruit, which is characterized by more than 2 seed germs in one seed case.

Keywords: *Wild pear, Morphological characterization, Leaf, Fruit.*

POMOMETRIC PROPERTIES OF POMEGRANATE (*PUNICA GRANATUM* L.) IN HERZEGOVINA REGION (BOSNIA AND HERZEGOVINA)

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Abstract

Pomegranate (*Punica granatum* L.) has long been domesticated in our area and it is rightfully considered as one of the autochthonous species of Herzegovinian karst. In lower karst areas, pomegranate occurs in various types of habitats and grows individually or in larger and smaller groups, forming pure populations or populations mixed with other species such as spruce, Jerusalem thorn and others. Wild pomegranate, known under the names *ljutun* and *ljutunac* (*P. granatum* var. *spontanea*) is different from cultivated pomegranate or *sladun, sladunac* (*P. granatum* var. *sativa*). A study of the wild-grown population of pomegranate was conducted at several sites in Herzegovina during two vegetation years, 2013 and 2014. In this study, the following pomegranate fruit properties were measured in 11 accessions (phenotypes) from the natural population: fruit weight (g), arils weight (g), weight of 100 arils (g), peel weight (g), peel thickness (mm), fruit height (mm), fruit width (mm), fruit crown height (mm), and fruit crown width (mm). Portions of peel and arils (%) were also determined. The average fruit weight ranged from 73.56 g to 114.82 g. The weight of most samples was higher in 2014 than in 2013. The average arils weight ranged from 32.87 g to 56.76 g. The average portion of arils in 2013 was 41.68% and 50.15% in 2014. The obtained data indicate significant effects of environmental conditions in individual years on properties of the same accessions at some locations, but also significant interaction effects between locations, years and accessions. The year factor had a greater influence on physical parameters of the wild pomegranate fruits than the location factor.

Keywords: *Wild pomegranate (Punica granatum L.), Location, Environmental conditions, Pomometric properties.*

VEGETATION OF THE CLASS *STELLARIETEA MEDIAE* IN THE "LIJEVČE POLJE" AREA IN NOTHERN BOSNIA AND HERZEGOVINA

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Abstract

This paper shows the results of two-year research (2013-2014) of the weed vegetation of the Lijevče polje area which includes four associations: *Panico-Galinsogetum parviflorae* Tüxen at Becker 1942, *Panico-Portulacetum oleraceae* Lozanovski 1962, *Cynodono-Sorghetum halepense* (Laban 1974) Kojić 1979 and *Erigerono-Setarietum glaucae* Šumatić 1997. Floristic-phytosociology researches were performed by the principles and methods of the Switzerland-French phytosociologic school on 61 localities from the area of municipalities Gradiška, Laktaši, Srbac and Kozarska Dubica in Nothern Bosnia and Herzegovina where 49 relevés were taken. Vegetation research included taking of relevés on test area of 100 m^2: space in row and between rows in orchard and vineyard, in grain crops and stubble from the whole area, root crops, and space between the rows. Relevés in orchards and vineyards on the territory of Lijevče polje were taken in neglected orchards and vineyards and in vineyards which are extensively processed and relevés in thick set crops and stubble were taken from parcels where herbicides were used, as well as from parcels where the application of herbicides was reduced. Also, relevés in root crops were taken in the same manner. Weed flora covered with four plant communities consists of 91 species. Results of correspondence analysis of all association shows similarity of stands association do not stand out subassociations. By projecting the plant communities on the mail components (Principal Component Analysis) and comparting them to the ecological indices (variables), it shows that *Panico-Galinsogetum parviflorae* depends on humidity the (F) and the chemical reaction (R), while *Panico-Portulacetum oleraceae* shows the dependence on the nutrients (N). Association *Cynodono-Sorghetum halepense* shows the dependence on the temperature (T) and the light (L). Association *Erigerono-Setarietum glaucae* is separated because it develops on the stubble.

Keywords*: weed vegetation, ecological indices, Lijevče polje*

ALTERNATIVE SUBSTRATE USE IN SAGE TRANSPLANTS PRODUCTION *(SALVIA OFFICINALIS* L.)

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Abstract

Mushroom production has become more popular in our environment. The most common cultivated mushroom is *Agaricus bisporus.* After mushrooms are harvested a large amount of used compost remains. This compost is a good material and producers used it as alternative substrate in plant production. The benefits of this compost are numerous like high content of organic matter and the rich mineral composition. The aim of this study was to determine the effectiveness of the use of spent mushroom compost (as alternative substrate) on growth and development of roots and above-ground parts of sage transplants (*Salvia officinalis* L.). Measurements of morphological parameters of plants (plant height, number of leaves, number of branches and plant diameter) were performed, as well as determination of fresh and dry weight of roots and above-ground parts of transplants. Application of spent mushroom substrate in the production of sage *Salvia officinalis* L. positively influenced growth and development as well as fresh and dry weight of roots and above-ground parts of treated plants compared to non-treated plants during transplanting growing stage. Plant height (+104%), number of leaves (+65%), number of branches (+143%), plant diameter (89%), were significantly increased by the spent mushroom compost application compared to the control - commercial substrate.

Keywords: *spent mushroom compost, seedlings, sage.*

EFFECTS OF PLANT DENSITY ON THE YIELD AND TOTAL PHENOLIC CONTENTS OF TARTARY BUCKWHEAT

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Abstract

Tartary buckwheat (*Fagopyrum tataricum* L., Gaertn) is an annual plant from Polygonaceae family. This species is mostly grown in Asia where it is used as a traditional food. In Bosnia and Herzegovina, Tartary buckwheat is grown sporadically and mostly in a mixture with Common buckwheat. In some plant species, increasing the planting density may be used to increase grain yield in crops. The aim of this study was to determine the impact of different planting densities on yield and total phenolic contents in kernel. During three study years (2011-2013), three different planting densities were used: 200, 300 and 400 seed per m^2. Experiment was set up by randomized block method in four repetitions at the village Donje Selo, near Ilijaš. The result showed that plant density did not have a significant effect on plant height, 1000-grain weight, hectoliter mass and phenol contents. Grain yields were significantly dependent on plant density and the year of the study. The lowest grain yield (1666 kg ha^{-1}) was recorded in the sowing variant with 200 seed per m^2 and the largest grain yield (2215 kg ha^{-1}) was recorded in sowing variant with 400 seed per m^2. Phenol contents in kernels depended on years of investigation and ranged from 1.07 to 13.94 mg g^{-1}.

Keywords: *tartary buckwheat, plant density, yield, total phenolic.*

THE ACCUMULATION OF BIOMASS IN TRITICALE VARIETIES DEPENDING ON THE TREATMENT WITH PGRS AND DIFFERENT FERTILIZATION LEVELS

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Abstract

A field experiment was conducted during 2016-2018 growing season on the experimental field of the Crop Science Department at the Agricultural University of Plovdiv (Bulgaria). The experiment was arranged using the block method as split plot in three replications and plot size of 10 m^2. Comparative assessment of the biological productivity of the tested Trismart, Musala and Kolorit (standard) varieties was made between the variants with application of PGRs under the action of lower and higher fertilizer rate. The foliar application of the PGRs followed in BBCH 31. During the vegetation of triticale, fresh plants were taken at stages: tillering-leaves, spike emergence-leaves, stem, spikes, maturity- straw, spikes, grains, glumes. The results from the study showed, that the effect of the mineral fertilizer at stage steam elongation on the biomass accumulation of triticale was better expressed than the differences between the varieties. The lowest biological productivity at this growth stage during the years of the study was detected in all varieties treated with the lower fertilizer levels. The higher fertilizer level itself led to 7-8% increase of the dry biomass accumulation during the years of the study. Similar percentage increase was observed in the variants treated with higher fertilizer level in combination with the plant growth regulators. In the analysis of the varieties regarding the different fertilizer level, there were no differences in the organ distribution compared to the total biological yield and by all treatments the straw occupied the largest share, followed by the grain and glumes. The biological yield of triticale at maturity during the period 2016-2018 was mainly formed by the straw, whose share by the different treatments and varieties varied from 47.15 to 50.28 %.

Keywords: *Biomass accumulation, fertilization, PGRs, triticale, varieties.*

PEA (*PISUM SATIVUM* L.) DIVERSITY IN BULGARIA AND A STRATEGY FOR ITS UTILIZATION

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Abstract

This paper presents the diversity of pea plant genetic resources (PGR) and carries out an analysis of the accumulated database for the National collection, supported by the Institute of Plant Genetic Resources (IPGR) in Sadovo, Bulgaria. Numerous varieties, populations, forms and breeding pea lines, diverse in phenotype, maturity, directions for use and productivity represent the plant materials that are studied and preserved in the IPGR. Special attention is given to the accessions of Bulgarian origin, as they take a central point of the studies conducted in the Institute. The share of the indigenous pea forms is about 12.4% (out of total number of accessions) as the oldest ones were collected during expeditions prior to 1950. Most of the preserved varieties are a result of long-standing selection and people's breeding with a goal for green mass. They are characterized by high winter resistance and rapid early spring growing (*M-9, P-1, №155, 35 [a], 37[a], Podobren Plovdivski, Pleven 10, Mir*). Other varieties from these accessions are bred for dry seed (*Pleven 4, Pikardi, Vessela*). The third ones are bred as a priority for lodging-resistance (*Tedi, Amitie*) and are adapted for direct harvesting (affilate forms). The typical green pea varieties for canning and freezing (*Uspeh, Plovdivska perla*) are stored at the Institute. A large number of old varieties and populations are actively grown in organic farms with a closed production cycle, in home gardens and in smaller farms. It should be mentioned that accessions with alien background are used as gene donors of valuable features for the breeding process or for evaluation of their potential and opportunities for utilization.

Keywords: *Plant genetic resources, Pisum sativum L., organic farms, breeding process, utilization.*

THE EFFECT OF PGRS AND DIFFERENT FERTILIZATION LEVELS ON THE DRY MATTER FORMATION AND PHENOLOGICAL DEVELOPMENT OF TRITICALE VARIETIES

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Abstract

The biologically active substances known as plant growth regulators (PGRs) are steadily gaining popularity, because they are harmless and ecologically friendly. Their application is not only easy and economically profitable, but also improves the action of the fertilizers, the mineral balance of the plant and leads to yield increase. In order to establish whether the PGRs would influence the phenological development of triticale, a biennial field experiment (2016-2018) was carried out on the experimental field of the Crop Science Department at the Agricultural University of Plovdiv using the block method in three replications, with plot size of 10 m^2. The action of the PGRs Vitafer Algi and Vitafer Green on three triticale varieties (Trismart, Musala and Kolorit (standard)) was conducted under two different fertilizer levels $N_6P_5K_2$ and $N_{12}P_{10}K_4$. The PGRs were applied in the beginning of stem elongation (BBCH 31). The results showed that the both PGRs treatments combined with higher fertilizer levels increased the specific growth rate and dry matter accumulation of the tested plants compared to the untreated variants and the variants treated with lower fertilization rates in combination with PGRs. The beneficial interactive effects of PGRs and fertilization levels on the phenological development of triticale are worthy to further exploration.

Keywords: *Dry matter, fertilization, PGRs, phenological development, Triticale.*

EFFECT OF NITROGEN ON THE ACCUMULATION AND REUTILIZATION OF DRY MASS IN GRAIN SORGHUM

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Abstract

Accumulation and reutilization of dry mass until anthesis and during a grain filling period of sorghum in response to nitrogen fertilization in rates 0, 60, 120, 180, 240 and 300 kg $N.ha^{-1}$ was studied in a field experiment. Grain sorghum hybrid EC Alize was grown under not- irrigated conditions in the experimental field of Agricultural University of Plovdiv, Bulgaria. The experimental design was a randomized, complete block design with four replications with a size of experimental plots of 20 m^2 after wheat as predecessor. Standard farming practices for the region of Southern Bulgaria were applied. It was established that nitrogen fertilization significantly increased the amount of accumulated dry mass at anthesis and total above ground dry mass at maturity compared to N_0. Not significant effect of higher rates (180, 240 and 300 kg $N.ha^{-1}$) on the dry mass accumulation of sorghum was found. Average post anthesis net dry mass accumulation was 3291 $kg.ha^{-1}$ and its amount increased in parallel with the nitrogen rate up to N_{180}. The highest dry mass translocation, translocation efficiency, and contribution of pre-anthesis assimilations of the grain was established at nitrogen rate N_{120} with values 2073 $kg.ha^{-1}$, 25.0 % and 41,8 %, respectively. Growth of sorghum at higher nitrogen rates N_{180}, N_{240}, N_{300} significantly decreased efficiency of dry mass translocation and contribution of pre-anthesis assimilations of the grain. Nitrogen fertilization had very strong negative correlation with dry mass translocation efficiency (-0.860*) and contribution of pre-anthesis assimilations of the grain (-0.863*). Very strong positive correlation (0.988**) was found between dry mass translocation efficiency and contribution of pre-anthesis assimilations of the grain.

Keywords: *Grain sorghum, Nitrogen, dry mass, reutilization.*

PERFORMANCE OF SALT-STRESSED TOMATO CROP AS AFFECTED BY NANO-$CACO_3$, GLYCINE BETAINE, MKP FERTILIZER AND ASPIRIN APPLICATION

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Abstract

Salinity problem is a major abiotic stress affecting tomato growth. In Lebanon, the problem is rising in coastal zone and Northern (Baalback-Hermel belt) areas. The current work aimed to study the effect of Monopotassium-phosphate (MKP), Lithovit® (LITHO) (nano-$CaCO_3$), Glycine betaine (GB) and Aspirin (ASP) applied each in three concentrations (Low, Med and High) on tomato (*Solanum lycopersicum* L.) subjected to five salinity levels (EC=2,4,6,8 and 10 dS/m). Control treatments were those subjected to the five salinity levels with no products application. Results showed that increased salt stress reduced fresh weight of aboveground parts and roots while MKP-High improved fresh weight of aboveground parts at EC8 (by 44.6g) and EC10 (32.7g) and ASP-Med improved fresh weight of roots by 18g at EC10 compared to control. Root mass fraction was enhanced by Aspirin applied with all concentrations at EC2 and EC4 and by Lithovit at EC8. Dry matter accumulation in the aboveground parts was only improved by MKP at EC4, 6 and 10 and by Lithovit at EC6 and 8. Leaf area was reduced by 142.4g and cell electrolyte leakage was increased by 17% with increasing salinity. Lithovit enhanced leaf area with Lithovit-Med and total chlorophyll content with all concentrations at all ECs. Finally at EC4 total soluble solids increased following the application of Lithovit, MKP, ASP and GB with the highest concentrations, while Titratable acidity was increased only with GB-low. In conclusion, products' effects varied with EC level and applied dose.

Keywords: *tomato, fertilizer, osmo-regulator, salt-tolerance.*

COMPARATIVE STUDY OF GRAIN MAIZE HYBRIDS IN THE REGION OF NORTH – EAST BULGARIA

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Abstract

The field experiment was held in Stozher village (north-east Bulgaria) in the period 2014 - 2016. The test was performed by using blocking with four repetitions; experimental field area - 25 m^2 with winter wheat predecessor. The following hybrids were tested; PR38D89, PR37D25, PR36R10, PR37H24 and PR35F38. The total studied area was 500 m². The aim of the investigation was to establish the productivity of five maize hybrids cultivated for grain as well as recommend for growing the most suitable one under non-irrigation in region of north-east Bulgaria. All the stages of the established technology for maize growing were followed. For the purpose of determining the quantity dependence between the studied indicators, the experimental data was processed according to the Anova Method of dispersion analysis, and the differences between the variants were determined by means of the Dunkan's Multiple Range Test. The analysis of the results showed that the production possibility of hybrids maize is determined to a great degree by the meteorological conditions of the year mostly by the precipitation quantity. The highest values of elements of productivity (length of the cob, cop diameter, number of the row per cob, number of the grains per row, number of the grains per cob and mass of grains per cob) were reported with the hybrid PR35F38 and the lowest – with the PR38D89 hybrid. During the years of study the highest yield was obtained from PR35F38 – 6483 kg/ha, followed by PR36R10 – 6200 kg/ha and the lowest one – from PR38D89 hybrid – 5237 kg/ha. We recommend hybrid PR35F38 for growing being the most suitable, under non-irrigation conditions in region of north-east Bulgaria.

Keywords: *maize, hybrids, productive characteristic, yield of grain.*

SUBSTRATE TYPES EFFECT ON NUTRITIONAL COMPOSITION OF BUTTON MUSHROOM (*AGARICUS BISPORUS*)

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Abstract

Button mushroom (*Agaricus bisporus*) has been recognized as a fair substitute for meat and is the most intensively cultivated mushroom worldwide. The nutritional value of the mushroom is one of the main factors determining its quality. The current study investigated the variation in nutritional composition of button mushroom as affected by substrate type. Three locally composted wastes were used; chic: deep litter chicken manure, ban: banana wastes (leaves and pseudo-stems) and win: winery wastes (grape marc). Each type of compost was mixed separately with horse manure compost (hors) in different ratios (30%, 50%, 70% and 100%) on volume basis. Control substrate consisted of 100% horse manure compost. Results showed that in the mixture hors-win: 30-70 water, fat, Mg, Fe, Cu, Zn, Na and Ca contents were reduced, while ash and K contents were increased. There was a peak of water (90%), proteins (5.2%), Fe (21.9mg/kg), Cu (18.6mg/kg), Zn (10.2mg/kg), Na (74.5mg/kg), K (2mg/kg) and Ca (65.8mg/kg) contents in mushrooms picked from hors-chic: 0-100. Moreover, growing the mushroom on composted banana wastes (hors-ban: 0-100) produced fruits with the lowest protein (2.9%), fat (0.01%), Mg (147.5mg/kg), Na (64.8mg/kg), K (1.4mg/kg) and Ca (55.8mg/kg) contents and the highest ash content (2%). It seemed that the total use of chicken manure compost allowed the production of mushrooms with the closest nutritional composition to those of the traditional compost.

Keywords: *Button mushroom, nutritional value, substrate.*

EFFECT OF INTERCROPPING MAIZE WITH COWPEA ON FORAGE YIELD AND QUALITY

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Abstract

Low cost and high dry matter content are the reasons why cereals play an important role in feeding ruminant animals. Nevertheless, maize forage is poor in protein content which leads to low quality and nutritive value. Regarding the high feed costs of protein supplementations, legumes can be used in livestock nutrition for their high protein content, and thus, provide cost savings. In this study, maize (*Zea mays* L.) and cowpea (*Vigna unguiculata* L.) were intercropped in different sowing densities and their monocropping equivalents were tested to determine the best intercropping system on forage yield and quality. Maize was cultivated alone (75 000 plants ha^{-1}) and intercropped with cowpea as follows: 75 000 plants ha^{-1} of maize and 37 500 plants ha^{-1} of cowpea (M_1), 75 000 plants ha^{-1} of maize and 50 000 plants ha^{-1} of cowpea (M_2) and 75 000 plants ha^{-1} of maize and 75 000 plants ha^{-1} of cowpea (M_3), in rows alternating with maize. The highest dry matter yield was produced by M_3 (20.4 t ha^{-1}), and the lowest by M_1 (17.3 t ha^{-1}). All intercropped systems had higher dry matter crude protein contents, M_1 (101 g kg^{-1}), M_2 (114 g kg^{-1}) and M_3 (125 g kg^{-1}), than the monocrop maize (79 g kg-1). Intercropping of maize with cowpea reduced neutral detergent fibre and acid detergent fibre contents, resulting in increased forage digestibility. Therefore, maize intercropping with cowpea could substantially increase forage quantity and quality, and decrease requirements for protein supplements as compared with maize monocrop.

Keywords: *Intercropping, maize, Cowpea, yield, quality.*

EFFECT OF INTERCROPPING MAIZE WITH SOYBEAN ON FORAGE YIELD AND QUALITY

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Abstract

Cereals are high important in feeding ruminant animals for their high dry matter production and low cost. However, maize forage is poor in protein content which shows its low quality and nutritive value. Regarding to high feed costs of protein supplementations, legumes can be used in livestock nutrition for their high protein content and, thus, providing cost savings. Since legumes have low dry matter yield, acceptable forage yield and quality can obtained from intercropping cereals and legumes compared with their sole crops. In this study, maize (*Zea mays* L.) and soybean (*Glycine max* L. Merril) intercropped in different numbers of rows and their monocropping equivalents were tested to determine the best intercropping system on forage yield and quality. Maize was cultivated alone and intercropped with soybean as follows: 1 row maize to 1 row soybean (1M1S), 1 row maize to 2 rows soybean (1M2S) and 1 row maize to 3 rows soybean (1M3S). The highest dry matter yield was produced by intercropping 1M3S (19.2 t ha^{-1}) and the lowest by 1M1S (16.9 t ha^{-1}). All intercropping had higher crude protein values in dry matter 1M1S (113 g kg^{-1}), 1M2S (122 g kg^{-1}) and 1M3S (130 g kg^{-1}) than the monocrop maize (77 g kg^{-1}). Intercropping of maize with soybean reduced neutral detergent fiber and acid detergent fiber content, resulting in increased forage digestibility. The study showed that among all intercropped forages the 1M3S (1 row maize to 3 rows soybean) was preferable according to forage yield and quality than other intercropping.

Keywords: *Intercropping, maize, soybean, yield, quality.*

PHYSICOCHEMICAL AND COOKING QUALITY OF RICE GENOTYPES

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Abstract

Rice production is largely expanding in Ethiopia. Although rice production is growing, very little information is available on the grain quality of rice. The objective of this study was to determine the physicochemical and cooking qualities of rice genotypes. Physicochemical analysis was conducted at Bahirdar University laboratory from July to August, 2015. The result on 15 rice genotypes showed that most of the genotypes had high to intermediate amylose content, which showed the susceptibility of the genotypes for stickiness. The cooking time ranged from 12 to 30 minutes, loss of solid gruel during cooking ranged from 1.94 to 5.31%. Non-significant ($P< 0.05$) difference was found in grain elongation in most of the genotypes. Grain elongation on cooking is dependent on genetic factors as well as the degree of milling. The alkali spread value indicated, the gelatinization of six genotypes including the released variety (NERICA 4) was intermediate gelatinization temperature (70-74^{o}C) which shows the softness of these genotypes after cooking. Optimum cooking time was positively correlated with water uptake ratio, alkali spread value and ash content. This showed that the presence of minerals elongate the cooking period. Gel consistency positively correlated with alkali spread value and negatively to ash, water uptake ratio and optimum cooking time. Generally, it was found that some genotypes had favorable grain quality and good correlation with most important characteristics. Also, good cooking characteristics were found in some of the genotypes. It is highly recommended to characterize more genotypes and improve important cooking quality traits.

Keywords: *amylose content, cooking quality, gelatinization, genotype, rice characterization*.

TECHNIQUE OF THE ACCELERATED RECEIVING OF BASIC (ELITE) SEEDS OF NEW AND DEFICIT VARIETIES

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Abstract

The intensification of all processes of cultivation and production of agricultural crops is a basis of the modern agriculture, which means sowing of thoroughbred seeds. Therefore, in the leading countries of the world, special attention is paid on industrial seed farming. The right management of seed farming enables complete realization of productivity of the variety and maintaining its economic and biological properties. In the modern conditions in seed farming great attention is paid to variety replacement and variety renewal. Fast replacement of a variety provides the complete revealing of potential opportunities of new variety, which ensures the fastrefund. Renewal of the varieties provides the maintaining of high-quality traits of varieties. Proceeding from the methods of releasing of varieties, the duration of their use in production varies from one to five years. Proceeding from international experience, those countries which provide fast replacement of varieties and their renewal, receive big yield per hectare. Nowadays, in Georgia there is no system of seed farming, the farms as usual use sub-standard seeds therefore productivity of crops is catastrophically low (wheat – 1,5 t/hectare, corn - 2,5 t/hectare, potatoes - 15,0 t/hectare). The system of seed purification of varieties is quite a long process and it takes 6-7 years. Therefore for the reduction of duration of seed purificationwe set a goal to develop the accelerated method of receiving seeds. On the basis of the researches conducted in 2013-2017 was developed the technique of the accelerated receiving of basic seeds of new and deficit varieties in 3-4 years instead of 6-7 years.

Key words: *seed farming, grade, wheat, elite, standard seeds.*

SINGLE-PLANT SELECTION AT ULTRA-LOW DENSITY OF THREE BEAN CULTIVARS AND SALINITY TOLERANCE DURING GERMINATION

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Abstract

Single-plant selection under ultra-low density (interplant distance of 100 cm), between 3 common bean (*Phaseolus vulgaris* L.) cultivars, the Greek cultivars, Iro and Pirgetos and an imported one, was performed in a honeycomb design experiment established during 2017 in the main farm of the Western Macedonia University of Applied Sciences in Florina resulting in first generation sister lines. Divergent selection of individual plants characterized as providing high (H) and low (L) yield led to 3 H and 3 L first generation genotypes, for each cultivar respectively. Salinity tolerance during germination and early seedling growth was evaluated for 18 first generation sister lines and 3 original cultivars at 0, 60, 120 and 180 mM NaCl in a randomized complete block design experiment with four replications. Germination percentage (G%), mean germination time (MGT), coefficient of velocity of germination (CVG%), time to 50% germination T_{50}, sensitivity index (SI) and fresh and dry weight of radicles and hypocotyls were measured. Salinity stress delayed germination and affected early seedling growth significantly, with the biomass of radicles plus hypocotyls decreasing with increase in salinity stress, in all genotypes tested. Significant differences were observed among first generation sister lines and the original cultivars in their response to the highest salinity stresses. Significant differences between H and L yielding lines were also shown on SI in salt stress especially within the cultivar Iro. Further research is needed to confirm the results of the present study so that any existing variation is beneficially exploited.

Keywords: *Ultra-low plant density, Salt tolerance, bean germination, Sensitivity index.*

EFFECT OF THE 1BL.1RS WHEAT-RYE TRANSLOCATION ON QUALITATIVE TRAITS IN BREAD WHEAT

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Abstract

Despite the positive effect on yield and resistance under stress conditions, cultivars carrying the 1BL.1RS wheat-rye chromosome translocation have a critical drawback, i.e. the deterioration of the end-product quality of the host cultivar. In order to study this deterioration, four bread wheat cultivars carrying and six without the aforementioned translocation, were evaluated in the field for two successive years. The experiments were established in the farm of the Western Macedonia University, which represents a rather cold and wet area. Each experiment consisted of four replications and every effort was made to grow the plants under optimum conditions. The following traits were studied: yield, 1000 kernel weight, hectoliter weight, protein %, moisture %, starch %, Zeleny test. The results indicated that there was not any specific effect of the translocation on yield because two cultivars without the translocation were ranked first, although they did not differ from the following two cultivars carrying the translocation. On the other hand, there was no negative effect of the translocation in most of the qualitative traits in bread wheat. Furthermore, one of the cultivars carrying the translocation (cvr. Acheron) performed equally sufficient with the cultivars without the translocation in 1000 kernel weight. A similar performance was observed in the rest of the examined traits: cvr. Acheron was ranked first in protein content, wet gluten and Zeleny test. Cultivar Elissavet, also carrying the translocation, performed equally well with Acheron in protein content (%) and was ranked first in hectoliter weight. It could be concluded from all the aforementioned results that the translocation had no negative effect on bread wheat quality. However further study is needed to confirm the above results.

Keywords: *yield, quality, 1000 kernel weight, protein, gluten, Zeleny test.*

PLANT PROTECTION OF GERANIUM (PELARGONIUM) IN HORTICULTURAL OF KECSKEMÉT

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Abstract

In Hungary, the second best-selling potted and balcony plant is geranium (*Pelargonium*) after cyclamen (*Cyclamen* sp.). Of the more than 240 types of *Pelargonium*, the most sensitive and most infected is the garden geranium (*Pelargonium hortorum*). Due to the large crossing of natural species, a large number of hybrid varieties are grown. The research was carried out in Kecskemet at the Gyenes Flower gardening. In horticulture, there are more than 80 different colors of the geranium standing, running, semi-trailer types, and the most recent F1 hybrid types and English gnawing. The geranium plants are grown in 3 greenhouses on Klasmann's peat. The research describing crop protection was carried out between 2013 and 2018. The greatest damage was caused by the Western flower thrips (*Frankliniella occidentalis*). The following insecticides were used against it: Mospillan, Admiral, Cyperkill and Lannate. The leaves and a bud damage caused destroyed the plants to a large extent. Major damage was caused by the greenhouse leaflet (*Trialeurodes vaporariorum*) and to the peat fly (*Bradysia* sp.). The larva of peat fly damaged the geranium cuttings, which could cause the geranium to develop and therefore death of the plant. Of the diseases, botrytis (*Botrytis cinerea*) was the most typical. Typical geranium rust (*Puccinia pelargonii-zonal*) did not occur in horticulture, due to the adequate prevention. Horticulture expands year by year and changes the proportions of the types of geranium according to customer needs.

Keywords: *Geranium (Pelargonium), Gyenes Flower gardening, plant protection, Frankliniella occidentalis, Botrytis cinerea.*

THE EFFECT OF SOWING DATE AND WATER STRESS ON GRAIN, FODDER YIELD AND SOME AGRONOMIC TRAITS OF FOXTAIL MILLET (SETARIA ITALICA) IN SISTAN REGION (IRAN)

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Abstract

In order to assess the most suitable planting date and the effect of drought on grain and forage of Foxtail millet (Bastan varieties), the experiment was conducted on a split plot in a randomized complete block design with three replications in agricultural and natural resource Research Station of Zahak in Iran in 2012-2013. The main plots were consisted of four sowing dates (1-15-30 March and 15 April) and the sub plot was the drought (50-65- 80)% field capasity where 50% field capasity were used as control. Analysis of variance showed the planting date on all traits had significant effect. The highest grain yield and fresh and dry forage with an average 1519, 25222 and 6405kg.ha^{-1} respectively on March 15 planting were obtained. The interaction of water stress and planting date on all traits had a significant effect. The highest fresh forage and dry forage yield with an average of 6512 and 25701kg.ha^{-1} respectively was obtained in 50% field capasity. Most grain, fresh and dry forage yield with average 2130, 35547 and 9108 kg.ha^{-1} respectively were obtained on 15 March planting and field capasity of 50%,.

Key words: *Bastan cultivar, planting date, drought stress, grain yield.*

INFLUENCE OF HARVEST DAY-TIME ON ANTIOXIDANT ACTIVITY OF ISTANBUL OREGANO (*ORIGANUM VULGARE* SSP. *HIRTUM* (LINK) LETSWAART)

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Abstract

The species of Oregano has antibacterial and antimicrobial properties due to its components. Istanbul oregano (*Origanum vulgare* subsp. *hirtum* (Link) Ietswaart) is a member of the genus Origanum and it is widely distributed in North Africa, in temperate and arid zones of Eurasia. The aim of this study was to investigate the influence of different harvest day-times (6:00, 9:00, 12:00, 15:00, and 18:00 o'clock) on antioxidant activity in oregano leavesin Urmia region, West Azerbaijan, Iran. The antioxidant indices of plant were determined, including phenolic content, flavonoid content, DPPH, nitric oxide radical scavenging activity, super oxide radical scavenging activity and chain-breaking activity. The results showed that the antioxidant activity differed significantly in response to variation in harvesting times, so that the highest nitric oxide radical scavenging activity (27.19%), super oxide radical scavenging activity (71.67%) and chain-breaking activity (53.64 -Abs-3 /min/mg extract) were found at 18:00 harvest time; total phenolic content (61.85mg Gallic acid/g DW), and DPPH (1,1-diphenyl-2-picryl hydrazyl) (62.30%) were observed at 12:00 harvest time, whereas the highest total flavonoid content (7.21 mg quercetin/g dry weight) was found when harvest time was 15:00. In conclusion, in terms of different antioxidant activity indices, harvesting at 18:00, 12:00, and 15:00, respectively, proved to be better than harvesting at other times. The results showed that the highest nitric oxide radical scavenging activity (27.19%), super oxide radical scavenging activity (71.67%) and chain-breaking activity (53.64 -Abs-3 /min/mg extract) were found at 18:00 PM harvest day-time; total phenolic content (61.85mg Gallic acid/g DW), and DPPH (62.30%) were observed at 12:00 harvest day-time, whereas the highest total flavonoid content (7.21 mg quercetin/g dry weight) was found when harvest time was 15:00 PM. Healthy and antioxidant properties of Istanbul oregano leaves depend on harvest day-times. Knowledge of the nutritional properties of these the plant leaves might translate into benefits to growers and enhancement of health for consumers.

Keywords: *Phenolic content, nitric oxide, harvesting time, aromatic.*

EFFECT OF ETHYLENE ON ANTIOXIDANT ENZYMES ACTIVITY IN ETHYLENE-INSENSITIVE CUT ROSES (*ROSA HYBRIDA* L.)

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Abstract

Cut roses (*Rosa hybrida* L.) have been classified as ethylene-sensitive, but the nature of the ethylene sensitivity changes in these flowers has not been well characterized. Therefore, in this work, ethylene-insensitive cut roses consisting *etr1-1* gene were evaluated. Cut roses prepared from an isolated greenhouse at commercial stage, after transferring to the laboratory, were compared regarding the content of antioxidant enzymes by ethylene treatment (0, 0.5 and 1 µl l^{-1}). Evaluations were carried out in wild type and transgenic line in bud and half-open stages. The research was performed in completely randomized factorial design by four replicates. After measuring and applying the statistical differences at the $P \leq 0.05$ level via SAS software was done. The results showed that ethylene significantly increased superoxide dismutase, catalase and guaiacol peroxidase activities in bud and half-open stages in wild type and transgenic line. Maximum antioxidant enzymes activity was observed in wild type roses in bud and half-open stages treated by 1 µl l^{-1} ethylene which had a significant difference in comparison with the same stage in transgenic line. According to the increasing trend of these enzymes activities in wild type and transgenic lines with higher concentrations of ethylene, it seems that, ethylene by inducing senescence oxidative damage could accelerate flower senescence. Therefore, genetic manipulation of ethylene receptor genes of ethylene-sensitive flowers as well as roses could decrease oxidatve stress during senescence and considerably improved longevity.

Keywords: *Antioxidant enzyme, Cut roses, Ethylene.*

ESTABLISHMENT OF HAIRY ROOT CULTURES BY *AGROBACTERIUM RHIZOGENES* MEDIATED TRANSFORMATION OF *CICHORIUM INTYBUS* L.

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Abstract

Hairy roots culture has been cosidered as an alternative method for medicinal compounds production in plants. Thistechnology causes improvement high volume production of pharmaceutical substances.Chicory (*Cichorium intybus* L.) is a medicinal plant from *Asteraceae* and contains many important metabolites including chicoric acid, inulin, scoline, coumarin and flavonoids. It is useful forhepatic disease treatmentand promotes appetite and digestion.Over 100 individual and important compounds have been identified from this medicinal plant and the most of them are present in roots.In this study a reliable gene transfer system via different strains (A_4, ATCC11325 and ATCC15834) of *Agrobacterium rhizogenes* and explants (leafs and petioles) were established in *C. intybus* L. then were chosen the best hairy roots lines obtained from different explants. The results of experiments showed that the highest hairy roots induction (60 percent) were observed in the A_4 strain with leaf explantswhereas ATCC15834 and petiole explants have shown the lowest percentage of hairy roots induction (13.33 percent) also difference in means of hairy roots number, length and branching was observed in different treatments. The maximum hairy roots number (8.78 roots per explant), length of roots (8.66 cm) and root branching (18.82) were induced from the A_4 strain with leaf explants. The highest hairy roots lines growth occurred by ATCC15834 strain and line 3. Molecular confirmation of transgenic hairy roots was done with PCR using gene-specific primers for *rol*B genes.

Keywords: *Co- culture, hairy roots line, Rolgene, secondary metabolites.*

EVALUATION OF THE CULTIVARS MELONS (*CUCUMIS MELO* L.) FROM IRAN

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Abstract

In order to determine high yiel melon landraces in sistan region for yield, 20 melon landraces were evaluated in March 2014 cropping season, these landraces including: Khaghani, Ghandak Kerman, Suski green skin, Ghaenat, Green striated, Shadgan, Ghomi, Jajrood, Kabiri seed thined, Yellow Ivanaki, Ghasri, Hendi, Talebi, Sefidak Zabol, Til neyshaboor, Dargazi, Ghandak Zabol, Atashi, Golden Sefidak and Helmendi. The experiment was conducted in agriculture resarch station of Zahak (Iran) in randomised complete-block design with 3 replications. Analysis of variance showed significant difference among landraces for number of fruit, fruit weight, fruit width, cavity diameter, flesh thickness and total yield. The highest yield were recorded in Golden Sefidak and Dargazi (28.2 and 23 t/ha) respectively. Correlation analysis revealed that the final yield was related to plant yield. Factor analysis showed that 3 factors had the most cumulative variance and cluster analysis divided all landraces in two groups. The highest total solid soluble (TSS) and fruit weight were recorded for Ghomi and Shadegan, respectively. According to the results of factor analysis, total of 75% of variation between and within landraces were explained by 3 factors. All landraces were divided into 3 groups in cluster analysis based on the ward method.

Key words: *Melon, Landrace, Population, Yield, Sistan.*

VARIATION OF RYE GENOTYPES FOR SOME MORPHOLOGIC TRAITS VIA BIPLOT METHODOLOGY

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Abstract

Limited information is available on trait relations of rye landraces in world and the objectives of this study were to understand the relationships among traits, and to document trait profile of some rye landraces. Effective interpretation of the data is important at all stages of plant improvement and the genotype by trait (GT) biplot was used for two-way wheat dataset as genotypes with multiple traits. For this propose, 18 rye genotypes with specific characteristics were evaluated in randomized block design with four replications. The GT biplot explained 61% of the total variation (the first two principal components explained 40 and 21%, respectively). The polygon view of GT presented for 11 different traits of rye landraces showed six vertex landraces as genotypes G1, G3, G6, G8, G11 and G13. The landrace G8 had the highest values for most of the measured traits. The genotypes G8 and G7 following to genotypes G3, G18 and G19 could be considered for the developing of desirable progenies in the selection strategy of rye improvement programs. The landraces used in this study were found to be useful sources for genetic variability for future breeding that targets to improve grain yield and other agronomic traits of rye.

Key words: *genotype-by-trait, principal components, trait associations.*

GENETIC VARIATION OF SOME MORPHOLOGICAL CHARACTERISTICS AMONG CUMIN LANDRACES

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Abstract

Genetic improving seed yield performance is the most important target of cumin breeding programs. Thus, 64 landraces were studied in field conditions across two years and plant height, days to flowering initiation, number of umbels per plant, number of umbellets per umbel, number of seeds per umbel, thousand seed weight, biological yield, seed yield and harvest index were measured. The results revealed significant differences among accessions for all studied traits across both experimental years. According to factor analysis, the first two components explained about 60% of variation in the first year while the first two components explained 61% of total variation in the second year. In the first year, biological yield, seed yield and number of umbels per plant were positive correlated traits while in the second year number of seeds per umbel was associated with above traits. In both years, thousand seed weight and harvest index were positive correlated with each other. Based on factor analysis, 64 genotypes were divided into four groups in both years, whereas groups 1 and 2 showed maximum seed yield and some yield components while the other groups indicated maximum performance of other variables.

Key words: *Factor analysis, morphological traits, genetic variation.*

EFFECTS OF CHEMICAL FERTILIZERS ON BELL PEPPER SEEDLING PRODUCTION

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Abstract

Pepper (*Capsicum annum* L.) belongs to *Solananceae* and it is one of the most important vegetables. Capsicum annuum is a species of the plant genus Capsicum native to southern North America and northern South America. The species encompasses a wide variety of shapes and sizes of peppers, both mild and hot. There is a correlation between the seedling quality and yield and it is necessary to use seedlings with the best quality in the green houses. In this research, the effects of different concentrations of NPK (20:20:20), time of fertilizing, and KH_2PO_4 fertilizer on three commercial bell pepper cultivars (hybrid of Inspiration, Arancia and Tarento) were investigated on seedling production using a factorial arrangement in a completely randomize design (CRD) with 6 replications. The results showed that the highest values for most traits and in all three cultivars were obtained in applying 2 $g \cdot L^{-1}$ NPK (20:20:20) and 100 $mg \cdot L^{-1}$ KH_2PO_4 and fertilizing every three days.

Keywords: *Seedling, KH_2PO_4, NPK.*

PHYSIOLOGICAL EFFECTS OF GRAFTING IN APRICOT TREES

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Abstract

Grafting of fruit trees is a widely used agronomic practice. Depending on the purpose of its application, grafting may influence many phenological traits of the plant, such as vegetative growth, precocity of fruiting, balance between vegetative growth and fruit production, ripening time and fruit quality. In physiological terms, grafting may modify plant photosynthesis, transpiration and water use capacity. The aim of the present study was to determine the effects of different grafting techniques and of different combinations of rootstock and scion and to characterize the changes induced in the plants. In the experiment, apricot *cv.* San Castrese was studied in combination with two different clonal rootstocks: Isthara and GF677. The effects of interstock grafting were also investigated, using the Japanese apricot species *Prunus mume*. Various tests and physiological measurements were completed to quantify the effect of grafting on vegetative growth and development of the plants. All measurements were taken on leaves located in the middle of the main branches using the photosynthesis-meter Li-Cor in closed systems. Botanical assessments at the grafting point and other physiological data allowed the evaluation of the effects of grafting on plant physiology. Since water equilibrium is controlled by a complex physiological system, dependent on genetic characteristics of the species and the cultivation conditions, this study confirmed significant differences between different plants. The use of stomata conductivity and leaf temperature as indicators for determining the water balance in plants offers an effective and rapid method for characterizing the influence of water stress on plants and allows the determination of its degree of resistance to drought.

Keywords: *Rootstock, scion, disaffinity, intermediate grafting, graft union.*

MECHANIZED MANAGEMENT OF PRUNING RESIDUES IN SWEET CHESTNUT ORCHARDS

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Abstract

In Italy, *Dryocosmus kuriphilus* is a major insect pest of chestnut orchards causing gall formation and significant yield losses. The use of the parasitoid wasp *Torymus sinensis* is an effective biological control method that requires the appropriate management of the pruning residues, to preserve the woody galls in which *T. sinensis* adults overwinter. An innovative tractor-pulled combined mechanical shredder was tested for treating the residues, once the pruning operations are completed. The machine processes the residues in a single-step, picking-up the prunings from the orchard floor, shredding them to appropriate size, and collecting them into a rear container. The shredded residues may then be concentrated into a few piles for the long-term field storage, until next spring. The aim of the study was to evaluate the machinery's operative performance, the quality of the shredded biomass and the impact on gall integrity. In the field trials, the machinery effectively shredded the residues achieving an average operative capacity of 1.19 $ha \cdot h^{-1}$ and a work capacity of 1.79 $t \cdot h^{-1}$. Moisture content, apparent bulk density, and particle size distribution of the shredded biomass were determined. Over 95% of wood chips were included in the 3.15-45 mm size range, making them suitable for use in residential biomass furnaces. The calorific power of the chestnut residues was similar to that reported for other hardwood species (18-20 $MJ \cdot kg^{-1}$). Also, the mechanical action of the shredder preserved at least two thirds of the winter galls, safeguarding the parasitoid's life cycle.

Keywords: *Gall wasp, Castanea sativa, mechanical harvesting, biomass quality, gall integrity.*

MITIGATING SALINITY EFFECTS ON ZUCCHINI PLANTS BY APPLICATION OF GLYCINE BETAINE

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Abstract

Most of irrigated arable lands in Arabic countries are suffering of salinity problems either in soil or irrigation water. This problem has a strong impact on countries such as Egypt with limited natural resources of agricultural land and irrigation water, more precisely in the Northern parts of the Nile River. Therefore, this work was designed to investigate the responses of Zucchini plants (*Cucurbita pepo L.*) to salinity while applying glycine betaine (GB) to improve such responses. The experiment was carried out in an open-field in Beheira governorate, Egypt in order to study the effect of exogenous application of GB on improving salt tolerance of zucchini plants (*var. cylindrica*). Salt stress was induced by daily fertigation using saline water of an EC=6 dS/m. GB was applied through foliar spray with a concentration of 10 mM one week (first application) and four weeks (second application) after transplanting. It was found that GB application induced superiority in all tested indicators except in fruit number. Stem length, fresh weights of leaves and stems, chlorophyll content, fruit yield and weight of individual fruit were improved by 18.7%, 127%, 58%, 7%, 26% and 45% respectively. Moreover, fruits of treated plants were bigger and richer in total proteins, potassium, phosphorus and water compared to control fruits. Results revealed that GB application has helped in mitigating the detrimental effects of salinity on growth and production of zucchini plants under the current experimental conditions.

Keywords: *glycinebetaine, salt stress, zucchini, plant growth, production.*

DETERMINATION OF CHEMICAL COMPOSITION AND AMINO ACIDS IN WHEAT BY NEAR INFRARED REFLECTANCE SPECTROSCOPY

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Abstract

Wheat cereal grains are among the most important staple foods for the world's population. Near-infrared spectroscopy (NIRS) for determining grain chemical constituent contents has been studied over the past few decades around the world. The grain industry is in need of an automated, economical, and rapid means of determining grain quality. The aim of this work was to determine the chemical composition of wheat (*Triticum aestivum* L.) by near infrared reflectance (NIR) spectroscopy. This paper presents the chemical and amino acid composition of twelve spring wheat (n = 6) and winter wheat (n = 6) varieties grown in one location in Lithuania. Wheat grain samples of the 12 varieties were analysed for crude protein, crude fat, crude ash, crude fibre and amino acids using the FOSS NIRS™ DS2500 system according to the manufacturer's instructions in CARAT laboratory, Adisseo, Commentry, France. The results showed that crude protein content was between 11.53–13.97 g 100 g^{-1} and in winter wheat varieties it was 9.68–11.00 g 100 g^{-1} dry matter. Analyses showed that starch content in spring and winter wheat varieties ranged from 53.29–58.67 and 60.51–63.89 g 100 g^{-1} respectively, crude fat in spring and winter wheat were 2.54 and 2.19 g 100 g^{-1} respectively, ash 1.71 and 1.69 g 100 g^{-1} respectively. Comparison of spring and winter wheat varieties grown in Lithuania suggests that varieties of spring wheat outperform winter wheat in protein, crude fat, ash and amino acids contents.

Keywords: *amino acids, wheat, chemical composition, grains, NIRS.*

THE IMPACT OF CLIMATE CONDITIONS ON THE LEAF SIZE OF BASMA TOBACCO

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Abstract

Morphological traits are of major importance in determination of the type of tobacco and varieties within the type. These traits differ to a lesser or greater extent and are genetically controlled. Under the influence of inadequate agro-ecological and technological conditions, tobacco types can also show strong variations in bio-morphological properties, especially in dimensions of the leaves. Such variations can occur despite the genetic control and are known as "plasticity" of tobacco. Therefore, before starting the production of some tobacco type or variety, it is necessary to know the basic preconditions for its stable production in order to avoid major variations in morphological and production characteristics. Three-year investigation 2009, 2010 and 2011 was carried out in the experimental field of Tobacco Institute – Prilep Republic of Macedonia. The trial was set up using the method of randomized blocks in 5 replications, with three varieties of Basma tobacco (MK-1, MB-2 and MB–3) and one Yaka variety (YK 7-4/2) as a check. The aim of investigation on morphological traits length, width and angle of the top and bottom leaf was to get a real picture of the varieties and their plasticity under the influence of different climate conditions. Research workers of the Scientific Tobacco Institute – Prilep created several varieties of Basma tobacco, including MK-1, MB-2 and MB-3, approved by the State Commission for variety testing in 2010, which yield and quality guarantee a cost - effective production. The creation of new tobacco varieties is a long-term commitment of the Tobacco Institute - Prilep and continuous process which has not been interrupted up to this day, giving a great contribution to the production. The significance of the trials was computed statistically and with the use of LSD test.

Keywords: *morphological traits, basma, length, width, leaf.*

QUALITY OF THE POMEGRANATES VARIETIES "HICAZ" AND "KARAMUSTAFA" FROM THE REGION OF MACEDONIA

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Abstract

Pomegranates are valuable fruits due to the high level of anthocynanins in juice and phenolic compounds responsible for antimicrobial activity of pomegranate peel. Significant amounts of phenolic acids, vitamin C and other polyphenolics are responsible for health benefits of the consumers. The objects of our study was the impact of variety on the quality of pomegranates grown in the region of Macedonia. More precisely, morphological parameters for fruits and chemical characteristics of pomegranate juice were significantly affected to the variety of pomegranates. Morphological parameters, in particular fruit weight, fruit height, equatorial and calix diameter favorited "Hicaz" variety in comparison to autochthonous "Karamustafa" variety of pomegranates. Furthermore, the pH value of fruit juice, the level of phenolic acid and percentage of glucose and fructose indicate significant differences between varieties. The quantity of anthocyanins (537 mg/L), catechins (50 mg/L) and total phenolic compounds (3367 mg/L) indicated higher quality of pomegranate juice from "Hicaz"pomegranate variety. The effect of pasteurization did not influenced significantly to the quality of pomegranate juices from both varieties.

Key words: *pomegranate juices, morphological parameters, total phenolic compounds, anthocyanins, catechins.*

SAFFLOWER YIELD RESPONSE TO IRRIGATION AND GAMMA IRRADIATION

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Abstract

Safflower (*Carthamus tinctorius* L.) is drought resistant plant, but the adequate irrigation is important for the increasing of safflower yield. The effects of drip irrigation associated with pre-sowing gamma irradiation of seeds on plant growth and yield were investigated. The seeds were irradiated by gamma rays (^{60}Co) at various doses (50, 100, 150Gy). The safflower plants were grown under drip irrigation and rainfed conditions of the Republic of Moldova in season of 2017. Modifications of bio-morphological (height, number of secondary branch, developed and undeveloped inflorescence) and yield attributing (number of seeds per head and per plant, weight of seeds per plant and 1000-seed weight) characters of safflower were studied. The results showed that the drip irrigation influenced positive and statistically significant ($p \leq 0.001$) on all studied characters of safflower. The plant grown under irrigation had the number of developed inflorescences, the number of seeds and the weight of seeds per plant, respectively 1.83, 1.81 and 2.50 times more than rainfed plants; as well as undeveloped inflorescence less 2.47 times. The contribution of pre-sowing irradiation was not so pronounced. The impact of factors (irradiation, irrigation) and their interaction for the improvement of bio-morphological and yield attributing characters were determined. The significant impact of growing condition on the number of seeds per plant at $p \leq 0.01$, weight of seeds per plant and 1000-seeds weight at $p \leq 0.01$ was established. The gamma radiation had the contribution to changes in 1000-seeds weight but the contribution of growing condition on this character was 15.7 times stronger.

Keywords: safflower, seed yield, pre-sowing seed irradiation, rainfed, irrigation.

POTENTIAL ADAPTABILITY OF PIGEON-PEA GENOTYPES UNDER DIFFERENT AGRO-ECOLOGICAL ENVIRONMENTS OF MOROCCO

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Abstract

Pigeon pea (Cajanus cajan (L.) Millsp.) is the fifth most important food legume cropped in rain-fed agriculture in the semi-arid tropics of south Asia, Africa, and America Latin. It is used as source of proteins for food, feed add to the uses of wood in the fire and hedges. It grows in a wide range of edaphic and climatic conditions, making it well-suited to succeed in a variety of agricultural systems. Drought resistance of pigeon pea might be suitable in marginal land of Morocco in current climate change and might offer opportunities to diversifying protein's sources for both human and animals. Thus, seventeen genotypes received from ICRISAT germplasm were evaluated in different agro-ecological conditions of Morocco. The study aimed to analyze genetic variability, yield potential, yield components and grains and pods nutritional value using sixteen quantitative traits. Recorded data were used for descriptive and variance analysis and to build hierarchical cluster based on similarity and dissimilarity among genotypes. The results showed a high significant variability among genotypes for almost all measured quantitative traits. The genotypes AN33, AN34, AN21 and AN32 showed higher values for yield potential and grains nutritional value. Cluster analysis grouped the evaluated genotypes in four groups at 82% of similarity. The first cluster grouped the four previous performed genotypes, while the second and the fourth clusters grouped each one six genotypes. Whereas, the third cluster grouped a single genotype ATZ19 that was distinguished by late blooming, high pods weight, pods width, high number of seeds per plant and small seed size.

Keywords: *Pigeon pea, adaptability potential, yield and yield components, Morocco.*

EFFECT OF OSMOTICUM AND SILICA-GEL DESICCATION ON SOMATIC EMBRYOGENESIS FROM CALLUS CULTURES OF *BIGNONIA ADENOPHYLLA* D.C

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Abstract

Ornamental plants are important source of aesthetic value and the production of medicinal compounds. It is planted along the roads and parks due to its beautiful shape of pods and greenish look of leaves. Leaf and wood extracts of this tree has medicinal properties to control viral diseases. In this paper, we report an efficient protocol for somatic embryogenesis (SE) and plant regeneration of *Bignonia adenophylla*. Seeds were germinated *in vitro* on basic Murashige and Skooge (MS) medium to obtain green cotyledons from sterile seedlings and cultured on MS medium supplemented with thidiazuron or n^6-benzyladenine (BA) alone and with indol-3-acetic acid, α-naphthaleneacetic acid or 2, 4-Dichlorophenoxyacetic acid (2, 4-D) for callus induction. In the first experiment, greenish nodular calluses were grown on 0, 25, 50, 75 or 100% MS salts along with 0, 1.5, 3 or 6% sucrose for four days. In the second experiment, 0, 5, 10, 15 g/L silica gel powder was added in the plain agar for dehydration treatment. Highest (75%) callus induction was obtained with 0.139 g dry weight at BA (2 µM) + 2, 4-D (4 µM) after 36 days. Callus further proliferated and produced 80.33% somatic embryos, having 70.15 number of somatic embryos at 15 g/L silica gel after 15 days. Such somatic embryos germinated up to 11% into cotyledonary stage. We observed that TDZ inhibited the growth of shoot as well as root in the present study. Growth of such habituated cultures was further improved and produced somatic embryos on desiccation (silica gel) medium. The germination of somatic embryos was good enough that may further be improved.

Keywords: *Dehydration treatment, marud phali, somatic embryogenesis, sucrose, thidiazuron*

MORPHOLOGICAL PROPERTIES OF DIRECTLY SOWED SWEET CORN PLANTS CULTIVATED WITH COVERING TECHNOLOGIES

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Abstract

The sweet corn is the vegetable which is grown on the greatest area in Hungary. Aim of experiment set up in 2014 was, to study the evolution of sweet corn growing period with application of some technological elements: propagation time, propagation method, floating row cover. The choosen variety was a conventional, very early ripening sweet corn hybrid, 'Spirit'. The following growing technologies were compared: 1. direct sowing of plants with floating row cover, early period 2. direct sowing of plants without row cover, early period 3. direct sowing of plants with floating row cover, normal period and 4. direct sowing of plants without row cover, normal period (regarded as control). It was studied the influence of above mentioned technological elements on some important morphological properties of sweet corn plant: evolution of phenological phases, plant height, tassels length, ear weight, height of ear insertion.

Key words: *earliness, sweet corn, vlies covering*.

COMPETITION ON RAPE SEED MARKET IS GETTING STRONGER

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Abstract

The article goal is to identify factors with higher input to the expansion of foreign seeds at the Russian rape seed market. Methods combined economic-statistical, abstract-logical, graphical, expert rating ones. Materials of the State statistics, the National Seed Registers, Russian Ministry of Agriculture, and USDA are used. Oil seeds acreage increased in this country +207% from 4 in 1990 till 12.3 m Ha in 2017 vs majority of cereals and fodder crops to be reduced. While spring rape seed acreage grew up fivefold, winter rapeseed has done fourfold during last 27 years, and is close to 1 m Ha. Farmers switch from cereals cultivation to oilseeds and, in particular, rape seed due to their higher margin, and oil seed processor demand. All-Russia Research Institute of Rapeseed, All-Russia Research Institute of Oil Crops by V.S. Pustovoit and Fodder Crops Institute are leaders on the local rape seed market. Number of listed local rapeseed varieties grown up +44%, from 48 in 2011 till 69 ones in 2017; and non-resident ones did +83% from 89 to 163 varieties for the last 7 years only. Foreign seed companies prefer to commercialize hybrids vs conventional varieties due to their more efficient return of investment to the breeding programs. Rape seed life cycle is assessed as 11 years for winter type varieties, and 13 years for spring ones. Hybrids market share is counted as 56% of spring, and as 76% of winter rape acreage. German seed companies (NPZ-Lembke, Bayer CS, and Deutsche Saatveredelung AG), American ones (Monsanto and Pioneer) and French ones (Euralis semences S.A., and others) domain on local markets. Clearfield and Express production systems (systemic herbicides application in combination with resistant hybrid varieties), improved fatty acid composition, and yellow color of seeds varieties may have competitive advantages.

Key words: *Rape, seeds, hybrid, conventional variety, seed market, breeding program.*

HEAVY METAL UPTAKE BY GRASSLANDS DEVELOPED IN A DEGRADED SOIL IN CENTRAL BALKANS

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Abstract

Extensively managed natural grasslands are predominant in Central Balkan countries (Montenegro, Bosnia and Herzegovina, Serbia) and the productivity of these communities is extremely low in general. Beside main limitations in grassland productivity, such as strongly acidic soils, organic matter fluctuations, high variability in phosphorus content, some soils were developed on bedrocks with potentially high heavy metal content. The researches were conducted in 2016 and 2017 on representative grasslands in three countries, mainly on *Agrostietum capillaris* type of community. There were five study sites in Montenegro, two in Bosnia and Herzegovina, and six in Serbia in mountainous region. We analysed nutritive status of the topsoil samples collected in summer in each study site, as well as possible presence of heavy metals (Ni, Cd, Pb and Cr) in the soil. The experimental fields were cut once in the time of inflorescences formation of the dominant grasses and the total concentrations of heavy metals (Pb, Ni, Cd and Cr) in the samples of plant material were determined. In all study sites soil pH was acidic, with low P content, except in a certain site in Bosnia. Generally, the soils were low productive, but according to Regulation of tolerant amount of hazardous and toxic materials in soil, there were not surpassed maximum permissible concentrations of Ni, Cd, Pb and Cr in Montenegro and Bosnia, while in some sites in Serbia very high concentrations of Ni and Cr were observed. Although some elements exceeded maximum permissible amount for soil and water, the ability of plants collected from the *Agrostietum capillaris* communities to accumulate heavy metals was generally low. It could be explained by the physiology of dominant plant species (grasses), which influenced relatively low uptake and generally low accumulation of micronutrients.

Key words: *Agrostietum capillaris, Central Balkans, degraded soil, heavy metals.*

YIELD COMPONENTS AND SEED YIELD OF FOUR RED CLOVER GENOTYPES FROM SOUTHEAST EUROPE

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Abstract

The aim of the study was to analyze the most important yield components and seed yield of selected red clover (*Trifolium pratense* L.) genotypes from Serbia and Bulgaria. Positive traits of individual genotypes could be the use in hybridization and the creation of new varieties, which, in addition to high forage yield potential would have a higher seed yield. The experiment was established in 2012 in Čačak on leached vertisol soil type with acid reaction (pH_{H2O} 4.8). Three genotypes isolated from the local populations and variety of K-39 were planted using a randomized block design with five repetitions, at a distance of 70x40 cm. Weed control was done mechanically. For the analysis of the yield and yield components was used the second cut in the second year of cultivation when usually done the production of seeds. The genotypes differed among themselves in each other's properties, except in a thousand seeds weight. The highest seed yield was achieved variety K-39 (19.8 g plant^{-1}), while the yield of other genotypes varied from 4.4 to 8.6 g plant^{-1}. Also, this variety had the highest values for most yield components. However, the genotype 3, which was isolated from the populations of Rozova dolina, had a significantly higher number of flowers per inflorescence (124.1), compared to the K-39 variety (89.4). The results suggest that certain genotypes could be used in further selection work in order to increase seed yield at already existing culivars.

Key words: *genotypes, red clover, seed yield, seed yield components.*

ESTIMATION OF GENETIC DIVERSITY AMONG MAIZE INBRED LINES

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Abstract

One of the most effective method in maize (*Zea mays* L) selection of adapted material is to create synthetic populations from inbred lines of known origin and superior properties. The methods used for inter- and intra-population synthetic improvement are some of the recurrent selection techniques. Success of recurrent selection depends on the choice of parent components and the method that will be used to obtain new inbred lines. The aim of this paper was to apply molecular markers for estimation of genetic variability of inbred lines, as potential parent components of synthetic populations. Molecular characterization of 26 inbred lines was done with 18 polymorphic SSR (*Simple Sequence Repeat*) markers. The total number of obtained alleles was 54, and ranged from two alleles for primers: phi033, phi036, phi087 and umc1013 to five alleles for primer umc1040. Genetic similarity values were calculated using Dice coefficient in the NTSYSpc2 program package. The highest similarity value (0.96) was calculated between inbred lines L22 and L24, while the lowest value (0.26) was between inbred lines L7 and L21. Cluster analysis divided the inbred lines into three groups mostly in accordance with their origin. The variability detected using SSR markers could be useful in selecting best parental combinations in creating synthetic populations.

Keywords: *inbred lines, synthetic population, SSR markers.*

EVALUATION OF EARLY PLUM CULTIVARS IN THE REGION OF BELGRADE (SERBIA)

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Abstract

Phenological traits, yield, and fruit characteristics of nine plum cultivars of early maturation time were studied in the region of Belgrade (Serbia) in the five-year period (2013-2017). The control cultivar for comparison was 'Čačanska Rana'. The average time of flowering of tested cultivars was in the first half of April, and the average duration of flowering varied from 7.4 to 10.4 days. The average time of maturation ranged from June, 22 ('Boranka') to July, 14 ('Minerva'). The average yield per tree was lowest in the control cultivar, 'Čačanska Rana' (8.4 kg) and highest in the cultivar 'Dalikatnaya' (25.5 kg). Compared to control, significantly higher yield was achieved in four cultivars: 'Dalikatnaya', 'Opal', 'Minerva', and 'Katinka'. The lowest vigor was recorded in the cultivar 'Katinka', and the highest in the cultivar 'Opal'. The average fruit weight ranged from 22.9 g in the cultivar 'Katinka' to 55.9 g in the cultivar 'Čačanska Rana'. Compared to control, fruit weight was significantly lower in all cultivars except 'California Blue'. Soluble solids content was lowest in the cultivar 'Boranka' and highest in cultivars 'Opal', 'Herman' and 'Minerva'. The best rated cultivars for fruit appearance were 'Čačanska Rana' and 'California Blue', while cultivars 'Opal' and 'Katinka' had the best scores for taste.

Key words: *Prunus domestica, flowering, maturation, yield, fruit characteristics.*

SOME MORPHOLOGICAL AND PRODUCTIVE TRAITS OF WINTER TRITICALE DEPENDING ON VARIETY AND METEOROLOGICAL CONDITIONS

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Abstract

Thanks to the high genetic potential for yield and favorable nutritional values, triticale is ranked among the perspective plant species.High and stable yields can be achieved under favorable weather conditions and with adequate agro-technology and variety selection.The paper presents the results of examining some morphological and productive traits of winter varieties of triticale cultivated in the north of Montenegro during the two vegetation season (2009/11). The experiment placed on a random block system in three repetitions, included five varieties of winter triticale(Odisey, Kg-20, Triumph, Rtanj and Tango). The applied agro-technology in the production of triticale was standard, with the application of NPK fertilizer combination 120:80:80. The following parameters were observed: height of plants, spike length, number of grains per spike, 1000 grain mass and grain yield of triticale. The results of the study showed significant differences in terms of the morphological and productive traits of winter triticale depending on the variety and weather conditions in the years of research. Variety Tango in both years achieved the highest yield (6841.6 kg ha^{-1}), while the lowest yield was recorded in Kg-20 variety (5216.6 kg ha^{-1}).Also, the variety Tango stood out significantly higher values for most other monitored parameters in both study years. The obtained results indicated that differences in the yields of the cultivars included in the research were the result of varietal specificity, which was mostly genetically conditioned.

Key words: *triticale, variety, morphological traits, productive traits.*

FROM THE GREGOR MENDEL'S GARDEN TO A MOLECULAR MARKER LAB: CUTTING EDGE OF BREEDING GRAIN AND FORAGE CRUCIFERS IN SERBIA

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Abstract

A complex and strategically structured research on oil-rich grain, vegetable and forage crucifers at the Institute of Field and Vegetable Crops in Novi Sad (IFVCNS) is based upon maintaining and sustainably utilising the germplasm collections of each crop. It comprises conventional and molecular breeding, biotechnology, agroecology, physiology, biochemistry, agronomy and seed science as well as commercial production for local and international markets. Here, we shall focus on oil-rich grain and forage crops, namely rapeseed, black and white mustards, forage kale and false flax. All collected accessions of our collection were phenotypically and cytogenetically characterized, including the monitoring and examining flower morphology, pollen features and number of chromosomes. The Mendel's rules are the basis of all the methods in breeding cultivars and hybrids of oil and forage crucifers. Constant and systematic use of these fundamental genetic postulates has led to the development and official registration of 13 autumn-sown rapeseed cultivars and two hybrids, two spring-sown rapeseed, one black mustard, one oil-rich grain white mustard, three autumn-sown forage kale and one spring-sown forage white mustard cultivar, as well as two false flax lines. Today, the conventional breeding methods are closely followed by various molecular genetic tools. So far, the most prominent role in assisting the selection of the genotypes with desirable traits has been played by RAPD and SSR molecular markers. A well-designed and feasibly organized integration of the Mendel's rules, conventional breeding methods and molecular breeding tools are anticipated as significantly improving the existing programmes. It ensures that the future efforts will yield further progress in oil and forage crucifers' research. This will benefit to various aspects of economy, especially the environment friendly production of quality oil for both human consumption and non-food industry and low-input and esteemed forage in ruminant feeding.

Keywords: *Breeding, crucifers, forage production, oil production, Serbia.*

THE EFFECT OF GENOTYPE AND SEEDING RATE ON THE YIELD AND QUALITY OF SAINFOIN FORAGE

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Abstract

The effect of genotype and seeding rate on the yield and quality of sainfoin (*Onobrychis viciifolia* Scop.) forage was examined in agroecological conditions of South Serbia. The Makedonka cultivar of sainfoin, as well as the local population Sokobanja, were sown at different rates: 100, 120 and 140 kg/ha. The average forage yield of 47.7 t/ha^{-1} was measured over the course of three years. The sowing year yielded the least amount (30.2 t ha^{-1}), with the maximum amount being recorded in the second year (67.2 t ha^{-1}) of research. The Makedonka yielded a three-year long average of 49.1 t/ha^{-1}, while the Sokobanja yielded an average of 46.3 t ha^{-1} during the same period. The 120 kg ha^{-1} showed to be the most effective seeding rate, with the highest forage yields of 50.8 t ha^{-1} (Makedonka) and 47.4 t ha^{-1} (Sokobanja), while the highest seeding rate (140 kg/ha) showed to result in the least amount of forage yield: 4.,5 t ha^{-1} (Makedonka) and 44.8 t ha^{-1} (Sokobanja). In terms of the dry matter quality, the Sokobanja culture was distinguished by slightly higher contents of crude protein than those of Makedonka (19.3% vs 18.4%), as well as lower contents of crude cellulose (26.5% vs 27.3%).

Keywords*: Sainfoin, forage yield, dry matter quality.*

THE INFLUENCE OF DIFFERENT PURITY OF NATURAL ALFALFA SEEDS ON THE PROCESSING EFFICIENCY

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Abstract

This paper presents the results of the seed processing of ten lots of natural alfalfa seed with different purity (from 68.0% to 86.5%). The test was carried out at the seed processing center of the Institute for forage crops Kruševac-Serbia. Seed losses, processing output, seed yield and quality of the processed seed were investigated. It is important that the difference between the amounts of pure seed from laboratory assessment and the actual amount after processing, are low. The purity of natural alfalfa seed depends on the crop condition and the harvest process. In the seed processing of small-grained leguminous plants, the processing output of seed is directly dependent on the percentage of weed species and other species in the natural seed. Seeds of quarantine weeds of dodder and curly dock are a particularly big problem in alfalfa seeds. In the case of high-purity seeds with low quarantine weeds share, processing output are high. By the legal procedure on the seed quality, the content of pure seed, inert materials, weeds and other species in the processed seeds is defined. The efficiency of the alfalfa seed processing depends on the initial purity of the seed, as well as the applied technical and technological process of seed processing. Based on the obtained results, it is possible to optimally adjust and select the appropriate equipment for the processing of alfalfa seed, depending on the quantity and type of weeds and other ingredients in the natural alfalfa seeds.

Keywords*: alfalfa, purity, processing, seed, weeds.*

MORPHOLOGICAL DIFFERENCES AMONG STRAINS OF OYSTER MUSHROOM GROWN ON DIFFERENT SUBSTRATES

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Abstract

Distribution of oyster mushroom production worldwide is based on its cultivation on available and low-priced substrates prepared using residues of cellulose materials from agricultural production. It is also based on its nutritive value and content of medically active matters that favourably affect the human organism, as well as the specific taste, which offers wide possibilities in cooking. Forms of oyster mushroom differ by colour, size and shape of the cap, length and width of stems, taste, as well as the physiological requirements during cultivation on different substrates in various climate conditions. Three isolated and determined strains of oyster mushroom (*Pleurotus ostreatus*) were studied - NS 77, NS 355 and NS 244. They were grown on residues of agricultural production most frequent on the territory of Vojvodina, such as wheat and soybean stems, and stalks of maize and sunflower, as individual substrates and in combinations with wheat straw. Variability was recorded among strains in most important morphological traits. The study monitored the ratios of cap weight (CW) and stem weight (SW), cap length (CL), cap width (CWi), stem length (SL) and stem width (SWi), as well as the number of mushrooms per bunch (NM). The monitored morphological traits have been expressed differently most of the time, depending on the strain, while in some cases the substrate was the determining factor. The number of fruiting bodies in strain NS 244 therefore varied in range 4.2-5.5, depending on the substrate. Strain NS 77 ranged from 7.4 to 11.2, while strain NS 355 ranged from 8.6 to 10.7. However, the highest values of cap weight of all three strains were recorded on maize stalk substrate.

Key words: *oyster mushroom, morphological traits, different substrates.*

PREDICTION OF SOIL MOISTURE IN DOUBLE CROPPING USING THE FAO AQUACROP MODEL

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Abstract

Double cropping in the growing conditions in Serbia can be successful only with irrigation. For the establishment of an adequate irrigation schedule and water dosage it is necessary to monitor soil moisture in the rhizosphere layer. Soil moisture assessment instruments are not yet in mass use by irrigation system users. Prediction of soil moisture can also be performed by crop models. The aim of this paper is to test the reliability of soil moisture simulation in double cropping obtained by use of FAO Aquacrop model. The testing was carried out on the basis of the results of experimental research carried out on the chernozem type of the soil on a loessial terrace in Zemun Polje (Serbia). The soil moisture content in the rhizosphere horizon was measured in two fields. One field was double cropped with soybeans following wheat, and the other with green beans following wheat. The fields were irrigated by the sprinkling method. The soil moisture measurements in the experimental field were performed by a gravimetric method. Soil samples were taken at different depths, in three repetitions, at 10cm intervals up to a depth of 60cm, and then at every 20cm up to a depth of 1m. The reliability of simulations obtained using the Aquacrop model was rated by use of statistical parameters: root mean square error (RMSE), normalized root-mean-square error (nRMSE), the Willmott index of agreement (d) and the correlation coefficient (R). Simulation of soil moisture at the rhizosphere horizon shows good concurrence with measured values ($RMSE<2.0$, $nRMSE<8.31$, $d>0.82$, $R>0.82$). The one year results are showing that the Aquacrop model is able to simulate chernozem moisture of root zone of succession plants (in irrigation condition) accurately. This finding should be confirmed by the results of the research during several more vegetation seasons.

Key words: *Aquacrop model, soil moisture, soybeans, green beans, double cropping.*

PROPERTIES OF APRICOT (*PRUNUS ARMENIACA* L.) GENOTYPES SELECTED IN THE ČAČAK REGION (CENTRAL SERBIA)

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Abstract

The Čačak region (central Serbia) is famous for apricot growing, accounting for about 10% of total apricot production in Serbia, with 3–4,000 t of fruit produced in high-yield years. Research was conducted from 2008 to 2012 to evaluate a large number of apricot genotypes in the region. Five genotypes exhibiting the best performance were singled out and marked with the letters GG and the numbers 1–5. This paper presents two-year results on the properties of these genotypes and their comparison with cv. 'Roxana' used as the control. Phenological characteristics (flowering and ripening), leaf traits and fruit attributes were assessed. The results showed that, compared to the control, all apricot genotypes began to flower 2 to 3 days earlier and were similar in both the progress and abundance of flowering. The onset and termination of ripening in all genotypes were 5 to 6 days earlier than in the control cultivar. As far as leaf properties are concerned, the genotypes GG_1 and GG_2 had larger leaf dimensions compared to the control. The petioles in all genotypes were shorter and had fewer glands than those of 'Roxana'. Regarding fruit dimensions and fruit weight, the fruit size of GG_5, followed by GG_4, was similar to that of 'Roxana', whereas the other genotypes had smaller fruit dimensions and lower weight. Soluble solids content was highest in GG_1. There was no significant difference in this trait between 'Roxana' and the tested genotypes. Overall, the largest number of positive properties was found in GG_5 and GG_4, which could be used as experimental material in further research, as well as for orchard establishment.

Keywords: *Apricot, genotype, phenological properties, fruit traits.*

UNUSUAL GROWTH OF POLLEN TUBES IN THE OVARY OF PLUM GENOTYPES DEVELOPED AT FRUIT RESEARCH INSTITUTE (ČAČAK, SERBIA)

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Abstract

Unusual growth of pollen tubes in different pollination variants (self-, cross- and open pollination) was observed in the ovary of six promising plum (*Prunus domestica* L.) genotypes developed at Fruit Research Institute (FRI), Čačak (hybrids 38/62/70, IV/63/81, 32/21/87, 34/41/87 and 22/17/87 and cultivar 'Nada') in Serbia. The cross-pollination was performed using the pollen of plum cultivar 'Čačanska Lepotica'. The occurrence of unusual pollen tubes growth in the ovary was studied over the three-year period (2009–2011) using fluorescent microscopy method. The appearance of unusual growth of pollen tubes in the ovary of all studied genotypes during the whole examination period was recorded in the region of the obturator and the micropyle, with or without further growth of the pollen tubes to the nucellus. Several different types of unusual growth of pollen tubes were observed, i.e. the growth of pollen tubes in opposite direction in relation to the nucellus, the curling up of pollen tubes, the branching of pollen tubes, as well as combinations of some of the above mentioned types of specific pollen tubes growth. Average values of all analyzed genotypes showed that the highest frequency of the ovaries with unusual growth of pollen tubes was determined in the open pollination variant (7.89%), followed by the cross-pollination variant (6.27%), while the smallest frequency was found in the self-pollination variant (3.12%).

Key words: *Prunus domestica L., promising genotypes, pollination variant, pollen tubes growth, ovary, unusual growth.*

PARAMETERS OF YIELD AND QUALITY OF SPRING MALTING BARLEY GRAIN

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Abstract

During a two-year period, two varieties of spring malting barley, Mile and Marko, were studied, which were created at the Institute of Field and Vegetable Crops in Novi Sad.Grain yield, weight of 1000 grains and hectoliter mass of grains were examined. The experiment was carried out in the vicinity of Kruševac according to the plan of a random block system in four repetitions, and the size of the base parcel was $5m^2$.The sowing standard was 400 germinable kernels/m^2. The experiment includes the fertilization factor with growing nitrogen doses N_0, N_{80}, N_{100}, N_{120}. At variants with a nitrogen dose, another 90 $kgha^{-1}$of P_2O_5 and K_2O were used. Sowing density and applied nitrogen doses are two extremely important factors in the production technology of spring malting barley. In the interaction with the genotype of the variety and different soil factors as well as climatic factors, it contributes decisively to obtaining high yields of good grain quality.The aim of this research is to examine the influence of increased nitrogen doses in mineral nutrition on fertility parameters and grain quality of spring malting barley. The achieved results of the study show that the use of nitrogen had a positive effect on fertility parameters and grain quality of spring malting barley in all varieties and at both varieties.Using a higher nitrogen dose, a somewhat larger mass of 1000 grains was found in the fertilization variant of 100 kg ha^{-1}N per average for the examined two-year period, while the hectolitre mass was somewhat higher in the case of the fertilizer variant of 80 kg ha^{-1}N in the Mile variety as well as the higher yield of grain in relation to the variety Marko.The different reaction of the tested varieties on the application of mineral fertilizers is the result of their varietal specificity.

Keywords: *mass of 1000 grains, spring barley, yield, variety.*

FORAGE QUALITY AND *IN VITRO* DRY MATTER DIGESTIBILITY OF PEA:OAT MIXTURES DEPENDING ON STAGE OF GROWTH

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Abstract

The production and utilization of intercropped, complementary legume : cereal bi-crops as ruminant feeds is beneficial for many reasons. The nitrogen fixation by the legume benefits the cereals and decreasing the need for N fertilization. In turn, the cereal supports the legume, thereby preventing the lodging that typifies pure stands of mature forage pea. The investigations were carried out to evaluate the quality of oat (*Avena sativa* L.) and pea (*Pisum sativum* L.) in pure stands as well as in mixtures of 75:25, 50:50 and 25:75 ratios at the Institute for forage crops to address the problem of nutritious green forages for livestock in the region. The samples were harvested at the beginning of pea flowering – 10% of flowering and at the forming green seeds in 2/3 pea pods. Green forage samples were assayed for CP (Crude Protein), Crude Ash, Ether Extract, NDF (Neutral detergent Fiber), ADF (Acid Detergent Fiber), Hemicellullose, ADL (Acid Detergent Lignin) and IVDMD (*in vitro* Dry Matter Digestibility). Oat:pea mixtures produced higher crude protein content than oat pure stand. 75:25, 50:50 and 25:75 oat : pea mixtures resulted in 46.4%, 57.0% and 80.5% higher crude protein content than oat pure stand, respectively. The highest forage quality parameters were achieved when pea was grown as a monoculture or when at a high proportion (75%) in mixture. The results showed that mixture of pea and oat at the 75:25 seeding ratio was obtained the highest forage quality.

Keywords: *oat:pea mixtures, forage quality, dry matter digestibility.*

THE INFLUENCE OF THE SOIL TYPE ON TOTAL NUMBER OF MICROORGANISMS IN UGAR AND SOWN MAIZE

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Abstract

Various groups of microorganisms live in the soil: aminoheterotrophs, aminoautotrophs, oligonitrophilic bacteria, cellulolizators, *Azotobacter* sp., actinomycetes, fungi, sporogenic bacteria and others. The mentioned groups of microorganisms have a precisely determined and irreplaceable role in the processes of matter cycling in the soil, which lead to mineralization and repeated synthesis of organic matter whereas nutrients become accessible to plants. In this work, the total number of microorganisms is determined, as the most significant indicator of the soil fertility, in two types of soil: "cernozem" (at the locality Zemun Polje) and "gajnjaca" (at the locality Rača Kragujevačka) in Serbia. The total number of microorganisms is determined depending on the soil type, the manner of its use (ugar and sown maize) and the quantity of the applied N fertilizer. It is examined how the rising quantities of nitrogen fertilizers, N_{30}, N_{60}, N_{120}, N_{160} kg ha^{-1}, affect the total number of microorganisms in relation to the control variation, which was without applied fertilizer. The soil samples for this microbiological analysis are taken on the depth of 0-30 cm. The number is determined by the standard indirect method of sowing of diluted soil samples on the nutritious substratum tripton-soya agar TSA (10^{-5}) and it is expressed in grammes of completely dry soil. The results of the research are analysed by the descriptive statisics method. The total number of microorganisms is different in different types of soil and it shows the dependance on examined factors.

Key words: *microorganisms, different types of soil, nitrogen, maize.*

PROPAGATION OF *COTONEASTER MULTIFLORUS* BUNGE. BY SOFTWOOD CUTTINGS

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Abstract

This deciduous large shrub, with long arching branches and very abundant white flowers followed by scarlet-red fruit, is suitable for landscape use as an ornamental plant. It is considered as a drought tolerant species that can grow on clay soils. The aim of this study was establishing quick and effective method for vegetative propagation of selected elite genotypes of *Cotoneaster multiflorus* growing in the Belgrade area (Serbia). Two types of softwood cuttings were used: cuttings with current season wood and cuttings with two year old wood. The cuttings were divided into two groups, with cuttings treated with 1% IBA (indole-3-butyric acid) and with cuttings without auxine treatment. After 7 weeks of sticking, rooting percentage as well as number and length of primary roots, and presence and number of secondary roots were determined. Obtained results showed that there were no statistically significant difference in rooting rate among current season wood cuttings (49.3%) and two year old wood cuttings (36.7%), although current season wood cuttings had a better rooting percentage and higher number and length of primary roots. Results obtained in a control treatment without IBA were poor, indicating that auxine treatment was necessary in propagation of this species, and that obtained results could be improved investigating the use of different auxine treatments.

Keywords: *Many-flowered cotoneaster, vegetative propagation, cuttings, greenwood, auxine.*

THE INFLUENCE OF THE SUBSTRATE COMPOSITION ON ROOTING OF HARDWOOD CUTTINGS OF LYCIUM BARBARUM L.

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Abstract

Lycium barbarum is a deciduous shrub that has been used for centuries in China as a traditional medicinal and food supplement. Today, it is widely grown as a fruit as well as a landscape ornamental species, including some ornamental varieties. It is easily grown plant, suitable for hedges, and it endures pruning. Goji has well developed root system and it can be planted for erosion control or to stabilize sandy soils. It can be propagated by seed, cuttings, layering and division. Propagation by cuttings is the most convenient method for mass production of uniform plants. In order to establish an efficient production system, the influence of different substrates on rooting of hardwood cuttings was examined. Six substrate mixtures were tested: sand, sand and compost (1: 2), sand and peat (1: 2), pine bark and compost (1: 1), pine bark and peat (1: 1), pine bark and sand (1: 1). Except for rooting percentage, success of rooting was determined using following parameters: the number and length of primary and secondary roots, number and length of shoots. The best results were obtained in sand. The rooting percentage was the highest (66%), and the length of primary roots, number and length of shoots were higher compared to other treatments. The influence of pH value of substrates on rooting performance was also discussed.

Keywords: *Goji, vegetative propagation, cuttings, rooting medium.*

CORRELATION BETWEEN AGGRESSIVENESS AND SYNTHESIS-ABILITY OF MYCOTOXIN ISOLATES OF *FUSARIUM GRAMINEARUM* IN MAIZE IN SERBIA

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Abstract

Fusariosis is one of the most common and most important diseases of maize. Every year, *Fusarium graminearum* (Schwabe) reduces grain yield and quality in both commercial and seed production. This species is probably one of the most destructive pathogens. The damages it causes increase due to mycotoxin synthesis-ability. The determination of a correlation between aggressiveness and synthesis-ability of deoxynivalen and zearalenone in isolates originating from wheat and maize grain was the aim of this study. The pathogenicity of 30 isolates of *F. graminearum* was tested after Reid et al. (1996). Artificial inoculation of ears was done by injecting 2 ml of conidial suspension ($1x10^5$) into silk channels on the second day after maize silked. The estimation of the degree of pathogenicity was based on the determination of symptoms of fusarium maize ear rot on the 1-7 scale. The mycotoxin concentration was determined by the ELISA according to the manufacturer's instructions (Tecna, Italy, CelerDON, ZEA Test Kit). Isolates exhibited pathogenicity on maize ears and synthesised both mycotoxins. The correlation between aggressiveness and DON, i.e. ZEA synthesise-ability was statistically significant, i.e. not statistically significant, respectively.

Keywords: *Fusarium graminearum, maize, deoxynivalenon, zearalenone.*

IMPROVED MAIZE CROPPING TECHNOLOGY TO REDUCE THE IMPACT OF CLIMATE CHANGES

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Abstract

Maize (*Zea mays* L.) is the highest ranking crop in terms of area and production in Serbia. During the whole growing period maize requires high temperatures and sufficient amounts of precipitation. High yields could be achieved on loose and porous soil with good capacity for water and those containing easily-accessible nutrients. The agro-ecological conditions for maize production differ over various regions of Serbia and meteorological parameters can seriously influence maize cultivation. Natural hazards, such as the occurrence of frosts, heavy rains in spring, floods, storms, hail, droughts, cause stress and to a significant degree can reduce or destroy maize yields. The application of appropriate cropping practices mitigates adverse effects of climate and soil and provides conditions for the maximum utilisation of the genetic yielding potential of maize hybrids. A system of measures that encompasses proper crop rotation, primary soil tillage, fertilisation, sowing date and density, irrigation, as well as some ecological measures such as intercropping or cover crops, are basic prerequisites for successful production of maize in Serbia. Many producers do not use these measures at the appropriate level even though results shows that fertilisation can improve maize yields from 7.87 t/ha to 10.00 t/ha under rainfed and from 9.42 t/ha to 12.32 t/ha under irrigated conditions. Irrigation can also increase maize yields by more than 30%. In the study, good agricultural practices as components of an improved technologies that could help to reduce the impacts of natural hazards and obtain high and stable yields, are identified and validated.

Key words: *Maize, cropping practices, yield, natural disasters, drought.*

CORRELATION BETWEEN GRAIN YIELD AND YIELD COMPONENTS IN TRITICALE (*X TRIRICOSECALE* WITTMACK)

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Abstract

Grain yield of small grain cereals is mostly determined by the number of spikes m^{-2}, number of kernels per spike and kernel weight, which are, therefore, direct yield components. The objective of the study was to assess the effect of mineral fertilisers, particularly phosphorus, manure and liming, on grain yield and yield components in triticale cultivars grown on an acidic soil, and evaluate their interactions. The results confirmed significant differences among cultivars and showed a positive effect of mineral fertilisers, manure and liming on grain yield and yield components in all cultivars. There were significant positive correlations at ($P \leq 0.05$) between grain yield and yield components, as well as among yield components. Grain yield exhibited the strongest correlation with number of spikes per m^{-2}, plant height and number of kernels per spike. Number of kernels spike was very strongly correlated with spike length, kernel weight per spike and main stem weight. Interactions between grain yield and yield components under different agro-environmental conditions serve not only as a guide to making a proper choice of cultural practices but also as a selection criteria in choosing cultivars for less favourable production conditions.

Keywords: *Triticale, correlation, grain yield, yield components.*

VARIABILITY AND PATH ANALYSIS FOR YIELD COMPONENTS OF DIFFERENT WHEAT GENOTYPES

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Abstract

The study was carried out to investigate the genotypic and phenotypic variability, heritability and relationship between wheat yield components. A randomized complete block design experiment was conducted, with sixteen wheat genotypes (Dukat, Dunavka, Fundulea 4, Iskra, Jedina, Jugoslavija, Kavkaz, Mačvanka 1, Marija, NS-5804, Pitoma, Poljana, Skopjanka, Tamiš, Vali PKA-7114 and Zvezda), in Novi Bečej (Vojvodina, Serbia), during 2016 and 2017 growing seasons. Grain weight per plant had the highest genotypic and phenotypic variability (15.45 and 20.58%, respectively), while spike length had the lowest ones (5.68 and 6.78%, respectively). High broad sense heritability was observed for plant height (H^2=86.19%) and spike length (H^2=71.73%). Heritability was low in the case of spike weight (H^2=38.82%) and grain weight per spike (H^2=26.56%), which indicates that environmental factors had higher impact on expression of these traits in relation to genetic factors. Path analysis revealed that spike weight and spike length had the highest significant direct positive effect on the grain weight per plant, while thousand grain weight had the highest significant negative effect. The grain weight per spike, number of grains per spike and spike length had a significant indirect effect, through spike weight, on grain weight per spike.

Key words: *Heritability, variability, direct effect, indirect effect.*

A 10-YEARS ANALYSIS OF GRAPE PRODUCTION IN SERBIA

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Abstract

Grapes and grape wine have played an important part in Serbian history, stretching back for thousands of years. Unfortunately, during the last decade the Republic of Serbia had devastating results in regard to the total production of grape. Statistics shown on Statista,astatistic portalshows the global leading grape producing countries in 2016/2017. For that period,China is ranked first and the United Statesfifth in grape production. Serbia is not in the top-ten and the possible reason forthiscan betheshrinking of harvested areas during the last decade. This paper presents an analysis of grape production in the Republic of Serbia, using the index comparison method, i.e. using the statistical data on previous years, comparing them with the data on 2017. The data available on the website of the FAOSTAT statistical database and the Statistical Office of the Republic of Serbia (RZS) were used for the comparison and analysis. The analysis of the data on the period from 2007 to 2017 showed that the total production of grapes and harvesting area was diminishing as the time went on. The biggest harvested area was measured in 2007 and it was 59,068 ha. On the other hand, the harvested area in 2017 was 21,201 ha. The best results in grape production were achieved in 2009. In comparison to 2017, the Republic of Serbia had bigger production of grapes in 2009 by 160%. Theworst results were made in 2014 and the production was around 26% lower than the production in 2017. In the last few years, the harvested area has stopped diminishing and onecan see a little improvement in the production.

Keywords: *grape, production, harvested area.*

THE INFLUENCE OF WEATHER CONDITIONS AND FERTILIZING METHOD ON PLANT HEIGHT AT DIFFERENT CULTIVARS OF WINTER WHEAT

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Abstract

Examinations were performed at stacionary field experiment with fertilization that had been applied for many years (over 30) at the property of Center for Small Grains in Kragujevac (Serbia). The experiments were performed in three years period. The experiment on which examinations have been performed includes also six variants of fertilization: 1) N_0 P_0 K_0; 2) $N_{80.\ 120}$ P_0 K_0; 3) $N_{80.\ 120}$ P_{60} K_{60}; 4) $N_{80.\ 120}$ P_{100} K_{60}; 5) $N_{80.\ 120}$ P_{60} K_0; 6) $N_{80.\ 120}$ P_{100} K_0; 7) $N_{80.\ 120}$ P_0 K_{60}. Individual fertilizers were used: KAN as the nitrogen fertilizer, superphosphate as the phosphate fertilizer, 60% potassium saltas the potassium fertilizer. The experiment included also seven different of winter wheat cultivars: Takovchanka, Ana Marija, KG 100, Lazarica, KG 56S, KG 4 and KG 5. The aim of this work was to examine the influence of various dosages and relation of mineral fertilizers on plant height of different cultivars of winter wheat. The height of plant was the varietal characteristics, but in a great extentlargely depends on the entered fertilizers and weather growing conditions. In the three year average, minimum height of plant for examined varieties of the winter wheat was on the control. The use of fertilizer had a highly significant increase in the height of winter wheat. The biggest height of plants of winter wheat in period of triennial examination, obtained in cultivar KG 4 (80 cm) at NP_1K variant of fertilization, at higher nitrogene dose.

Keywords: *Wheat, plant height, fertilizing variants, cultivars.*

ESTIMATION OF ABOVEGROUND BIOMASS AND GRAIN YIELD OF WINTER WHEAT USING NDVI MEASURMENTS

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Abstract

Aboveground biomass of wheat is considered as one of the most important crop parameters and correct estimation of aboveground biomass can help improve crop monitoring and grain yield prediction. Remotely sensed vegetation indices such as NDVI (Normalized Difference Vegetation Index) represent one of the most promising tools for application in field phenotyping with potential to provide complex information on different traits of wheat. The objective of this study was to evaluate the potential of different NDVIs derived from field reflectance measurements in identification of a specific growth stage in which proximally or remotely sensed data showed the highest correlation with aboveground biomass and grain yield of 24 winter wheat genotypes. The NDVI was determined using an integrated proximal sensor GreenSeeker (NTech Industries Inc., Ukiah, California, USA) and hyperspectral camera (Ximea Corp., Lakewood, CO USA) at four growth stages of wheat: full flowering, medium milk, early dough and fully ripe. The hyperspectral NDVI indices were calculated from two-band combinations between red (600-700 nm) or far-red (700-750 nm) and near-infrared (756-955 nm) regions. Highly significant correlations were found between different NDVIs and both examined traits at medium milk growth stage, with r values of up to 0.69. The strong positive relationship implies that medium milk stage is optimal for wheat traits assessment in semiarid or similar growing conditions. The overall results indicated that hyperspectral camera provided alternative spectral combinations for different NDVIs which could be successfully used in assessing aboveground biomass and grain yield of a large number of wheat genotypes.

Keywords: *GreenSeeker, hyperspectral, NDVI, wheat, yield.*

MICROPROPAGATION OF CHRYSANTHEMUM CULTIVARS IN SERBIA

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Abstract

Micropropagation represents the plant tissue technique for rapid multiplication of valuable plant material. Last two decades there has been a continuous research effort in Institute for Biological Research "Siniša Stanković" (Belgrade, Serbia) for development of fast and efficient protocol for micropropagation of chrysanthemum cultivars. Recently, the focus of our research is on implementation of developed protocol in practice. The aim of this work was to evaluate potential for mass plant production by classical micropropagation approach of five commercially growing cultivars of chrysanthemums in one growing season from single shoot as a starting plant material. Aseptic stem segment cultures (88 explants/cultivar) were established from all investigated cultivars (12-54%) in January. Shoot multiplication was evaluated during next three subcultures with shoot multiplication index of 2.8-6.1 newly developed shoot/explant depending on cultivar and culture media. The best shoot multiplication was obtained on nutritional medium supplemented with α-naphthalene acetic acid (NAA) and 6-benzylaminopurine (BAP). Regenerated shoots were rooted (100%) in following three weeks on plant growth regulator free medium. About 3500 micropropagated chrysanthemum plantlets were rooted and planted in field in nurseries during May. Plants were successfully (100%) acclimatized *ex vitro* and flowered during autumn. As a final result we evaluated the cost of *in vitro*-derived chrysanthemum plantlets produced by our protocol for micropropagation.

Keywords: *stem segment culture, plant production, in vitro.*

THE RESPONSE OF ALFALFA TO INOCULATION WITH INDIVIDUAL AND COMBINED CULTURES OF MICROORGANISMS

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Abstract

From the point of view of agricultural production, alfalfa is one of the most important forage legumes in Serbia and the world. Considering the significant area on which this plant species is grown and production potential of alfalfa, average yields in practice are not high enough. One way to improve the productive performance of alfalfa seed is inoculation of the seed with effective strains of microorganisms, which would allow the better use of potential for the development of plants and microorganisms.In this study the influence of pre-sowing inoculation with individual and combined cultures of rhizobia (*Sinorhizobium meliloti*), azotobacter (*Azotobacter chroococcum*) and actinomycetes (*Streptomyces sp*.) on the weight of alfalfa plants was examined. Analyses were carried out in the beginning of blooming stage. In the experiment the influence of seven variants of microbial inoculation on plant weight was examined on two alfalfa cultivars. After inoculation seed from each inoculum variant were planted in the pots filled with soil. For tested parameter, interaction between cultivar and inoculation resulted in positive effect. Only the application with combined cultures *A. chroococcum* and *Streptomyces* sp.(6) in the variety K-28 did not result in a statistically significant increase in green mass per plant compared to the control.

Key words: *alfalfa, inoculation, cultivar, weight.*

ANALYSIS OF VARIABILITY OF MEADOW FESCUE (*FESTUCA PRATENSIS* HUDS.) POPULATIONS AND CULTIVARS

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Abstract

Meadow fescue (*Festuca pratensis* Huds.) is one of the important perennial fodder grasses for animal feed production on grasslands and pastures, with high yield potential and biomass quality. As in other species, basic requirement for successful breeding of meadow fescue is variability of the initial material in breeding programme. The collection examined consisted of five populations and six meadow fescue cultivars. The study was conducted in an experimental field of the Institute for Forage Crops, on degraded alluvium soil type. The trial was set up in a space plant nursery with plant to plant distance 60x60cm as a randomized block design with 30 plants per genotype in two years. The aim of these study was to determine and compare variability of the most important phenological (heading date) and morphological traits (plant height, sward diameter, length, width and leaf number, terminal internodes length and the number of tillers per plant), seed yield components, herbage quality, green mass and dry matter yield of populations and cultivars. The data were analysed by ANOVA. Populations have demonstrated higher variability compared to cultivars for most studied parameters. The highest genetic coefficient of variability in populations was determined for seed yield per plant and number of tillers per plant (CV_G 66.05% and 63.35% in second year of investigation). In cultivars, the highest genetic coefficient of variability determined for green mass yield and number of tillers per plant (CV_G 50.47% and 46.65% in second year). The lowest variability in both studied groups in both investigated year, was determined for heading date. Broad sense heritability (h_b^2) was high, in both studied groups, in populations and cultivars, for all investigated traits. The highest heritability was determined for plant height (99.32%) and ash content (99.84%) in populations, and for green mass yield in the third cut (99.67%) in cultivars.

Keywords: *meadow fescue, variability, heritability, populations, cultivars*.

CHEMICAL PROPERTIES OF BLACK CURRANT (*RIBES NIGRUM* L.) BERRY AND LEAF EXTRACTS

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Abstract

The objective of this experiment was to identify and quantify individual invert sugars (glucose, fructose, sucrose) organic acids (citric acid, malic acid), total anthocyanins, anthocyanin glycosides (delphinidin 3-glucoside, delphinidin 3-rutinoside, cyanidin 3-glucoside, cyanidin 3-rutinoside), vitamins (C, A, B3) and minerals (K, Ca; Mg, Na, P, Cu, Zn, Fe) in berry and leaf extracts of black currant. The extracts prepared from black currant leaves and berries exhibited different characteristics. Berries had higher contents of the tested parameters compared to leaves. Fructose was the dominant invert sugar in all extracts, followed by glucose, while the amount of sucrose was very low. Berry extracts contained 4.35 times more fructose than leaf extracts, and glucose was 3.92 times higher in berries than in leaves. The main organic acid was citric acid, whereas twice as low quantities of malic acid were observed in all tested berries and leaves. The content of total anthocyanins ranged from 289.2 to 12.3 mg C3G 100 g^{-1} in berry and leaf extracts, respectively. In the present research, cyanidin-3-rutinoside was the most abundant anthocyanin in both berries and leaves. The major vitamin in the tested black currant was vitamin C (213.5 and 38.7 mg 100 g^{-1}, respectively), whereas the most abundant mineral was K (328.1 and 20.3 mg 100 g^{-1}, respectively). The results suggested that black currant berries and leaves can be used as valuable ingredients for functional foods.

Keywords*: black currant, berry, leaf, chemical properties.*

BANANA FIBER FROM CANARY ISLANDS: SCIENCE AND EXTRACTION

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Abstract

Natural fiber composites are nowadays used in various engineering applications to increase the strength of a product as well as optimize its weight and cost. One such natural fiber which can be used as a reinforcement material is banana fiber. Banana fiber is produced from the leaves that make up the pseudo-stem of the plant, that is, its stalk or trunk. In the same way as other natural fibers, they contain five basic chemical components, namely cellulose, hemicellulose, lignin, pectin, and certain extractable compounds (vegetable fat, proteins and inorganic salts). Although the Canary Islands is a significant producer and consumer of bananas, the fiber which the plant produces has not been put to much use at all, and, thus, there has been little research into it. The main sectors in which the fiber does have a potential use are those of textiles, paper and plastic. This paper will briefly describe the science of banana fibers and review various methods of banana fiber extraction which are already in existence. The first method is a manual one. There are two chemical methods that can be used to make banana bast fiber. The first comprises an acid treatment of the banana stalk, and the second consists in a basic treatment with lime. Another method use steam explosion-based degumming. Another way of obtaining banana fibers is by employing the biological process of retting. Finally, there is also a variety of machines that can be used to extract banana fibers.

Keywords: *Waste, banana, fiber, extraction, Spain.*

THE EFFECT OF MOVEMENT OF TRACTORS AND MOBILE SYSTEMS ON SOIL COMPACTION AND THE YIELD OF VARIOUS MAIZE HYBRIDS IN THE CONDITIONS OF SOUTHERN SERBIA

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Abstract

Movement of tractors and mobile systems during the plant production can be divided into the movement of the interior of the plot and the movement on the headlands. Both movements result in soil compaction of various intensity, whereby the compaction is more expressed on the headlands, unlike the interior of the plot due to lower speeds in turning. The consequences of compaction create unfavorable conditions for growth and development of cultivated crops, permanent soil damage, reduction of yields and increase production costs. The paper shows the results of measuring the impact of tractors and mobile systems movement on soil compaction changes and the yield of various maize hybrids. The tests were carried out in the conditions of the Jablanica County, and the soil compaction was measured by the Eijkelkamp 6.0 penetrologer in accordance with EN 5140, while the soil moisture was measured by the Theta probe. Cone resistance was measured at the inner part and the edges of the plot at the beginning of the vegetation (emergence phase) and at the end of the vegetation (harvesting phase). The aim was to determine the effects of changes in soil compaction, on the growth, development and yield of various maize hybrids. The obtained results showed that the soil compaction in the emergence phase of maize on the headlands was on average higher by more than 92% in relation to the interior of the plot. In the harvesting phase on the headlands, more intensive soil compaction values were measured in relation to the plot's interior, and the soil compaction increased more than 57%. Due to the more intensive soil compaction on the headlands, the yields of maize on average were reduced more than 60%, compared to the plots interior.

Keywords: *Soil compaction, tractor, maize, yield.*

EFFICIENCY OF GARDEN WASTE COMPOST TEAS ON POTATO GROWTH AND ITS SUPPRESSIVENESS AGAINST *RHIZOCTONIA*

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Abstract

Compost teas are organic solutions obtained by the fermentation of compost in a liquid phase for a few days, with or without aeration. The use of these teas in agriculture is emerging for supplementing or substituting fertilizers and for their ability to suppress soil-borne pathogens. In this study physical and chemical characterization of garden waste compost tea, its application effects on potato growth and its suppressive effect against *Rhizoctonia solani* were analyzed. N and K content were relevant (3200 and 3848 ppm, respectively). Humic acid level was 190 mg L^{-1}. Field trials were carried out with three fried industrial cultivars (Agria, Hermes and Lady Amarilla) in soils affected by *Rhizoctonia* located in Rasueros municipality (Avila, Spain) during 2017. Different dosages of compost tea (d1:1l and d2:3l per plot-7.5m^2) were applied in experimental potato crops, in order to evaluate growth and production parameters (plant height, SPA units, shoots number, yield, tuber size and fried quality) and the *Rhizoctonia solani* control (attack severity). The application of the dosage 1 (1333,3 l ha^{-1}), with respect to control, increased the yield (9,47%), improved the culinary quality (40 %) and reduced the Rhizoctonia incidence (12,4-23,7%). These results show that the use of garden waste compost tea can be of great interest to organic and sustainable agriculture.

Keywords: *Solanum tuberosum*, *Organic fertilizer*, *Biological control*, *Rhizoctonia solani.*

GENETIC RELATIONSHIPS AMONG *PISTACIA VERA* L. F1 HYBRIDS AND THEIR PARENTS (P*. VERA*×HERMAPHRODITE GENOTYPES OF *P. ATLANTICA*) USING SSR MARKERS

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Abstract

This research was conducted at the Scientific Agricultural Research center in Sweida province during (2014-2015). Breeding program was assessed in the aim to insert the bisexual phenomena of *P.atlantica* species (3 different hermaphrodite genotypes PA12, PA35, and PA37 as donators of pollen grains) to the commercial cultivars of *P.vera* (Ashouri and Batouri). Genetic relationships among the previous species and their progenies (F1, 6 genotypes of crossing program) was studied using 20 specific SSRs primer pairs, 16 of them were able to detect PCR amplification. Simple Sequence Repeat (SSR) segregation produced 44 putative alleles, out of which 40 were polymorphic (90.91%). Genetic similarity between the hybrids and their parents were closer to their female than to their male parents except for the hybrid HB3,which revealed a genetic distance 0.37 with its female parent (Batouri cultivar FB) and 0.43 with its male parent (PA35 hermaphrodite *P.atlantica* genotype). The UPGMA cluster plots based on Jaccard's coefficient grouped the genotypes into two main clusters. The number of alleles revealed by each SSR analysis ranged from 1 to 8, with a level of expected heterozygosity (He) 0.496, observed heterozygosity (Ho) 0.25, and Marker Index (MI) 19.84. These results suggested the efficiency of SSR markers for distinguishing lineage genetic studies in the *Pistacia* spp. in breeding programs to elicit new cultivars, in particularly the primer pairs Ptms-7, EPVM021, EPVM016, and EPVF019 which may form the platform to detect sex expression in the genus *Pistacia*.

Keywords: *pistachio, P.atlantica, hermaphrodite, SSR, genetic similarity.*

INFLUENCE OF STRATIFICATION PERIODS AND CULTURE MEDIUMS ON THE GERMINATION OF APPLE ROOTSTOCK SEEDS

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Abstract

This investigation was conducted at General Commission for Scientific Agriculture Research – Pome and Grapevine Division in Sweida Province (Syria) during 2014 – 2015, to study the ability of apple seedswhich derivedfromthe hybrid genotype (HS) and seedling rootstock (B) in apple rootstock breeding program in addition to 'Golden Delicious' variety (GD) to germinate at alternative periods 45, 60 and 90 days of cold stratification at 4°C in different mediums Murashige-Skoog, Murashige-Skoog + 3% sucrose, sand, and sand + 3% sucrose. The results showed that the highest seed germination percentage in HS(87.5% and 80%)was obtained after 60 days of stratification in Murashige-Skoog + 3% sucrose and sand respectively. In B rootstock the highest seed germination percentage was 88.7% after 90 days' stratification in Murashige-Skoog + 3% sucrose, followed by 85% in sand + 3% sucrose after 60 days. However, the highest seed germination percentage in GD cultivar was 87.5% after 60 and 90 days' stratification in Murashige-Skoog and sand + 3% sucrose respectively. The mean time for germination was between 2.7 and 9 days depending on the studied treatments. These results illustrated the importance of determining the best cold stratification period and stratification mediumfor each genotype seeds to produce high apple seedlings in breeding programs and nurseries.

Keywords: *apple, cold stratification, seed germination.*

THE EFFECTS ON FLOWER QUALITY AND FLOWERING TIME OF SOME APPLICATION IN FONDANT HYACINTH (*HYACİNTHUS*) BULB CULTIVAR

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Abstract

This study was conducted to determine the optimal planting time and the effect of humic substance in the Fondant *Hyacinthus* variety bulbs in Selcuklu district in Konya Province. We investigated the effects on flower quality and flowering period of applications: 1) I. planting time (November 7) (unfertilized), 2) II. planting time (November 28) (unfertilized), 3) III. planting time (December 19) (unfertilized), 4) I. planting time (November 7) (Tki-Humas), 5) II. planting time (November 28) (Tki-Humas), 6) III. planting time (December 19) (Tki-Humas). According to findings, the longest flower stems we had at the III. planting time with 12.02 cm (unfertilized) and III. planting time with 12.17 cm (Tki-Humas); the longest flower stalks (Tki-Humas) we had at I. planting time with 1.15 cm (Tki-Humas), at II. planting time with 1.16 cm (Tki-Humas), at III. planting time with 1.17 cm (Tki-Humas) and at III. planting time with 1.19 cm (unfertilized); the maximum number of flowers per stem with 37.00 number had II. planting time (Tki-Humas); the longest flower diameter with 6.98 cm had III. planting time (Tki-Humas); the longest leaf with 16.72 cm had I. planting time (Tki-Humas); the widest leaf with 3.33 cm had III. planting time (Tki-Humas); the opening of the first flowers began on March 26 in all applications; the duration of flowering is determined to be 22 days in all applications; the effect of the applications on the number of leaves was not statistically significant.

Keywords: *Fondant variety (Hyacint), planting time, Humic substance, quality, flowering period.*

THE BUDDING SUCCESS IN LOQUAT (*ERIOBOTRYA JAPONICA* LINDL.) ON DIFFERENT QUINCE ROOTSTOCK

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Abstract

The purpose of the work was to find out the success of budding of loquat on different Quince rootstocks and the effect of these rootstocks on the growth of the nursery plants. For this purpose, Hafif Çukurgöbek loquat cultivar was budded on Quince-A, Quince-C and BA-29 rootstocks with chip budding on 25 April (spring), and 21 October (dormant), 2016. The experiment was laid out in a split-plot experimental design with five replications and fifteen plants per replication. The percentage values were transformed by the angle transformation before submitting the data to the analysis of variance. The means were separated by Tukey's Honestly Significant Difference (HSD) method at p=0.01 and p=0.05. The average success rate of budding on Quince rootstocks was better in October (89.2%) than in April (79.3%). In the both budding periods, it was found that buddings on BA-29 (respectively, 85.5% and 93.1%) were more successful than the ones on Quince-A (respectively, 69.8% and 88.5%) and Quince-C (respectively 83.2% and 86.0%). However, the highest bud sprout rate (86.1 %) was taken from the buddings which were done on Quince-C rootstock in October. Budding performed in autumn gave the higher values (81.4%) of bud sprout rate than the budding done in spring (28.4 %). In the measurements made, the highest values of stock and scion diameter and annual shoot length of the nurseries were obtained from Quince-C rootstock. As result, preliminary data obtained from this research show those quince rootstocks as dwarf rootstock in intensive loquat cultivation can be used.

Keywords: *dwarf rootstock, loquat, budding success, high density.*

EFFECTS OF SOME QUINCE ROOTSTOCKS ON PHENOLOGICAL PROPERTIES AND FRUIT SET RATES IN HAFIF CUKURGÖBEK LOQUAT CULTIVAR

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Abstract

In the research, it was aimed to determine the effects of different quince rootstocks on phenological stages and inflorescence properties besides to the success of obtaining dwarf loquat nursery, which was a requirement of intensive loquat cultivation. For this purpose, one year old nursery of Hafif Çukurgöbek loquat cultivar budded on BA-29, Quince-A and Quince-C quince rootstocks was used. The experimental plants were planted at high density with planting spaces of 1.0 m x 0.5 m in January 2017. The plants were irrigated by drip irrigation since their transplantation. The experiment was arranged according to a completely randomized designed with 5 replications and 6 plants were used in each replicate. In the study, effects of the rootstocks on the flowering periods, the inflorescence characteristics, flowering and fruit set rates of the cultivar were evaluated. In terms of the number of flower buds in the inflorescence (bud/per cluster), plants with Quince-A rootstock (114.91) were given higher values than the BA-29 (106.13) and Quince-C (104.06) rootstocks. However, the highest blossoming rate was observed on BA-29 (99.22%), followed by Quince-C (87.36%). The lowest blossoming rate was measured in plants with Quince-A rootstock (86.27%). Plants with BA-29 rootstock reached full bloom 7-15 days before the other two rootstocks. The fruit set ratios were observed similar in plants with Quince-A and Quince-C rootstocks (14.68 %, 14.11, respectively) whereas the lowest fruit set ratio was observed in and BA-29 rootstock (10.29%).

Key words: *BA-29, Quince-A, Quince-C, rootstrock, phenological properties.*

IDENTIFICATION OF *IN SILICO* MIRNAS IN FOUR PLANT SPECIES FROM FABACEAE FAMILY

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Abstract

Plant microRNAs (miRNAs) are small non-coding RNAs, about 21-24 nucleotides, which have critical regulatory roles on growth, development, metabolic and defense processes. Their identification, together with their targets, have gained importance in exploring their parts on functional context, providing a better understanding of their regulatory roles in critical biological processes. With the advent of next-generation sequencing technologies and newly developed bioinformatics tools, the identification of microRNA studies by computational methods has been increasing. In the presented study, we identified some putative miRNAs for *Cicer arietinum*, *Glycine max, Medicago truncatula* and *Phaseolus vulgaris* genomes. We also provided the similarity between those organisms regarding common/different miRNAs availability throughout their genomes. According to the data, the highest similarity was found between *Glycine max* and *Phaseolus vulgaris*. We also investigated the potential targets of putatively identified miRNAs for each organism. We analyzed which miRNA families were expressed *in silico*. We also showed the representation (copy number of genes) profile of predicted putative miRNAs for each organism. Since most of the food products and animal feeds consist of Fabaceae family members as it is mentioned above, these findings might help to elucidate their metabolic and regulatory pathways to use them efficiently in biotechnological applications and breeding programs.

Keywords: *microRNA, Cicer arietinum*, *Medicago truncatula*, *Glycine max*, *Phaseolus vulgaris*

EVOLUTIONARY INSIGHTS INTO MICRORNAS OF KIWIFRUIT *ACTINIDIA CHINENSIS* AND ITS CLOSE RELATIVES

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Abstract

The advent of next-generation sequencing technologies and newly developed bioinformatics tools have provided us complete sequence information of organisms. Plant microRNAs (miRNAs), small non-coding RNAs about 21-24 nucleotides, and their regulatory roles in biological processes have been uncovered since the identification of the first miRNA. MicroRNA biogenesis and modes of actions have also been elucidated in previous studies. In the presented study, we identified putative microRNAs from *Actinidia chinensis, Arabidopsis thaliana*, *Solanum lycopersicum*, *Solanum tuberosum* and *Vitis vinifera* to compare their miRNA repertoire. According to the results, the highest synteny was found between *V.vinifera-A.chinensis* and the least synteny was found between *A.thaliana-A.chinensis*. The highest number of putative miRNAs were identified from *A.thaliana* whereas the least amount of putative miRNAs were identified from *V.vinifera*. This may be depended on the size of the genomes. We also analyzed the targets of putatively identified miRNAs for each organism. Expectedly, the target pathways of the predicted putative miRNAs were similar between the closest organisms. Expressed miRNA families and copy number of miRNA genes were compared between all organisms. In *A.thaliana*, the number of expressed putative miRNAs are more than the other organisms. For all the organisms, different miRNA families had the high copy number of genes. Therefore, highly represented miRNA families on each genome may have specific functional roles. The findings in this study will help the research community to identify the roles of miRNA players on critical biological pathways.

Keywords: *MicroRNAs, Actinidia chinensis, Solanum tuberosum, Solanum lycopersicum, Vitis vinifera.*

CULTIVATING FORAGE RAPE WITH FORAGE PEA FOR FEED PRODUCTION IN WINTER PERIOD

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Abstract

Most of the researchers say that mixed growing has lots of advantages and it can produce more balanced feed compared to sole production. Prominent advantage of forage rape and pea is that they can be grown during the winter period in our region. Thus, there is no irrigation demand and this mixture reach the harvesting stage before the sowing time of main warm season crops such as corn, tobacco, sunflower, sugar beet, watermelon, melon and other vegetables. There is a big roughage gap in our region, as well as in Turkey. Aim of this study was to determine suitable forage rape and forage pea cultivars, their binary mixture and harvesting time without causing any restriction to warm season crops. The research was designed as split plot in randomized blocks with four replications and carried out in coastal Central Black Sea Region. Forage rape (Cv. Lenox) was grown as binary mixtures with Gölyazı, Kirazlı, Ulubatlı, Tamkoc (Turkey), Letin, Adam (Croatia) and Kosmaj (Serbia) cultivars of forage pea. All the cultivars were grown solely, also. The harvests were made at budding and blossoming periods of forage rape. Letin, Kirazlı and Gölyazı forage pea cultivars started blossoming one week earlier than forage rape. Average blossoming duration of these was 138 days after sowing. Blossoming time of Ulubatlı cultivar was the same with forage rape, but Adam, Tamkoç and Kosmaj blossomed later. Plant height of sole forage rapes (63.5 cm) were higher than mixed (55.9 cm) ones. While the highest forage pea was Kirazlı cultivar (78.2 cm), the shortest one was Adam cultivar (47.0 cm). Forage yield and quality parameters of mixed plots were generally higher than sole forage rape plots.

Keywords: *Forage rape, forage pea, mixture, harvesting time.*

DETERMINATION OF SUITABLE MIXING RATIOS OF CHICORY WITH ORCHARDGRASS AND RED CLOVER

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Abstract

Researchers and farmers have paid more attention to chicory recently, because of its palatability, high yield, nutritive value, digestibility, kept greenery throughout the summer period, deep and strong root system and drought resistant ability. In addition, it has some positive effects on animal health. Chicory is very common in natural areas of Turkey. This study was conducted according to randomized block design with three replicates in Samsun conditions in 2017. In the study, chicory (C), orchardgrass (OG) and red clover (RC) were grown as solely and binary mixture in rain fed conditions. Binary mixtures were 80% C + 20% OG, 60% C +40% OG, 40% C + 60% OG, 20% C + 80% OG, 80% C + 20% RC, 60% C + 40% RC, 40% C + 60% RC, 20% C + 80% RC. Harvests were made when chicory plants reached 25 cm average plant height. Three cuts were performed (twice in June and once in July) in 2017. Only chicory plants could reach the harvest stage for the third cut. The highest fresh yields was 55.7 and 17.7 t ha^{-1} at the 20% C + 80% RC mixture for the first and second cuts, respectively. Yield was getting decreased with each cutting sequence and it declined to 5.7 t ha^{-1} for the third cut. In totally, 20 % C + 80% RC binary mixture gave the highest yield. Total fresh yield was determined between 65.1 – 8.8 ha^{-1}. The highest hay yield was obtained from the treatments contain red clover as follows; 40 % C + 60 % RC, 100 % RC, 20 %C + 80 % RC, 80 % C + 20 % RC and 60 % C + 40 % RC (respectively; 12.30, 12.00 , 11.50 , 10.40 and 9.90 t ha^{-1}) . Crude protein ratios were 24.1 –16.1 % in the first, 26.9 – 17.5 % in the second and 22.9 – 20.3 % in the third cut. In the first, second and third cuts ADF ratios were 32.4 – 24.1 % , 33.5 – 20.4 % and 23.6 – 20.1 % ; NDF contents were 54.6 – 34.3 % , 58.2 – 34.0 % and 35.0 – 31.7 % , respectively.

Keywords: *Chichory, orchardgrass, Red Clover, mixture rates.*

FORAGE YIELD AND SOME AGRICULTURAL TRAITS OF COWPEA GROWN AS DOUBLE CROP IN ECOLOGICAL CONDITIONS OF SAMSUN (TURKEY)

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Abstract

In addition to the good adaptation of high temperature and low nutrient soil, cowpea (*Vigna unguiculata* L.) can be a good source of forage for livestock. This research was conducted to determine forage yield and some quality parameters of cowpea grown as double crop in Samsun ecological conditions. In this study, we examined hay and seed yields and related traits of cowpea grown as double crop with different row spaces. In the experiment, two types of forage cowpea genetics Registered Cultivar Ülkem and genotype black seed cowpea and four different row spaces were used (20cm, 35cm, 50cm, 65cm). Field trials were designed in randomized block design with three replications and 8 rows in each plot. Cowpea seeds were sown after wheat harvesting at July 13, 2017. The first cut was after 57 days (8 Sep) and the second cut was made after 90 days (10 October). Hay yield of the first cut was higher than the second one. Other than the hay yield, plant height, stem diameter, crude protein, ADF, and NDF were also determined. Field results showed that the hay yield ranged from 3.98 to 7.12 ton ha-1 for the first cut and 0.72 – 1.46 ton ha-1 for the second cut. Plant height in the first cut was between 111.2 – 137.3 cm were height of the second cut, they were 24.0 – 29.6 cm. Plant stem diameter was between 6.10 - 8.77 mm. At the laboratory work, it was clarified that crude protein ratios of hay were 18.87 – 21.14% for the first cut and 24.7 – 27.65% for the second cut. ADF ratios were 25.95% - 28.00% in first cut, while the second cut was 19.13 - 24.24%. NDF ratios of hay were ranged from 33.66 to 36.64% and from 24.48 to 31.15% for the first and second cuts respectively.

Keywords: *Cowpea, Forage yield, Row space, Second crop.*

EFFECT OF ROOT PARAMETERS ON SURVIVAL OF *IN VITRO* GROWN STRAWBERRY

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Abstract

This study carried out in Çukurova University of Turkey was started with six runner strawberry varieties and genotypes: 'Sevgi', 'Rubygem' 'Kaşka' cultivars and '291', '60' and '36' hybrid genotypes. These materials were waited in 15% sodium hypochlorite solution for 10 minutes in order to surface sterilization and then were rinsed with sterile water in tissue culture laboratory. After sterilization, shoot tips of plants were extracted by sterile forceps and scalpels under a stereobinocular microscope in laminar flow and placed on hormone free Murashige and Skoog (MS) nutrient medium for initiation development during four weeks. Then, the explants were transferred to the MS medium containing 1 mg L^{-1} 6-Benzylaminopurine (BAP) for shoot proliferation. After four weeks, the effects of genotypes on root number, root length and explant weight were investigated. The number of root varied from 4.11 ('Sevgi') to 2.33 ('36'). Root length was changed between 1.61 ('36') and 0.64 cm ('Sevgi'). Our results showed that root length and number were negatively correlated with each other due to nutrition competition. At the same time, there was the difference in rooting capacity even in the same genotype. Therefore, at the end of study, the explants were divided to tree classes (well rooted, medium rooted and non-rooted) to determine the effect of root on the percentage of survival *in vitro* plants during acclimatization stage. The genotype, amount of root and their interaction were significantly effective on the acclimatized plants successfully. As expected, the percentage of survival plants was influenced from the number of roots. The highest percentage for rooting obtained was 75.8%. Also, *in vitro* plants obtained from 'Rubygem' variety did not need many roots to survive. However, any *in vitro* plants could not live under non rooted condition in this cultivar. This study presents preliminary results of a project aimed testing different types of plant growth regulators and their different doses on important breeding varieties and genotypes using shoot tip culture. These pre-results will be useful for us in terms of knowing the tissue culture capacities of our genotypes and varieties.

Key words: *Strawberry, in vitro, Shoot tip, Rooting.*

DETERMINATION OF THE NITROGEN DOSES EFFECTS ON GRAIN YIELD AND YIELD COMPONENTS OF SOME OAT GENOTYPES

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Abstract

In order to healthy ruminant feeding, high quality forage must be eaten and at least half of feed should consist of forage. Though oat is commonly used as food and feed in the world. In Turkey oats are mainly used for feeding as forage and kernel. Its kernel has high Content of carbohydrate, protein, oil, minerals and vitamins. Protein level of oat kernel can be reached up to 16% and its biological value is similar to the other cereals. Oat kernel has one of the highest oil content among cool season cereals with 6.5%. These properties increased oat kernel nutritive value, palatability and voluntary intake of oat by ruminants. The climatic characteristics of Samsun are very suitable for oat requirements. The aim of this study was to determine the effects of 5 different nitrogen doses, on grain yield and yield components of 2 oat varieties and 1 oat line. The experiment was established according to split plots design with 3 replicates on 11 November 2016. In the study, grain yield, 1000 seed weight, height of plant, number of panicle per square meter and harvest index of oat genotypes were determined. Average grain yields were 2.53, 2.86, 3.37, 3.62 and 3.93 t ha^{-1}, respectively, depending on N doses (0, 50, 100, 150 and 200 kg ha^{-1}). Panicle numbers were also increased with N fertilization, the highest value was obtained from 200 kg ha^{-1} N rate with 467 panicle number m^{-2}. As the N doses increased, grain yield was also increased even though 1000 seed weight decreased.

Keywords: *Oat, Nitrogen dose, Cultivar, Grain yield, Yield components*.

REMOTE SENSING TECHNIQUES FOR RESEARCH AND CLASSIFICATION OF THE PHOSPHORUS AMOUNT REQUIRED FOR SUGAR BEET PLANT

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Abstract

Remote sensing and its terrestrial components provide practical and effective solutions in agricultural applications. Remote sensing in such areas as plant stress, irrigation, fertilization and investigation of chlorophyll content does not only provide a quick solution, but also provides precision agriculture with high accuracy. One of these application areas is to investigate the proper amount of fertilizers for plant health and development. Phosphorus was used as fertilizer in this study. Phosphorus is an element that people, plants and animals must take, however, phosphorus deficiency is a common occurrence. In addition, excessive amounts of phosphorus could be harmful to both plant health and to the ecosystem. Therefore, it is significant to apply the correct amount of phosphorus fertilizer in agriculture. In this study, an agricultural land in Sivas province was divided into three parts and phosphorus fertilizer was introduced at three different doses (0 kg P ha^{-1}, 150 kg P ha^{-1} and 300 kg P ha^{-1}) were, then sugar beet was planted to these areas. After the plants developed, spectroradiometer measurements were made on their leaves to obtain the spectral signatures of the plants in each phosphorus group. Spectroradiometer measurements were performed simultaneously with Sentinel 2 satellite transition. A spectral classification was carried out by resampling the reference spectra from the terrestrial measurements to the Sentinel 2 satellite band intervals. As a result, the growth of plants was monitored and sugar beet, which was treated with different amounts of phosphorus fertilizer, could be detected by using a satellite image.

Keywords: *Remote sensing, Spectral classification, Sugar beet, Phosphorus.*

A QUESTIONNAIRE SURVEY ON AGRICULTURAL PRODUCTION AND USE OF MACHINERY IN SOME TRADITIONAL AREAS OF SOUTHERN ÇANAKKALE IN THE NORTHWEST TURKEY

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Abstract

The main objective of this study was to evaluate the impact of water resources and mechanization inputs on the productivity and technical efficiency of crop production in the Bayramiç-Ezine-Kumkale plains located in Çanakkale province. The irrigation water was supplied by Bayramiç Dam constructed in 1996 with a capacity of 96 m^3. Data were collected during a questionnaire by farmers interviewed in villages of 3-plain. According to pre-1996 period, dry-agriculture decreased while irrigated-agriculture increased in both annual and perennial crop areas, especially in silage maize, clover, feeder, peas, sorghum, apple, meddler, pomegranate, palm, quince, fig, plum, cherry, apricot, olive. With these improvements, many cold storage and olive processing factories were opened with a capacity of 100% and 50%, respectively. Tractor use increased by 71% in province, 69.29% of them were in 3-plain. Tractor brands increased from one to seven, particularly New Holland. Plough, cultivator, disc harrow, weed tiller and row-sowing commonly used in dry-agriculture were also increased in 3-plain. Similarly, fruit harvester use increased in both province and 3-plain, self-powered or tractor-powered. The increase in irrigated silage maize by 5.5 times in 3-plain increased use of maize harvester and stalk shredder. This increased sprinkling, drop irrigation, milking, seedling and maize drying machines. Tractor power was 2.5 kW $hectare^{-1}$ in 1995 before the irrigation application, but this increased by 2.5 times (5.50 kW $hectare^{-1}$) in the last period of 2017. The area per tractor decreased from 11.55 hectare to 7.05 hectare, but tractor power size increased from 35 kW to 48 kW, many of them were over 15-year old. Tractor per 1000 hectare was 132 in province, 37.4 of them were in economic life and 94 of them were over their economic life, but in 3-plain, 50% of the total park was in economic life.

Key words: *Çanakkale, farming system, mechanization, Bayramiç dam.*

ANALYSING OF ENERGY INPUT-OUTPUT OF FLAT AND SLOPING LAND OLIVE ORCHARDS IN MEDITERRANEAN COASTAL AREAS

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Abstract

The study was carried out on use of energy input and output olive production under traditional-flat/sloping and intensive or full mechanized-flat olive orchards in Çanakkale province located south Marmara region, the one of the origin of olive plant in western Turkey. Data were collected from orchards through personal interviews of farmers in all districts of province. The results show that average olive yield per tree and unit area was 18.2 kg tree^{-1} and 1.98-ton ha^{-1}, respectively, 10.91% of table olive and 89.09% of olive oil in regardless of flat or sloping orchards in the province. Olive oil production is fairly high by 3.92-ton ha^{-1} due to Ayvalık variety usually grown for olive oil in this environment and spread over the hilly and Ida mountain along coasts of the province. Total energy outputs from olive and its pruning residues was the highest for intensive-flat orchards by 45.43 GJ ha^{-1} due to fairly high olive and pruning yield because of receiving usually fertilising, irrigation, spraying, etc., but the energy output in the traditional-flat corresponds to almost the half of the mechanized-flat with 19.73 GJ ha^{-1}, and followed by traditional-sloping with 10.50 MJ ha^{-1}. Total energy inputs, farm operations and sequestered of machinery, was found 31.10, 14.89 and 8.05 GJ ha^{-1} for intensive-flat, traditional-flat and sloping olive orchards, respectively. Energy ratio were higher for intensive-flat by 1.46 MJ ha^{-1}, while it is 1.32 and 1.31 MJ ha^{-1} in both flat and sloping of traditional, respectively. Energy productivity is the highest in the intensive-flat by 0.93 MJ ha^{-1}, and the lowest in traditional-sloping by 0.69 MJ ha^{-1}, while traditional-flat is 0.90 MJ ha^{-1}. Specific energy increased in traditional-sloping by 1.46 MJ kg^{-1} due to the lowest olive yield followed by traditional-flat with 1.11 MJ kg^{-1} and intensive-flat with 1.07 MJ kg^{-1} having the highest olive yield.

Key words: *Olive tree, land situation, energy analyses.*

PLANT HEIGHT CONTROL OF *HYACINTHUS ORIENTALIS* BY GIBBERELLIN INHIBITORS

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Abstract

In this study, effect of gibberellin inhibtors as preplant bulb soaks on plant height of *Hyacinthus orientalis* cv. 'Jan Bos' grown in pots were investigated. Bulbs of hyacints were soaked in flurprimidol at 0, 10, 20 ppm and paclobutrazol at 0, 100, 200 ppm before planting. Effect of gibberellin inhibitors on the flowering time, flower diameter and length, leaf length, plant height, flower life, chlorophyll content of leaves were determined. In addition, after hyacints grown in pots in the greenhouse arrived at the sales stage to determine the changes that occur in the plant height, plants were taken to the laboratory where temperature was held constant at 20 °C. The shortest plant height was obtained from the 200 ppm paclobutrazol and 20 ppm flurprimidol treatment as given bulb soaks. In this treatments, plant heihgt was 7.33 and 8.61 cm and were 49% , 41% shorter than untreated control. The lower dose of 10 ppm flurprimidol and 100 ppm paclobutrazol were also effective on height control with 9.11 and 9.71 cm plant height, respectively. Gibberellin inhibitors also shortened leaf lenght. Flurprimidol and paclobutrazol treatments resulted in higher chlorophyll content per unit area in the leaves than untreated controls. The highest chlorophyll contetnt was obtained from the plants treated 200 ppm paclobutrazol with 83.36 CCI (Chlorophyll content index), while the control was 50.56 CCI. The effects of treatments on plant height were maintained in lab conditions (home-office). The shortest plant height was obtained from 200 paclobutrazol treatment with 9.75 cm, while the control was 21.5 cm during post production period.

Keywords: *Flurprimidol, Paclobutrazol, Bulb Soak, Hyacinthus, Plant Height.*

EFFECTS OF ROW SPACING AND SEEDING RATES ON SEED YIELD AND QUALITY OF BIRDSFOOT TREFOIL (*LOTUS CORNİCULATUS* L.) İN CENTRAL BLACK SEA REGION OF TURKEY

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Abstract

Birdsfoot trefoil a series of abiotic stress adaptation is an important component of grassland ecosystems and natural life, apart from producing feed in restricted areas in the direction of environment. One of the solutions for generalize the birdsfoot trefoil breeding is to produce quality seeds in sufficient quantity. This research was conducted to determine the effects of various row spacing (20,40,60 and 80cm) and seeding rate (5,10,15 and 20 kgha-1) on birdsfoot trefoil (cultivar candidate) seed yield and quality components. The experiment was conducted at the Tokat Agricultural Research Institute, using a randomized complete block split-plot design with three replications in 2016-2017 growing season. Research result; while the row spacing and seed amount applications had significant influences on the seed yield and the weight of thousand seeds for the first harvest and on the germination rate for the second, they didn't have a statistically relevant effect on other parameters. The interaction between row spacing and seed rate had no correlation except for the seed yield performance of the first harvest. Seed yield was to increase with narrowest spacing and increased seed rate. Highest yield for both harvests (226.1 and 85.4 kgha-1 respectively) were achieved with 40 cm row spacing and 10 and 15 kgha-1[1] seed amounts. Highest weight of 1000 seeds performance was achieved with 40 cm row spacing with 5-10 kgha-1 seed rate, while the highest germination rate was found to occur in 40-60 cm row spacing with 10 kgha^{-1} seed rate.

Keywords: *Birdsfoot trefoil, Sowing frequency, Thousand seed weight, Seed germination.*

DETERMINATION OF SOME QUALITY PARAMETERS IN SILAGE CORN AFTER DIFFERENT HUNGARIAN VETCH + CEREAL MİXTURES

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Abstract

This study was conducted to determine some quality traits of silage corn (*Zea mays* L.) after Hungarian vetch (*Vicia pannonica* Crantz) intercropping with barley (*Hordeum vulgare* L.), wheat (*Triticum aestivum* L.) and triticale (*Triticosecale* Wittmack) sown at different mixture rates (100:0 70:30, 60:40, 50:50 and 40:60%) and cut at the flowering and milk dough stages in the ecological condition of Yozgat during 2014 and 2015 growing seasons. The experiment was arranged in split plot-design with four replications, main plots were sowing time and sub plots were previous crop (mixture rates). Crude protein ratio and crude ash ratio, ADF, NDF, K, P, Ca and Mg contents were determined. Crude protein and ash ratio were ranged between 5.90 – 7.75% and 6.18 – 7.38% of respectively. The lowest ADF and NDF ratios were determined sole barley (34.19 – 61.38%), while the highest were determined 50HV:50T% (36.88 – 65.99%). K, P, Ca ve Mg contents of silage corn were ranged 1.96 – 2.17%, 0.271 – 0.289%, 0.23 – 0.30% and 0.18 – 0.22% of respectively. According to two years results, it has been determined that it is decreases quality when delayed silage maize sowing time and also, some corn plots that were planted after the Hungarian vetch + cereal mixtures of previous crop are not difference to stubble plot in terms of hay quality.

Key words: *Pre-plant, sowing time, quality, silage corn.*

PRODUCTION AND GENETIC MAINTENANCE OF PURE QUALITY MAIZE SEEDS BY SMALLHOLDER FARMERS IN KARAMOJA SUB-REGION, UGANDA

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Abstract

Improving agricultural productivity in Karamoja, Uganda commenced with implementation of a comprehensive program for seed revitalization system through: creating a multi stakeholder innovation platform for commercial seed production, training and equipping farmers with practical grower knowledge, quality control and marketing of pure quality seeds in a sustainable venture, and increasing seed volumes through block farming. Successes achieved involved application of effective methodologies including: establishing an inter-linkage platform for sourcing production and marketing information used in seed system, application of nucleus and farmer field school (FFS) perspective for practical farmer training, application of isolations (time and distance) and half-sib methods for genetic purity maintenance, and establishing block fields for seed production. Four farmer groups were formed each comprising of 25 farmers across selected districts. Farmers started with foundation seed stocks and produced quality declared seed and finally pure quality seeds after three seasons. The project registered the following benefits including: platform for seed enterprise established and functionalized, favorable contract agreements for commercial seed scheme developed and operationalized, model for seed profit margin analysis for crop enterprise selection developed, 5 farmer groups under FFS made operational. Growers (62.5%) trained in production and marketing of maize seed systems, 80% of farmers applied half-sib method at various isolation perspectives, and 108MT of pure maize seeds were produced. Presently growers have knowledge of seed production and access to pure quality seeds for use in production.

Keywords: *seeds-purity, smallholder, half-sib, farmer, school.*

EVALUATION OF GENETIC DISTANCES CORRELATIONS AMONG SUGAR BEET GENOTYPES (*BETA VULGARIS* L.)

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Abstract

A search and a combination of different statistical methods for determining the similarity and difference between genotypes is a hot topic for breeding. In the formation of adaptive potential and appropriate protective mechanisms for the implementation of the adaptive potential of sugar beet, terpene compounds and saponins are involved. To determine polymorphism based on DNA of sugar beet materials under investigation, RAPD analysis was performed. A cluster analysis of the hybrids affinity was carried out in terms of the qualitative biochemical state of the system and DNA polymorphism. As a result, it was found that hybrids that demonstrated high activity of the secondary metabolism and, consequently, showed different ability to form a high adaptive potential in the conditions of long-term cultivation *in vitro,* formed separate clusters. With the aid of RAPD markers, the authors also determined two clusters that were formed on the basis of genotype affinity. In order to determine the correlations between genetic distances obtained by RAPD markers and terpene compounds, the Mantel test (linear correlation for Pearson) was performed. The values of coefficients $r = 0.517$ were obtained at $\alpha = 0.05$. However, according to the data interpretation, the calculated value of p (0.088) was higher than the significance level of $\alpha = 0.05$, which indicates the absence of correlations between the matrices under investigation. Thus, the revealed genotypic features of the secondary metabolism and genetic distances are additional characteristics for evaluation of the ecological plasticity of sugar beet plants, which is important in the breeding process.

Keywords: *terpene compounds, saponins, DNA markers, Mantel test.*

EFFECTS OF ZEOLITE ON GERMINATION OF SOYA BEAN SEED AND ITS USE AS A SUBSTRATE

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Abstract

Zeolite is a mineral of volcanic origin with negatively charged crystalline sieve that, according to many studies, has the ability to exchange ions. Mechanical processing - grinding of zeolite results in the increase of the particle surfaces and thereby its ability to adsorb heavy metals, mycotoxins, positively charged ions of sodium, potassium, nitrogen. The aim of the present study was to determine the effect of natural zeolite on seedlings and their development, as well as on total soya bean seed germination under laboratory conditions. The use of zeolite in the combination with soil and sand, as methods for seed germination, was observed in the study. The test was conducted on three samples of soya bean seeds at the Seed Testing Laboratory of the Maize Research Institute, Zemun Polje. Particles (0.3-1 mm) of natural zeolite, mixed with soil and sand in the concentration of 1% and 3%, were used in the study. The soil type was degraded chernozem taken form the ploughing layer of the maize field and prepared according to the standard procedure: 4x100 seeds of soya bean were tested by the methods filter paper + soil, filter paper + sand (standard), filter paper + soil + zeolite (1% and 3% weight percentages) and filter paper + sand + zeolite (1% and 3% weight percentages). Seeds were germinated in the germination cabinet at the alternating temperature of 20<=>30^{o}C (16 h : 8 h / light : dark photoperiod) for 8 days. The use of zeolite increased germination of soya bean seeds, while different concentrations of zeolite did not significantly increase germination.

Key words: *zeolite substrate, germination of soya bean seeds.*

THE EFFECTS OF HUMIC SUBSTANCE APPLICATION ON CLUSTER AND SHOOT CHARACTERISTICS OF "TRAKYA ILKEREN" GRAPE VARIETY

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Abstract

Clay soils make it difficult to grow plant roots and grow the plant with tightly structured, heavy soil structure. humic substance contribute to plant growth and development by improving the structure of the soil. This research was carried out in order to determine the effects of humic substance application on the bunch and shoot characteristics of “Trakya Ilkeren” grape variety from the soil and foliage grown in clay soil conditions in 2014-2015. In the study, humic substance (total humic + fulvic acid 15%, total organic matter 10%, water soluble K_2O 2%, pH 8-10) was applied from the soil and foliar in pre-flowering and post-flowering periods. The effects of humic + fulvic acid application on leaf area, shoot length, berry length, berry weight, bunch length, titratable acidity, TSS and pH were investigated in the study. The effect of humic + fulvic acid application on cluster characteristics was not significant. However; bunch weight, bunch width, berry length was found highest in soil application while cluster length and berry weight found high in foliar application. In the study, the effect of humic substance application on leaf area and shoot length was found to be important but there was no effect on shoot diameter. The humic substance application of soil was determined positively on TSS, bunch and berry weight compared to the control.

Keywords: *humic substance, grape, cluster, vegetative development, quality.*

STUDY OF THE INTERACTION SALINITY-FERTLIZATION ON THE MINERAL NUTRITION OF CANOLA

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Abstract

Soil salinity causes serious problems for cultivation in arid and semi-arid regions. Yield is low when soluble salts unbalanced the mineral nutrition of plants. In 2005, Food and agriculture organisation (FAO) estimated that 7% of agricultural land in the world was affected by salinity. The issue is also widespread in cultivated areas because of irrigation waters containing dissolved salts. To limit this issue, it is necessary either to use vegetable species and varieties tolerant to the salts. The aim of this work was to study the effects of increasing doses of salinity with fertilizer on the mineral nutrition of Canola. Our aim was also to determine the nitrogen, phosphorus and potassium contents in Canola plant tissues and to compare the results of each treatment (interaction between salinity and NPK fertilizer). The chosen experimental design was the complete random block, with 4 levels of salinity (S0=0dSm^{-1}control; S1=2dSm^{-1}; S2 =8 dSm^{-1}; S3 =32 dSm^{-1}) and two doses of NPK fertilizer (0 mg/pot and 99 mg/pot). The results showed that S3 had a negative effect, we recorded the lowest nitrogen content in the plant in the absence of NPK fertilizer. The supply of NPK fertilizer had a significant effect on the nitrogen, and phosphorus nutrition of Canola. The content of exchangeable potassium in plant tissues of Canola decreased when the concentration of NaCl was high, which was in agreement with the bibliography. There was an antagonism between Na^+ and K^+. The S0 level recorded the highest potassium content while S3 recorded the lowest content. Salinity levels (S1, S2, and S3) without fertilizer had a depressive effect on the mineral nutrition of Canola. The application of NPK fertilizer increased the nitrogen and phosphorus content in plant tissues of Canola in a saline environment.

Keywords: *Soil, interaction, fertilization, salinity, NPK.*

LARVICIDAL ACTIVITY OF AN ESSENTIAL OIL FORMULATED ON THE TOMATO LEAF MINER TUTA ABSOLUTA (MEYRICK, 1917)

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Abstract

Today, the future of agriculture lies in the sustainability of its practices. Some plant species of Lamiaceae family are abundant and invade the areas of crops in Algeria. The exploitation of the biocidal properties of these plants would make it possible to valorize these species in a context of sustainable agriculture. The massive use of chemical pesticides in crop protection, has led to many environmental disorders. Biopesticides, especially essential oils from botanical sources, are good alternative to remedy this disease by reducing risks and maintaining biodiversity. The present study investigated the efficacy of an essential oil formulated with Thymus vulgaris on tomato leaf miner larvae (Tuta absoluta Meyrick), compared to a synthetic insecticide (Thiamethoxam). The different doses applied during the treatments showed that the complete dose (D) of thyme essential oil was the most effective compared to the other doses applied and the registered dose of the phytosanitary product (DH) because of its low rate residual populations recorded (PR <28.5%). The interaction of dose and time factors after treatment revealed a progressive efficacy over time from the medium toxicity to the high toxicity. For the two products used, namely biological or chemical, the period of 72 hours after treatments was defined as the best time for obtaining optimal toxicity on the larvae of Tuta absoluta.

Keywords: *Essential oil, Residual Population, Thymus vulgaris, Tuta absoluta, toxicity.*

ANTIBACTERIAL ACTIVITY OF *ARTEMISIA JUDAICA* ESSENTIAL OIL AGAINST SOME MULTI-RESISTANT BACTERIAL STRAINS

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Abstract

The Algerian flora and particularly the Saharan flora abound with an important reserve of spontaneous plants with medicinal and aromatic characteristics. These species play a decisive role in the treatment of certain pathologies and occupy an important place in the Algerian pharmacopoeia. *Artemisia judaica* is an aromatic plant, belonging to the Asteraceae family, commonly called by the Saharan population "Chih Sahrawi" or "Tihajjeli". The species is recognized for its many medicinal and aromatic virtues. In the present study, we tried to evaluate the antibacterial activity of *Artemisia judaica* essential oils from the Tamanrasset region, located in the center of the Algerian Sahara, with respect to some gram-negative bacterial strains. This species provided an essential oil with a yield of 1.27%. The results of the carried out antibacterial tests revealed that the essential oil of *Artemisia judaica* had a growth-inhibiting effect starting from a concentration of 6,25 mg/ml with respect to the *Escherichia coli* strain. The most important minimum inhibitory concentration (MIC) was recorded for multi-resistant strains: *Klebsiella pneumoniae*, *Citrobacter freundii* and *Pseudomonas aeruginosa*, with a concentration of 50 mg/ml. The recorded MIC values corresponded to those obtained for the CMB (Minimum Bactericidal Concentration) and this for all the bacterial strains tested. These results point towards a bactericidal effect of the essential oil of *Artemisia judaica*. Therefore, based on these promising results obtained in our current work, subsequent *in vivo* clinical studies are needed to confirm the antimicrobial efficacy of these natural products.

Keywords: *Artemisia judaica, Leaves, essential oils, multi-resistant bacterial strains.*

EVALUATION OF ANTIMICROBIAL ACTIVITY OF HYDROALCOHOLIC EXTRACTS FROM *SALVIA ARGENTEA* LEAVES

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Abstract

Antibiotic resistance is accelerated by the unjustified and excessive use of antibiotics but also by bad practices of prevention and fight against infection. Measures must be taken to reduce the impact of the strength and limit its spread. As such, the purpose of our study is to highlight the herbal medicinal power of a plant collected in the Saida region, *Salvia argentea* (L.) belonging to the Lamiaceae family which is a plant species originating to the Mediterranean region, by testing the antimicrobial activity of the ethanolic and methanolic extracts obtained from leaves of *Salvia argentea* on 8 bacterial strains *(Staphylococcus aureus, Methicillin-resistant Staphylococcus aureus, Pasteurella multocida, Klebsiella pneumonia, Enterobacter cloacae, Citrobacter freundii, Salmonella enteric, Escherichia coli)* and two fungal strains *(Candida albicans , Saccharomyces cerevisiae)* using two techniques: the disc diffusion method and the determination of the minimum inhibitory concentration (MIC). The results show that both extracts are effective on most microorganisms tested with inhibitions areas ranging from 8.5 to 17.5 mm while the liquid medium dilution method has yielded important results with MICs between 3.90 and 15.62 mg/ml. These values reflect the inhibitory efficiency of this plant on the microbial strains considered most resistant. These results obtained constitute a very valuable source of information for the Algerian medicinal flora. A more detailed study of these extracts of this plant, carried out according to different protocols could be developed for further research in the fields of phytochemistry, pharmacology and in order to seek new natural molecules with therapeutic interests.

Keywords: *Salvia argentea (L.), Leaves, Antimicrobial activity, Hydroalcoholic extracts.*

STUDY OF ALLELOPATHIC EFFECTS OF CUPRESSUS ARIZONICA ESSENTIAL OIL AGAINST GERMINATION AND SEEDLING GROWTH OF WEEDS AND WHEAT

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Abstract

This work focuses on the research of the effect of allelopathic inhibitor of a bioproduct formulated on the basis of essential oil, extracted from Cupressus arizonica on the germination and growth of Sinapsis arvensis and on three varieties of cereals: Hordeum vulgare of the var. Rayhane, Triticum aestivum of the var. HD 1220 R1, Triticum durum var. Amar 06, as much as strategic cultures. For this, biological tests were carried out. In our study, the germination of samples was first carried out in boxes of Petri dishes following a protocol, We opted for three dilutions from the mother solution which is concentrated at 10% to obtain the following doses: D1 = 0.25g/l, D2 = 0.5g/l and D3 = 0.75g/l. Then, the herbicide effect of this oil was compared with an herbicide of synthesis. The characterization of essential oil by analysis CG-MS allowed us to identify 13 major compounds. The results obtained with the doses D2 and D3 of the bioformulated product have an inhibitive effect on the weeds with the same efficiency as the chemical herbicide. Concerning the various species of handled cereal, the bioproduct has no negative effect on the seeding however the herbicide delayed the seeding and blocked the growth. We can conclude according to the results so obtained as the bioproduct the bioactive molecule of which is the essential oil of cupressus arizonica in an allopathic effect on weed and do not affect the seeding and the development of cereal.

Keywords: *Essential Oil, germination, allelopathic, weeds, creals.*

DIRECT IDENTIFICATION OF ESSENTIAL OIL ADULTERATION BY USING VIBRATIONAL SPECTROSCOPY

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Abstract

The interest in essential oils as natural products and their compounds is increasing due to the strong demand by consumers [1]. The market of essential oils is rapidly expanding and generates several billions of dollars every year. However the price for natural products are often much higher than those of synthetic materials and unfortunately has resulted in adulteration for dishonest profits [2, 3]. A preliminary study was carried out by using transmittance near-infrared (NIR) and attenuated total reflection (ATR-FTIR) spectroscopy as analytical technique, for the identification of essential oil adulteration. (25) Commercial Samples of essential oils from different plant species were obtained from Algerian and Spanish market and directly measured, without any previous treatment and their Spectra were recorded in both the NIR and MIR wavenumber region between 14000 and 3500 cm^{-1} and from 4000 to 550 cm^{-1}, respectively. Pure essential oils were obtained by hydro and steam-distillation extraction method and their NIR transmittance and ATR-FTIR spectra obtained and compared with those obtained for commercial samples. Results found evidenced the presence of solvents in some commercial formulations and permitted a rapid authentication of pure essential oils correctly extracted from those diluted. Both techniques provide comparable identification for commercial samples included in this study. NIR and MIR spectroscopy can be considered as a quick, direct and not destructive analytical techniques for the characterization of commercial essential oils and can be a green alternative to the commonly employed chromatography methods to detect the presence of solvents in commercial formulations.

Keywords: *essential oil; adulteration, near spectroscopy, middle spectroscopy; direct characterization*

BIOACTIVE PROPERTIES OF THE ENDEMIC ALGERIAN *MYRTUS NIVELII* BATT &TRAB.: SCIENTIFIC APPROACHES TO THE TRADITIONAL USES

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Abstract

*Myrtus nivelli i*leaves are widely used in the Algerian folk medicine, due toits health-promoting properties attributed to the phenolic composition. In this context, bioactivities of the aqueous extract and its organic sub-fractions (ethyl acetate and butanol) were evaluated with focus onantioxidant properties (free radicals' scavenging activity, reducing power, inhibition of β-carotene blanching andlipid peroxidation), anti-inflammatory potential (inhibition of NO production in lipopolysaccharide-stimulated RAW 264.7 macrophages), cytotoxicity for human tumor cells and normal porcine liver primary cells, and antibacterial activity against ten clinical isolates. The obtained results indicated high activities for all the tested samples. The antioxidant activity was higher than that obtained for Trolox (positive control), showing the ethylacetate fraction the highest activity as also the highest inhibition of NO production (EC_{50}= 104 ± 6 μg/mL) and cytotoxicity for all the tested tumor cell lines (HeLa- 15.39±1 μg/mL, MCF-7- 16.12± 1μg/mL, NCI-H460-, HepG2-17.67±1 μg/mL and 49.01 ± 3 μg/mL). The butanol fraction and the crude aqueous extract presented the highest antibacterial activity. Overall, this study highlights the potential of *M. nivellii* leaves in the preparation of bioactive ingredients.

Keywords: *Myrtus nivellii, extract/fractions, antioxidant, anti-inflammatory, cytotoxicity, antibacterial.*

BIOLOGICAL ACTIVITY OF *LAURUS NOBILIS* L. IN VITRO

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Abstract

The valuation of the sector of medicinal and aromatic plants (MAP) has become indispensable in a country full of very important wealth in flora.Our work focuseds on the study of antimicrobial activity of the essential oil of *Laurus nobilis* L plant. The extraction of essential oil of the aerian part of *Laurus nobilis* L, was conducted by the hydrodistillation method. The antimicrobial activity test was performed on the five bacterial strains (*Klebsiella pneumonia*, *Escherichia coli*, *Proteus mirabilis*, *Enterobacter cloaceai*, *Enterococcus faecalis*). The results showed that the essential oil of *Laurus nobilis* hads antimicrobial activity. In addition, the essential oil testing antifungal activity of the plant *Laurus nobilis*L was performed on Fusarium sporotrichoid by the direct contact method in different essential oil concentrations (0.05, 0.25 and 0.5% of Eo). The results showed that the essential oil of *Laurus nobilis* hads significant antifungal activity of this strain a 100% inhibition index with the concentration of 0.5% that represents the minimum inhibitory concentration.

Keywords: *Laurus nobilis L, essential oil, antimicrobial, antifungal, inhibition.*

AGRONOMICAL AND PHYSIOLOGICAL BEHAVIOR OF DURUM WHEAT (*TRITICUM DURUM* DESF.) UNDER SEMI-ARID CONDITIONS

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Abstract

In the semi-arid high plains of Algeria, water stress is one of the most significant factors restricting cereal production. This study aims at analyzing water stress effect on durum wheat behavior with a particular focus on relationships between some agronomical and physiological traits. Ten genotypes were tested under rain-fed and full-irrigated conditions in semi-arid climate of Eastern Algeria. The experiment was led down in a randomized complete block design (RCBD) with three replications at the experimental field of Natural and life Sciences Faculty of Sétif 1, Algeria. Yield and its components, leaf relative water content, leaf specific weight, grain-filling rate and duration and leaf chlorophyll content were measured. Significant genotypic and environmental variations were observed for major measured traits. Water stress significantly decreased potential yield by 39%. Significant and strong correlation was observed between agronomical and physiological characteristics. In both stress and non stress conditions grain yield was positively and significantly associated with: harvest index (r = 0.896), Chlorophyll content (r = 0.895), relative water content (r = 0.956) and grain filling duration (r = 0.853). Our results indicated that wheat productivity was highly associated with high photosynthetic activities, good water status and long grain filing duration. This finding suggests using these traits as tool for screening durum wheat tolerance to water stress.

Keywords: *Chlorophyll content, Tolerance, Wheat, Water stress, Yield.*

INVENTORY OF WEED SPECIES OF CITRUS GROVES IN THE REGION OF TLEMCEN (NORTHWESTERN ALGERIA)

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Abstract

The fight against weeds, or rather the long-term management of weeding a plot in a given agro-ecological context, is one of the main challenges for the sustainability of production systems. The implementation of this management requires a thorough knowledge of these weeds, notably, their floristic composition, their specific diversity, and the ecology and biology of the species that compose them. There are many strategies for weed control adopted by farmers. Nevertheless, any thoughtless intervention will directly harm biodiversity. The objectives of this study is to inventory and analyze the floristic composition of citrus groves. To achieve these goals, we based on the technique of phytosociological surveys, and 168 statements were conducted during 2016-2017. The inventory consisted of 88 species, belonging to 29 botanical families and 71 genera. Poacaeae (21.59%), Asteraceae (15.90%) and Apiaceae (10.22%) were the most represented families. All species were angiosperms, including 32 species of Monocotyledonous, a rate of 36.36%, and 56 species of Dicotyledonous (63.63%). As for the analysis of the biological spectrum, it revealed a dominance of Therophytes (51.13%). Regarding the chorological aspect, the majority of the species had a distinctly Mediterranean character, a rate of 34.09 %. Weeds are often considered undesirable to the eye of farmers, especially in annual crops. In citrus growing, these species do not only have a harmful aspect, because they have many advantages related to their presence, in addition to the enrichment of the flora of the cultivated plots, which contributes to the maintenance of the biodiversity.

Keywords: *Inventory, weeds, citrus, floristic diversity, Tlemcen.*

GRAIN YIELD PERFORMANCE OF SELECTED BLAST RESISTANT RICE (*ORYZA SPP.*) UNDER LOWLAND AND UPLAND GROWING CONDITIONS IN BENIN

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Abstract

Africa has an abundant supply of natural resources that can support a huge expansion in food, specifically rice production. However, annual rice production only covers 62% of the actual needs whereas the demand is growing faster than for any other staple food on the continent. The future of African rice food security highly depends on improving the level of local production to achieve self-sufficiency for rice. In order to close the existing gap between the production level and actual rice demands, combining high of disease tolerance level and high-yield potential of the varieties is necessary. The current study was set up to gain insights into the performance of selected blast resistant rice accessions along with some currently grown varieties under upland and lowland conditions in Benin. High phenotypic variability was found between rice accessions that can be combined with several interesting traits to be used in breeding programs. The performances of accessions differed significantly for seven agronomic traits between upland and lowland. The analysis revealed a better yield potential among the resistant rice germplasm that were either *O. sativa* or *O. glaberrima* compared to the varieties currently grown in Benin. Valuable information on the relationship between agronomic characteristics and both population structure and blast resistance were highlighted in this paper and could be integrated in breeding for attaining higher yield potentials. Significant correlations of yield and several agronomic traits were observed and discussed to serve as an early screening method for identifying promising varieties.

Keywords: *Benin, Field evaluation, Rice, Yield.*

EFFECT OF SOWING RATE ON BIOMASS YIELD OF ANNUAL FORAGE LEGUMES

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Abstract

Annual forage legumes represent a significant source of forage crops that can be produced in hilly and mountainous areas due to their short vegetation period. Yield of forage crops, i.e. silage and hays are extremely environmentally dependent. Sowing rate also affects yield and it has not been enough studied for the area of Manjaca mountain yet. With the aim of ensuring sufficient quantity of protein feed for livestock feeding, it is necessary to study the sowing rate of annual forage legumes (mixtures) in order to determine optimal sowing that would bring the highest green mass yields. The researches were carried out at the location of the village Dobrnja on the mountain Manjaca in 2015. The soil was with acid reaction. The following species were used for the study: 1. Spring field pea, the variety NS Junior + the oats variety Flemingsregent, 2. Spring vetch the variety NS Novi Beograd + the oats variety Flemingsregent. The plots size were 1,0 m wide and 2 m long, with 0,2 m space between rows. The following sowing mixture of pea and oats were examined: a) 100 kg ha^{-1} of peas + 40 kg ha^{-1} of oats, b) 125 kg ha^{-1} of peas + 55 kg ha^{-1} of oats, c) 150 kg ha^{-1} of peas + 70 kg ha^{-1} of oats, d) 175 kg ha^{-1} of peas + 85 kg ha^{-1} of oats and e) 200 kg ha^{-1} of peas + 100 kg ha^{-1} of oats. The following sowing mixture of vetch and oats were tested: a) 100 kg ha^{-1} of vetch + 30 kg ha^{-1} of oats, b) 115 kg ha^{-1} of vetch + 40 kg ha^{-1} of oats, c) 130 kg ha^{-1} of vetch + 50 kg ha^{-1} of oats, d) 145 kg ha^{-1} of vetch + 60 kg ha^{-1} of oats and e) 160 kg ha^{-1} of vetch + 70 kg ha^{-1} of oats. The sowing was performed on 21th of April by hand to a depth of 3-5 cm. Green mass harvesting was on 10th of July. Varieties with the least use of seeds gave the lowest average yield of green mass, and it was found that their content had the highest content of weeds, in which ambrosia was dominant. This study proved that each mixture of varieties, when using the highest quantities of seeds, failed to give the highest average yields of green mass. With the option of the highest use of seeds, the crop lodging occurred, and partly the crop failure, which could not be completely harvested when produced on larger areas and when using mechanised harvesting. The highest average yield of green mass of peas with oats amounting 19.6 t ha^{-1} was achieved with sowing of 150 kg ha^{-1} peas + 70 kg ha^{-1} of oats, while the sowing of 130 kg ha^{-1} vetch + 50 kg ha^{-1} of oats gave the highest average yield of green mass of 22.8 t ha^{-1}. These could be recommended sowing rates for the Manjaca mountain growing conditions.

Key words: *pea, vetch, oats, sowing rate, biomass yield.*

GENOTYPE AND ENVIRONMENT EFFECT ON SOYBEAN PRODUCTIVITY IN AGROEKOLOGICAL CONDITIONS OF BANJA LUKA, BOSNIA AND HERZEGOVINA

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Abstract

The soybean (*Glycine max* (L.) Merr) is the one of the oldest and most important crops in the world. Its significance comes primarily from the chemical composition of the seeds. The aim of this study was to determine the genotypic specifity of seven varieties of soybean (Valjevka, Galina, Galeb, Dukat, Biser, Milica, Sonja) in two vegetation seasons in agro-ecological conditions of Banja Luka, Bosnia and Herzegovina. For the majority of studied traits, variability was mainly due to the year, while the small portion of variation was attributed to the effects of variety, and the interaction year×variety. The smallest variability was found in the harvest index (CV=1,48%), while the higest was at the height of the first pods (CV=64,9%). The number of pods per plant ranged from 28, produced by the variety Galina, to 32, produced by the variety Sonja. Interaction year×variety showed significant influence in all traits , except 1000 seed weight and the number of the seeds per pod. 1000 seed weight was lowest in the variety Valjevka (157 g), and the highest in the variety Sonja (171 g). The lowest yield was found in the variety Galina (1,751 kg/ha), while the highest was in the variety Biser (2,365 kg/ha). The harvest index varied from 0,31 to 0,43. The number of seeds per pod was positively correlated with pot weight, plant height and aboveground biomass, and seed yield with number of pods per plant, aboveground biomass and straw yield. Based on the received results, we propose varieties with the highest and most stable yield for the production.

Keywords*: Soybean (Glycina max L.), variety, yield components, yield, harvest index.*

EFFECT OF SOWING RATE AND ROW SPACING ON BIOMASS YIELD OF CLOVER

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Abstract

To ensure a viable livestock, first of all for cattle and sheep production, it is necessary to produce forages at the lowest possible costs. Perennial legumes are characterised by high nutritional value. Legumes has a positive effect on the soil by enriching it with organic matter, in addition to feeding ruminants. The aim of our research was to determine the optimal way of growing red clover and birdsfoot trefoil for the production of green mass in the hilly region. During 2016, in the first and second harvest of the second year of life of red clover and birdsfoot trefoil at the location Manjača (525 m asl) in Entity of Republic of Srpskia (Bosnina and Herzegovina) a research was carried out to examine an optimal method of growing two varieties of red clover (the varieties Viola and K-39) and birdsfoot trefoil (the variety Tera). The first harvesting was on 30th of May and second on 12th of August. The sowing was on 27th of April 2015 with three row spacing and three sowing rates, to a depth of 1,5-2 cm. Varieties of birdsfoot trefoil sowing: raw spacing of 12,5 cm (25 kg/ha of seeds), row spacing of 25 cm (20 kg/ha of seeds) and row spacing of 37,5 cm (15 kg/ha of seeds). Both varieties of red clover in row spacing of 12,5 cm (21 kg/ha of seeds), row spacing of 25 cm (17 kg/ha of seeds) and row spacing of 37,5 cm (13 kg/ha of seeds). Based on research, it was found that the highest average yield of green mass of two varieties of red clover was 50,4 t/ha and it was gained at row spacing of 12,5 cm, by sowing 21 kg/ha of seeds. The highest average yield of green mass of birdsfoot trefoil was 38,2 and it was gained at row pacing of 12,5 cm, by sowing 25 kg/ha of seeds. The lowest average yields with both plants were achieved with sowing at row spacing of 37,5 cm. In the first harvest, both plant species had a higher yield of green matter.

Key words: *clover, yield, green mass*.

NITROGEN DYNAMICS IN THE SOIL - PLANT SYSTEM UNDER DEFICIT IRRIGATION STRATEGIES IN POTATOES

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Abstract

Experiments were conducted in the open field with silty-clay soil to study the effects of subsurface drip irrigation treatments, full irrigation (FI), regulated deficit irrigation (RDI) and partial root zone drying (PRD), on nitrogen (N) dynamics in the soil – plant system of potatoes. FI plants received 100% of evaporative demands, while RDI and PRD plants, in static approach in 2007, received 70% of water of FI and dynamic approach in 2008 where the reduction of water for PRD irrigation from 70 to 50% was done in the stage of tuber ripening.By four or five harvests during the season we measured N content of leaves, stems and tubers were followed. Results showed, in both years, that N concentration in leaves and stems was progressively reduced during the growing season until final harvest when the lowest values were found in all irrigation treatments. In both years the PRD treatments resulted in the increase N in potato tubers.At final harvest N content was by 16% significantly higher in PRD than in FI plants in 2008. Results for N plant content indicated that PRD treatment could improve allocation of N from shoot to tuber at final harvest, although soil N data pointed out that PRD treatment could be beneficial from the point of increasing N - use efficiency.

Keywords: *Nitrogen content, Solanum tuberosum* L., *Partial root drying (PRD), Regulated deficit irrigation (RDI).*

THE TOTAL PHENOLS CONTENT OF AUTOCHTHONOUS CULTIVARS OF APPLE IN MAJEVICA AREA (BOSNIA AND HERZEGOVINA)

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Abstract

The autochthonous apple cultivars are the result of a long selection process by human population and edafish, climatic and geomorphological conditions. Many autochthonous cultivars and populations of many species of fruit trees are present in Bosnia and Herzegovina. The paper presents the one-year results of the study influence of cultivars on the total phenols content in six autochthonous cultivarst of apple (Petrovaca, Bjelicnik, Zelenika, Bobovec, Ljepocvjetka and Sampanjka) in Majevica area. The results of the research showed that the highest phenolic content was in the cultivar Ljepocvjetka (542.10 mg GAE/100 g), then in cultivar Bobovec (419.52 mg GAE/100 g) and Sampanjka (345.28 mg GAE/100 g), while the lowest content of phenols was in the cultivar Bjelcnik (247.45 mg GAE/100 g). Based on the results of research, there are significant variations in the total phenols content and there is no regularity in the content change.

Keywords: *apple, autochthonous cultivar, total phenols content, Majevica area.*

GROWING OF MAIZE (*ZEA MAYS* L.) IN EXTREME CONDITIONS

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Abstract

Maize is one of the most important agricultural crops having an important, almost indispensable role in animal breeding. In addition to most common use as a silage crop, it is a regular ingredient in concentrated feeding stuffs. It has an important role as a component for industrial processing and in human food. The aim of this research was to determine the impact of the factors related to the year of growing to yield silage variation of the hybrid maize ZONE FAO 420 in four growing seasons (2014, 2015, 2016 and 2017), and the yield of the cob of the hybrid Kalina FAO 280 in two growing seasons (2014 and 2015) in the village of Dobrnja on the mountain Manjaca. Notable variations in the yield were recorded between the tested years. The cob yield of 7,16 t/ha was obtained in 2014 and it was higher by 2,37 t/ha compared to the yield in 2015. The highest yield of the maize silage of 29,26 t/ha was in the year 2014, while the lowest of 12.25 t/ha was in the year 2017. Achieving relatively high yield of the maize cob and maize silage in 2014 was affected by the sufficient rainfall. Extremely low yield of silage in 2017 was mostly caused by the lack of rainfall and high temperatures. The weather conditions on Manjaca in 2017 could be considered as extremely adverse for the production of maize silage. In the years when the weather conditions are like those in 2014, they can be considered as favourable for the production of maize cob and silage on Manjaca. The amount and distribution of rainfalls had the strongest impact to the maize during the tested period. In order to gain the projected and for the subject area of breeding realistically achievable yields of maize in the coming years, one of the key measures that would contribute to this production is to ensure irrigation of crops, because the production and yields, in the years with the lack of rainfalls become more and more risky without irrigation.

Key words: *maize, moisture, year, cob, silage.*

IMPORTANCE OF SPIKELET FORMATION PHASE IN THE YIELD BIOLOGY OF WINTER BARLEY

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Abstract

Plants evolve through strictly defined stages of development, which can be identified by changes in plant phenotype or by changes in the morphology of apical meristem. Differentiation of apical meristem passes through phases that proceed in a precise chronological order. This paper analyzes the significance of the length of the period of spikelet primordia formation, i.e., the double ridge (DR) phase, and its genotypic and phenotypic correlation with the other growth phases and yield components. In the course of five growing seasons we studied the development of apical meristem in three two-rowed winter barley cultivars - Novi Sad 525, Sonata and Monaco. DR stage was shortest in the seasons with favorable weather conditions during that stage. It was longest when conditions were unfavorable, especially when temperatures were high. The shortest DR stage was found in the early cultivar Novosadski 525, the longest in the medium early cultivar Sonata. The cultivars had similar genotypic and phenotypic correlations between the length of DR stage on one side and the duration of the other development stages and yield components on the other. DR period length was positively correlated with the duration of the formation of leaf primordia and negatively correlated with the other development stages, i.e., grain filling period, numbers of leaves and spikes and harvest index. The obtained results may find practical application in winter barley breeding. Further, more detailed study involving a number of cultivars is required in order to confirm the above results.

Keywords: *Barley (Hordeum vulgare L.), Organogenesis, Double ridge stage, Genotypic and phenotypic correlations.*

ORGANIC CARBON STOCKS IN ARABLE LAND OF REPUBLIC OF SRPSKA

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Abstract

On the territory of Republic of Srpska (RS), in the period 2014 - 2017, the fertility control of arable land was performed in 4125 average samples *(taken from top soil, 0 - 30 cm)* representing the surface area of 5776 ha. All samples were geo-positioned and linked to the SOTER database *(soil and terrain databases)*. RS is divided into 262 SOTER units. The following analyses were performed in each sample: pH *(H_2O and 1M KCl)*, available P_2O_5 and K_2O *(AL method Egner Riehm)* and humus (*colorimetric method, wet burning with 1N $K_2Cr_2O_7$ and conc H_2SO_4*). Soil organic carbon (SOC) was calculated from humus (% humus x factor 0,58). SOC stock *(t ha^{-1})* for each plot were calculated on the basis of the volume mass *(mg m^{-3})* of the soil type on which the plot was located, the soil weights up to 30 cm *(kg ha^{-1})* and the area of the plot *(ha)*. SOC stock on 5776 ha of agricultural land was 225168 t ha^{-1}. The analyzed area was represented by 24 types of soil *(FAO class)*. The highest average SOC stocks of 130 t ha^{-1} *(based on 31 samples)* was found in Calacaric Cambisol and the lowest in Stagnic Luvisol 38 t ha^{-1} *(based on 464 samples)*. In 84% of the tested samples, representing 89% of researched area, the SOC stocks were less than 57 t ha^{-1}. Estimation of the SOC stocks on the total arable land was prepared by GIS analysis interpolation of the SOC results for 4125 samples on the agricultural land area *(arable land, gardens, orchards, vineyards and meadows)*. Estimated SOC stocks on 578894 ha of arable land were 32833549 t. The result of this research is the first step towards the establishment of SOC monitoring system in RS.

Key words: *soil organic carbon, arable land, GIS, Republic of Srpska.*

EFFECT OF WEATHER CONDITIONS ON YIELD AND QUALITY OF SMALL GRAIN CEREALS IN MOUNTAINOUS AREAS

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Abstract

The aim of this study was to establish yield variation of seed crop in triticale, rye and oat in two vegetation seasons in 2013 and 2014, at the location of Manjaca in Entity of Republic of Srpska (Bosnia and Herzegovina), as well as to get to know which plant types bought the highest grain yields and quality at the researched locality. Three grain types were covered by the research, winter triticale (the variety Oskar), winter rye (the variety Oktavia) and spring oat (the variety Flemingsregent). The examined cereals were sown in poor soil above 500 m asl. The sowing was performed to a depth of 3-4 cm, with 12,5 cm spacing between rows. The highest yield was recorded with triticale 4,3 t/ha in 2013. Triticale had the highest average yield in two years, which was 3,68 t/ha. The lowest yield of 2,24 t/ha was found in rye in 2014, while the lowest average yield of 2,52 t/ha was recorded with oat. In the first year all types of cereals met the legal quality parameters. The yields of triticale 3,15 t/ha and rye 2,24 t/ha gained in the second year were to the greatest extent the consequence of large amounts of rainfalls in the time of ripening. The large amount of rainfalls caused rye lodging on certain parts of the plot thus conditioning the development of viviparity which brought to the decrease in the yield and the quality of natural quantities compared with triticale and rye. The lack of rainfalls in the first year was mostly responsible for the low yield of oat being 2,28 t/ha, whereas large quantity of rainfalls in the second year caused lodging of oats crops and complicated combine harvesting which ultimately brought to poorer yield. The best average yield was achieved by triticale, which coped with the adverse weather conditions well (large amount of rainfalls) in the second year. The resistance of triticale reflected in its resistance to lodging and in having the property that the grain did not shatter/disperse when ripen as the case was with rye and oats, which made it suitable for growing in the areas with rainy summers. Seed production of triticale should be organised on greater areas.

Key words: *grains, yield, year, weather conditions.*

INFLUENCE OF CLIMATIC FACTORS ON THE QUALITY OF MERLOT GRAPEVINE VARIETY IN TREBINJE REGION VINEYARDS (BOSNIA AND HERZEGOVINA)

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Abstract

The aim of this paper is to analyzed climatic influence on quality of yield of Merlot grapevine variety, in Trebinje region (Entity of Republic of Srpska, Bosnia and Herzegovina) vineyards, during the vegetation 2016 and 2017. We investigated the mechanical properties of bunch and berry (bunch weight, number of berries on the bunch, weight of 100 berries, weight of 100 berries flesh, weight of the berries skin, weight of seeds in 100 berries) and quality properties of grapes (sugar content and total acid content in the must). The highest bunch weight, as well as the number of berries on the bunch was achieved in 2017 (276.84 g, i.e. 183.03), while the lowest bunch weight (193.6 g) and number of berries on the bunch (158.53) were measured in 2016. Weight of 100 berries, weight of 100 berries flesh, weight of the berries skin, weight of seeds in 100 berries were larger in 2017. The highest sugar content was measured during 2017 and the highest level of acid in must was measured during 2016. During the years 2016 and 2017 a significant influence of climatic factors on the quality characteristics of the studied variety was observed. Although both considered years had above average temperature and less precipitation, further analysis of differences in monthly values of climatologically parameters could provide an explanation for differences in mechanical and quality properties of grapes.

Keywords: *climate, influence, Merlot, Trebinje vineyards*.

SHOOT MULTIPLICATION SYSTEM OF HYSSOP (*HYSSOPUS OFFICINALIS L.*)

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Abstract

An efficient method for the micropropagation of hyssop (*Hyssopus officinalis* L.) has been developed. The plants were cultured on Murashige and Skoog medium (MS) supplemented with 6-benzyl-aminopurine, thidiazuron, zeatin and indole-3-butyric acid during four weeks of culture. The above mentioned cytokinins were applied in concentration 0.5 and1.0 mg l^{-1}. Maximum multiplication frequency, numbers of shoots, shoot length, fresh and dry weight were established at 1.0 mg l^{-1}6-benzyl-aminopurinecombined with 0.1 mg l^{-1}indole-3-butyric acid. The other tested cytokininsthidiazuron and zeatin were less effective for the micropropagation of hyssop. For root induction, the micropropagated plants from the most effective variant (MS supplied with 1.0 mg l^{-1}6-benzyl-aminopurineand 0.1 mg l^{-1}indole-3-butyric acid) were cultured on root development medium. The uniform micro shoots were excised and transferred to the rooting medium containing half strength MS medium supplemented with three types of auxins: indole-3-butyric acid,and indole-3-acetic acid, applied at a concentration of 0.1 mg l^{-1} with addition of 2.0% sucrose. The obtained results suggest that all three investigated auxins could be used separately in ½ MS medium for rooting of *H. officinalis*. Indole-3-butyric acidacid was more effective to produce plants with well-developed roots, therefore, this auxin was found to be the best rooting hormone as opposed to α-naphthalene acetic acidand indole-3-acetic acid. The multiple plants were successfully *ex vitro* adapted with 90% survival. The described protocol allows the establishment of numerous micropropagated plants of *H. officinalis.*

Key words: *Hyssopus officinalis, micropropagation, plant growth regulators.*

A STUDY ON THE PHENOLOGICAL STAGES OF THE VARIETY CABERNET SAUVIGNON UNDER THE EFFECT OF CLIMATE CHANGE GROWN IN THE REGION OF WEST, BEKAA-LEBANON

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Abstract

Lebanon is one of the oldest sites for wine production in the world. The sector of viniculture is witnessing a general development in the last decades, where more than 65 wineries are found. Worldwide, the reality of climate change being a problem is affecting agricultural aspects by modifying phenological growth of crops. Therefore, in the current study, the performance of the variety Cabernet sauvignon as affected by climate modification was observed during the last decade in the west Bekaa. In fact, the effect of increasing temperature and decreasing precipitation between 2009 and 2017 was tested on dates of budburst, flowering, fruit set and fruit maturity. All dates were calculated considering the first of January as an initial date ($date_0$). As a result, in 2017, budburst, flowering and fruit set occurred earlier by 15 days, 12 days and 28 days respectively compared to 2009. Accordingly, the number of days between beginning budburst and fruit set was later in 2009 (52 days) by 3 days than the one in 2017 (49 days). Consequently, the phenomenon of earliness in all phenological stages was detected on the entire growth cycle presented by the harvest date. This latter was earlier by 23 days in 2017 (262 days after $date_0$) compared to 2009 (285 days after $date_0$). The phenological stages of the variety Cabernet Sauvignon were highly affected by the climate variation occurring in the last years.

Keywords: *Lebanon, Cabernet Sauvignon, viniculture, phenology, climate.*

CONTENT OF BIOLOGICALLY ACTIVE COMPOUNDS IN *HYSSOPUS OFFICINALIS* TRADITIONALLY CULTIVATED, *IN VITRO* PROPAGATED AND PLANTED FROM NATURAL HABITATS

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Abstract

The changes of biologically active substances in methanolic extracts from traditionally cultivated *H. officinalis* plants (from seeds), *in vitro* propagated and adapted under field conditions plants and planted from natural habitats were compared. The content of the investigated non-enzymatic low molecular metabolites – water and lipid soluble metabolites with antioxidant capacity, phenols, flavonoids - reached the highest values in the flowers and leaves in the in vitro propagated and adapted under field conditions plants. Leaf and flower extracts of *H. officinalis* in all three plant breeding modes showed different antioxidant potential, but the highest values were observed in *in vitro* propagated plants. Differences were observed between the total content of essential oil and the components of essential oils depending on the way of plants cultivation. Essential oil yield from in vitro propagated plants are about two times higher than those derived from conventionally propagated plants. The monoterpenes are the main compounds of hyssop essential oil. Highest content of essential oil in percentage of the drug was measured in plants from natural habitats. Essential oil from plants propagated from seeds had the highest values of the sabinen. Essential oil derived from *in vitro* propagated plants had the highest content of pinocamphon. Oil derived from natural habitats plants had the highest content of β-binen and pinocampen.

Key words: *Hyssopus officinalis, antioxidant metabolites, essential oil.*

Acknowledgments

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STUDY ON HYDRO-PHOBIA OF MAIZE SEED AS A METHOD OF EARLIER TERMS OF SOWING

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Abstract

The possibility of earlier sowing of maize before the optimal time (12-15 ^{0}C) leads to more rational use of machineries, ensures early germination and fuller use of the moisture from the winter-spring period. This opportunity is achieved through a peculiar preserving of the seeds, considered as an additional part of their pre-sowing preparation or complex preparation including the treatment with pesticides. Hydro-phobia represents a construction of a protective water-impermeable layer of polymers with different thickness and different time of degradation under definite conditions. The treatment of seeds with pesticides is done separately or in combination with the creating of the polymer covering. The exposure of the seeds in cold and moist soil to their germination is directly dependent on the thickness of the coating and the time for its breaking under the influence of the soil microbial activity. A correlation between the surface of corn from different fractions and their mass is established. A relationship between the thickness of the polymer coating and the period's duration of its degradation is established. A function between the mass of grains, the thickness of the coating, the amount of polymer and the amount of the solvent is established. The period of stay of the seeds in the soil depends on the thickness of the coating and the time of sowing should end with the coming of minimum conditions (7-9 ^{0}C) for germination.

Keywords: *maize, hydro phobia, polymer, coating, terms of sowing.*

GROWING OF WINTER CEREALS IN POOR SOIL MOUNTAINOUS AREAS

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Abstract

The aim of this research was to determine the productivity and yield of winter crops grown on soils with poorer nutrients in the conditions of mountainous area of the city of Banja Luka, in the village of Dobrnja on the mountain Manjaca. Over the period of two years, in the vegetation seasons in 2012 and 2013, two types of cereals were tested - winter triticale (the variety Oskar) and winter rye (the variety Oktavia). The examined crops sowing were performed in poor soils above 500 m asl. The sowing was performed to a depth of 3-4 cm, with 12,5 cm spacing between rows. The highest yield was recorded with triticale and was 3.93 t/ha in the second year, as well as the average yield of 2,67 t/ha in the two years. Both types of cereals had higher grain yield in the second year. Besides weather conditions, production yields of winter crops grown on Manjaca was also affected by the fertility of soil, primarily its acid reaction. When it comes to growing triticale in acidic soils, the consequence is reflected in the fact that the plant live in the first stages of development, but plants die in later stages and weeds grow mostly at places the plants have died. Regardless of weather conditions, the most dominant weeds is ambrosia which makes the harvesting process difficult on the parts of the parcel where crops are less frequent, and later on it also complicates the process of drying of the grain in storeroom. In the area where the researches were conducted, triticale gave better results. Therefore, in conditions for production on larger areas, advantages in the structure of sowing should be given to triticale, in particular when taking into account major changes and oscillations in weather conditions, first of all in the period of ripening and harvesting, as well as the possibility of delayed harvesting of triticale with minimum loss in yields.

Key words: *winter crops, grain yield, resistance, Manjaca.*

ENHANCING THE ADAPTATION OF SUGAR APPLE AND CHERIMOYA TO SOIL CONDITIONS OF SOUTH LEBANON BY GRAFTING AND IRON FERTILIZATION

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Abstract

Annona is a subtropical crop of an increasing popularity in Lebanon. Its cultivation is concentrated along the southern coast where climate conditions are the most suitable. Soil analysis at this location revealed a dominance of calcareous-clay soils poor in iron. The paper describes the results of an experiment which evaluated the effect of iron fertilization on the vegetative growth of three annonacultivars obtained by self- or cross-grafting of sugar apple (*Annona squamosa*L.: Sq) and Cherimoya (*Annona cherimoya* Mill.:Ch): Ch/Ch,Sq/Sqand Sq/Ch and cultivated in South Lebanon. Annona scions were grafted on rootstocks of 12 months age and data collection covered various vegetative indicators during on 1 year, 2 years and 3 years old plants. Iron (Fe) was provided to plants with irrigation water once per month starting from April till October in year 1, 2 and 3 with of 30g/plant. Results showed an improvement of vegetative growth in all cultivars compared to control plants during the three years with superiority for the cross-grafted cultivar (Sq/Ch). Iron-fertilized Sq/Ch and Ch/Chcultivars had the highestplant height (around 175cm), number of primary roots (around 42), length of primary roots (27cm), while the cultivar Sq/Ch developed the highest trunk diameter (4.1cm), diameter of primary roots (3cm), leaf biomass (142g) and freshand dry weights of roots (85g and149g respectively).Finally, iron fertilization improved the tolerance of annona plants to the present soil conditions of the southern coast allowing a better performance of plants during their juvenile stage.

Keyw ords: *South Lebanon, annona, grafting, iron fertilization.*

DO THE PLANT GROWTH REGULATORS INFLUENCE ON HYSSOP (*HYSSOPUS OFFICINALIS* L.) ANTIOXIDANT SYSTEM DURING MICROPROPAGATION?

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Abstract

Micropropagation of *H. officinalis* offers the best technique for quality and disease free uniform plant material, but there are no studies conducted on the effect of plant growth regulators added to the culture medium on plant antioxidant capacity. *H. officinalis* plants were cultured on Murashige and Skoog (MS) medium supplemented with different cytokines: 6-benzyl-aminopurine, thidiazuron, zeatin in concentrations of 0.5 and 1.0 mg l^{-1} combined with indole-3-butyric acid during four weeks of culture. The creation of reactive oxygen species, during *in vitro* cultivation as well as their detoxification, was highly synchronized in plants, and their levels were kept under firm control by a complex antioxidant system. Application of cytokines to the MS nutrient medium led to increased enzyme activities with an increase in their concentration. The highest superoxide dismutase, catalase, ascorbate peroxidase and guaiacol peroxidase activities were measured when plants were cultured on the MS medium supplied with 1 mg l^{-1} 6-benzyl-aminopurine and 0.1 mg l^{-1} indole-3-butyric acid. The content of water- and lipid-soluble metabolites with antioxidant capacity expressed as ascorbate or α-tocopherol equivalents also increased when cytokines concentration was increased but the highest levels were observed in the MS medium without growth regulators, followed by the treatments when 6-benzyl-aminopurine was applied. The content of total phenols and flavonoids was not influenced by the presence of cytokines as well as total antioxidant potential. The antioxidant defence of *in vitro* cultured *H. officinalis* was determined mainly by the enzymatic parameters (the higher activity of antioxidant enzymes) not by the non-enzymatic (declined concentration of low molecular metabolites – water and lipid soluble metabolites with antioxidant capacity, phenols and flavonoids).

Keywords: *Hyssopus officinalis, plant growth regulators, antioxidant enzymes, metabolites.*

Acknowledgements

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POST EFFECT OF ORGANIC AND MINERAL NUTRITION ON GROWTH, YIELD AND QUALITY OF SPINACH (*SPINACIA OLERACEA*).

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Abstract

Cultivating spinach during autumn, as a sealing crop, has important economic and agro-ecological significance both through the yields achieved and by the more complete and rational utilization of the residual nutrients in the soil after harvesting the previous main crop. A field experiment with spinach variety Matador is conducted on the alluvial-meadow soil. The soil reaction (pH) is slightly acidic, humus content is low (1.33 %). The availability of mobile forms of N, P and K variants of an experiment in post-harvest predecessor are low mineral nitrogen and high P_2O_5 and K_2O. The study aimed to assess the post-effect of organic, mineral and mixed manure and mineral nutrition in the predecessor previous crop early potato with many treatments. Control variant without nutrition (T1), with organic (manure) (T2), with mineral (T3), and with mixed 50% manure-50% mineral nutrition (T4). The effect of treatments on growth, yield, quality of production and quality parameters in autumn growing Spinach (Spinacia oleracea Linn) has studied. The experiment is a completely randomized design. The results indicate that the highest yield of spinach is obtained from the plants with post effect of the mineral nutrition. Plants are grown after mineral nutrition has higher nitrogen, chlorophyll and nitrates contents. The dry matter content and total sugars are highest in the production of spinach after the previous crop fertilized with manure.

Key words: *Organic, mineral nutrition, spinach, quality parameters.*

TEMPERATURE CONDITIONS FOR GROWING CHERRY *(PRUNUS AVIUM* L.) AND PEACH TREES (*PERSICA VULGARIS* MILL.) IN BULGARIA

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Abstract

In all European regions, variations of temperatures have a cyclic character with a relatively regular change for the periods of active vegetation and dormancy. This regularity is valid and also observed on the large areas in the country. The unfavorable combination of high temperatures and low rainfall, as well as temperature changes at the end of winter and the beginning of spring season are factors which may have critical effects upon the development of orchards. Also important factor often responsible for establishing the warm or cold winter margin for many fruit trees and strongly affecting production near those margins is the amount of chilling available during the plants rest phase of its growth cycle. Chilling is generally considered to be that amount of time during the period the plant is in rest when the temperature is below 0^oC. Cherry (*Prunus avium* L.) and peach (*Persica vulgaris* Mill.) plants are the most widely spread orchards in Bulgaria. They can grow in all over the country, but the optimum results are got only in separate regions, where the meteorological conditions are most suitable for their growth and development. The aim of this paper is to establishing the empirical between the sums of negative temperatures measured in the period from of durable transitions of temperatures below 0^oC (chilling degree days) and the number of days with temperature below 0^oC. The other aim is to find empirical relation between date of durable transitions of temperatures above 10^oC to fruits ripening and the number of days with temperature above 10^oC.

Keywords: *cherry, peach, sum of temperatures, chilling.*

GROWING AGARICUS BISPORUS ON COMPOST MIXTURES BASED ON CHICKEN MANURE AND BANANA RESIDUES

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Abstract

The current study evaluated the potential use of two widely available agricultural wastes at local level: chicken manure (chic) and banana wastes (ban) in the production of *Agaricus bisporus* mushroom in order to assess the possibility of alternating the traditionally imported substrate (based on horse manure). Therefore, the trial consisted on growing the mushroom on substrates formed by several mixtures of both wastes subjected to composting and mixed in various proportions (0%, 30%, 50%, 70% and 100% at volume basis) compared to a control substrate (based totally on horse manure). Fruit formation in the substrate chic-ban:100-0 was earlier by 1 to 3 days compared to remaining substrates. Average yield was the highest (350.9 g/box) in control substrate and the lowest in substrates based totally on chicken manure or banana wastes composts. Individual mushroom weight ranged between a minimum of 36.8 g in chic-ban:0-100 and a maximum of 58.5 g in control substrate. In the substrates chic-ban:70-30 and chic-ban:50-50 yields were comparable to control (283.9 g/box and 294.2 g/box respectively). Fruit number did not vary significantly among all substrates. Cape diameter was the highest in chic-ban: 50-50 (6 cm), stipe diameter was the highest in control (2.25 cm), and mushroom length was superior in both substrates compared to others. All substrates produced marketable fruits except chic-ban:0-100. Consequently, it was possible to totally substitute the traditional compost by the mixtures chic-ban:70-30 and chic-ban: 50-50 making of this type of cultivation more cost-effective at the level of Lebanon.

Keywords: *A. bisporus, agricultural wastes, composting, substrate, yield.*

EVALUATION OF TWO COTTON COMMERCIAL CULTIVARS SEED QUALITY PARAMETERS UNDER MULTI-LOCATION ASSESSMENT

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Abstract

Cotton is cultivated mainly for its fibers, which are very useful in textile industry, although cotton seed has multiple purposes. Cotton seed contains elevated amounts of fat and proteins of high nutritional value. The concentration of these components are genetically depended, however, the final seed composition in protein and fat is affected by environmental conditions. Two cotton commercial cultivars, Celia (Bayer) and ST 402 (Pioneer) were assessed in a multi-location experiment, conducted in the four main cultivation areas in Greece: Sterea Ellas, Thrace, Thessaly and Macedonia. Both cultivars were sawn in four different fields in each area in order to exploit and evaluate different soil types. The objective of the study was the evaluation of cottonseed quality parameters across diverse environments, like fat and protein content, thousand-kernel weight, ash and dry matter content. Preliminary data revealed that environmental fluctuations affect cotton seed quality traits. Furthermore, locations may be selected to differentiate cultivars more effectively, with regard to cotton seed quality.

Keywords: *environmental fluctuations, fat, protein, thousand-kernel weight, Greece.*

SEED YIELD OF ITALIAN RYEGRASS AS INFLUENCED BY NITROGEN FERTILIZATION AND PLANT GROWTH REGULATOR

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Abstract

Croatian farmers have a lack of knowledge about agricultural practices and operations for seed production of Italian ryegrass (*Lolium multiflorum* Lam.). Thus, the main aim of this study was to evaluate the effect of nitrogen (N) fertilization and plant growth regulator (PGR) application on the seed yield and other traits of Italian ryegrass crop grown for seed production. Field experiment was conducted in northwestern Croatia over two growing seasons with the four N fertilization rates (0, 60, 120 and 180 kgha^{-1}) and PGR application (Moddus 250 EC applied during stem elongation at the rate of 1,0 Lha^{-1}along with the unsprayed plots). Growing year significantly affected seed yields as well as all other investigated traits. As expected, Italian ryegrass crop produced higher seed yields in the first growing yearby an average of 5.2%. Compared to the unsprayed plots, the application of PGR reduced stem height, and in turn, improved seed yields by an average of 27.0% (383 kg ha^{-1}). Nitrogen fertilization significantly increased seed yields mainly due to increased spike number and heavier 1000 seed weight. Seed yields following N fertilization rates of 120 and 180 kg ha^{-1} were slightly larger than those produced with 60 kg ha^{-1}. However, a significant N fertilization × PGR interaction was found for seed yield, which indicated that crop responses to N fertilization rates were influenced by the application of PGR. Neither N fertilization nor PGR had an effect on germination rate, but seed viability was higher with heavier seeds.

Keywords: *Italian ryegrass, Plant growth regulator, N fertilization, Seed yield.*

RELATIONSHIP BETWEEN PHOSPHORUS STATUS AND NITROGEN FIXATION BY COMMON BEANS (PHASEOLUS VULGARIS L.) UNDER DRIP IRRIGATION

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Abstract

The current study aimed to examine the response of contrasted recombinant inbred lines of common bean to the application of phosphorus in order to identify the bean recombinant inbred lines which were efficient in phosphorus utilization when dependent on nitrogen fixation as a source of nitrogen. The experiment was conducted at the experimental farm of Agricultural Research Station of the Nubaria district, Behera (Egypt), during the winter seasons of 2008–2009. Three levels of mineral phosphorus fertilizers were applied (0, 45 and 90 kg ha-1 phosphorus pentoxide). Nodulation, plant growth parameters, leaf area, soil Olsen phosphorus, pH, and phosphorus and nitrogen of shoots, nodules and seeds were measured. The results showed that the recombinant inbred lines responded positively to P application levels. The best values were observed in recombinant inbred lines 75, 83 and 34. Vegetative growth parameters were significantly enhanced by increasing levels of phosphorus. The highest level of phosphorus, i.e., 90 kg ha-1 phosphorus pentoxide gave the optimal values of growth parameters for all common bean recombinant inbred lines while control plants obtained the lowest values. An increase of Olsen-P and a decrease of soil pH were also observed with increases in phosphorus. These results led to the conclusions that phosphorus applied to Nubaria soil: (1) improved the soil fertility; (2) enhanced the ability of root nodules of common bean recombinant inbred lines to fix atmospheric nitrogen; and (3) increased the release of hydrogen by roots, thus decreasing soil pH and reducing the immobilization of phosphorus in the soil solution and transforming it into available form for the plant.

Keywords: *Drip irrigation, Nitrogen fixation, Phosphorus, Phaseolus vulgaris, Recombinant inbred lines, Sandy soil.*

YIELD, FRUIT QUALITY AND LEAF MINERAL CONTENT OF MANGO TREES AS AFFECTED BY SUBSURFACE DRIP IRRIGATION SYSTEM

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Abstract

Fagri Kalan mango trees grown under sandy soil conditions were irrigated with 12, 9 or 6 drippers per tree either as subsurface or surface irrigation system. The effect of irrigation system and number of drippers on yield, fruit quality, chlorophyll and leaf mineral content were studied. The obtained results indicated that subsurface irrigation system was more effective than the surface one. Also dripper number showed different effects concerning yield per tree or fruit quality and leaf mineral content. However, it could be concluded that treatment where trees were irrigated with 12 drippers as subsurface irrigation was the promising treatment, since this treatment increased yield as kg per tree or fruit number and fruit physical properties such as fruit weight, fruit length and fruit circumference. Also the same treatment increased chlorophyll content and nitrogen percentage in the leaves and enhanced leaf phosphorus, potassium, calcium and magnesium percentages of Fagri Kalan mango trees.

Key words: *Fagri Kalan mango, subsurface irrigation, number of drippers, yield, fruit quality.*

EFFECT OF CLIMATIC CHANGES ON SHELF LIFE AND QUALITY OF KEITT MANGO (*MANGIFERA INDICA* L.) FRUIT

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Abstract

Exposure to elevated temperatures during growing season can cause physiological and, ultimately, biochemical changes in plant tissues (including fruits) and, as a consequence, hasten ripening and other associated events. The present study was aimed to investigate the impact of changes in some climate factors including temperature, relative humidity (RH) and light intensity on shelf life and the incidence of jelly seed disorder in mango fruits. To investigate the changes in climatic factors mango plantlets were transplanted under two different conditions which were: open field and net cover (30% shade). All plantlets were grafted on balady rootstock, grown in sand soil in an orchard located at Elboseily region, Beheira governorate North West Egypt and subjected to similar agricultural practices. Eight years later, the present study was carried out during 2012 and 2013 seasons. Mature fruits were stored in carton boxes under ambiental temperature and investigated in two days intervals until ripe stage. The results revealed that high temperature (in open field) during the growing season hastened fruit ripening and decreased shelf life. High temperature also accelerated respiration rate and softening of Keitt mango fruits. The role of climatic factors in enzymatic activities, ripening and internal breakdown of mango was widely discussed.

Key words: *Climatic factors, Respiration, Breakdown, Ripening, Firmness.*

IMPACT OF DIFFERENT POLLINATORS AND CONTENT OF ELEMENTS ON FRUIT QUALITY OF THE KADARY DATE PALM CULTIVAR (*PHOENIX DACTYLIFERA* L.)

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Abstract

This study was carried out for two successive seasons (2016 and 2017) on the Kadary date palm cultivar (Phoenix dactylifera L.) cultivated at the Agriculture Research and Experiment Station, Dirab, College of Food and Agricultural Sciences, King Saud University, Riyadh. Pollen grains from males of different cultivars such as Succary, Khalas, Dikhiny, Shaishee, and Maktumi were used to pollinate the female Kadary date palm cultivar. The percentage of fruit retention was positive and influenced by all male pollen grains in the second season. The results present that there were no positive variance among and fruit weight, fruit flesh weight, fruit volume and fruit diameter in both seasons, and fruit length in the second season. Regarding seed weight, the variance was positive among male pollen grains in two seasons. Reducing sugar, total sugar percentage in the second season, and moisture content percentage in the first season were positive with different pollen grains. Different pollen grains did not significantly influence total soluble solids, total acidity, and reducing sugar percentage in two seasons, and non-reducing sugar and total sugar percentage in the first season. Pollination by Succary pollen grains and Khalas pollen grains led to highest iron and manganese content, respectively; however, the effect was negative with other male pollen for each of the nitrogen, phosphorus, potassium, copper, and zinc content.

Key words: *Date palm, pollen grain, pollinisers, fruit quality and elements.*

EFFICIENCY IN UTILIZATION OF PHOSPHORUS FOR SYMBIOTIC NITROGEN FIXATION AFFECTING THE PHOSPHORUS BIO-AVAILABILITY IN ORGANIC-HORTICULTURE SOILS OF HÉRAULT VALLEY

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Abstract

Phosphorus is one of the most limiting nutrients for plant growth in soil. Current study field experiments of Multilocation tests were carried out in various fields of production in the Herault valley (France). Two contrasting RILs of common bean 115 and 147 were used through three seasons during the period 2007-2009. The final objective would be to get a variety that combines good adaptation to production constraints, an appropriate yield and grain quality. Both beans were associated with rhizobial symbiosis for optimal nitrogen nutrition, and the efficient use of phosphorus to increase the soil fertility, save mineral fertilizer, minimizing environmental risk. The parameters which we investigated were shoots and nodules dry weight, number of nodules, contents of nodule and plant P and plant N, soil total and Olsen P, calcium carbonate and soil pH. In many sites inhibition of nodulation was found to be associated with an excess of N mineralization from organic fertilization. Among other sites correlations between shoot and nodules dry weight were significant within some individual sites. The influence of phosphorus on nodulation and growth could be established in the fields where RIL115, tolerant to P deficiency, produced significantly more biomass than the sensitive RIL147. Thus during the year of 2007 and 2009, significant correlations between plant growth and Olsen P were observed. It is concluded that the RILs can be used to assess the adaptation of grain legume to low both N and P in soils, to identify soils where P availability is deficient for the legume N_2-dependent growth, and to improve the varieties of common bean for adaptation to low P.

Key words: *N_2 fixation, Phaseolus vulgaris, Phosphorus, Rhizobial symbiosis, Soil fertility.*

QUALITY CHARACTERISTICS OF COMMERCIALLY AVAILABLE SOYBEAN MEAL SAMPLES FROM GREEK MARKET

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Abstract

The cultivation of soybean (*Glycine max* (L) Merr.) in Greece is limited, as it is economically uncompetitive. To meet the local animal nutrition needs that reach 500.000-550.000 MT soybean flour/year, large quantities of non-GMO soybean seeds and meal are imported from abroad. Soybean meal is regarded as the best vegetable protein source, and it is characterized by high content of crude protein standardized in two different commercial forms for feed market (mainly poultry and pigs nutrition), containing 44% and over 49% crude protein (CP), respectively. In the present study, protein content, as well as crude ash and moisture content of thirty-five commercially available soybean meal samples, standardized as containing 44% CP, were assessed using classical analysis methods (Kjeldahl digestion for nitrogen and protein determination, organic matter digestion at 550^{o}C and moisture determination at 103^{o}C). Samples were obtained by thirty-five different feed stuff selling points in seven Greek regions, namely Thessaloniki, Larissa, Trikala, Karditsa, Xanthi, Grevena, Kilkis. Data showed significant variation in chemical composition among the samples, which had an impact in nutrient content of animal diet and therefore affected the optimization of their performance results. More specifically, soybean meal samples contained from 8.16 to 12.79% water and crude protein content varied from 43.6 to 51.8% on a dry matter basis among samples, while ash content ranged from 6.5 to 7.9% on a dry matter basis.

Keywords: *soybean meal, crude protein, crude ash, Greece.*

GENETIC VARIABILITY STUDY OF YIELD AND YIELD RELATED TRAITS IN RICE (*ORIZA SATIVA* L.) GENOTYPES

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Abstract

Rice is one of the most important food crop which is a stable food for more than a half of the world population providing one fifth of calorie consumption. In Ethiopia, it is considered as one of the target commodity that can promote agricultural production of the country. Ethiopia has a wide area that is suitable for rice production which is not suitable for other crops. Although the country has high potential, the lack of well adaptable varieties is one of the major problems especially for irrigated areas. The present study was conducted with the objective of assessing the presence of genetic variability in 64 genotypes. The genotypes were evaluated from June to November 2016 at WARC experimental site using 8x8 simple lattice design. The ANOVA revealed that there was highly significant difference between the genotypes in all studied traits. Also, GCV and PCV indicated the presence of variability in all studied traits. But PCV was a bit higher than GCV which indicated the influence of the environment in each trait although the effect was not big except in PL. The presence of high heritability and genetic advance in most of the traits indicated the presence of additive gene action. So these traits could be improved through direct selection. The phenotypic correlation and principal component analysis showed that most of the traits evaluated were important for selection of high yielding genotypes and contributing with their share for wider genetic variability of the genotypes. Therefore, the overall result indicates the presence of enough variability for development of improved rice varieties and the studied traits can be used for selection.

Keywords: *Genotype, Irrigated Rice, Rice, Variability*.

STUDY OF THE PERFORMANCE OF GREEK DURUM WHEAT CULTIVARS IN A COLD ENVIRONMENT

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Abstract

Durum wheat is one of the most important cereal crops in Greece, both because of its nutritional value and its economic importance, and its good adaptation to the soil and climate conditions of the country as well. To study how the Greek durum wheat cultivars perform in the cold environment of Florina under low input conditions, eight Hellenic durum wheat varieties (cvs. Anna, Elpida, Selas, Mexikali, Athos, Papadakis, Aiantas and Thraki) were used. The complete randomized block design was applied with four replications and the experiment was established in the farm of the Western Macedonia University of Applied Sciences in Florina. The following morphological traits were measured: height and total height, the blooming, the length of spike, the number of fertile grain per spike, the length of grain as well as the germination capacity, the yield, the weight per thousand grains, the hectoliter weight, the protein content and the ashes. Differences were found between durum wheat varieties regarding germination and yield as well as the agronomic traits. No significant differences were found concerning the protein content and the ashes. More early blooming variety was the variety Thraki and the more late blooming was Athos. Regarding yield, durum wheat cultivars Anna, Mexicali and Athos were ranked first, followed by cultivar Thraki. It was concluded from the results of the present study that most of the examined cultivars performed satisfactory under low temperature and low input conditions and could be used by wheat breeders to produce new promising varieties under similar conditions. Further research is needed to confirm the results of the present study.

Keywords: *yield potential, cold resistance, low input conditions.*

NITROGEN CONTENT OF GRAPES DETERMINED BY RAPID COLORIMETRIC METHOD

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Abstract

Nitrogen in grapes is found in different forms, i.e. free amino acids, ammonia, ammonium (NH4+), proteins, and its concentration affects the evolution of alcoholic fermentation, as well as the clarity and proteinstability in stored wine and the formation of bioactive compounds and ethyl carbamate. Free amino acids (except proline), ammonia and ammonium (NH4+) represent the nitrogenous forms available to be utilized by yeast during alcoholic fermentation, which are referred as Yeast Assimilable Nitrogen (YAN). A multi-variety evaluation was conducted in vineyards of Chalkidiki, Northern Greece, in order to assess YAN content of grapes with a rapid colorimetric method. Grapes were harvested at the stage of technological maturity. Primary amino acid nitrogen fraction was determined through a spectrophotometric procedure, which was based on the implementation of o-phthaldialdehyde/N-acetyl-L-cysteine (OPA/NAC) reagent for the derivatization of primary amino groups, the formation of isoindole derivatives and the subsequent measurement of its absorbance at wavelength of 335 nm. Data showed that primary amino nitrogen concentration ranged from 40 to 274 mg N/L juice. Both native and foreign grape varieties were examined during this studyand most of them contained less than 150 mg/L of YAN, therefore nitrogen supplementation might be necessary for successful completion of alcoholic fermentation. The application of NOPA method is able to provide rapid results regarding a nitrogenous source that is difficult to measure routinely, while with the additional determination of ammonium content, it provides crucial information to wineries for the smooth evolution of alcoholic fermentation.

Keywords: *nitrogen content, grapes, NOPA method, free amino nitrogen.*

CATTLE GRAZING ON HERB-ENRICHED MEADOWS IN GREECE

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Abstract

Grazing in meadows and grasslands is essential for development and welfare of large ruminants. Members of shorthorn cattle breed "Vrachikeratiki", a native breed used mainly for beef production under extensive farming, are found in very few areas in Greece, usually in organic farms located in mountainous regions. Among them, a small mountainous organic farm situated in Polydendri Lagada (Northern Greece), pays attention on animal health and welfare. During autumn 2015 and 2016, a meadow nearby the farm was enriched with herbs, i.e. oregano (*Oreganum vulgare hirtum* L.) and thyme (*Thymus capitata* L.) and grazing followed for two full periods. A group of cattle (group A - 20-members) grazed on this meadow for both periods, while another group (group B- 40 members) did not use it. Results showed that group A cattle had a healthier appearance and about 10% more births, while calf mortality was 0%, as opposed to 10% for group B. Only two animals were slaughtered from group A, grazing in the enriched meadow, instead of 10 for group B. Average weight was about 80 Kg for group A, while group B cattle showed an average of 71 Kg. Herb incorporation in livestock nutrition provided evident positive effects on animal health and welfare by the second grazing period, however, continuous long-time supervising is necessary in order to provide secure results and conclusions.

Keywords: *Meadow enrichment, oregano, thyme, Shorthorn cattle breed, Extensive farming.*

ASSESSMENT OF POLYEMBRYONY AND MOLECULAR CHARACTERIZATION IN SOME INDIAN POLYEMBRYONIC VARIETIES OF MANGO

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Abstract

Mango (*Mangifera indica* L) is a commercially leading fruit crop in India and in many south-east Asian countries. All the commercial varieties cultivated in India are monoembryonic. The polyembryonic varieties being less ideal for table purpose, are used as rootstock by nurserymen for propagation. The present work was carried out at ICAR-IIHR from 2009-2016 for assessing the variability with respect to germinability, polyembryony and genetic configuration using simple sequence repeat (SSR) markers in eleven different polyembryonic varieties maintained in the field gene bank. Percent germination and polyembryony varied depending on varieties and prevailing climatic conditions across different years. Variation in mean number of seedlings/stone was observed across the genotypes which ranged 1–6/seed. Singlets were more frequent (75–100%) than other forms of morphotypes. The frequency of occurrence of quadruplet and quintuplets was low. The first seedling to emerge was taller and thicker than late emerging seedlings. For accurate identification and assessment of genetic relationships among varieties, the molecular characterization of eleven polyembryonic mango varieties was done using SSR markers. Ten polymorphic SSR primers generated alleles specific to varieties. UPGMA dendrogram separated eleven varieties of polyembryonic varieties into three clusters. Mylipilian variety was found to be genetically diverse and placed apart in the dendrogram. The degree of polyembryony and DNA marker data would provide a useful guide for selecting specific polyembryonic variety with distinct genetic background for rootstock breeding programmes involving commercial monoembryonic varieties for imparting desirable traits.

Key words: *Mango, Polyembryony, SSR markers, Diversity.*

COMPARATIVE STUDY OF CONVENTIONAL AND ORGANIC FARMING SYSTEMS OF FIVE FEED PEA VARIETIES

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Abstract

Grain legume feed pea (*Pisum sativum*) is an important crop for Greece, with numerous usages. The adaptability of its varieties to different environments is a priority for all breeding programs, nationwide. Organic farming applies methods of cultivation that minimizes the impact of human activity on the environment, while ensuring the natural function of agricultural system, in the degree it is possible. During the past decade, agricultural land used for organic farming is constantly increasing. A field experiment was carried out in the farm of Western Macedonia University of Applied Sciences in Florina, Greece, regarding five feed pea (*Pisum sativum* L.), varieties, namely cv. Olympos, cv. Pisso, cv. Livioletta, cv. Vermio and cv. Dodoni in a split-plot design with four replicates, having two main plots (conventional and organic farming system) and five sub-plots (i.e. five varieties randomized within each plot). The aim was the assessment of feed pea characteristics in both conventional and organic crops. Significant differences in seed yield between conventional and organic farming systems, as well as between varieties, occurred from this study and the marginal superiority of organic farming over conventional was observed, with regard to seed yield.

Key words: *legumes, varieties, organic farming, conventional farming, yield.*

INFLUENCE OF GROWTH REGULATORS ON PROPAGATION OF *ZAMIOCULCAS ZAMIIFOLIA* ENGL. – AN INDOOR ORNAMENTAL PLANT

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Abstract

Zamioculcas zamiifolia Engl. (ZZ), native of Eastern Africa, is a stem-less herbaceous monocotyledon belonging to Family Araceae. It produces attractive dark green and glossy foliage with succulent rhizomes at the base. This foliage ornamental is gaining popularity as an indoor plant showing best performance even under reduced light and restricted water. ZZ plants are propagated vegetatively using leaflets. Large scale multiplication is very expensive due to its slow growth and low multiplication rate. The use of growth regulators in the propagation of ZZ plants has been attempted to address the issue. Mature leaflets collected from healthy stock plants were treated with rooting hormones *viz*: IAA, IBA and NAA at 1000, 2000, 3000, 4000 and 5000 ppm. IAA at 2000 ppm was found to initiate rhizomes in 30 days and 30% of the treated leaflets produced plantlets in five months. IBA at 2000 and 3000 ppm also resulted in initiation of rhizome in 30 days. However, the number of plantlets formed was less (12.5%). Early tuberization and shoot initiation occurred in three weeks and subsequently plantlet formation was observed in twelve weeks at 3000ppm NAA and maximum shoot length of 11.42 cm at 5000ppm. Among the growth regulators tested, NAA 3000 ppm gave promising results in terms of time taken for initiation of tubers, tuberization and formation of new shoots and its employability in nursery production. The findings of the research are useful for largescale and faster multiplication of ZZ plant in nursery production to meet the demand.

Key words: *ZZ, propagation, IAA, NAA, IBA.*

CONTROLING FUSARIUM HEAD BLIGHT ON WHEAT BY POTASIUM ANDVARIOUS NITROGEN SOURCES

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Abstract

Among the cereals, wheat has great importance in the human food supply. Some of pathogens have an important role in reducing yield and qualify of crops. *Fusarium graminearum* causes wheat head blight and produces phytotoxin named as deoxynivalenol (DON). The effects of potassium and nitrogen were studied on Fusarium head blight in wheat. The experiment was carried out as a factorial in a completely randomized design with three replications at the experimental greenhouse of Faculty of Agriculture and Natural Resources of the University of Mohaghegh Ardabili, Ardabil, Iran. Treatments included two levels of disease (control and infected), three levels of potassium (80, 100 and 120 kg ha^{-1}) and three forms of nitrogen (ammonium sulfate, calcium nitrate, combination of 75% calcium nitrate and 25% ammonium sulfate). At heading, the spikes were treated by *Fusarium graminearum* spores. Some parameters, such as soluble sugars, proline, antioxidants, polyamines and some metabolites involved in disease, were studied. Results showed that the activity of anti-oxidant enzymes, such as superoxide dismutase, catalase, polyphenol oxidase and also proline and soluble sugars, were increased by application of potassium and nitrate. Fusarium head blight decreased total protein and lysine content but application of potassium decreased the amount of methionine. It seems that potassium is effective in lowering the levels of polyamines and nitrate on putrescine (which is one of the stimulators of DON synthesis). Fusarium decreases grain yield, but using potassium, Fusarium impact on yield can be ameliorated.

Key words: *wheat, Fusarium Graminearum, Nitrogen.*

ANALYSIS OF GENETIC DIVERSITY OF SOME IRANIAN NATIVE WALNUT (*JUGLANS REGIA* L.) GENOTYPES BY MOLECULAR MARKERS

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Abstract

The Persian walnut (*Juglans regia* L.) is one of the most valuable genetic resource in Iran due to its multi benefits such as, nutrition, wood, environment conservation, genetics and medicine. Genetic resources are the most valuable national treasure of a country and it is vital to identify, conserve and use them. This research was conducted in Meshkin shahr at Ardabil province. In this study, to determine the level of genetic diversity, a total of 31 walnut genotypes were analyzed using Inter Simple Sequence Repeats (ISSR) markers. Genotypes were evaluated using 10 ISSR markers and a total of 26 polymorphic alleles were identified The average of observed alleles was equal to 7 in each locus. The highest genetic distance was found between genotypes AK4 and RM2, and the lowest was among genotypes MZ4 and ES1. The lowest RP value was found ISSR5.marker and the highest RP value was found ISSR9. Marker. Cluster analysis based on Nei similarity coefficient matrix using UPGMA method classified the populations into three main groups.

Keywords: *Allele, Genetic resources, cluster, Persian walnut.*

EFFECT OF ZNONANO PARTICLES AND ZN $(NO_3)_2$ ON GERMINATION CHARACTERS IN SEVERAL VARIETIES OF MUNGBEAN *(VIGNA RADIATE* L.) AND VETCH *(VICIA SATIVA* L.)

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Abstract

The present study is aimed at investigating the effects of zinc oxide nanoparticles (Nano-ZnO) and Zinc-Nitrate (Zn $(NO_3)_2$) on the germination characters varieties of Mung bean (*Vigna radiate* L.) and Vetch (*Vicia sativa* L.). This experiment was done as a factorial experiment in a complete randomized block design (RCBD) with three replicationsand 24 treatments including four varieties and seven Zn concentrations. The results showed that nano-ZnO, Zn $(NO_3)_2$ and variety had significant effect ($P \leq 0.01$) on the root length and shoot length, shoot and root dry weight, shoot and root fresh weight, germination rate, germination percentage and germination index.The interaction between the two factors was significant in all parameters examined in this study. Maximum length and root dry weight corresponded to Nano-ZnO 500 ppm concentration and Austrian Mungbean variety, while the lowest amount of root length was related to Zn $(NO_3)_2$ 500 ppm concentration and Vetch. Changing procedure of shoot length was increasing with the increase in concentration of Zn $(NO_3)_2$ in Austrian and Gotondri Mungbean varieties, whereas in Fereiduni Mungbean variety and Vetch it was declined. In Fereiduni and Austria Mungbean varieties germination rate initially increased and then decreased with increasing concentration of Zn $(NO_3)_2$ up to 100 ppm. Although different concentrations of Nano-ZnO and Zn $(NO_3)_2$,compared with control treatment, had no significant effect on seed germination percentage in Vetch and Gotondri Mungbean variety seeds, they caused significant increase in germination percentage other Mungbean genotypes. In general, treatment of nanoparticles improved the germination characteristics of Gotvand Mungbean variety as compared with other varietie .

Keywords: *Nanoparticle, Germination, Dry weight, Vigna radiata.*

IN VITRO REGENERATION OF AFRICAN VIOLET *(SAINTPAULIA IONANTHA)* FROM VEGETATUIVE EXPLANTS

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Abstract

African violet *(Saintpaulia ionantha)* is one of the popular cultivated ornamental pot plants due tovaried type of shape and color. As there is an increasing demand for multiplying and breeding of African violets, *in vitro* studies are indispensable to meet the requirements. Direct regenerations occurring without passing callus phase are important since fewer somaclonal variation and genotype-dependency are likely to arise comparing with regenerations trough callus. This research has been done to callus induction and plant regeneration from leaves and petiolesseparately and in combination with each other in 4 varieties. Explants were cultured in Murashige and Skoog (MS) medium. Effects of different concentrations of naphthaleneacetic acid (NAA) and benzyl adenine (BAP) were studied in detail. Indirect organogenesis pathway from complete leaf explants,100 μM NAA + 500 μM BAP resulted in the highest direct regeneration response (89.5 percentage), whereas other treatments were the most effective combination in indirect regeneration. Simple MS medium was found effective for the induction of shoot growth and multiplication of the *in vitro* regenerated explants. Both regeneration types showed normal growth and shape after 4 months subcultures and were capable to produce entire rootsystem. The present research illustrates *in vitro* regeneration system to apply in genetic engineering technology in these varieties.

Key word: *Saintpauli aionantha, organogenesis, callus, in vitro.*

RESPONSE OF DIFFERENT ORIGINATED CUT ROSE FLOWERS TO VARIOUS RELATIVE HUMIDITY AND RECUT

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Abstract

Experiments were conducted to evaluate the response of different originated cut rose flowers to various levels of relative humidity and recut. Three different experiments based on completely randomized design with factorial arrangement with 10 replications were done. Cut rose flowers obtained from three growers (Fleur, Liki and Longonot area) from Ethiopia were recut to 5 cm and placed in 60, 75 and 90% relative humidity (RH) as commercial supply chain. No recut flowers were used as a control.Mean comparison in three experiments revealed that with increasing storage time in cold room, flower vase life decreased.75% Rh produced the highest and significant flower vase life compared to 60 and 90% conditions.However, mean comparisons showed that cut rose flowers originated from Liki growers significantly had the highest vase life compared with others,followed by Longonot and Fleur ones.The results revealed that 5 cm cut end of flower stem significantly increased flower vase life compared to no cut ones. Mean comparison showed that Ex1 (first experiment) significantly had highest bacterial population compared to EX2 (second experiment) and EX3 (third experiment).Cut rose flowers originated from Liki growers significantly ($P \leq 0.05$) had the highest microbe population in the bottom part of stem compered to others.The result also showed that the end of stems contained lots of bacteria compared to top of stem.

Keywords: *Bacteria, cold room, growers, vase life.*

ETHICS AND ITS APPLICATION IN WEED SCIENCE

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Abstract

Specifically, ethics tells a branch of philosophy that it is comparable to a society that seeks to parse and explain existing thoughts and ideas about its usefulness. Agriculture is one of the most important human activities that it is very necessary to observe the ethical aspect. These aspects include human (as a component), animals, the environment, society, economics and politics. The most important ethical issue is the production, consumption and food business in the presence of the hungry, and the health of the food is also a very important moral issue. In relation to weed plants, if a farmer controls a weed with a wide root system or with a high distribution potential, it prevents the spread of losses to others, which is an example of the external sample of profit. On the other hand, if farmers fail to control some weeds, other farmers will be at risk of external infection, and additional costs of weed control or yield loss will apply to them. In addition, widespread use of chemical pesticides against weeds may reduce water quality, increased protests, the environment and the cost of treatment. Accordingly, the responsibility of the future as well as of the present generations will make us committed to preserving natural resources (sustainable management of weeds) and avoiding irreversible changes. Therefore, the ethical look is a holistic view, and it is not merely a set of methods; it is a view that does not focus solely on production and consider the whole system, and human beings are also part of this system, so stepping In line with the sustainability of agriculture, this attitude is realizing the goals.

Keywords: *agriculture, ethics, society, weeds.*

GENETICALLY TRANSFORMED ROOT INDUCTION AND SHOOT ORGANOGENESIS OF *DRACOCEPHALUM KOTSCHYI*

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Abstract

An efficient hairy root induction system for an important endangered medicinal plant, *Dracocephalum kotschyi*, was developed through *Agrobacterium rhizogenes* mediated transformation by modifying the co-cultivation medium using five bacterial strains, A4, ATCC15834, LBA9402, MSU440, and A13 (MAFF-02-10266). A drastic increase in transformation frequency was observed when a Murashige and Skoog medium lacking $NH_4NO_3KH_2PO_4$ and $CaCl_2$was used, resulting in hairy root induction frequencies of 52.3%, 69.6%, 48.6%, 89.0%, and 80.0% by A4, A13, LBA9402, MSU440, and ATCC15834 strains, respectively. For shoot induction, hairy roots and unorganized tumors induced by strain ATCC15834 were placed on an MS media supplemented with 0.1, 0.25, 0.5, and 1 mg/l BA plus 0.1 mg/l NAA. The high frequency of shoot regeneration and number of shoot were obtained in the medium containing 0.25 mg/lBA and 0.1 mg/l NAA. Root induction occurred from the base of regenerated shoots on the MS medium supplemented with 0.5 mg/l IBA after 10 days.

Keywords: *Agrobacterium strains, Co-cultivation medium, Dracocephalum kotschyi, Hairy root.*

DETERMINING OF THE ORGANIC COMPOUNDS BY SAFFRON IN SOIL OF FARMS WITH DIFFERENT AGES

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Abstract

A major factor that limits the saffron cultivation area is its substitution on a rotational basis. The aim of the study was to identify the allelopathic substances that the saffron plant released around its roots. This research comprised three experiments on the soil of saffron farms and on saffron (*Crocus sativus* L.) corms at Torbat Heydarieh in Iran. The method included sample collection from four farm types. One was the control farm (no saffron cultivation). Saffron was grown on one farm for one year, on the other farm for four years, and on the fourth farm for seven years. The results indicated that the soil of the four-year-old farm had the higher contents of nitrogen, phosphorus, and potassium compared with the other three farms. Compounds like crocin and total phenolic increased significantly in the soil, and especially around the saffron root, as saffron cultivation period increased. The comparison of the corms obtained from the one-, four-, and seven-year-old saffron farms relative to the organic compounds, such total phenolic compounds (56.6mg/100 g), crocin (22.3µg/g), picrocrocin (16 µg/g), and cartamin (29.39µmol/g), revealed that the compounds were significantly more prevalent in the four-year-old farm corms compared with the one- and seven-year-old farm corms. With respect to the development of crocin and total phenolics in the soil, it can be concluded that saffron has an allelopathic property and secretes organic compounds (crocin and total phenolics content) that accumulate more in the soil around the saffron root than other parts of the soil.

Keywords: *Allelochemical, Corm, Crocin, Phenolic compounds, Soil.*

MIX CROPPING OF HUNGARIAN VETCH AND SMOOTH VETCH UNDER COLD DRYLAND CONDITIONS

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Abstract

Vetch species (Vicia spp.) are adapted forage legumes for rainfed areas of Iran. Mix cropping of some vetches may increase biomass production because of positive interaction between crops. Different mixing ratios of two vetch species (*Vicia panonica* and *Vicia dasycarpa*) were investigated as a randomized complete blocks design with three replications during two growing seasons (2015-2017) under Iranian cold highland conditions. Treatments included pure stands of smooth vetch (cv. Maragheh) and Hungarian vetch (cv. Golsefid) along with increasing seed mixing ratios with 10% rate. Comparison of means and estimation of land equivalent ratios were done using dry forage yield. There was significant difference ($P < 0.01$) between treatments. Golsefid as a winter type vetch produced 1953 (kg/ha) dry biomass in sole planting over two years. Pure stands of cv. Maragheh were completely damaged from cold and freezing during the second year. However, Maragheh in different mixtures could pass winter successfully in both years and could form compact forage in a positive antagonistic with Golsefid plants. The highest dry biomass (2889 kg/ha) was obtained from mixture of 70% Golsefid and 30% Maragheh in the first year. However, the highest land equivalent ratio (1.34) was obtained from 60% Golsefid and 40% Maragheh mix cropping. It was concluded that mix cropping of Golsefid and Maragheh cultivars were better than pure stands and mixture of 60% Golsefid and 40% Maragheh was advisable for Maragheh cold rainfed areas and similar conditions, probably.

Keywords: *Forage crops, Highlands, Vicia Sp.*

MINERAL CONTENT OF SOIL AND *CARUM COPTICUM* AS INFLUENCED BY NANO-SILVER PARTICLES AND MAGNETIC FIELD

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Abstract

Arid and semi-arid regions of the world are generally noted for their low primary productivity. Sustainable agricultural systems rely on environmentally friendly technologies based on physical and biological treatments to increase crop production. In order to study the effect of nano-silver particles and magnetic field on mineral absorption by *Carum copticum* an experiment was conducted in Birjand, Iran. Irrigation levels (control and water stress) were as main plot and soil fertilizing methods (no fertilizer, fertilizing with NPK -F, magnetic band-M, nano silver- N, M+N and M+N+50%F) were as subplots. Soil EC in control treatment (5.25 ds/m) was higher than in drought stress condition (3.77 ds/m). On the other hand, N, P and K quantities of soil were significantly affected by fertilizing treatments. The highest soil N content (0.064%) was related to control (no fertilizer). The treatment of M+N+50%F had the greatest soil P (12.17 ppm) and K (197.5 ppm). N and Ca content of plant tissue in drought stress condition increased 13% and 7.6%, respectively. The highest plant N (1.96%) and K (3.798%) content and plant ash (12.13%) were related to F treatment, but the highest plant P (0.387%) was related to M+N+50%F. Totally the result showed that there was no clear relationship between seed yield with plant and soil mineral content. On the other hand, it could not be said that in all environmental conditions and any plant species the use of magnetic field increased nutrients absorption from soil.

Keywords: *Nano silver, magnetic field, water stress, nutrient absorption.*

ECOLOGICAL GROWTH AND OPTIMAL TIMING OF PLANTING *HYPNEA FLAGELLIFORMIS*

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Abstract

Global utilization of seaweeds for food, fodder, chemicals and pharmaceuticals is on the increase and, in terms of harvested biomass per year, seaweeds are among the most important cultivated marine organisms. In this study, a culture system for the commercial carrageenophyt seaweed *Hypnea flagelliformis* was developed, using long-line rope method for grow-out. Several environmental parameters of seawater at the cultivation site were registered monthly over a year (December 2015 to November 2016)**.** Correlations between relative growth rate (RGR) and environmental parameters were investigated using Pearson correlate Test. Proximate composition (moisture, ash, protein and lipid content) of *H. flagelliformis* was estimated at the during of cultivation. We could grow this species only in 3 months during the year (November, December and January) in outdoor conditions. The highest biomass (8.8±0.4% day^{-1}) was obtained in December. Temperature, followed by salinity, had significant impacts on the growth of *H. flagelliformis*. The range of moisture content (91.70-87.46%), ash (37-38% dw.), total protein (1.43-2.46% dw.) and lipid (1.62-3.14% dw.) was obtained. These results indicated that *H. flagelliformis* could be successfully cultivated in the study area.

Keywords: *Cultivation, Biomass, RGR, Macroalgae, Proximate composition, Persian Gulf.*

EFFECTS OF NITROPROSIUM AND CALCIUM ON CHARACTERISTICS QUALITY OF 'GOLDEN DELICIOUS' APPLE

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Abstract

Apple as Climatric fruit exposed to respiration and ethylene production, therefore, any chemical that can prevent breathing and ethylene production plays an important role in increasing storage and post-harvest quality. This experiment was conducted to assess the effects of Nitroprosium and calcium ascorbate on characteristics quality of apple golden delicious cultivar in the completely randomized design in split plot design with 3 replications in Azad University of mahabad. This experiment was carried out in two ways in one of the main factors of sodium nitroprusside concentrations (0, 6 and 7 mmol / L) and in another, the main factor was concentrations of calcium ascorbate (0, 2.5 and 5%),In each split, the sub-factor was the different storage times (90, 150 and 210 days). The results showed that the fruits were treated with sodium nitroprusside Activity of peroxidase and ascorbate peroxidase enzymes, soluble sugars, pH and EC fruit and ethylene production significantly reduced and the amount of insoluble sugars, vitamin C, titratable acidity, fruit firmness, fruit vitality increased significantly. Also, ascorbate calcium treated with enzymes such as peroxidase, ascorbate peroxidase, soluble sugars and ethylene production decreased significantly and the, titratable acidity, fruit firmness, and fruit vitality increased significantly. The results also showed that by increasing the fruit holding time, antioxidant enzymes such as catalase, peroxidase, ascorbate peroxidase, soluble sugar, soluble protein, PH and EC, total soluble solids, browning and ethylene production increased, and insoluble sugars, non-reducing sugars, total phenol, vitamin C, titratable acidity, fruit firmness, and shelf life of fruits were reduced. . The interaction of sodium nitroprusside in storage time showed a significant effect only on soluble sugars, total phenol, titratable acidity and fruit firmness ($P < 0.01$). Under the interaction of calcium ascorbate during storage, only soluble protein, soluble sugars, total phenol and ethylene were significant ($P < 0.01$). Based on the results of the comparison of the averages at each level, calcium ascorbate concentration increased by increasing the fruit ethylene. According to the results of this study, apply Sodium Nitroposide and Ascorbate Calcium, fruit can be stored for a long time. It seems that the apply of these compounds has led to an increase in the shelf life of apple fruit during storage by slowing the ethylene production process.

Keywords: *Ethylene, Calcium Ascorbate, Storage, Antioxidant Enzymes, Sodium Nitroposide, Fruit Quality Traits.*

SCREENING OF CYTOTOXIC, ANTIOXIDANT AND ANTI-MICROBIAL ACTIVITY IN MARINE MACROALGAE

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Abstract

Properties of toxicity, antioxidant activity and antimicrobial of brown (*Sargassum angustifolium*, *Cystoseria myrica*) and red (*Acanthophora muscoides*, *Chondrophycus papillosus*) seaweeds from Persian Gulf of Iran were evaluated. In the cytotoxic assay, n-hexane extract of *Sargassum angustifolium* showed potent toxicity against *Artemia franciscana*. In the antioxidant assay, ethyl acetate extract and n-hexane extract of *Sargassum angustifolium* showed higher reducing power and Total antioxidant capacity, respectively. Total four seaweeds, two belong to Phaeophyta (brown), two other belong to Rhodophyta (red) were screened for the cytotoxic activity. All of the extracts of four seaweeds showed LC_{50} value below 1000 µg/mL against. In antimicrobial, the seaweed extracts had the highest antibacterial effect against gram-positive bacteria, *Bacillus subtilis*, and *Staphylococcus aureus*. The results of this study clearly display that the seaweed extract of *S.angustifolium* is a strong anti-microbial mixture that also possesses antioxidant and cytotoxic activities against two types of brine shrimp (*A.salina*, *A.franciscana*). Data obtained in the present study display that, ethyl acetate and n-hexane were the most effective solvent for the extraction of the bioactive compounds compared with methanol. Marine algae are known to produce a wide diversity of bioactive secondary metabolites and several compounds have been derived from them for prospective expansion of novel drugs by the pharmaceutical industries. However seaweeds from the Persian Gulf appear to have enormous activity as a source of toxicity, antioxidant activity, and antimicrobial compounds, they could be used in treating diseases caused by these organisms test.

Keywords: *seaweed extract; cytotoxic; antioxidant; anti-microbial; Persian Gulf.*

STUDY OF THE EFFECTS OF LOW IRRIGATION STRESS AND PLANT DENSITY ON SOME AGRONOMIC AND PHYSIOLOGICAL TRAITS OF CHICKPEA (*CICER ARIETINUM*)

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Abstract

To investigate the effect of water deficit stress and plant density on morphological and physiological characteristics of chickpea (*Cicer arietinum*), a split plot experiment based on randomized complete block design with three replications was conducted at the College of Agriculture and Natural Resources of Karaj, Iran in 2015. The water deficit stress included eight levels as the main factor and plant density at three levels (30, 40 and 50 plants.m^{-1}) as a sub plots. The results showed that increasing water deficit stress reduced the growth traits and ultimately the grain yield of chickpea cultivar ILC 482. Increasing plant density increased the growth traits such as leaf area index, dry matter production per unit area, and finally raised yield components and grain yield. The highest grain yield (2892 kg. ha^{-1}) was obtained in full irrigation (I_1), and the lowest (1075 kg. ha^{-1}) was gained from I_4. The highest grain yield (2068 kg. ha^{-1}) was acquired at 40 plants m^{-1}. By increasing the level of water deficit stress, the leaf area and canopy decreased which caused more light to pass through the canopy and increased the light absorption coefficient. As the density increased, the absorption coefficient decreased. The highest chickpea radiation use efficiency (RUE) recorded was 31 MJ. g^{-1}in full irrigation(I_1)and at 50 plants m^{-1}, and the lowest RUE was 9 MJ. g^{-1} in full irrigation to flowering (I_4) with 30 plants m^{-1}.

Keywords: *Plant density, Chickpea, low irrigation, leaf area, incoming light.*

INTERACTIVE EFFECTS OF GRAFTING AND WATER DEFICIT ON MORPHOLOGICAL PROPERTIES AND YIELD OF CUCUMBER

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Abstract

Water deficit is a major factor for crop productivity in arid and semiarid regions. Grafting elite commercial cultivars onto selected vigorous rootstock is considered as a useful strategy to alleviate the impact of environmental stresses. In order to evaluate the effect of different cucurbit rootstocks (Flexifort cucurbit, Shintoza cucurbit and ungrafted cucumber) and water stress (90, 60 and 40% of field capacity) on growth and yield of cucumber (*Cucumis sativus* L. var. Nagen), an experiment was conducted as split plot design based on randomized complete blocks with three replications. Results showed that plant dry weight, leaf and stem fresh weight and node number in Flexifort rootstock compared to ungrafted plants increased 91, 53, 58 and 28% respectively. Root volume in the Shintoza and Flexifort rootstocks was almost twice as much as the ungrafted plants. Plant dry weight, leaf and stem fresh weight, leaf number, root volume and leaf and root moisture content were decreased with increasing water stress. Maximum stomatal conductance (693 µmol m^{-2} s^{-1}) leaf area (362 cm^2) and marketable yield (3465g $plant^{-1}$) was obtained in Flexifort rootstock irrigated with 90% of field capacity and minimum stomatal conductance (220 µmol m^{-2} s^{-1}) leaf area (203 cm^2) marketable yield (1342 g $plant^{-1}$) was obtained in ungrafted plants irrigated with 40% of field capacity. Water use efficiency at Flexifort, Shintoza and non-grafting was 22.81, 22.69 and 11.45 Kg per m^3 respectively. These results suggest that grafted plants have more resistance to water stress than ungrafted plants.

Key words: *Grafting, Water stress, Vegetative properties, Cucumis sativus L.*

HOW MAY KAOLIN PARTICLE FILM REDUCE SUNBURN IN POMEGRANATE?

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Abstract

In this study we aimed to reduce pomegranate losses because of sunlight injury in Khorasan Razavi province, Iran. Midday temperatures in summer may rise above 45°C in this area causing sunburn damage to the fruits, which suffered losses of up to 28% of the total yield. Processed kaolin (Khorasan Kaoline Co.) was sprayed over the whole canopy and fruits four times at 12 – 16 days intervals from early July to early September. All treatments were done at 4, 6 and 8% of kaolin suspension. As a result, white coating significantly reduced fruit surface temperatures mean from 35.44°C in control to 29.3°C. Sunburn damage of fruits decreased from 22.35 % in control to 15.30 % in the kaolin treated fruits. Beside the total reduction in sunburn injury of fruits, kaolin reduced the severity of sunburn. Sunburned fruits in kaolin treated trees had lower intensity of injury in comparison to control, significantly.

Key words: *Evaporative cooling, Fruit surface temperature, Sunlight injury.*

EFFECTS OF SALICYLIC ACID AND PHYLAX IN THE CONTROL OF BEAN ROOT ROT DISEASE CAUSED BY *RHIZOCTONIA SOLANI* KUHN

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Abstract

This study was conducted to detect the pathogenic fungi associated with bean stem base and root rot disease and evaluate the activity of Salicylic acid(SA) and Phylax to induce resistance in the plants against the main causal agent under field conditions. nine species belongs to 7 genera of fungi were found associated with infected plants collected from three locations in Baghdad area at different frequency levels. of these fungi, *Rhizoctonia solani* was the more dominant followed by *Fusarium solani* and *Macrophomina phaseolina*. Seven isolates belongs to *F. oxysporum*, *F. semitectum*, *F. solani*, *M. phaseolina* and *R.solani* have caused reduction in seed germination and increase in disease severity in contaminated soil compared with control .Among the tested isolates , *R.solani* isolates were found the more aggrissive where seed germination was totally inhibited by RS1 and RS3 isolates. It was found that seeds socking, soil application or foliage application with SA and Phylax at 2500 ppm, Separately or in combination induced resistance in bean plants characterized by a restriction of *R.solani* and a suppression of disease symptoms development associated with increase in plant fresh and dry weights .soaking seeds in water and soil application of SA+ Phylax was found the more effective in reduction of disease incidence and severity compared with control .

Key words: *Root rot, Rhizoctonia solani , Salicylic acid.*

AM FOR QUALITY - USE OF CHITO-OLIGOSACCHARIDES TO ENHANCE PLANT MYCORRIZATION AND FORAGE QUALITY

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Abstract

Population increase and ecosystem welfare urge XXI century farmers to send an *SOS message* to soil micro-organisms such as arbuscular mycorrhizal (AM) fungi, ancient symbionts providing mineral nutrients and water to most crop plants. Experimental evidence showed that plant treatment with AM fungal signaling molecules (short chain chito-oligosaccharides, or Myc-COs) enhanced AM establishment under controlled conditions. In view of Myc-CO application in biosustainable agricultural practices, we analyzed four conditions in an experimental meadow: untreated, Myc-COs, a commercial AM inoculum (Mycosat F), and Mycosat F + Myc-COs. The meadows were composed by a mixture of forage species: *Festuca arundinacea; Dactylis glomerata, Festulolium, Trifolium pratense, Medicago sativa, Onobrychis viciifolia, Poa pratensis*. We present here the results from the first year of studies of AM colonization intensity and biomass yield. Myc-CO treatment significantly increased the intensity of AM colonization and biomass in mycorrhizal fields compared to control, fully supporting our laboratory results. Moreover, Myc-CO treatment improved biodiversity, by generating a better balance among forage species. We are currently monitoring the experimental meadows for the second growing season, and our preliminary results confirm the mycorrhization increase. Furthermore, the recording of seasonal patterns in AM development suggests that root colonization is anticipated in Myc-COs-treated compared to non-treated fields. Concerning the nutritional and organoleptic properties of forage, we will relate the symbiotic status of the forage plants with their content in crude protein, neutral detergent fibre (NDF) and acid detergent fibre (ADF).

Key words: *AM fungi, crop plants, short chain chito-oligosaccharides, experimental meadows, biodiversity*.

Acknowledgement

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CHITO-OLIGOSACCHARIDE TREATMENT ANTICIPATES AND ENHANCES ARBUSCULAR MYCORRHIZAL COLONIZATION

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Abstract

During the establishment of arbuscular mycorrhizal (AM) symbiosis a molecular dialogue occurs between the AM fungus and the host plant, through an exchange of chemical signals that is crucial to the recognition of both partners. In particular, AM fungi release short-chain chitin oligomers (Myc-COs) that trigger symbiotic responses in the host plant. Here we investigated the impact of exogenous Myc-CO application on pot-grown *Medicago truncatula* inoculated with the AM fungus *Funneliformis mosseae*. We evaluated the colonization level by morphological and molecular approaches over 4 weeks. The Myc-CO treatment enhanced AM colonization with an extensive development of arbuscules in several layers of root cortical cells, compared to untreated mycorrhizal plants. Moreover, we observed an increase in biomass production and leaf photosynthetic surface in treated and untreated mycorrhizal plants. Gene expression analyses during the course of AM development recorded an increase in the expression of AM marker genes - such as *MtPT4* (a symbiosis-specific phosphate transporter) and *MtBCP* (a blue copper binding protein) - for Myc-CO treated plants at early time points. By contrast, the transcript levels for both genes were lower in Myc-CO treated plants at later time points. Overall, these results suggest that the Myc-CO treatment anticipated the whole process of AM development, encouraging the use of Myc-COs as a promising tool to promote AM establishment in sustainable agricultural practices.

Key words: *sustainable agriculture*, *AM symbiosis*, *chitin oligomers*, *Medicago truncatula*, *AM markers genes*.

Acknowledgement

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PRODUCTION UNDER THREE SALINITY LEVELS OF IRRIGATION WATER

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Abstract

Seven commercial varieties of forage brassica/rape were grown under field conditions at 5 dS/m, 10 dS/m and 15 dS/m salinity levels of irrigation water to evaluate and assess their forage yield potential under saline conditions. The overall objective was to identify salt tolerant, high yielding promising varieties for general cultivation in the Arabian region under saline conditions. Irrigation water was applied with drip irrigation system and 64 litre/m^2/day of water was applied throughout the cropping system. Salinity caused a significant decrease in biomass and/or seed production of all the varieties. On an average, the yield was decreased by 12-15% at medium salinity (5 dS/m) and about 30% at high salinity (15 dS/m) levels. Forage yield ranged from 16.8 to 29.8 T/ha among the varieties. Varieties showed marked genetic variation for biomass production and yield components. Heritability for forage yield and yield components was found as moderate (50%). Continuous irrigation with medium and high saline water significantly increased the root zone (0-30 cm) salinity.

Key words: *Varieties, forage, salt tolerant, salinity, biomass, heritability.*

EFFECT OF GIBERELLIC ACID ON BERRY QUALITY OF SEEDLESS TABLE GRAPES

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Abstract

In Lebanon, it has been shown that about 50% of table grapes productions are not exportable or marketable due to small berry size. Giberellic acid (GA3) is known as plant growth regulator used in vineyard in order to enhance berry quality, especially berry size. Therefore, investigating the effect of GA3 on berry quality of the seedless ARRA 15 table grapes variety was the objective of the study. The applied treatments were: T1: thinning treatment (1.5ppm GA3), T2: thinning treatment (1.5ppm GA3) + sizing treatment (20ppm GA3), T3: thinning treatment (1.5ppm GA3) + sizing treatment (40ppm GA3), T4: thinning treatment (1.5ppm GA3) + sizing treatment (40/20 ppm GA3), T5: thinning treatment (1.5ppm GA3) + sizing treatment (20/40/60ppm GA3), T6: thinning treatment (1.5ppm GA3) + sizing treatment (20ppm GA3 + 2ppm Synthetic Cytokinin), T7: control (without GA3 or Synthetic Cytokinin application). During growth cycle, the highest berry diameter and weight were obtained in T5 (19.2 mm, 5.33g), while at harvest berry diameter was the highest in T5 and T6 (≈6.5g). T6 gave the crispiest aspects with the lowest brix index (11.16^0) while it reached 14^0 in T1 and in the control. T6 delayed the date of reaching brix 16^0 by 10 days compared to control. Finally, T6 was the best way to reach a better quality.But, in Lebanese conditions it is recommended to apply T5 because Synthetic Cytokinin should be used at low concentration to be effective without side effect on clusters which could be hard to some growers to regulate it and this products are almost unavailable in Lebanese market.

Keywords: *ARRA 15, Lebanese coast, Synthetic Cytokinin.*

EFFECTS OF NANO-FERTILIZERS AND GREENHOUSE CULTIVATION ON PHENOLOGICAL EVENTS AND YIELD OF SEEDLESS TABLE GRAPES VARIETIES

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Abstract

In order to meet the market demand, new seedless varieties of table grapes in Lebanon should be supplied on the market outside harvest season and their cultivation areas must be expanded to new Lebanese regions. Greenhouse cultivation could be a way to achieve this goal and nano-fertilizers would help vines to withstand the warm conditions of the Lebanese coast. In fact, there were not enough studies conducted to investigate the effect of those two agricultural practices on table grapes. The current study investigated the effect of nano-fertilizer (LITHOvit AMINO 25) application and greenhouse cultivation on phenological events and production of three ARRA seedless varieties: ARRA 15, ARRA 18 and ARRA 19. Experimental treatments were: open-field/nano$^-$(control), greenhouse/nano$^-$, open-field/nano+ and greenhouse/nano+. Regarding the three varieties, greenhouse cultivation induced earliness in budburst and fruiting (one week), flowering (2 weeks) and harvest (3 weeks) compared to open-field despite nano-effect. LITHOvit treatment did not affect budburst, fruiting, flowering and harvest dates in both cultivation system except on ARRA 18 cultivated in open-field where it caused early fruiting by 1 week. The yield was increased by LITHOvit application outdoor compared to indoor (by 19.1%, 19.1% and 6% in ARRA19, ARRA18 and ARRA 15, respectively). Finally, greenhouse cultivation seems to be an effective method to supply table grapes outside the harvest season, while LITHOvit application did not enhance vines productivity.

Keywords: *Lebanon, LITHOvit, budbreak, productivity.*

APPLICATION OF GIBBERELLIC ACID ON THREE SEEDLESS TABLE GRAPES GROWN UNDER GREENHOUSE OR IN OPEN-FIELD

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Abstract

Table grapes grown in Lebanese coast especially under greenhouse are faced by lack of enough chilling hours which affect negatively bud-break, some phenological stages and consequently yield. Few studies reported the beneficial effect of Gibberellic acid (GA) as plant growth regulator used in vineyard in order to regulate bud dormancy release in table grapes. Consequently, the objective of this study was to investigate the effect of gibberellic acid on budbreak, flowering and fruiting of three seedless table grapes varieties: ARRA 15, ARRA 18 and ARRA 19 grown under greenhouse and in open-field conditions in Lebanese coast. Therefore, Four treatments were the subject of this study: greenhouse/GA-, open-field/GA- (control), greenhouse/GA+ and open-field/GA+. Three parameters will be discussed in this paper: number of bursted bud per main shoot, number of flowers and number of clusters per vine. Giberellic acid did not have any effect in open-field conditions. However, under greenhouse, Giberellic acid induced full budburst compared to 35 % and 25 % in the control and the treatment greenhouse/GA- respectively. Number of flowers and clusters were higher in the treatment greenhouse/GA+ by around 67 and 80 % for ARRA 19 and ARRA 18 respectively compared to all other treatments. A full fruit set was observed in all treatments and regarding all varieties except on treated ARRA 15 under greenhouse where it was 54%. Thus, greenhouse cultivation created a suitable microclimate compared to open-field and could help Giberellic acid to be effective on resolving the disturbance of bud-break on vine in Lebanese conditions.

Keywords: *ARRA variety, bud-break, Dormex, Lebanon.*

COMPARING THE PERFORMANCE OF TWO PASSION FRUIT (PASSIFLORA EDULIS) CULTIVARS UNDER LEBANESE CLIMATE CONDITIONS

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Abstract

Passion fruit is a woody perennial vine that bears a delicious fruit which occurs in purple and yellow colors. Although in Lebanon passion fruit has not yet reached commercial volumes, however there is an increasing market demand for such fruit. In the current study, two cultivars of the purple passion fruit (*Passiflora edulis*) known as Perfecta and Black Knight were grown in Ghazir, Lebanon that is characterized by an altitude of 539 meters above sea level; latitude of 34°1'6 N and longitude of 35°39'58 E. This site was selected for being a suitable site that agrees with the minimum climatic requirements of purple passion fruit. The objective was to compare the behavior of both cultivars under local soil and climate conditions. Results indicated that the Perfecta was more adapted to clay soil and prevailing weather conditions than Black Knight. It showed a better vegetative growth that was expressed through greater averages of plant height (by 2.1 cm), leaf number (1 leaf), leaf nodes (by 11 nodes) and a higher accumulation of dry matter in leaves, shoots and roots. However, there was no significant difference at the level of leaf area, Specific Leaf Area (SLA), and Leaf Area Ratio (LAR) among both cultivars. Moreover, Perfecta plants flowered earlier and produced more flowers compared to Black Knight (94 and 4 flowers, respectively). Perfecta plants fruited while those of Black knight did not. Consequently, Perfecta cultivar showing a better adaptation is recommended for Lebanese growers seeking to diversify their income by growing alternative crops.

Keywords: *Passion fruit, adaptation, soil, climate.*

EFFECT OF GIBERELLIC ACID AND SYNTHETIC CYTOKININ ON CLUSTER QUALITY AND YIELD OF SEEDLESS TABLE GRAPES VARIETIES

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Abstract

In order to meet local and export markets demand, seedless table grapes should require the visual and standard demands of those markets. Then several studies reported the beneficial effect of Giberellic acid (GA3) and Synthetic Cytokinin (S.C) on table grapes quality and yield. Consequently, the current study was conducted to investigate the effect of those plant growth regulators on cluster quality and yield of ARRA 15 seedless table grape variety in Lebanese cost. Seven treatments were applied: T1: thinning treatment (1.5ppm GA3), T2: thinning treatment (1.5ppm GA3) + sizing treatment (20ppm GA3), T3: thinning treatment (1.5ppm GA3) + sizing treatment (40ppm GA3), T4: thinning treatment (1.5ppm GA3) + sizing treatment (40/20 ppm GA3), T5: thinning treatment (1.5ppm GA3) + sizing treatment (20/40/60ppm GA3), T6: thinning treatment (1.5ppm GA3) + sizing treatment (20ppm GA3 + 2ppm S.C), T7: control (without GA3 or S.C application). T5 and T6 increased yield by around 38% where the highest cluster length (≈26 cm), the most compact cluster and some rotten berries were recorded compared to control. Cluster weight was the highest in T5 (780g) and the lowest one was in T7 (306g). Harvest was delayed in T5 and T6 by 3 and 7 days respectively compared to control. The control clusters were sold at 0.7$/kg compared to 1$/kg for clusters of T5 and T6. Since S.C is hard to obtain in Lebanon,the application of T5 is preferred which also has an acceptable delay in harvest date.

Keywords: *ARRA 15, Lebanon, market prices.*

THE BIOLOGICALLY ACTIVE SUBSTANCES IN THE DIFFERENT CULTIVARS OF BASIL LEAVES

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Abstract

Basil (*Ocimum basilicum* L.) belongs to *Lamiaceae* family, and it is highly aromatic with pleasant taste used mostly in culinary. Basil is an aromatic herb which has a high value and is of high demand in the world. The influence of the cultivars on the accumulation of biologically active substances with antioxidant properties was studied for five cultivars 'Lemon', 'Purple Opal', 'Cinamon', 'Toscano', and 'Verde Foglia Fine'. The experiment was conducted in the greenhouse during period from February to May 2017. Total phenolic compounds, ABTS, ascorbic acid and chlorophylls were determined by standardized methods. The experiment identified that the methanolic leaves extracts exhibited statistically significant differences in antioxidant activity, as measured using the ABTS method. The highest antioxidant activity and the biggest amount of total phenolic were observed in 'Toscano' extract from leaves and slightly lower were in the 'Lemon'. Antioxidant activity increased proportionally with the phenolic content, allowing the establishment of a linear relationship between ABTS and total phenolic amount. Chlorophyll is the specifically pigment of green plants, which plays a key role in photosynthesis. In plants there are several types of chlorophyll as a, b. The most important in photosynthesis is chlorophyll “a”, which is darker. Our research showed that basil leaves contained more chlorophyll a. The highest content of chlorophyll a and b were identified in 'Purple Opal' leaves. The essentially highest amount of ascorbic acid and carotenoids were accumulated in the basil leaves of 'Toscano' cultivar.

Keywords: *basil, leaves, biologically active substances.*

THE EFFECT OF LIGHT PENETRATION ON THE CHANGES OF PHOTOSYNTHESIS INDICES IN APPLE TREE LEAVES

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Abstract

The impact of light penetration into crown and the effect of seasonality and growth technology on photosynthetic behavior were analyzed. Apple cultivar 'Rubin' was grafted onto dwarfing rootstock P60 and different growth regulating methods were used (pruning, trunk incision, plant growth regulator). Nitrogen balance index and photochemical reflectance index were measured in 1.5 m above ground outside the canopy and 0,8 m above the ground deep in the canopy; specific leaf area, fresh and dry weight were evaluated from all canopy. The significantly effect of seasonality on all tested indices was observed. Dry and fresh mass ratio was significantly lower during harvest time compared to results obtained in summer, but specific leaf area was significantly lower in summer time compared to harvest time. Photochemical reflectance index was significantly negatively affected by trunk incision. This index was significantly lower during harvest time compared to summer time, but nitrogen balance index during harvest time was significantly bigger during harvest time. Both indexes, photochemical reflectance and nitrogen balance index, were significantly bigger outside canopy compared to measurements deep in the canopy. Summarizing, it can be stated, that decreasing light penetration into the crown results in the decrease in NBI and PRI. Moreover, seasonality has significant effect on apple tree photosynthetic behaviour.

Key words: *apple tree, light penetration, growth regulating.*

A SYSTEMATIC APPROACH TO COLD PLASMA- AND ELECTROMAGNETIC FIELD-INDUCED EFFECTS ON SEEDS AND PLANTS GROWN FROM TREATED SEEDS

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Abstract

The effects of non-thermal or cold plasma (CP) and electromagnetic field (EMF) are currently under extensive investigation in agricultural studies as an alternative to the traditional pre-sowing seed treatment technologies. Numerous studies provide evidence that seed treatment with CP or EMF improves agricultural performance of crops, leads to stimulation of germination and seedling development followed the long-term changes on plant metabolism, biomass production, and disease resistance. However, a detailed approach to molecular mechanisms of mentioned effects is still missing. The present study is a systematic overview of our long-term observations on effects of CP and EMF seed treatment on numerous parameters of seed and plant morphology and physiology: surface topology, microbiome, generation of reactive oxygen species and phytohormones, germination rate, branching, rooting, nodulation, and synthesis of bioactive compounds in plants grown from treated seeds. A "favourite" physical stress (eustress) and distress duration and mode was determined for numerous perennial and annual plants. We have proved the role of complex changes in phytohormone amount and ratios in CP- and EMF-treated plants in the mechanism of plant enhancement maintenance and transfer to the next generation. We have reported for the first time that pre-sowing seed treatment with short-duration physical stressors (CP, 2-7 min, and EMF, 5-15 min) induces not only changes in germination and plant growth but also increases amount of biologically active constituents and antioxidant activity in leaves up to 3-fold.

Keywords: *Pre-sowing seed treatment, Cold plasma, Electromagnetic field, Plant improvement.*

INTRODUCTION OF *GERANIUM ROBERTIANUM* L., NON – VOLATILE SUBSTANCES IN AREAL PART DURING DIFFERENT STAGES

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Abstract

In XIX century research of medicinal (aromatic) plants (MAP's) and bio-active compounds had an important role. The aim of current chemical analyses was to determin non – volatile substances in *Geranium robertianum* areal part. Methanolic extracts was analysed in different vegetation stages: intensive growth, flower budding, beginning of blossoming, massive blossoming and the end of blossoming. *G. robertianum* was introduced in 2006 in Medicinal and spice (aromatic) plants collections of Botanical Garden at Vytautas Magnus University. *G. robertianum* is the annual or biennial herbaceous plant of *Geraniaceae* family which can be found widely in Europe with the exception of the far north in temperate parts of Asia, North Africa, Atlantic area of North America. In Lithuania it grows in humid deciduous or mixed forests, bushes, ash. In this study the amount of non-volatile compounds was determined using spectrophotometry methods. The total amount of phenolic compounds was evaluated using modified Folin–Ciocalteu reagent spectrophotometry method. Modified colorimetric aluminium chloride method was carried out to determinate the total content of flavonoid compounds. Radical scavenging activity was estimated by DPPH.

Keywords: *Geranium robertianum L., introduction, analyses.*

ORGANIC AND INORGANIC FERTILIZERS FOR APPLICATION IN COFFEE IN MALAWI

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Abstract

The study on effect of inorganic and organic fertilizers on coffee growth and yields was conducted at Lunyangwa and Ntchena-chena stations from 2013/14 to 2016/17 seasons. The objectives of the experiment were to assess the effect of organic fertilizer on coffee yield, quality and to determine the optimum combination of organic and inorganic fertilizers for coffee production. The treatments consisted of 100, 75, 50 and 25% rates of inorganic fertilizers and 100, 25, 50 and 75% organic fertilizers giving various combinations. The experiment was laid in a randomized complete block with three replicates. The gross plot size was 10m by 7.5m. Nyika was the variety used for study. The growth parameters data was collected on plant height stem girth, number of primary braches, and number of bearing branches, canopy radius and yield. The results for 2013/14 season showed no significant differences between treatments. The results for 2014/15 season showed significant differences in plant height ($P \leq 0.006$) and stem girth ($P \leq 0.04$) at Lunyangwa. The results for 2015/16 season showed significant differences in plant height ($P \leq 0.001$), stem girth ($P \leq 0.006$), number of primaries ($P \leq 0.001$), number of bearing branches ($P \leq 0.001$), and canopy radius ($P \leq 0.001$) and significant differences in number of primaries ($P \leq 0.005$), number of bearing primaries ($P \leq 0.006$) and canopy radius ($P \leq 0.004$) at Lunyangwa and Ntchenachena respectively. The combination of 50% organic and 50% inorganic fertilizer was superior to all treatments in plant height, stem girth, number of primaries and number of bearing primaries at Lunyangwa for the two seasons whilst the 100% inorganic fertilizer was superior in primary branches, bearing branches and canopy radius at Ntchenachena for the season 2015/16. The results for 2016/17 showed significant differences in primary branches ($P \leq 0.05$), canopy radius ($P \leq 0.022$) and yield ($P \leq 0.011$) at Lunyangwa but no differences were observed at Ntchenachena. The results suggest a combination of 50% organic fertilizer and 50% inorganic fertilizer as a suitable technology.

Key words: *Fertilizers, coffee, Malawi.*

PULP COMPOSITION, OIL IN SEEDS, AND ESSENTIAL OILS OF FEIJOA FRUIT IN A TROPICAL HIGHLAND OF MEXICO

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Abstract

The feijoa (*Acca sellowiana*) is a fruit tree recently grown in Mexico, and trees had been established in humid tropical highland conditions of Veracruz, Mexico, at 1900 m of altitude. Aspects about its possible local industrial potential are unknown. The objectives of this study were to determine aromatic compounds in the skin of the fruit, oils in the seeds, and some physical and chemical characteristics in the pulp. Commercial-sized fruits were obtained from eight-year-old trees with a single compost application per year and without artificial irrigation. Feijoa seeds had 69.4% unsaturated fatty acids, mainly linoleic (46.2 %) and linolenic (3.7). The major compounds in the essential oil of the feijoa skin were benzoate 2-methylpropane and caryophyllene acids with 18.41% and 10.28 %, respectively. The total dry mater, humidity, ash, proteins, ethereal extract, crude fiber in the pulp differed slightly from those reported in the literature of feijoa cultivated under temperate conditions. The feijoa fruit produced under tropical highland conditions is adequate as a fresh commodity and for making industrial food products.

Keywords: *Acca sellowiana, essential oils, fruit skin, oil in seeds, isobutyl benzoate.*

THE SUNFLOWER PRODUCTIVITY IN FUNCTION BY THE NUTRITION LEVEL ON CHERNOZEM CAMBIC IN LONG-TERM EXPERIENCES

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Abstract

The evaluation results on the sunflower productivity cultivated on the chernozem cambic in according to the fertilization level and agro-meteorological conditions in the years 2011-2017 are presented. Sunflower seed production obtained from the unfertilized (witness) variant ranged from 0.85 t/ha to 1.93 t/ha. Administration of fertilizers on the natural background on average for 5 years led to the increase of the sunflower yields from 1.48 t/ha to 2.47 t/ha, the production increase being 19-67%. At phosphorus levels the crop yield increased from 10% containing 1.5 mg/100g of soil to 48% - 3.0-3.5 mg/100g of mobile phosphorus soil versus the $N_{45}K_{30}$ background. In the $P_{3.5}K_{30}$ variant, the increase in harvest versus control variant was 38%. In nitrogen-based versions of PK at doses of 30-90 kg/ha the increase in sunflower production was 51-67% compared to the control variant and 13-29% relative to PK. The optimal soil phosphorus level for chernozem cambic in the sunflower cultivation was 3.0-3.5 mg/100g of soil (Machigin method) and optimal nitrogen were 45-60 kg/ha.

Keywords: *Chernozem Cambic, Fertilization, Nutrition level, Productivity, Sunflower.*

CHARACTERSTICS OF FRUIT BEARING SHOOTS (FBS) AND THEIR IMPACT ON POMOLOGICAL AND TECHNOLOGICAL TRAITS OF INTRODUCED PEACH CULTIVARS IN AGRO-ECOLOGICAL CONDITIONS OF PODGORICA (MONTENEGRO)

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Abstract

This paper presents the results of two year study (2016-2017) which examined the effect of fruit bearing shoots characteristics on pomo-technological traits of newly introduced peach and nectarine cultivars. The study examined following cultivars: Elegant Lady, Maria Marta, Rome Star, Royal Gloria, Spring Bella, Springcrest, White Lady, Adriana, Big Top, Caldesi, May Grand, Maria Aurelia, Morsiani. Our study discovered that the effect of fruit bearing shoots characteristic on pomological and technological traits for examined cultivars could be variable. This study discovered a statistically significant correlative dependence between yield and fruit weight (r=0,499) and number of maintained fruits per fruit bearing shoot and the length of fruit bearing shoot (r=0,6848). The highest number of maintained fruits per fruit bearing shoot was noted in cultivar Rome Star, while significant number of maintained fruits per fruit bearing shoot was noted in cultivars: Royal Gloria, Spring Bella, White Lady and May Grand. The highest content of dry matter was noted in cultivar Big Top, while the lowest was noted in cultivars Spring Bella, Adriana and Caldesi and they were statistically significantly lower in comparison to the rest of the cultivars.

Key words: *peach, nectarine, cultivar, length of fruit bearing shoot, fruit weight.*

NEW PERENNIAL CALLAS FOR TROPICAL HIGHLANDS OF MEXICO

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Abstract

The perennial calla lily (*Zantedeschia aethiopica*) or arum lily, of the family Araceae, is native to temperate regions of Africa, and has been adapted to temperate and tropical highland areas in Mexico. The main producing states of white calla are Veracruz, Puebla, Jalisco, Chiapas, Oaxaca, Colima and the State of Mexico. If not cultivated, the white calla can be found naturally in tropical and subtropical forest ecosystems of Mexico. The only registered experience with calla lily breeding in Mexico is 'Deja Vu'. This cultivar has its spathe with three different colors - pink, green and white. In other countries, calla lily breeding has been mainly focused on obtaining new varieties of the deciduous group with very bright spathe colors. Among the most striking cultivars of the perennial group of *Z. aethiopica* are 'Green Goddess', 'Green Desire', 'Red Desire' and 'Hercules', 'Green Desire' was generated in Holland by the Hoff Quality First Company and is very similar to 'Green Goddess', which no longer pays royalties. The same company developed 'Red Desire', which features pink tones. 'Hercules', registered in the United States, is an extremely vigorous cultivar that can reach up to 1.80 m in height, has very large leaves and white spathes and could be used as a vigor promoter for other calla lilies. Crosses of several kind of perennial *Zantedeschia* produced different spathe colors.

Keywords: *New ornamental plants, innovation, calla lily breeding.*

MORPHOLOGICAL CHARACTERISCS OF FRUITS AND PITS OF SOME JUJUBES (*ZIZIPHUS JUJUBE* MILL.) GENOTYPS

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Abstract

During the two consecutive years (2015-2016) the main morphological characteristics of jujubes fruits and pits of three cultivated and three 'domestic' genotypes were studied. The research was carried out on three well known varieties ('Lang', 'Li' and 'Tsao'), and three domestic genotypes with higher fruit weight. The highest weight of fruit (24.32 and 23.97 g) was registered in varieties 'Lang' and 'Li', statistically significantly higher compared with other varieties and genotypes. Varieties with higher weight of fruit ('Lang' and 'Li') also had the highest weight of flesh (23.57 and 23.03 g), and weight of pits, although the smallest weight of pit was registered in variety 'Tsao'. The highest flash portion in accordance with the whole weight fruit was registered in all cultivated varieties ('Lang' 96.87%, 'Li' 95.95 % and 'Tsao' 95.15%), mostly due to the higher mass of flesh. Also, Tsao variety had the smallest mass of pit (0,40 g), statistically significantly smaller than other cultivated varieties, and domestic genotype 3. According to the results of the correlation testing we found statistically highly significant dependence between the weight of fruit and the weight of the flash (r=0,986**), and pit weight (r= 0,929**). Morphological characterization can be first step in future breeding program for improvement domestic genotypes aiming to increase fruit size, and keeping the quality of fruit.

Keywords: *morphological characteristic, jujube, Ziziphus jujube Mill.*

EFFECT OF ECOLOGICAL CONDITIONS ON BIOPOMOLOGICAL CHARACTERISTICS OF RASPBERRY

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Abstract

The aim of this study was to examine the effect of ecological conditions on biopomological traits of eight single-bearing raspberry cultivars: Tulameen, Willamete, Malahat, Glen Ample, Chilliwack, Glen Lyon, Titan and Meeker and eight ever-bearing raspberry cultivars: Autumn bliss, Heritage, Himbo Top, Polka, Polana, Ruby, Rossana and Paranna rosa which were cultivated at Slacka-Mataševo ecological conditions during 2007-2008. The study determined the length of young shoots for certain cultivars and yield and fruit weight for all cultivars. The largest length of young shoots was noted in cultivar Chilliwack (201 cm) and Himbo Top (174 cm) while the smallest length was noted in cultivar Heritage (103 cm). The biggest fruit weight for single-bearing cultivar was noted in cultivar Glen Ample (5,5 g) and for ever-bearing cultivar in cultivar Himbo Top (4,15 g). The highest yield was recorded for cultivar Malahat (2967,5 g/m) and the lowest for cultivar Chilliwack (1369,5 g/m) and Paranna rosa (1997,5 g/m).

Key words: *raspberry, cultivar, fruit weight, yield, length of young shoots.*

RHIZOGENESIS OF MATURE CUTTINGS OF WHITE MULBERRY (*MORUS ALBA* L.), RED MULBERRY (*MORUS RUBRA* L.) AND BLACK MULBERRY (*MORUS NIGRA* L.)

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Abstract

The results of the exogenous application of different phytohormone types: Indol - butyric acid (IBA), Alpha - Naphthyl Acetic Acid (NAA) and Indol - Acetic Acid (IAA) on rooting percentage of mature cuttings of white mulberry (*Morus alba* L.), red mulberry (*Morus rubra* L.) and black mulberry (*Morus nigra* L.) are presented in the paper. The study was carried out in 2017 in the covered facility (glasshouse) of the Center for Subtropical Cultures in Bar. A different influence of the exogenous application of phytohormones (2000 ppm), NAA (1%) and IAA (1%) on the rooting success of mature mulberry cuttings was noted. The lowest average values of rooting were found in cuttings that were not treated with phytohormones (control) in all investigated mulberry species and then in cuttings treated with phytohormone IAA 1%. The best rooting of mature cuttings in studied mulberry species was recorded in application of IBA at a concentration of 2000 ppm and it was 83.20 in all studied species while the lowest rooting was recorded in cuttings not treated with phytohormones (53.00%). The best rooting of mature cuttings was recorded in white mulberry (*Morus alba* L.) - (90%) treated with 2000 ppm IBA. The smallest average value of rooting was registered in black mulberry (*Morus nigra* L.) whose cuttings were not exogenously treated with phytoregulators and amounted to 45.50%. Statistical highly significant differences in the rooting success were established between the investigated mulberry species according to the analysis of variance and LSD test, indicating that the success of rhizogenesis depends on the type of phytohormones used to treat the cutting and on the species genotype. The application of IBA solution (2000 ppm) proved to be the best in the process of rhizogenesis and as such, it could be recommended in the technology of mulberry scions production on its own root.

Key words: *mulberry, phytohormones, rooting, mature cuttings.*

INDUCED QUANTITATIVE VARIABILITY IN RAPESEED (BRASSICA NAPUS L.) BY PHYSICAL (GAMMA RAYS), CHEMICAL (EMS) AND COMBINED MUTAGEN TREATMENTS

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Abstract

Genetic variability is a prerequisite feature of any crop-breeding program and physical and chemical mutagenesis has become a proven way of creating new variations within a crop germplasm. Genetic variations induced by gamma rays (1300 Gry) and ethylmethanesulphonate (EMS) (1, 1.2, 1.4 and 1.6% doses during 6, 7 and 14 hours) and combined mutagen treatment (1100 Gry + 0.8% EMS during 6 hours) were evaluated for important quantitative traits in rapeseed (*Brassica napus* L.). Observations on days to flowering, days to maturity, plant height, number of branches/plant, number of pods/plant, number of seeds/pod, pod length, pod diameter and 1000-seed weight were recorded on M2 populations. A large variability was observed and mutagenic treatments had a significant effect on all traits studied. Compared to control plants, mutant genotypes derived from seeds treated with low EMS doses were earlier to flowering and maturity, and were characterized by a higher number of pods/plant. For high dose of EMS during long time and for combinations of physical and chemical mutagen, a significant decrease in plant height and stature was noticed, as compared to control. Besides, plants derived from seeds treated with gamma rays (1300 Gy) exhibited the highest number of branches/plant and 1000-seed weight. The induced variabilitymay be exploited for developing new rapeseed varieties with improved agronomic traits.

Keywords: *Rapeseed, induced variability, EMS treatment, gamma rays, Quantitative Traits.*

DETERMINATION OF THE OPTIMAL PERIOD OF POMEGRANATE (*PUNICA GRANATUM* L.) RHIZOGENESIS BY GREEN CUTTINGS

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Abstract

The research was carried out at the Center for Subtropical Cultures in Bar (Montenegro) in 2017. The research involved three pomegranate varieties (Slatki barski, Šerbetaš, Glavaš). That year's growth (shoots) was used for rhizogenesis of pomegranate green cuttings. The time periods when the cuttings were into the substrate for rooting were as follows: the first decade of June 2017, the beginning of the third decade of June 2017; the first decade of July 2017 and the beginning of the third decade of July 2017. Lower (basal) parts of the cuttings were treated with a liquid solution of 1000 ppm IBA, and then the cuttings were maintained in a substrate of black peat (50%) and river sand (50%). Different influence of phytoregulator indole - butyric acid (IBA) in the concentration of 1000 ppm on the rooting success of green cuttings of the studied pomegranate varieties, as well as on the length of root and shoots of rooted pomegranate cuttings was noted. The highest average percentage of rooting in green cuttings in the four time periods was in the variety Barski slatki (12,20%), while the lowermost value was in the variety Šerbetaš (8,20%). In relation to the period of rooting, the highest percentage was achieved in the second period (14.20%), while the lowermost percentage was achieved in the first period, which amounted to 4.22%. The largest average length of the root system of rooted cuttings was in the variety Barski slatki, with an average length of 15.50 cm. The lowermost average length of the root system was in the variety Šerbetaš, with an average length of 9.60 cm. In relation to the period of rooting, it could be noted that the highest average root length (16.20 cm) was in the second period. The lowermost average root length was recorded in the first rooting period and it was 7.70 cm. The largest average growth length of the rooted cuttings was in the variety Barski slatki (17, 80 cm), while the lowermost average growth length was in the variety Šerbetaš (8,10 cm). In relation to the periods of rooting, it could be stated that the highest average growth length (11, 80 cm) was in the second period, while the lowermost average length (6.30 cm) was in the first rooting period. Based on the results obtained, it can be concluded that it is not advisable to apply this method of pomegranate propagation, because the percentage of rooting is very low, so it is not possible to achieve successful plant production. Green cuttings were poorly developed in the above-mentioned periods, and therefore there is a small possibility of green cuttings rhizogenesis. Analysis of variance and LSD test showed differences between the studied varieties, where the success of rooting, length of root and growth of rooted cuttings depended on the rooting period and the genotype of the tested varieties.

Key words: *pomegranate, variety, phytohormone, cuttings, rooting.*

QUALITY OF CEREAL GENOTYPES AS NUTRITON IMPROVEMENT TOOL EVEN AT INTOLERANT CONSUMER POPULATION

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Abstract

The world's population by 2050 will reach around 9 billion, three times higher than today. An important task of agriculture is to ensure sufficient amount of food for growing population. The conducted study covers seven types of commercial cereal genotypes as soft wheat, durum wheat, barley, rye, oats, millet and brown rice. Durum wheat grains are the richest in proteins (13.31 g 100 g^{-1}) and fat poorest (1.84 g 100 g^{-1}). The same species had also the highest wet gluten content 26.33 g 100 g^{-1}, while in the barley it was the lowest (8.19 g 100 g^{-1}). Regarding the dry gluten the highest value is found in soft wheat grains (14.81 g 100 g^{-1}) and at least in rye (3.03 g 100 g^{-1}). Differences between investigated commercial cereal cultivars regarding quality traits are statistically significant.

Key words: *cereal grains, genotypes, gluten intolerance, nutrition, quality.*

MINERAL COMPOSITION OF SEVENTEEN UNDERUTILIZED MOROCCAN WILD LEAFY VEGETABLES

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Abstract

Morocco's vascular flora is one of the richest in the Mediterranean region. Women, particularly in rural areas have known for generations how to use wild edible plants (WEPs) available in their environment to make many popular traditional dishes. To our knowledge, there are no studies on the nutritional composition of WEPs in Morocco. The aim of the present study was to fill this gap by determining the mineral composition of wild edible plants traditionally used as vegetables in Morocco and to highlight the potential food use of these natural underutilized products in the contemporary diets. Seventeen species belonging to nine families were selected among the most available and popular WEPs in the rural area of El Jadida. The determination of K and Na was carried out by atomic absorption spectroscopy, Ca and Mg by complexometric titration, and Fe and P by spectrophotometry. The finding of this study showed that most of the wild vegetables analyzed are a rich source of minerals. However, considerable variations have been observed between the analyzed species, especially concerning their contents of Ca (70-1333 mg/100 g), Na (54-528 mg/100 g) and Mg (12-177 mg/100 g). Based on these new results, the studied wild vegetables could be considered as valuable food resources in the traditional Moroccan diet. The promotion of these under-exploited products could diversify consumed vegetables and improve the nutritional status of the local population.

Keywords: *Food composition, nutritional value, traditional Mediterranean diet, wild food plants, Morocco.*

WILD EDIBLE PLANTS USED IN TRADITIONAL RECIPES: PRESERVING A MOROCCAN CULINARY HERITAGE

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Abstract

Wild edible plants (WEPs) traditional knowledge is largely declining in the Mediterranean countries diet. Even there are some inventories of wild edible taxa consumed around the study region; data on traditional recipes are scarce. The present study is a contribution to a better understanding of how WEPs are consumed in Morocco. It aimed to investigate the knowledge related to their utilization in traditional recipes by the population in two rural communes in El Jadida province. An ethno-botanical survey was carried out among 100 women native or long-time residents in the study area using a semi-structured questionnaire. All informants were aged 45 years and older. Twelve different traditional recipes, prepared mainly in winter, from leaves, stems, flowers or roots were identified as being consumed, presently or in the past, in the study area. The results showed that the consumption of WEPs is in a widespread regression. Nevertheless, this decline does not affect all the plants in the same way. Some WEPs continue to play an important role in the local cuisine. "Beqoula" was found to be the most common traditional WEPs-based dish among the local population. We suggest extending this type of studies to other parts of the country with the aim to safeguard this heritage before its erosion. Also, it would be interesting to investigate the nutritional potential of WEPs to promote and revive the interest in these underutilized traditional food products.

Keywords: *Beqoula, Mediterranean diet, Morocco, traditional food, wild food plants.*

EFFECT OF ALTITUDE ON THE POMOLOGICAL AND PHYSICO-CHEMICAL TRAITS OF DELLAHIA PRICKLY PEAR FRUITS IN NORTHERN MOROCCO

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Abstract

Opuntia sp., commonly known as cactus pear, originates from Mexico and illustrates the impressive genetic diversity of Cactaceae with 400 species and a great number of varieties for Opuntia ficus indica. Moroccan cactus presents a very high genetic variability and several cultivars exist. They are distinguished by the flowering period (early, late), the flower color (yellow, orange and pink), fruit and pulp colors (green, yellow, orange, red and purple), fruit shape (oval, round or oblong), organoleptic characteristics and antioxidant content of the fruit. Cactus crop plays an important role on the ecological and economical scales, but unfortunately, in Morocco, its production is faced with a high lost due to the lack of valorization prospects. Dellahia prickly pear variety, widespread in northern Morocco, is characterized by the green pulp color of the fruit. It is among the lowest valorized cactus varieties due to the low oil content of its seeds. Therefore, its fruits are mainly used for fresh consumption. The aim of this study is to discuss the effect of the altitude on the pomological (fruit dimensions, seediness and weight) and phytochemical (juiciness, sugariness, etc.) characteristics of the fruits of this variety in northern Morocco in order to reconsider the different possibilities to transform the excess of the production.

Key words: *Opuntia ficus-indica*, *Dellahia*, *altitude*, *pomology*, *phytochemistry*

EVALUATION OF THE BIOSTIMULANT EFFECT OF FEW PRODUCTS ON PEACH PRODUCTION AND QUALITY IN SAIS PLAIN (MOROCCO)

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Abstract

Quality food demand in the world seems to be the biggest challenge of the farmers, and the main reason for the food industry competition. Hence, the solution was the development of the synthetic fertilizers sector (causing many health problems). The use of bio effectors, formally known as plant biostimulant, has become common practice in agriculture. However, there are little research work on this issue in Morocco. The present study aims to evaluate the improvement of production and quality of peach grown under calcareous soil and dry and hot summer conditions of Sais (Morocco). High soil pH induces low micronutrients uptake, which favors leaf chlorosis, and extreme temperature and dry air during end of spring and summer time altogether with other conditions induce high incidence of fruit drop and uncertain fruit quality. The present experiment was carried out during 2017 season in a conventional orchard of Zee Lady peach trees grafted onto almond rootstock in Sais, Morocco with an aim to evaluate the biostimulant effect of five products on peach yield and quality. Six variants namely Vitazyme, Protifert LMW 10, Protifert LMW 6,3, Protifert Zinc and Naturfer biostimulants and Control (unsprayed trees) were compared according to a completely randomized design with 3 repetitions. Data collected indicated a remarkable effect of biostimulant on fruit number per tree and harvest size and some pomological fruit parameters namely fruit weight, dimensions, core weight and core/flesh ratio.

Key words: *Biostimulants, Fruit drop, Fruit quality, Parameters, Peach.*

DIVERSITY STUDIES IN VIGNA SPECIES AND THEIR IMPLICATIONS IN FURTHER BREEDING

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Abstract

Diversity studies was carried out on some wild and cultivated species of *Vigna* in order to evaluate, identify and select superior genotypes with better agronomic traits that could be useful in hybridization and further breeding activities. The results of the investigation showed that there were significant variation in most of the quantitative attributes of the species studied but the qualitative vegetative attributes were considerably uniform. The Principal Component Analysis showed that some of the important traits that contributed significantly to the variation were number of days to germination, plant height, leaf length, leaf breadth, petiole length, pod length, pod breadth, seed length, seed breadth, number of seeds per pod and number of locules. From the findings obtained in this study, it could be concluded that the desirable attributes of Tvnu1249 (*V. vexillata*) such as early maturity, and Tvnu72 (*V. vexillata*) with high percentage seed set and resistance to flower bud thrips could be transferred into Sanzi and Ifebrown (*V. unguiculata* varieties) with larger seed sizes and high percentage seed set through hybridization and other breeding techniques.

Key words: *Cowpea, Vigna vexillata, Vigna unguiculata, Plant selection, Crop improvement*

PERFORMANCE EVALUATION OF SOYBEANS GENOTYPES (*GLYCINE MAX (L) (MERR.)* ACROSS DIFFERENT LOCATIONS

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Abstract

The research was conducted at three different locations: Gaya, Gumel and Dutse Sudan Savanna agro-ecological zone of Nigeria in 2015 rainy season to assess some quantitative characters of soybeans varieties. Experimental material consist of three varieties TGX-1987-10F, TGX-1955-4F, TGX-1835-10E. All the varieties were laid in Randomized Complete Block Design (RCBD) and replicated three times. Growth and yield characters observed during the experiment were recorded with significant differences among the three varieties. The result revealed that, the performance of the variety TGX-1835-10E was better in Dutse and Gaya than the other two varieties in the same locations. Thus farmers in these areas could be advised to use TGX-1835-10E for commercial production.

Keywords: *Soybean, Genotype, Different locations, evaluation.*

EFFECT OF POST EMERGENCE HERBICIDES ON WEED MANAGEMENT IN COTTON (*GOSSYPIUM HIRSUTUM*)

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Abstract

Cotton is the main cash crop of Pakistan and weeds infestation in cotton crop is a serious problem to be addressed. With the passage of time the weeds become resistant to herbicide. In order to evaluate the performance of different herbicides an experiment was conducted at Central Cotton Research Institute Multan. The experiment comprised of different pre-emergence herbicide treatments (Gramaxone 200L™, Percept 10.8EC™, Topmax 96EC™ and Glyphosate 480SL™) while a control treatment with no weeding and hand weeding were kept for comparison. The experiment was laid out in randomized complete block design with three replications. The results of the experiment revealed significant effect of different herbicide on weeds density, weeds fresh and dry weight, boll weight, seed and lint yield and ginning out turn percentage. Among different herbicides Gramaxon™ and Glyphosate™ performed better in terms of efficient weed control and seed yield of cotton. The hand weeding was proved superior in terms of weed control and yield as compared to chemical weed control. It is concluded from the experiment that application of Gramaxone™ controlled weed better as compared to other herbicide tested. Hand weeding is recommended for efficient weed control and higher yield.However under certain limitation regarding hand weeding, Gramaxone™ is recommended for chemical weed control.

Keywords: *Post emergence herbicides, weed resistance, cotton, seed and lint yield.*

IMPROVING THE QUALITY AND YIELD PERFORMANCE OF SAFFLOWER THROUGH FOLIAR APPLICATION OF SELENIUM

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Abstract

Selenium is an essential trace element for many organisms including humans, while in plants it can trigger a variety of beneficial effects i.eenhanced crop growth and crop tolerance to abiotic stresses when applied in trace amounts. However, physiological responses of different plants vary significantly to the Selenium fertilizer applications. The present study was conducted at research farm of College of Agriculture, Bahauddin Zakariya University, Bahadur Campus Layyah. The aim of this study was to investigate the effect of foliar application of selenium on quality and yield performance of Safflower genotypes. Different concentrations of selenium (50ppm, 100ppm, 150ppm, and 200ppm) were applied foliarly on four Safflower genotypes viz. 16427, 16493, 26733 and 26748. Foliar applied Selenium significantly improved plamt traits like plant height, number of branches, pods per plant, number of seed per pod, 1000-seed weight, bio- logical and seed yield were also increased by foliar applied selenium in all genotypes.

Keywords: *Selenium, Yield, Quality, Plant height.*

COMPARATIVE STUDIES OF PHYSICO-CHEMICAL AND NUTRACEUTICAL PROSPECTIVE OF *CICER ARIETINUM L* GENOTYPES UNDER DIFFERENT AGRO-CLIMATIC CONDITIONS

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Abstract

The nutraceutical significance of *Cicer arietinum* is very mesmerizing and has profound role in health sector. Being economical and potent source of essential nutrients, chickpea play its crucial roles as staple food in the deprived populace. Researchers ascertain about the importance of climatic conditions in the provision of nutrients in the chickpea. The present project considerate four chickpea genotypes grown at three different agro-climatic conditions (temperature, humidity, rainfall etc) Peshawar, Karak and D. I. Khan in the period 2016-2017. Our results verified that the examined chickpea genotypes were potential functional foodstuff including ash content (4.20-5.30%), crude fat (4.70-5.30 %), crude protein (24.33-26.27%) and crude fiber (4.50-5.33%) in promising amounts. The mean value of the data reveal that seed density for NDC-3 (1.47 g/ml), while hydration capacity (0.35), hydration index (1.62), swelling capacity (0.28) and swelling index (1.88) of NDC-1 chickpea genotype grown at Peshawar were significantly different as compared to other genotypes grown in all the subject climatic conditions. Aspartic acid, Arginine, Glutamic acid, Alanine, Leucine and Tyrosine were the key amino acids found in the range of 3.45 to 9.69%, 1.87 to 6.22%, 22.63 to 38.45%, 0.54 to 1.90%, 0.28 to 7.51% and 0.06 to 7.66 %, respectively in the selected genotypes sown at different ecological zone of Khyber Pakhtunkhwa. The GCMS chromatogram confirmed the presence of several important fatty acids including Linoleic acid (2.65 to 13.10 %) cultivated at different agro-climatic locations. It was concluded that astonishing changes in weather conditions inclined the quality of chickpea genotypes.

Key words: *Cicer arietinum, physicochemical composition, Nutraceutical, Amino acid, Fatty acids.*

CORRELATION ANALYSIS OF SEEDLING TRAITS UNDER LEAD STRESS IN SUNFLOWER (*HELIANTHUS ANNUUS* L.)

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Abstract

Sunflower is an important oilseed crop. The research was conducted in the wire house of Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad. The trial was laid out by following complete randomized design under factorial experiment with three replications. Pb was used as heavy metal. Ten genotypes of sunflower (Sundak, HA 302, Saturn, CM 374, CM 195, CMS CM 338, CM 603, CM 182, RHA 282 and CM 88) were expose to heavy metal (lead). Data were recorded on germination percentage, fresh root weight, fresh shoot weight, dry root weight, dry shoot weight, shoot length, root length, chlorophyll content, Pb absorption in leaves, Pb absorption in shoot and Pb absorption in roots. The recorded data were subjected to analysis of variance, correlation and path coefficient analysis. The accessions were highly significant for studied traits. The accession Saturn showed good performance for shoot length, lead contents in shoot and lead content in roots. Selection criteria could be based on the results of correlation and path coefficient analysis. Genotypic and phenotypic correlation of lead in root and chlorophyll content was highly significant and positive. In all accessions, genotypic correlation was higher than phenotypic correlation. Root length, fresh root weight, fresh shoot weight, dry root weight, dry shoot weight had positive indirect effect on lead content in shoot and positive direct effect on lead stress in shoot.

Key words: *Sunflower, Heavy metals, Lead*.

AGRONOMIC SIGNIFICANCE OF SALT TOLERANT BACTERIAL COMMUNITIES ASSOCIATED WITH *SUAEDA FRUTICOSA* (L.)

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Abstract

Halotolerant bacterial strains associated with the rhizosphere and phytoplane of *Suaeda fruticosa* (L.) growing in saline habitats were isolated to mitigate the salinity stress of *Zea mays*. 16S rRNA gene sequencing confirmed the presence of strains that belong to *Gracilibacillus, Staphylococcus, Virgibacillus, Salinicoccus, Bacillus, Zhihengliuella, Brevibacterium, Oceanobacillus, Exiguobacterium, Pseudomonas, Arthrobacter* and *Halomonas* genera. Strains were screened for auxin production, 1-aminocyclopropane-1-carboxylate (ACC) deaminase and biofilm formation. Bacterial auxin production ranged from 14 to 215 µg ml^{-1}. Moreover, several bacterial isolates were also recorded positive for ACC-deaminase activity, phosphate solubilization and biofilm formation. In pot trials, bacterial strains significantly mitigated the salinity stress of *Z. mays* seedlings. For instance, at 200 and 400 mMNaCl, significant increase for shoot and root length (up to 1 fold) was recorded with *S. jettensis* F-11. At 200 mM, *Z. flava* F-9 (45%) and *B. megaterium* F-58 (42%) witnessed significant improvements for fresh biomass. For dry biomass, *S. jettensis*F-11 and *S. arlettae*F-71 recorded up to 3 folds increases at 200 mM, over respective control. Results of this study suggested that natural plant settings of saline habitats were a good source for the isolation of beneficial salt tolerant bacteria to grow crops under saline conditions.

Keywords: *Antioxidant enzymes, Bacterial auxin production, Halotolerant bacteria, Halophytes, Plant growth promoting rhizobacteria, Suaeda fruticosa.*

SUPER CANOLA: NEWLY DEVELOPED HIGH YIELDING, LODGING AND DROUGHT TOLERANT CANOLA

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Abstract

The aim of present research was to develop a high yielding Canola cultivar having good quantitative and qualitative characteristics under the scenario of climate change. The research was initiated during 2005 and successfully completed during 2018 by Oilseeds Research Institute, Faisalabad Pakistan. Super Canola (RBN-13018) is an outcome of hybridization (Rainbow x RBN-03052) in 2005-06 and subsequently following by the pedigree method of selection. Homozygous progenies from F7 were bulked in 2013-14 for yield evaluation in replicated trials. Its performance was evaluated in the station and outstation yield trials at different agro-climatic conditions. It performed well in all yield trials and gave better yield than all the existing Canola varieties. RBN-13018 showed good tolerance against diseases and also exhibited better lodging tolerance. It also performed well in Polyethylene Glycol (PEG 6000) induced drought and showed good genetic potential against drought stress. Oil quality analysis showed that it has a best fatty acid profile for human consumption and its meal is also fit for animals. Agronomic studies revealed that this variety thrives well with the prevailing rate of inputs and agronomic practices. Considering the qualitative and quantitative performance of RBN-13018 Punjab Seed Council (Pakistan) approved this strain as commercial variety for general cultivation with the name of Super Canola.

Keywords: *Canola, Pedigree method, Seed yield, Erucic acid, Glucosinolates, Variety.*

INFLUENCE OF BIOCHAR ON THE BIOAVAILABILITY OF Cd TO WHEAT (*TRITICUM AESTIVUM* L.) IN ALKALINE SOIL

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Abstract

Cadmium (Cd) is a well-known and widespread toxic heavy metal, while the effect of biochar (BC) on Cd bioavailability and toxicity in wheat, especially under sandy alkaline soil condition,is unknown. In the present study, a pot experiment was conducted in the green house of College of Agriculture BZU, Bahadur Campus Layyah, Pakistan (2016-2017) to investigate the influence of biochar on the bioavailability of Cd to wheat in alkaline soil. Normal soil was collected from cultivated areas and then artificially contaminated at 5 mg kg^{-1} (highly toxic) with $CdNO_3.4H_2O$ salt. In polluted soil, different levels of biochar sources such as poultry manure (PM), farm yard manure (FYM) and sugar cane press mud (PS) were mixed and incubated for three months at room temperature (25^oC) with 60% moisture level. The experiments were laid out in CRD with three replications. The treatments were T1: control, T2: PM BC 5 tons ha^{-1}, T3: PM BC 10 tons ha^{-1}, T4: FYM BC 5 tons ha^{-1}, T5: FYM BC 10 tons ha^{-1}, T6: PS BC 5 tons ha^{-1} and T7: PS BC 10 tons ha^{-1}. After this, wheat plants were grown in the amended soil until maturity. The results showed that the FYM BC treatments increased the germination, number of tillers, chlorophyll content, plant height, spike length, biological and economic yield and reduced the Cd concentration in roots, shoots and grains when compared with control treatment. Overall, it is concluded that the application of FYM BC was very effective for immobilization of metal from soil and reduced its uptake and translocation towards plant tissues and grains.

Key words: *Cadmium, Biochar, Chlorophyll content, Wheat.*

DEVELOPING A VIABLE IRRIGATION STRATEGY FOR THE WASTE WATER USE IN SPRING MAIZE

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Abstract

The practice of using waste water for crop production is very common among farming communities. However, by using sewage waters of big cities there is always a threat of crop contamination with heavy metals. To develop suitable strategy for using sewage wastewater in maize so that optimum grain yield could be achieved along with no or low heavy metal uptake by crop, a pot experiment was conducted at the agronomic research area of College of Agriculture, University of Sargodha. Different irrigation treatments were canal water (control), waste water, canal water: waste water (0.5: 0.5 v/v ratio), canal water: waste water (0.5: 1.5 v/v ratio), canal water: waste water (1.5: 0.5 v/v ratio), and alternate irrigation with canal and waste water. Maize hybrid DK-919 was sown in bags (50 kg capacity) filled with soil during spring, 2015. After applying an initial irrigation with canal water just after maize germination, subsequent irrigations were applied as per treatment plan - 3 liter per bag with an interval of 1-2 days. Maximum root dry weight, root lead (Pd) and cadmium (Cd) concentrations and grain yield of maize were observed in treatment where canal and waste waters were applied in 1.5:0.5 ratio. However, alternate irrigation with canal and waste waters gave the maximum plant dry weight, cob weight per plant and Pb and Cd concentrations in maize shoot and nickel (Ni) concentration in maize root. It can be concluded that sewage waste water application should be applied in mixture with canal water (with 0.5:1.5 ratio).

Keywords: *grain yield, heavy metals, maize, sewage, wastewater.*

CORRELATION BETWEEN TRUE SEED AND TUBER DORMANCY IN A *SOLANUM TUBEROSUM* GROUP PHUREJA × STENOTOMUM POPULATION

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Abstract

Short tuber dormancy is desirable when multiple cropping seasons occur yearly, yet most potato cultivars were developed for regions with one growing season per year and have long dormancy. Although several methods exist for breaking tuber dormancy, they can lead to uneven emergence and poor stand counts. Breeding short dormancy cultivars could alleviate this problem. A long-day adapted diploid hybrid population of *S.tuberosum* Group *phureja- S. stenotomum* (*phu-stn*) has been developed with short tuber dormancy. The purpose of this study was to determine if there was a correlation between tuber dormancy in these *phu-stn*parents and true potato seed dormancy in their offspring, which would allow rapid breeding of short-dormancy germplasm. Tuber dormancy was evaluated for 12 diploid *phu-stn*parents harvested from three different locations:Presque Isle, Maine (ME), Plymouth, North Carolina (NC)andBeltsville, Maryland (MD) and stored at 7 °Cin MD.Twelve crosses were made among these parents.Each parent was represented twice in the offspring. True potato seed (TPS) from these 12 families were disinfected and soaked in water for 24 hours, dried, and sown in tissue culture. TPS germination was recorded daily for 35 days and the germinated proportion was calculated. The experiment was conducted three times. Parental tuber dormancy ranged from 6-10+ weeks. TPS family proportion germination ranged from 9 to 99%. There was no correlation (r=0.01) between parental tuber dormancy and TPS family germination proportion. These results show that the relationship between offspring TPS dormancy andtheir parent's tuber dormancy is unpredictable. Additional research is needed to determine if selection for early sprouting in the offspring *in vitro* is correlated with short tuber dormancy in subsequent field generations of these offspring.

Key words: *Correlation, Solanum Tuberosum, Tuber dormancy.*

PROGRESS IN GENETIC MODIFICATION OF SUNFLOWER OIL TO EXPAND ITS INDUSTRIAL VALUE

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Abstract

Increasing sunflower seed oil contents and genetically modifying oil quality to make it compatible for industrial demands areimportant breeding objectives of sunflower which increases its market value and ensure high returns for the producers. The present review focused on determining the progress of improving seed oil contents and modifying oil quality of sunflower through empirical and advanced molecular breeding methods. It was noticed that sunflower oil contents and quality were genetically modified through empirical selection methods and mutation breeding programs in various parts of the world. Further improvement in seed oil contents and its components (such as phytosterols, tocopherols and modified fatty acid profile) was slowed down due to lower genetic variation in elite germplasm and complex hereditary of traits. Introgression from wild species can be carried to modify the fatty acids and tocopherol contents with linkage drags. The revolution in molecular genetics provided the essential tools to improve the seed oil contents and oil quality. Marker assisted selection was utilized to improve the polygenic traits such as oil contents, phytosterols and tocopherols. Different transgenes were introduced through biotechnological methods which produced novel long chain fatty acids within sunflower oil. Bio-engineering of sunflower oil could allow utilizationin diverse industrial products such as biodiesel or bio-plastic. These results showed that past and current trends of modifying the sunflower oil quality were essential for its further expansion as an oilseed crops.

Key words: *lubricants, oleic acid, polar compounds, triacylglycerols, very long chain fatty acid.*

FIELD EVALUATION OF DIFFERENT TUBER-DORMANCY BREAKING METHODS IN SIX POTATO GENOTYPES

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Abstract

Different exogenous dormancy breaking methods are used worldwide to force sprouting in potato tubers. In this study we evaluated four methods for breaking dormancy in six genotypes: plant growth regulators (60 mgL^{-1}benzyl aminopurine + 20 mgL^{-1} gibberellic acid), electric current (80 volt), cold pre-treatment (2°C) and irradiation (3.5 kGy). After treatments, tubers were planted at 60 cm × 20 cm spacing in a randomized complete block design with three replications. All recommended cultural practices were adopted during the course of experimentation. Haulms were cut 90 days after planting. The treatments were harvested ten days after haulm-cutting to allow tubers to suberize in the field. Dormancy breaking methods and genotypes were significant ($p<0.05$) for days to emergence, emergence percentage, number of stems and tubers per plant and leaf area. Plant photosynthetic rate, transpiration rate, stomatal conductance, leaf chlorophyll content, tuber specific gravity and tuber dry matter content were significantly affected by both the main and interactive effects of dormancy breaking methods and genotypes. Overall, PGRs treated tubers gave the best and early emergence and highest crop stands, followed by electric current, cold storage and irradiation.

Key words: *Tuber dormancy, potato, genotypes.*

EFFECT OF ASPARTATE CAPPED SILVER NANOPARTICLES (ASP-AGNPS) AND INDOLE BUTYRIC ACID (IBA) FOLIAR SPRAY ON AMELIORATION OF DROUGHT STRESS TOLERANCE IN MAIZE *(ZEA MAYS* L.*)*

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Abstract

The study was aimed to determine the effect of aspartate capped silver nanoparticle (Asp-AgNPs) and Indole butyric acid (IBA) on physiological mechanism of drought stress tolerance in maize (Sarhad yellow) under induced drought stress of 7 and 10 days at vegetative stage. Maize seed collected from CCRI, Persabaq Nowshera were sown in triplicate in earthen pots of 18cm lower and upper inside diameter filled with 2kg of air dried soil and silt (2:1) having field capacity of 2.98-14.3, moisture content of 2.90-11.6, EC of 2.85-6.70 and pH of 6.86-7.17 in the greenhouse of the Department of Botany, University of Peshawar. The EDX peaks of aspartate capped silver nanoparticle (Asp-AgNPs) were observed at 3.0keV and binding energies of 20.194keV. The drought stress reduced physiological character including chlorophyll "a", "b", protein, carotenoid and POD content whereas; Asp-AgNPs enhanced these attributes at lower level of 7 days drought stress.

Keywords: *Nanotechnology, Asp-AgNPs, Maize, Drought, Antioxidant.*

ASSESMENT OF GENETIC DIVERSITY OF *CERATOCYSTIS MANGINEC* AND SUSCEPTIBILITY OF MANGO CULTIVARSTO MANGO DECLINE IN PAKISTAN

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Abstract

Mango (*Mangifera indica*) is an important fruit crop of Pakistan. Pakistani mangoes are unique in global market due to their taste and tenderness. But nowadays, mango crop in Pakistan is experiencing low yield. One of the main factors contributing to low yield is sudden decline due to a devastating soil born fungus *Ceratocystis manginecans*. Population diversity and biology of *C. manginecans*are not well known for Pakistan region. So in this study, genetic diversity was evaluated to discover the population structure and biology of this fungus. Resistance/susceptibility status of different mango cultivars was also estimated through survey of mango growing districts of Pakistan. Samples of *C. manginecans* from the mango orchards were also collected, isolated and purified. Twenty-four simple sequence repeat (SSR) primers of high reproducibility and PIC value were used for PCR. The amplified PCR products were run on PAGE. No genetic diversity was found for *C. manginecans*. Sixteen isolates were sequenced for ITS gene region to discover the species status of isolates. The sequences of these isolates were aligned and compared with already reported strain of fungus for this region. Phylogenetic analysis was carried out based on sequencing information of the ITS gene region. The results of phylogenetic analysis showed that isolates were similar with the already reported isolates in Pakistan and Oman.

Keywords: *Mango, Mango Decline, Susceptibility, Genetic Dicersity, ITS.*

MAINTAINING DRYNESS DURING HARVESTING AND POST-HARVESTING OPERATIONS CONTRIBUTES TO SMART COTTON FARMING

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Abstract

Cotton is the major source of foreign revenue in Pakistan. Low quality seed constraints uniform, vigorous crop stands and profitable cotton production. Moisture as rainfall or high ambient relative humidity in the time window between harvesting to storage is the primary culprit behind seed quality losses. Considering the whole cotton production line, quality seed is the virtue of good harvesting and post-harvest handling practices. Cotton picking in early morning during humid weather, carries excessive moisture that accelerates the seed deterioration and also makesit sensitive to physical damages during ginning process. Furthermore, conventional drying and storage modules inept to dry cotton seed are insufficient to shield the seed from ambient relative humidity fluctuations, therefore seed loses vigor and viability sharply during storage. The present study assessed the influence of drying and storage modules on seed quality of fresh harvests of two cotton genotypes picked at three interval sand from five different sowing dates. Cotton seed was subjected to sun drying and zeolite desiccant beads drying and subsequently stored in cloth bags, hermetically with zeolite beads and in cold at 10°C for five months. Cotton seed of both genotypes carried maximum moisture when picking delayed to November and sown before 15 April. Highest boll weight, width and length, number of seeds per boll, seed length and width, embryo length were observed at 30 days after anthesis. Maximum seed cotton yield and seed quality in term of germination were observed during 2nd picking of April, 15 sowing. Storage with drying beads reduced cottonseed moisture contents by 5.6% within an hour, maintained low equilibrium moisture contents (5.5%), free fatty acid contents (1.5%) and had maximum germination potential (80%). Subsequently, cotton seed dried and stored with drying beads had early and uniform stand establishment, exhibited more number of sympodial branches and bolls with higher economic returns compared to conventional drying and storage. In conclusion, management of pre-harvest factors of primary interest during production assured the harvest able yield and advancements in post-harvest handling kept the seed in good quality through maintaining dryness thus contributed towards smart farming.

Keywords: *Cotton, moisture, temperature, humidity, storage.*

GENETIC DISSECTION OF HEAT TOLERANCE IN TOMATO FOR DEVELOPMENT OF CLIMATE RESILIENT CULTIVARS

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Abstract

Tomato (*Solanum lycopersicum*) is an important vegetable crop in Pakistan, which is widely consumed for its balanced nutritional profile. Tomato yield is challenged by various biotic and abiotic factors. Among abiotic stresses, heat stress is critical in reducing the yield potential of tomato. Rise in temperature is one of the factors promoting climate change in coming years. So there is a need to screen the germplasm and identify the potential mechanism underlying heat stress tolerance. The present study was carried out to evaluate 107 diverse tomato genotypes collected from across the world. Initially, whole germplasm was screened based on cell membrane thermo-stability (CMT). Genotypes with high CMT score were considered as heat tolerant while those with lowest CMT were scored as heat susceptible. On the basis of cell membrane thermo-stability scoring 20 (10 having highest CMT score while 10 with lowest CMT score) genotypes were selected for further studies. These selected 20 genotypes were exposed to heat shock treatment (HST) at 36°C/28°C day/night for 7 days at their seedling stage. After 7 days of HST, plant parameters including plant height, fresh and dry plant biomass, fresh and dry weight of root and shoot, chlorophyll contents were studied, while plant height stress tolerance index and dry matter stress tolerance index were also recorded and analyzed. Results declared that genotypes Sunder $F_1$and CLN-2366-Awere heat tolerant, while Furuya K-go and BL-1175 were heat susceptible genotypes. To understand the molecular basis of heat tolerance in tomato, two heat tolerant (Sunder F_1 and CLN-2366-A) and two heat susceptible (Furuya K-go and BL-1175) genotypes were used for transcript profiling of heat stress related genes. Genotypes were heat stressed at 36°C/28°C day/night for 7 days. Sampling for RNA extraction from leaves was done after 0, 3, 5 and 7 days of HST and further utilized into real time qRT-PCR transcript profiling. Results demonstrated that the expression of heat shock protein genes including mitochondrial heat shock proteins (*MTSHP*), *HSP21*, *hsp100/ClpB* and *HSC2* was enhanced with increasing heat shock duration. Expression was relatively much higher in heat tolerant genotypes than heat sensitive genotypes. Present study provides us the genetic basis of heat tolerance along with the identification of climate resilient tomato genotypes. Selected heat tolerant tomato genotypes should be used in tomato breeding programme for the development of heat tolerant cultivars.

Keywords: *Heat tolerance, Transcript profiling, Cell membrane thermos stability.*

AN ANALYSIS OF THE EFFECTS OF AN INNOVATIVE FERTILIZER ON THE SANITARY AND ENZYMATIC PARAMETERS OF SOIL AND MAIZE YIELD

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Abstract

Along with people's growing awareness it is increasingly important to search for alternatives to mineral fertilisation so as to increase soil fertility and improve its sanitary state. The yield of most crops can be increased by applying adequate agrotechnical procedures, organic fertilisation and biological protection of plants by microorganisms. Fertilizer preparations with microorganisms usually work more slowly than their artificial equivalents, but they do not have negative effect on the biological balance in soil. Thus, they are in line with the current EU agricultural policy on integrated plant protection (Directive 2009/128/EC). The aim of the study was to assess the sanitary (the count of *Fusarium* sp. and *Alternaria* sp.) and enzymatic state (dehydrogenase and catalase activity) of soil under a maize plantation where mineral (NPK, limestone) and organic fertilisation (biochar, plant substrate) with microorganisms (EM preparation, algae) was applied. Soil samples for microbiological and biochemical analyses were collected at different phases of plants development. The research results showed that at the end of the experiment (the harvest phase) the development of pathogenic moulds was the most strongly inhibited in the variant with biochar inoculated with the EM preparation and algae. The highest enzymatic activity of soil, which indicated its fertility, was observed in the variant with the plant substrate. The study proved that organic fertilizer enriched with microorganisms could be used as an alternative to mineral fertilisation. The yield of maize grain after the application of an innovative fertilizer (biochar) and plant substrate was similar to the yield after application of mineral fertilisation.

Keywords: *Fungi, Dehydrogenase, Catalase, Maize, Biochar.*

Acknowledgement

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AN ASSESSMENT OF THE BIOCHEMICAL ACTIVITY OF SOIL AFTER USING BIOCHAR AS A CARRIER OF SELECTED BACTERIA, INCLUDING DIAZOTROPHS

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Abstract

The production of biochar from forest and municipal waste, agricultural biomass, sewage sludge and other sources is becoming increasingly common. Biochar, which is carbonate, can be obtained by pyrolysis. It has been used for a wide range of purposes, including agriculture, where it improves soil quality and thus reduces the use of organic and inorganic fertilizers as well as plant protection products. The aim of the study was to assess the sanitary (the count of *Fusarium* sp. and *Alternaria* sp.) and enzymatic state (dehydrogenase and catalase activity) of soil under a soy plantation fertilised with pellets with microorganisms (EM preparation, mycorrhizal fungi, *Rhizobium*, algae) in a controlled pot experiment. Soil samples for microbiological and biochemical analyses were collected at different phases of plants' development. The biochar carrier in the form of pellets was made from oats. The count of *Fusarium* sp. was measured with the plate method, using a Komada selective medium with ox bile, chloramphenicol, streptomycin, borax and PCNB (pentachloronitrobenzene). The count of *Alternaria* sp. was measured using the medium developed by Hong and Pryor, with 20% lactic acid, botran (dichloran), bayleton (triadimefon) and streptomycin. The activity of dehydrogenases and catalase was measured and the Biological Index of Fertility (BIF) was calculated. The agri-carbonate fertilizer increased the soil pH. In consequence, it significantly affected the growth of soy plants and activity of heterotrophic bacteria, including symbiotic microorganisms. The numberof pathogenic fungi of the *Fusarium* and *Alternaria* genera was reduced in the variants with biochar. These variants were also characterised by better fertility than the control variant where traditional NPK fertilisation was applied.The highest soybean yield was recorded after bio-carbon application inoculated with *Bradyrhizobium* bacteria.The experiment shows a new perspective for biochar in agriculture, which could help to handle large amounts of waste produced nowadays.

Keywords: *Fungi, Dehydrogenases, Catalase, BIF.*

Acknowledgement

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COMPARISON OF COMPETITIVE ALLELE SPECIFIC PCR (CASP) AND SIMPLE SEQUENCE REPEAT (SSR) GENOTYPING FOR MAIZE BREEDING PROGRAMS

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Abstract

Correct division of derived inbred lines into heterogeneous groups enhances the growth in effectiveness of the maize hybrid breeding and lowers the costs of this process. Estimation of the genetic distance based on DNA polymorphism analysis represents a more objective method than analysis of the phenotypic diversity. Some of the most used methods for characterization of the maize inbred lines in breeding companies is SSR (Simple Sequence Repeat) markers. These markers enable to assess the diversification of lines as they display a high level of polymorphism, and are both species-specific and highly reproducible. Competitive Allele Specific PCR (CASP) is an emerging method of SNP genotyping, which is being increasingly adopted for crop improvement programs. The aim of the research was to define the genetic similarity between new inbred lines of the maize. The study material comprised 95 maize lines derived at Polish breeding companies. DNA, isolated from the maize seedlings, was used in molecular analyses with the employment of amplified microsatellite sequences markers and KASP genotyping. The revealed DNA polymorphism allowed to calculate the coefficients of genetic similarity between the studied maize lines, and subsequently to delineate a dendrogram illustrating the genetic distance between them. Results of the analyzes allowed to compare the suitability of these two methods to determining the genetic similarity of the maize inbred lines.

Keywords: *genetic distance, inbred lines, maize, CASP.*

THE INFLUENCE OF GROUND PARAMETERS ON SELECTED TRACTION ABILITIES OF AGRICULTURAL VEHICLE

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Abstract

Nowadays, farm tractors are characterized by high versatility – one tractor can be used at various works on different grounds. Different abilities of grounds can cause the differences in traction abilities of agricultural vehicles. In turn, it may make difficult to achieve the optimal pulling abilities of tractor; moreover, in some cases the high energy losses can occur. For this reason, the aim of provided research was to demonstrate the differences in values of selected tractive parameters (wheel slip, pulling force, traction force, tractive efficiency) on two surfaces with different properties. Research was conducted on cultivated soil with two compaction levels and on the pasture turf (with one compaction level). Two tires with similar external dimensions were used in experiment – the difference in this tires concerned their internal construction; 11.2R24 tire had a radial construction (higher flexibility), while 9.5-24 was the bias-ply tire with smaller flexibility. To measure the tractive parameters the measure device mounted o tractor was used. The measure parameters were: pulling force, torque of wheel with tested tire, rolling resistance, theoretical and actual velocities. Then, the values of wheel slip, traction force and tractive efficiency were calculated. Based on obtained results it can demonstrate that the radial tire had a less sensitivity to change of surface of exploitation – the differences in pulling force did not exceed 8% (for the tractive efficiency – 5%). For the bias-ply tire the higher values of pulling force were observed on the soil with higher compaction level (in comparison with the second soil the difference was equal 21%). Moreover, the bias-ply tire achieved the smaller tractive efficiency than radial tire – difference reached 11%. The comparison of the tires on the pasture turf allowed to show that both tires had similar values of pulling force, but the radial tire achieved the higher values of tractive efficiency.

Keywords: *agricultural vehicles, pulling abilities, tractive efficiency, compaction.*

NEW AROMATIC FLUORINE-CONTAINING POLYCARBONYL COMPOUNDS AS PESTICIDE CANDIDATES

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Abstract

Poly-*β*-diketones exhibit number of biological properties like fungicidal, antibacterial, antiviral, insecticidal, antioxidant, anti-angiogenic, antitumor, and other activity. For example, Avobenzon has already been used as an anti-sunscreen agent, phloroglucinol derivatives and related triketones have been found to be active against antibiotic-resistant bacteria, curcumin is a well-known phytochemical with broad spectrum medicinal values, and mesotrione is a herbicide sold under the brand names Callisto and Tenacity. In view of these facts and also as a part of our continuous studies on the new pesticide candidates, the synthesis and biological evaluation of a series of aromatic fluorine-containing polycarbonyl compounds are reported herein. The studied compounds are related to the abovementioned medications and agrochemicals. Biological activity of the compounds towards nine phytopatogenic fungi (*P. infestans* (Mont.) de Bary, *C. arachidicola*, *A. solani*, *B. cinerea*, *G. zeae*, *P. piricola*, *S. sclerotiorum*, *R. cerealis*, *P. sasakii*), two Gram-negative phytopathogenic bacteria (two *P. atrosepticum* strains), and virus (*Tobacco mosaic virus*) was evaluated. According to the results of the experiments, the compound 4-MPBD shows the best activity among the diketones, the compound bis-MPBDP is the best among the bis-diketones. It should be noted that only the compound bis-MPBDE demonstrates to have phytotoxic properties. The MIC values towards tested bacterial strains lie in the range 64–256 μg/mL. The inhibition of the fungal growth is different towards different strains.

Keywords: *diketones, antivirals, antibacterials, fungicides, agrochemicals.*

CALLUS CULTURE PRODUCTION OF *CALLUNA VULGARIS* (L.) HULL USING NEW SYNTHETIC GROWTH REGULATORS

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Abstract

The use of modern biotechnologies for accelerated reproduction *in vitro* can become a strategy for the conservation of populations of rare and medicinal plants, as well as the gene pool as a whole. Modern biotechnological methods of reproduction of medicinal plants are aimed at the industrial production of a large volume of cell culture with a programmable content of biologically active substances (flavonoids, polysaccharides, amino acids, etc.) in a short time. The objective of the present work was to optimize the medium composition for the production of *C. vulgaris* callus. Synthetic growth regulators were selected to increase the growth rate of the cell culture. The nutrient media were prepared on the basis of Murashige & Skoog medium supplemented with kinetin (0.1 mg/l) and new synthesized phytohormones of the 1,2,3-triazolo[5,1-b]1,3,4-thiadiazine series (6-MPTT and 6-CHTT) at the concentrations of 5 and 10 mg/l. The compounds were demonstrated to have different effect on the morphology of the callus culture cells of *Calluna vulgaris*. Calluses grown on a medium supplemented with compound 6-CHTT at the concentration of 10 mg/l had the largest cell sizes, while those supplemented with compound 6-MPTT at the concentration of 10 mg/l had the smallest ones. High branching of the cells occurs in the medium with the addition of the compound 6-MPTT at the concentration of 5 mg/l, the average perimeter of the cell was 87±34 μm. It was shown that the most promising compound for production of cell mass was 6-MPTT at the concentration of 5 mg/l. Cell mass therewith photosynthesizes actively and forms vegetative shoots. The compound 6-CHTT, which has shown the ability to activate rhizogenesis, can be suggested as a stimulator for seed germination *in vitro*.

Keywords: *plant growth regulators, phytohormones, calluses, Calluna vulgaris, triazolothiadiazines.*

POTENTIAL OF PLANT GROWTH-PROMOTING RHIZOBACTERIA (PGPR) FOR IMPROVEMENT OF TURFGRASS GROWTH

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Abstract

Plant growth-promoting rhizobacteria (PGPR) are known to improve plant growth by various direct and indirect mechanisms. Despite the early studies on agronomic crops, there has been little emphasis on development of PGPR for turfgrass. Sixteen turfgrass rhizospheric soil samples were collected from different locations of parks in Qassim region. A total of fifty-five bacteria were screened initially on the basis of their nitrogen-fixing capacity using Burk's nitrogen-free medium. Twenty-three isolates designated (QSA-1 - QSA-23), were selected. These isolates were identified using 16S rDNA gene sequencing. These bacterial strains were identified under eight genera: *Enterobacter, Pseudomonas, Stenotrophomonas, Klebsiella, Serratia, Erwinia, Rhizobium,* and *Cedecea.* The results indicated that all the tested PGPR strains were able to grow at pH values between 6 and 10, in NaCl concentrations of up to 5% and temperatures between 35 and 40°C. Seven isolates QSA-1, QSA-2, QSA-10, QSA-12, QSA-18, QSA-19 and QSA-23 showed both salinity and temperature tolerance. All the isolates were positive for catalase activity, 11 isolates were able to produce amylase, and 8 isolates were able to produce protease. All of the isolates were able to produce IAA, siderophore and solubilize phosphate (except QSA-22 isolate). Eleven isolates showed nitrogen-fixing activity on Ashby's media, 8 isolates were positive for ammonia production, and only 4 isolates (belong to *Pseudomonas* genus) showed positive HCN production. These results showed that isolates may have the potential for their application as inoculants adapted under stressed environmental conditions.

Keywords: *Rhizobacteria, Turfgrass.*

AGRO-COAL AS A COMPONENT IN SUBSTRATA FOR THE PRODUCTION OF FLOWERS

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Abstract

This paper examined the influence of agro-coal application as one of the possible components in the substrata for flower production. The agro-coal, also known as bio-coal,is a natural organic component obtained in the process of pyrolysis of wood and other organic residues from the plant, such as straw and corn representing partially burnt carbon-rich material, which is used to improve productive soil-substrata properties. Agro-coal processing in Serbia still has no practical application in agriculture, and due to its soil-substrata properties (increasing porosity, better water and nutrition, as well as beneficial microorganisms), the aim of this paper was to examine the possibility of using agro-coalin substratafor flower production. We selected *Pelargonium x hortorum* as one of the most commonly cultivated flower cultures. The tested substrata were prepared on the basis of the volume ratio of the components, in which the agro-coal participated with 20% and 30%. The research was carried out on three different hybrids: *Dark Red*, *Shocking pink* and *Blancheroche*. The results of the research showed the justification for the application of agro-coal. By applying 20% in the substrata, it improved the productive properties of the examined hybrids such as a greater number of branches, higher above-ground mass and a greater number of flowers per plant.

Key words: *Agro-coal, Substrata, Pelargonim x hortorum.*

EVALUATION OF GENOTYPES OF ARTICHOKE (CYNARA CARDUNCULUS VAR. SCOLIMUS L.) AS A SOURCE OF MEDICINAL HERBS - FIRST COMMUNICATION

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Abstract

Artichoke leaf is an important medicinal raw material because it produces preparations that influence blood detoxification and improves blood counts, affect the bile and liver, lower blood cholesterol, and enhance immunity to people after long-term treatment of chronic diseases. In the artichoke plant there are: essential oil, cinarin, glycosides and flavonoids. This plant is rich in fat oils, proteins, minerals and vitamins (A, C and B - complexes). The subject of the research was 4 genotypes: Institute variety, Green Globe, Violet and Cardoon. The Experiment was set up at two sites, "Radmilovac" which is an experimental plot Faculty of Agriculture of the University of Belgrade (Serbia) and private estate in Batkusa village (Bosnia and Herzegovina, Entity of Republic of Srpska, municipality of Samac). The density of crops within the plots was different: 70 cm x 10 cm, 70 cm x 20 cm, 70 cm x 30 cm and 70 cm x 40 cm. The sight was set according to the Latin square system (random block system) and three factors were examined: genotype, density of crops and localities for yield of artichoke. The following values were measured: the rosette diameter, the number of leaves in the rosette, the largest leaf area, the weight of the dry plant and the dry leaf randman. Experimental plots at both sites were set at the beginning of April 2017. The results of the first year of the experiment showed that different sites did not significantly affect the tested parameters. The density of crops statistically significantly influenced the differences between the parameters tested. The variety Cardoon proved to be the most relevant, then the variety Institutska, while the worst results were shown by Violet.

Keywords: *variety, genotype, site, crop density, yield.*

THE INFLUENCE OF BA, NAA, ETHEPHON, METAMITRON ON THINNING INTENSITY ON YOUNG TREES OF GOLDEN DELICIOUS APPLE

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Abstract

For several decades, the use of intensive orchards has been proposed to improve profitability and yield, notably ofearly cropping, in apple orchards. Fruit yield primarily depends on two components: fruit number and fruit size. Fruit number is mainly affected by flower bud formation and final fruit set. Crop load, defined as the number of fruits per tree, has a significant impact on both fruit quality and tree physiology. Thinning of flowers or fruit lets is the most important technique in apple growing practice to improve fruit quality, increase return bloom and reduce biennial cropping.The highest crop loud per trees had no thinning and trees thinning with NAA. Increasing crop loud has significant influence on return blooming. In third leaf of apple trees only two treatments prevent the occurrence of biennial cropping. The highest fruits are in trees thinning with metamitron and hand thinning.

Keywords: *apple, fruit quality, thinning, yield efficiency.*

HEAT-INDUCED EXPRESSION OF PROTEIN SYNTHESIS ELONGATION FACTOR 1A ASSOCIATED WITH POTATO HEAT TOLERANCE

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Abstract

Potato is a highly heat-vulnerable crop. Even moderately elevated temperatures can disturb the process of tuberization in this important plant species, causing a decline in tuber initiation, a reduction in tuber bulking, and tuber disorders. Investigation of heat stress-related proteins might be helpful for improvement of potato heat tolerance trait. In this research, heat-induced expression and accumulation of potato elongation factor 1A (eEF1A) were investigated, both in a controlled environment and field trials. *In vitro* experiments revealed a higher level of eEF1A accumulation under heat stress (HS) in microtubers of relatively heat-tolerant cultivar Festival, as well as an unaltered number of initiated tubers and yield, compared to relatively heat-sensitive cv. Desiree. *Ex vitro* experiments included prolonged heat treatment of potato plants in the stages of tuber initiation and early tuber bulking. Results revealed the accumulation of eEF1A in minitubers of cv. Festival (>1 cm) under HS. Conversely, unaltered or reduced amount of eEF1A was observed in minitubers of cv. Desiree under HS. We also tested six potato cultivars in the field experiment. Cultivars that accumulated higher amounts of eEF1A in leaves during high-temperature occurrences had higher yield in two extremely hot years, indicating the importance of this protein in alleviating the negative effects of heat stress. Potato eEF1A is protein of 49.2-kDa encoded by a multigene family. Identification and utilization of heat-inducible eEF1A genes might be helpful for the development of the heat-tolerant potato varieties.

Keywords: *heat tolerance, potato, elongation factor 1A, Solanum tuberosum.*

VARIABILITY OF LENGTH OF SPIKE AND NUMBER OF SPIKELETS PER SPIKE IN WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract

Variability of length of spike and number of spikelets spike^{-1} have share in forming of grain yield of wheat. The aim of this study was estimation of variability of length of spike and number of spikelets spike^{-1} in 20 genetically divergent wheat cultivars grown in different environmental conditions. The experiment was set up as a randomised block design in three replications. Obtained results indicated differences in average values of length of spike and number of spikelets spike^{-1} among tested cultivars in both years of experiment. In average for all cultivars length of spike was higher in the second year than in first year of experiment. Also, average value of number of spikelets spike^{-1} was higher in second year at the analysed wheat cultivars. The wheat cultivar Dejana expressed the highest length of spike (12.50cm) in average in the second experimental year while the wheat cultivar Sumadinka had the least length of spike (8.91cm) in average in the first year. Based on the results was established, variability of wheat cultivars for the both analysed traits of spike, as well as, significant differences between the wheat cultivars according to length of spike and number of spikelets spike^{-1}, which are in dependence of genetic and environmental factors.

Keywords: *wheat, variability, spike length, spikelets, cultivars.*

EFFECTS OF CROP DENSITY ON THE QUALITY AND YIELD OF CAULIFLOWER

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Abstract

Cauliflower represents a highly popular type of vegetables. Cauliflower head is undeveloped metamorphosed inflorescenceand it is used in nutrition. The inflorescence is used in its technological maturity from the moment of itsformation.Smaller inflorescences are used in households and catering industry, while larger inflorescences are dominantly used in industrial processing. Picking smaller inflorescences leads to the lower yield per unit area of land cultivation. A two-year long study examined the effects of crop density of the hybrid cauliflower on the inflorescence quality and yield. The experiment was carried out in Western Serbia (Mačva) in the randomized block design with four replications. Establishing the production was performed using seedlings, and transplantingthem in the field in the first half of July. During the transplanting period the plants had 5-7 permanent leaves. The distance between the rows had a constant value (60 cm), while the distance between plants in the row varied from 30 to 70 cm. Thus, five densities were obtained in which the number of plants ranged from 23 to 55 thousand/ha. The cauliflower had the standard care: irrigation,hoeing, fertilization and protection from diseases and pests. Harvesting was carried out in October, when the inflorescence quality and yield were determined. At thelower crop density, the cauliflower inflorescences had a larger mass and diameter. The average inflorescenceweight had the maximum value of 1.9 kg (and the diameter of 23cm). Such crop density resulted in the yield which amounted to 44.5 t/ha. On the contrary, the higher crop density led to smaller inflorescences with the weight of up to 1 kg (and the diameter up to 15 cm). The obtained yield amounted to 35 t/ha and was significantly lower than the yield obtained in the crops of lower density.

Key words: *cauliflower, crop density, inflorescence, yield.*

THE CONTENT OF ORGANIC MATTER IN THE SOIL OF NIS MUNICIPALITY (SERBIA)

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Abstract

One of the main components of soil, which affects the yield of plants, is the content of organic matter. The aim of this paper was to examine the saturation of the soil with organic matter on the territory of the Nis (Serbia) in 2015. An analysis of 284 soil samples from 110 farms at the location of Nis municipality, with total area of 115,28 ha, showed that 0.4% of the samples belonged to the class of very poorly humified soil, containing organic matter up to 1%. It was also found that 50.4 % of the samples belonged to the class of poorly humified soil, with the organic matter content ranging from 1% to 3%. Furthermore, 47,9% of the analyzed soil samples belonged to the class of well-humified soil, with the humus content ranging from 3% to 5%. The lowest value was found in one of the samples from the village of Trupale in Crveni Krst, and it was 0.88%, while the samples with the highest humus value were found in the village of Hum (5.,47%). Chemical analysis was performed in 2015, in the Agricultural Advisory and Professional Service - Nis, where the humus content was determined by using the Tyurin method. Soil samples were taken from a depth of 0-30 cm in field crops and vegetable cultures, or 0-60cm in orchards. The analysis showed that the soil of this area wais not humified enough, wherefore it was necessary to pay attention to the content of humus, increased the level of organic matter with organic fertilizers and reduced losses which happened by removing and burning the crop residues.

Keywords: *Organic matter, Humus, Soil, Serbia.*

INVESTIGATION OF CONTENT OF PRIMARY AND SECONDARY OXIDATION PRODUCTS IN SUNFLOWER OILS WITH A DIFFERENT CONTENT OF OLEIC ACID

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Abstract

Oxidative stability, *i.e.* shelf life of oil is related to the degree of the oxidative changes in the amount of the resulting primary and secondary oxidation products of unsaturated fatty acids. In order to improve oxidative stability, *i.e.* oil shelf life, sunflower hybrids with altered fatty acid composition have been created, *i.e.* significantly higher oleic acid (C18:1) content, even over 90% w/w, relative to the linoleic type with 25-30% w/w of oleic and 60-65% w/w of linoleic acid (C18:2). In order to examine the oxidative stability of the oil, three samples of sunflower seed oil NS hybrids (NS Oliva, NS Horizont and NS Romeo) of different fatty acid composition were analyzed. Samples were exposed to moderate temperatures (63±2°C) over a period of 8 days. Changes in the content of primary and secondary oxidation products based on changes in peroxide (PV) and anisidine (*p*-AnV) values, as well as changes in the content of conjugated dienes and trienes, were observed. The highest oxidative stability was observed in the oleic type oil sample. In this sample the determined values of the tested parameters of oxidative stability, after 8 days, were PV=4.85 mmol/kg and *p*-AnV=0.65, compared to the initial sample (PV=0.36 mmol/kg and *p*-AnV=0.57). The greatest oxidative changes occurred in the oil sample with the lowest content of oleic and the highest content of linoleic acid, as indicated by the PV=73.22 mmol/kg and *p*-AnV=3.60, after 8 days, in relation to PV=2.16 mmol/kg and *p*-AnV=0.50 in the initial linoleic type oil sample.

Keywords: *Sunflower oil, primary and secondary oxidation products, oleic acid, peroxide value, conjugated dienes.*

PROSPECTIVE PROTEIN MARKERS FOR SELECTION OF HEAT TOLERANT POTATO CULTIVARS

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Abstract

Most of the commercially important cultivars of potato are well adapted to cool climates, whilst adversely affected by high temperatures. In order to develop a procedure for efficient screening of potato genotypes regarding heat tolerance, we investigated expression and accumulation of heat stress-related HSP17.6, HSP21, HSP101 and eEF1A proteins in various potato cultivars both in a controlled environment and field trials. Potato plants were grown in a climate-controlled chamber and exposed to prolonged heat stress (HS) in the stages of tuber initiation and early tuber bulking. Tuberization parameters were measured and prospective protein markers analyzed in collected leaf and minituber samples. In a field experiment, the potato was grown in the irrigated field in Zemun Polje (Serbia) and leaf samples for protein analyses were collected after high-temperature incidents in two extremely hot years (2011 and 2012). Besides, relevant growth and yield parameters were measured each year. Positive, linear correlation was determined between yield per plot and accumulation of HSP17.6, HSP101 or eEF1A under HS in examined potato cultivars, while negative correlation was determined between the height of primary shoots, as well as above-ground biomass, and accumulation of these three proteins. In other words, potato genotypes which accumulated higher amounts of HSP17.6, HSP101, and eEF1A under HS in the field, also had shorter primary shoots, lower above-ground biomass, and higher tuber yield. Our results indicated that among investigated proteins, HSP17.6, HSP101, and eEF1A might be considered as prospective protein markers for selection of heat tolerant potato genotypes.

Keywords: *potato, heat tolerance, HSP, eEF1A.*

EFFECT OF METHODS OF APPLICATION OF NITROGEN FERTILIZER ON THE YIELD OF MAIZE GROWN ON PSEUDOGLEY SOIL

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Abstract

In order to find the most favorable method of application of nitrogen fertilizer, for achieving high yields of maize grown on pseudogley soil, a trial was conducted during 2015 and 2016, in the agroecological conditions of Kraljevo. The soil on which the research was carried out showed acid reaction (pH/H2O 5.4; pH/KCl 4.7), with low humus content (2.2%), total nitrogen (0.12%) and available phosphorus (4.6 mg/100 g of soil), while the content of available potassium was high (22.1 mg/100 g of soil). In the experiment, nitrogen fertilizer KAN (27% N) was used in the amount of 375 kg/ha (101.25 kgN/ha), according to the following variants: 1. Control; 2. 375 kg/ha of KAN during pre-sowing cultivation of the soil; 3. 190 kg/ha of KAN during pre-sowing cultivation of the soil+ 185 kg/ha of KAN by feeding in the phenophases of 8-10 leaves of maize; 4. 375 kg/ha of KAN by feeding in the phenophases of 8-10 leaves of maize. The highest yield of maize (11450 kg/ha) was achieved in the variant where half of the nitrogen was applied during pre-sowing cultivation of the soiland half for feeding in the phenophases of 8-10 leaves of maize. The lowest yield (7870 kg/ha) was achieved on the control variant. In the variant where the total amount of nitrogen fertilizer was appliedduring pre-sowing cultivation of the soil, the yield was achieved 10070 kg/ha, where the difference in yield was not statistically significant in relation to the yield (10350 kg/ha) achieved on the variant where the total amount of KAN was applied during the cultivation in phenophases of 8-10 leaves.

Key words: *Maize, Yield, Method of application, Nitrogen fertilizer, Pseudogley.*

PARENTAL POLYMORPHISM ANALYSIS IN MARKER ASSISTED SELECTION FOR B-CAROTENE RICH MAIZE

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Abstract

Marker assisted selection (MAS) is widely implemented into modern grain breeding programs. Molecular markers are used in foreground selection to control the target gene, as well as in background selection to accelerate the reconstruction of the recurrent parent genotype. The best results have been achieved with the qualitative traits, regulated by the action of a single or several genes and clearly phenotypically defined. One successful example of MAS is the improvement of β-carotene content using *crtRB1* specific molecular marker. Maize Research Institute "Zemun Polje" has a breeding program aimed at conversion of standard maize to β-carotene rich genotypes adapted to temperate regions. The objectives of this study were to test the utility of gene-specific SSR marker in foreground selection and to identify polymorphic markers between parental lines to be used in background selection. Genetic variability between two standard and three high β-carotene parental inbred lines was analyzed with 40 SSRs distributed over the maize genom. Total number of alleles detected with 30 informative markers was 77, average being 2.57. The genetic similarity values calculated on Dice coefficient ranged from 0.49 to 0.66. Parental polymorphism for *crtRB1* showed a 543 bp fragment in donor lines, whereas a distinct 296 bp amplicon and a faint 1221 bp amplicon were generated in the recurrent parents. This marker will be used as foreground selection marker for the *crtRB1* gene in the conversion of standard maize to β-carotene enriched lines for growing in temperate regions.

Keywords: *β-carotene, crtRB1 gene, maize, marker assisted selection, SSR.*

VEGETATIVE PROPAGATION OF *CALLICARPA BODINIERI* LEVL. BY HARDWOOD CUTTINGS

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Abstract

Callicarpa bodinieri is an ornamental, deciduous shrub that can be easily grown in well-drained soil in full sun to part shade. It is suitable for landscape use, for planting in group or mass, in bird gardens or in open woodland areas. For this research, two types of hardwood cuttings were used: t-cuttings with a part of two-year old wood and standard hardwood cuttings. The cuttings were treated with 0.8 % IBA (indole butyric acid) using a quick dip method. After rooting in mixture of peat and sand (2: 1), following parameters were recorded: number and length of primary roots, and presence of secondary roots. Considerably better results were achieved with t-cuttings, and there were no significant difference among those cutings treated with IBA and control. Rooting percentage was high, 95.3 % (IBA treatment) and 96 % (control), and there were no significant difference regarding other parameters, except root length. T-cuttings treated with IBA formed longer roots. Rooting rate of cuttings without two-year old wood was low - 21.3 % (IBA treatment) and 17.3 % (control). These results indicated that carbohydrate and endogenous hormone levels possibly significantly influenced rooting of hardwood cuttings of this species.

Keywords: *Bodinier beautyberry, vegetative propagation, cuttings, rooting medium, auxine.*

BRYOPHYTES AS NOVEL CROPS

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Abstract

Bryophytes, the second biggest group of terrestrial plants (after flowering plants), are not so widely used by humans. They are acknowledged to be difficult subjects for experimental work, primarily due to problems in their cultivating and maintaining. Though, they have many features that are interesting for human wellbeing. It can be mentioned that they have anti-feeding effects to some animals, repellent or even deadly effect to others, chemical constituents which are potentially cancer or HIV cure, as well as fragrances that can be used in cosmetics. The main problem in bryophyte use is achieving the monoculture, free of xenic organisms, having in mind that they are small ecosystems *per se*. These haploid organisms often have endobionts, or can switch the ploidy by endoreduplication. Some can undergo anabiosis and resurrect shortly upon rehydratation. The other can be rather good in harsh environment coping with salt and toxic metals. They harbor many different compounds that can be a huge benefit for humans. The biotechnological approach such as *in vitro* growth, optimization and production in bryo-reactors is applied in achieving biomass that can be further apply for any purpose. The era of non-field production of novel corps is developing rapidly and many bryophyte species can be applied. The world largest axenic collection of bryophytes (i.e. *in vitro* cultures) is maintained in the Belgrade Botanical Garden (University of Belgrade) and it counts at present over 260 species. Among these are the accessions from all continents including Antarctica. Apart from basic research and conservation, many interesting biotechnological features are investigated. Some of the research achievements will be highlighted, e.g. liverwort *Marchantia polymorpha* production and yield up of marchantins (macrocyclic bis(bi) benzyls) that are effective to some cancer types, or rare trisaccharides in *Rhodobryum ontariense* a moss with anti-hypertensive effects both to humans and animals.

Keywords: *mosses, liverworts, culture, potential.*

GRAIN YIELD AND STABILITY PARAMETERS OF ZP MAIZE HYBRIDS GROWN IN CENTRAL SERBIA IN THE PERIOD 2014-2017

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Abstract

Central Serbia, besides Vojvodina, is the most important crop production region in Serbia. The climate is the main difference between central Serbia and the Autonomous Province of Vojvodina. The first region is characterised with somewhat lower precipitation sums during the growing season and with temperatures a bit lower during the whole year. Due to this, every year, the Maize Research Institute, Zemun Polje performs production trials with its most distributed commercial hybrids in both regions. In this study, 10 commercial ZP maize hybrids were tested in 85 locations in central Serbia in the period 2014-2017. The number of locations per year amounted to: 26, 22, 23 and 14 in 2014, 2015, 2016, 2017 respectively. The average maize grain yields were recorded in 2014 and 2015, while 2016 was exceptionally high yield year. On the other hand, drought in 2017 reduced the yield. Yield stability was estimated by the method developed by *Eberhart* and *Russel*. The lowest four-year average yield (7.199 t ha^{-1}) was recorded in the hybrid ZP 341. This hybrid was also unstable (b_i=0.729). The highest yield was recorded in the hybrid ZP 600 (9.506 t ha^{-1}). The highest yield stability was estimated in the hybrid ZP 606 (b_i=0.954), which was also high yielding (8.688 t ha^{-1}). The most yielding hybrid ZP 600 was at the same time the least stable (b_i=2.483) and adjustable to favourable growing conditions.

Key words: *maize, grain yield, stability performance.*

SEARCHING ON NOVEL BIOFUNGICIDES FROM BRYOPHYTES

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Abstract

The conventional treatment of crop fungal diseases is rather environmental unfriendly. Additionally, fungal plant pathogen became more and more resistant to conventional fungicides. Thus, a problem in treatment of crop plant fungal diseases has increased and alternative solutions are welcomed. Bryophytes (i.e. mosses and liverworts) are well known to cope well with fungi as competitors and/or cohabitants. There are also very few reports on bryophyte infections by fungi, although there are fungal specialist group known to grow exclusively on selected bryophytes as parasites (bryophilous fungi) or as endophytes. It is widely accepted that these features come from chemical constituents of bryophytes, which are insufficiently known. Bearing to mind all known interactions of fungi and bryophytes we came to idea to test the potential of bryophyte extracts as biopesticides on selected fungal pathogens of cultivated plants. Methanolic and ethanolic extracts from selected bryophyte representatives were applied. Half dozen of fungal plant pathogens were isolated to study influence of extract on these fungi as measured by their growth when treated with bryophyte extracts. An interesting network of results comprising species to species interaction, extract type and extract amount was achieved. From these entire tests, it could be clearly inferred that the phytopathogenic fungi (namely *Botryosphaeria dothidea, Botrytis cinerea, Phomopsis viticola, Colletotrihum acutatum, Monilinia laxa* and *Calosphaeria* sp.) reacted to bryophyte (namely mosses *Cinclidotus fontinaloides, Anomodon viticulosus, Thuidium tamarsicinum, Eurhynchium striatum, Isothecium alopecuroides* and *Polytrichum formosum* and liverworts *Porella platyphylla* and *Scapani anemorea*) extracts in various extension. The strongest effect can be summarized as follow: ethanol extract of the moss *I. myosuroides* to fungal counterpart *B. cinerea*; methanol extract of the liverwort *S. nemorea* to fungal counterpart *B. dothidea*; ethanol extract of the moss *A. viticulosus* to two fungal counterparts, namely *M. laxa* and *P. viticola.*

Keywords: *biopesticides, bryophytes, antifungal activity, crops.*

SOMATIC EMBRYOGENESIS OF *CENTAURIUM ERYTHRAEA* RAFN. TIME-LAPSE DOCUMENTATION OF *IN VITRO* DEVELOPMENT

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Abstract

Organogenesis and somatic embryogenesis (SE) are often used for mass propagation of high quality material of medicinal, endangered and rare plant species. In *Centaurium erythraea* Rafn. (Gentianaceae), used as a model system in developmental studies, both pathways can be exploited. SE from centaury leaf tissues starts with the formation of embryogenic callus which develops into somatic embryos following globular, heart, torpedo and cotiledonary embryo phases. SE potential of leaf explants and embryogenic calli is highly dependent on concentration and ratio of added plant growth regulators, genotype, explant type and number of subcultures. Frequent (weekly) subculturing of the calli slows down growth and differentiation, whereas biweekly subculturing results in better embryogenic response. Higher CPPU to 2,4-D ratio drives the callus development towards embryo differentiation. Embryogenic potential of the callus cultures also depends on the presence of already formed globular embryos, since their removal reduces both growth and embryogenic potential. Once this potential is reduced, it cannot be restored by increasing exogenous hormone concentration. In order to further characterize and improve these processes in centaury, a documentation system was developed, using LED white light epi illumination, coupled with a smartphone camera with macro lens. Developmental processes were observed sequentially on leaf sections subjected to different 2,4-D and CPPU concentrations. Image processing of focal stacks from developing explants was automated in Adobe Photoshop and Bridge. A relational database containing all relevant sample information and photographs was then built using Excel and R.

Key words: *development, somatic embryogenesis, 2,4-D, CPPU.*

Acknowledgments

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THE QUALITY OF SOIL IN VOJVODINA AND ITS SUITABILITY FOR HAZELNUT PRODUCION

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Abstract

Over the course of the last decade, surfaces under hazelnut cultivation in Serbia have been under significant expansion thanks to the new market possibilities. Given the high investment required for establishment of hazelnut plantation, proper and thorough examination of agroecological conditions, above all climate and soil, is necessary for this type of cultivation. Research was, therefore, carried out in 2017 and 2018, including 120 agricultural plots in AP Vojvodina where 240 samples were collected from the depth of 0 – 30 cm and 30 – 60 cm. The tested parameters included the main agrochemical soil properties (pH, total $CaCO_3$, humus content, total nitrogen and content of readily-available phosphorus and potassium), content of active lime ($CaCO_3$) and mechanical content. The most important limiting factor of the research was high content of active $CaCO_3$, resulting in adverse conditions for hazelnut tree growing at 1/4 of the tested plots. A few plots had an acidic pH reaction, while 1/4 of the tested plots had very low humus content (below 2 %). Since most of the tested plots were used for field crop cultivation, nutrients were mainly concentrated within the surface soil horizon; deep tillage should therefore be encouraged, so that the nutrients were transferred into the active rhizosphere which was suitable for growing perrenial plants such as hazelnut trees. In addition, nine pedological profiles were open and the results showed that the tested soils belong to chernozem soil type, or its subtype or form. Having conducted the detailed research, we can conclude that the soils in AP Vojvodina are suitable for contemporary and intensive hazel growing, with the good prospect of obtaining high, top-quality hazelnut yields.

Keywords: *hazelnut, lime, basic agrochemical properties, soil.*

QUO VADIS, RES RUSTICA?

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Abstract

Humanity is facing the population growth, environmental erosion, and climate changes. Dramatic challenges require resolute solutions in agriculture. The agro-industrialization was the main goal of the 20th Century Green Revolution (GR). A new plant ideotype capable to respond to the new requirements was created. Though GR mitigated the hunger in the world, it opened some other problems. The prize was environmental erosion, climate changing, and over population. Using long term results of wheat breeding in the Institute of Field and Vegetable Crops in Novi Sad, Serbia, the authors comment plant breeding goals and selection criteria that were established to meeting growing demand for food, through the variation of some yield and quality marker in wheat, plant stature variation and creation a novel genetic variability for overcoming stressful growing conditions. Allelic variation of seed storage protein loci on 1B, wheat rye translocation, and 1D chromosomes, HMW glutenin alleles, mostly, as a consequence of selection pressure in wheat breeding showed that the main effort through selection criteria was to reconciling negative correlation between high yield and good quality. The variation of sink/source ratio and its effects studied, as well. On the basis of GR legacy, authors tried to anticipate future trends in agriculture. Whether a further genotype by environment interaction minimization by more controlled agro-production conditions in closed growth systems could be the next level? In order to feed more than 10 billion people are we forced to seek for radical solution in food production increment, rather than step by step improvements?

Keywords: *Agriculture, food, wheat, breeding, future.*

KINETICS OF DRY MATTER CONTENT DURING DRYING OF CV 'ČAČANSKA RODNA' FRUITS

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Abstract

Drying kinetics of plum fruits can be presented with diifferent drying curves (curves of fruit mass, moisture content on a wet base, moisture content on a dry base…), as well as with appropriate drying rate curves. This paper presents the curve of dry matter content change of the fruits of CV 'Čačanska Rodna' during the drying process. Fruits of the plum cultivar Čačanska rodna taken from the Fruit Research Institute Čačak 'Preljinsko brdo' site have been used for the examination. Tests were conducted using convective procedure in the hot air flow at the constant drying temperature of 90 ºC throughout the experimental drying chamber. Prior to drying experiments, fresh fruit mass, content of stone and dry matter content were determined. Mass share of the stone in the fruit was determined based on the fruit and stone mass. Before the drying process, the fresh plum fruits with pre-defined characteristics were distributed on the trays. Then the trays were placed in a drying chamber with the pre-adjusted drying air temperature. During the drying process, fruit masses were measured on the trays at the respective time intervals, thereby monitoring the kinetic process. It was noted that dry matter content in fruits increased during the drying process and the curves of dry matter content change were suitable for presenting the kinetics of drying process.

Key words: *Convective drying, Drying curves, Dry matter content, Fresh fruit characteristics*.

EVALUATION OF THE BEST PERFORMING INDICES IN ASSESSING MORPHO-PHYSIOLOGICAL TRAITS OF WINTER WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract

Spectral reflectance indices such as NDVI (Normalized Difference Vegetation Index), computed using the red (RED) and near-infrared (NIR) bands have been used as a promising tools in field phenotyping with potential to provide information on different morpho-physiological traits of wheat. Since that reflectance in visible and near-infra red regions is dependent on structural and biochemical properties of the canopy and varies with the growth stage and environmental conditions, there is a need to develop an unique and optimal two-waveband combination for NDVI exclusively sensitive to targeted traits. The objective of this study was to analyze the potential of different NDVIs derived from field reflectance measurements to estimate grain yield per plant, plant height, total leaf chlorophyll, carotenoids and nitrogen content, as well as relative dry matter for the contrasting winter wheat cultivars. The NDVI was measured using an active hand-held sensor GreenSeeker (NTech Industries Inc., USA) and hyperspectral camera (Ximea Corp., CO USA) at four growth stages of wheat: full flowering, medium milk, early dough and fully ripe. The relationships between different NDVI, involving all possible two band combinations between 650 nm and 955 nm, with examined traits were analyzed to determine which NDVI estimated these traits most effectively. Results indicated that the most of NDVIs showed negative correlation with relative dry matter at all observed stages. Strong positive correlations were found between the specific hyperspectral NDVIs and grain yield per plant, plant height, total chlorophyll, carotenoids and nitrogen leaf content, but varied with growing stages and genotypes. Hyperspectral measurements provided additional spectral band combinations for NDVI more sensitive to targeted traits. This study gives promising results which can be used as a basis for development and improvement sensing devices based on wider range of wavelengths which could provide real-time information in monitoring key traits associated with grain yield of wheat.

Keywords: *hyperspectral, Normalized difference vegetation index, wheat.*

INFLUENCE OF THE RECIPROCAL CROSSES ON GRAIN YIELD AND MORPHOLOGICAL TRAITS IN SINGLE-CROSS MAIZE HYBRIDS

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Abstract

Every single-cross maize hybrid can be produced in its original and reciprocal variant depending on the choice of the maize inbred line to serve as a maternal, or paternal component. Due to the manifestation of maternal effects, significant differences for various traits can be exhibited between the two variants of the same hybrid. The goal of this experiment was to examine a possible influence of reciprocal crosses on grain yield and some morphological traits in maize. Ten commercial ZP maize hybrids belonging to the maturity FAO 500-600 group were examined. All hybrids share a common parental line T1 which is used as a paternal line in original and as maternal in the reciprocal variants of investigated hybrids. The trial was set on two locations during 2015 and 2016. Grain yield, plant height , ear height and total number of leafs per plant were recorded. Location, year and reciprocal crosses were significant factors for all examined traits. Hybrids ZPH2, ZPH7 and ZPH8 had significantly higher grain yield in their reciprocal compared to the original variants with the difference ranging from 4.5 to 6.87%. Plant height was significantly higher in reciprocal variants of hybrids ZPH7 and ZPH9, and original variants of hybrid ZPH3 and ZPH6 (3,9 and 5,1% respectivily). Hybrid ZPH7 exhibited the highest difference in leaf number in reciprocal variant, compared to the original (11,6%). Hybrids ZPH1, ZPH4 and ZPH10 weren’t influenced by the reciprocal crosses for neither of the investigated traits.

Key words: *maize, reciprocical effect, grain yield, morphological traits*

GENETIC AND PHENOTYPIC VARIATION OF YIELD AND QUALITY OF PEPPERMINT (MENTHA PIPERITA L.)

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Abstract

Aim of this study was to examine and evaluate genetic and phenotypic variance of important traits of peppermint genotypes. Five genotypes of peppermint were used in the study and two of their traits were analysed-the leaf yield and essential oil content. Genotypes had been derived by selection of population clones. Vegetative multiplication have provided the favourable genotypes to be selected in the process of breeding and to remain constant in the course of reproduction. The trial was conducted in three replications, according to a randomised block desing. Experimental data were used for calculating several statitical parameters. Basic biometric parameters indicated that the interval of variation, variance and the coefficient of variation were high for the leaf yield. The coefficient of variation amounted to 45% and 28% for the yield and the essential oil content, respectively. The analysis of variance showed significant differences for dry leaf yield, among inevstigation genotypes. The proportion of genetic variance (S_g^2) in the total phenotypic variance (S_f^2) was higher for the essential oil content. This resulted in higher values of its heritability (h^2=0.96). On the other hand, heritability was smaller for leaf yield (h^2=0.81). This indicates that variations of examined traits had been highly genetically controlled. The values of the essential oil content were significantly higher for coefficients of both genetic (CV_g) and phenotypic (CV_f) variation than the values of the leaf yeild. Based on experimentally gained values, it can be concluded that the essential oil content had relatively higher varations.

Keywords*: genetic and phenotyppic variation, heritability, yield, quality, peppermint.*

TESTING AND SELECTING NEW, PROMISING ZP MAIZE HYBRIDS

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Abstract

Every year, the Maize Research Institute, Zemun Polje organizes the strip trials in a great number of locations throughout Serbia, in order to establish a proper regional distribution of hybrids and to select commercial maize hybrids best adapted to particular production regions. These trials are usually organized in approximately 50 locations per year and they cover all major regions of maize growing in our country. In addition, in 10-12 locations every year, the trials are set up not only with commercial hybrids, but with newly developed hybrids with good traits that have shown promising results in the process of their releasing. The trials were set up to check and compare values of newly developed hybrids with already existing commercial hybrids and to select new hybrids for future production and commercialization. The production value of new hybrids has to be higher than the value of current commercial hybrids within the same maturity group. The results, obtained in 37 locations in the 2014-2017 period, are presented in the present paper. Based on gained four-year results, the medium early maturity hybrids ZP 366 and ZP 388 were selected for commercialization, as they had results better than the commercial hybrid ZP 341.

Key words: *commercial maize hybrids, new hybrids, strip trials*

MORPHOLOGICAL AND PRODUCTION CHARACTERISTICS OF OATS CULTIVATED ON EUTRIC CAMBISOL, PRODUCTIVITY AND QUALITY OF OAT GRAINS (*AVENA SATIVA* L.)

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Abstract

The aim of this research was to examine the impact of the application of different nitrogen amounts and the timing of nitrogen fertilizer applications on morphological characteristics, yield and yield components and grain quality of the winter oats. The research was performed in 2015/2016 production year, with the domestic Vranac variety, on the eutric cambisol soil type, according to the randomized block system with four replications. Two factorial trial was based on the following variants: A) Time of fertilization (1. February, 2. March, 3. February and March); B) Nitrogen content (1. Control (without fertilization), 2. 50 kg ha^{-1} N; 3. 100 kg ha^{-1} N; 4. 50 + 50 kg ha^{-1} N). Combinations i.e. variants were as follows: Control, February 50 kg N ha^{-1} (F_{50}); March 50 kg N ha^{-1} (M_{50}), February 50 kg N ha^{-1} + March 50 kg N ha^{-1} (F_{50} + M_{50}); February 100 kg N ha-1 (F_{100}) and March 100 kg N ha-1 (M_{100}). The highest values of plant height (82.6 cm), number of internodes (4.6), panicle length (20.8 cm), number of spikes in a panicle (30.2), number of grains (66.4) and grain weight (1.78 g) per panicle were obtained in the variant F_{50} + M_{50}. The highest values of the 1000-grain weight (32.4 g) and the hectoliter weight (51.6 kg) were measured when fertilization was carried out in March with 50 kg N ha-1. The largest grain yield (4.23 t ha^{-1}) and grain protein content (8.6 %) were observed for the variant F_{50} + M_{50}.

Key words: *oats, nitrogen, morphological and production characteristics, protein content*

MICRONUTRITIENT VARIABILITY IN MAIZE INBRED LINES

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Abstract

Development of micronutrienten riched staple plant foods through plant breeding holds promise for sustainable and cost-effective food-based solutions to combat micronutrient deficiencies. The first step in this process is screening aviable germplasm for micronutritient content, so the aim of this study was determination of carotenoids and tocopherols content in set of maize inbred lines. Carotenoids (lutein, zeaxanthin and *β*-carotene) and tocopherols (α, β+γ and δ) content in 101 maize inbred lines with different kernel type (37 orange, 29 yellow, 4 white,19 sweetcorn and 12 popcorn) were determined by HPLC-DAD. The mean values of L+Z, β-carotene, α-tocopherol, β+γ tocopherol, and δ-tocopherol, were 31.34, 8.72, 10.22, 49.17 and 1.81 μg/ g, respectively. Content of α -tocopherol was in the range from 2.22 to 38.14 μg/g and β+γ tocopherols from 12.10 to 105.52 μg/g, β-carotene 1.20 to 39.37 μg/g and lutein+zeaxanthin 11.28 to 69.31 μg/g. White maize lacked carotenoids in the endosperm due to the presence of recessive genes. The highest value of β-carotene had inbred line H, L+Z inbred W-4, γ-tocopherols KRW 803-3-1-2-1 and α –tocopherol P21. Orange kernel inbred lines had the highest value of L+Z and β-carotene, yellow kernel inbred lines α –tocopherol, whereas sweetcorn inbreds had the highest value of γ-tocopherols. The genetic background undoubtedly influences chemical quality and line with high content of particularly micronutritients may be used in breeding program to improve nutritional value.

Keywords: *biofortification, carotinoids, maize, tocopherols.*

WHEAT PLANT STATURE AND EAR PRODUCTIVITY PARAMETERS VARIATION IN MULTI-ENVIRONMENT TRIAL

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Abstract

The human population has increased more than 200% during the 20th Century. UN projection is 10 billion people in 2055 demanding food. To meet the challenge, contemporary agriculture is to using all its resources to increase the food production. In order to investigate the way to enhance productivity level of marginally suitable land multi-environment trials has been established. A portion of these multiyear trials is analyzed in this article. Six bread divergent wheat varieties were grown 4 environment trials (2 years x 2 localities). The first year was extremely humid and rainy, and the second could be considered as an average year. Two localities differed in soul type. One locality was characterized by chernozem, and the other by solonetz soil. The paper presents the results of the plant height (cm), the spike length (cm), the mass of the spike (g), the grain mass per spike (g), the number of grains per spike and the spike index of 6 bread wheat varieties (Renesansa, NSR5, Pesma, Banatka, Jugoslavia and Bankut 1205). The results are presented via the GGE biplot in order to analyze the common genotype effect and the genotype by environment interaction (G + GE). GGE biplotes were used to distinguish genotypes with the highest GGE effect. Graphs are constructed based on PCA results. For all tested traits, the first principal component (PC1) has explained more than 50% of the total variation of the trial. The genotype by environment interactions (GEI) for each examined variety varied depending on variety and trait.

Keywords: *wheat, MET, GEI, GGE, yield components.*

GENETIC POTENTIAL AND YIELD COMPONENTS OF WINTER BARLEY

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Abstract

The experiment was established in the experimental field at the experimental field of Secondary Agricultural-chemical school "Dr Djordje Radic" in Kraljevo (Serbia) during the 2009/10 and 2010/11 growing seasons. The objective of this study was to investigate the influence of genotype and environment on the yield of winter barley cultivars (Rekord, Grand and NS 565). The following characteristics were analysed: grain yield, 1000 grain weight and test weight. The highest yield of all tested varieties of winter barley was achieved by NS 565 (3.567 t/ha) and Grand (3.473 t/ha), while the lowest yield was obtained by Rekord cultivar (3.092 t/ha). The highest two-year average of 1000 grain weight (41.64 g) were obtained by NS 565 cultivar. The largest two-year average value of test weight was found in the cultivar NS 565 (66.59 kg/hl). The average value of all genotypes was 66.16 kg/hl. Highly significant influence of the year on grain yields, 1000 grain weight and test weight was established at investigated winter barley cultivars by variance analysis, while genotype influence on grain yields were significant. Highly significant differences in grain yield at investigated barley cultivars were found relative to the interaction environmental factors and cultivars. Correlation coefficients showed large variations, which results from the interaction between the properties within each genotype and genotype interactions with environmental factors.

Key words: *cultivar, grain yield, winter barley*

THE STABILITY PROPERTIES OF TRITICALE PRODUCTION ON ACID SOIL

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Abstract

The experiment was established at the Small Grains Research Centre in Kragujevac, three varieties of triticale were investigated in this paper. The highest two-year average of grain yield (4.499 t/ha) and 1000-kernel weight (49.80 g) were obtained by Bingo cultivar. The highest two-year average of test weight (71.23 kg/hl) were obtained by Trijumf variety. The highest two-year average value of protein content was found in the variety Favorit (11.170%). Highly significant influence of the year on grain yield, 1000-kernel weight, test weight and protein content was established for investigated winter triticale cultivars by variance analysis. The influence of the cultivar on grain yield, 1000-kernel weight, test weight and protein content was not statistically significant. Triticale yield in 2010/11 and 2011/12 years was positively correlated with test weight and 1000-grain weight, but negatively correlated with protein content.

Key words: *grain yield, protein, test weight, triticale.*

EFFECT OF LIGHT CONDITIONS ON THE TERRESTRIAL MICROALGAE GROWTH RATE DYNAMICS

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Abstract

The possibilities of using algae biomass are numerous, from production bioactive compounds for medical and pharmaceutical industries to their use in agriculture as a biopesticides, biostimulants and biofertilizers. Algal cell growth is significantly affected by light, temperature, aeration, medium and carbon source but also habitat area. The aim of this research was to investigate the effects of different light conditions on algal growth stimulation. Natural day/night (D/N) cycle and continuous artificial lighting (CAL) below 950 lux were tested. Microalgal strains were isolated from two acid soils in Vojvodina, dystric cambisol (pH 4.31) and vertisol (pH 5.50) using BG11 medium. Six selected monoalgal cultures of the genus *Chlorella* (strains C63, C71 and C72), *Dictyosphaerium* (strains D36 and D37), and *Tribonema* (strain T50) were chosen for testing. The growth curve was observed for 24 days. Determination of growth kinetics was monitored spectrophotometrically by measuring the optical density (OD) on the spectrophotometer (Unicam SP600 Series 2, Cambridge England) on 750 nm. The results showed that there was no significant difference in terms of growth rate. Algal strain T50 showed significantly better growing dynamics under CAL relative to D/N cycle. On the other side, under CAL, two *Chlorella* strains (C63 and C71) showed faster initial growth and entered the exponential phase sooner, compared to other examined strains. Faster initial growth indicated better physiological adaptation of the cell metabolism to growth in induction (lag) phase. Grown in their natural environment, photoautotrophic microorganisms showed stable increase in the levels of enzymes and metabolites involved in cell division and carbon fixation.

Keywords: *Terrestrial microalgae, light conditions, spectrophotometry, optical density.*

EFFECTS OF LOW TEMPERATURES ON CABERNET SAUVIGNON AND SAUVIGNONE BLANC CV. RESISTANCE GROWN IN CONDITIONS OF OPLENAC

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Abstract

In vineyard of King Peter I Karadjordjevic-Royal Winery at Oplenac-Topola municipality and laboratories of Faculty of Agriculture at the University of Belgrade, varieties Cabernet sauvignone and Sauvignone blanc were examined on winter degree bud freezing. The aim of research was to test Cabernet Sauvignon and Sauvignon blanc cultivars during two years on degree resistance to low negative temperatures. Test carried out with one-year-old shoots in chamber, in three terms on december 15th, january 15th and february 15th at three different temperatures -15, -25 and -20°C. Conditions in chamber were identical to the external conditions. The highest resistance was shown for both varieties in the second testing term. Sauvignone blanc had the highest percent of partially frozen buds in first term, while for Cabernet sauvignone the highest percent of partially frozen buds was recorded in the third term. Statistical significance founded for percent of partially frozen buds were it was significant influence of interaction of variety*treatment.

Key words: *resistance, buds, freezing, Cabernet Sauvignon, Sauvignone blanc.*

EFFECTS OF SEVERAL TREATMENTS IN VEGETATIVE PROPAGATION OF CULTIVARS OF *LEUCOSPERMUM*, AND THE HISTOLOGICAL STUDY

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Abstract

The Proteaceae family includes the genera *Banksia, Grevillea, Leucadendron, Leucospermum, Protea* and *Telopea*, in which inflorescences play an important role in the cut flower trade worldwide. Currently, in the Canary Islands, the crops of *Leucadendron, Leucospermum* and *Protea*, represent an import factor in the export trade of cut flowers and green for Spain and Europe. The future of these crops in our islands lies in obtaining high quality plants quickly, in an adequate quantity, resorting to the process of propagation through cuttings. This study aimed, primarily, to determine the effect of hydrogen peroxide (H_2O_2) and indole butyric acid (IBA - 2000 and 4000 ppm), in treatments alone or in combination, on the propagation via cuttings of the cultivars of *Leucospermum* `High Gold´ and *L.* 'Spider'. Their responses were examined at histological level (light microscopy study). The different treatments, alone or combined, produced transplantable cuttings of both cultivars. The best results were obtained in *L.* High Gold with the combination of H_2O_2 + IBA-4000 ppm, and in *L.* 'Spider' through the use of IBA-2000 ppm. The application of the different treatments generated a series of anatomical changes in the stem-cuttings of both cultivars, showing greater meristematic activity in the cambial area and cortex, with elongation of the vascular bundles. There was also an increase in sclerenchymal tissue and stone cells, whose presence could not be considered as a barrier to root production. In addition, phenolic substances became more abundant in several different tissues.

Keywords: *Leucospermum, rooting, growth regulators, anatomic features.*

DIRECT ORGANOGENESIS OF *STEVIA REBAUDIANA IN VITRO* USING NODAL EXPLANTS

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Abstract

Stevia rebaudiana Bertoni is a medicinal herb belonging to the family of Asteraceae. It is a natural sweetener plant, which is estimated to be 300 times sweeter than cane sugar. In this study, reliable protocol was developed for direct organogenesis of *S. rebaudiana* using *in vitro* derived nodal explants. Seeds were collected from mother plants and they were surface sterilized. To optimize the surface sterilization procedure, dark color (fertile seeds) seeds were surface sterilized using different concentrations and in different exposure time of carbendazim and sodium hypochlorite (Clorox). Out of different combinations 0.2% carbendazim for 5 minutes, 10% sodium hypochlorite for 10 minutes and 70% ethanol each followed by two successive washings in sterile distilled water was found to be the best for surface sterilization. Two sets of seeds (fresh, stored) were cultured on MS basal medium supplemented with different concentrations of GA3 for seed germination. According to the results seed viability was lost with time and it affected seed germination. Seed germination was not affected by GA3, but seedling height was affected by it. Seeds germinated on MS medium supplemented with 3.0 mg/L GA3 showed the highest seedling height after 10 days. MS basal medium supplemented with different concentrations of BAP and Kin were tested for shoot bud and multiple shoot induction. Out of different media Ms basal medium supplemented with 2.0 mg/L BAP was found to be the best medium for shoot bud and multiple shoot induction within 60 days.

Keywords: *Stevia rebaudiana, surface sterilization, seed germination, shoot induction, direct organogenesis.*

ORIENTATION AND BEHAVIORAL RESPONSES OF APANTELES GLOMERATUS (HYMENOPTERA: BRACONIDAE) TO HOST PLANTS (ALMOND) AND HOST LARVAL BODY (APORIA CRATAEGI) EXTRACTS

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Abstract

The foraging activity of a parasitoid is highly influenced by the chemical cues released from the host plants and their potential hosts in a cropping system. In this present study using *Apanteles glomeratus* (L) as a model, we examined the capacity of naive *Apanteles glomeratus* (L) virgin and gravid females to learn and orient towards the odour of almond host plant, and its host larval body extracts of *Aporia crataegi* (L.).We found the gravid females oriented to mix damaged host plant with larval body extract. Then, they oriented to mix undamaged host plant with larval body extract as seem as larval body extract, after that they oriented towards damaged host plant, at last, they oriented towards undamaged host plant. But the virgin females oriented to undamaged and damaged host plant extract in same percentage. Also,they didnot prefer larval body extract as the other extracts.

Key words: *Apanteles glomeratus, Aporia crataegi, orientation, host plant and host larval body extracts, foraging ability, Y-tube olfactometer.*

ASSESSMENT OF GENETIC SIMILARITY AMONG THE PROGENIES OF THREE APPLE SEEDLING ROOTSTOCKS BY USING SSR MARKERS

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Abstract

This investigation was done at the General Commission for Scientific Agriculture Research (GCSAR) – Pome and Grapevine Division in Sweida province (Syrian Arab Republic) during 2012 and 2013, in order to study the genetic similarity among 10 seedlings and the mother plant of three different seedling rootstock genotypes (A, B and C), which have been included in the breeding programme for apple rootstocks, by using 17 SSR markers. The results revealed the ability of 16 primer pairs to amplify alleles in all studied progenies and mother plants. The highest polymorphism was observed in progeny raised from the genotype B (87.1 %), followed by the progenies of genotypes A and C (80% and 78.1%, respectively). Genetic similarity of both genotypes A and C with their progenies were more than 0.5 in each of them, while in genotype B with its progeny was more than 0.5 in 8 seedlings, whereas genetic similarity among the progeny of each genotype (A, B and C) were 0.53, 0.53 and 0.58, respectively. Cluster analysis divided the progeny of genotype A into two groups and progenies of B and C genotypes into three groups. The expected heterozygosity (He) was 0.39 in each studied genotype, and the observed heterozygosity (Ho) was 0.27, 0.3 and 0.5 in A, B and C, respectively. On the other hand, the results showed high efficiency of some markers to detect genetic differences within genotypes, such as CH01H02, Hi04g05, O2b1 and CH01f02. These results showed the degree of homogeneity among the seedlings produced by each genotype, and the importance of using SSR markers in apple rootstock breeding programme.

Keywords: *Malus, rootstock, genotyping, microsatellites.*

ACTIVITY STUDY OF THE FRUIT SCALE INSECT *PARTHENOLECANIUM CORNI* (BOUCHÉ, 1844) ON ALMOND TREES AND ITS NATURAL ENEMIES IN JABAL AL- SHEIKH, SYRIA

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Abstract

Activity study of the fruit scale insect *Parthenolecanium corni* (Bouché, 1844) (Homoptera: coccidae) was conducted in five lacations in Jabal Al- Sheikh Syria on almond trees from 2015 to 2016. Results indicated that the diapause stage of *P. corni* was the second instar nymph on the woody parts of trees. Activity started at the beginning of April. It had two generations in the year. Results showed that an average of fecundity was 1805.147±129.3 and 1892.677±136.34 eggs/female in 2015 and 2016 respectively, The sex ratio was 1: 1.12 (female:male), and 1: 1.6 (female:male) in 2015 and 2016 respectively. Also results showed that there were five species of parasitoid was collected from the level. Three of those parasitoids were considered to be primary parasitoids: *Aphytisaonidiae, Metaphycushageni* and *Microterysflavus*. Two of them were considered to be secondary parasitoids: *Necremnus* sp and *Pachyneuron concolor*.

Keywords: *Parthenolecanium corni*, sex ratio, fecundity, *Metaphycushageni, Aphytisaonidiae, Microterysflavus, Necremnus sp, Pachyneuron concolor.*

EFFECTIVENESS OF SOME FURNACE ASH AGAINST COWPEA SEED BEETLE *CALLOSOBRUCHUS MACULATUS* (F.) UNDER LABORATORY CONDITIONS

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Abstract

Ash toxicity of pruning residue from three plant species: apple, grape and olive, was tested against adults of Cowpea seed beetle *Callosobruchus maculatus* (F.) (Coleoptera, Bruchidae) using the following concentrations: (5, 10, 20, 40 and 80 g/Kg). The study was carried out in incubator at fixed temperature and humidity at Biotechnology Research Center, Al-Baath University (Syria). Readings were taken after (24, 48 and 72 h) of treatment, and corrected mortality rates were calculated, and values of LC_{50}, LC_{90}, LT_{50} and LT_{90} were evaluated. Results showed that the mean of corrected mortality rate was (57.07, 75.82, 79.34, 82.32 and 84.25%) at concentrations of (5, 10, 20, 40 and 80 g/Kg), respectively, with significant deference ($P \geq 0.01$), and (40.58, 89.39 and 79.31%) at (24, 48 and 72 h), respectively, with significant deference ($P \geq 0.01$). The higher mean of corrected mortality rate was 77.86% for apple ash, and the lower was 73.22% for grape ash. The values of LC_{50} and LC_{90} were (1.251 and 11.520 g/Kg) for apple ash, (2.154 and 12.490 g/Kg) for grape ash and (2.631 and 1.99118.492 g/Kg) for olive ash after 48h. The values of LT_{50} and LT_{90} were (22.941 and 35.262 h) for apple ash, (24.377 and 37.306 h) for grape ash and (26.305 and 40.242 h) for olive ash hours at 40×10^{-3} w/w. As a result, apple ash showed the higher toxicity and the minimum mortality time.

Keywords: *Ash Toxicity, Pruning Residue, Cowpea seed beetle, Callosobruchus maculatus.*

STUDY OF BIOLOGICAL CHARACTERISTICS TO PARASITOIDE *COTESIA GLOMERATA* ON THREE OF LABORATORY HOSTS

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Abstract

The study was carriedout in the Biological Control Studies and Researcher Center during 2013-2016. It aimed to determine the biological characteristics, sex ratio and natural factors of death of fparasitoides *Cotesia glomerata* whenrearing on three of laboratory hosts: *Aporiacrataegi, Galleria mellonella, Pieris brassicae.*The highest percentage of parasitism was in larvae *P. brassicae* which reached to 88% from the total number of larvae used experimentally and the *P. brassicae* larvae were the best host to put much of the parasitoide eggs, and the number of parasitoides larvae which emerged from each larva *P. brassicae* was 24.7 ± 2.54 larvae. But accordance with Brodeur equation was parasitism percentage to closer between *A. crataegi* and *P. brassicae*, but the factors natural death of parasitoides were different. The failure to get out the larvae parasitoides from larvae host was the highest on the larvae of *G. mellonella*, which reached 21.8%, andthe failure to wrap cocoon and die pupa inside the cocoon were closer between the three insect species. In contrast to laboratory experiment, the sex ratio in the field was higher for females more than males, on the three species, the period of eggs to hatch and larval stage depend on host diapauses, which was the longest on *A.crataegi* larval.

Key words: *Biological characteristics, sex ratio, parasitism percentage, natural factors of death, Cotesiaglomerata, Galleria mellonella, pierisbrassicae, Aporiacrataegi*.

CONTROL OF *VARROA DESTRUCTOR* (ANDERSON AND TRUEMAN, 2000) BY PLANT EXTRACTS

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Abstract

This study was conducted in the apiary of a honeybee scientific research laboratory of the Faculty of Agriculture, the University of Damascus, using the Syrian honeybee colonies to determine the efficiency of different natural plant substance extracts (all plant parts, some parts and seeds) for controlling *Varroa destructor*, and to determine the best concentrations and extraction methods. Bees were sprayed with a water solution of plant substance in 5% diluted sucrose solution, and plant substance concentration between 5-15%. The methods were simple for the beekeeper to apply during periodical apiary visits. The order of the relative efficacy mean for the plant extracts was, as follows: Milfoil (*Achillea millefolium* L.) 80%, Artemisia (*Artemisia herba alba*) 75%, Pennyroyal (*Mentha pulegium* L.) 75%, Cypress (*Cupressus sempervirens Horizentalis* L.) 75%, Cinnamon (*Cinnamomum zeylanicum* Ness.) 66%, (*Citrus aurantium* L.) 66%, Inula (*Dittrichia viscosa* L.) 65%, Gralic (*Allium sativum* L.) 64%, Thyme (*Thymus vulgaris*) 64%, Redgum (*Eucalyptus camaldulensis* Dehnh.) 58%, Pomegranate (*Punica granatum* L.) 53% and (*Olea europaea* L.) 45%. The water solution of the tested plant substances showed good efficacy in limiting Varroa population development in the colonies. The decrease in the bee population and the brood in the hives treated with the natural materials was in normal limits, indicating the effectiveness of such materials in decreasing the Varroa population with no harm to the bee colonies. However, in both treated (bees sprayed only with a 5%sucrose solution) and untreated control, bees and brood reduction was serious due to a Varroa infection. The efficacy of the treated control was between 17-44%. The T-test showed significant differences: 0.01 and 0.05 between the treatments and the treated control in most applications. The goal of the research was to avoid chemical pesticides and their residues in honey, wax and propolis. Using local natural plant extracts would reduce negative consequences on the health of bees and people, and also reduce the cost of having a colony.

Keywords: *Varroa destructor (V. jacobsoni Oud.), Apis mellifera syriaca, water plant extracts, natural extracts.*

SEARCHING AND RESPONDING POTENTIAL OF PARASITOID *COTESIA GLOMERATA* (L) (HYMENOPTERA:BRACONIDAE) TO DIFFERENT INSECT HOSTS

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Abstract

The biological control of insects is the most safe and important way of control.It depends on mass rearing of parasitoid, but the ability of parasitoid become weaker after several generations of laboratory rearing. The aim of the present study was to determine the potential of *Cotesia glomerata* (L) in searching and responding when rearing on alternative hosts in laboratory *Aporiacrataegi* (L), *Pieris brassicae* (L) and *Galleria mellonella* (L). The fertilized females showed a preference for host larvae that reared on then for the larvae *Pieris brassicae* (L), so the olfactory memory in *C. glomerata* (L) gets in larvae stage and continue until the emergence of adults and lay their eggs in their hosts which reared in more efficiently.

Keywords:*Cotesia glomerata (L), Aporia crataegi (L),Pieris brassicae (L), Galleria mellonella (L), searching and responding potential.*

STUDY OF ABILITY OF *COTESIA GLOMERATA* (L) TO DISTINGUISH BETWEEN THE STAGES OF DIFFERENT *APORIA CRATAEGI* (L) LARVAE AND ALSO TO DISTINGUISH BETWEEN ALMOND PLANTS INFECTED BY THEM

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Abstract

Cotesia glomerata, the white butterfly parasite, is a small parasitic wasp species belonging to family Braconidae. This small braconid wasp is black, with two pairs of wings. It can parasitize a wide range of Pieris butterfly species as host. The study was done during 2013-2016, in the Biological Control Studies and Researcher Center. It aimed to determine the ability of *Cotesia glomerata* (L) to distinguish between the stages of different *Aporia crataegi* (L) larvae and also to distinguish between almond plants infected by a different stage of larval *A. crataegi* (L). The study proved that the parasitoide *C.glomerata* (L) could not distinguish between the almond plants infected by a different stage of larval, but it's attractive to infected plant, also the parasitoides can distinguish between the stages of different larvae.

Key words: *Cotesia glomerata (L), Aporia crataegi (L), Y-tube olfactometer, response.*

EFFECT OF THE IN-VITRO APPLICATION OF SOME BOTANICAL OILS ON LARVAE OF THE GREATER WAX MOTH (*GALLERIA MELLONELLA* L.)

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Abstract

The greater wax moth (*Galleria mellonella* L.) is the most damaging pest of honey bee wax, and in particular of stored wax combs. This study was carried out to determine the efficacy of three botanical oils: black cumin oil (*Nigella sativa* L.), bitter almond oil (*Prunusdulcis var. amara* Mill) and nettle oil (*Urtica dioica* L.) on the mortality of greater wax moth larvae in laboratory conditions (temperature 28±1º, A relative humidity of 60±5%). The second instar larvae of the wax moth were fed by an artificial diet containing different concentrations of the oils (10, 20, 40 and 80 g/kg). The number of dead larvae was recorded in all the treatments and control 5, 10 and 20 days after the treatment. The corrected mortality values, killing concentration values LC_{50}, and killing time LT_{50} were calculated for each oil type. The results showed a higher mortality rate of the larvae when increasing the concentration of oil and reading time. The mortality rate caused by black cumin oil reached 95.88% after 20 days of treatment at 80 g/kg concentration, followed by 79.55% and 59.14% mortality resulted from the application of bitter almond oil and nettle oil, respectively, at the same time and within in the same concentration, with a significant difference among the treatments at the probability level of 0.01. After 20 days of treatment, the LC_{50} values for the larvae were 15.068, 22.576 and 58.468 g/kg for the treatment black cumin, bitter almond, and nettle oil, respectively. The LT_{50} value did not exceed 3.633 days for the treatment of black cumin oil at a concentration of 80 g/kg.

Key words: *Botanical Oils, Galleria mellonella L., Black Cumin Oil, Bitter Almond Oil, Nettle Oil.*

LANDRACES AND IMPROVED WHEAT GENOTYPES RESPONSE TO *RHIZOPHAGUS IRREGULARIS* INOCULATION UNDER CONTRASTING WATER IRRIGATION SALINITY

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Abstract

Arbuscular mycorrhizal fungi (AMF) are known to increase plant tolerance to salinity stress. Here we investigated the salinity tolerance of four wheat genotypes inoculated with the AMF *Rhizophagus irregularis* MUCL 41833. Different parameters were analyzed: chlorophyll fluorescence (Fv/Fm), leaf area (LA), relative water content (RWC), plant yield, soil and plant phosphorus content (P). Two landrace wheat genotypes (i.e. Agili Glaber and Bayadha) and two improved genotypes (i.e. Maaliand Razek) were compared under non-saline and saline water irrigation (0.3and12dSm^{-1}) with and without AMF inoculation. Under saline conditions, plant growth was higher in presence of AMF as compared to the controls, suggesting that AMF might help plant to resist stresses caused by salinity.Whereas, AMF-inoculated Agili Glabre, Bayadha and Razzek genotypes had very good response under saline conditions in term of grain yield plant^{-1}and number of grain plant^{-1}, no marked differences was noticed with the genotype Maali. The beneficial effect of mycorrhization was related with phosphorus nutrition and physiologicals responses, since our findings confirm that AMF could alter host response to salinity stress by improving P uptake, water status, Fv/Fm and LA in land races genotypes than improved ones. Our results opens the door to the application of AMF in durum wheat genotypes under field conditions.

Keywords: *Arbuscular mycorrhiza, durum wheat, salinity, landraces, improved genotypes.*

COLOR-BASED FILLED BOTTLE DETECTION SYSTEM USING LABVIEW

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Abstract

Computer vision application areas in the field of instrumentation are increasing in the agriculture industry. The vision-based measurement technique is a well-known technique with the lots of applications in the agriculture industry, which develops with the modern camera and hardware technology. Also, it is still developing with the computer hardware and computer vision software. Agriculture industry follows these developments strictly and applies them to the agricultural production and post-harvest technologies of agriculture. One of these post-harvest technologies is bottle filling level inspection of bottle filling machines. In the markets, there are a lot of agricultural products placed in glass bottles like wine, vinegar, olive oil, cold tea, milk, different kinds of fruit juices, etc. Because of this reason, low-cost glass bottle filling level detection systems is essential for post-harvest industrial machines of agriculture. In this study, the effectiveness of a bottle fills detection system, which works with awebcam, based color detection process by using LabVIEW software.

Keywords: *Bottle filling, Bottle Level inspection, Image processing, Virtual instruments, LabVIEW.*

A TRACTOR MOUNTED AUGER DRILL STRESS ANALYSIS BY USING AUTODESK INVENTOR NASTRAN IN CAD MODULE

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Abstract

Auger drillingis a digging method where a large helical drilling part gets out the soil from the earth. During the drilling process, the auger drill throws up the soil and the other material to the earth surface with the help of the shaft and its power source. Different types of auger drillers are available today. The auger drills used in agriculture are tractor mountable agrıcultural machinesmostly powered by an extendable shaft connected with a power take-off (PTO) or hydraulic system of the tractor. It uses the weight of the tractor for auger drilling to downward. It widely rotates using an extended shaft from the power take-off (PTO) of the tractor. The hydraulic cylinders also give a chance to drilling machine with up and down movement that throw the soil after digging to clean the hole. In this study, an auger drill was modeled and analyzed for agricultural works in Autodesk Inventor software with the help of Nastran in CAD Module.

Keywords: *Auger drill, Stress analysis, Nastran in CAD, Autodesk Inventor.*

DETERMINATION OF YIELD AND BIOFUEL POTENTIAL OF SOME EARLY SWEET SORGHUM (*SORGHUM BICOLOR VAR. SACCHARATUM* (L.) MOHLENBR.) GENOTYPES

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Abstract

Sweet sorghum is used for the production of biofuels. The stalk and seed are used directly for biomass energy and lignocellulosic biofuel production. Sweet sorghum biomass is burned for getting energy. And also sweet sorghum biomass is burned by fast pyrolysis to produce syngas, bio-oil, and charcoal. One of the main products of sweet sorghum is its sweet juice which is obtained from stems of plant. The stalks are pressed and juice obtained. Sweet sorghum juice contains 15-20% sugar. High sugar content of juice allows to fermentation to make ethanol. The juice is fermented and distilled for the production of ethanol and biofuels. The residual fiber (bagasse) from sweet sorghum can be used to feed livestock or pelletized to burn for heat in buildings, produce electricity, paper, and cattle fodder. The objectives of the study were to determine yield and biofuel potential of some early sweet sorghum genotypes. This research was carried out during the second crop growing season of 2016 in Sanliurfa, Turkey. The experiment was designed as complete randomized blocks design with four replicates, with 12 early sweet sorghum genotypes. In the study, flowering duration, plant height, stem yield, plant juice yield, water soluble dry matter ratio and ethanol yield properties were investigated. Significant differences were found between the genotypes for tested characteristics ($P \leq 0.01$). Flowering duration values ranged from 57.5 to 72.5 day, plant height from 252.25 to 340.75 cm, stem yield from 7440 to 13950 kg da^{-1}, plant juice yield from 3525 to 6225 L da^{-1}, water soluble dry matter ratio (brix) from %13.50 to %18.25 and ethanol yield from 214.3 to 464.5 L da^{-1}. It was determined that UNLY-hybrid-4, Blue Ribben, Rex and Colman sweet sorghum cultivars gave higher values than others in terms of stem yield, plant juice yield, water soluble dry matter ratio and ethanol yield.

Keywords: *Sweet sorghum, stem yield, plant juice yield, brix, ethanol.*

SOME PHYSICOCHEMICAL PROPERTIES OF HAZELNUT GROWN SOILS IN BLACK SEA REGION OF TURKEY

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Abstract

In this study, some physicochemical properties of hazelnut grown soils in Black Sea Region of Turkey was determined. A total number of 32 surface soil samples (0-20 cm) were taken from Hazelnut orchards located in Ordu and Giresun Provinces of Turkey. According to the soil test results, 28% of the samples were moderately coarse textured (SiL), 56% was moderately fine textured (CL, SiCL) and 15.6% was fine textured (C) soils. The most of the soil samples (75%) had medium (37.5% between 4.5 and 5.5) and slightly acid (37.5% between 5.5 and 6.5) in soil reaction (pH). According to the electrical conductivity values, most of the samples were nonsaline (41% less than 0.15 dS/m) and slightly saline (57% between 0.15 and 0.35 dS/m). Soil organic matter (OM) content varied between 2.71% and 8.30% with a mean of 5.54%. OM content in 84% of the samples were found to be high. Generally exchangeable Ca, Mg and K contents were determined as highin more than 70% of the soil samples. Mean exchangeable cation contents in the soil samples were 17.74 cmol/kg for Ca, 6.24 cmol/kg for Mg, 1.48 cmol/kg for K and 0.67 cmol/kg for Na. It can be suggested that lime requirement should be determined and fertilizers having alkaline characteristic should be used in acidic soils of the hazelnut orchards.

Keywords: *Hazelnut, soil organic matter, soil reaction, exchangeable cations*.

DETERMINATION OF POLLEN GERMINATION RATES AND POLLEN QUANTITIES OF SOME HYBRID WALNUT GENOTYPES

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Abstract

The aim of this study is to determine the rate of pollen germination and pollen production of 29 hybrid walnut genotypes grown in Kahramanmaraş (Turkey) ecological conditions. The pollen grains of 29 different hybrid walnut genotypes were tested *in vitro* to determine their germination percentage and amount of pollen production. For this aim, the germination percentage of the pollens was examined by using the agar in the petri and hanging drop methods. Pollen production amount of the genotypes was determined with the hemacytometric method. Average pollen germination rate values were varied range from 22.15% to 54.65%. The highest germination rate was obtained by the agar in the petri method in 1% agar+10% sucrose (54.65%). In 15% sucrose concentration in the hanging drop method, which is the best medium for all 29 hybrid walnut genotypes, pollen germination rate was 51.84%. The amount of pollen in a flower and an anther is very high in all genotypes. The consequence indicates that different treatments had a significant effect on the germination percentage. As a result of the findings obtained from this study, genotypes can be used as a pollinator.

Keywords: *Hybrid walnut genotype, pollen, germination, production.*

DETECTION OF THE SITUATION OF VIRUS DISEASES CAUSING LEAF CURLING AND DEFORMATION ON CITRUS BY SEROLOGICAL AND MOLECULAR TECHNIQUS IN EAST MEDITERRANEAN REGION

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Abstract

Citrus grown in the world and Turkey is one of the important fruit group in terms of domestic consumption and foreign trade. Virus and virus-like agents, an important group of diseases, restricting the production on citrus has significant importance. This research has been performed to search existence of CTLV, CLRV, CCDV, CYVCV, OLV-1, CVV, CPsV causing symptoms of leaf curling, deformation and vein clearing on citrus produced in Adana and Mersin provinces. In the surveys, all samples collected have been tested by ELISA against to virus which exists of antisera, and Polymerase chain reaction (PCR) against to virus which exists of specific primers. In the result of serological and molecular test, chlorotic dwarf virus (CCDV) and Citrus yellow vein clearing virus (CYVCV) have been detected on samples. The samples which have been infected with the viruses have been indexed by grafting to indicator plants and symptom development has been observed. After PCR test, DNA sequences have been obtained. In the result of Phylogenetic analysis depend on DNA sequences, CYVCV and CCDV identified in Turkey have demonstrated the phylogenetic relationship with other isolates in the world.

Key words: *Citrus, CCDV, CYVCV, PCR, Phylogenetic.*

DETERMINATION OF YIELD AND FACTORS AFFECTING YIELD IN SOME SESAME GENOTYPES

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Abstract

This study was carried out to determine yield and the factors affecting yield of some sesame varieties and lines in the experimental field of Siirt University Faculty of Agriculture at the sesame growing seasons of 2016 and 2017 as second crops. In the experiment, ten different sesame genotypes were used as material, that consisting of three registered sesame varities (Arslanbey, Hatipoğlu, Boydak) and seven different lines. The study was designed with 3 replications according to randomized block trial design. According to the results obtained for two years study, the plant length is 104,13-152,87 cm, the first branch height is 2,67-11,87 cm, the number of plant branches is 1,87-10,33, the number of capsules per plant is 90, 93- 200,33 units, 1000 grain weights were found to be between 3,25 and 4,83 g and the hectare yield varied between 479,29-1579,88 kg. The highest grain yield was obtained from the Arslanbey variety with 1579.88 kg / ha in 2016 and from line-8 with 1502.41 kg in 2017. The lowest grain yield was obtained from line-7 with 479.29 kg in the first year and from line-3 with 68.69345 kg in the second. It has been determined that genotypes are significantly different from one another in terms of yield and other characteristics, and it turns out that these varieties show different responses.

Keywords: *Sesame, Genotype, Yield, Factors affecting yield.*

THE EFFECTS OF N AND P FERTILIZATION ON MIXTURE, CALCIUM, MAGNESIUM AND CRUDE PROTEIN RATES IN MIXED PRODUCTION (TRITICALE AND VECTH)

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Abstract

This study was conducted to determine the effects of Nitrogen and Phosphorus fertilizers on yield and yield components of intercropped common vetch and triticale in Şanlıurfa province (Turkey) in 2010 and 2012. The study was designed as split-plots where main plots were treated with different levels of phosphorous while split-plots (sub-plots) were treated with different levels of Nitrogen with three replications. Seed amount in the mixture of individual plants were determined as considering their sole crop seed amount which are 20 and 10 kg/da for triticale and common vetch, respectively. Pure Nitrogen and Phosphorous were applied at a rate of 0, 3, 6, 9 and 12 kg/da by using fertilizers in the forms of ammonium sulphate and triple super phosphate fertilizers. In the study, 22 different characteristics were investigated. Application of nitrogen and phosphorous fertilizers caused an increase in triticale and vetch crude protein ratios, P (%) ratios, K (%) ratios, Ca (%) ratios and vet Mg (%) ratios were statistically significant. The highest value for the ratio of crude protein to triticale was obtained from the plot of N9P3 at 16.16% for the average of two years, while the lowest value for crude protein was taken from the N0P0 parcel with 10.84%. In the vetch plant, the highest crude protein ratio was obtained from the N9P3 parcels with 27.26%, while the lowest rate was obtained from the N0P0 parcels with 16.55%. The highest average triticale K ratio was obtained from parcels of N6P12 with 1.24%, i.e., 6 kg/da nitrogen and 12 kg/da phosphorus fertilized plots. The ratio of Ca to triticale ranged from 0.07 to 0.14% in the average of two years and the highest triticale Ca value was taken from the N3P6 plot. The highest average triticale to Mg ratio value was obtained from the N3P0 and N12P0 parcels with 0.14%. The highest vetch ratio values were obtained from the N3P12 and N12P6 plots, ie, at 12 and 6 kg/da phosphorus fertilization with 3 and 12 kg/da nitrogen. Among the characteristics examined, the lowest vetch Ca (%) value was taken from the N6P9 parcel, whereas the highest mean vet Ca ratio (%) value was; 3.75 with N0P3, that is, 3 kg / da phosphorus fertilizer. The highest percentage of vaginal Mg (%) was obtained from N3P12 plots, ie 3 kg / da nitrogen and 12 kg / da phosphorus fertilization. According to the results of the research, the most suitable fertilizer combination is 9 kg / ha, provided that at least 10 kg / da of phosphorus is found in the soil, in order to obtain the highest yield in mixed cultivation system to be made with 60% Özveren vetch and 40% Tacettinbey triticale varieties in Şanlıurfa province conditions, nitrogen (N) and 6 kg/da phosphorus (P), respectively.

Key words: *Common vetch, Triticale, Nitrogen, Phosphor, Fertilizing, Yield component.*

THE USE OF MOLECULAR MARKERS INVESTIGATION OF THE EFFECTS OF DROUGHT STRESS ON THE ANTIOXIDANT DEFENSE SYSTEM IN SOME WHEAT GENOTYPES

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Abstract

Plants are exposed to abiotic stress conditions such as drought, salinity and high temperature, which adversely affect the growth of plant causing physiological and metabolic changes in the plant. In abiotic stress factors, drought is a complex feature controlled by a large number of genes. Wheat is one of the most important crops in the world and its yields are falling down because of the drought. For this regard, the antioxidant defense system response to drought stress is very important. For this reason, effects of drought stress should be investigated both using molecular markers and biochemical characterization tests in wheat genotypes. Microsatellite markers, also known as simple sequence repeats (SSR), are widely used in genetic characterization and genomic research in wheat because of their chromosome specificity, multiallelic nature, high polymorphism rate and distribution throughout the wheat genome. The aim of this work was characterization of some wheat genotypes in respect to tolerance to drought which widely grown in Turkey. In this study, 10 wheat varieties were grown for forty days and then exposed to drought stress for ten days. We scanned some wheat genotypes by SSR markers (Xwmc 89, Xwmc 118, Xwmc 304, Xgwm 337) related drought tolerance. This study is important to enable physiological and biochemical changes under drought stress to be compared with the results of molecular scans and also results of this study will be useful preliminary data for breeding studies about drought in wheat.

Keywords: *Abiotic stress, drought, molecular markers, wheat.*

Acknoledgement

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FRUIT SET, YIELD AND SOME QUALITY TRAITS OF DIFFERENT FOREIGN ALMOND CULTIVARS GROWN SANLIURFA PROVINCE

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Abstract

This study was conducted on the 4th and 5th leaf old Ferragnes, Ferraduel, Lauranne, Bertina and Felisia cultivars which are growing at the area of private sector at Bozova Province in Sanliurfa. In the experiment 9 fruiting trees were used as plant materials. Fruit samples were taken during harvesting time of the trees. Fruit set, yield and some quality traits were analyzed. According to two years results the highest (29,23 %) fruit set was determined Ferragnes cultivar while the lowest (11.57 %) was Bertina. According to yield per tree Ferragnes cultivar is the best average of two years. Pomological analyzes were done such as weight and dimensions of fruit and kernels. The obtained results show that the biggest fruit was Bertina cultivar. So the kernel and dimensions of fruit and kernel was higher than the others.

Keywords: *Prunus amygdalus, Almond, fruit set, yield, quality.*

RAINWATER HARVESTING PROPOSAL FOR SOIL AND WATER CONSERVATION IN PASTURE LAND IN SOUTEAST OF TURKEY

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Abstract

Generally soil erosion occurs less in plant-covered areas than in bare agricultural areas in our country. Pasture areas erosion hazards areas covered with 15-20% of the plant and average plant height is less than 7.5cm. Precipitation is one of the most important cause's soil and water erosion. Short-term, high-intensity rainfall has causes flooding and sediment losses in bare soils. It is necessary to store winter rainfall in soil depths with average annual rainfall is 400 kg/m^2, by rainwater harvesting techniques and for use it during the arid summer season in arid region. Contour ridges and stone terraces systems can be planted with bushes such as hawthorn, sumac, menengic and spindle in the form of bushes into the contours opened by the rainwater harvest technique in pasture areas. Thus, our villagers can benefit from the fruit of these trees as well as conserving soil and water. In more inclined areas, a water spreader technique can be applied to protect floods and landslides from water erosion. It distributes the high intensity rainwater from the high mountains, which can cause gully erosion, from mountain with water spreading systems. Region animal husbandry is also supported with this method. Water harvesting techniques can be introduced to our farmers by trainings and can be explained in their arid regions. In this study, some methods of water harvesting can be easily applied is stated that in because of their arid climate and geographical location pasture areas in the Southeastern Anatolia Region. These areas covered with plants would benefit by supplying the green grass and water needed for livestock as well as preserving soil and water thanks to water harvesting techniques. Water harvesting methods are suggested to our farmers as an economical and useful technique that they can be easily applied with their family members.

Key Words: *Soil and water erosion, pasture, rainwater harvesting.*

ISOLATION AND IDENTIFICATION OF SOFT ROT DISEASE AGENT FROM CULTIVATED MUSHROOMS (*AGARICUS BISPORUS*) IN TURKEY

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Abstract

Agaricus bisporus is one of the more extensively cultivated mushrooms in the world. Cultivated mushroom production and consumption are rapidly developing in Turkey. Brown discolorations and soft rotting disease symptoms were recorded on the caps of cultivated *Agaricus bisporus* in Kadirli distinct of Osmaniye, Turkey. Twenty-three bacterial strains, including fluorescent bacteria, were isolated from diseased parts. The strains morphologically displayed the characteristics of the genus *Pseudomonas*. Gram reaction, cytochrome oxidase, arginine dihydrolase, ability to potatoes soft rot, levan production, hypersensitive reaction in tobacco and the identification of microbial species using proteomic approach, such as Matrix Assisted Laser Desorption Ionization-Time of Flight Mass Spectrometry (MALDI-TOF/MS) were used to identify possible causal disease agent. The mushroom bacterial strains and reference strain *Pseudomonas marginalis* (GSPB 2325, Göttingen Germany) showed the similar LOPAT profile which is characteristic for the *Pseudomonas marginalis.* It was also confirmed by pathogenicity tests and analyzing MALDI-TOF/MS between 1.781 and 2.094 score values. To our knowledge, this is the first report on soft rot disease caused by *Pseudomonas marginalis* on cultivated mushrooms in Turkey.

Keywords: *Soft rot disease, Pseudomonas marginalis, Agaricus bisporus, MALDI-TOF/MS, Mushroom*

DETERMINATION OF PREFERENCES OF KILIS CITY (TURKEY) COMMUNITY REGARDING ORNAMENTAL PLANTS

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Abstract

The use of ornamental plants is very widespread and visually significant in our cities which are especially important in terms of history and tourism in our country. In the Southeastern Anatolia region, the desired number of species diversity cannot be achieved even if it is suitable for growing ornamental plants due to climate and geographical structure. Despite the wishes of the people of the region for different plant species, it is observed that only certain ornamental plants are included in the applications made in the city. It has been determined that the people living in the province of Kilis, whose population is increasing due to the large number of immigrants, especially in the Syrian border, have a high demand for green areas and ornamental plants. Under these conditions, the population is expected to contribute to the morale and motivation of reaching such areas. In this study, the preferences of the users of Kilis province about ornamental plants were determined through visual forms. As a result of the study, it was determined that the people preferred more colorful, flowering and fruit-bearing species. In addition, they preferred species forming more canopies and remaining green.

Keywords: *Ornamental plants, preference, Kilis.*

INVESTIGATIONS ON STOMATA OF SOME OLIVE VARIETIES GROWING IN SANLIURFA PROVINCE IN TURKEY

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Abstract

This research estimated changes in the number of stoma and types found on different types of olive and olive plant leaves. It also investigated different types of olives adaptation to low moisture levels in the hot and dry region of Sanliurfa (Turkey) from a stoma density point of view. Different cultivars were examined and no significant statistical differences were found on the three types of leaves found in the region. Stoma numbers varied from region to region in the same cultivar on the leaf. The changes are random, and for every cultivar the result varied. Negatif statistical results were found between stoma sizes and numbers. On the same type of leaves differences were noticed between different cultivars after examination on the middle, upper and lower part of the stem. Leaves ranging in size and length were examined from different regions for different olive types. Leaves found on the south regions were larger and longer in size.

Keywords: *Olive, Stoma, Density, Stoma Size, North, South.*

PISTACHIO PRODUCTION IN THE WORLD AND SOME NEW PROBLEMS RELATED TO IRRIGATION IN TURKEY

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Abstract

Pistachio can be grown in only some part of the world due to special climatic requirements. The most important pistachio producer countries in the world are Iran, U.S.A., Turkey and Syria, respectively. Growing and processing techniques after harvest in Iran and U.S.A differ from those in other countries. Modern growing and processing techniques are performed in only U.S.A. In this presentation, the production values, growing problems and solutions, harvest and post-harvest processing techniques are compared that pistachio producer countries. In Turkey, growing of pistachio is intensified to the Southeast of Anatolia. After irrigation facilities start to be used in this area with GAP Project, it is expected to be important changes in new and old orchards. The farmers know the effect of water for pistachio trees. They are trying irrigation methods. An additional to this growing system, post harvest processing is start to be modernized during last decades.

Keywords: *Pistachio, production, yield, quality, irrigation.*

DETERMINATION OF THE EFFECTS OF LESS AND EXCESSIVE LEAF REMOVAL LEVELS ON CLUSTER CHARACTERISTICS IN "TRAKYA ILKEREN" GRAPE VARIETY

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Abstract

In Turkey, since the vine leaves stuffed is one of the traditional Turkish foods, its consumption is quite high. "Trakya Ilkeren" grape variety is early ripening and high quality dark red colored table grape which is also use for brined vine leaf. Leaf removal is made intensively for brine leaf production in Turkey. Also leaf removal is made for green pruning during the summer season in vineyards. This study was carried out at the research and application vineyard of Ondokuz Mayis University in 2017 growing season. The purpose of this study was to determine the effects on the cluster properties of less and excessive leaf removal according to no leaf removal in the "Trakya Ilkeren" variety. In the study no leaf removal, less and excessive leaf removal applications were carried out between May and June. Leaf removal application had significant positive effect on TSSC, titratable acidity, bunch width, berry width and height. In addition, less leaf removal had a positive effect on pH, berry weight, bunch weight and bunch height. Hue and Chroma values were found to be significantly higher in the control, b (-) and *L* values were found to be considerably higher in the less leaf removal. In the study, it was determined that less leaf removal application had a positive effect on cluster characteristics on "Trakya Ilkeren" grape variety.

Key words: *leaf removal, grape, brine leaf, cluster, berry.*

PERFORMANCE OF BARLEY LANDRACES FOR DIRECT SELECTION

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Abstract

The improvement of suitable barley varieties for the different ecologic zones has world-wide importance. There is therefore a need for research interventions to develop improved varieties with higher yield, better resistance to lodging, tolerance to cold and drought, a higher nutritional value, and to strengthen the barley pathology research programmes. Barley (*Hordeum vulgare* L.) landraces display a high degree of variability in morphological and developmental traits, in disease resistance, and in protein content. Representatives of 29 barley landraces from southeast Turkey were collected from farmers' fields, for a total of 800 accessions. The objectives of this study were to characterize these accessions over four years for morphological and agronomical traits to be used for future selection and breeding program. The observed variation between landraces was very large for all traits. In the first year of testing the accessions showed average grain yields ranging 197-2225 kg ha^{-1}. After three years of selection, promising accessions were tested at two different geographical regions by using two different irrigation methods. One line was identified which significantly out-yielded the local landrace in all of the testing years and had a higher average yield than the check genotypes. Our results confirm that these morphological and developmental traits are good descriptors for differentiating barley germplasm accessions.

Keywords: *Earliness, Genetic diversity, Hordeum vulgare, Selection, Turkish landrace.*

SEED SIZE INFLUENCE ON EMERGENCE AND YIELD OF DURUM WHEAT

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Abstract

Seed quality is important as much as yield and quality of used cultivar as a genetic factor. Seed quality associates germination percentage, seed size, and genetic and physical purity of seed. A two years study was conducted to determine the effect of seed size on seedling emergence, yield and quality of 'Ceylan 95' durum wheat. In the study, seeds were separated with different sieves and 4 different size groups were prepared. Seed sizes were smaller than 2.2 mm, 2.2-2.5 mm, 2.5-2.8 mm and bigger than 2.8 mm. The seed density of each group was 450 seeds m^{-2}. The trial was performed according to the completely randomized block design with three replications. Grain yield was increased with uniform large seeds in both years. The use of largest seeds resulted in a more competitive cropping system, improving grain yields by 15%. Germination and emergence rates were higher in bigger seeds. The 1000 kernel weight and test weight of smaller seeds were higher than those of bigger seeds because of poor emergence rate. The use of uniform large seeds increased seedling emergence and grain yield. Results demonstrated that Large-grained seeds showed higher germination and seedling emergence than small ones (with 2.2 mm diameter). Because of the low seedling emergence in small-grained seeds, plant numbers per unit area were low; thus, spike length, thousand kernel weight and test weight were higher. On the contrary, while the highest grain yield means were obtained from large-grained seeds (with 2.8 mm diameter), 2.2 mm seed size showed the lowest values. At the field conditions, commercial seeds >2.2 mm wide can be successfully used in wheat production.

Keywords: *Durum wheat, Seed size, Yield, Emergence.*

DETECTION OF ASCOCHYTA BLIGHT DISEASE IN *CICER* SPECIES USING PCR AMPLIFICATION METHODS

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Abstract

Ascochyta blight caused by *Ascochyta rabiei* (Pass.) Lab. [telemorph: *Didymella rabiei* (Kovachevski) v. Arx] is one of the greatest biotic stresses reducing yield in chickpea throughout the world. Frequently, it damages chickpea crop and causes significant yield losses (up to 100%) under suitable conditions. Ascochyta blight can affect negatively all above ground parts of both domesticated chickpea and its wild relatives. The best economical and practical methods to control Ascochyta blight are the use of healthy seed and host plant resistance. Current studies have been conducted for identifying resistance sources, transferring these genes into new chickpea lines and developing screening methods in testing breeding materials. Besides the visual screening methods, amplification of the ribosomal RNA genes of fungi permits the molecular characterization. The most common region used for these purposes is the internal transcribed spacer (ITS) region (ITS-1, 5.8S rDNA subunit, ITS-2) of rRNA genes. The ITS region is universal in nature and found in all eukaryotes. In addition, the high copy numbers of rRNA genes in the fungal genome enable a highly sensitive PCR amplification. Furthermore, a large number of ribosomal sequences are publicly available in databases, facilitating the validation and the reliability of the detection assays. In this study, *Cicer anatolicum* Alef. and *Cicer montbretii* Jaub. & Spach which are the perennial wild relatives of domesticated chickpea with characteristic ascochyta blight brown lesions on leaves, petioles, stems, and pods were collected. For detection of fungus ITS region, PCR amplification was carried out using primers ITS 5 and ITS 4. The obtained ITS bands were sequenced. The sequences confirmed the nucleotide identity of the fungus with the corresponding sequence in GenBank for *A. rabiei*. This quick technique could provide a useful approach for detection of *A. rabiei* in chickpea as an alternative to the visual disease assessment.

Key words: *Ascochyta blight, chickpea, GenBank, ITS*

DISTRIBUTION OF FRUIT QUALITY TRAITS IN APPLE BREEDING POPULATIONS DERIVED FROM SOME CROSSES

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Abstract

This study is aimed to determine parent performances on fruit quality in apple populations derived from some crosses. The first crosses were made in 2008 with eight hybridization combinations at Fruit Research Institute, Eğirdir, Isparta (Turkey). Jerseymac. Golden Delicious, Braeburn, Priscilla and William's Pride hybrids were selected from within the breeding population. Sensory evaluations were performed over 2 years for each fruited genotype. Unipolar hedonic scale of 1-9 (1: no liking, 9: very satisfied) and bipolar intensity scales of 0-9 (0: no, 9: many) were used. Harvested fruits were also evaluated for some phenotypic characteristics such as ground colour, over colour, fruit flesh colour, fruit shape, aperture of locules etc. Harvest time of genotypes changed from August to October. Most of Jerseymac offsprings were with similar shape and taste. Braeburn was the most efficient parent regarding fruit quality among the parents.

Keywords: *Variety development, sensory evaluation, Malus x domestica, consumer preference.*

EFFECT OF INFUSION AND DECOCTIONS ON ANTIOXIDANT ACTIVITY, TOTAL PHENOL, FLAVONOID CONTENT AND PHENOLIC COMPOUNDS OF OLIVE LEAVES

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Abstract

Total phenol, antioxidant activity and flavonoid contents of olive leave extract were determined as 12.13 mg GAE/g, 89.47 % and 32.65 mg CE/g catechin, respectively. While total phenol contents of olive leaves change between 0.89 and 8.81 mg GAE/g depending on infusion time, antioxidant activity values ranged from 8.21 to 28.11%. Flavonoid contents of infusion varied between 2.71 and 14.81 mg CE/g catechin. While total phenol contents of decoction are determined between 1.81 and 8.41 mg GAE/g, antioxidant activity values changed between 10.41 and 25.33%. Also, flavonoid contents of olive leave decoction ranged from 8.67 to 37.44 mgCE/g. The most abundant compounds in olive leaves were oleuropein, hydroxytyrosol, caffeic, the flavone-7-glucosides, luteolin, apigenin and verbascoside. While luteolin contents of infusion change between 0.09 and 0.91 µg/kg, this compound ranged from 0.14 to 0.89 µg/kg in decoction. While oleuropein content of infusion changed between 0.10 and 0.97 µg/kg, oleuropein contents of decoction samples varied between 0.13 and 0.87 µg/kg. In addition, rutin contents of decoction varied between 0.19 and 0.99 µg/kg. Also, caffeic acid contents of decoctions ranged from 0.09 to 0.83 µg/kg. Generally, phenolic compounds of decoction (except 10.min) were found higher than those of phenolic compounds of infusion.

Key words: *olive leaves, Ayvalık cv, antioxidant, phenol, flavonoid, phenolic compounds, infusion, decoction*

SAFFLOWER (*CARTHAMUS TINCTORIUS* L.), PRODUCTION IN DRYLAND AREAS AND ITS EXAMPLES IN TURKEY

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Abstract

It is believed that origin of safflower is in Eurasia, including Turkey and the neighboring countries. Cultivated safflower was first introduced into Turkey from Western Thrace in the 1930's by Turkish immigrants but production began slowly in the 1950's. Safflower is an oilseed crop well adapted to the semi-arid (Dryland) region of the world and of great importance to the Middle East. However, it can be a great potent oilseed crop for low-rainfall areas. Safflower was originally grown for the flowers that were used in making cloths coloring and food sector. Today this crop supplies oil, meal, birdseed, and foods and industrial product markets. In 2000's the total acreage grown was only 18 tons and last three years production of it increased and raised up to 70 000 tons in 2016 in Turkey. Main reason for this increase is need of edible oil marked and biodiesel program. Oilseed crops have always been an important segment and Turkey has to import oils and oilseeds by expending 5 billion USD.Nowadays,in Turkey, national production of edible oil is insufficient to meet the demand. Thus, increasing the area of oil crops utilizing fallow land is very important. It is clearly indicated that safflower could contribute significantly to meeting the large requirement of oilseed crops in Turkey. Safflower gives farmers cash income and may increase flexibility in dryland crop rotations.

Key words: *Safflower: Safflower, Production, Dryland areas, Turkey's sample.*

CAPSAICIN AND EFFECTS

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Abstract

Peppers are species belonging to the genus Capsicum of the Solanaceae family. All peppers are classified in Capsicum annuum, Capsicum frutescens, Capsicum baccatum, Capsicum pubescens and Capsicum chinense. Pepper is found in alkaloids called capsaicin and bitterness is the quantitative inheritance. It is determined by many genes and environmental factors. The degree of bitterness depends on the type of Capsicum and the pepper. This is influenced by different factors such as the developmental stage of the fruit. The ability of the pepper to synthesize and accumulate capsaquinoids is a dominant character and is controlled by locus C. The places where capsisinoids are synthesized and accumulated are the placenta of the fruit. Capsaicin (n-vanillyl-8-methyl-6-(e)-noneamide) is an alkaloid that is slightly soluble in water and is odorless and solid under normal conditions. According to ratio of this alkaloid, the bitterness of peppers is of special importance as a disinfectant in the digestive system as well as an appetizing property. It is good for rheumatism when drained from the outside and the water is bored. Capsaicin contains antioxidant properties that protect against cell oxidative damage. In particular, it increases the tolerance of pepper plants against biotic and abiotic stress factors. In vitro systems, capsaicin analogs, linoleic acid, can protect against free radical damage by preventing both autooxidation and oxidation due to iron or EDTA. The formation of free radicals induced by lipid peroxidation of capsantine and capsorubinin is known to inhibit the formation of superoxide and nitric oxide, and thus to exhibit an antioxidant effect. It is also stated that Capsaisonin can be used for agricultural purposes due to its allelopathic effect. It has also been reported that Capsaicin has been shown to have positive effects on many diseases, but has been implicated in various diseases in its excessive consumption. It is known that some of the bitter pepper varieties have a relationship between the content of the high content of pepper and the resistance to anthracnose and caries diseases. In this review, we aimed to provide information about the content, distribution,plant and human health of the Capsaicin, the substance of the bitter pepper, and the effects on the oxidative damage in the plants.

Key words: *pepper, Capsaicin, alkaloid, antioxidant, oxidative damage.*

EFFECT OF CALCIUM ON TOMATO PLANT GROWTH UNDER CHILL STRESS

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Abstract

The aim of this study was to determine whether applying different doses of calcium to chilling stress would increase the tolerance of tomato plants In the study, Adamset type F1 hybrid seedling was used. Plants were grown in peat + perlite medium by watering with Hoagland nutrient solution at a light intensity of 400 µmol m-2s-1, at 65% humidity, 20° C in a 16/8 hour light/dark photoperiod in controlled climate conditions. Doses of 200 ppm, 250 ppm, 300 ppm, 350 ppm and 400 ppm of Ca^{+2} were applied to the nutrient solution. When the plants reached 4-5 leaves, an incubation set was taken for 12 hours at 10° C (day) and 12 hours at 5° C (night). The plants were watered before the incubator was taken. After the plants had been under stress for 15 days, sampling was done. Total plant weight, root, stem and leaf weights, stem size and diameter and number of leaves were determined. In addition, 1-5 scales of plants affected by stress were examined. In the study, it was seen that there were differences between doses of Ca^{+2}. Against chilling stress, it was determined that the best plant growth was in plants where doses of 250 ppm and 300 ppm of Ca^{+2} applications were applied. In addition, morphologically, it was observed that the least damage was in these applications well as the lowest scale value obtained, while the most harmful effect was in plants with 400 ppm Ca^{+2}applied.

Key words: *Tomato, chilling stress, calcium, plant growth.*

THE EFFECT OF INDOLE ACETIC ACID ON ANTIOXIDANT ENZYMES ACTIVITY IN SUGAR BEAT UNDER DROUGHT STRESS

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Abstract

The purpose of this study was to determine the effect of treatment with indole acetic acid on the antioxidant enzyme activity of the sugar beet plant under drought stress. The experiment was conducted according to a design of random blocks in 36 pots in 3 replicates with 4 different doses of indole acetic acid (0.5, 10, 20 μM) and 3 different irrigation levels (33%, 66% and 100% of field capacity). After harvesting, the malondialdehyde (MDA) level, superoxide dismutase (SOD) activity, catalase (CAT) activity, ascorbate peroxidase (APX) activity and glutathione reductase (GR) activity were determined. According to the data obtained, IAA administration to sugar beet under drought stress did not positively affect antioxidant enzyme activity. The data yielded no definite evidence that the IAA used on sugar beet protectedthe plants against drought stress by increasing antioxidant enzyme activity. This situation indicates that it is necessary to conduct more detailed studies into various types of stress and different doses.

Key words: *Antioxidant Enzymes, Indole Acetic Acid, Drought, Sugar Beet.*

THE EFFECT OF INDOLE ACETIC ACID IN SUGAR BEAT UNDER DROUGHT STRESS

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Abstract

The aim of this study was to determine the effect of indole acetic acid applications on the vegetative development of the sugar beet plant under drought stress. The experiment was conducted with a random block design of 36 pots in 3 replicates, with 4 different doses (0, 5, 10, 20 μM) of indole acetic acid and 3 different irrigation levels (33%, 66% and 100% of field capacity). Stomatal conductivity and chlorophyll content were measured during the experiment. After harvest, leaf length, leaf width, proportional water content of leaves and membrane damage in leaf cells were determined. According to the findings obtained, IAA applications had a positive effect onthe vegetative characteristics of the plant, but water restriction had a negative effect. IAA application alleviated the negative effect on the vegetative parts. This situation indicates that it is necessary to conduct more detailed dose studieswith different types of stress.

Key words: *Chlorophyll, Drought, Stomata Conductivity, Sugar Beet.*

PERFORMANCE OF THE PLUM (*PRUNUS DIVARICATA*) GENOTYPE UNDER DIFFERENT PROLIFERATION MEDIUM

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Abstract

The study was initiated with shoot tips that were selected from plum genotype which had remarkable rootstock potential. The aim of this study was to determine the most appropriate protocol for the propagation of different plum genotypes in vitro. The shoot tips of the selected plum belonging to Prunus divaricate species were surface-sterilized with sodium hypochlorite (15%) for 10 minutes. All these plant materials were placed to hormone free Murashige and Skoog (MS) as initiation medium for four weeks. After this period of time, they were divided into four groups for evaluating the performance of proliferation under the different medium. The first medium was included MS, sucrose (30 %) and agar (8 %). The other media included the tools from the first medium as well as different concentration of TDZ, NAA, GA3 and IBA. The lowest proliferation was found in hormone free medium (first medium) with 0.75 value and no vitrification. At the same time, the highest vitrification (33 %) was observed in the second medium [the first medium + TDZ (0.75 mg), NAA (0.5 mg), GA3 (0.5 mg) and IBA (0.5 mg)] with 1.21 proliferation. The highest shoot number was obtained from the third medium with 2.26 proliferation rate. This medium was similar to the second medium except the TDZ ratio (1.5 mg). The result of the study suggests that effect of TDZ ratio on vitrification and proliferation in this plum genotype is of great importance.

Key words: *In vitro, Rootstock, Vitrification*.

POTENTIAL OF PLANT GROWTH MODELS TO MITIGATE CLIMATE CHANGE IMPACT ON AGRICULTURAL SYSTEMS

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Abstract

Climate change and drought pose considerable threats and risk for agricultural productivity. Agricultural production requires very complex models because it uses soil, water, and plant materials besides factors of climate change and human influence. Therefore for ensuring the sustainability of agricultural production, the need of knowledge-based new models has steadily increased, recently. These complex models may provide rapid advancements in modeling plant growth. For this, an adequate modeling of plant growth must be able to establish a good relationship between models which used internal and external factors effecting plants growth besides experimental data and mathematical modeling. In addition, the characteristics of the data used in the models, their effects, and their direct and indirect relationships with each other should be well evaluated. In this study, firstly detailed information was given about environmental factors affecting water uptake and water stress of plants in different climate, and their effects on plant growth. Soil physical constraints to plant growth and crop production such as soil aeration, root and soil respiration, effect of soil structure and tillage on aeration, and soil temperature were explained. Then, the potentials of the concepts in the most commonly used for plant growth models were discussed and the success of these models was compared.

Keywords: *Agricultural systems, Plant growth models, Water use efficiency, Climate change, Sustainable development.*

DETERMINING THE PERFORMANCE OF SOME NEW POTATOES CULTIVARS AND CANDIDATES IN TOKAT-ARTOVA (TURKEY)

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Abstract

Potatoes were introduced to Europe in the second half of the 16th century by the Spanish. Today they are a staple food in many parts of the world and an integral part of much of the world's food supply. This study was conducted to determine yield and yield components of 15 potato genotypes in Tokat- Artova in 2014-2015. The experiment was a randomized complete block design with four replications. In the study, some agronomic traits such as tuber yield, average tuber weight, marketable tuber yield and technological values were studied. According to the results, average tuber yield was 47.90-96.82 g, tuber yield was 699.96-3625.04 kg/da, and marketable tuber yield was 488.24-3354.74 k/da. It was conclude that genotype Alegria with the highest tuber yield seemed to be suitable for the region.

Key words: *Potato, cultivar, cultivar candidate, registration, adaption.*

TOXICITY OF SOME ALUMINUM DOSES ON CAB-6P (*PRUNUS CERASUS* L.) CLONAL ROOTSTOCK

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Abstract

Abiotic and biotic plant stress factors are the major causes of yield limitations. Aluminum toxicity is one of the most important stressors for plant growth and development after salinity. The most common effect of Al toxicity on the plant is the reduction of root growth. Reduced root growth decreases yield and fruit quality. Thus, high-quality rootstocks, that can cope with elevated toxic mineral levels, are important resources for fruit growers and breeders. The CAB-6P (*Prunus cerasus* L.) seedlings were evaluated to determine aluminum toxicity and its effect on biomass production. Seedlings reproduced in tissue culture and grown for 2 months in growth room were used for the study. Plants with similar sizes were transplanted into 9-liter pots filled with turf and perlite medium (2:1). Four doses of aluminum (200-400-600-800 µM) were treated every 30 days one month after transplanting into pots. Above and below ground parts, and leaves were separated after four months of aluminum treatment. Data for root, shoot and leaf biomass (fresh and dry), trunk and root collar diameters, plant height and root length were collected. According to data analysis, there were significant differences between control and elevated doses of Al. Plant height, root length, root and shoot fresh and dry biomass were significantly reduced with increased Al doses. However, trunk (10.88 mm) and root collar diameters (14.74 mm) were larger on 200 µM Al treatment than control (9.90 mm and 12.96 mm, respectively) and other doses. Aluminum doses had a significant negative effect on CAB-6P rootstock growth.

Keywords: *Aluminum toxicity, CAB6-P, Root biomass, Shoot biomass.*

DETERMINING THE RELATIONSHIPS BETWEEN SEED YIELD AND LEAF CHARACTERISTICS IN COWPEA

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Abstract

Cowpea is an important legume that is resistant to arid conditions and rich biomass. This study was carried out to determine the relationship between the seed yield, biologic yield and leaf properties. The experiments were conducted at two locations where one of them was warm (Samsun), other was with continental climate (Amasya). Sixteen cowpea line/cultivars were used in this study. The experiments were set up in the randomized complete block design with three replications. In the both locations, sowing on seeds was made with 60 cm row space to plots 12 m^2. The leaf samples were collected for both locations in a period at the beginning of pod setting period. All of leaf properties were determined by LICOR LI 3000A Portable Leaf Area Meter. Collected data were subjected to variance analysis in MSTATC package program by being combined over the location. According of variance analyses, total leaf area of plant, number of leaves, leaflet length, dry matter rate of leaf, seed yield per plant and biological yield showed statistical difference among genotypes. The significant differences between two locations were found for biological yield, seed yield and number of leaves. Plant seed yield and biological yield positively and significantly correlated with leaves number, leaf area per plant, leaflet number, leaflet area of per plant.

Key words: *cowpea, leaf properties, seed yield.*

HERBAL MEDICINE IN HYPERTENSION TREATMENT

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Abstract

World health Organization defined Hypertension (also known as high or raised blood pressure) as a condition in which the blood vessels have persistently raised pressure. Hypertension is an important public health problem worldwide due to the high prevalence and the increased risk of accompanying disease. Hypertension is prevalent all over the world and has many diseases. So, for centuries, there have been medical developments for the treatment of this disease, as well as the use of herbal products. Herbal products used vary from country to country. However, some herbal products in countries are more known and used in hypertension. The aim of this study is to investigate the herbal products used in hypertension in the world and studies on possible side effects.

Keywords: *Herbal medicine, hyperetension.*

EFFECT OF THE TEMPERATURE AT VARIOUS GROWTH STAGE BASED ON LOCATION ON YIELD AND QUALITY IN BREAD WHEAT (*TRITICUM AESTIVUM* L.) CULTIVARS

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Abstract

The high temperature is mainly abiotic environmental factor influencing bread wheat quality during grain filling stages in Trakya region (Turkey). In this research is investigated effect of the temperature, during growth stage Z24 and Z89, on yield, quality and some agronomic characters in bread wheat cultivars. Mean and maximum temperatures from shooting up to grain filling period were taken in experimental area. This research was established with 25 genotypes in RCBD with 4 replications in Edirne and Tekirdağ location, from 2011 to 2016 growing seasons. Grain yield, 1000-kernel weight, test weight, protein ratio, gluten, gluten index, hardness, sedimentation, plant height and days of heading were investigated. According to the results of research there were various relations among locations and investigated parameters based on temperature with yield and quality. At Edirne location, during 6 years environments, the mean grain yield was in the range of 445.4- 815.8 kg da^{-1}, mean grain yield was 652.5 and 2014 was the highest yielding year. Regarding the years, the highest mean values of 1000-kernel weight and test weight for all genotypes were in 2014 and 2012 while the lowest values were in 2011 and 2013. The results of Edirne location showed that higher temperature from shooting up to grain filling stage had a negative effect on protein ratio, gluten value, hardness and sedimentation in cultivars. Also, 1000-kernel weight was positively affected by mean and maximum temperature from shooting to maturating stage. Increasing in mean and maximum temperature during Z24 and Z89 reduced plant height and shortened days of heading. At Tekirdağ location, during 6 years environments, the mean grain yield was in the range of 548.5-828.3 kg da^{-1}, mean grain yield was 683.7 and 2012 was the highest yielding year. Based on years, the highest mean values of TKW, TW, protein ratio and gluten value for all genotypes were in 2012. The results of Tekirdağ location showed that mean temperature from Z31 up to Z89 growth stage had a positive effect on grain yield, 1000-kernel weight, and test weight. But, increasing in maximum temperature during Z77-89 reduced grain yield, 1000-kernel weight, and test weight. Gluten index in cultivars was negatively affected by mean and maximum temperature from shooting up to physiological maturating stage. Protein ratio, hardness and gluten value were positively affected by mean temperature during Z31-49 and Z77-89 stage.

Key words: *Bread wheat, location, temperature, yield, quality characters.*

GENETIC DIVERSITY OF BREAD WHEAT (*TRITICUM AESTIVUM* L.) GENOTYPES BASED ON PRINCIPAL COMPONENT ANALYSIS AND CLUSTER FOR YIELD AND QUALITY TRAITS

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Abstract

Drought is the mainly abiotic stress factor and amount of the rainfall during grain filling period affect bread wheat yield and quality in. The study was carried out in the experimental field of Trakya ARI, Edirne (Turkey), in 2008-2009 and 2009-2010 years. 15 genotypes were planted in RCBD in a split-plot with three replications. The main plots were assigned to five moisture regimes, which included 3 drought stress environments, one non-stress and one non-treatment environment. Yield and 1000-kernel weight, test weight, protein content, gluten and gluten index, hardness and sedimentation were investigated. Principal component analysis (PCA) and cluster analysis was used to determining for genotypes environment interaction. Principal component analysis (PCA), indicated that the first (20.63%) and second (41.42%) components justified 62.04% of variations between the criteria. According to GGE biplot results Kate A-1 and Tekirdağ was determined as most stable cultivars for grain yield. Mean values of the genotypes changed between 29.7-43.5 g for TKW, 73.6-83.2 kg/hl for test weight, 11.1-13.3% for protein content, 28.5-37.0% for gluten value, 34.3-56.0% for sedimentation, 68.9-95.3% for gluten index and 383.0- 658.3 for grain yield. When all parameters were evaluated using the PCA analysis, protein ratio, gluten value and hardness were involved in the same group, while yield and gluten index and sedimentation value and test weight were grouped in two different groups. The cluster analysis was done and 15 genotypes divided into 3 clusters based on Ward's method. The cluster I and II were more clearly separated than cluster 3. The cluster analysis revealed that considerable variation existed among genotypes that could be implicated in selection of bread wheat for the development or improvement of cultivars. According to the results of the study, genotypes with appropriate combination in terms of examined traits were selected for national breeding program of bread wheat.

Keywords: *Bread wheat, biplot analysis, genotypes main effect, genotypes environment interaction, quality parameters*

EFFECT OF RAINFALL AND HUMIDITY AT VARIOUS PLANT GROWTH STAGE ON YIELD AND QUALITY OF TWO AND SIX ROWED BARLEY (*HORDEUM VULGARE* L.) CULTIVARS

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Abstract

Rainfall and humidity are among the mainly abiotic environmental factors influencing barley leaf disease infection during shooting up to grain filling period in Trakya region (Turkey). We investigated effects of the rainfall and humidity from shooting to end of the grain filling stage, on yield and agronomic characters of two and six rowed winter barley cultivars. Rainfall and humidity from shooting up to grain filling period were taken from experimental area. This research was established with 25 genotypes in RCBD with 4 replications in Edirne, between 2007 and 2016 growing seasons. Two rowed winter barley Bolayır cultivars and six rowed winter barley Martı cultivars were selected from this experiment. Grain yield, 1000-kernel weight, test weight, protein ratio, days of heading, plant height, *Pyrenophora teres* and leaf rust and relationship amongst these traits were investigated. There were various relations among investigated parameters based on rainfall and humidity with yield, quality and other agronomic parameters. In two-rowed cultivar, during ten years environments, the mean grain yield was in the range of 448.0 - 877.3 kg da^{-1}, and mean of grain yield of ten years was 702.3 and 2008 was the highest yielding crop season. Based on years, the highest mean values of TKW in 2015, TW in 2011, and protein ratio in 2009 were determined. The higher infection of leaf rust and *Pyrenophora teres* took place in 2013. In six-rowed cultivar, during ten years environments, the mean grain yield was in the range of 520.3 - 916.7 kg da^{-1}, and mean of grain yield of ten years was 675.4 and the highest yielding crop year was 2007. According to years, the highest mean values of TKW in 2015, TW in 2009, and protein ratio in 2008 growing years were determined. The higher infection of *Pyrenophora teres* was made epidemic in 2013 and 2015 while leaf rust was the biggest in 2011.

Key words: *Barley, rainfall and humidity, yield, quality characters.*

THE IMPACT OF SOME NATURAL SOAPS *THAUMETOPOEA PITYOCAMPA* (DEN. & SCHIFF.) (LEP.:THAUMETOPOEIDAE)

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Abstract

The pine processionary (*Thaumetopoeo pityocampa* Schiff (Lepidoptera: Thaumetopoeidae), which is an important forest pest, eats pine needle which slows the tree's growth, causing economic loss as well as allergic reactions in humans and animals. Due to the inadequacy of control methods used against this pest, the endurance problems of insecticides used in chemical control methods, and its adverse effects on the environment and human health, alternative control methods have gained importance. In this study, 3 g of handmade natural soaps (goat milk soap, lavender soap, argan soap, juniper tar soap, bittim soap, eucalyptus soap, mint soap, nettle soap, clay soap, moss soap) each diluted with 1 l water was used. For each replication3 ml of soapy water from the prepared stocks was sprayed into 10x15x15 cm plastic containers, each containing 10 pine processionary larvae obtained from natural populations. The container sprayed with only water was considered as the control group. The study was carried out in 4 replications, 22 ± 2^{o}C, 70% humidity and was repeated 2 times. The study was observed for 5 days and deaths were noted. Mortality rate was determined via the Abbott formula. On the 5th day of the study, the highest effect was seen in eucalyptus and nettle soaps (97.06%), followed by argan and bittim soaps (94.12%), moss and clay soaps (88.24%), mint soap (85.29%), juniper tar soap (79.41%), goat milk soap (76.47%) and lavender soap (70.59%). As a result of the study, eucalyptus, nettle, argan and bittim soaps showed a similar effect to chemical insecticides with an effect over 90%, hence these natural soaps had potential to be used as alternative control methods.

Keywords: *Natural soap, pine processionary, Thaumetopoeo pityocampa, control.*

EVALUATION OF ADVANCED BREAD WHEAT (*TRITICUM AESTIVUM* L.) MUTANT LINES FOR GRAIN YIELD AND SOME YIELD COMPONENTS

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Abstract

This research was conducted to assess yield and some yield components of 65 advanced bread wheat mutant lines of M_6 generation selected from M_4 populations of 4 different bread wheat genotypes. They were sown using augmented design consisting of five blocks of which every block had 13 mutant advanced lines and 4 standard varieties (parents) in the 2014-2015 growing season. According to the data obtained from the experiment, there was a great variation for plant height (69.15-119.56 cm), spike length (9.26-11.78 cm), number of grains per spike (30.59-59.84), grain weight per spike (1.43-3.13 g), harvest index (32.57-48.37%), thousand kernel weight (34.13-55.93 g) and grain yield (471.20-951.45 kg/da). The 33 lines for plant height, 22 lines for spike length, 21 lines for number of grains per spike, 31 lines for grain weight per spike, 35 lines for harvest index, 30 lines for 1000 grain weight and 33 lines for grain yield have been found to perform better than standard genotypes. According to the results of study, advanced mutant lines that were superior to the standard types in more than one trait were MT35 (IB-400), MT14 (B-100), MT27 (IB-300), MT19 (IB-200), MT20 (IB-200) and MT15 (IB-100). These mutant lines were selected for yield trials when compared to check cultivars, and they may prove useful for yield improvement in wheat breeding programme. Gamma irradiations with 100 and 200 Gy may be more beneficial for yield improvement in wheat mutation breeding.

Key words: *Bread wheat, mutant line, augmented, grain yield, yield components.*

DETERMINATION OF COMPATIBILITY OF TRITICALE TO DIFFERENT SOIL CONDITIONS AND COMPARISON OF YIELD WITH COOL CLIMATE CEREALS

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Abstract

In the study, 7 triticale, 3 bread wheat, 2 barley, oats and 1 rye varieties were used as material. Experiments were established in four different locations in terms of soil properties as a randomized block design with three replications. Sowing was made by hand on a length of 6 m to 1 m wide (17 cm row spacing and 6 row) 500 seeds per square meter plots. In the study, grain yield and green grass yield and hay yield were investigated. According to the results of average grain yield, ITYN 818, TT 201 and ITYN 819 triticale varieties had the highest grain yield while Presto 2000 and Tatlıcak 97 triticale varieties had the lowest yield. According to the results of two year grain yield, TT 201 and ITYN 818 triticale varieties in Agriculture Faculty location, TT 201, ITYN 818 and TR 2201 triticale varieties in Ortaca location (water holding land), TT 201, ITYN 818 and ITYN 819 triticales in Kılavuzlu location (arid and slope land) and TT 201 and Tatlıcak 97 varieties of triticale in Selçuklu location gave the highest yield. According to average green grass yield, Tatlıcak 97 and Karma 2000 triticale varieties had the highest, while TT 201 and ITYN 819 triticale varieties the lowest yield values. In terms of the average hay yield, the ITYN 819, Karma 2000 and TR 2201 were found to have the highest value while the TT 201, Presto 2000 and Tatlıcak 97 triticale varieties gave the lowest values.

Keywords: *triticale, line, different soil conditions, grain yield, forage yield and hay yield*

EVALUATION OF YIELD AND SOME QUALITY TRAITS OF ADVANCED BREAD WHEAT MUTANT LINES WITH BI-PLOT ANALYSIS

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Abstract

This study was The study was carried out in the experimental areas in Department of Field Crops, Faculty of Agriculture, Namık kemal University. The aim of the study is to determine the change in quality characteristics of some mutant bread wheat lines and their use in the wheat breeding programs. Sixty bread wheat mutant lines and 4 check genotypes (Beozstoja-1, Atilla-12, Kate A1, IBWSN-4) were used as experiment material. The experiment was conducted by augmented experimental design consisting of five blocks of which every block had sixteen genotypes. the grain yield, test weight, thousand grain weight, protein content, grain hardness, sedimentation value, wet gluten content, alveograph value, gluten / protein rate and sedimentation / protein rate of mutant bread wheat lines and standard varieties were examined.. Bi-plot analysis was performed on the data related to the examined traits. As a result of bi-plot analysis related traits to each other and prominent genotypes in terms of particular traits visually were shown. In the formed bi-plot graph, the most of the lines showed superiority for grain yield, test weight, thousand grain weight, protein content, grain hardness, sedimentation value, wet gluten content, alveograph value, gluten/protein rate and sedimentation/protein rate. These mutant lines, which are determined to be superior in terms of the yield and quality characteristics examined, are not only promosing variety candidates but also show suitable genetic resource characteristics within the crossing studies.

Key words: *Augmented experimental design, bread wheat, mutant line, grain yield, bi-plot.*

EFFECTS OF DORMANCY-BREAKING TREATMENTS ON GROWTH OF *PISTACIA TEREBINTHUS* L. SEEDLINGS

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Abstract

The seeds of *Pistacia* species are surrounded by a hard sclerotic endocarp that makes it difficult to germinate, for this reason the germination rate in these species is low. Various chemical solutions are used to stimulate seed germination. Gibberellic acid (GA) is one of the growth regulators which can be used to partially or fully replace the required period of cold moist stratification in a number of plant species. Scarification and cold stratification were found to improve the seed germination in *Pistacia* spp. This study was carried out to determine the effects of different dormancy-breaking treatments including stratification, sulphuric acid scarification, dehulling and gibberellic acid (GA_3), on seedling growth of *Pistacia terebinthus* using as rootstock for pistachio trees. Seed dormancy-breaking treatments were shelled (control), shelled + GA_3, dehulled, dehulled + GA_3, sulphuric acid scarification and sulphuric acid scarification + GA_3 applications in the present experiment. The seeds of both genotypes were stratified at 4 ºC for 50 days after the dormancy-breaking treatments. Stratified seeds were sown in the viols filled with peat in the greenhouse, and then plantlets were transplanted to plastic containers to determine the vegetative growth. In *P. terebinthus* seedlings, the highest stem growth were obtained from scarification application, whereas the poor development was obtained from shelled + GA_3 application. The effect of the scarification on the root development of the seedlings was better than the other applications. Scarification also increased the number of leaves in *P. terebinthus* seedlings. As a result, dormancy-breaking applications were found to be effective on seedling growth of *P. terebinthus*.

Keywords: *Pistacia terebinthus*, *Stratification*, *Scarification*, *GA_3*, *Seedling Growth.*

DIE-BACK OF THE SIIRT CULTIVAR SEEDLINGS USED AS ROOTSTOCK FOR PISTACHIO TREES

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Abstract

Pistacia genus is a member of the Anacardiaceae family and consists of at least eleven species. Seven species, *Pistacia vera*, *P. terebinthus*, *P. khinjuk*, *P. atlantica*, *P. mutica*, *P. palaestina* and *P. lentiscus*, are present and distributed in different regions of Turkey. Except for *P. lentiscus*, which is in the shrub form and is a green plant, all other species grown in Turkey can be used as rootstock for pistachio trees. Nowadays, the main pistachio rootstock used in Turkey is *P. vera* cv. Siirt. The seedling of Siirt cultivar are widely used as a rootstock due to rapid growth, early reach to budding thickness and good budding take. These are desirable characteristics in the rootstock. However, in the last 2 years, it has been observed that the Siirt rootstocks start drying 2 months after the budding. The plants dry up to the ground level together with the bud shoots and form bottom shoots again from the bottom of rootstocks. It is considered that these plant dryings have been caused by high summer temperatures occurred in 2017 and 2018. When pistachio seedlings budded, strong pruning is done on the grafted plants in our region. In this case, the severely pruned plants are supposed to be unable to withstand the high temperatures and thus dried up. These dryings are less in seedlings that are not severely pruned during the budding.

Keywords: *Pistachio, Siirt cultivar, Rootstock, Die-back.*

INFLUENCE OF HORMON CONCENTRATIONS AND DIFFERENT CULTURE SYSTEMS FOR *IN VITRO* MASS MICROTUBERS POTATO PRODUCTION

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Abstract

In this study, the effect of continuous immersion with supporting net culture systems and aeroponic culture system and, Kinetin and Naphthaleneacetic acid (NAA) concentrations on the induction and development of microtubers number per plant and microtuber number per growing system by *in vitro* micropropagation was evaluated for Hermes cultivar. The *in vitro* derived plantlets produced from *in vitro* plantlets and the plantlets produced from microtubers were cultured on 1/2 Murashige and Skoog (MS) medium supplemented with 2 ppm gibberellic acid, 10 ppm paclobutrazol, 5.0 g/l activated charcoal, 100 g/l sucrose; and as well as Kinetin and NAA *in vitro*. Liquid medium was distributed to the carrier *in vitro* continuous immersion with supporting net liquid culture system containing glass wool + filter paper layer as substrate. It was also investigated whether an increase in Kinetin (until 6 ppm) and NAA (1 ppm) concentrations would improve *in vitro* microtuber propagation and the effect of different doses of Kinetin (2.0, 4.0, 6.0 and 8.0 ppm) and NAA (1.0, 2.0, 3.0 and 4.0 ppm) on *in vitro* microtuberization. After a 42-day of incubation, on the continuous immersion culture system; the number of microtuber formation was 331.36 and, 5.21 mm diameter of microtuber, 109.36 mg microtuber fresh weight in bioreactor, smaller than <3 mm diameter of microtubers number was 265.05, bigger than >3 mm diameter of microtubers number 192.24 and 7.33 microtuber number per plant at 6.0 ppm Kinetin at in vitro derived plantlets produced from in vitro plantlets. Increasing the NAA supply decreased the microtuber formation number; however, at concentrations of Kinetin higher than 6.0 ppm and NAA higher than 1.0 ppm decreased the number of microtuber formation. Continuous immersion culture system was more suitable and stable for mass propagation of potato microtubers than aeroponic culture system.

Key words: *Aeroponic culture, Tuberization, Immersion culture, Potato, Solanum Tuberosum L.*

EFFECTS OF DIFFERENT GIBBERELLIC ACID (GA_3) DOSES AND DURATION OF HARVESTING TIMES ON ENGLISH LAVENDER (*LAVANDULA ANGUSTIFOLIA* MILL. SUBSP. *ANGUSTIFOLIA* MILL.) ESSENTIAL OIL CONTENTS

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Abstract

The lavender (*Lavandula angustifolia* Mill.subsp. *angustifolia* Mill.) essential oil is used for medicinal purpose as an aid in digestion that increase the mobility of food in the intestines and for preparation of scent. This study aimed to determine the optimum time of harvest on lavender essential oil contents post application of variable doses of GA_3. The material used in this study was from the 4 year plantations of lavender grown under hot-summer Mediterranean climate of Uşak, Turkey. The study was conducted using split plots randomized complete block design with 3 replications. The lavender flowers were harvested after 24, 30, 36, 48, 54, 60, 72, 78, 84 hours post treating them with 0 (control), 200, 400 and 600 mg/l Gibberellic acid (GA_3). The harvested blossoms were dried under shade at room temperature. The essential oils were extracted from the dried blossoms with clevenger apparatus using steam water distillation technique. Different harvesting durations in hours, and hormone doses showed significant interaction (p<0.01). Harvesting at different durations of times showed the essential oil range of 6.20 – 8.20 %. Unstable and precarious improvement in essential oil yield was noted using 200 mg/l GA3 after any duration of time post GA3 application. Stable and significantly improved essential oil yield was noted using 400 mg/l GA3 after all durations of time post GA3 application. The maximum essential oil was obtained on the shoots harvested post 54^{th} hour of 400 mg/l GA_3 applications, while the minimum essential oil percentage was obtained after 30 hours without GA_3 application on control treatment. However, significant, changeable inhibition in the essential oil yield was noted using 600 mg/l GA_3 compared to 400 mg/l GA_3 applications and control treatment after any duration of time and doses of GA3 applications. Therefore, control treatment, 200 and 600 mg/l GA3 applications were considered insufficient and inhibitory to achieve economic essential oil yield.

Keywords: *Lavender (Lavandula angustifolia Mill. subsp. angustifolia Mill.) esential oil, hormones, variability, harvesting time.*

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DEVELOPMENT OF SIMPLE SEQUENCE REPEAT (SSR) MARKERS DERIVED FROM SSR-ENRICHED GENOMIC LIBRARY OF LENTIL (*LENS CULINARIS* M.)

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Abstract

Simple sequence repeat (SSR) markers are the major molecular tools for genetic and genomic researches that have been extensively developed and used in major crops. However, few are available for lentils (*Lens culinaris* M.), economically an important cool-season legume. The lack of informative simple sequence repeat (SSR) markers in lentil has been a major limitation for lentil molecular breeding studies. Therefore, in order to develop SSR markers for lentil, an enriched genomic libraries for AC and AG repeats were constructed from the *Lens culinaris* cv Kafkas. A total of 350 clones were inquired for the detection of SSRs. Of 350 clones, 68 had SSR motifs. In polymorphism analysis using 53 newly developed SSRs, a total of 144 alleles across using 24 lentil cultivars were detected with an average of 4.64 per locus. The average heterozygosty was 0.588 and polymorphism information contents ranged from 0.194 to 0.895 with an average value of 0.520. These newly developed SSRs will constitute useful tools for molecular breeding, mapping, assessments of genetic diversity and population structure of lentils.

Keywords: *Lens culinaris* M., *Lentil, Microsatellites, SSRs, Enriched library.*

Acknowledgement

This study was supported by TUBITAK (The Scientific and Technical Research Council of Turkey) (Project no: 215O088).

MOLECULAR CHARACTERIZATION OF WILD APRICOT (*PRUNUS ARMENIACA* L.) GENOTYPES SELECTED FROM CAPPADOCIA REGION (NEVSEHIR-TURKEY) WITH SSR MARKERS

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Abstract

In this study, 44 wild apricot genotypes selected from Cappadocia Region (Nevşehir – Turkey) as prominent with their late flowering, resistance to spring late frosts, large fruit sizes and/or late fruit ripening characteristics and 5 reference apricot cultivars (Hacıhaliloğlu, Kabaaşı, Hasanbey, Aprikoz and Levent) were characterized with SSR (Simple Sequence Repeats) markers. A total of 16 SSR primers were used and 13 of them were successfully amplified. Total number of alleles was identified as 107, average number of alleles as 8,23, average *He* and *Ho* values as 0,722 and 0,669 respectively. Polymorphism information content (PIC) values varied between 0,471 - 0,845 and genetic similarities among the genotypes varied between 12 – 96%. Homonymous and synonymous genotypes were not encountered.

Key words: *Apricot, Prunus armeniaca, gene source, molecular characterization, SSR markers.*

Acknowledgement

This study was supported by TUBITAK (The Scientific and Technical Research Council of Turkey) (Project no: 114O279).

DETERMINATION OF THE RELATIONSHIP BETWEEN THE SPECTRAL REFLECTIONS OF THE SUGAR BEET AND THE HEAVY METAL CONTENTS IN THE SOILS

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Abstract

When plant production is carried out in soil contaminated with heavy metals, this is included in the food chain and adversely affects all living systems, especially human and animal health. For this reason, the contamination of heavy metals which can be added to the soil environment naturally and/or artificially is one of the obligatory subjects to be controlled and followed especially in agricultural areas. Today, spectral techniques which are practical, fast and environmentally friendly methods are used intensively to identify heavy metal pollution or high pollution potential areas in different studies. In this study, it was aimed to determine of Ni, Cr, Cu, Pb, Zn, Cd accumulation from geogenesis origin to spectral signatures of sugar beet leaves by using Landsat - 7 multispectral image in TURKEY - Konya region. The mean values of the spectral reflections of sugar beet belonging to normal parcels and contaminating parcels were statistically compared with the *TUKEY* test. The study results showed the change in spectral signatures with graphical comparison of the mean reflectance, but, we determined that this change was not due to the heavy metal content of the soil and there was no statistically significant difference in the leaf spectral reflectances compared to the non-contaminated zones. Thus, it is necessary to examine the content of other nutrient elements affecting the mean reflection, and, depending on the risk of continuation of heavy metal accumulation, it is recommended to analyze the soil of the region periodically.

Keywords: *Heavy metals, Spectral techniques, Sugar beet, Tukey test.*

THE FOLK MEDICINAL PLANTS USED IN THE TREATMENT OF HYPERCHOLESTEROLEMIA

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Abstract

Atherosclerosis is the most prevalent and important cardiac disease which involves heart and brain. Studies have shown a marked association between hypercholesterolemia and development of atherosclerosis. In recent years, in many countries, alternative therapies, particularly phytotherapy and dietary supplements, have been increasingly explored for the treatment of diseases. Since antiquity, humanity has benefited from plants in the treatment of various disorders because toxicity factors have decreased side effects. There are many folk medicinal plants used in hypercholesterolemia. The nutritional value of these plants is derived from monounsaturated and essential fatty acids, polyphenols, vitamins, and fructo-oligosaccharides. Some of those are *Petroselinum crispum* (Mil.) A. W. Hill, *Pyruselaeagnifolia* Palas subsp. *Elaeagnifolia, C. Scolymus, T. Porrifolius, A. sativum (garlic), C. Lanatus, Crataegus szovitsii* Pojark, *Crataegus monogyna* Jacq. subsp. *monogyna, Hypericum perforatum* L., *Juglans regia* L., *Morus alba* L., *Onosma isauricum* Boiss. et Heldr., *Phlomisarmeniaca* Wild., *Rubussanctus* Schreber, *Stachysannua* L., *Thymus sipyleus* Boiss., *Tribulusterrestris* L. They are usually prepared in the form of a decoction or infusion.In addition to these, rosemary, thyme, rosehip, grape seeds, green tea and ginger also have hypolipidemic effects.As a result, information on traditional folk remedies known to be effective against hypercholesterolemia and many diseases is forgotten due to the widespread use of modern health services over time.

Keywords*:* *Folk medicine, Hypercholesterolemia, Atherosclerosis.*

EFFECTS OF PHOSPHORUS FERTILIZATION ON SEED YIELD OF SAINFOIN (*ONOBRYCHIS SATIVA* L.)

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Abstract

This research was conducted to determine the effects of five phosphorus doses (0, 40, 80, 120 and 160 kg ha^{-1}) on seed yield and some yield components of sainfoin (*Onobrychis sativa* L.) under Mediterranean region of Turkey. The experiment was established in a randomized complete block design with three replications. Seed yield, raceme number per plant, raceme number per m^2, fruit weight per raceme, fruit weight per plant and 1000-fruit weight were determined. Phosphorus rates significantly affected all components determined in sainfoin. Phosphorus applications increased seed yield, raceme number per plant, raceme number per m^2, fruit weight per raceme, fruit weight per plant and 1000-fruit weight. At the end of this research, 120 kg ha^{-1} phosphorus dose is recommended for high seed yield in sainfoin.

Key words: *sainfoin, seed yield, raceme number per plant, 1000-fruit weight.*

EFFECTS OF PHOSPHORUS FERTILIZATION ON FORAGE YIELD AND QUALITY OFALFALFA (*MEDICAGO SATIVA* L.)

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Abstract

This study was conducted to determine the effects of five phosphorus doses (0, 40, 80, 120 and 160 kg ha^{-1}) on forage yield and quality of alfalfa (*Medicago sativa* L.) under Mediterranean region of Turkey. The experiment was established in a randomised complete block design with three replications. Each plot consisted of 6 rows each 5 m in length. The between-row spacing was 30 cm. The seeding rates were 20 kg ha^{-1}. Dry matter (DM) yield, crude protein (CP) ratio, neutral detergent fiber (NDF), acid detergent fiber (ADF), total digestible nutrient (TDN) and relative feed value (RFV) were determined. Phosphorus rates significantly affected all components determined in alfalfa. Phosphorus applications increased DM yield, CP ratio, TDN and RFV values but decreased ADF and NDF ratios. The highest DM yield was obtained from 90 and 120 kg ha^{-1} P rate (4.98 and 5.03 t ha^{-1}), while the lowest DM yield (4.49 t ha^{-1}) was obtained from control plot. The highest CP content (19.5 %) was obtained from 120 kg ha^{-1} P rate, while the lowest CP content (17.2%) was obtained from the control treatment. The highest ADF (36.7%) and NDF contents (42.2%) were obtained from the control treatment, while the lowest ADF (31.7%) and NDF contents (35.8%) were obtained from the 120 kg ha^{-1} P rate. The TDN refers to the nutrients that are available for livestock and are related to the ADF concentration of the forage. As ADF increases there is a decline in TDN which means that animals are not able to utilize the nutrients that are present in the forage. The highest TDN values (60.4 and 60.3) were obtained from 90 and 120 kg ha^{-1} P rate, while the lowest TDN value (54.0) was obtained from the control treatment. The RFV is an index that is used to predict the intake and energy value of the forages and it is derived from the DDM and dry matter intake (DMI).The highest RFV values (167.0 and 163.8) were obtained from 90 and 120 kg ha^{-1} P rate, while the lowest RFV values (132.9) was obtained from the control treatment.At the end of this research, 120 kg ha^{-1} phosphorus dose is recommended for high forage yield and quality in alfalfa.

Key words*: Alfalfa, Dry matter, Neutral detergent fiber, Relative feed value*.

EFFECT OF CLIMATIC CHANGES ON SHELF LIFE AND QUALITY OF KEITT MANGO (*MANGIFERA INDICA* L.) FRUIT

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Abstract

Exposure to elevated temperatures during growing season can cause physiological and ultimately, biochemical changes in plant tissues (include fruits) and, as a consequence, hasten ripening and other associated events. The present study was aimed to investigate the impact of changes in some climate factors include temperature, relative humidity (RH) and light intensity on shelf life and the incidence of jelly seed disorder in mango fruits. To investigate the changes in climatic factors; mango plantlets were transplanted under two different conditions which are: open field and net cover (30% shade). All plantlets were grafted on balady rootstock, grown in sand soil in an orchard located at Elboseily region, Beheira governorate North West Egypt and subjected to similar agricultural practices. Eight years later, the present study was carried out during 2012 and 2013 seasons. Mature fruits were stored in carton boxes under ambient temperature and investigated two days intervals until ripe stage. The results revealed that high temperature (in open field) during the growing season hastened fruit ripening and decreased shelf life. High temperature also accelerated respiration rate and softening of Keitt mango fruits. The role of climatic factors in enzymatic activities, ripening and internal breakdown of mango was widely discussed.

Key words: *Climatic factors, respiration, breakdown, ripening, firmness.*

CHANGES IN QUALITY PARAMETERS DURING FRUIT GROWTH OF CERTAIN TANGERINE VARIETIES AND HARVESTING UNDER DORTYOL CONDITIONS

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Abstract

This research has been conducted to determine the harvest time depending on the changes in quality parameters in Satsuma owari, Okitsu, and DöBeshi Beni tangerine varieties grafted on sour orange rootstock under Dortyol conditions. Fruit samples were received from trees, selected during fruit development, in 15-day intervals starting from the beginning of June until ripening. Fruit width (mm) and length (mm), fruit weight (g), fruitjuice content(%), total soluble solid(TSS, %), titratable acidity (TA, %), TSS/TA ratio of received fruits were measured for all periods. In consideration of the changes in fruit weight and the criteria set forth in OECD and TSE standards, it was determined that Okitsu, DöBeshiBeni and Satsuma owari varieties reached optimum ripeness respectively at the beginning of September, at the end of September, and at the end of October.

Keywords: *Mandarin, quality, harvest time.*

THE EFFECTS OF LIME DOSES ON SOME MORPHOLOGICAL AND FRUIT CHARACTERISTICS OF SOME STRAWBERRY (*FRAGARIA X ANANASSA* DUCH.) CULTIVARS

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Abstract

Calcareous soil causes iron (Fe) deficiency in many cultivated plants. Strawberries are among those most affected by lime stress among plants. In high-lime soils, sensitive plants such as strawberries, give less yield by not taking certain nutrients, especially iron. In the recent study, some morphological and fruit characteristics of four (Amiga, Festival, San Andreas and YFL) strawberry cultivars were examined in 5 lime doses (0%, 5%, 7.5%, 10% and 12.5%). The plants were grown in a mix of peat and perlite (2: 1) containing lime at rates reported in 9 litre pots. After planting, fruits were harvested for four months. After this time the plants were removed and the root and stem characteristics were examined. According to the data obtained from recent study, although there were differences between the varieties of strawberries, little amount of lime was needed for fruitful and high quality fruit production. However, in high doses, lime leaded to reduced strawberry yield and quality, and even plant mortality. While 5% lime dose had a positive effect on root collar diameter (33.40 mm 'Amiga', 32.78 mm 'YFL2), crown per plant (7.42 per plant 'Amiga', 6.00 per plant 'YFL') and number of leaves (41.17 per plant 'YFL', 38.50 per plant 'Amiga'), 7.5% lime had a positive effect on root volume (54.67 ml 'Amiga', 41.33 ml 'YFL'), fruit yield per plant (96.99 g 'Amiga', 82.31 g 'Festival'), fruit size (35.68 mm 'San Andreas', 33.20 g 'Amiga') and fruit width (27.71 mm 'San Andreas', 26.21 mm 'Festival'). However, the number of chlorophyll decreased with increase in lime doses. As a result, more specific work is needed to determine the types of strawberries that can be grown in calcareous soils.

Key words: *Lime, strawberry, high pH and chlorophyll.*

EVALUATION OF SOME BIOCHEMICAL FEATURES OF *AMARANTH* HAY IN VIEW OF ANIMAL NUTRITION

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Abstract

Feed potential of in today's challenging pseudocreal *Amaranth* species was studied. After an average of 85 days growth period 9.45 to 19.4 t ha^{-1} dry herbage was harvested at blooming in Mediterranean conditions. DMD of the hay was rather high despite being a C4 plant. RFV of the herbage which their CP varying between 12.10-15.54 %, was comparable with any hay classified as prime out of that values 149.8-187.9. Most of the minerals' comprising seemed to satisfy the daily requirement of any livestock. Ca/P ratio of the hay was extremely higher than the ideal ratio 2:1 because of lower P accumulation. It was detected as Zn poor in terms of daily maintenance of livestock, but so rich in respect to Cu and Fe even might cause a toxicity in case of overdose of consumption. The highest WSC concentration determined for the Mexican ecotype of *A. hypochondriacus* with 12.67 g 100 g^{-1} DMrevealed that it would be appropriate for silage purposes. The unsaturation of the methyl esterifiedfat,being linoleic acid predominant,varied between 73.3-77.8% depending on the genotypes. Antioxidant activity according to DPPH assay was 4.58 mMTrolox kg^{-1} DW for the Zimbabwe ecotype of *A. cruentus*. Both valuable components and the remarkable concentrations of total phenolic compounds such that 54.51-254.68 mg g^{-1} of the herbage demonstrated the *Amaranth* hay may be evaluated safely as a natural antioxidant sources in animal diet.

Key words: *amaranth hay, antioxidant activity, feed quality, phenols.*

CALORIFIC VALUE AND CHNS PREDICTION OF SWITCHGRASS STRAW USING NEAR-INFRARED REFLECTANCE SPECTROSCOPY

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Abstract

The application of near-infrared reflectance spectroscopy (NIRS) and multivariate analysis for determining the calorific value and elemental composition (CHNS) of 174 *switchgrass* genotypes was assessed. Oven dried and finely grounded switchgrass hay samples about 10-15 gr were scanned with FT-NIRS on the reflectance mode from 4000 to 10000 cm^{-1} wave length. The calorific value of the genotypes varied between 15.72-19.26 Mg J kg^{-1} as a result of the conventional analyses. CHNS were determined by an elemental analyzer as 27.5-45.3 %, 3.7-6.1 %, 0.2-0.5 % and 0.05-2.44 % respectively. The regression coefficient of calibration (R^2 C) and prediction (R^2 P) of the created NIRS calibration via chemometric software NIRCal with partial least squares (PLS) regression model and data pretreatments were realized 0.9706 and 0.8551 respectively for the property of calorific value. It was build up for CHNS as (R^2C/ R^2P) 0.7968-0.7599, 0.8300-0.7930, 0.9664-0.9250 and 0.9166-0.9145 respectively. Standard error of both calibration (SEC) and prediction (SEP) were almost close to zero for all properties (SEC/SEP Calorific; 0.0845/0.1634, C; 0.5358/0.5644, H; 0.0566/0.0692, N;0.0100/0.0162, S; 0.2173/0.2419). So, the NIRS models developed here were therefore useful for quick determination ofthe calorific value and CHNS content of switchgrass genotypes without using any regents.

Key words: *Bioenergy, NIRS, calorific value, elemental composition.*

FORAGE QUALITY OF SWITCHGRASS (*PANİCUM VİRGATUM* L.) GENOTYPES AT EARLY PHENOLOGICAL STAGES

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Abstract

The purpose of this study was to determine the forage quality of switchgrass genotypes at early phenological stages. The stem number of switchgrass genotypes at early blooming stage varied between 11-63.8 stem per plant. Green herbage production from the harvest at this stage was determined as 387.8 kg da^{-1} - 7163.2 kg da^{-1} depending on the genotypes. The variety Trailblazer that was oktoploid upland genotype produced the highest forage yield. Alamo was fixed as the superior variety in view of dry forage yield, which varied between 363.8 kg da^{-1} - 2488.0 kg da^{-1}. Lignocellulosic structural components that were NDF, ADF and ADL were exposed as 49.07-66.96%, 18.33-33.63% and 1.30-8.88%, respectively. The tetraploid upland genotypes, BN-11357-63 and T-2099 came in to prominence in terms of higher forage digestibility rates. Crude protein content determined in the range of 6.17-16.38% was comparable to many cool season grasses. However, the genotypes with high biomass were clustered as low protein contents.

Key words: *Switchgrass, ecotype, forage quality.*

MOLECULAR IDENTIFICATION OF STEM AND BULB NEMATODE (*DITYLENCHUS DIPSACI*) ISOLATED FROM ONION IN TURKEY

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Abstract

Onion is an important economical culture plant for human nutrition in Turkey and the world. One of the most important constraints of onion production, stem and bulb nematode (*Ditylenchus dipsaci*), has more than 30 races in different host plants. The precise identification of the nematode's races is an important step for effective control of the host plant. For this purpose, it was aimed to identify the races of the stem and bulb nematode on onion in Turkey using morphological and molecular methods. The phylogenetic relationship among the isolates was also focused on this study. In the study, plant samples from onion planted fields were collected once for every 1000 decares in Adana, Hatay and Tekirdağ. Nematodes collected from field samples were scanned using DitNF1 - rDNA2, DipU F - DipU R and 18S – 26S molecular markers for species identification. All primers confirmed the *Ditylenchus dipsaci* presence in the samples and were correlated with each other. The results showed that the primers used in the study accurately identified *D. dipsaci* on onion and were useful technique for identification of the race. Molecular identification of *Ditylenchus dipsaci* in onion grown fields in Turkey would help to make the control measures that could be taken against this nematode more consciously and effectively.

Keywords: *Ditylenchus dipsaci, onion, stem and bulb nematode, Turkey.*

Acknoledgements

This study is supported by TÜBİTAK project number 215O468.

INVESTIGATION OF GENETIC DIVERSITY BY USING MOLECULAR MARKERS (RAPD AND ISSR) IN LOCAL CHICKPEA POPULATIONS COLLECTED FROM KIRSEHIR PROVINCE

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Abstract

Chickpea is very important in Turkey as Food and additive sources. Turkey is greatly origin legumes, especially lens and chickpea. Local genotypes were sources for gen stock. However, chickpea can be like to other genotypes. This situation provides to explore new cultivars. This study was carried out in Kirsehir covering the areas of Kaman, Mucur, Boztepe, Akpinar, Akcakent, Cicekdagi districts and Central of City. In this study, RAPD (Random Amplified Polymorphic DNA) and ISSR (Inter Simple Sequence Repeat) methods were used to determine the genetic relationship between the samples belonging to the local chickpea populations collected from the towns and villages of the Kırsehir province. The applicability of these markers was investigated in the distinction of local chickpea genotypes. A total of 30 varieties were evaluated, including 24 local chickpea genotypes and 6 standard varieties (Uzunlu 99, Inci, Gokce, Azkan, Yasa 05 and Aksu) within the scope of the study. Bands obtained by PCR (Polymerase chain reaction) to be performed with ten RAPD and ten ISSR primers were displayed by electrophoresis. Data were analyzed with NTSYS-pc 2.1 package program and polymorphisms of the populations were determined. The genetic diversity of chickpea gene sources belonging to the Kirsehir region has been determined for the first time by this study.

Keywords: *Chickpea, RAPD, ISSR, Molecular markers, Genotype.*

MICROELEMENT RELATIONSHIP WITH POTASSIUM DOSES OF PEPPER PLANT UNDER SALT STRESS

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Abstract

This study was carried out in order to determine whether there was a change in the microelement of plants by applying potassium (K +) at different doses of pepper plant under salt stress. Demre pepper type was used as the material. The study was carried out in a controlled 16/8 hour light/dark photoperiod, at 25°C and 70% humid climate. After the seeds germinated into the pumice, the hydroponic cultures were taken up with seedlings consisting of 2 true leaves. Hoagland nutrient solution was used in the culture in the hydroponic solution. 116, 136, 156 and 176 ppm K^+ doses were used in the present Hoagland solution. In addition, 100 mM NaCl salt was applied to the plants. Sampling for the measurements and analyzes were carried out on the 20th day of the salt application. In these samples, iron (Fe + 2), zinc (Zn + 2), copper (Cu + 2), manganese (Mn +) and magnesium (Mg +) contents were examined. In the plants subjected to salt stress, it was observed that the micro elements Fe + 2, Zn + 2, Cu + 2 increased at first compared to the control plants and when the K + dose increased, this increase decreased and reached the same level as the control plants with the highest K + dose. In this study, K + application was found to be an important element in providing ion balance.

Key words: *Microelements, Potassium, pepper.*

CHUFA (CYPERUS ESCULENTUS L.) SEEDS' USE AREAS AND NUTRİTİON PROPERTİES

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Abstract

Chufa (*Cyperus esculentus L.*) is a less known vegetable that produces sweet nuts-like ovules known as "soil almonds". Tiger nuts are also known by various other names such as chufa (Spanish), ground nuts, yellow nuts sedge, ground badminton, rush almond and edible galingale. The Badademi is an important representative of the Spanish Mediterranean region, with approximately 2450 ha and 9000 ton per year. There they are used to make tubers "horchata" or "horchata de chufa". Most of the groundmass production in Spain is used to prepare a drink called "horchata de chufa". Nowadays groundnut is also grown in northern Nigeria, Niger, Mali, Senegal, Ghana and Togo, where it is mainly cooked as a garnish. Countries like Ivory Coast and India and other countries export to Spain each year. The major fatty acids in the ground oil were 14: 0 (0.2%), 18: 0 (3.2%), 20: 0 (0.4%), 16: 1 n - 72.6%), 18: 2 n - 6 (8.9%) and 18: 3 n - 3 (0.4%). It has been reported that it has a composition with a monounsaturated profile (> 60% monounsaturated fatty acids (MUFA)), which is a fatty acid (FA) profile similar to oils of ground almond oil olives, hazelnuts, macadamia nuts, avocados and apricot kernels. Consumption of C. esculentus is a "healthy" food because it is said to help prevent heart disease and thrombosis and to activate blood circulation. This tuber is rich in energy content (starch, fat, sugar and protein), minerals (mostly phosphorus and potassium) and vitamins E and C and is therefore also suitable for these tuberous diabetic patients. In this compilation, the chufa plant is updated with actual scientific informations on its variety, use areas, nutritional properties as a new source of oil.

Key words: *Chufa, (Cyperus esculentus L.), seed, oil, nutrition, plant.*

EFFECT OF DIFFERENT CALCIUM (CA^{+2}) AND POTASSIUM (K^{+}) DOSES ON SOME GROWTH PARAMETERS OF TOMATO PLANTS UNDER DROUGHT STRESS

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Abstract

The aim of this study was to determine whether, by applying different doses of calcium (Ca) and potassium (K) to drought stress (PEG-6000), would increase the tolerance of tomato plants under drought stress. In the study, Adamset type F1 hybrid seedling was used. In the study, plants were grown in hydroponic culture using a Hoagland nutrient solution at a light intensity of 400 µmol m-2s-1 at 65% humidity at 20 ° C in a 16/8 hour light/dark photoperiod in a controlled climate. Doses of 200 ppm, 250 ppm, 300 ppm, 350 ppm and 400 ppm of Ca and doses of K were applied to the nutrient solution. When the plants werewith 5-6 leaves, Hoagland was added in the nutrient solution to 7% of the polyethyleneglycol (PEG-6000). The samples were taken after the plants were under the stress of drought for 7 days. Total plant weight, root, stem and leaf weights, stem size and diameter and number of leaves were determined. In addition, 1-5 scales of plants affc ted by stress were examined. In the study, it was seen that there were differences between Ca + K doses in terms of plant growth parameters. Against drought stress, it was determined that the best plant growth was in plants where doses of 250 ppm and 300 ppm of Ca applications were applied. In addition, it was observed that, morphologically, the least damage was in these applications and that the lowest scale value was obtained and the most harmful effect was in plants with applied 400 ppm Ca.

Keywords: *Tomato, drought, PEG-6000, calcium, potassium, plant growth.*

EFFECT OF CHILLY STRESS ON ANTIOXIDANT ENZYME ACTIVITIES OF WATERMELON (*CITRULLUS LUNATUS*)

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Abstract

In this study, watermelon genotypes belonging to Citrullus lunatus were used as material. These materials belong to Tunceli, Çorum, Amasya, Erzurum and Sivas regions. These regions show different ecological characteristics of the geography of Turkey. Seeds were obtained from the Menemen Research Institute GenBank. In addition, the F1 hybrid type Golden Crown was used in the experiment. The aim of the study was to investigate superoxide dismutase (SOD), catalase (CAT) and ascorbic peroxidase (APX) from the antioxidant enzyme activities of the leaves of the plants of the genotypes in order to measure the stress response of the plants by applying cold stress to the watermelon seedlings. After 4-5 true leaves formed, the seedlings of six different watermelon genotypes were cultured in the growth chamber controlled climate conditions, in the Hoagland nutrient-containing cups. For the application of cold stress, plants were kept for 5 days at the $+4^0$C temperature in the air conditioning room. As a result of the research, it was seen that there were differences between genotypes in terms of antioxidant enzyme activities as well as differences between controls and applications. The highest value of CAT and SOD activity was found in Erzurum and Sivas genotypes, while the highest value in APX activity was found in Tunceli and Çorum genotypes**.**

Keywords: *Watermelon, Citrullus lanatus Cold stress, antioxidant enzyme activities.*

ORNITHOGALUM SPECIES CONSUMED AS MEDICINAL PLANT

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Abstract

Turkey is the gene center of many plant species. There are some documents about studies on the preservation, sustainability and evaluation of plants found in natural flora. The most of plants are collected uncontrollably from nature. They are consumed fresh, dried or processed with different methods. Some of them are *Ornithogalum* species known as Turkish name "Çiğdem, Tükrükotu, Sakarcan". *Ornithogalum*, a member of the family Hyacinthaceae, contains around 150 species. Geofit is a plant. There are 44 species in Turkey, 17 of which are endemic. It grows with onions and seeds. The plant grows up well in barnyard area, not processed soil and hazelnut fields. White flowering bulbs were collected from the mid of February until the end of April from nature. These onions can be consumed as fresh, boiled, roasted, pickled and preserves. The onions contain saponin. It is used as digestive system activator, constipation reliever, diabetes and cholesterol control. The gathering of the plant with its bulbs in the flowering period prevents both the onions and the seeds from being transferred to the next generation. This situation will cause ornithogalum species to disappear of from nature. In this research, the growing areas of *Ornithogalum* species collected from nature in Turkey, consumption forms as medicinal plant or vegetables and their consumption purposes were mentioned. In addition, with the survey conducted, lost amount by collecting from the nature was determined during the last 10 years.

Keywords: *Ornithogalum, saponin, geofit, medicinal plant.*

DETERMINATION OF POMOLOGICAL AND BIOCHEMICAL PROPERTIES OF SOME STANDARD APPLE CULTIVARS IN DIFFERENT PERIODS

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Abstract

Purpose of this study was to determine pomological and some biochemical properties of five standard apple cultivars in two different periods. In the first stage of the study, the fruits were taken to the experiment after being harvested from the garden. The highest antioxidant levels were found in the Fuji variety (0.71 µmol Troloxy equivalent/g wet weight) and the highest phenolic compounds in the Top Red variety (201.03 mg GAE/kg wet weight). The highest flesh firmness in the Granny Smith variety (94.4 N), the average water-soluble total dry matter in the Fuji variety (14.8%) and the highest titratable acidity level (TA) in the Granny smith (1.53%) variety were determined. In the second phase of the study, relevant analyzes were applied to the same varieties purchased from the local bazaar and markets. According to the analysis results, the highest antioxidant (0.58 µmol Troloxic equivalent/g wet weight), and the phenolic compound level (156.73 mg GAE/kg wet weight) were confirmed in the Fuji variety. In the related analyzes the highest antioxidant (0.58 µmol Troloxic equivalent/g wet weight), and the phenolic compound level in the Fuji variety (156.73 mg GAE/kg wet weight) were recorded. The highest fruit flesh firmness, average water soluble total dry matter (SCC) and titratable acidity (TA) were been identified in the varieties of Granny Smith (89.3 N), Fuji (12.5%) and Granny Smith (1.02%) respectively.

Key words: *Apple, pomological, antioxidant activity, total phenol.*

POMOLOGICAL AND MORPHOLOGICAL CHARACTERISTICS A NEW MUTANT PRUNUS CERASIFERA EHRH.

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Abstract

For researching purposes hardwood of Apricot scion (*Prunus armeniaca cv.* Malatya) was grafted on the five years old *Prunus cerasifera pissardii nigra*, which was accepted as a rootstock. After 3 years of the experiment, while the normal development was going on, a new and different shoot arose out from the apricot section. Fruits, leaves and fruit colours of this new shoot did not look like those of *Prunus cerasrifera* or apricot.The conclusion was that this branch (shoot) arisen from the apricot might be the result of a bud- mutation or bud sport. Horticulturally, mutation (within clones) has been observed through the sudden appearance of branches or whole plants with marked specific characteristics. There are referred to as bud mutation and have sometimes given risen to important new cultivars. In this study short pomological, phenological, morphological and fruit characteristics of this new mutant plum emerged as a result of bud mutation were determined. For this purpose, time of bud burst, full blooming, leaves size and fall, fruit weight, width and length, firmness, length of fruit stalk, harvesting time, fruit colour, stone weight, percentage of total soluble solids, pH, total acidity, evaluated of flavor(by 1-5 scale) were taken into consideration.

Keywords: *Rootstock, Scion, Mutant, Plum.New fruit.*

EFFECTS OF DIFFERENT GIBBERALIC ACID (GA3) AND MYCORRHIZA (*GLOMUS* SPP) DOSES MULTIPLICATION OF POTATOES MINI TUBERS

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Abstract

This research was carried out in partially controlled conditions in the polycarbonate greenhouses of Field Crops Department of Faculty of Agriculture, Tokat Gaziosmanpasa University in 2016. In the study, it was aimed to determine the effects of different doses of mycorrhiza (0, 500, 1250, 2000 mg/100 tubers) and gibberellic acid (0, 5, 10, 15 ppm) on the multiplication of mini tubers produced from some potato clones by meristem culture. Also, in this research, it was aimed to produce seed tubers needed for location experiments by multiplying mini tubers obtained through meristem culture from clones numbered GOU-3/110, GOU-6/28, GOU-7/12 and GOU-10/15 in the TUBİTAK-TOVAG 214O115 project. The experiment was established in the randomized complete block in a split plot design with three replications. According to results, the highest number of seed tuber for GA3 and mycorrhiza applications, carried out in separate experiments, were obtained from 15 ppm and 500 mg/100 tuber doses and for tuber yield per plant from 15 ppm GA3 dozes and 1250mg/100 tuber mycorrhiza applications, respectively.

Keywords: *Potato, GA3, Mycorrhizal fungi, mini tuber.*

PROBOSCIS MORPHOLOGY AND ECOLOGY OF THE ADONIS BLUE (*POLYOMMATUS BELLARGUS)* (ROTTEMBURG, 1775) FROM TURKEY (LEPIDOPTERA: LYCAENIDAE)

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Abstract

The Adonis blue (*Polyommatus bellargus*) is a butterfly from the Lycaenidae family. The caterpillar reaches 1.6 centimetres in length, has a dark green body with dark spines, and yellow bands along the back and sides. The preferred habitat of the Adonis blue is calcareous grasslands with hot and dry climatic conditions. The Adonis blue is bivoltine, with adults usually flying from mid-May to mid-June and early August to mid-September. They are not specific in their choice of a nectar source, generally utilising the most common flowers present. The mouth parts of Lepidoptera mainly consist of the sucking part; this is known as the proboscis. The proboscis consists of two tubes held together by hooks and separable for cleaning. The proboscis contains muscles for operating. Each tube is inwardly concave, thus forming a central tube upward which moisture is sucked. In the resting position, the proboscis of the Adonis blue (*P. bellargus*) is coiled so tightly that the surface of consecutive coils are in close contact and the outer most coil touches the ventral side of the head. The number of coils varies from 4 to 5 coils in the proboscis of *P. bellargus.* In the scanning electron microscope (SEM) examination, the outer surface of the proboscis of *P. bellargus* has cuticular structure and a great number of sensilla. The proboscis has different types of sensilla (sensillum basiconicum, bristle-shaped sensillum trichodeum and sensilla styloconica). Sensilla trichodeum are only on the external surface of the proboscis, but sensilla styloconica become scattered toward the tip. Sensilla basiconica each have a short blunt-tipped sensory cone and both on the external and internal surface of the galea. Internal sensilla basiconica form a single row in the food canal. The morphology of the proboscis and the distribution of sensilla are adapted to food habits.

Keywords: *Proboscis morphology, sensilla, Polyommatus bellargus, SEM.*

PROBOSCIS MORPHOLOGY AND ECOLOGY OF LARGE CABBAGE WHITE (*PIERIS BRASSICAE* LINNAEUS, 1758) (LEPIDOPTERA: PIERIDAE)

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Abstract

Pieris brassicae, the large white, also called the cabbage butterfly, is a butterfly from the Pieridae family. It is common throughout Europe, North Africa, and Asia. A female butterfly lays masses (50-100 egg) of yellow eggs on underside of leaves of the Crucifera species. After egg hatch, the caterpillars feed on the leaves. The fully-grown caterpillar leaves the plant. The pupa is anchored by a spindle of silk. The adult butterflies are active from April through October, feeding on nectar from a wide array of plants. Compared with the proboscis of other nectar-feeding insects, the proboscis of Lepidoptera has several unique features. It forms a flat vertical spiral when at rest. In the resting position the proboscis is coiled so tightly that the surface of consecutive coils are in close contact ant the outer most coil touches the ventral sıde of the head. The number of coils varies from 3 to 5 coils in the proboscis of *P.brassicae*. Examined with the scanning electron microscope (SEM), the outer surface of the proboscis is fluted with cuticular processes and a great number of sensilla. The numerous cuticular processes have different shapes in different regions of the proboscis. They are spin or hair-like in the dorsal and the ventral galeal walls of the proboscis and interlocked between the consecutive coils in the resting position. *P.brassicae* proboscis has different types of sensilla (sensilla chaetica and sensilla basiconica). Sensilla chaetica are only on the external surface of the proboscis and become scattered toward the tip. Sensilla basiconica has a short blunt-tipped sensory cone and both on the external and internal surface of the galea and on the tip of the proboscis. Internal sensilla basiconica form a single row in the food canal. We used SEM to elucidate the fine structure of the proboscis of *P. brassicae*.

Keywords: *Pieris brassica, proboscis, ecology, morphology, SEM.*

SOME PROPERTIES DETERMINED IN CONFECTIONARY SUNFLOWER PLANT IN PROGRESSIVE SELFING-GENERATIONS

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Abstract

Sunflower (Helianthus annuus L.) is cultivated in many countries of the world due to its high adaptability and is being used for various purposes. It is primarily produced for sunflower, confectionery, ornamental plant, fodder, and other purposes for agriculture in order to obtain oil. As a confectionery production and consumption have an economy that can not be underestimated. In this respect, there is a need to develop varieties of confectionery sunflower. Approximately for 10 years, 36 lines have been selected by single plant selection and have the ability to be combined with each other. In the study, promising lines in the third year of the self-fertilization phase were used. In each line, 10 plants were isolated before flowering and prevented from taking polen from the outside. Results of the study were shared in 2017. Characteristics discussed: self-fertilization rate, plant height, disc diameter, disc shape, full achene, empty achene, achene length and achene width. Significant changes were observed in the plant height and table size in the lines due to depression of the self-fertilization. In addition, deformations were detected in the shape of disc. An increase in the rate of full achene in the subsequent selfing generations has been observed as a positive development.

Keywords: *Sunflower, breeding, confectionery, selection.*

INDUSTRIAL HEMP: AN IMPORTANT ACHIEVEMENT FOR THE ENVIRONMENT

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Abstract

It is important to research and develop sustainable production methods to protect the environment and natural water resources and transfer natural resources to future generations. Hemp is an important industrial plant. The industrial, medical and commercial properties of hemp have been known for many years. However, it has emerged in recent years to be sustainable and environmentally friendly. To summarize the eco-friendly properties of hemp:

Woody hemp plant has low humidity, quickly builds up and instant energy is high. This provides less dependence on fossil fuels, which are non-renewable energy sources and which cannot meet the long-standing global demands. Hemp stalks have much lower lignin content than trees. Thus, the dough is faster and easier to prepare. Since the hemp hull has a natural shine, there is no need for chlorine bleaching, which is used in traditional paper mills and gives a toxic substance called dioxin to the environment. The use of cannabis also has environment-friendly features in the construction sector. Hemp-based composite fiber sheets are stronger and sharper than those made of wood. The combination of hemp fiber and lime is stronger than concrete. It also has sound and heat insulation properties. Bio-based plastics can be made of long hemp fibers and they are as strong as fiberglass. It will be able to provide significant contributions to reducing environmental pollution due to its spontaneous disintegration after a certain period of time. Being active in the agriculture and industry sector of the hemp will help to protect the environment and will leave a cleaner and greener world for future generations.

Key words: *Hemp, environment, sustainability, energy.*

PROBOSCIS MORPHOLOGY OF *TRETOPTERYX PERTUSALIS* (LEPIDOPTERA: PYRALIDAE)

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Abstract

Tretopteryx pertusalis Geyer, 1832 first time described from Greece. The monotypic moth is from the Pyralidae family. In this study, specimens are obtained from museum material in Turkey. The external structures of the proboscis were examined with scanning electron microscope (SEM). In the resting position the proboscis is coiled so tightly that the surface of consective coils are in close contact and the outer most coil touches the ventral side of the head. The number of coils varies from 3 to 4 coils in the proboscis of *T. pertusalis*. A short tip region is characterized by rows of intake slits leading into the food canal. Along the dorsal, the lateral and ventral sides of the proboscis have sensilla trichodea, sensilla basiconica and sensilla styloconica. They are distributed in varying patterns, depending on their distance from the base. The sensilla basiconica of the external proboscis surface is arranged in irregular rows, whereas in the food canal they form a single row. In the proximal region of the proboscis, there are numerous sensilla trichodea, bearing trichom of different lengths that are distributed on the lateral surfaces. In the distal region of the proglottis there are sensilla styloconica. Sensilla styloconica compose of short stylus with spines positioned around sharp-tipped sensory cones. The morphology and distribution of the proboscis sensilla in *T. pertusalis* were investigated in order to contribute to the understanding of feed behaviour of moths.

Keywords: *Tretopteryx pertusalis, proboscis, morphology, sensilla, SEM.*

SURFACE MORPHOLOGY OF THE EGGS OF *NEOLYCAENA SOEZEN* SEVEN 2014 (LEPIDOPTERA: LYCAENIDAE)

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Abstract

The genus *Neolycaena* de Nicéville, 1890 belong to the Lycaenidae family Leach, 1815. *Neolycaena soezen* Seven**,** 2014 first time described from Turkey. It is a local and rare species. The preferred habitat of the *N. soezen* is the anatolian gypsum steppe. This species is univoltin, with adults usually flying in the period from the end of April to mid- May. Adult females leave their eggs one by one on the plant stems. Eggs of *N. soezen* were collected from a food plant (Garagana) in the Eskisehir province. *N. soezen* larvae are fed with *Caragana grandiflora*. Approximately 10 eggs were examined and measured with an Olympus SZX12 light microscope. For scanning electron microscope (SEM), the eggs were cleaned and air-dried before being mounted with double-sided tape on SEM stubs. They were then coated with gold in a Polaron SC 502 Sputter Coater, and examined with a JEOL JSM 6060 LV SEM. In this study, filaments covering the eggs and chorion structure of *N. soezen* were studied both with light and scanning electron microscopy. The spherical eggs were about 0.72-0.75 mm long and 0.36-0.37 mm wide. A half of the eggs was covered with hairs like filament from their bodies and the rest of the egg was flattened. This filament-like hairs may therefore perform multiple roles. They act as a physical barrier against both predators and adverse weather. The surface of the egg chorion of *Neolycaena soezen* is covered polygonal cells. There are aeropile in the corners of these polygons. Here we present a first-time description of the egg structure of *Neolycaena soezen* using both light microscopy and SEM with some notes on the life cycle of the moth.

Keywords: *Neolycaena soezen, egg morphology, chorion, SEM.*

EVALUATION OF TWO NATIVE ORANGE VARIETIES IN TERMS OF ORANGE JUICE PRODUCTION

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Abstract

Several properties of two orange varieties (“Kozan Yerli’’ (KY) grown in Adana Province of Turkey and “Finike Yerli’’ (FY) grown in Antalya Province of Turkey) were determined during maturation in order to evaluate these varieties in terms of orange juice production. The increase in the size and the weight of the oranges at the maturation period increased the orange juice yield. Sucrose was found as the primary sugar in these two orange varieties. Amounts of sucrose were found to be 3.3-4.3 g/100 g and 4.1-4.6 g/100 g for KY and FY, respectively. Glucose (2.1-3.2 g/100 g for KY and 3.3-3.5 g/100 g for FY) and fructose (2.0-2.8 g/100 g and 2.8-2.9 g/100g for KY and FY, respectively) were the other sugars determined in these orange juices. Citric acid (811.6-843.7 mg/L for KY and 726.7-742.0 mg/L for FY) was the dominant organic acid in the orange juices obtained from these native orange varieties. Other organic acids were ascorbic (545.1-560.1 mg/L and 501.4-530.2 mg/L for KY and FY, respectively) and malic (58.2-81.3 mg/L for KY and 54.1-61.4 mg/L for FY) acids. Colors of the juices obtained from the oranges at different stages of maturation were almost similar. The major carotenoid in these orange juices was ß-carotene. Kozan Yerli, however, had higher amounts of ß-carotene than Finike Yerli. As a result of this study, “Kozan Yerli” orange is more favorable than “Finike Yerli” for the orange juice production.

Keywords: *Orange, Sugar, Carotenoid, Organic acid.*

EFFECT OF DN1 BACTERIAL STRAIN APPLIED BY DIFFERENT METHODS ON SOME MORPHOLOGICAL CHARACTERISTICS OF STRAWBERRY CV. SAN ANDREAS (*FRAGARIA X ANANASSA* DUCH.)

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Abstract

There have been quite intensive studies on the use of Plant Growth-Promoting Rhizobacteria (PGPR) in agriculture. *Acidovorax facilis* strain DN1 is one of the PGPR commonly used. The effect of DN1 bacterial strain on some morphological characteristics of strawberry cv. San Andreas was investigated. The DN1 bacterial strain was applied via soil, leaf, and soil + leaf, for 3 months (once a month) to strawberry plants. The DN1 spores were prepared with 0.2% boron, 10% corn starch and distilled water. The bacterial solution was applied to plants at the following day with a hand pump (to leaves; 50 cc) and graduated cylinder (250 cc each 5-liter pot). After 3 treatments, plants removed from pots and data collected. According to the results, DN1 bacterial strain often had a positive effect on the morphological and fruit characteristics. Spraying treatment was the most effective way for the stem and root traits we evaluated (crown diameter: 36.87 mm; stem fresh weight: 63.64 g; leaf number: 38.69; root fresh weight: 34.89 g). In addition, soil + leaf treatment had a positive effect on mean fruit weight (23.57 g) and fruit diameter (27.64 mm). The effect on other properties was also positive, but the root length (26.34 cm) was reduced in leaf treatment compared to the control (29.69 cm). It is expected that the most effective treatment is the combined (leaf + soil) treatment, while the leaf treatment may be the most effective method on soils with boron toxicity.

Keywords: PGPR, DN1 (*Acidovorax facilis*) strawberry, and boron (B).

PLANT AND PRODUCTIVITY CHARACTERISTICS OF SOME POMEGRANATE GENOTYPES IN GAZIANTEP CONDITIONS (TURKEY)

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Abstract

In the study, plant and productivities of six pomegranate varieties and types (‘Kışnarı’, ‘Kirli Hanım’, ‘Nuz Ekşi’, ‘Çekirdeksiz’, ‘Hicaz’ and ‘Oğuzeli Çekirdeksiz’') were evaluated. The experiment was designed according to completely randomized design with five replications having single tree in each replication. In this study, the plant specifications such as tendency suckers from the base, branching condition, spiny situation, canopy width and height, and productivity such as yield per plant (kg/plant), yield per unit canopy volume(kg/m^3), yield per shoot length (kg/cm), yield per canopy geometric projection (kg/m_2) were determined for pomegranate varieties and types. Fifteen and more suckers from the base were observed for all varieties and types. Kışnarı and Kirli Hanım varieties had often branching while others had mid often branching. Hicaz and Kirli Hanım had medium spiny while the others had more spines. Canopy width and heights of Kışnarı and Kirli Hanım cultivars were higher than those of other genotypes. Kışnarı, Nuz Ekşi and Hicaz varieties had more yield per plant (14.8 kg,13.7 kg ve 13.3 kg, respectively) than the others. Oğuzeli çekirdeksiz and Nuz ekşi had higher yield per canopy volume (5.85 kg/m^3 and 4.81 kg/m^3 , respectively) than the others while Nuz Ekçi and Hicaz had higher value than the other types and varieties for yield per canopy geometric projection (4.74 kg/m2 and 4.49 kg/m^2, respectively).

Keywords: *Punica granatum**,** suckers**,** spiny situation**,** yield.*

PHENOLOGICAL AND POMOLOGICAL CHARACTERISTICS OF VARIOUS POMEGRANATE GENOTYPES IN GAZIANTEP ECOLOGICAL CONDITIONS

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Abstract

This study was carried out at the pomegranate experimental orchard of Pistachio Research Institute in Gaziantep, Turkey. The objective of the study was to determine phenological and pomological characteristics of various pomegranate cultivars and types. Altitude of the experimental site was 705 m a.s.l. (38° 57' N). In the experiment, six pomegranate types and cultivars ('Kışnarı', 'KirliHanım', 'Nuzekşi', 'Çekirdeksiz', 'Hicaz', 'Oğuzeli Çekirdeksiz') were used. The experimental cultivars were planted on 1 x 5 m in 2006 as one-year-old plants. The plants were irrigated by drip irrigation since their transplantation. Pomegranate plants were formed as shrubs form with 3-4 trunks. The experiment was designed according to completely randomized design with five replications having single tree in each replication. In the study, some phenological observations (first flowering, full flowering and as well as fruit maturation date) fruit pomological analyses [such as fruit weight (g), fruit size (mm), seed weight (g), soluble solid (SS) (%), titratable acidity (%), pH, and fruit cracking ratio (%)] were determined. Fruits were harvested between 5 October and 11 November. The cultivars and types had a range of 168-453 g for fruit weight, 52-61% percent arils, 30-49% juice rate, 13.8-16.5% total soluble solids (TSS), 0.21-1.23% titratable acidity and 17-56% cracking rate.

Keywords: *Punica granatum, fruit characteristics, phenological stage.*

THE EFFECTS OF 2,4-D AND BAP ON *IN VITRO* SOMATIC EMBRYOGENESIS IN QUINOA (*CHENOPODIUM QUINOA* WILLD.)

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Abstract

Chenopodium quinoa Willd. is a pseudocereal that is an annual broad-leaved plant, 1–2 m tall with deep penetrating roots and can be cultivated from sea level upto an altitude of 3800 m. The plant shows tolerance to frost, salinity and drought, and has the ability to grow on marginal soils and also is highly nutritious due to its outstanding protein quality and wide range of minerals and vitamins. The grain protein is rich in amino acids like lysine and methionine that are deficient in cereals. Somatic embryogenesis is the main plant tissue culture method used in *in vitro* mass production, synthetic seed production, and gene transformation. The effect of different concentrations of BAP (6-benzylaminopurine)-2,4-D (2,4-dichlorophenoxyaceticacid) on *in vitro* somatic embryogenesis from shoot apex and stem explants of quinoa (*Chenopodium quinoa* Willd.) was studied. The most commonly used auxin type to promote callus formation and somatic embryogenesis was 2,4-D in previous studies. The highest percentage of seed germination was obtained in full strength MS medium on 5% NaOCl application for 5-10 minutes (100%). Best embryonic callus induction (100%) was observed on MS medium supplemented with 0.5 mg/l 2,4-D for shoot apex explants. The callus which was produced in this treatment was compact and of high quality for somatic embryogenesis. We think that this work will be used to develop the virus-free and saponin level reduced cultivars on quinoa.

Keywords: *Chenopodium quinoa, Quinoa, somatic embryogenesis, 2,4-D, BAP.*

A STUDY ON PLANT HEIGHT CONTROL OF *IRIS* FLOWERS

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Abstract

We investigated the effect of paclobutrazol as preplant bulb soaks on plant height of *Iris x hollandica* cv. 'Frans Hals' and 'Blue Magic'cultivars which were grown in pots. Bulbs of iris were soaked into gibberellin inhibitor paclobutrazol solution at 0, 15, 30 ppm before planting. Effect of paclobutrazol on the flowering time, flower diameter and length, leaf length, plant height, flower life, and chlorophyll content of leaves were determined. The shortest plant height was obtained from the 'Blue Magic' cultivar treated with 30 ppm paclobutrazol which gave plants with 11.3 cm, 68% shorter than untreated control. 'Frans Hals' cultivar treated with 30 ppm paclobutrazol was 20.9 cm and 50% shorter than control. In 'Blue Magic' and 'Frans Hals'cultivars the lower dose of 15 ppm paclobutrazol were also effective on height control with 11.8 and 21.5 cm plant height, respectively. This gibberellin inhibitor also shortened the leaf length of iris cultivars. Paclobutrazol treatments resulted in higher chlorophyll content per unit area in the leaves. The highest chlorophyll content (57.00 CCI) was obtained from the 'Blue Magic' iris treated with 30 ppm paclobutrazol, while the control plants had 32.70 CCI chlorophyll in their leaves. Chlorophyll content of 'Frans Hals' treated with 30 ppm paclobutrazol were 52.87 CCI, while control plants of this cultivar were 28.80 CCI. Plants applied with paclobutrazol resulted with smaller flower diameter compared to the control plants of both cultivars. The smallest flower diameter was obtained from 30 ppm paclobutrazol treatment with 38.83 mm in 'Blue Magic' iris while the control of this cultivar was 99.63 mm. The flower diameter of 'Frans Hals' cultivar treated with 30 ppm paclobutrazol was 109.1 mm, while the control one was 112 mm.

Keywords: *Paclobutrazol, Bulb Soak, Iris x hollandica, Plant Height.*

APOMIXIS IN SUGAR BEET BREEDING

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Abstract

Sugar beet is a variety of the species *Beta vulgaris* L. (*Beta vulgaris* L. ssp. vulgaris convar. crassa Alef. var. altissima Döll. = var. *saccharifera* Lange) belonging to sec. *Vulgares*. In breeding hybrid cultivars, plant breeders exploit the phenomenon of heterosis where the performance of the hybrid exceeds the average performance of the parents. Apomixis is another mode of sugar beet reproduction for use in breeding. Apomixis is a mechanism of seed formation without fertilization and a powerful plant breeding trait in species, potentially a powerful breeding tool to fix heterosis. The major advantage of apomixis over sexual reproduction is the possibility to select individuals with desirable gene and to propagate them as clones. It simplifies the process of commercial hybrid and cultivar production and enables a large-scale seed production. If apomixis is effectively exploited as a breeding tool, hybrid seed breeders would not need to make crosses each year and heterosis would be retained and duplicated year after year. The commercial hybrid production method could be simplified without fertility control and field isolation. The apomictic hybrids display valuable pest resistance. Traditional breeding systems require four to eight generations of selfing, backcrossing of lines before advance trials. The aim of this abstract is to identify use of apomixisprovide for practical breeding in the near future.

Key words: Beta vulgaris *L., heterosis, hybrid, selfing, backcrossing.*

THE DETERMINATION OF SOME AGRONOMIC CHARACTERS OF MAIZE AND COWPEA VARIETIES AT THE INTERCROPPING SYSTEM

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Abstract

Intercropping system is traditionally done in Middle and East Black Seaof Turkey. Maize and bean intercropping type is the most common type in this region. The morphology, cultivation and usage form of cowpea is very similar to bean. But it is more resistant to drought. For this reason the potential for the spread of cowpea farming is high in this region. This study was conducted to determine maize and cowpea potential within the near and alternative row in maize and cowpea intercropping system in Bafra-Samsun condition. In this study, 2 registered cowpea varieties [Sırma (S) and Ülkem (Ü)] and a maize variety [Sabia (M)] were sown sole and intercropping at the 70 cm row spacing. The eight different intercropping arrangements (1.M+Ü, 2.M+S, 3.1M+1Ü and 4.1M+1S in near ridge, 5.2M+1S, 6.2M+1Ü, 7.1M+2Ü, 8. 1M+2S in alternative ridge) and 3 sole sowing were sown in the completely randomized block design with three replications. According to result of the study, it was concluded that 1 maize+2 cowpea intercropping system was the most suitable for food seed. Ülkem was variety climbed to maize in especially the near ridge pattern and causing fall down of maize. If the climbing cowpea variety is to be used in the intercropping system, maize must be tall and thick stem.

Key words: *intercropping, cowpea, maize.*

EVALUATION OF THE NEW F1 WALNUT GENOTYPES WITH HIGH NUT QUALITY IN TURKEY

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Abstract

Turkey is reported to be the genetic origin of Juglans regia. The selection breeding methods are used in walnut variety breeding program in Turkey. The aim of the GOÜ walnut breeding program is to provide new walnut cultivars by crossing for the Turkey walnut industry. The primary goal is to develop cultivars with late leafing, lateral fruit bearing, early harvest dates, and good nut quality. In this study Pedro, Hartley, Akça and Oğuzlar 77 walnut varieties were used in the crossings. The pomological characteristics of the F1 genotypes were examined in the breeding plot. The characteristics of the F1 walnut genotypes were compared with the Chandler. In F1 genotypes, the nut length was between 39,80 mm (55-58-15) –60,01 mm (55-58- 10), nut suture 33,00 mm (55-58-15) –58,93 mm (55-58-10), nut cheek 31,80 mm (55-58-15) –50,12 mm (55-58-10). The average nut weight was determined between 15,17 g (55-58-15) to 34,43 (55-58-10), kernel weight ranged from 10,08 g (58-178) to 14,95 (55-58-12) and kernel percentage changed from 42,40 % (55-58- 10) to 70,41% (3A2/2), shell thickness 0,52 mm (3A2/2) – 1,86 MM (55-58-78). The leafing time of new F1 walnut genotypes is later than Turkish cultivars.

Keywords: *Juglans regia, late leafing, lateral bud fruitfulness, crossing breeding.*

THE EFFECTS OF DIFFERENT POTATO GENOTYPES YIELD CHARACTERISTICS OF DIFFERENT ALTITUDES

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Abstract

This research was carried out in Tokat-Erbaa (230m), Tokat-Kazova (640m) and Tokat-Artova (1200m) in 2017 in Turkey. In different maturity groups 20 potato genotypes were used in the study. Fifteen (15) of these genotypes were advanced breeding clones and it was aimed to determine the responses of these clones to different altitudes. The experiment was established in the randomized complete block in a split plot design with three replications. According to the results of the research, Agria variety (4142.25 kg/da) and GOU-7/12 clone (4093.25 kg/da in Tokat Erbaa, Agata variety (3928.4 kg/da) and GOU6/28 clone (3927.7 kg/da) in Tokat Kazova and PAI-8.16 (4930.6 kg/da), PAI-8.8.57 (4695.7 kg/da) in Tokat Artova were determined as higher yielding other genotypes. It has been determined that the tuber yields per decare from the early season to the high altitude towards the late season increases from the low altitude to the late season.

Keywords: *Potato, tuber yield, altitude.*

THE STABILITY OF SOME QUALITY CRITERIA IN POTATO GENOTYPES AT DIFFERENT LOCATIONS

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Abstract

This study was done as a part of the studies carried out on breeding potato varieties adaptable to central-north intersectional region. This study started in 2007, with about 20 thousand hybrid potato seedlings and as a result of clonal selection. Twenty clones, performing excellent characteristics in terms of yield and quality characteristics, were subjected to the analysis of stability in terms of genotype x environment interactions. The study was conducted under Tokat-Niksar, Tokat-Kazova (2012-2013) and Tokat-Artova (between 2011-2012 and 2012-2013) conditions as a randomized complete block design with 3 replications in 8 different environments, as the years and locations were accepted as an environment. In the study, four commercial varieties were tested as standards beside white, cream, light yellow and dark yellow clones. The data were subjected regression analysis. Based on the Finlay-Wilkinson regression coefficients, some of the clones (A7-12, T5-4, T11-10, T5-14, A3-15, A3-167, and T10-8) which had better yield and quality characteristics than commercial varieties, showed good adaptation to specific environments while the clones (T6-28 and A3-234) had good adaptation to all the environments (Tokat-Niksar, Tokat-Kazova, and Tokat-Artova). Also in terms of dry matter, A13-1 was identified as a clone with higher (28.4%) dry matter contents.

Keywords: *Potato, Clone Selection, Solanum tuberosum, Breeding, Stability Analysis.*

DETERMINATION OF HAY YIELD OF HUNGARIAN VETCH + CEREAL MIXTURES GROWN UNDER HAZELNUT ORCHARDS

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Abstract

The aim of this study was to determine the hay yield of different Hungarian vetch + cereal mixtures sown under hazelnut orchards. This study was carried out in Sinop province, Turkey where 50% Hungarian vetch + 50% oat and 50% Hungarian vetch + 50% triticale mixtures were sown in October 2017. Also, natural vegetation under trees was used as control. Twenty quadrats were harvested from both mixtures and control area. The analyses of variance with 20 replicates randomized plots design was used for hay yield and t test was used in order to determine weed suppression caused by mixtures. As a result, it was determined that hay yield of mixtures was considerably higher than in control plot as a natural vegetation statistically and these mixtures suppressed weed under hazelnut trees. All plants found in natural vegetation were not consumed by animals. These plants also competed with other plants having high hay quality in terms of water, nutrition and light. In the study, Hungarian vetch oat and triticale had high yield because they were annual plants and had large habitus and, also, Hungarian vetch as a legume in the study stimulated the biological nitrogen fixation. These were the reasons of high yield of mixtures. Even though it is not possible to cultivate forage plants as an undersowing in all hazelnut gardens in the region, the forage production in the hazelnut orchards should be suggested in the areas where the land structure is suitable. This provides also weed control in the area.

Keywords: *Corylus avellana, Fodder crop, Hazelnut plantation, Pasture.*

GENOTYPING OF ESCHERICHIA COLI STRAINS ISOLATED FROM CLINICAL SAMPLES BY PULSED-FIELD GEL ELECTROPHORESIS

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Abstract

E.coli is one of the hundreds of bacteria that cause sickness in humans. Those are often multi-resistant and can generally cause several intestinal and extra-intestinal infections such as urinary tract infections, meningitis, peritonitis, mastitis, septicemia and Gram-negative pneumonia. With the more frequent use of invasive devices in hospital care, these types of nosocomial infections have increased, particularly in seriously ill patients. In order to decrease transmission of bacterial strains between patients and to study the epidemiology of these bacteria, it is of great importance to develop rapid and specific methods to be able to subtype on strain-level. In this study, a total of 47 *Escherichia coli* strains isolated and identified from various clinical samples were investigated to determine their genetic relationships. Pulsed-field gel electrophoresis method (PFGE) was used to characterize the genetic relationship and diversity of *E. coli* isolates. Currently, Pulsed field gel electrophoresis (PFGE) is often considered the "gold standard" of molecular typing methods for bacterial pathogens. The phylogenetic dendrogram of strains were established according to PFGE profiles obtained after restriction with *Xba*I. At a similarity level of 80 %, the results of PFGE separated the *E. coli* strains into 39 distinct groups representing 4 subtypes. Based on the result obtained from study it was concluded that PFGE analyze revealed very high genetic diversity among strains and was shown to possess high discriminatory power in typing clinical isolates.

Keywords*: Clinical samples, E.coli, Pulsed-field gel electrophoresis.*

AGROBIOLOGICAL FEATURES OF MUSTARD (*BRASSICA JUNCEA L*) IN UKRAINE UNDER CURRENT CLIMATE CHANGE CONDITIONS

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Abstract

The market for oilseeds in Ukraine is a large segment of the general market for agricultural products. Mustard (*Brassica juncea*L) is an oilseed crop that can restore the optimal ratio of crops in crop rotation and not reduce the rates of economic activity. Ukraine is among the top ten world leaders in its cultivation. The warming trends observed over the last 30 years in the world and in Ukraine, allow growing of mustard throughout the country. Consequently, it became necessary to develop varietal technologies for growing mustard for specific soil and climatic conditions. The objective of this research was to develop cultivation technology for *Brassica juncea*L in the conditions of the north-eastern forest-steppe of Ukraine for the first time. We studied the influence of weather conditions on the peculiarities of growth, development, formation of biomass, photosynthetic activity, productivity indices, yield, seed quality, oil production, depending on the variety, sowing time, seeding rates and fertilizer for growing bluish mustard. According to research results, for the formation of 1.71-1.91 t/ha of bluish mustard seeds in the conditions of the north-eastern forest-steppe of Ukraine on typical black soil, the cultivation technology should include: use of seeds of modern high-yielding adapted varieties; start sowing at soil temperature of 4-5 ^{o}C at a depth of 10 cm; the rate of fertilizer $N_{30}P_{30}K_{30}$ (during pre-sowing cultivation) and seeding rates of the varieties Prima - 1.5 million pieces/ha, and Retro -2.0 million pieces/ha.

Keywords: *bluish mustard, sowing date, fertilizer rates, seeding rates, yield.*

PARAMETERS OF BIOLOGICAL CIRCULATION OF PHYTOMASS AND NUTRITIONAL ELEMENTS IN CROP ROTATIONS

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Abstract

The circulation of field crops phytomass and nutritional elements is one of the efficient factors of development of a specific (as opposed to virgin) cultural process of soil formation and soil fertility formation. The research shows, that an increase of phytocoenoses provided an increase of phytomass volume in the biological cycle from 63.5 to 114.3 t/ha. The yield of phytomass in a crop rotation, different in structure and set of crops, was as follows: for four-field and five-field crop rotation - 63.5-86.7 t/ha, six- field - 89.4, seven-field - 96.9, and eight-field - 114.3 t/ha. The optimization of the ratio of grain, technical and fodder crops allowed us to regulate quantitative parameters of crops' phytomass, which was alienated from agrocoenosis. The yield of the main products, alienated from the field was, as follows: in four-field crop rotation - 20.7 t/ha, five-field - 26.6, six-field - 37.8, seven field - 28.4 and eight field - 41.3 t/ha, which was 32.6%, 30.7%, 42.3%, 29.3% and 36.1%, respectively. The rest returned to the soil with by-products and crop remains. The total amount of nutrients (NPK) in the phytomass, involved in the circulation, was within the range for four-field crop rotation (100% of grain crops) – 1,814 kg/ha, five-field (80% grain and 20% technical) – 2,368 kg/hectare, six-field (66.8% of cereals, 33.2% of technical ones) - 2,599 kg/ha, seven-field (57.2% of cereals and 42.8% of technical) - 2,956 kg/ha, eight-field (62.5% of cereals, 25.0 % of technical, 12.5% of fodder) – 3.491 kg/ha.

Keywords: *Crop rotation, phytomass of crops, Biological circulation.*

CHARACTERISTICS OF NEW MULTI-FLORET BREEDING LINES OF RYE

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Abstract

One of the ways to increase the yield of rye is to create varieties that must have three or more grains in a spikelet. In this study, the authors compare new multi-floret variety and breeding lines of rye: Levitan, lines №15-14, №16-14, №17-14, №25-14, which have stable 3-d and 4-th grain in spikelet. The weight of 1000 grains of these lines is from 33.1 to 42.4 g, fertility is 68 - 91%. Levitan is a potentially four-floret variety, as it is capable of forming the additional third and fourth flower. An analysis of the correlation dependencies between the elements of the ear structure for multi-floret lines was carried out. There was a positive correlation between the number of grains in the main ear and the amount of grains received from all the flowers, from the 2nd to the 5th (r = 0.73, 0.93, 0.78, 0.33). The positive correlation between the weight of grains from the ear and the weight of grains from certain flowers separately was also: to the weight of grain from the 2nd flower - r = 0.71, 3rd flower - r = 0.57, and 4th flower - r = 0.35. There was a negative correlation between the total weight of grains from the ear and the weight of grains from the 5th flower. In general, the fertility of additional flowers has a positive effect on the formation of weight of grain from the plant.

Keywords: *Rye, Multi florets, Fertility.*

SEASONAL IMPACT ON SOME QUALITY TRAITS AND BIOMASS YIELD OF COOL SEASON TURF GRASS GENOTYPES IN SAMSUN CONDITIONS

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Abstract

This study was carried out in order to determine adaptation and some quality traits of some cool season turf grass cultivars at randomized plot design with 4 replicates in Ondokuz Mayis University Experimental Area during 2010-2012. Plot size was 2 m² (1×2 m). In the research 5 cultivars of *Festuca arundinaceae* (Fa), 6 cultivars of *Lolium perenne* (Lp), 5 cultivars of *Festuca rubra commutate* (Frc), 6 cultivars of *Festuca rubra rubra* (Frr), 5 cultivars of *Festuca ovina* (Fo), 7 cultivars of *Poa pratensis* (Pp), 2 cultivars of *Poa trivalis* (Pt), 1 cultivar of *Agrostis stolonifera* (As), 2 cultivars of *Agrostis capillaris* (Ac), 1 cultivar of *Agrostis tenuis* (At) and 1 cultivar of *Festuca rubra trichophylla* were used. Leaf form (1-9), leaf colour and ranging of leaf colour depending on the seasons (1-9), regeneration power (1-5), fresh and dry biomass yields (g m^{-2}) were investigated. Cultivars of *Festuca arundinacea* were different from the others as coarse form (3.3). Two cultivars of *Agrostis stolonifera* were also the same coarse form group. There were pronounced colour change of the whole cultivars depends on the seasons. Compare to the others, colour change of *Festuca rubra* and *Festuca ovina* cultivars were limited. While the highest regeneration power was *Festuca rubra trichophylla*, the lowest was determined for *Poa trivialis*. Four cuttings were made in the second year. The highest biomass yield was obtained from the first cutting and it decreased by advancing cuttings. The lowest fresh biomass yields were obtained from *Poa pratensis* and *P. trivialis* cultivars (62,69 and 97,77 g m^{-2} respectively). *Festuca arundinacea* cultivars produced low and similar biomass yield for each cutting.

Keywords: *Turf grass, Seasonal change, Colour, Biomass yield, Quality.*

DETERMINATION OF PROTEIN, FAT AND FATTY ACID CONTENTS OF WALNUT GENOTYPES IN BESNI AND GÖLBAŞI DISTRICTS (TURKEY)

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Abstract

Anatolia is one of the centers of the germplasm of nuts and this fruit species is grown in almost every region there. There are a lot of seedling walnut populations with wide genetic variation in Turkey. This provides a very important potential for walnuts breeders. Walnuts are a functional food ingredient rich in nutrients such as protein, vitamins, and minerals. The most important characteristic of walnut oil is the plenty of polyunsaturated (PUFA) fatty acids such as Omega-3 and Omega-6, which makes it a unique food because of the high amount of linoleic acid. Unsaturated fatty acids play an important role in human nutrition, so walnuts become an indispensable part of human nutrition. Therefore, walnut production and consumption in World and Turkey are increasing every year. In this study, some chemical compositions were determined for 14 promising walnut genotypes in Besni and Gölbaşı (Adıyaman Province) in Turkey. The protein rates of walnut genotypes were determined to vary between 13.69% and 19.85%. We have also found that the oil content of these walnut genotypes varies between 49.44% and 60.87%. Oleic acid contents of walnut genotypes ranged from 14.434% to 30.052%. In addition, linoleic and linolenic acids contents of walnut oils were found between 49.647% and 63.534%, and 7.731% and 15.097%, respectively. This study has confirmed the presence of high percentage of oleic, linolenic and linoleic acids in walnut.

Keywords: W*alnut, fat, protein, fatty acids.*

2. PLANT PROTECTION AND FOOD SAFETY

ANTIFUNGAL ACTIVITY AGAINST PATHOGENIC FUNGI AND PGPR TRAITS OF RHIZOSPHERIC ACTINOBACTERIA

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Abstract

All species of plants, wild and cultivated, are subjected to diseases, although each species is susceptible to characteristic pathogens. Plant diseases cause a significant loss, it is 40% in industrialized countries and over 50% in developing countries. The occurrence and prevalence of plant diseases vary from season to season, depending on the presence of pathogens, environmental conditions, and crops varieties grown. The rhizosphere is rich in actinobacteria. This bacterial group has strong biocontrol capacity against plant diseases. In this study, isolation of plant pathogenic fungi was conducted on infested vegetable plants and cereal crops. The work was focused on the evaluation of antifungal capacity of actinobacteria against pathogenic fungi and their PGPR traits. Six strains of actinobacteria (*Streptomyces griseus* Lac1, *S. rochei* Lac3, *S. anulatus* Pru14, *S. champavati* Pru16, *Nocardiopsis dassonvillei* Vic8 and *N. alba* Pin10) isolated from rhizospheric soils of the semi-arid region in Northeast Algeria were used. These strains were tested for their ability to produce auxin (indole-3-acetic acid: IAA) in the presence of L-tryptophan (L-Trp) as a precursor, to hydrolyze phosphate and to produce siderophores. Thus, three phytopathogenic fungi were isolated and identified, namely: *Fusarium culmorum* TRI-1, *F. oxysporum* CIT-4, *Botrytis cinerea* SL-1. The *in vitro* antagonism of the actinobacteria strains against the phytopathogenic fungi showed that, except *N. alba* Pin10, the other actinobacteria inhibited the growth of all tested fungi, and *S. griseus* Lac1 presented the most significant activity. IAA was detected in all strains with L-Trp as a precursor and the quantities varying from 2.57 to 12.10 µg/mg DW. Four strains produced siderophores and only two hydrolyzed phosphate. This study revealed the antifungal activity and some PGPR traits of actinobacteria belonging to the genera *Streptomyces* and *Nocardiopsis*.

Key words: *Actinobacteria, Botrytis, Fusarium, IAA, phosphate, siderophores.*

CONTENT OF PB, FE, CU AND ZN IN THE FIG AND HIP FRUIT ON DIFFERENT AREAS

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Abstract

In everyday diet, fruits and vegetables are used more and more because of their well known beneficial effects on human health. Population is mostly oriented on consummation of greater amounts of fruits that are planted in their surroundings. The Herzegovinian area is well known after figs and hips, during the history. These kinds of fruits are common for this area, and they are available for all population layers such as poor ones and rich ones as well. Both cultivations are available during the whole year and they can be consumed both as fresh ones and processed as well. This research had an aim to establish, on the science base, the way that metal went from the ground to the fig and hip fruit and their accumulation in these fruit cultivation. We chose different locations all around Mostar city area and its suburb. Our research showed that certain fig fruits, with or without peel, had different contents of researched elements, but content in all fruits was under permissible level. It was very interesting that all fig samples with peel showed higher level of iron presence, when we compared them with samples without peel. The presence of iron, copper and zinc was shown in the hip fruit, with or without mesocarp, and the levels were under permitted ones. Generally, we could say for the hip fruit that zinc, iron and copper were mostly accumulated in samples of grain with mesocarp instead of pure grain.

Keywords: *fig, hip, ground, heavy metals.*

RAGWEED AND MUGWORT POLLEN (ASTERACEAE FAMILY) - MONITORING AND COMPARATIVE ANALYSIS OF SEASONAL DYNAMICS DURING 2011-2017

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Abstract

In addition to appearing in crops, weeds may pose a risk to human health, indirectly due to the widespread use of herbicides and directly, because they are source of pollen that in susceptible people can cause allergic reactions. Among the weed species, the main allergens are the species of the botanical family: Asteraceae, Amaranthaceae, Urticaceae, Euphorbiaceae and Plantaginaceae. Asteraceae family includes 1,100 genera and 20,000 species, which is one of the largest flowering plants. However, in our area as a potential allergen the most important is Ambrosia and Artemisia pollen. Sampling of ragweed and mugwort pollen during the pollination period 2012-2017 was conducted in urban part of Banja Luka in PI AIRS, BL with Hirst sampler using the method defined by the International Association for Aerobiology (IAA). The first mugwort pollen grains in 2011 were recorded at the end of May, during 2012 and 2016 in the first decade of June, and from 2013 to 2015, as well in 2017 in the second decade of June. Mugwort pollination period lasted for an average of 55 days and it was characterized by low (1-10 p/m^3) to moderate (11-50 p/m^3) concentrations. The ragweed period pollination during the seven-year monitoring lasted, on average, about 115 days. High concentrations (51-500 p/m^3) were recorded between the second decade of August to the third decade of September, while very high concentrations (>501 p/m^3) were recorded only in 2011. On an annual basis not only the season of ragweed pollination lasted longer, but the results of the monitoring and comparative analysis showed significantly higher % share of ragweed pollen within the weed species in the family Asteraceae in the city of Banja Luka.

Keywords: *pollen, ragweed, mugwort, seasonal dynamics, Banja Luka.*

ANTIBACTERIAL ACTIVITY OF DOMESTIC APPLE CIDER VINEGAR

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Abstract

In recent years, interest in examining the chemical composition and pharmacological properties of apple cider vinegar in synergy with the application of natural products in the pharmaceutical, food and cosmetics industry has been growing. The apple vinegar shows a wide range of biological activities (antimicrobial, antioxidant, anti-diabetic, anti-inflammatory, antihypertensive, immune-stimulatory, anticancer) and it has been used in traditional medicine for a long time. It consists of 8 essential amino acids (phenylalanine, isoleucine, leucine, lysine, methionine, threonine, tryptophan and valine), organic acids, enzymes, minerals (potassium, calcium, phosphorus, copper, grape and boron) and vitamins (provitamin C, vitamin A, E, B1, B2, B6, vitamin P and provitamin Beta-carotene). The aim of the study was to examine the antibacterial activity of traditionally produced apple cider vinegar and to determine whether it exhibits bactericidal or bacteriostatic activity. The results of the study confirmed the antibacterial activity of apple cider vinegar produced with the traditional method. Its antibacterial activity is in the range of 11.33mm to 14mm.

Key words: *bactericidal, bacteriostatic, antibacterial, therapeutic effects, vinegar*.

ANALYSIS OF THE PRODUCTION OF SEED POTATOES IN REPUBLIC OF SRPSKA (BOSNIA AND HERZEGOVINA)

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Abstract

In Entity of Republic of Srpska (Bosnia and Herzegovina), average annual production of potatoes is produced on an area of about 15.000 ha, and the average yield is 11.9 t ha^{-1}, while the seed potato production represents about 80 ha, which is only about 8% of the total needs for Republic of Srpska. The largest part of seed production is located in the municipality of Rogatica, about 54 ha. This is influenced by agroecological conditions, but also by the tradition of potato production in this area. The analysis of seed potato production was conducted in the association of farmers „Solanum produkt", where the seed potatoes were grown on 30 hectares, and mercantile potatoes on about 8 hectares. A two-year study (2014 and 2015) was performed on 5 varieties (Agria, Faluka, Kennebec, Kurada and Desiree) which were grown on the larger areas on "Solanum produkt." In the two-year study the highest yield was found in Desiree variety with an average yield of 18.6 t ha^{-1}, while Kurada variety had the lowest average yield of 14.05 t ha^{-1}. In 2014, the average potato yield was 21.4 t ha^{-1} and in 2015 average potato yield was 27.9 t ha^{-1}. For all varieties we noticed a large variation in yield due to agro-ecological conditions, and lack of moisture in the embryo phase and in the filing of tubers. Since this is a seed potato production, it is necessary to take care of the size of tubers because the large tubers are not desirable. In 2014, there was a higher percentage of seed tubers because of the influence of weather conditions and the timely interruption of vegetation, while percentage of small tubers increased in 2015. In the case of seed production, it is necessary to stop the vegetation earlier, in order to obtain a greater percentage of seed tubers.

Keywords: *seed potatoes, variety, yield, tuber yield structure.*

CWR OF GRAIN LEGUMES IN BULGARIA

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Abstract

This paper presents information from the first phase of Bulgarian and international *in situ* conservation of grain legumes CWR projects. An expedition investigation has been carried out in regions indicated in the flora of Bulgaria as well as other preliminary studies. Description of several species localities has been carried out in Strandzha Mountain and Kaliakra Natural Reserve - North Black Sea region, which during the past years of species, belonging to the group of rare species in Bulgaria: *Pisum elatius L., Cicer monbretii, Lupinus albus* and *Vicia incisa*. The number of population sand concomitant species have been defined. Seed material for *ex situ* collection has also been collected. It has been found, that the main limiting factors for disturbing condition of natural habitat sare the invasive plant species and some socio-economic reasons. We consider it is necessary to undertake a profound analysis for the situation of preserving the CWR in Bulgaria and to coordinate this activity with all scientific centers and institutions. It is imperative to prepare an action plan and monitoring.

Keywords: *Grain legumes, CWR, in situ conservation, ex situ collection, Action plan, Monitoring.*

FIRST RECORD OF THE BROWN-BANDED COCKROACHES, *SUPELLA LONGIPALPA* (F.) IN NEW VALLEY, EGYPT

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Abstract

The tropical cockroach, *Supella longipalpa* (Fabricius) (Blattodea: Ectobiidae) was detected as pest for the first time in El-Kharga, New Valley, Egypt. The city is the capital of the New Valley Governorate and located in the south-west of the western desert in Egypt (24°32'44" N, 27°10'24" E, altitude 32 m) and has a hot desert climate with annual average relative humidity 37.9%. These special conditions in this region are very suitable for proliferation the brown-banded cockroach, *Supella longipalpa*. The complaint led to the inspection of infested houses, using glue traps and the brown-banded cockroaches were found in every room where they showed a preference for high places, often around furniture and sometimes in the kitchen. In addition, they were found in subsequent surveys, confirming the establishment of this species in this region. The brown-banded cockroaches lately have invaded the houses, restaurants and hospitals in this region. Many of adults, nymphs and oothecae were obtained after their rearing under room conditions. The aim of this study was to recognize current information gaps about this pest in the New Valley area to acquire more knowledge about health-related effects and prospective management of *Supella longipalpa* in Egypt. This paper reports the first detection of tropical roach, *S. longipalpa*, as an urban pest in New Valley, Egypt. For enhanced management of *S. longipalpa* an intelligent pest management program is required. Sanitation, harborage removal, glue traps and insecticide baits are advised to be used in an integrated manner.

Keywords: *Blattodea, Furniture roach, Tropical roach, urban pest, Egypt*.

EFFECT OF EXTRACTION CONDITIONS, HEAT TREATMENTS AND SPRAY-DRYING ON STABILITY OF ROSELLE ANTHOCYANINS AS NATURAL FOOD COLORANTS

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Abstract

The present study was designed to investigate the effect of spray-drying as microencapsulation technique on the stability of roselle calyces (R.C.) anthocyanins. Different extraction conditions were evaluated to identify the best extraction presider for extracting roselle anthocyanins. The results showed that using 2% citric acid solution by 1: 10 solids: solvent ratio with a crushed flower at 85°C for 20min. was the best condition for extraction of the red pigments from roselle calyces and recorded the highest anthocyanin yield of 1229mg/100g R.C. Total phenolic contents (TPC) and antioxidant activity was determined and the results showed that roselle calyces had TPC ranged from 12.16 to 14.45mg. gallic acid equivalent /g. depending on the extraction solvent. Methanol: water (80:20 V/V) recorded the highest TPC. Results also reflected that R.C had a strong antiradical efficiency of 0.727 and EC_{50} of 1.37μg roselle extract/μg DPPH. Thermal stability of roselle anthocyanins was investigated and the results showed that roselle extract heated at 95°C for 30 min. recorded retention value of 80.017%. The effect of three different encapsulating agents i.e. maltodextrin D.E. 18.7, gum Arabic and whey protein isolate on pigments stability was investigated. Maltodextrin DE 18.7 was found as the most effective carrier in stabilizing the pigments under the storage conditions examined with a half-life of 577.62days. The application results proved that the addition of encapsulated roselle anthocyanins as a natural color with the level of 0.3 % in a strawberry drink model system and 0.5% to jelly formulation was acceptable and can replace the synthetic color.

Key words: *Roselle (Hibiscus subdariffa L), Anthocyanins, Encapsulation, whey protein, shelf-life, jelly.*

THE ECONOMIC PARTNERSHIP AGREEMENT BETWEEN THE EUROPEAN UNION AND JAPAN: A COMPARATIVE ANALYSIS WITH FOCUS ON THE QUALITY STANDARDS IN THE AGRI-FOOD SECTOR

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Abstract

In 2013, the European Union (EU) initiated negotiations for an Economic Partnership Agreement (EPA) with Japan, one of the largest economies in the world and a key trading partner. After 18 rounds of negotiations, both partners agreed on the principles and implementation of this Free Trade Agreement (FTA) on 6 July 2017. The final EU-Japan agreement is expected to enter into force at the beginning of 2019 and will give both economies a major boost, lowering tariffs and trade barriers as well. Primarily, it will open new markets for agri-food export. Moreover, it is another strong example of the global supply chain matters and the sharing of values and interests. This study outlines the current situation of quality standards used in the EU and Japan. Japan, as well as the EU, have their own regulatory schemes applied to labeling, certification and trade in the agri-food sector. The purpose of this study is to investigate the differences between their standards and gain more insight into their similarities. The research has three major objectives. Firstly, the food safety regulations of the EU and Japan will be discussed more detailed. Secondly, the primary investigation of this paper is to compare those food safety standards and focus on their equivalency issues. Finally, the study insists on the necessity of understanding the importance of the emerging issues from food safety equivalency in relation to trade between the EU and Japan. Thus, the main research question, namely, till what extent are the food safety standards between the EU and Japan equivalent, will be answered and analyzed in this paper.

Keywords: *agri-food industry, food safety, quality standards, EU-Japan Economic Partnership Agreement (EPA), Free Trade Agreement (FTA).*

CONTROL OF *CERATITIS CAPITATA* (WIEDEMANN) (DIPTERA:TEPHRITIDAE) WITH MASS TRAPPING ON WASHINGTON ORANGE IN ANTALYA PROVINCE OF TURKEY

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Abstract

The Mediterranean fruit fly (Medfly), *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae) is one of the important pests of citrus in Turkey. The Medfly is a polyphagous tropical fruit fly which attacks more than three hundred and fifty botanical species from sixty five different families. The females puncture the fruits and lay eggs below the skin of the host fruits, which are destroyed by larval feeding. The study was conducted to control of *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae) with mass trapping on washington orange in Antalya province of Turkey. Fourty eostrap® invaginada traps baited with 95% trimedlure impregnated in a polymeric plug-type dispenser were used in both years. After two years of the study, the average number of the catches per trap varied in the sampling period. In the first year, a total of 894 adults were caught by traps the average number of the catches per trap was recorded between 1 and 2 percent. The highest number of catches per trap was recorded on 1st November, followed by 6th September and 15th November 2016. In the second year, a total of 408 adults were caught by traps. The average number of the catches per trap was recorded between 1 and 2 percent. The highest number of catches per trap were recorded on 11th October, followed by 13th September, and 6th September 2017.

Keywords: *Ceratitis capitata, Washington orange, pheromone traps, Antalya province.*

STUDY ON THE ALLELOPATHIC EFFECT OF *AMARANTHUS RETROFLEXUS, DATURA STRAMONIUM* AND *PANICUM MILIACEUM* ON THE GERMINATION OF MAIZE

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Abstract

The plant extract of *Amaranthus retroflexus* showed an inhibitory effect on the development of both cotyledons and rootlets in the Petri dish trials. In the pot experiments, among the three examined weeds, dry plant residues of *A. retroflexus* hindered the germination of maize to the greatest extent. Also in the pot experiments, it showed a negative effect on the shoot length and weight, while a positive effect on the root length and weight. A 2.5% concentration of *Datura stramonium* plant extracts showed a stimulative effect, but the 5% and 7.5% extracts inhibited the shoot and root development of germinating maize. In spite of the 60% germination rate, the incorporation of dry plant residues into the soil did not show any significant effect on the development of shoots, but a stimulative effect on root development was observed. However, the dry weight of roots exceeded the control values only at a concentration of 7.5%. The plant extract of *Panicum miliaceum* had a stimulative effect on the shoot and root development of maize. The dry plant parts in the soil of the pots hindered the germination of maize, but significant effect on the shoot and root lengths could not be proven. At the 7.5% ratio the dry weight of shoots was higher than the control values, but all the other soil-plant part rations caused lower values.

Keywords: *dry weight, germination, weed extract, root, shoot.*

THE ROLE OF *SOLANUM NIGRUM* IN THE SPREAD OF POTATO VIRUSES

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Abstract

Solanum nigrum is a common, high-spread weed throughout the country. It occurs commonly in arable lands and agricultural areas, and likes high nitrogenous soils. It can spread anywhere, where the right living conditions are met. The biggest problem is caused by cultures belonging to the same genus, especially in potatoes. In many ways, this relationship is unfavorable: it makes difficult to use herbicides, the weed can easily absorb many important nutrients from the crop and greatly promotes the spread of viruses from infected weeds. The aim of the experiment was to determine the virological examination of *Solanum nigrum*, and to determine the viruses appearing on the collected samples. The examined plant samples were collected in the autumn, from the potato peaks around Keszthely, Central Transdanubia, Hungary. A total of 55 *Solanum nigrum* plant samples were tested. More developed individuals with viral symptoms were collected. In order to detect viral infections, DAS ELISA serological method was used. Of 55 samples, we could diagnose viral infections in 30 cases. Epidemiological studies showed *Potato virus A* (PVA) and *Potato virus Y* (PVY) in most of the cases: PVA in 24 cases, PVY in 21 cases. In 10 samples *Tobacco mosaic virus* (TMV). *Potato virus X* (PVX) 3 samples, *Tomato mosaic virus* (ToMV) 2 samples were identified. *Tomato spotted wilt virus* (TSWV) was not detected in the collected samples. In most cases, complex viral infections were observed. Six types of virus complexes were diagnosed from 20 multiply infected plants. 12 samples showed PVY, PVA complex, PVY, PVA, TMV complex on 4 samples, PVX, PVY, PVA, TMV, ToMV complex, PVX, PVY, PVA TMV complex, PVX, PVY, PVA complex and TMV, ToMV complex appeared only at 1 plant. Our results point to the huge role played by weeds in spreading viruses. In our study, it has been shown that *Solanum nigrum* can not only carry a pathogen in most cases, but it can also carry more than one. Therefore, weed control is of particular importance.

Keywords: *Solanum nigrum, PVX, PVY, PVA, TMV, ToMV.*

INVESTIGATION OF THE IN VITRO REGENERATION OF *ASCLEPIAS SYRIACA* AND *SORGHUM HALEPENSE*

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Abstract

According to the Hungarian weed surveys, the significance of the *Sorghum halapense* and the *Asclepias syriaca* is growing significantly. Today, Johnsongrass is the most important weed of maize, and their field coverage in Hungary is over 1%. It is ranked on the 11th place on maize fields, which shows its significance. The northeastern part of the country is the most infected. The common milkweed is spreading in more and more places. In 2002 there were more than 200,000 hectares infected. Its proliferation continued both on wheat and maize fields. It is spreading predominantly in the northeastern part of the country, but its appearance can be expected anywhere. The aim of our study was to observe the regeneration of two perennial weeds, using the vegetative reproductive organs of common milkweed and johnsongrass, under controlled in vitro conditions. For this purpose, a climate chamber experiment was set up at Keszthely with different lengths of root segments (1, 3, 5 nodes and 1, 5, 10 cm), at the Plant Protection Institute, University of Pannonia. The different sized vegetative organs were regularly measured, and the renewal capabilities of the two weeds were concluded. According to our experience, the initial size of the segments had an effect on the shoots generated by them. By increasing the size of the roots the number of buds increased. The buds in the direction of the apex formed the longest shoots, because of the abolition of apical dominance. However, the larger initial size did not mean clearly higher values in the average length of the shoots. For the defense against perennials, we need to combine our capabilities, think towards an integrated approach, and if it is required, we need to use herbicides against the perennial weeds. This is the only way now, which can be used for a long period of time to suppress the foes of our crops.

Keywords: *Hungary, regeneration ability, apical dominance, Sorghum halepense, Asclepias syriaca.*

FATTY ACID COMPOSITION OF LOQUAT FRUIT (*ERIOBOTRYA JAPONICA* L.)

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Abstract

Eriobotrya japonica L., loquat, is a large evergreen tree of the Rosaceae family, which is mostly cultivated for its tart fruit. The aim of this study was to investigate the total oil and fatty acid composition of the mesocarp and seed of laquat fruit grown in southern Iran. The averages of oil content were 1.21% and 14.3% for mesocarp and seeds, respectively. Gas Chromatography – Flame Ionization Detector revealed that unsaturated fatty acid content in laquat mesocarp (75.43%) was higher than that of seeds (51.46%). Oleic acid was the main fatty acid both in mesocarp (30.25%) and seed (25.92%). Other fatty acids of mesocarp were linolenic acid (23.38%), linoleic acid (17.28%), palmitic acid (16.76%), stearic acid (6.39%), and arachidonic acid (3.04%), respectively. While, lignoceric acid (19.39%), palmitic acid (16.56%), arachidonic acid (12.55%), stearic acid (11.35%), linoleic acid (8.14%), and palmitoleic acid (3.98%) were the major components in fatty acids of seeds, respectively. This study predicts that loquat seed oil could be stored safely during a longer period than mesocarp oil and could be used in cosmetic and pharmaceutical products. Based on the large amount of loquat seed oil and its fatty acid composition, it is recommended more research should be conducted using this natural oil in edible and non-edible products.

Keywords: *Fruit, gas chromatography, oil, oleic acid.*

ISOLATION, CHARACTERIZATION AND FORMULATION OF ANTAGONISTIC BACTERIA AGAINST FUNGAL PLANT PATHOGENS

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Abstract

Concerns regarding food safety and the environment have led to reduced use of agrochemicals and the development of sustainable agriculture. In this context, biological control of fungal plant pathogens can improve global food availability, one of the three pillars of food security, by reducing crop losses, particularly for low-income farmers. Antagonistic bacteria are common soil inhabitants with potential to be developed into biofungicides for the management of fungal plant pathogens. In this study, antagonistic bacterium was isolated from the commercial compost from a Resen factory for compost and screened for its growth inhibition of fungal pathogens in laboratory tests. The zone of inhibition (mm) was recorded by measuring the distance between the edges of the growing mycelium and the antagonistic bacterium. Five replications were maintained for each isolate. Based on phenotypic characteristics, biochemical tests, and sequence analysis of 16S rRNA, the antagonistic bacterium was identified as *Paenibacillus alvei* (strain DZ-3). The bacterium suppressed the growth of all five tested fungal plant pathogens (*Fusarium oxysporum, Rhizoctonia solani, Alternaria alternata, Botrytis cinerea* and *Plasmopara viticola*) in *in vitro* conditions over. The survival of antagonistic bacterium in peat and talc formulations decreased time at room temperature, but the populations remained above 10^8 CFU/g during the 180-day storage period. This study suggests that this bacterium can be developed and formulated as biofungicides for minimizing the crop losses caused by fungal plant pathogens and diseases caused by them.

Keywords: *biocontrol, fungal plant pathogens, biofungicides, antagonistic bacteria.*

NEW AREAS OF INVASION WITH *HELIANTHUS TUBEROSUS* (JERUSALEM ARTICHOKE) IN REPUBLIC OF MACEDONIA

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Abstract

A population of *Helianthus tuberosus* L., an invasive plant species native to the North America, has been recorded in 2016 nearby village Gradište and along side the regional road R 1204 (Gradište, Skačkovce, Dobrošane and Kumanovo) in the Northern mountainous part of the Republic of Macedonia. *H. tuberosus* is a new alien species to the Macedonian flora. The surveys revealed an intensive growth and low to medium dense population of *H. tuberosus*. The population's density was not quantified, but several stands of different sizes were found. An ecological risk assessment, mainly based on knowledge about invasion histories in north-western and central European countries, showed that this species is a serious threat to Macedonian biodiversity. Biological invasions of *H. tuberosus* affect biodiversity worldwide and, consequently, the invaded ecosystems may suffer from significant losses in economic and cultural values. As the species with potentially high negative influence on biodiversity, *H. tuberosus* is the threat to biodiversity in wet habitats, natural and extensively managed habitats, riparian areas and swamps. It grows best in habitats repeatedly disturbed by floods (riparian areas), but may also occur in ruderal and agricultural environments. Although many herbicides can be used to control *H. tuberosus*, their use is limited as the plants are often near water ways where herbicide uses is not recommended. The other control methods, however, are time consuming, and could be quite costly.

Key words: *Helianthus tuberosus, alien weed, Republic of Macedonia, environmental impact, forecast.*

EVALUATION OF THE DAMAGE RATES OF LEOPARD MOTH, *ZEUZERA PYRINA* L. (LEPIDOPTERA: COSSIDAE) IN OLIVE ORCHARDS IN HATAY PROVINCE OF TURKEY

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Abstract

The leopard moth, *Zeuzera pyrina* L. (Lep. Cossidae), is one of the significant pests of olive trees in Turkey. The leopard moth is a xylophagous species that attacks the shoots and branches of numerous fruit-bearing in larval states, and may cause the death of young trees or loss of the branches in old trees. The study was carried out to evaluate damage rates of the leopard moth in 'Gemlik', 'Ayvalık', 'Savrani' and 'Karamani' varieties of olives orchards in Antakya, Yayladağ, Belen and Altınözü districts of Hatay province of Turkey. Evaluation of the damage rates of the pest in each of the sampling orchard were done by counting numbers of the damaged branches and trucks of olives trees. As a result of investigation, the damage rates of this pest varied in each of the sampling varieties. The highest damage rates of the leopard moth were observed in 'Gemlik A' with 90 percent, located in Antakya (Arpahan village) district, following 'Gemlik B' with 40 percent, located in Yayladağ district. On the other hand, the damage rates of this pest were not observed at the 'Ayvalık', located in Belen district, 'Savrani' and 'Savrani' +'Karamani', located in Altınözü district of Hatay province.

Key words: *Leopard moth, Zeuzera pyrina, olive trees, damages rates.*

INSECTICIDAL AND ANTIFEEDANT ACTIVITY OF THE ETHANOLIC EXTRACTS FROM *ALLIUM ROTUNDUM* L.

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Abstract

The species of the genus *Allium* L., one of the largest genera of higher plants, occupying a significant place in the modern plant world, are of great interest both from the theoretical and from the practical point of view. Plants of *Allium* spp. accumulate a large amount of carbohydrates, phenolic compounds (flavonoids and its glycosides, coumarins, anthocyanins, catechins), amino acids and organosulfur compounds, such as allicin – a precursor for alkaloids and saponins formation. Secondary metabolites of *Allium spp*. have been successfully used during the past few decades in plants protection against pests and pathogens. We have earlier reported about high insecticidal and antifeedant properties of extracts from *A. subhirsutum* L., *A. narcissiflorum* Vill. and *A. ramosum* L. The highest insecticidal properties against imago (20.0%) and larvae (60.0%) of *Leptinotarsa decemlineata* (Coleoptera: Chrysomelidaea) were demonstrated by extract from aerial part of *A. subhirsutum.* The purpose of this investigation was to determine the insecticidal, antifeedant and repellent properties of *A. rotundum* L. extracts against various species of insects. As a result, it was found that the ethanolic extracts from the aerial part possessed the moderate level (40.0%) of insecticidal properties against the larvae of the *L. decemlineata* and low – against the imago (6.7-13.3%). Moreover, the extracts of *A. rotundum* showed moderate level of insecticidal, antifeedant and repellent activity against the larvae of lepidopterans (cotton budworm *Helicoverpa armigera* and wax moths *Galleria mellonella*).

Keywords: *Allium rotundum L., extract, insecticidal, antifeedant, repellent*.

THE EFFECTS OF ADDING LENTIL SEMOLINA ON THE NUTRITIONAL QUALITY OF FORTIFIED COUSCOUS

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Abstract

Couscous is a traditional dish for Moroccan population, based on wheat semolina and habitually consumed on Fridays and days of family reunion, its design is different according to the regions and according to the availability of the raw material (wheat, barley ...). In order to contribute to the reduction of malnutrition in Morocco, this study was carried out. Legumes including lentils have a great role in human diet, they are commonly consumed for their nutritive value specifically proteins and iron. Lentil is among the oldest and most appreciated grain legumes of the Old World. Thus, the current investigation aims to enhance the nutritive value of conventional Moroccan couscous through its preparation by incorporation of lentil semolina into its components. Four experimental variant proportions of grains legumes semolina (25, 50 and 75%) were analyzed, with couscous made of grains lentil semolina only (100%L) and of grains wheat semolina only (0%L) as control. From nutritive point of view, the higher contents of proteins, iron and potassium were found in couscous with addition of 75% of lentil semolina. In effect, the lower content was recorded for conventional Moroccan couscous, and more the percentage of incorporation increased more its content of proteins, iron and potassium increased. Contrariwise, more the percentage increased more carbohydrates and sodium contents decreased. From technological point of view, the addition of lentil semolina at 25% presented the closest results to the technological parameters of conventional Moroccan couscous. Microbiological tests revealed that couscous of wheat semolina only is a favorable environment for the growth of microorganisms. The nutritional value of lentils and their technological characteristics are useful in increasing nutritional and technological value of fortified conventional Moroccan couscous.

Key words: *Malnutrition, Couscous, Bio-fortification, Legumes, Morocco.*

EFFECTIVENESS OF BENEFICIAL BACTERIA *PSEUDOMONAS* SPP.TO CONTROL GREY AND GREEN MOLD

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Abstract

The green mold and the grey mold, caused by *Penicillium digitatum* and *Botrytis cinerea* respectively, are the major postharvest diseases of tomatoes and citrusand other species as well. Synthetic fungicides are the primary means to control these diseases.However,thechemical residues in the food and environmental safety make it unwanted. Biological control using microbial antagonists is one of the most promising alternatives to chemical fungicides. *Pseudomonas* spp. produce many antifungal metabolites, previously shown to be effective against a wide range of fungi. In this study, the inhibitory effects of *Pseudomonas putida* Q172B, *P. fluorescens*Q110B and *P. fluorescens*Q036B, isolated from tomato roots in Agadir-Morocco, on *B.cinerea* and *P. digitatum* were examined. The effect of *Pseudomonas*strains was observed on the inhibition of mycelium elongation by production of soluble and volatile metabolites. The results showed the antagonism effect of three strains. The inhibition rate ranged from 39 to 54% for *P. digitatum*, and 66% for *B.cinerea* for all three strains. Forvolatile metabolites,100% of mycelium inhibition was recorded in *B.cinerea* for all three strains, but 44% was the maximum mycelium inhibition recorded in *P. digitatum*. Our result highlights that the *P. putida*Q172B and *P. fluorescens*(Q110B and Q036B) can be used as a non-chemical alternative treatment to control postharvest diseases of fruits.

Key words: *Biologicalcontrol, Botrytis cinerea, Penicillium digitatum, Pseudomonas fluorescens, Pseudomonas putida.*

RESPONSE OF SPRING BREAD WHEAT QUALITY AND YIELD PARAMETERS TO DIFFERENT DROUGHT SCENARIOS UNDER MOROCCAN CONDITIONS

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Abstract

Under climate change, the release of productive bread wheat cultivars with high quality standards is a major challenge in Moroccan wheat breeding program. The aim of the present study was to investigate drought stress influence on productivity traits and the main relevant quality parameters (grain protein content, quantity and strength of gluten) and to select new performing genotypes. Fourteen elite and national genotypes of bread wheat were evaluated in two Moroccan contrasting locations (favourable and semi-arid) during two consecutive seasons (2014-2015). Besides, electrophoretic patterns of seed storage proteins profiles using SDS-PAGE technique were performed. Results indicated that 2014 cropping season presented drier climate compared to 2015 season for both experimental sites. The analysis of variance showed significant effects of genotypes, site, year and site x year for yield traits and almost all quality parameters (P<0.001). The mean grain yield ranged from 3.92 t/ha to 2.49 t/ha under favourable and semi-arid conditions respectively. Moreover, protein content varied from 14.44% in semi-arid location to 12.52% in favourable site. The drought affected negatively all parameters at favourable and semi-arid regions. However, the genotypes behaviour at the driest year (2014) was similar for both sites based on mean comparison. Therefore, the genetic differencesin terms of quality were restricted because of drought stress.The correlation analysis showed negative correlation between yield and gluten content (r=-0.32**) at the driest environment. Also, both gluten and protein content showed negative correlation with biomass, plant height and number of grain per fertile spike.

Keywords: *bread wheat, drought, qualityparameters, yield, electrophoretic analysis.*

EVALUATION OF POPULATION DENSITY OF EUROPEAN GRAPEVINE MOTH, *LOBESIA BOTRANA* (DENIS & SCHIFFERMÜLLER) (LEPIDOPTERA: TORTRICIDAE) ON DIFFERENT VARIETIES OF VINEYARDS IN HATAY PROVINCE (TURKEY)

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Abstract

The grape berry moth, *Lobesia botrana* (Denis & Schiffermüller) (Lepidoptera: Tortricidae), is one of the important pests of wine vineyards in Hatay province of Turkey. The current study was conducted to determine the population density of grape berry moth at the different varieties of vineyards in Hatay province of Turkey. The study was carried out in 2016-2017 at ten varieties: Arra 4, Arra 13, Arra 15, Arra 16, Arra 18, Arra 19, Arra 30, Redglop, Vitroblack 25, and Crimson varieties, located in Reyhanlı district of Hatay province. The grape berry moth pheromone (10 mg, (E, Z) -7,9-dodecadienyl acetate) with delta type traps were used in this study. One pheromone trap was placed in each of the vineyard. The pheromone traps were weekly checked and captured grape berry moth adults were counted and then traps were cleaned. Pheromones in the delta traps were replaced with the new ones in every 40 days. After two years of the study, the average number of the catches per trap varied in the sampling period. In the first year, the highest number of the the grape berry moth were recorded in June, followed by July, May, August and April. In the second year, the highest number of the grape berry moth were recorded in June, followed by July, May and August.

Keywords: *Grape berry moth, Lobesia botrana, vineyards, pheromone traps, Hatay*.

BIOCONTROL POTENTIAL OF *TRICHODERMA HARZIANUM* AGAINST ROT CAUSING FUNGI OF WHITE YAM (*DIOSCOREA ROTUNDATA* POIR*)* TUBERS

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Abstract

Biological control potential of *Trichoderma harzianum* in the control of postharvest fungal pathogens of Pepa white yam tubers in storage was carried out for two years. Rotted Ogoja and Pepa white yam tubers were collected from farmers' barns in Zaki-Biam, Benue State, Nigeria. Pathogenicity tests conducted on healthy Pepa yam cultivars after fourteen days of inoculation revealed that the tubers were susceptible to *A. flavus, F. moniliforme* and *P. expansum*. Treatments comprised either inoculation of yam tubers with *A. flavus, F. moniliforme* and *P. expansum* alone or paired with *T. harzianum* as well as a control where the tubers were neither inoculated with antagonist nor fungi pathogens and were stored for five months between December, 2015 and April 2016 and between December, 2016 and April, 2017. Results got in the first year of storage showed that tubers treated with fungi pathogens alone caused mean percentage rot of between 8.89% (*P. expansum*) and 20.00% (*A. flavus*) while those treated with *T. harzianum* alone produced only 2.22%. In the paired treatments, mean percentage rots were between 4.44% (*P. expansum* × *T. harzianum*) and 6.67% (*A. flavus* × *T. harzianum*). The findings in the second year revealed 13.33% (*P. expansum*), 22.22% (*A. flavus*) and 4.44% (*T. harzianum*) in the alone treatments while paired treatments produced mean rot of between 4.44% (*P. expansum* × *T. harzianum*) and 8.89% (*A. flavus* × *T. harzianum*). The results revealed that *P. expansum* was the most antagonized while *A. flavus* was the least inhibited. The findings revealed that *T. harzianum* (biological control agent) was more effective in inhibiting the growth of *A. flavus, F. moniliforme* and *P. expansum* in the first year of storage compared with the second year of storage. The antagonist therefore has biological potentials in controlling fungi pathogens of yam in storage.

Keywords: *Aspergillus flavus, Biocontrol, Pathogenicity test, Trichoderma harzianum, Zaki-Biam.*

IDENTIFICATION OF PHYTOPATHOGENIC BACTERIA IN MAIZE SEEDS IN UKRAINE

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Abstract

The main bacterial diseases of maize: bacterial wilt of maize (*Pantoea stewartii* subsp. *stewartii*), goss's bacterial wilt (*Clavibacter michiganensis* subsp. *nebraskensis*), seed rot-seedling blight of maize (*Bacillus subtilis*), bacterial spot of maize (*Pseudomonas syringae* pv. *syringae*), bacterial leaf spot of maize (*Pantoea agglomerans*) and bacterial stalk rot of maize caused by several causative agents, were described. The causative agents of these diseases are often stored and transmitted with seeds, so seed analysis for the presence of phytopathogenic bacteria is an important step in the pathogen control system. For analysis, the corn seeds that were grown in the Poltava and Kiev regions of Ukraine were used. Microbiological analysis of seeds was carried out by classical methods. From visually healthy corn seeds, that form shoots in the field conditions, strongly affected by root rot, were isolated the strains of *Pseudomonas fluorescens*. Isolated *P. fluorescens* strains were the reason for the damage of soft rot in the field. This type of bacteria is an opportunistic pathogen and is capable of causing soft rot of a number of crops. It has been established that *P. fluorescens* cause root rot of maize seedlings. From visually healthy seeds, from which healthy corn seedlings form, *Pantoea agglomerans* and *Pantoea ananatis* were isolated. *P. agglomerans* are widespread plant epiphyte. *P. ananatis* causes disease symptoms in a wide range of economically important crops and forest tree species worldwide. It is regarded as a pathogen based on the increasing number of diseases reports on previously unrecorded hosts in different parts of the world and can cause damage to maize seedlings in the field.

Key worlds: *maize, seeds, bacterial diseases, Pantoea agglomerans, Pseudomonas fluorescens, Pantoea ananatis.*

CHANGES IN THE ECOLOGICAL PARAMETERS OF FUNGAL COMMUNITIES COLONIZING PERENNIAL RYEGRASS AFTER THE APPLICATION OF NANOTECHNOLOGY-BASED BIOSTIMULANTS

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Abstract

Perennial ryegrass is the main forage grass used in livestock production in Poland. The quality of herbage is influenced mainly by the yield and nutritional value of grass and the presence of undesirable microbiota. Nanotechnology-based plant growth stimulants can improve plant health, germination and yield, but their impact on the microbiota colonizing plants remains unknown. Three types of silver nanoparticles, two types of titanium dioxide nanoparticles, silver nitrate, a chelated form of titanium, and an additional rate of nitrogen were applied in this study. Perennial ryegrass without stimulant treatment was the control. Grass was harvested twice during the growing season, and the biostimulants (10 ppm per 10 m^2) were applied twice after each harvest. Fungi were isolated from tillering nodes after the second harvest. Herbage yield did not differ significantly between treatments, and the highest yield was achieved in the control treatment. The applied stimulants, excluding tannic acid-reduced silver nanoparticles, improved sod density. The largest number of fungi were isolated from the control treatment and the chelated titanium treatment, and the smallest number of fungi were obtained from treatments with an additional rate of nitrogen and the silver nitrate treatment. The control treatment with a higher fertilizer rate was characterized by the highest ecological value (species richness and species diversity). The highest counts of *Penicillium* spp. (eudominance) and *Fusarium culmorum* (dominance) were observed in the titanium chelate treatment. Excluding the control, undesirable fungi were most effectively controlled in the $AgNO_3$ treatment. The remaining biostimulants exerted indirect effects and did not completely eliminate undesirable fungi (*Fusarium* spp., *Cladosporium herbarum*, *Microdochium* spp.).

Keywords: *perennial ryegrass, biostimulants, nanoparticles, fungi*.

THE MICROBIOLOGICAL VALUE OF THE RHIZOSPHERE SOIL OF WINTER WHEAT AND WINTER OILSEED RAPE CULTIVATED IN MONOCULTURE AND IN CROP ROTATION

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Abstract

Crops are selected for cultivation in view of economic, technological and organizational considerations, which implies that some plant species are cultivated year by year. Long-term monoculture accelerates soil degradation, and it can decrease the species richness and diversity of soil microorganisms. This study analyzed the rhizosphere soil of winter wheat (*Triticum aestivum* L.) and winter oilseed rape (*Brassica napus* L.) plants grown in a 5-field crop rotation system and in long-term monoculture. The effect of the crop sequence on the counts of bacteria of the genera *Pseudomonas, Bacillus* and *Azotobacter*, actinobacteria and the number of TRI5 genes involved in the biosynthesis of mycotoxins in fungi of the genus *Fusarium* was determined. The crop sequence did not affect the counts of *Pseudomonas* and *Bacillus* bacteria and actinobacteria in soil from the crop rotation, but *Azotobacter* spp. were not detected. The number of TRI5 genes was relatively high in each treatment, and no significant differences were detected between treatments. In winter oilseed rape, the number of TRI5 genes was approximately three-fold lower in crop rotation than in monoculture, whereas the reverse was observed in winter wheat. It can be concluded that plants cultivated in monoculture and in crop rotation do not significantly affect the counts of bacteria stabilizing the biological value of soil and, consequently, do not lead to a significant decrease in the abundance of *Fusarium* fungi. Bacteria of the genus *Azotobacter* were eliminated in crop rotation, which indicates that they are sensitive to the crop sequence.

Keywords: *microorganisms, bacteria, monoculture, crop rotation, Fusarium.*

FUNGI ACCOMPANYING CULTIVATION OF SPRING BARLEY DEPENDING ON DIFFERENT FERTILIZATION

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Abstract

Agrotechnical treatments and plant protection are shaped by communities of soil microorganisms and colonies of crop plants. The quantitative and qualitative structure of soil mycobiota as well as the severity of disease symptoms depend on the potential of the perpetrator, variety resistance, weather conditions and fertilization. Therefore, research was undertaken to find out the quantitative and qualitative structure of the population of fungi associated with the cultivation of spring barley. The analyzed factors of the experiment were the effect of mineral fertilization in various NPK and mineral doses with the application of manure to the soil fungus community associated with the cultivation of spring barley and the identification of fungi isolated steam base. On the basis of the research, it was found that mineral fertilization supplemented with organic stimulates the number of soil microorganisms. The strongest increase in their number is associated with the application of manure together with NPK at a dose of 120/60/120 kg/ha and 40 kg/ha of Mg, while the introduction of calcium in this dose of NPK limits the soil fungi. The use of only mineral fertilizers stimulates the development of pathogens in the soil and inhibits fungi with antagonistic features, especially at doses of 120/60/120 and 120/60/120/40 kg/ha NPKMg. At this dose of NPK, after supplementation of fertilization with manure, there was an increase in the fusarium severity of foot rot, and a high dose of nitrogen (180 kg ha) along with organic fertilization stimulated the severity eyespot of cereal. In the soil fungus group, saprotrophs dominated: *Aspergillus*, *Penicillium*, *Chaetomium* and pathogenic species: *Fusarium*, *Rhizoctonia*, *Botrytis*.

Keywords: *Spring barley*, *fungi*, *fertilization.*

STUDY OF THE COMPRESSION BEHAVIOR OF SUNFLOWER SEEDS USING THE FINITE ELEMENT METHOD

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Abstract

It is known that the phenomena that occur during compression of sunflower seeds are very complex. Comprehension of these phenomena is important for increasing the performance of the equipment in the vegetable oil industry, both for the cracking of shells and for the grinding of kernels. Also for the pressing of oilseed materials it is helpful to understand the compression behavior of sunflower seeds. The major objective of this work is to find an easy way of highlighting how the stresses and deformations propagate in sunflower seeds kernels and shells during the compression process, with the aim of optimizing the energy consumption required for the mechanical processing. Therefore, now days there is and we can use the finite element method. This method is the most advanced engineering tool for computing numerical and mathematical modeling of complex phenomena involving the propagation of stress and strain fields in continuous media. In this paper a two-dimensional FEM model for analyzing sunflower seeds subjected at compression by axial and lateral directions is presented. For experimental validation of FEM model we made uniaxial compression tests on sunflower seeds, using a Hounsfield/Tinius Olsen unit for mechanical tests, H1KS model. The models used in this work highlight that the orientation of the seeds is very important. There are situations when it is desirable that the stresses to be higher (at shelling, grinding, pressing, etc.) or situations when it is desirable that the stresses to be smaller (at transport, storage, etc.).

Keywords: *Finite Element Method, Sunflower seeds, Experimental validation, Oil industry.*

RESEARCH OF TECHNOLOGICAL PROPERTIES OF FLOUR MIXTURES WITH AMARANTH EXTRUDATE

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Abstract

Development of technologies for specialized food products, including functional orientation, is one of the priority tasks of ensuring the quality of life of the population. Bakery products, being a product of mass consumption, can improve the structure of the population's nutrition. In this case, the dosages of the components should not only ensure the improvement of the ingredient composition, but also preserve the traditional organoleptic characteristics. For this purpose, the effect of amaranth extrudate on certain baking and functional-technological properties of flour was investigated depending on the size of the grinding and the ingredient composition of the flour mixtures. Based on the analysis of fat-emulsifying, fat and water binding abilities, the most variable in its application fineness of the grind was determined - 0.125 mm and less. 12 model mixes of flour from an amaranth extrudate and wheat flour of the highest and the first grade with various dosages were made. The optimal dosage is determined from the color flour position. A decrease in the amount of gluten was established with an increase in the mass fraction of the amaranth extrudate in the flour mix and a change in its quality. It is shown that a rational dosage of the enriching ingredient should be established taking into account the initial characteristics of batches of wheat baking flour.

Keywords: *Amaranth, extrudate, protein, functional and technological properties, enrichment.*

STUDY OF BIOLOGICAL EFFECTIVENESS AND DYNAMICS OF THE DESTRUCTION PREPARATIONS BASED ON NEONICOTINOIDS AND PYRETHROIDS ON CEREALS

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Abstract

Cereals are one of the most important crops grown for food, fodder and technical purposes. Stable obtaining high yields and grain quality is one of the most important tasks of agriculture. The purpose of this work is to present results on the biological effectiveness and safety of the use of insecticides for protection against a complex of piercing-sucking pests. Field experiment was conducted for two years. Pest management was carried out in accordance with the procedure on the day before spraying and on the 3rd, 7th and 14th days after spraying. The biological effectiveness of the pesticide was determined by reducing the number of pests with the correction for control and calculated according to the Henderson-Tilton formula. To study the dynamics of the decomposition of residual amounts of thiamethoxam and alpha-cypermethrin in 2016 and 2017, samples of plant material were sampled on the day of spraying with the pesticide and at 8, 15, 23, and 30 days after. The analysis of residual quantities of thiamethoxam was performed under laboratory conditions using high performance liquid chromatography, residual quantities of alpha-cypermethrin are analyzed by gas chromatography. The test pesticide showed high biological efficiency. Based on the results of the analyzes, it was established that the level of thiamethoxam and alpha-cypermethrin content in the crop did not exceed the maximum allowable levels.

Key words: *Cereals, Insecticide, Russian Federation, Neonicotinoids, Pyrethroids, Piercing-sucking pests.*

EVALUATING POPULATION DENSITY OF THE CODLING MOTH, CYDIA POMONELLA L. (LEPIDOPTERA: TORTRICIDAE) ON WALNUT IN TURKEY

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Abstract

The walnut, *Juglans regia* L. (Juglandaceae), is one of the important hard-shelled fruits in Turkey. The codling moth, *Cydia pomonella* L. (Lepidoptera: Tortricidae), is one of the important pests for several horticulture plants in the world. The larvae of this pest cause significant damage on apple, pear and walnut. The study was conducted in 2016-2017 to determine the population density of the codling moth, *Cydia pomonella* L. on ten walnut orchards in Mersin province. The study was carried out from May to November in both years. Each of the walnut orchards contained different variety of walnut. The delta type trap and pheromone ((*E*,*E*)-8,10-dodecadien-1-ol) of the codling moth were used to monitor population density of the codling moth on walnut orchard. The pheromone trap was weekly checked and counted, and catches of codling moth were removed. The pheromone dispanser in the delta trap were replaced with new one every 40 days. As a result of two years investigations, it is noticed that the population density of codling moth varied during the sampling period and sampling orchards.

Keywords: *Walnut, codling moth, Cydia pomonella, pheromone, damage rates* **.**

Acknowledgement

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CHEMICAL CONTROL OF *GRAPHOLITA MOLESTA* BUSCK IN PEACH ORCHARDS

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Abstract

The oriental fruit moth *Grapholita (Laspeyresia, Cydia) molesta* Busck (Lepidoptera: Tortricidae), also known as the oriental peach moth, is one of the most destructive and economically important pests of stone and pome fruits worldwide. In Serbia, *G. molesta* represents one of the most damaging pests of peach fruits. In this work, pest susceptibility to insecticides based on indoxacarb, deltamethrin, spinetoram, and azadirachtin was assessed. Field trials were carried out in Vojvodina, the northern region of the Republic of Serbia, at localities Čerević and Mala Remeta. Trials were designed according to the EPPO method, following the pest biology and crop phenophase. Before and during the experiment, the flight of *G. molesta* adults was monitored using pheromone traps to determine the optimal timing for insecticide distribution. Products based on indoxacarb (Avaunt 15 EC), deltamethrin (Decis 2.5 EC), spinetoram (Delegat 250 WG) and azadirachtin (Ozoneem Trishul 1% EC) were 0.33, 0.5, 0.2 and 5.0 L ha^{-1} sprayed, respectively. Assessment of spray distribution efficiency was based on the number of fruit damaged by caterpillars, on a base of 100 fruits per repetition scrutiny. The results were processed using ANOVA and Fisher LSD test, while the efficiency was determined according to Abbott. Spraying application showed a efficiency in both trial localities in between 79-87% (indoxacarb), 74-91% (deltamethrin), 84-88% (spinetoram) and 74-80% (azadirachtin), compared with the untreated control sample. The highest efficiency at both sites was given by products based on deltamethrin and spinetoram, while azadirachtin had the lowest efficiency. Assessment of the number of damaged fruits was done for the all investigated insecticides, and it was at a significantly lower level in all treatments in comparison to control indicating the high sensitivity of the *G. molesta* to the tested insecticides.

Keywords: *Prunus persica, insects, plant protection, pesticides.*

DETERMINATION OF INSECTICIDE INDOXACARB RESIDUES IN PEACH FRUITS

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Abstract

In this study, a method for the determination of indoxacarb residues in peach fruits was developed and validated. Indoxacarb belongs to oxadiazine insecticides voltage-dependent sodium channel blockers, IRAC 22A. Maximum residue level (MRL) for indoxacarb in peach fruits, set by EU legislation is 1 mg/kg. For determination of indoxacarb residues, the QuEChERS method coupled with high-performance liquid chromatographic (HPLC) analysis were carried out. The HPLC Agilent 1100 system with diode array detection and Zorbax Eclipse XDB-C18 column (50 mm × 4.6 mm, 1.8 μm) were used. The mobile phase was water and acetonitrile (25:75). The flow rate was maintained at 1.0 ml/min in isocratic mode and the injection volume was 20 μl. Chromatograms were extracted at 310 nm. Under these conditions retention time of indoxacarb was 1.501 min. Method validation was performed taking into consideration linearity, recovery, precision, matrix effect, limits of detection and quantification, completely fulfilling the SANTE/11813/2017 criteria. The limit of detection and limit of quantification were 0.006 mg/kg and 0.018 mg/kg, far below the MRLs established for indoxacarb. The average recovery ranged from 83.3 to 91.6%, for three fortification levels. The precision of the method, expressed as RSD, was 0.1% and the matrix effect was 102.39%. The results obtained in this study confirm that the proposed method can be used for the determination of indoxacarb residues in peach fruits.

Keywords: *indoxacarb, peach, residues, method validation.*

PHENOLIC COMPONENTS AND ANTIOXIDANT ACTIVITIES IN VARIOUS TYPES OF CARROT EXTRACTS

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Abstract

The objective of this study was to evaluate antioxidant activities of vegetable extracts *Dancus carota* L., grown in Serbia. Different experimental models have included the determination content of total phenolics, total flavonoids and antioxidant activities of extracts. From the same material, two extracts were obtained by various methods: maceration and ultrasonic extraction. The highest content of phenolic compounds was detected in *D. carota* L. 50.42 mg GAE/g, ultasonic extract. The lowest content of phenolic compounds shown *Dancus carota* L. macerat, 17.45 mg GAE/g. The obtained antioxidant activities are in correlation with the content of phenolic components. On the basis of the results obtained, extract of were found to serve as a potential source of natural antioxidants due to their marked activity. The obtained results may be useful in the evaluation of new dietary and food products.

Keywords: *D. carota L, maceration, ultrasonic extraction, phenolic compounds*.

INFLUENCE OF *CURCULIO GLANDIUM* (MARSHAM, 1802) (COLEOPTERA, CURCULIONIDAE) ON TURKEY OAK (*QUERCUS CERRIS* L., 1753) (FAGALES, FAGACEAE) ACORN GERMINATION

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Abstract

Turkey oak is one of the most common oak species in Serbia. Its wood has a high calorific value, and that is why it is commonly used for firewood in Serbia. In the last few years the oak started to dieback, mainly in the northern parts of Serbia. Because of this, and many other reasons like the negligible presence of young stands in the total area, and the prevailing vegetative origin of, Turkey oak forests must be regenerated. For the natural regeneration of its forests, a significant amount of healthy acorn is needed. Unfortunately, Turkey oak acorn is frequently infested by insects. We focused on the influence of the damage caused by of one of them, *Curculio glandium* (Marsham, 1802) on the Turkey oak acorn germination. The research was conducted on three localities in the vicinity of Belgrade. Five trees from which the acorns were collected were selected at each site. Acorn rate of infestation and germination were then analyzed. The infestation rates ranged from 24 to 60% depending on the tree. There were no statistically significant differences in the infestation rates between the different localities and the individual trees. A statistically significant difference in germination was found between undamaged and damaged acorns. The average germination rate was 35.8% for the damaged, and 66.1% for the undamaged acorns. A significant difference in germination was also noted between the localities where the acorns were collected. The germination of the damaged acorns was significantly influenced by their dimensions as well. The larger acorns had a higher germination rate.

Keywords: *acorn weevil, Serbia, generative regeneration, germination rate.*

TERBUTHYLAZINE APPLICATION WITH HERBICIDES OF DIFFERENT MODE OF ACTION IN MAIZE CROP

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Abstract

Based on the damage caused by weeds in maize crops, the efficiency of a large number of commercial preparations with different active ingredients was examined in order to suppress dominant weed species. The experiment with terbutylazine in combination with S-metolachlor and mesotrione was placed at the following locations: Zobnatica, Ruski Krstur and Gornja Badanja (Serbia). Efficacy and phytotoxicity was evaluated according EPPO/OEPP standards. The dominant weeds were: *Abutilon theophrasti* Medic., *Amaranthus retroflexus* L., *Ambrosia artemisiifolia* L., *Avena fatua* L., *Bilderdykia convolvulus* L., *Cannabis sativa* L., *Chenopodium album* L., *Chenopodium hybridum* L., *Cynodon dactylon* (L.) Pers., *Cirsium arvense* (L.) Scop., *Datura stramonium* L., *Galinsoga parviflora* Cav., *Helianthus annuus* L., *Hibiscus trionum* L., *Matricaria chamomilla* L., *Mentha arvensis* L., *Polygonum aviculare* L., *Plantago minor* L., *Potentilla reptans* L., *Rumex patientia* L., *Solanum nigrum* L., *Sonchus arvensis* L., *Taraxacum officinale* Web., *Veronica persica* Poir., *Xanthium strumarium* L. At the present weed flora in the location of Gornja Badanja, the combination of terbutylazine and S-metolachlor, applied after sowing and before the emergence of weeds and maize, had a low efficiency (59.70-66.30%). At the location of Ruski Krstur, the combination of terbuthylazine (125 g/l) and mesotrione (50 g/l), foliar applicated, had a satisfactory efficiency (88.61%) during the first and good efficacy (94.72%) during the second assessment of the present weed flora. Combination of terbuthylazine (326 g/l) and mesotrione (50 g/l), foliar applicated, had a satisfactory (81.94%) and good efficiency (92.77%) on the present weed flora at the location of Zobnatica.

Keywords: *Maize, Weeds, Terbutylazine, Mesotrione, S-metolachlor.*

THE IMPORTANCE OF A CROP ROTATION ON MAIZE PRODUCTIVITY

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Abstract

One of important measures in agriculture is a crop rotation. It is known that a crop rotation is associated with high yields, and suppressing of pathogens and weeds. It is a cheap measure – only decision is needed. On the other hand, a crop rotation gives possibility to use different crops and different pesticides (herbicides), what could be beneficial in anti-resistant strategy. The aim of this work was to evaluate maize growing in a crop rotation with winter wheat and maize monoculture. The field trial was set up in 2009 on an experimental field of the Maize Research Institute "Zemun Polje" in Serbia. This paper presents the results from 2017– after eight years of growing maize in monoculture and after four maize-winter wheat rotations. Maize hybrids ZP 677 and ZP 606 were tested in the experiment. Herbicide combination of isoxaflutole and s-metolachlor was applied (in recommended and ½ of recommended dose) for weed control. The effects of the crop rotation on maize were evaluated by observing the leaf area and plant height (at the anthesis stage), as well as the grain yield. In the crop rotation treatments the leaf area and plant height were significantly higher when compared to maize grown in monoculture. Irrespective to unfavourable meteorological conditions, both hybrids had higher yields when grown in rotations with winter wheat, in comparison to monoculture.

Keywords: *Maize, maize-wheat rotation, monoculture.*

EVALUATION OF THE POPULATION DENSITY OF EUROPEAN GRAPEVINE MOTH, *LOBESIA BOTRANA* (DENIS & SCHIFFERMÜLLER) (LEPIDOPTERA: TORTRICIDAE) AT WINE VINEYARDS IN HATAY PROVINCE (TURKEY)

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Abstract

The grape berry moth, *Lobesia botrana* (Denis & Schiffermüller) (Lepidoptera: Tortricidae), is one of the important pests on wine vineyards in Hatay province of Turkey. The study was conducted to determine the population density of grape berry moth on the wine vineyards in Hatay province (Turkey). The study was carried out at four different wine vineyards located in Belen district of Hatay province. The wine vineyard contained Syrah, Sangiovese, Cabetnet sauvignon and Barbari varieties. The grape berry moth pheromone (10 mg, (E, Z) -7,9-dodecadienyl acetate) with delta type traps were used in this study. Two pheromone traps were placed in each of the wine vineyards. The pheromone traps were weekly checked and captured grape berry moth adults counted, and then the traps were cleaned. Pheromones in the delta traps were replaced with the new ones every 40 days. A total of 1786 grape berry moth adults were caught by the pheromone traps. The number of captured grape berry moth adults was changed during the sampling period. The highest number of the grape berry moth adults captured by pheromone traps was in 11 July, following in 25 July, 18 July, the lowest number of the grape berry moth adults caught by pheromone traps was on 15 August.

Keywords: *Grape berry moth, Lobesia botrana, wines vineyards, pheromone traps, Hatay.*

CONSEQUENCES OF EXPOSURE TO ORGANOPHOSPHATE PESTICIDES

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Abstract

The greatest challenge for the world in the upcoming period will be to feed itself without ruining its environment. An increased use of pesticides and mineral fertilizers has resulted in a large production of diverse agricultural crops and thousands of new products, which have enabled the regular supply of the market and good nutrition of the population. Due to great competition and demand, many farmers tend to use organophosphate pesticides excessively in order to increase yields. However, when spraying, farmers should, must to adhere but do not adhere to the instructions for the safe use of pesticides, i.e. they do not use appropriate personal and protective gear, which enables pesticides to enter the blood stream through inhalation and dermal exposure, negatively affecting their health. In this paper, the authors compared the relationship between the length of exposure to organophosphate pesticides and signs of disease caused by direct exposure to pesticides during spraying. In the Rasina District, the Republic of Serbia, 80 farmers were interviewed by using pre-designed questionnaires over the course of 16 months. The farmers who had been exposed to pesticide spraying reported acute signs and symptoms resulting from that exposure, such as blurred vision, burning eyes, redness and skin itching, difficulty in breathing, excessive sweating, dry throat and burning in the nose. The duration of the symptoms depended on the length of the exposure. It was concluded that there was need for raising awareness among farm sprayers on the safe use of pesticides and use of personal and protective gear while handling pesticides.

Keywords: *Organophosphate pesticides, exposure, pesticide spraying, farmers, protective gear.*

OCCURRENCE OF THE SEPTORIA LEAF BLOTCH CAUSAL AGENT IN SOME WINTER WHEAT CULTIVARS

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Abstract

Wheat is exposed to attack of many pathogens, so it is essential to establish their occurrence and intensity every year. Septoria leaf blotch of wheat, caused by the fungus *Septoria tritici*, is one of the most common diseases in the world and shows the significant effect on wheat production. One of the reasons for more intensive occurrence of the disease is introducing into production shorter stem cultivars, having lower leaves closer to the ground, which facilitates infection of plants during autumn. This paper aimed to establish attack intensity of the disease in some winter wheat cultivars in the conditions of natural infection. The field trials were carried out during 2014/2015 and 2015/2016 in the locality Leposavić-Lešak, at fields of the Agricultural School, with ten cultivars studied as follows: Pobeda, Evropa 90, Renesansa, Simonida, NS 40s, Zvezdana, Planeta, Kruna, Sirtaki and Euklid. Sowing was done by sowing machine. Every cultivar was sown in 46 rows, 50 m long. Soil was fertilized before sowing by 300 kg ha^{-1} of mineral fertilizer (NPK 15:15:15), and additionally, during tillering stage, by 200 kg ha^{-1} of nitrogen fertilizer LAN. The rest agrotechnical measures applied on the trial were standard. One hundred randomly selected plants were sampled from every cultivar, and grading of attack intensity in both investigation years was done during the first week of June, according to the scale of Gešele (1978), by determining infection intensity from 0-100%. The highest average infection intensity in 2015 was observed in cultivars Pobeda and NS 40s (40%), and the attack intensity in most of cultivars (Renesansa, Planeta, Kruna and Euklid) was graded as 20%. In 2016 the cultivar Pobeda also showed attack intensity of 40%. Blotches covering 30% of leaf area were observed in cultivars NS 40s, Zvezdana and Sirtaki. Infection intensity in the cultivar Kruna amounted 10%.

Keywords: *Winter wheat, Cultivars, Pathogen, Intensity, Disease.*

RESEARCH OF EXPERIMENTAL HOSTS OF ISOLATES *COLLETOTRICHUM* SPP. WITH ALFALFA FROM SERBIA

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Abstract

The *Colletotrichum* spp. fungus, the anthracnose causers, are cosmopolitan and extremely aggressive. Like herbal parasites, fungus *Colletotrichum* can cause economic losses on cereals, legumes, vegetable and fruit cultures.Inoculation under controlled conditions was examined for the pathogenicity of the studied isolates of *Colletotrichum* sp. according to different plant species. In this experiment, a total of 15 plant species from 6 botanical families were inoculated. The experiment includes 10 plants of alfalfa, birdsfoot trefoil, red clover, soybeans, peas, beans, field bindweed, flax, vetch, common sainfoin, fodder kale and pepper, per isolate. The plants were inoculated by stinging and by applying parts of the colony of examined isolates at the point of the sting. Ten plants per isolate of the Timothy-grass, cat grass, wood bluegrass is inoculated by spraying a spore suspension at tested isolates. In this research, ten isolates of *C. trifolii, C. destructivum* and *C. linicola* were used. Reactions to inoculated plants that proved to be experimental hosts of the investigated isolates *Colletotrichum* spp. were mostly balanced. Around the inoculated places, the distinct necrotic strips of light brown to dark brown were distinguished. After five days, changes in the appearance of leaves necrosis and drying of plant top inoculated with isolates from the genus *Colletotrichum* were observed. The aim of this research is the ability to monitor the emergence of primary infections in the wild, for forecasting and suppressing illnesses on alfalfa.

Keywords: *Anthracnose; alfalfa; Colletotrichum destructivum; C. linicola, C. trifolii, experimental hosts.*

CONTROL OF OLIVE FRUIT FLY, *BACTROCERA OLEAE* (GMELIN) (DIPTERA: TEPHRITIDAE) WITH DIFFRENT ATTRACTANTS IN OSMANIYE PROVINCE OF TURKEY

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Abstract

The olive fruit fly, *Bactrocera oleae* (Gmelin.) (Diptera: Tephritidae), is a serious pest on olives in Turkey. The study was conducted in 2015-2016 to control olive fruit fly, *Bactrocera oleae* (Gmelin.) (Diptera: Tephritidae) with different attractants in Osmaniye province of Turkey. In 2015, two studies were conducted with ammonium acetate (AA), ammonium carbonate (AC), ammonium bicarbonate (AB), AB+AA and di-ammonium phosphate (DAP) attractants. In 2016, two studies were conducted with AC, AB, AB+AA, DAP, Ammonium sulfate (AS) attractants and Spiroketal. In 2015, transparent 500 ml polyethylene bottles with four holes were used as traps. Each of the traps consisted of 300 ml of one of the attractants, propylene glycol (10%) and DDVP (2%). The traps, hanged at 1-1.30 m above ground on the tree branches, were arranged as 5 trees/traps and randomized complete blocks design with twelve replicates. In 2016, a homemade plastic wipes were prepared containing 25 ml concentration from mixed attractants. The Decis traps were used also as traps. They were hanged with homemade plastic wipes at 1-1.30 m above ground on the tree branches, arranged as 3 trees/traps in randomized complete blocks design with five replicates. In 2015, a total of 260 adults were caught by traps in the first trial. The highest number of adults (♀♂) was caught by AB+AA attractant traps. In the second trial, a total of 174 adults were caught by traps. The highest number of adults (♀♂) was caught by AB+AA attractant traps. In 2016, a total of 394 adults were caught by traps in the first trial. The highest number of adults (♀♂) was caught by AC attractant traps. In the second trial, a total of 306 adults were caught by traps. The highest number of adults (♀♂) was caught by Spiroketal pheromone traps.

Key words: *Olive fruit fly, Bactrocera oleae, attractants, Osmaniye province*.

Acknowledgement

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PESTICIDE RESIDUES PROBLEM AT BEE PRODUCTS

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Abstract

Application of modern agriculture techniques is esessential for enhancement of the yield and quality of agricultural products. Especially many of the pesticides explored towards the end of the 1940s used this field to increase productivity in the production of grain, fruit and vegetables. However, in the 1960s, pesticides were found to be harmful to environmental pollution, ecological health and human health, and it was observed that some harmful substances became resistant to the pesticides used. For this reason, more stringent regulations on pesticides have been made. In the 1980s and 1990s, the use of pesticides has come to the forefront as well as the control of pests by biological and physical methods. The fact that the harmfulness of each plant that is cultivated is different requires the use of different pesticides. Pre-planting, insemination, flowering, etc. in agricultural lands. Usage of pesticides which are plant protectors, is a complementary element of modern agriculture. Usage of pesticides is an important agricultural control form used to protect products from dieases and damages by weeds, ensure high quality production. Pesticides are one of the primarly preffered methods of agriculture due to their short time effect, simple usage and low cost. However, these chemical drugs along with reaching target organism frequently are transferred to bees and to hives by bees. The compounds transferred to hives contaminate bee products. The main issue of bee product export is unsafe products and residue problem of products. The latter problem results from the use of pesticides and veterinary drugs. Effect only to target pests is expected from pesticides. Though pesticides by their chemical structures affect all living creatures at different levels. Through this feature of pesticides, it is inevitable that beneficial insects, bees, birds, pets and even humans can be poisoned acutely or chronically.

Keywords: *Bee products, pesticides, veterinary drug residues.*

THE RESULTS OF INVESTIGATION THE IMPACT OF DIFFERENT COLORS NETWORKS ON YIELD AND QUALITY OF PEPPERS

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Abstract

The disadvantages of extreme high temperatures accompanied by low relative humidity, leave a whole range of consequences for most vegetable crops, first of all disruption of physiological processes, reduction in yield and quality of yields, more intense occurrence of diseases and pests. In order to reduce the negative impact of high temperatures and the direct impact of UV rays on the yield and quality of the peppers on the field of Agriculture Extension Service "Sombor" (Serbia), performed a trial experiment with the application of different color nets: blue, green, black, white and yellow. The trial experiment was performed during four years from 2014 to 2017. The results of the experiments show that the application of shading networks affect the lushness, renaissance, quality of peppers, reduction of diseases, pests, protection from the city and increase of yield. The trials were conducted with mulching with black foil in ''drop by drop'' system. In this way of production, the advantages of shading networks are simple and mobile construction, as well as the ability to use it for many years. The disadvantages of shading networks were a significant investment in production during the first year as well as the lack of effect in favorable weather conditions for the production of peppers. The application of this technology is recommended for the production of peppers on smaller surfaces as it contributes to stable and quality production.

Keywords: *High temperature, color networks, peppers.*

MICROBIOLOGICAL QUALITY, ANTIOXIDATIVE AND ANTIMICROBIAL PROPERTIES OF SLOVENIAN BEE POLLEN

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Abstract

Bee pollen can be considered as perfect food with a great nutritional value, high protein and essential amino acid content, vitamins and minerals. It can be a source of healthy nutrients, but as an animal product also of harmful microbial contaminants. The aim of our study was to determine potential health risks and benefits of Slovenian bee pollen. We determined its i) microbiological burden: aerobic mesophilic microorganisms, yeast, molds, and coliform bacteria in CFU/g; ii) polyphenolic content: the Folin-Ciocalteu method (mgGA/g); iii) antioxidative potential (AOP): $DPPH^{\bullet}$ scavenging assay (EC50 in mgGA/L); and iv) antimicrobial activity (MIC): microdilution method on *Escherichia coli*, *Listeria monocytogenes* and *Campylobacter jejuni.* We analyzed 14 samples of bee pollen gathered from 7 Slovenian geographical regions, from April until May 2017. The microbiological burden was high, with all indicator tests reaching up to 6.78 $\log_{10}$CFU/g of bee pollen, but the number of coliform bacteria in all samples from 2.00 to 4.48 $\log_{10}$CFU/g. The polyphenolic content and AOP of the samples was good, with up to 13.1 mg GA/g and as low as 2.4 mgGA/L (EC50), respectively. Interestingly, antimicrobial activity was not always in correlation with polyphenolic content, but always strongly against *E. coli*, substantial against *C. jejuni*, and negligible against *L. monocytogenes.* Our results show a great health potential of bee pollen for human health, but also the need of bee pollen processing improvement for its standardized quality and safety.

Key words: *Bee pollen, polyphenols, antioxidant, antimicrobial activity, microbiological safety.*

THE POTENTIAL USE OF LACTIC ACID BACTERIA AS ANTIOXIDANT AGENT IN MEAT PRODUCTS

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Abstract

Lactic acid bacteria (LAB) are commonly used and generally regarded as safe. The most significant contribution of these microorganisms to the product is to preserve the nutritive qualities of the raw material through an extended shelf life and the inhibition of spoilage and pathogenic bacteria. LAB may positively affect taste and aroma of foods. LAB can maintain the balance of gut microbial flora, enhance resistance to diseases and show immunomodulatory activities. Certain LAB strains also have other significant functions such as antioxidant activity. Antioxidant properties of some LAB strains may be derived from antioxidases such as superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GSHPx). SOD, CAT and GSH-Px catalyze the decomposition of superoxide anion radical scavenger, hydrogen peroxide and hydroxyl radicals/hydrogen peroxide respectively. LAB play major role during meat fermentation as they contribute to final product quality and safety. The role of LAB in fermented meat products has been investigated widely, and some LAB strains have been shown to contain antioxidant properties *in vitro*. Studies indicated that *Pedioccocus* and *Lactobacillus* species had antioxidant properties. It has been shown that lipid and protein oxidation in sausages were significantly reduced by *Pedioccocus pentosaceus*. *Lactobacillus* species were also suggested as antioxidant agents for production of fermented meat products. In this review, studies using LAB as antioxidant agent in meat and meat products are presented.

Keywords: *Meat products, Lactic acid bacteria, Antioxidant*.

INVESTIGATION OF FARMERS AWARENESS ON THE USES OF CERTAIN PLANTS IN RURAL AREAS (THE CASE OF ANTALYA / TURKEY)

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Abstract

Humans have been seeking solutions for healing diseases encountered in different periods of their lives by applying different treatment methods and cures against different diseases. Natural plant products have been used throughout human history for various purposes. In fact, written records of the use of herbal medicine date back more than 5,000 years, and for much of history, herbal medicine was the only medicine. Due to complementary effect of medical treatments, alternative herbal medicine practices and cures are becoming increasingly important in developed countries. These products are complex mixtures of organic chemicals that may come from any raw or processed part of a plant. On this purpose the questionnaires were carried out in Serik, Aksu, Manavgat, Kumluca, Demre and Finike districts and villages of Antalya (Turkey) and 43 different questions were asked to 200 people living in the countryside. The alternative utilization of local plants by residents, the purpose of utilization, the consumption way, the contribution to their budget and the collection sites and collection ways were determined. As a result of this study, purslane (Portulaca oleracea L.) has been determined as most consumed plant as food material while tea and goosefoot (Chenopodium album L.) were the most commonly used plants. In disease treatments plants were mostly collected from field edges and fresh leaves were consumed. Leaf, stem and flowers were commonly used in treatments of diseases such as influenza, bronchitis and blood pressure and were commonly used as cough remover, pain reliever. These herbs are less expensive and they're a safer means of treatment than conventional medications

Keywords: *Rural areas, treatment, Antalya, weed, survey, medicinal plant.*

CONTROL OF OLIVE FRUIT FLY, *BACTROCERA OLEAE* (GMELIN) (DIPTERA: TEPHRITIDAE) WITH VARIOUS ATTRACTANTS IN HATAY PROVINCE OF TURKEY

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Abstract

The olive fruit fly, *Bactrocera oleae* (Gmelin.) (Diptera: Tephritidae), is a serious pest on olives in Turkey. The study was conducted in 2016 to control of olive fruit fly, *Bactrocera oleae* (Gmelin.) (Diptera: Tephritidae) with various attractants in Hatay province of Turkey. In 2016, three studies were conducted with ammonium carbonate (AC), Ammonium bicarbonate + Ammonium acetate (AB+AA), di-ammonium phosphate (DAP), Ammonium sulfate (AS) attractants and Spiroketal. In 2016, a homemade plastic wipes were prepared containing 25 ml concentration from mixed attractants. The Decis traps were used as traps hanged with homemade plastic wipes at 1-1.30 m above ground on the tree branches. Traps were arranged as 3 trees/traps. Three studies were conducted as randomized complete blocks design with five replicates. In the first study, a total of 2,489 olive fruit fly adults were caught by traps. In the second study, a total of 2,929 olive fruit fly adults were caught by traps. In the third study, a total of 2,804 olive fruit fly adults were caught by traps. The results of three studies indicated that the highest number of olive fruit fly adults (♀♂) were caught by DAP attractant traps, followed by AB+AA, AC, AS attractant traps and Spiroketal pheromone traps.

Key words: *Olive fruit fly, Bactrocera oleae, attractants, Hatay province*.

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HOST RANGE AND DISTRUBUTION OF EUROPEAN MISLETOE *VISCUM ALBUM* IN NORTHWESTERN MARMARA, TURKEY

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Abstract

Weeds compete with crop plants for water, light, and nutrients leading to direct and indirect crop losses. Furthermore some weed species were a good hosts for many pathogens and insect. *Viscum album* is a semi-parasitic plant on fruit trees and schurbs which approximately provides only about half the nutrients on its own. *Viscum album* is found parasitic on more than 100 different genera and 230 different species which uses hosts for water and nutrient. This weed is reported parasitising many host plants across Turkey but host status in Northwestern Marmara Region of Turkey is not known. A field study was carried out in three provinces in Northwestern Marmara Region of Turkey to identifiy hosts frequency and density of *V. album*. The parasitic weed was mostly found in wild pear, pear, almond, plum, apricot, oak, spruce tree, willow, cherry and poplar trees in Edirne, Kırklareli and Tekirdağ provinces (Turkey). The incidence of weed was higher in Tekirdağ especially on pear trees. Tree death due to higher weed infection was observed on cherry and pear trees. According to our observations a correlation between the number of mistletoe shrubs on the host and tree health status was observed in infected fruit trees. Significant increase in damage on trees was determined paralel to increase of number of misletoe schrubs. Dried branches were observed in upper parts of infected trees. The infections in upper branches were found more destructive on examined trees. The geographic distribution map, occurance rate, host status and damage level were comprehensively detailed.

Keywords: *Misletoe, Hosts, Northwestern Marmara Region.*

ANTIFUNGAL ACTIVITIES OF PRUNELLA VULGARIS EXTRACT PLANT PATHOGENIC FUNGI

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Abstract

Wound wort or selfheal is the common name for *Prunella vulgaris.* Prunella can grow all over the world. The plant's chemical constituents include betulinic acid, D-camphor, D-fenchone, cyanidin, delphinidin, hyperoside, manganese, lauric acid, oleanolic acid, rosmarinic acid, myristic acid, rutin, linoleic acid, ursolic acid, beta-sitosterol, lupeol, and tannins which have anti-microbial activities. To the best of our knowledge, there is only one report about the antifungal activities of *P. vulgaris* against plant pathogenic fungi. Therefore, the objective of the present study is to demonstrate the anti-fungal activity of *P. vulgaris* ethyl-acetate, hexan and methanolic extracts against *Fusarium oxysporum* f. sp. *lycopersici* (FOL), *Rhizoctonia solani*, *Sclerotinia sclerotiorum* and *Phytophthora infestans*. The extracts at concentration 2% was prepared in 10% acetone and mixed with potato dextrose agar (PDA) medium prior to autoclaving. Discs (5-mm diameter) of the mycelial plugs from the fungal culture were plated on the dishes and incubated in the dark at 25 ºC for 7 days. The media with 10% acetone were used as the negative controls. *S. sclerotiorum* and *P. infestans* were the most sensitive fungi with 100% mycelial growth inhibition rates at 2% ethyl-acetate and hexan extract concentrations. *P. vulgaris* methanol extract at 2% concentration inhibited the growths of *R. solani*, *S. sclerotiorum*, *P. infestans* and *FOL* mycelia at the rates of 67.6%, 66.6%, 92.3% and 23% respectively. The hexan extract caused 100% growth inhibition on all tested fungi except *FOL*. It is concluded that the hexan extract exhibit amazing fungicidal properties that can be used as antifungal compound.

Key words: *Extract, antifungal, Prunella, Phytophthora, Rhizoctonia.*

EFFICACY OF ENTOMOPATHOGENIC FUNGUS *BEAUVERIA BASSIANA*ISOLATE GOPT-228 AGAINST *GONIOCTENA FORNICATA* (BRUGGEMAN)

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Abstract

The lucerne beetle, *Gonioctena fornicata* (Brüggeman) (Coleopteran: Chrysomelidae)causes significantdamages on alfalfa. Both adults and larvae eat the leaves, flowers, leaf buds, young shoots and leaf stalks of alfalfa. Biological control methods are environmentaly safe and friendly ways of controling this pest. Entomopathogenic fungi are promising biocontrol agents for this pest under field conditions. At the present study, control potential of the entomopathogenic *Beauveria bassiana* isolate (GOPT-228) were tested against adults of *G. fornicata* at five different concentrations ($1x10^3$, $1x10^5$, $1x10^7$, $1x10^8$, and $1x10^9$ spores/ml). The experiment was laid out in completely randomized block design with 5 replications and replicated 2 times. Mortalities were recorded on the 1st, 3rd, 5th, and 7th days of incubation. Dead insects were transferred in humid sterile 90 mm glass petri dishes for 14 days to determine the mycosis rates. Mortality has been observed from the 3rd day and increased with increase in incubation period and inoculum concentration.Mortality rate of 100% was obtained at the end of the 7thin $1x10^9$spores/ml.The results showed that *B. bassiana* with LC50 and LC90 equal to 2×10^5 and 4.8×10^7 spores/ml The results of the study showed that B. bassiana isolate GOPT-228 can be used as a bioinsecticides against *G. fornicata* adults.Further study will be conducted to see performance of the isolate under field conditions.

Key words: *Entomopathogenic, Beauveria bassiana, Gonioctena fornicate, lucerne beetle.*

THE IMPACT OF COMMERCIAL PREPARATION *BACILLUS THRUGIENSIS VAR. KURSTAKI* ON THE *THAUMETOPOEA PITYOCAMPA* (DEN. & SCHIFF.) (LEP.: THAUMETOPOEIDAE)

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Abstract

The pine processionary moth (*Thaumetopoea pityocampa* (Den. & Schiff) (Lepidoptera: Thaumetopoeidae), which is a common pest spread all over the world, causing economic loss, as well as health problems in humans and animals. Since mechanical and chemical control methods against the pine processionary moth have not achieved permanent or prolonged success and due to the negative effects of chemical control on resistance and environment, the importance of biological control measures has been emphasized in recent years. *Bacillus* spp is an important entomopathogen, especially in the biological control against Lepidoptera. In this study, 3 different doses (0.75, 1.5 and 3 g/1 lt water) of a commercial preparation containing *B.thrugiensis var κurstaki* obtained from Kazakhstan Research Institute were applied in 4 replications to the larvae of pine processionary moth obtained from natural populations. 1 kg plastic containers were used in the study and 10 larvae were placed in each container. The study was conducted at 22 ± 2 o C and 70% humidity. The study was observed for 5 days and deaths were noted. At the end of the 5th day of the study, the mortality rate was 60% for dose 0.75 g/1 lt water, 75% for dose 1.5g/1lt water and 90% for dose 3g/1lt water. As a result, it has been determined that the *B. thrugiensis var. κurstaki* preparation can be used at a dose of 3g/1lt water in the control of the pine processionary moth.

Keywords: *Bacillus thrugiensis var. κurstaki*, commercial preparation, pine processionary moth, *Thaumetopoea pityocampa.*

CONTROL OF OLIVE FRUIT FLY, *BACTROCERA OLEAE* (GMELIN.) (DIPTERA: TEPHRITIDAE) WITH MASS TRAPPING IN HATAY PROVINCE OF TURKEY

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Abstract

The olive fruit fly, *Bactrocera oleae* (Gmelin.) (Diptera: Tephritidae), is a serious pest on olives in Turkey. The study was conducted in 2017 to control of olive fruit fly, *Bactrocera oleae* (Gmelin.) (Diptera: Tephritidae) with mass trapping in Hatay province of Turkey. The study was carried out at the 'Ayvalık' olive orchard (30 dekar/180 traps). Total of 102 Decis and 78 Maxitrap traps baited with attractant impregnated into paper handkerchief dispensers were used. Each of the paper handkerchief package (10x7.5 cm) had a 3-mm diameter hole and contained 25 g attractant, 2 ml of 10% propylene glycol to decrease water evaporation and 2 ml of 2% dichlorvos (DDVP). All traps were placed at 1.5-2 m high on southeastern side of the olives trees (1 trap in every three trees) on 10 July 2017. Attractant and propylene glycol and dichlorvos (DDVP) in the traps were replaced with the new ones every 45 days. All traps were removed on 04th November 2017 and brought to the laboratory where captured adults of *B. oleae* were counted. The fruit damage assessment was measured by the percentage of olive punctures during the harvest. As a result of investigations, the mass trapping significantly decreased population density of the olive fly. The damage rates of olives fly were observed approximate 0.25-0.75 percent on the olive fruits.

Key words: *Olive fruit fly, Bactrocera oleae, attractant, Hatay province.*

IDENTIFICATION OF NEW VARIANTS OF THE PATHOGENICITY FACTOR P25 OF *BEET NECROTIC YELLOW VEIN VIRUS* (BNYVV) IN TURKEY

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Abstract

Beet necrotic yellow vein virus (BNYVV) causes rhizomania which is one of the devastating diseases in sugar beet fields worldwide. In this study, 43 soil samples were collected from sugar beet growing areas of Ankara province in Turkey in 2016 and tested by ELISA and bait plant method. Out of the samples, 60.5% were found to be infected with BNYVV. Fifteen of them were selected according to their geographic origins in order to be used in molecular studies. The RNA-3 of BNYVV was amplified by RT-PCR, and the partial nucleotide sequences were obtained. The deduced amino acid (aa) sequences of the p25 protein indicated that BNYVV populations had 'VHPG', 'VHHG', 'AFHG', 'ACHG', 'AHHG', 'AHPG', 'ALHG' and 'ARHG' residues at position 67-70. In addition, two populations containing three nucleotide deletions, not shifting the reading frame but affecting the aa at position 67 (-FHG) or 68 (F-HG), was identified. Also, *Rz1 gene*-carrying cultivar was used in bait plant test to investigate pathogenicity of these BNYVV variants under controlled conditions. Of the BNYVV isolates containing 'VHPG' motif, 75% was able to overcome *Rz1* resistance; whereas 100% of the isolates with all other motifs did break resistance. The results showed that the mutant of BNYVV with a deletion is aggressive, as are the isolates without deletion.

Keywords: *rhizomania, RNA-3, resistance-breaking, Rz1.*

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PLANT PROTECTION PROBLEMS OF OLIVE PRODUCTION AND APPROACHES OF MANUFACTURERS IN AYDIN AND MUGLA PROVINCES IN TURKEY

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Abstract

Olive is an important agricultural crop in the Mediterranean countries. Olive is one of the most produced agricultural crop in Turkey. In this study, a questionaire with 50 questions has been carried out for the evaluation of plant protection problems encountered during olive cultivation in Aydin and Mugla provinces, main olive producing areas in western part of Turkey. This study was carried out to identify the importance given to olive production by producers, to recognize breeding methods and the plant protection factors they encounter and to find ways out of management. The olive producers in Aydin and Mugla have indicated that they generally know the basic plant protection problems and try to find solutions to these problems and they are aware that there will be significant losses if there is no control measures against these factors. It has been reported that except diseases and pests, weeds also cause considerable loss of quality and production. It has been concluded that the most frequently encountered weeds are couchgrass (*Elymus repens* (L.) Gould) and common lamb's quarters (*Chenopodium album* L.). It has been determined that the most effective method of controling weeds in the cultivated areas, according to producer statements, is tillage. Furthermore, according to their ideas one of the prominent problems is that the olive mill wastewater and olive dust produced in the olive processing damages the environment and smells bad. Besides, it has been found that the producers of Aydin are more conscious than the producers of Mugla in terms of recognizing and controlling plant protection problems.

Keywords: *Olive, plant protection problems, weeds, olive mill wastewater*.

THE EFFECT OF SYNERESIS ON PHYSICAL PROPERTIES AND MINERAL CONTENTS OF YOGHURTS

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Abstract

Syneresis values of yoghurt samples ranged from 50.00% (with carrageenan 0.25%) to 67.44% (with carrageenan 0.10%). Syneresis level of yoghurt samples with orange were ranged from 60.16% to 64.64%. Viscosity values of samples changed depending on additives. The mineral contents of yoghurt samples were determined by Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES). Ca contents of yoghurt samples changed from 4155.0 mg/kg (with orange 0.15%) to 6464.64 mg/kg (with carrageenan 0.15 %). K contents of yoghurt samples ranged from 6383.81 mg/kg (with orange with 0.15%) to 10626.32 mg/kg (with carrageenan 0.15%). Generally, mineral contents of liquid phase decreased according to the solid phase of yoghurt samples. While Ca contents of liquid phase change between 274.5 mg/kg (with lemon 0.10%) and 1510.95 mg/kg (with lemon 0.25%), K contents ranged from 406.56 mg/kg (with lemon 0.10%) to 2025.40 mg/kg (with carrageenan 0.25%).

Key words: *pectin, pectin sources, yoghurt production, syneresis, minerals, ICP-AES*

THE EFFECT OF DIFFERENT WEED CONTROL METHODS ON CHICKPEA YIELD COMPONENTS IN KIRSEHİR

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Abstract

The study was carried out in order to determine the effects of weeds on chickpea yield factors such as biological yield, number of main branches, plant length, the first pod height, number of pods per plant, number of seeds per plant, seed yield per plant, harvest index, 100-seed weight. Experiments were created according to randomized block design in Kirsehir Ahi Evran University, Agricultural Practice and Research Center, Turkey between 2015 and 2017 years. In the field experiments, 9 different treatments were included - control, weed free, one-time hoeing, two-time hoeing, three-time hoeing, poste-emergence herbicide application, one-time hoeing with herbicide application, two-time hoeing with herbicide application and three-time hoeing with herbicide application. According to the results, there are significant differences between chickpea yield and yield components depending on different weed control methods. According to results, it was determined yield of 159.7 kg when no weed struggle conditions occurred. On the other hand, three-time hoeing of weed revealed the best yield performance as 847.8 kg per ha?. It has been determined that even the single shearing process increases the yield of chickpea about 2.5 times, 3 hoeing operations increased 6 times according to an average. As the number of chickpea hatchings increased in Kirsehir conditions, the result of the study proved that the yield is positive. As the number of chickpea hoeing increased in Kirsehir conditions, the result of the study proved that the yield is positive.

Keywords: *Kirsehir, Aksu, weeds, yield, yield components.*

THE EFFECT ON CHICKPEA (AZKAN VARIETY) YIELD COMPONENTS OF DİFFERENT WEED CONTROL METHODS IN KIRSEHIR CONDITIONS

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Abstract

The study was carried out in order to determine the effects of weeds on yield factors for Azkan cultivar. In this context biological yield, number of main branches, plant height, the first pod height, number of pods per plant, number of seeds per plant, seed yield per plant, harvest index, 100-seed weight were evaluated. Experiments were created according to randomized block design in Kirsehir Ahi Evran University, Agricultural Practice and Research Center between 2015 and 2017 years. In the field experiments, 9 different applications were given as - control, weed free, one-time hoeing, two-time hoeing, three-time hoeing, poste-emergence herbicide application, one-time hoeing with herbicide application, two-time hoeing with herbicide application and three-time hoeing with herbicide applicationcontinuous weed control, continuous without weed, one-time hoeing, two-time hoeing, three-time hoeing, herbicide application after emergence, one-time hoeing with herbicide application, two-time hoeing with herbicide application and three-time hoeing with herbicide application. According to the results, there are significant differences as statistically between chickpea yield and yield components depending on different weed control methods. According to results, it was determined when no weed struggle occurred conditions yield 211.3 kg. On the other hand, three times shearing of weed revealed the best yield performance as 1315.1 kg. It has been determined that even the single shearing process increases the yield of chickpea about 4 times according to an average. As the number of chickpea hatchings increased in Kirsehir conditions, the result of the study proved that the yield is positive. As the number of chickpea shearing increased in Kirsehir conditions, the result of the study proved that the yield is positive.

Keywords: *Kirsehir, Azkan, weeds, yield, yield components.*

RAINBOW TROUT EGG AS A BIOACTIVE COMPOUND DELIVERING VEHICLE: DETERMINATION OF FOOD COLORANT (BRILLANT BLUE) INTAKE CAPACITY

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Abstract

Drug delivery systems are carriers that allow for the protection of the bioactive compound from physicochemical factors such as oxidation, denaturation, ultraviolet radiation (UV), high temperature, pH, enzymes, and biochemical interactions. Rainbow trout fish (*Oncorhynchus mykiss*) is one of the main commercial fish species widely farmed in Europe. Rainbow trout eggs contain high content of omega-3 polyunsaturated fatty acids in phospholipids form, essential amino acids, vitamins and valuable minerals. A wide variety of encapsulating materials has been used to protect bioactive ingredients. Brilliant blue is a most common food colorant used in food industry. Brilliant blue (BB) can soluble easily in water and gives blue color to food materials. It is hypothesized that BB could be used as an indicator to determine bioactive compound encapsulating capacity of rainbow trout egg. Thus, the aim of this research was to determine water-soluble compound loading capacity of trout fish egg by using BB. BB colorant was selected as a model bioactive compound for loading and encapsulating trial. Among the all concentrations of BB colorant tested, sample BB750 and BB1000 showed the highest bioencapsulating capacity. It resulted that trout fish egg could be successfully used as a bioactive compound carrier vehicle for water-soluble compounds.

Keywords: *Rainbow trout egg, Encapsulating, Brilliant blue colorant, Loading capacity.*

DETERMINATION OF THE EFFECTIVENESS OF COLOR AND PHEROMONE TRAPS IN APPLE FLOWERS FEEDING HAIRY BEETLE (*TROPINOTA HIRTA* PODA) CONTROL

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Abstract

Tropinota (*Epicometis*) *hirta* Poda (Coleoptera: Scarabaeidae) damages reproductive parts of flowers of several fruit trees, some vegetables, and many ornamental bushes. The hairy beetle overwinters as larvae and ecloses in soil. Adult beetles emerge in time for spring fruit trees blooming. This beetle is active during the day, concealing near soil to overnight. The control of hairy beetle is complicated, and insecticides cannot be used due to the impact on the honeybees, pollinators, and other beneficial insects. Traps, as chromotropic traps, alone or in combination with a pheromone lure, are a method for the control of hairy beetles while adult. We used picasso blue (#0000FF) traps lured by pheromone in several combinations: 1) clear/no pheromone; pheromone clear; colour/no pheromone, and) and colour/pheromone. Each traps were assembled with a 22 cm wide funnel, eventually painted with Picasso blue, connected with the neck of a 5-litre colourless plastic bottles filled with water (1 litre). The combination of Picasso blue funnel + pheromone lure was the most effective in hairy beetle control. Total caught hairy beetle counts: 351.33 for Picasso blue + pheromone treatment, 282.67 for Picasso blue treatment, 13.67 for pheromone treatment and 2.33 for the control. The maximum of hairy beetle catching was in the fifth week (17-24.04.2017); number of hairy beetles caught between 3rd and sixth weeks was high. Use of the funnel traps is an important method of harmful keep under control.

Keywords: *Apple, Konya, Blue, Attractant trap, Biotechnical control.*

RESISTANCE OF SUGAR BEET TO BEET CYST NEMATODE

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Abstract

The beet nematode *Heterodera schachtii* Schmidt is a major pathogen on sugar beet (*Beta vulgaris* L. ssp. v*ulgaris* var. *Altissima Döll*). The most favored strategy for the management of the beet cyst nematode is the breeding of resistant cultivars. The resistance genotypes suppressed the increase of the beet cyst nematode population until the end of the growing season and increased in the root yield and sugar yield. But the high level of resistance to the beet cyst nematode has never been observed in a cultivated beet (*Beta vulgaris* L. ssp. vulgaris var. *Altissima Döll*). Complete resistance is found exclusively in the three species of the section *Procumbentes; Beta procumbens, Beta webinana,* and Beta *patellaris.* Chemical control poses a threat to the environment and some nematicides have been banned. Crop rotation has been effectively keeping the population of nematodes down to a level threshold and sugar beet to be grown successfully, but sometimes the length of rotation not conductive. Like rotation, soil fumigation and other measures have been used for control of the cyst nematode; however, these are not fully enough, at this site, breeding research for the development of the varieties that are resistant to the beet cyst nematode has been a major alternative. In the past few years, a number of molecular markers closely linked to the $Hs1^{pro1}$ nematode resistance gene have been obtained. The introgression material is presently used in breeding programs to develop nematode resistant sugar beet varieties. The use of resistant varieties must be used to reduce cyst nematode damages.

Key Words: *Breeding, Beet cyst nematode, hybridization, backcrossing, Beta webbina, Beta procumbentes.*

EFFECTS OF LOCAL ENTOMOPATHOGENIC *BEAUVERIA BASSIANA* ISOLATES AGAINST *SITOPHILUS GRANARIUS* (COLEOPTERA)

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Abstract

The granary weevil *Sitophilus granarius* L. is one of the most damaging grains pest in many parts of the World and Turkey. Chemical insecticides have been widely employed for the control of stored grain pests. This has caused such problems as insecticide resistance along with contamination of foodstuffs with chemical residues. Thus, there is a growing interest in using pathogenic control agents as an alternative. This study aimed to evaluate the efficacy of entomopathogenic fungus *Beauveria bassiana* isolates (F-52, F-53, and F-56) on adults of granary beetle *S. granarius*. Five different doses, including 1×10^3, $1x10^5$, 1×10^7, $1x10^8$, and 1×10^9 conidia/ml for insect dipping, had been used. The experiment was laid out in a completely randomised block design with five replications and replicated two times. Mortalities were recorded on the 1st, 3rd, 5th, and seventh days of incubation. The highest mortality rate of 70% was observed at the end of the five-day incubation period with isolate F-53. Mortality increased with increase in the incubation period, and the highest mortality was observed after seven days of incubation period. Although the results indicated that isolate F-53 was effective against *S. granarius* and resulted in a high mortality 98% at the end of seventh day incubation period at 1×10^9 conidia/ml and followed by isolates F-52 and F-56 with 94% mortality. LC50 values confirmed that *S. granarius* was more susceptible to the isolate F-52 than the other two isolates F-53 and F-56 where the LC50's were $1x10^5$, $2x10^5$, and $5x10^5$ conidia/ml respectively. Mycosis was observed in all the treatments except the control. Our study indicates that all the isolates could be used as potential biological control agents. Further studies are ongoing for determination of the efficacy of this isolate under storage conditions.

Keywords: *Biological control, entomopathogen, Beauveria bassiana, granary weevil.*

PROSPECTIVE USE OF BACTERIOPHAGE ISOLATES AS AGENTS OF PHAGE THERAPY AND PLANT PROTECTION FROM PHYTOPATHOGENIC BACTERIA

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Abstract

Bacteriophages, as natural antagonists, have considerable potential for developing methodological approaches to control the spread of bacterial pathogens. Bacteriophages have a number of advantages over other control: they are highly specific to host bacteria, non-toxic to macro organisms, non-pathogenic for common microflora of plants and soil. Therefore, the main objective of the study was to isolate and identify bacteriophages that were specific to phytopathogenic bacteria. Samples of beets, potatoes, apples, garlic and mandarins with symptoms of rot were selected from vegetable storehouses. The main symptoms of bacterial lesions observed in fruits were areas of mild decay, softening of the tissues, and the extraction of the exudate. As a result of this work we isolated phages specific to *Pseudomonas syringae lachrymans* 7591, *P. fluorescens* 8573, *P. savastanoi pv. phaseolicola* 4013 and *Serratia marcescens* sp. Bacteriophages led to the formation of negative colonies which were separated into three groups based on plaque size: large (6 mm), medium (3 mm) and small (1 mm). To identify host range specificity of isolated phages, spectrum of lytic activity was studied against 9 strains of phytopathogenic bacteria. Our research revealed that among 14 phage isolates, five expressed lytic activity against different strains of phytopathogenic bacteria. Obtained data indicate that isolates with a broad spectrum of lytic activity can be used as promising biological agents in control of bacteriosis. Consequently, isolated bacteriophages can be considered as phage therapeutic agents.

Keywords: plant pathogenic bacteria, *morphological features, bacteriophages.*

MOLECULAR AND BIOLOGICAL PROPERTIES OF SOYBEAN MOSAIC VIRUS AND ITS INFLUENCE ON THE YIELD AND QUALITY OF SOYBEAN UNDER CLIMATE CHANGE CONDITIONS

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Abstract

Soil and climatic conditions of Ukraine provide the obtaining of ecologically sound yields of grain crops and legumes, among which the soybean occupies the forefront. In 2017, the average soybean yield was significantly (by 3.4 - 13 centner/ha) lower than in 2016. The aim of the work was to investigate the molecular and biological properties of the *Soybean mosaic virus* (SMV) isolate SKP-16, its effect on soybean yield and grain quality under agro-climatic change conditions. In 2015-2017, monitoring inspections of soybean crops showed that viral infections, occupied a significant place, mainly SMV. Also, seed transmission of SMV infected several soybean varieties was proved. In 2017, a very dry year for Ukraine, and especially for Poltava region, we found a significant infecting of many varieties with SMV. Hydrothermal coefficient of G.T. Selyaninov (HTC) was less than 1, only 0.53. This indicator takes into account simultaneously the actions of the main climate elements – temperature and precipitation. The low HTC provided a significant number of aphids – vectors of SMV. We have studied in detail the SMV isolate SKP-16 from soybean variety Kophy (GenBank Accession No MG940990). The yield of soybeans in the SMV-infected plants was reduced by 2.6 times, compared with healthy ones in 2017. But in 2016, the difference was considerably smaller, indicating a synergistic harmful effect of both factors - the virus and climatic conditions. The analysis of the nucleotide and amino acid sequences of the SKP-16 capsid protein gene revealed the highest percentage of identity (97.9% and 97.2% respectively) with the isolates UA1Gr, Ar33, Lo3, VA2. Four amino acid substitutions were found in position 1 (Ser → Cys), position 2 (Lys → Ser), position 3 (Gly → Leu), and position 5 (Val → Leu).

Keywords: *soybean, Soybean mosaic virus, sequencing, yield, quality.*

EVALUATING POPULATION DENSITY OF TOMATO LEAF MINER, *TUTA ABSOLUTA* (MEYRİCK) (LEPIDOPTERA: GELECHIIDAE) ON TOMATO PLANT IN ANTALYA PROVINCE (TURKEY)

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Abstract

The tomato leaf miner, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) is one of the most important pests on tomato plants. The study was conducted in 2015-2017 to evaluate the population density of the tomato leaf miner, *T. absoluta* (Meyrick) (Lepidoptera: Gelechiidae) at six tomato-growing greenhouses in Antalya province of Turkey. Each of the greenhouse contained different variety of tomato plant. The tomato leaf miner pheromone (0,5 mg (3E,8Z, 11Z)-3,8,11-tetradecatrienyl acetate (TDTA) (Econex) and delta type traps were used to monitoring population density of this pest. In the first year, a significant fluctuation on population density of tomato leaf miner was observed during the sampling period. The highest number of adults were caught by pheromone traps in March (22.72%), followed by 22.53% in November, 21.72% in February, 16.86% in January, and 12.16% in December. In the second year, a significant fluctuation on population density of tomato leaf miner was observed during the sampling period. The highest number of adults were caught by pheromone traps in October (39.31%), followed by 19.86% in March, 12.27% in February, 11.89% in November, and 6.96% in January.

Key words: *Tomato leaf miner, Tuta absoluta, pheromone, Antalya province.*

Acknowledgements

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INCIDENCE OF RESISTANCE BREAKING ISOLATES OF *BEET NECROTIC YELLOW VEIN VIRUS* IN SUGAR BEET IN CENTRAL PART OF TURKEY

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Abstract

Beet necrotic yellow vein virus (BNYVV) which is the agent of rhizomania disease, is transmitted by *Polymyxa betae* Keskin and causes significant losses in sugar beet fields all over the world including Turkey. The disease control is depend on the use of resistant beet cultivars. However, severe BNYVV symptoms were observed in *Rz1*-plants in a number of fields in Turkey. In this study, 365 soil samples were collected from six important sugar beet growing provinces in central part of Turkey in 2016. Incidence of BNYVV was determined by bait plant test using ELISA. The percentage of BNYVV infested soil samples was 54.8% (200 samples). Additionally, the pathogenicities of BNYVV isolates in the sugar beet genotype *Rz1* was investigated under controlled conditions. The soils samples found as BNYVV-positive were planted with the seeds of BNYVV-resistant variety (*Rz1*) of sugar beet. After eight weeks, sugar beet seedlings were tested for the virus presence by means of DAS-ELISA. Of the samples tested, 68% produced infection in the roots of sugar beet cultivar containing the *Rz1* gene. Our results revealed that BNYVV isolates associated with the breakdown of *Rz1*-mediated resistance seemed to be highly common and widespread in main sugar beet cultivation areas in central part of Turkey. Unfortunately, BNYVV does not seem to be controlled well bygrowing only *Rz1* gene containing resistant sugar beet cultivars.

Keywords: *BNYVV, bait plant, rhizomania, resistance-breaking, Rz1.*

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MONITORING OF AFLATOXINS IN DIFFERENT PHASES OF CORN AND IN CONCENTRATED FOOD OF DAIRY COWS

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Abstract

Some cereals and concentrated animal food are affected by mycotoxins which are produced from molds (genus of *Aspergillius, Fusarium, Penicillium*etc*)* in the different stages of grain growing and storage, being affected by atmospheric conditions such as humidity, temperature differences, drought and invasion of different insects.The purpose of this study was to determine the presence of aflatoxin in maize in the harvest phase, storage phase and in concentrated food for dairy cows. The determination of aflatoxins was carried out with rapid semi-quantitative methods and were confirmed by quantitative methods of ELISA's.The results of the study showed that 3 out of 10 samples of maize in the harvest phase and in storage were invaded by aflatoxins above the permissible norms for use in cows for milk production. Two samples obtained from concentrated food prepared with 50% from the above maize, resulted in permissible norms.From the above findings as well as from other authors, we can conclude that mycotoxins are a serious problem that can bring not only lower animal production but can also create disturbances in people. The monitoring of mycotoxin contamination in animal food, especially for dairy cows and using of various methods for preventing and absorbing mycotoxins if they are evident is a necessary and ongoing requirement. This monitoring and prevention process can be carried out in a cooperative way, where veterinarians, zoo techniciansagronomists and other scientists should be part of it.

Key words: *Mycotoxins, aflatoxins, cereals, animal food.*

OCURRENCE OF *TETRANYCHUS URTICAE* ON SOUR CHERRY TREES IN SOUTHEASTERN OF MACEDONIA

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Abstract

The two-spotted spider mite is probably one of the most polyphagous arthropods that feeds on tree fruits. It is distributed worldwide and is an economic pest of many crops. Its innumerable hosts include many weeds, field crops, ornamental plants, vegetables, forage crops, small fruits and tree fruits (apple, pear, peach, nectarine, apricot, cherry (sweet and sour) and plum). The research was conducted during 2017 in sour cherry orchards in southeastern of Macedonia (the region of Stip, Strumica and Gevgelija), before and after the harvest of the sour cherries (01.06. – 30.09.2017). Scouting for mites began prior the harvest. The method of monitoring two-spotted spider mite motile populations consists of sampling 10 leaves from 10 randomly selected trees (100 leaves) on an area of two ha. To estimate the number of mites per leaf, we count the number of leaves that have two or more two-spotted spider mite motile from each sample and follow the presence-absence sampling method look-up table. The results showed that after harvesting the sour cherries, during the summer and autumn, the number of two-spotted spider mite increases and exceeds the economic threshold (8-10 spiders on the leaf), so chemical treatment is required in order to control the population of the spider. The problem in the Republic of Macedonia is that sour cherries producers rarely perform postharvest treatment of the sour cherry trees, so the two-spotted spider mite population increases, which in turn contributes to a reduced yield of sour cherries.

Keywords: *two spotted spider mite, sour cherry, presence, acaricides.*

THE POSSIBILITY OF APPLYING *BACILLUS* SP. SP-40 IN THE CONTROL OF *FUSARIUM* FUNGI

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Abstract

Biological control is an increasing group of plant protection methods. In comparison to fungicides, the biological control agents have a weaker impact on the natural environment. Among the various methods, the usage of antagonistic bacteria is of the outmost importance in ensuring protection against phytopathogenic fungi. The beneficial strain of bacteria can inhibit the growth of phytopathogens by using several strategies and may promote the growth of plants it colonizes. The aim of this study was to determine i) evaluation of multi-trait plant growth promoting parameters of *Bacillus* sp. SP-40; ii) the antagonistic action of used strain on *Fusarium* spp. Growth on selective medium, dual-culture test, and PCR identification of gene response to fungistatic substance production were performed to enable detection of antagonistic traits of *Bacillus* sp. SP-40. Relationships between antagonist, pathogen and plant were examined as well. Study results showed the antagonistic effect of the tested strain against *Fusarium culmorum* and *F. oxysporum* on appropriate growth media. Chitinolytic and cellulolytic activities of *Bacillus* sp. SP-40 were determined either on the selective medium. The ability of fungistatic metabolite production (surfactin, bacilysin, fengycin, bacillomycin and iturin) was affirmed by PCR. The antagonistic strain grew at 10 to 37°C, pH 5 to 9, and NaCl 5% and was resistant to $CuSO_4$ and common fungicides, insecticides and herbicides. The fluorescence microscopy analysis demonstrated that the antagonistic strain colonized *Fusarium* mycelium (hyperparasitism). Results of water-agar test showed that wheat kernels inoculated with the *Bacillus* strain were more resistant to *Fusarium* spp., and seedlings had improved health status and biometric properties. In conclusion, *Bacillus* sp. SP-40 application caused significant inhibition of *Fusarium* spp. growth on both culture medium and wheat seedlings.

Keywords*: Biocontrol, antagonistic bacteria, wheat.*

CURRENT STATUS OF TOMATO LEAFMINER, *TUTA ABSOLUTA* (MEYRICK) (LEPIDOPTERA: GELECHIIDAE) IN ROMANIA

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Abstract

The tomato leafminer, *Tuta absoluta* (Meyrick) (*Lepidoptera:Gelechiidae*) is one of the most damaging invasive moths, threatening the tomato crop worldwide. It originates from South America and it was reported for the first time in Europe, in Spain, in 2006. It was reported even in Norway, in 2017. Having a spreading speed of more than 800 km in a year, *T. absoluta* reached Romanian borders most probably in 2009, when it was first found in Botoșani County. After this first interception, the pest spread in neighbouring counties as Maramures (2009), Bihor (2010), Arad (2010), Ilfov (2010) and Mures (2010). Although sustained efforts have been made to limit the spread and the Plant Protection Authority launched a national monitoring plan in 2011, while the pesticide companies have held numerous farmers' awareness sessions on the high potential of pest damage and the popularization of control measures, *T. absoluta* continues to spread in the main vegetable basins: Hunedoara (2013), Calarași (2011), Ilfov (2013), Galați (2015). According to the recent field reports, the pest started to be present outside protected areas (greenhouses and plastic film tunnels) and affect the open field tomatoes (Paradisverde, 2018). Also, the pest is now affecting and is now infesting sweet pepper, eggplants and other crops and weeds. In this paper current status of *T. absoluta* in Romania, nine years after its first interception, is presented. Considering the pest adapts very fast to different climate conditions, it is obvious that control measures are imperatives and knowing the real spread in the territory could help Romania to take the appropriate measures.

Keywords: *Tuta absoluta, invasive pest, spreading map, Romania, citizen science.*

INFLUENCE OF ARTIFICIAL INFESTATION WITH WESTERN CORN ROOTWORM EGGS ON PLANTS HEIGHT AND LEAVES NUMBER ON MAIZE

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Abstract

Western corn rootworm *Diabrotica v.* sp.*virgifera* is a pest native to America. Nowdays it presents economically one of the most important maize pests in Europe. A field experiment was carried out in Bečej (Serbia) during 2014 with Serbian maize cultivar NS-640. In experimental field, 96 plants were selected, marked, and arranged in 48 pairs. The number of leaves and plant height were recorded.. The maximum leaves number on C (control plants) was 15 during all five observations. The maximum leaves number on D (infested plants) was 14 in the first two and 15 in the last three observations. The maximum measured height on C (control) plants during five observations during vegetation was 180, 195, 300, 320 and 320cm, respectively. The maximum measured height on D (infested) plants during five observations was 178, 192, 295, 295 and 295cm, respectively. Statistical analysis shows significant differences between C and D plants based on their leaves number during the first three observations, while there were no differences between plant heights during all five observations.

***Keywords**: Western Corn Rootworm, artificial infestation, maize, height, leaves.*

EFFECTS OF ANTAGONIST BACTERIA AGANIST WALNUTS BACTERIAL BLIGHT DISEASE IN *IN VITRO* CONDITIONS

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Abstract

Walnut (*Juglans* spp.) crops are among the most economically important tree crops worldwide and cultivated to a different extent in all conditions. Bacterial blight (*Xanthomonas arboricola* pv. *juglandis*) is one of the main diseases of walnut that reduce the yield. Bacterial symptoms have been reported on all succulent tissues such as shots, leaves, buds, female flowers, catkins and nuts. The walnut leaves are more susceptible than other plant parts. Points of infection begin as water-soaked areas which develop into brown necrotic areas. Walnut bacterial blight is difficult to control because the bacteria overwinter and survive in dormant buds. So biological control is very important against walnut blight. The aim of this study was to determine whether bacterial antagonist could be used to control *Xanthomonas arboricola* pv. *juglandis.* In total, 69 potentially bacterial antagonists were isolated of healthy walnuts leaves. These samples were screened for their biological control activity against *Xanthomonas arboricola* pv. *juglandis* with dual culture methods in *in vitro* conditions. As a result of these study 48 antagonist bacterial strains obtained effective against *Xanthomonas arboricola* pv. *juglandis* with inhibition zone diameter ranging from 4.6 to 16.6 mm. Interestingly, among 21 effective antagonist bacteria, all of them totally inhibited the growing ability of pathogen *Xanthomonas arboricola* pv. *juglandis*. We clearly observed that these antagonist bacteria have a higher efficacy for *Xanthomonas arboricola* pv. *juglandis* biocontrol.

Keywords: *Xanthomonas arboricola* pv. *juglandis, juglan, biological control, dual culture method.*

MYCOTOXINS AND THEIR DETECTION METHODS IN CEREAL AND CEREAL PRODUCT: A REVIEW

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Abstract

Cereals represent the most important source of food providing significant amounts of rich nutrients. Cereals can be infected by fungi both at pre- and/or postharvest stages and during storage when stored in poor conditions with excessive humidity and temperature. Infection of crops and stored cereals by fungi can result in the production of secondary toxic metabolites which are called as mycotoxins. Important fungi growing on cereals include *Alternaria*, *Aspergillus*, *Fusarium*, and *Penicillium*. Currently about 450 mycotoxins have been known, among which aflatoxins (AFs), ochratoxin A (OTA), zearalenone (ZEA), fumonisins (FUM), T-2/HT-2 and deoxynivalenol (DON) are of primary importance in cereals and cereal products. Mycotoxins which are carcinogenic, hepatotoxicity, nephrotoxicity, teratogenic, mutagenic, and immunosuppressive can pose fatal poising and toxic effects called acute and chronic mycotoxicoses. To ensure the safety of food for consumers and to protect consumer health, several countries have set regulations for maximum allowed levels of mycotoxins. Therefore; cheap, rapid, accurate and sensitive methods for routine analysis are required for the analysis of toxins. There are many methods which have been used for detection of toxins such as chromatographic techniques, immunoassay-based methods and biosensors. Commonly used methods have the following steps; sampling, homogenization, extraction and detection. Chromatographic methods give the quantitative results while immunoassay-based methods provide qualitative or semi quantitative results. Among the chromatographic methods ultrahigh-performance liquid chromatography coupled to tandem mass spectrometry (UPLC/MS/MS) are preferred for the multi toxin detection. The biosensors are newly methods which are focused on improving practical applications in food industry. This review study summarizes mycotoxins found in cereals and cereal products and analysis methods of mycotoxin.

Keywords: *Fungi, mycotoxins, analysis method.*

DETERMINATION OF *PSEUDOMONAS SAVASTANOI* FROM OLEANDER IN TEKIRDAG OF TURKEY

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Abstract

Pseudomonas savatanoi is the causal agent of bacterial knot disease. These bacteria is thought to result from abnormal plant cell multiplication at the infection site in response by the host to large amount of indole-3-acetic acid (IAA) or cytokinin produced by pathogen. Bacterial knot has a lot of host range such as olive, oleander, jasmine, fontanesia, privet, myrtle and pomegranate plants. Bacterial knot disease is one of the most important and common disease. The aim of study was isolation and identification with pathogenicity and biochemical tests of disease agent *Pseudomonas savastanoi* from oleander. So in spring 2017, we obtained some samples of oleander leaves and branches with small ground galls in Tekirdağ province of Turkey. To investigate the variability of *Pseudomonas savastanoi* population, twenty one strains of the bacterium were isolated in Tekirdağ from oleander. The strains were exposed to Gram reaction, levan production on 5% saccharose nutrient agar (SNA), oxidase, pectolytic activity, arginine dihydrolase reaction, hypersensitive reaction on tobacco leaves and pathogenicity test on oleander plant. As result of tests twenety one bacterial strains from oleander produced knots on host species were tested, all strains were pathogenic on oleander plants. They were negative for levan, oxidase, arginine dihydrolase, pectolytic activity and positive for hypersensitive reaction on tobacco leaves. According to results of this study, bacterial knot disease determined and all strains were allocated in the LOPAT 1b with biochemical tests.

Key words: *Nerium oleander, oleander, bacterial knot.*

WEED FLORA OF MAIZE CROP IN LOCALITY OF SKENDERAJ (KOSOVO)

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Abstract

A field study was carried out in the region of Skenderaj municipality in Kosovo during 2015 to identify weed flora in maize crop. In total 150 plants releve with standard size of 25 m^2 were sampled in maize fields of Skenderaj municipality. The location of each plot was recorded with help of GPS using the UTM system. A total number of 44 species where documented in the maize crop. The dominant weed species were: *Convolvulus arvensis, Polygonum aviculare, Chenopodium album, Amaranthus retroflexus, Cirsium arvense, Mentha arvensis* and *Echinochloa crus-galli*. In maize crop, from total number of 44 weed species, 82% belong to broadleaf and 18% to grass species. Regarding the life forms of the recorded species, therophytes (57.0%) and hemicryptophytes (28.0%) were the most important groups, whereas geophytes (13.0%) and phanerophytes (2.0%) were the least important. The following species were predominant regarding floral elements: Eurasian (27.0%), Cosmopolitan (22.0%), Sub-euroasiatic (14%), while the rest of floristic elements accounted for to 2%. Relatively high species number and high proportions of perennial plants in the recorded fields might be the result from low levels of herbicide application and mechanical weed control in maize crop in past on the locality of Skenderaj.

Keywords: *Floristic elements, Maize, Weeds, Kosovo.*

ANTI-OXYDANT ACTIVITY OF THE ESSENTIAL OIL EXTRACTED FROM FLAX GRAINS

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Abstract

Linum usitatissimum is a medicinal plant from the *Linaceae* family widely used in traditional medicine. It is also known as common flax or linseed. It is a food and fiber crop cultivated in cooler regions of the world. The aim of the present work was to extract and analyze the essential oil from the seeds of *Linum usitatissimum* by stripping with water vapor at a yield of 0.80%. The extracted essential oil showed interesting physic-chemical and organoleptic properties. To determine the amount of total polyphenols, ethanolic and aqueous extracts were prepared. The results show that the total polyphenol content depends crucially on the nature of the solvent. The antioxidant activity was evaluated by two different methods, DPPH and bleaching of β-carotene. We got an IC50 of 9,81mg / ml and the bleaching method yields a result of 31.64%.

Keywords: *antioxidant activity, essential oil, seeds of Linum, polyphenols, β-carotene, DPPH.*

ANTIFUNGAL ACTIVITY OF *MENTHA ROTUNDIFOLIA* EXTRACTS AGAINST *ALTERNARIA ALTERNATA*

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Abstract

The antifungal activity of ethanolic and methanolic extracts of *Mentha rotundifolia* harvested in Setif (Algeria) was investigated *in vitro* using the method of double dilution on PDA medium against a phytopathogenic fungus *Alternaria alternata*, isolated from a rotten tomato. The molecular identification of the strain was based on a comparison (BLAST) of the sequences obtained against a database and was often supplemented by microscopic observations. After "SANGER" sequencing of the PCR products, the sequences were received in FASTA format. The HPLC analysis of extracts showed the richness of the extracts studied and allowed to identify: 14 compounds for the ethanolic extract including 7 phenolic acids and 7 flavonoids, 17 compounds for the methanolic extract including 9 phenolic acids and 8 flavonoids. The scutellarin was determined as the major phenolic compound of the two extracts. After seven days of incubation, the methanolic extract revealed significant antifungal activity with inhibition rate of mycelial growth greater than 50% (51.12%) with a concentration of 12.5 mg/mL, it showed 15.12 mg/mL IC_{50} value against *A. alternata*. The ethanolic extract inhibited the mycelial growth of pathogen with a rate greater than 50% (58.21%) at the 25mg/mL concentration. *M. rotundifolia* extracts might be a promising bio-fungicide for controlling *A. alternata*.

Key words: *Mentha rotundifolia, extracts, Alternaria alternata, molecular identification, HPLC.*

TOXICITY OF AQUEOUS EXTRACTS OF SOME MEDICINAL PLANT ON *EPHESTIA KUEHNIELLA* (PYRALIDAE: LEPIDOPTERA)

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Abstract

As part of a green extraction away from the use of any chemical solvent and high temperatures that could negatively affect the quality of the final extract, an aqueous extraction by infusion of *Nerium oleander* leaves and the mixture of four plants: *Artemisia herba-alba, Rosmarinus officinalis*, *Eucalyptus camaldulensis* and *Peganum harmala* was done. After a series of dilutions of the stock solution, four concentrations were chosen: 25%, 50%, 75% and 100%. The toxicity of the different concentrations of each extract was tested on eggs and larvae of *Ephestia kuehniella* Zeller. Preliminary results showed that hatching of eggs was affected only by the extract of the mixture of four plants. On the other hand, these extracts did not proveany effect against the larvae of this pest.

Keywords: *Aqueous extraction, medicinal plants, Ephestia kuehniella, toxicity.*

BIOLOGICAL CYCLE OF *TUTA ABSOLUTA* ON TOMATO TYPE ROUND AND TOMATO TYPE CHERRY

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Abstract

In a vegetable farm, a biological cycle of *Tuta absoluta* was monitored in a greenhouse. In fact, 5 plants were chosen for each of the two types of tomato, the round " Pristyla " and the cherry " Sarah ". It was a question of comparing the duration of the cycle on the two types of tomatoes. The 5 plants were chosen with respect to their position in the greenhouse,for each variety, two plants at both ends of the greenhouse and three in the middle. Contaminated plants were marked with a colored ribbon. The cycle was monitored by daily observations. The results showed that on the round tomato the average duration of the cycle from hatching to chrysalis was 14.5 days on plants ofborder lines. On the other hand, it was only 12 days on plants located in the middle of the greenhouse. However, on cherry tomatoes, the average cycle time on the plants of the periphery was 24 days and on the leaves located on the middle lines of the greenhouse extended over 21 days. Nevertheless, the life cycle development of *Tuta absoluta* on both types of tomatoes was short in middleplants compared to border plants in greenhouse. It should also be noted that during this experiment, the chrysalis was not seen on the leaves of two tomatoes.

Key words: *cherry tomato, round tomato, Tuta absoluta, life cycle.*

ASSESSMENT OF THE ANTIBACTERIAL EFFECT OF ESSENTIAL OILS EXTRACTED FROM THYME (THYMUS VULGARIS L.) IN THE REGION OF TIARET (ALGERIA)

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Abstract

The aim of this work was to study the antibacterial activity of essential oils extracted from thyme (*Thymus vulgaris* L.) in the region of Meghila (Tiaret).The extraction of these essential oils using hydrodistillation method gave a remarkable yield which was 2.41%. The analytical data of various physicochemical parameters (pH, specific gravity, rotatory power, miscibility, refractive index, iodine number, acid number and peroxide index) showed that this oil had a very appreciable quality. The results of antibacterial activity of different concentrations of thyme essential oils (5, 10, 25 and 50 µl) carried out by discdiffusion method against five pathogenic bacterial strains (*Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeroginosa*, *Bacillus cereus* and *Klebsiella ornithinolytica*) revealed the sensitivity of *Staphylococcus aureus*, *Escherichia coli* and *Bacillus cereus* to the studied oil with DZI (Diameter of the Zone of Inhibition); 37-74 mm, 17-71 mm, 26-74 mm and I% (Percent Inhibition), 43.52 -87.05%, 20-83.52% and 30.58-87.05% respectively. This oil had a significant bactericidal effect and it was proportional to the increase of its concentration.

Key words: *Antibacterial effect, Extraction, Essential oil, Thyme (Thymus vulgaris L.).*

EFFECT OF A GREEN ALGAE ULVA LACTUCAON GLYCEMIC CONTROLE ANDOXIDATIVE STRESSIN TYPE 2 DIABETIC RATS

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Abstract

The aim of this study was to examine the effect of a green alga (*Ulva lactuca*) on glycemic control, oxidative stress and enzymatic antioxidant defense in type 2 diabetic rats. Wistar male rats were subjected to a high fat (30% butter) diet (HFD) for 5 weeks. At the end of this period, an intraperitoneal injection of a low dose of STZ was administered to rats. The diabetic rats were divided into 3 groups (n = 6) and were subjected for one month to a 30% lipids with or without 1% algae (HFD-Alg) or 1% of its extract (HFD-Ex). A control (C) group (n = 6) consumed a standard diet (20% casein). The results showed that in HFD *vs* C, the diabetic state was accompanied by increased glycemia, glycated hemoglobin and homeostasis assessment of insulin resistance (HOMA-IR) index and decreased serum insulin and homeostasis assessment β cell function (HOMA-β) index. Moreover, serum and erythrocyte thiobarbituric acid reactive substances (TBARS) and carbonyls increased significantly while anti-radical defense decreased. In HFD-Alg or HFD-Ext groups *vs* HFD group, glycemia, HbA1c, HOMA-IR, serum TBARS and carbonyl levels decreased significantly while HOMA- β increased. In addition, enzymatic antioxidant activity (SOD, CAT, GSH-Px) increased. In conclusion, type 2 diabetes was accompanied by hyperglycemia, increased HbA1c and HOMA-IR and decreased HOMA-β. Moreover, oxidative stress was exacerbated in this pathology. It seems that the ingestion of the green algae or its extract corrects the metabolic abnormalities caused by the diabetes especially hyperglycemia andoxidative stress. Thus, the exploitation of this green algae in the therapeutic field would be promising.

Key words: *type 2 diabetes, Ulva lactuca, glycemic control, oxidative stress, rats.*

PHYTOCHEMICAL STUDY AND EVALUATION OF THE EFFECT OF THE ETHANOL EXTRACT OF *SOLENOSTEMMA ARGEL* ON FEEDING BEHAVIOR OF THE MIGRATORY LOCUST *LOCUSTA MIGRATORIA*

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Abstract

The present study concerns the phytochemical screening of the plant *Solenostemma argel* and the evaluation of the sublethal effect of a dose of 700 µg /larvae of the crude ethanolic extract on the feeding behavior of the 5th instar larvae of *Locusta migratoria*. Administration of the extract was made to newly emergent larvae by oral forcing. The control group received the solvent used for the solubilization of the extract. Conventional nutritional indices of consumption and food use were evaluated for control and treated larvae. The carried out phytochemical tests made it possible to highlight the presence of saponosides, alkaloids, glycosides and certain phenolic compounds (flavonoids and tannins) as major compounds of this plant. The results of the study of the evaluation of nutritional indices of consumption and use of food such as the coefficient of digestive use (CUD), ingested food conversion efficiency (ECI), digested (ECD) and growth index (ICr) revealed that L. migratoria L5 larvae showed sensitivity to the extract compared to controls. An extension of the duration of the larval stage was also observed in treated larvae. These last ones were presented in addition to abnormal moults.

Key words: *Locusta migratoria, 5th instar larvae, Solenestemma argel, phytochemical screening, nutritional indices.*

INVESTIGATION OF GENETIC DIVERSITY AMONG FIG CULTIVARS (*FICUS CARICA* L.) USING IPBS AND SSR MARKERS

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Abstract

In order to understand and precisely the unknown genetic background, relationships, structure and diversity of fig varieties, we studied Eighty-six trees belonging to Algeria and Turkey from different regions of origin (Skikda, Mila, Aydin, Izmir) evaluated by means of twenty-three inter-markers binding sites (iPBS)-retrotransposon and sixteen simple sequence repeat (SSR) markers. Reproducible and products bands were manually scored as present (1) versus absence (0) for each accession. Only clear and strong bands were recorded and used for further analysis. A total of 63 polymorphic bands for the iPBS-retrotransposon markers and 25 alleles for the SSR markers were detected with an average of 2.74 and 1.56 per locus, respectively. The average polymorphism information content (PIC) value for iPBS markers (0.73) was higher than that for SSR markers (0.69). A neighbor-joining cluster based on the combined iPBS-retrotransposon and SSR data clustered the fig varieties into two groups. The STRUCTURE software determined the population structure, two populations (K = 2) were identified among the varieties studied, indicating that the diversity between Algerian and Turkish varieties was low. Hence, the study revealed the both markers were able to differentiate all fig accessions and were efficient to discriminate closely related varieties. The information collected in this study can be used for fig breeding strategies and for the management and the conservation of Algerian and Turkish fig germplasm.

Keywords: *Ficus carica, genetic diversity, iPBS, SSR.*

THE EFFECTS OF PACKAGE MATERIALS AND STORAGE TIME ON THE VITAMIN C AND FLAVOR CONTENTS IN RECONSTITUTED ORANGE JUICE

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Abstract

The beverage sector is among the most dynamic sectors of the food industry in Algeria. Orange juice, one of the products of this sector, is the most consumed in the world and Algeria is no exception. This juice is known for its role of quenching, its taste both sweet and sour and especially for its vitamin C intake. However, like all juices, orange juice can undergo degradation reactions before reaching the consumer. These reactions, which are of a physical, chemical, enzymatic or microbiological nature, depend on several factors such as: the nature and condition of the product (fresh or processed), its packaging and storage. In the present work we studied the effects of the package materials and storage time on the nutritional and sensory quality of a reconstituted orange juice produced in Algeria. The evaluated parameters were respectively the vitamin C and flavor compounds. Samples of orange juice, packaged in the three most used packaging in the beverage industry,tetra-pack, glass and plastic (PET), were stored in the laboratory at room temperature in two conditions control, light exposure and total darkness. The monitoring of the quality during storage for three months showed that losses aromas and vitamin C through the plastic packaging materials were very important against glass or tetra-pack. In fact, significant losses ($p<0.05$) of vitamin C in PET were about 96% at light exposure and 92% in darkness. Thus, losses of vitamin C in plastic materials (PET) were correlated with their oxygen permeability and the sorption phenomena. The best conservation of vitamin C was in tetra packpacked juice. The glass packaging was intermediary for losses of aromas and vitamin C.

Keywords:*orange juice, quality control, orange aroma, vitamin C stability.*

CONTROL OF OLIVE FRUIT FLY, *BACTROCERA OLEAE* (GMELIN) (DIPTERA: TEPHRITIDAE) WITH MASS TRAPPING ON ORGANIC OLIVE ORCHARD IN TURKEY

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Abstract

The olive fruit fly, *Bactrocera oleae* (Gmelin.) (Diptera: Tephritidae), is a serious pest on olives in Turkey. The study was conducted to control olive fruit fly, *Bactrocera oleae* (Gmelin.) (Diptera: Tephritidae) with mass trapping on organic olives in Hatay province of Turkey. The study was carried out at the 'Savrani' olive orchard (20 dekar/180 traps). Total of 102 Decis and 78 Maxitrap traps baited with attractant impregnated into paper handkerchief dispensers were used. Each of the paper handkerchief package (10x7.5 cm) had a 3-mm diameter hole and contained 25 g attractant, 2 ml of 10% propylene glycol to decrease water evaporation and 2 ml of 2% dichlorvos (DDVP). All traps were placed at 1.5-2m high on southeastern side of the olives trees (1 trap in every three trees) on 10 July 2017. Attractant and propylene glycol and dichlorvos (DDVP) in the traps were replaced with the new ones every 45 days. All traps were removed on 04th November and brought to the laboratory and captured adults of *B. oleae* were counted. The fruit damage assessment was measured by the percentage of olives punctures during the harvest. As a result of investigations, the mass trapping significantly decreased population density of the olive fly. The damage rates of olives fly were observed approximate 0.25-0.75 percent on the olive fruits.

Key words: *Olive fruit fly, Bactrocera oleae, attractant, Hatay province.*

INVESTIGATION OF THE PRESENCE OF *PSEUDOMONAS SAVASTANOI PV. SAVASTANOI* AGENT IN THE TUBERCULOSIS OF THE OLIVE-TREE (*OLEA EUROPEA*) IN THE AREA OF CHLEF IN ALGERIA

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Abstract

Tuberculosis is the subject of very little research in Algeria and in particular in area of Chlef. There is not complete and precise inventory on its presence and its distribution. Only the phytobacteriose, known since always in Algeria like in Chlef, is tuberculosis of the olive-tree. It is caused by *Pseudomonas savastanoi Pv. savastanoi*a bacterial disease found on olive-trees. Our work was aimed to detect the presence of the disease (tuberculosis) of the olive-tree in the area of Chlef and to establish a map of the infected zones. First task was related to prospections and collecting of the olive branches in the area of Chlef. Firstly, we tested the presence of the bacteria in the samples prospected, followed-up by insulation and an identification of the bacteria on the basis of test of preselection and biochemical tests. By the positive samples we established a map of the affected areas by this disease. The results of this work showed that on the 60 analyzed samples of olive-tree from several areas, 16 appeared positive, they were typical colonies *of Pseudomonas savastanoi Pv. savastanoi.* Several zones were found in the area of Chlef. It would be interesting for the agricultural services to sensitize and advise farmers having the infected trees to tear off them and replace them by varieties resistant to disease of the tuberculosis of the olive-tree like Blanquette, san pardo, carmelitana, pendolino, coratine, etc. Also the good maintenance is needed allowing the increase in resistance to this disease.

Key words: *Investigation, Pseudomonas savastanoi Pv. savastanoi, Tuberculosis, olive-tree, Chlef.*

SCREENING OF *PLUM POX* IN ALGERIA

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Abstract

Prospecting carried out during eight years on several sites of stone fruit trees (peach, plum and apricot) situated in northern Algeria, namely Chebli, Bouinane, Guerouaou, Soumaa, Bougara, Boufarik, Sidi Moussa, Attatba, Kolea and the experimental station of the Department of Agronomy at the University of Blida revealed the presence of various symptoms typical of the *Sharka* stirring from simple chlorotic rings to the total perishing of fruit trees. Also, the existence of several species of aphid vectors of the *Plum Pox Virus* (*PPV*) were observed: *Brachycaudus helichrysi* (*B. helichrysi*), *Brachycaudus persicae* (*B. persicae*), *Brachycaudus cardui* (*B. cardui*), *Myzus persicae* (*M. persicae*), *Myzus varians* (*M. varians*), *Hyalopterus pruni* (*H. pruni*) and *Aphis pomi* (*A. pomi*). Infestation rates were different from one vector species to another, from one fruit species to another and from one site to another; The most dominant aphid was *M. varians* (100%), the most infested crop was plum (68.7%) and the most infested site was Attatba (96.3%). A new non-vector species which were not enfeoffed to stone fruit trees (*A. pomi*) was found with a considerable infestation rate (64.8%). All pea seedlings inoculated with aphid vectors collected from inspected fruit trees showed symptoms similar to those of *Sharka*. The Double Antibody Sandwish (DAS)-Enzyme Linked Immunosorbent Assay (ELISA) serological test revealed and confirmed the presence of *PPV* at varied impacts from one culture to another and from one site to another. Peach was the most infected culture with an incidence of 81%. The sites of Koléa and Sidi Moussa were the most infected sites (100%).

Key words: *Sharka, PPV, stonefruit trees, aphid vectors of PPV, diagnosis.*

EVALUATION OF ORGANIC EXTRACT OF *ZIZYPHUS LOTUS* (L.) ON ANTIBACTERIAL ACTIVITY

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Abstract

Aromatic and medicinal plants are an important source of bioactive molecules, especially in volatile extracts. In this context and in order to isolate new compounds with potent biological properties we were interested in the extraction of essential oil and tested the efficacy of oil and organic extracts from seeds of specie jujubier (*Zizyphus lotus L*.) against Gram positive bacteria and Gram negative bacteria. The chemical compositions of the oil was analyzed by hydrodistilation. Nineteen compounds representing 90.45% of the total oil were identified. The oil was diluted with methanol and extracts of water, ethyl acetate, chloroform and methanol (300 µg/disc) of *Zizyphus lotus* (L.) displayed a remarkable antibacterial activity against, *Staphylococcus aureus* (ATCC29737), *Micrococcus letus, Bacillus subtilis* (ATCC6633*) Klebsiella pneumoniae*(ATCC10231) and *Escherichia coli* (ATCC10536). Values determined for all the susceptible bacteria ranged between 22 mm and 13.4 mm. A low activity of essential oil and organic extracts tested was evaluated towards *Candida albicans*.

Keywords: *Zizyphus lotus, essential oil, Antibacterial activity, Gram positive, Gram negative.*

CODLING MOTH (*LASPERESYA POMONELLA* L.) MONITORING IN THE REGION OF AIN-TOUTA, ALGERIA

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Abstract

A monitoring of codling moth *Lasperesya pomonella* L. was conducted in an apple orchard (Starkrimson variety) in Ain-Touta municipality belonging to Batna province, a semi arid region in Algeria. The monitoring was determined by sexual trapping; an Delta trap developed by INRA (Institut National de la Recherche Agronomique, France) was placed in the center of the orchard from mid-April (1997) and the trap was replaced every four weeks. Two surveys were carried out per weeks (sameweek days) and the butterflies were counted and taken by a forceps. The curve of the flight of the pest was traced. The results obtained were compared with heataccumulations; considering the threshold temperature of this insect as 10°C (a thermograph was placed in the weather shelter from the first January). The flight graph showed that the codling moth is trivoltin, the first peak of flightwas recorded on May 28, the second one was recorded on July 9, and the last one on August 26. These flights correspond simultaneously to the heat of accumulation of 303.5 degree-days, 921.75 degree-days and 1693 degree-days. Previous dates could be the appropriate time to conduct effective chemical control.

Keywords: *Codling moth, dynamic, flight, heat accumulations, trap.*

INFESTATION DEGREES BY APHIDS ON THREE CITRUS SPECIES DURING SPRING SEASON IN THE REGION OF SKIKDA (ALGERIA)

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Abstract

Citrus aphids cause significant damage, direct through the weakening of trees, and indirect through the transmission of viral diseases such as Tristeza. A study was conducted in an orchard at the Technical Institute of Fruit Trees in Skikda (Algeria) to identify the aphids attacking the orange (cv. Washington Navel), tangerine (cv. Carvalhal) and lemon (cv. Eureka) during the spring of 2012 (between 21st March and 8th June). Samplings were carried out with an interval of approximately one week. An aphid count on five young shoots was conducted for each citrus species and at each sampling date. During the monitoring period, the lemon tree was the most attacked with more than 1100 settled individuals, while the orange tree was the least attacked with less than 80 individuals. The maximum infestation was observed on the 12th April for the lemon (451 individuals), on the 26th April for the tangerine (78 individuals) and on the 28th March for the orange (24 individuals). The green citrus aphid *Aphis spiraecloa* was present on the three citrus species considered, while *Aphis gossypii* was not installed on the tangerine tree. Concerning the auxiliaries, only one Hymenopteran parasitoid was found on the lemon tree. In conclusion, the lemon tree needs to be controlled and treated more than the orange tree (cv. Washington Navel) and the tangerine tree (cv. Carvalhal), as it is more susceptible to aphids and produces fruit in all four seasons.

Keywords: *Algeria, tangerine, orange, lemon, aphids.*

ONION THRIPS DYNAMICS ON ONION CROP IN THE ZIBAN, AN ARID ZONE OF ALGERIA

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Abstract

A study was conducted in an onion fieldsin the locations of Ain Naga (during 2009/2010) and M'zirâa (during 2010/2011) from the Ziban, an arid zone of Algeria. Thrips dynamics was determined by direct collect from plant seedling to harvest. A field of 400m^{2}was limited, where 40 plants were randomly selected, and checked weekly for thrips presence, than thrips were collected using a fine brush in a labeled vials containing ethanol at 60%. They were transferred to the laboratory, where they were sorted, counted and some invidious a wee mounted on slide for identification. The data showed the presence of two thrips species in onion field, with two activity periods. Thrips appeared from September to the end of onion cycle but the number per plant was not important, and probably did not cause important damages even if some damages were observed on leaves. This may be explained by the date of onion cultivation.

Key words*: Insects, Onion Thrips, Algeria.*

QUANTITATIVE ANALYSIS OF PROTEINS IN SOME SPECIES OF INSECTS OF THE ORDER ORTHOPTERA

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Abstract

This study was carried out in the gardens and the experimental station of the agronomic National School of El Harrach (36 ° 43 'N.; 3 ° 08' E.). The resort was a collection of ornamental plants divided into three layers, a tree layer, shrub layer, and a herbaceous layer. The resort was located 50 m above the level of the sea. It had a 541,1 mm rainfall in 2005 and 609.1 mm in 2006. It belonged to the sub-humid bioclimatic stage to mild winter. The sampling technique used to capture insects was that of sweep net at a rate of once a week. Selected biological models belonged to the order Orthoptera and family Acrididae. For each of the species analyzed, the dry matter content was conventionally determined by the weight of these species after drying in an air circulating oven.Total nitrogen was determined by the Kjeldahl method. Organic nitrogen of the substrate to be analyzed was digested with concentrated sulfuric in the presence of an acid catalyst. Ammonia nitrogen formed was displaced by sodium hydroxide and assayed by titration. The crude protein content was determined by the formula: MAT% = N (%) x 6.25. The analyses concerned both adults and larvae. Water contents recorded for all species tested ranged from 74.7% for the larvae *Aiolopus strepens* and 52.3% for the species *Oedipoda coerulescens sulfur escens*. The ash rate for calcined species ranged between 3.5% and 9.7%. Protein levels found in different species varied between 11,0 and 35, 1%. The obtained results showed that the protein content in larvae was more important compared to the adult stage except Euprepocnemisplorans (35.1%) and males *Aiolopus strepens* (24.9%). Apparently males seemed richer in nitrogenous matter than females except *Aiolopus thalassinus* but with small differences.

Keywords: *Insecta, Orthoptera, adult,larvae, Kjeldahl, total nitrogen.*

THRIPS OF SOLANACEA CROPS IN BISKRA REGION IN ALGERIA

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Abstract

The Solonaceae and tomato specifecally are importante crops in Biskra zone. They may be harmed by many pests like thrips, insects belonging to the order of Thysanoptera that are rarely studied in Algeria and they are still unknown to growers. In this reasarch, thrips species were inventoried on Solanacaea crops (Tomato, pepper, sweet pepper and egg plant), during the crop years 2014 to 2017. Thrips were collected from crops by scouting and washing methods. The data allowed identifying 16 species belonging to four families (Thripidae, Aeolothripidae, Melanthripidae and Phleaothripidae). The familly of Thripidae was represented by 11 species (*Frankiliniella occidentalis, Hercinothrips bicinctus Thrips angusticeps, T. minutissimus, T. tabaci, Odontothrips loti, O. confusus*, etc). The familly of Aeolothripidae represented by one species witch is *Aeolothrips intermedius*, the familly of Melanthripidae represented by the species *Melanthrips fuscus* and the familly of Phleaothripidae represented by he species *Bolothrips icarus, Cephalothroips monilicornis*, and *Neeohegeria verbas*. Most of identified species were phytageous. The species *A. intermedius* is considered as predator species, and only *B. icarus* was fungus feeding. The crops hosting the highest number of thrips species was sweet pepper (11species) followed by tomato (10 species), pepper (6 species) and egg plant (5 species). The polyphageous species were *F. occidentalis, T. tabaci* and *M. fuscu*s, which were present in all investigated crops. Two first species are the most dangerous because they may transmit viruses and causes serious damages.

Keywords: *Thrips, Solanacea, Algeria.*

STUDY OF THE PHYSICOCHEMICAL AND MICROBIOLOGICAL QUALITIES OF THE JUICES OF THREE VARIETIES OF ORANGE

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Abstract

The marketed juices are known for their contents in elements which can be harmful for the health (preservatives, dye, etc). Some consumers prefer home-pressed juices, but they do not know the shelf life and the variety of orange giving a more stable juice. For this, juices of three varieties of orange were mechanically pressed in the laboratory to study their characteristics,including vitamin C content, pH, total sugar content, and their tasting qualities. Also their contaminationwith microorganism were studied. All this was done at several intervals of time. The results showed that the juice of the Sanguine variety was the most appreciated by consumers, while the other two varieties were the most stable but could not be kept for more than six days.

Keywords: *Hamline, Sanguine, Late, orange, characteristics, Algeria*.

COMPARISON OF APHID INFESTATION LEVELS BETWEEN ORANGE (CV. WASHINGTON NAVEL) AND TANGERINE (CV. COMMUNE)

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Abstract

Following the disadvantages caused by the massive use of synthetic phytosanitary products, the use of other non-chemical pest control methods has become indispensable. The planting of pest-resistant species and varieties is one of the most important alternative methods. In this context, a comparison of the level of infestation of one tangerine variety (Commune) and one orange variety (Washington Navel) was carried out in an orchard in Skikda (Algeria). Between January and June 2014, 16 young leaves, distributed over the four cardinal points and four trees, were collected monthly for each of two examined varieties. Aphids (larvae and adults) found on these leaves were counted. Then, morphological keys were used for species determination. The variety 'Washington Navel' seemed to be the most suitable for aphids. It was the most infested during five months (January, February, March, April and May). Aphids reached their peak levels in April on both cultivars, with an average of 90 individuals/leaf on orange and 22 individuals/leaf on tangerine. It was suggested that 'Washington Navel' had morphological and/or nutritional qualities favorable to the establishment and the proliferation of aphids. Moreover, *Aphis spiraecloa* and *Aphis nerii* were identified on 'Washington Navel' and only *A. spiraecloa* on 'Commune'. Therefore, the use of 'commune' tangerine can contribute to the reduction of the sprayed quantities of chemical pesticides.

Keywords: *aphids, cultivar, chemical control, citrus, Skikda.*

EVALUATION OF THE EFFECT OF TWO CHEMICAL FERTILIZERS AND A BIOFERTILIZER ON VEGETATIVE GROWTH CHICKPEAS (*CICER ARIETINUM* L.)

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Abstract

Chickpea production in the Mediterranean regions is largely dependent on the availability of water and nitrogen. In these regions, the climate is characterized by low, often poorly distributed, rainfall and rapid mineralization of organic matter. We studied the effect of different types of biological and chemical fertilizers on the vegetative growth parameters, in comparison with a control without any addition. The results showed that the biological and chemical fertilizers generated a significant effect on the variability of the vegetative growth of chickpea (stem length and number of sheets). The results of the increase in stem height in function of time after application of biofertilizer and chemical fertilizers allowed to claim the biofertilizer with dose D1: 4 ml/l and biofertilizer dose D2: 8 ml/l appeared to have effect from the first 24hwhich was maintained until 72h, and which was distinguished from other products after 30 days. While chemical fertilizers are moderately effective after 24h and 7 days, they lose their effect 30 days after application. The indicator remains more effective than chemical fertilizers, with bigger lengths of stems and a greater number of leaves compared with chemical fertilizers, and they are less important as biofertilizers.

Key words: *Chickpea, chemical fertilizer, biofertilizer, vermicompost, vegetative growth.*

GENETIC DIVERSITY ANALYSIS OF RYE COLLECTION BY ISSR MARKERS

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Abstract

Rye (*Secale cereale* L.) is a diploid (2n=14), cross-pollinated cereal, belonging to the tribe *Triticeae*. It is important as a source of genes in the selection of wheat and as a component of the synthetic *triticale*. Compared to other cereals, rye has a high adaptive quality and is characterized by the ability to grow with high productivity in extreme conditions. The aim of our work was the study of the local and introduced rye genetic diversity preserved in the National GeneBank of Azerbaijan with the DNA markers. 83 rye genotypes were examined using 6 ISSR markers, 4 of which revealed a 100% level of polymorphism. The genetic diversity index of the used ISSR markers ranged from 0.49 to 0.98 with an average of 0.83 per primer. The polymorphic information content ranged from 0.23 to 0.42 with an average of 0.32. The cluster analysis based on genetic distance among the rye samples revealed a high genetic diversity inside grouped clusters as well as between individual genotypes. The grouping of the samples denoted that the structure of the rye genotypes was partly related to their belonging to a definite geographic region. The carried out molecular genetic analysis suggests that the ISSR-DNA technology is highly informative in assessing the genetic diversity of rye collection.

Key words: *genetic diversity, rye (S.cereale L.), ISSR markers, cluster analysis, polymorphic information content.*

APPLICATION OF SSR MARKERS FOR GENETIC DIVERSITY STUDIES IN BREAD WHEAT (*T.AESTIVUM* L.) GENOTYPES IN AZERBAIJAN

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Abstract

Laboratory study was carried out to identify the efficient primers, which could be used to detect alleles, estimate the degree of diversity among the studied genotypes and determine the suitable genotypes, which showed high degree of diversity in order to improve the economic characters in the local genotypes. As a part of this effort, we used 13 SSR markers and 88 wheat genotypes collected from different regions of Azerbaijan. Used SSR markers revealed a high level of genetic diversity in studied genotypes. The most polymorphic SSR loci were WMC262 with 28 alleles, followed by WMC332 with 20 alleles. The total number of alleles was 192, with an average number of 13 alleles. The WMC128 marker had higher percentage (0.81) of frequency, while WMC517 marker had lowest percentage (0.16) of frequency.Therefore, they showed high efficiency in categorizing the studied genotypes. The highest PIC valuewas0.89 for WMC262 and lowest PIC value was0.29 for WMC128 with an average 0.7. PIC value also showed a significant, positive correlation with the number of alleles for microsatellites evaluated in this study.As a measure ofinformativeness of microsatellites, genetic diversity ranged froma low of 0.31 (WMC128) to a high of 0.89 (WMC517) and an average of 0.72.In our experiment SSR markers proved to be a high informative and useful tool in study and assessment of bread wheat genetic diversity.

Key words*: bread wheat (T. aestivum L.), genetic diversity, SSR markers, PIC.*

INFLUENCE OF IRON PLAQUE ON UPTAKE AND ACCUMULATION OF ARSENIC BY RICE (*ORYZA SATIVA* L) GROWN IN SOIL

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Abstract

Pot experiment was conducted to test the effect of iron plaque on rice yield and arsenic and other elements uptake and translocation in different parts of rice plants. For iron plaque formation (25, 50 and 100 mg Fe L^{-1} solution) on rice root and As enriched soil (33 mg As kg^{-1}) were used. The treatment combinations were As_0Fe_0, $As_{33}Fe_0$, $As_{33}Fe_{25}$, $As_{33}Fe_{50}$, and $As_{33}Fe_{100}$. Experiment was laid out in a complete randomized design with three replications. Results revealed that the highest plant height and panicle length (76cm and 22.33cm), filled grain, total grain and total tiller (77.33, 83.33, 19.00), root volume (24.00 cm^3/plant), root weight and 100 seed weight (1.86 and 1.83 g/plant) were found in As_0Fe_0 treated plots, respectively. Maximum non-effective tiller (2.67) was found in $As_{33}Fe_{50}$ treated plots. The highest grain yield was obtained from As_0Fe_0 followed by $As_{33}Fe_{25}$ treatment. From these results it may be concluded that iron plaque on root using 25ppm Fe is an effective dose to inhibit the accumulation and translocation of arsenic and Cd from root to other parts of rice plants. Phosphorus inhibited by all treatments except grain in $As_{33}Fe_0$ and control. Significant Zn uptake was found in control treatment.

Keywords : *Iron plaque, arsenic and other elements uptake, rice yield.*

ENTOMOPHAGOUS FAUNA - PREDATORS OF PEARS IN EAST SARAJEVO AREA (BOSNIA AND HERZEGOVINA)

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Abstract

Entomophagous fauna – predators in region of East Sarajevo (entity of Republic of Srpska, Bosnia and Herzegovina) was examined in 2011 and 2012 in intensive orchards in the locations Vojkovići and Kula, in semi-intensive orchards in locations, Tilava and Petrovići, and in extensive orchard in the location Kasindo. Using entomological methods, such as visual examination of the trees, methods of shaking branches, taking a sample of infested plants organs, sampling and the collection before adult and adult stadium of predators species was carried out. Visual examination of trees was done during vegetation season, at intervals of 10 to 15 days and sampling of predators species at different developmental stages. Using entomological meshes and exhauster, all stages of predators species which lived freely in the plant organs and infested part of plant, were collected. In the area of East Sarajevo, in orchards of pears, in 2011 and 2012 year, eight predators species were found. Larvae and imaginal stages of these insects were reared from colonies af aphids (*Dysaphis pyri* Boyer de Fonscolombe, *Aphis pomi* De Geer) and psyllid species (*Cacopsylla pyri* Linne, *Cacopsylla pyrisuga* Forster, *Cacopsylla pyricola* Forster). Our examination showed the presence the following predators species: *Anthocoris nemorum* Linne (Hemiptera: Anthocoridae), *Adalia bipunctata* Linnaeus, *Coccinella septempunctata* Linnaeus, *Harmonia axyridis* Pallas (Coleoptera: Coccinellidae), *Episyrphus balteatus* DeGeer, *Syrphus ribesii* Linne (Diptera: Syrphidae), *Chrysoperla carnea* Stephens and *Chrysopa septempunctata* Wesmael (Neuroptera: Chrysopidae).

Key words: *Beneficial insects, Pears, City of East Sarajevo.*

ENTOMOPATHOGENIC FUNGAL ENDOPHYTES: CAN THEY COLONIZE CUCUMBER PLANTS?

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Abstract

Entomopathogenic fungi (EPF) are considered as insect pathogens and, thus, attention is mostly focused on developing them as inundative biopesticides. Lebanese local strains of *Beauveria bassiana* and *Metarhizium anisopliae* isolated from soil have previously shown effectiveness in controlling a wide range of pests. There were no studies reporting their endophytic ability in cucumber plants. Therefore, the present study investigated the abilities of the same fungal species to colonize cucumber seeds through artificial seed inoculation and to determine the endophytic activity of these fungi in resulted cucumber seedlings. The results of the germination test showed that treating seeds with EPFs and incubating at 25^{o}C for 2 days would significantly improve germination rate by more than 26% if compared to untreated seeds. Greater enhancement of germination was also observed in seeds treated with *B. bassiana* (72.5%) or *M. anisopliae* (47.5%) when grown under outdoor conditions. In addition, seedling's roots developed from treated seeds grew faster than untreated reaching 15 cm in length compared to 10 cm long control roots after 10 days of incubation. Moreover, seedlings from seeds treated with *B. bassiana* produced a significantly higher number of roots. However, seed treatments with fungal conidia had no effect on stem elongation. Ten days post-inoculation resulted seedlings were assessed for endophytic recovery from their tissues. Results show that both, *B. bassiana* and *M. anisopliae* have colonized cucumber seedlings. Significantly higher percentage recovery (100%) was observed in the cucumber plant tissues colonized by *M. anisopliae* as compared to 58.3% (cotyledon and stem) and 50 % (roots) of *B. bassiana* endophyte. No fungal growth was recorded in control. This is the first study to report a significant data on the interaction between *B. bassiana*, *M. anisopliae* and cucumber seedlings. However, there is a need for further research to find out if the colonized tissue with EPF can be used as an effective strategy against pests of cucumber crops.

Keywords: *Metarhizium anisopliae, Beauveria bassiana,* cucumber, colonization, plant growth promoter.

DARTS GENOTYPING FOR MAPPING RESISTANT QTLS TO ANTHRACNOSE DISEASE FOR RESILIENT SORGHUM IN BURKINA FASO

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Abstract

Sorghum (*Sorghum bicolor*) is an important cereal crop for many African countries where it is grown as a staple food crop particularly in Burkina Faso. To sustain its production several improved varietieshave been developed to meet farmers' needs and to with stand the climate variations in term of the rainfall length reduction during the crop production. The crop yield is very low 1 ton/ha, but the yield potential of the improved varieties is up to5 ton/ha. This low yield is based both on abiotic and biotic constraints. Among the biotic constraints fungi diseases especially anthracnose disease contributes to yield losses up to 45% in the susceptible varieties. The disease is endemic to all the thirteen regions where sorghum is grown and some areas are the hotspots. Two resistant materials were obtained, a mapping population of 500 backcrossed BC1F2 progenies were genotyped with 8553 DArTs markers to map the most important QTLs and phenotyped for anthracnose disease resistance. At the log value equal to 5 several quantitative traits loci were detected 6 QTLs on the linkage group of chromosome 3, 1 QTL on the linkage group of chromosome 4, 1 QTL on the linkage group of chromosome 8 and 3 QTLs on the linkage group of chromosome 9. SNPs based markers could be developed in order to introgesse the resistant loci within the susceptible lines from both farmers' locales and improved varieties for resilient sorghum production.

Keywords: *Resilient Sorghum, Farmers, DArTs, QTLs, improved varieties.*

BIOACTIVE COMPOUNDS CONTENT OF NEW ZEALAND SPINACH (TETRAGONIA TETRAGONOIDES (PALL.) O. KUNTZE SYN. (TETRAGONIA EXPANSA)) AT DIFFERENT NITROGEN CONCENTRATIONS

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Abstract

The aim of study was to determine the influence of different nitrogen concentrations (75, 140 and 205 mg L^{-1} NH_4NO_3) on the bioactive compounds content in New Zealand spinach (*Tetragonia tetragonoides* (Pall.) O. Kuntze syn. (*Tetragonia expansa*)) grown in floating hydroponic systems. Also, under the same conditions spinach (*Spinacia oleracea* L.) was grown and mentioned species were compared. Spinach as well as New Zealand spinach are nutritionally valuable leafy vegetables with high vitamin and mineral content. Both species are specific for the tendency of nitrogen accumulation, so it is necessary to be careful when consuming and processing it. New Zealand spinach is less known and mostly un-researched species in our region. By comparing the analyzed species significantly higher content of vitamin C (46 100 g^{-1} FW), phenols (108.04 mg L^{-1} FW), flavonoids (70.77 mg L^{-1} FW), non-flavonoids (37.27 mg L^{-1} FW), total chlorophyll (0.88 mg g^{-1} FW), carotenoid (0.17 mg g^{-1} FW) and antioxidant capacity (2172.63 μmol TE L^{-1}) were determined in spinach compared to New Zealand spinach. In spinach, nitrogen had a significant negative impact on the bioactive compounds content significantly reduced vitamin C content for 36.35 %, total phenols for 23.38 %, flavonoids for 26.08 %, non-flavonoids for 47.84 % and pigment compounds. In New Zealand spinach, with an increase of nitrogen in nutrient solution the opposite trend was determined. Namely, by increasing the nitrogen concentration significantly higher amounts of vitamin C even twice and total phenols for 5 % was determined in New Zealand spinach, while content of pigment compounds did not significantly change.

Keywords: *Floating Hydroponics, Leafy Vegetables, Vitamin C, Total Phenol, Antioxidant Activity.*

PREVALENCE OF NON-O157:H7 SHIGA TOXIN-PRODUCING *E. COLI* IN MARKET MILK

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Abstract

A total of one hundred raw milk samples were collected randomly from farms, street vendors, supermarkets and dairy shops in Damietta Province, Egypt. *E. coli* was detected in 21% of tested samples. Serological identification revealed that O26:H11 was the most prevalent serotype (7) 33.3 % while other serotypes O91:H21, O113:H4, and O12:H6 were (2) 9.5 %, (2) 9.5 %, and (3) 14.2 %, respectively. Other isolates were subdivided into O44:H18, O111:H2, O128:H2, O142, O146, and O27 as (1) 4.8% for each. Some non-O157 STEC strains caused HUS, so serotyping was not a definite method for detection of Shiga-toxin producing (Stx) strains. Molecular characterization of *E.coli* 26:H11, O91:H21 and O111:H2 in relation to Stx1and Stx 2 genes represented (4/5 and 5/5), (2/2 and 1/2) and (1/1 and 1/1), respectively. The most prevalent bacteria in this study was *E. coli* and *P. aerogenosa* followed by. *B.cereus, E. fecalis* and *Cl. Perfringens*. The study referred to toxigenic bacteria by using conventionl PCR technique which reveled out that *Cl. perfringens* was free from enterotoxin gene, *Bacillus cereus* harbored emetic (ces) and diarrhoeal (hblA) genes. All detected genes could be involved in food poisoning outbreaks. Antibiotic sensitivity test disclosed the multiple drug resistance bacteria, that represent a health disaster when transmitted to food chain. Measuring MDR index is an easy, simple and cheap method for detection of MDR bacteria. Potential health hazard of the genes also was discussed.

Keywords: *Shiga-toxin, E.coli, milk.*

A REVIEW ON SOME NUTRACEUTICAL PROPERTIES OF *CAPPARIS SPINOSA* AS A MEDITERRANEAN MEDICINAL PLANT

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Abstract

Medicinal plants, the oldest source of pharmacologically active compounds, continue to cater the therapeutic need of majority of population in the developing world and played a dominant role in the introduction of new therapeutic agents. Based on the knowledge of plants gathered from various ancient medical writings and civilizations, field observation and consultation with folk medicine men, research on medicinal plants have been undertaken all over the world for development of new herbal drugs. In addition, environmental factors such as alterations in climatic variables and abiotic stress are known sources for oxidative stress. The ability of plant cells to fight against these factors is important for maintenance of their healthy growth. *Capparis spinosa* L. (Caper) is a perennial spiny bush that bears rounded, fleshy leaves and big white to pinkish-white flowers. It is native to the Mediterranean region also growing wild on walls or in rocky coastal areas throughout India. It contains a number of bioactive compounds, mostly polyphenols. Even though it has been used in traditional Indian system of medicines for various human diseases, the summation of its medicinal properties is lacking. Hence, the present review focused to provide collective information regarding the medicinal value of C. spinosa.

Keywords: *Capparis spinosa* L., *medicinal properties, nutritional value, phytochemicals.*

CONTROL TRIALS OF ANABOLIC HORMONE RESIDUES IN TISSUES OF WILD AND FARMED NILE TILAPIA, EGYPT

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Abstract

Due to the excessive use of growth promoters in fish production and its possible hazards for human, our study focusses on monitoring and control attempts regarding their residues in Nile tilapia fish. A total of eighty random samples of Nile tilapia were collected from different Nile canals and markets in Al-Menoufia governorate, Egypt, for estimation of Methyltestosterone (MT) and Trenbolone acetate (TB) residues by using enzyme-linked immune sorbent assay (ELISA). In the present study, the MT and TB hormone residues were in acceptable levels and without exceeding the maximum permissible limits MPLs (2ppb) of codex (2007) and European Commission "EC" (1999), respectively; except MT residues level in small size farmed tilapia; as 49 % of samples were unacceptable and exceeded MPLs of codex (2007). These results provided no proof for illegal hormones use but did not exclude the possible misuse of hormones. Routine monitoring of these hormones as a food quality and health control measure is needed. Application of various cooking methods (frying and grilling) on Nile tilapia of each category (n =3) exhibited that cooking methods positively reduced residues of MT and TB. The obtained results revealed that the most effective cooking methods for reducing the levels of such hormone residues were grilling (78.8% and 82.05% for MT and TB, respectively) followed by frying (34.8% and 53.85% for MT and TB, respectively).

Key words: *Nile tilapia, methyl testosterone, trenbolone acetate, frying, grilling.*

VIRULENCE VARIATION IN SEXUAL AND ASEXUAL POPULATIONS OF *PHYTOPHTHORA INFESTANS*

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Abstract

Potato late blight caused by *Phytophthora infestans* is the reason for major potato crop loss in the world. It is a problematic disease because of the pathogens genetic instability and ability to adapt fast in the changing environmental conditions. To protect the crop successfully, it is important to know the virulence of the local pathogen populations to develop more resistant potato cultivars. The pathogen populations are very different in European countries due to different reproduction ways – populations in the Northern Europe reproduce sexually whereas the populations in the Western Europe are clonal. This is important for deciding the right time for the fungicide sprays as well as for knowing how the populations change over time and which market product to use. The virulence of *P. infestans* was studied on isolates collected across Europe: from Estonia, Norway, Denmark, UK and France. The study was conducted to research how the virulence profiles differ and if it is linked to the dominant pathogen genotype in that region. The extent of virulence diversity in sexual populations and the possibility to predict the virulence from the pathogen genotypes in asexual populations was analyzed. The virulence profiles were determined using Black's potato differentials that contain resistance genes R1 to R11; genotypes were identified using SSR analysis. The results suggest more extensive virulence diversity in sexual populations. The study showed that genotypes are reasonably good predictors of virulence in clonal populations, although it can be measured only to a certain extent due to the variability inside the lineages.

Keywords: *P. infestans, virulence, population diversity, S. tuberosum.*

NEW EMERGING PATHOGENS CAUSING LEAF SPOT DISEASE ON POTATO IN ESTONIA

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Abstract

The leaf spot on potato leaves was observed in several potato growing regions in Estonia in July and August 2017. The disease first appeared as small, round, dark grey to black lesions on lower potato leaves. As the disease progressed, the symptoms appeared on the upper leaves of the plants as well. This study aimed to identify the causal agents of this disease. For species identification, pure culture isolates on PDA were obtained. Morphological and molecular characterisation identified the isolates as *Boeremia exigua var. exigua* and *Cladosporium sp.* Also, DNA was extracted from the leaf tissue with disease symptoms, and direct sequencing of fungal ITS region confirmed its applicability for rapid detection of causal agents of the leaf spot disease on potato. Additionally, potato tubers showed gangrene development in the storage conditions, which were from the same field as were some *B. exigua var. exigua* positive potato leaf samples collected. Despite the resemblance of the symptoms to early blight disease, none of the leaf spot samples tested was positive for *Alternaria* sp. Further research is needed for evaluating the spread of *Boeremia* sp. and *Cladosporium* sp. as well as yield loss caused by these pathogens in potato production in Northern Europe.

Keywords: *Solanum tuberosum, leaf spot, fungal pathogens, molecular identification, Northern Europe.*

FINGERPRINTING AND AFLATOXIN PRODUCTION OF *ASPERGILLUS* SECTION *FLAVI* ASSOCIATED WITH GROUNDNUT IN EASTERN ETHIOPIA

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Abstract

Several *Aspergillus* species have the potential to cause aflatoxin contamination, posing a health threat to consumers of susceptible agricultural products such as groundnut, as well as an economic risk through commodity rejection of domestic and international markets. In this study, 184 *Aspergillus* isolates were obtained from groundnut seeds in eastern Ethiopia. They were analyzed for aflatoxin production by Ultra-Performance Liquid Chromatography, and fingerprinted using 23 Insertion/Deletion markers within the aflatoxin-biosynthesis gene cluster. The observed species included *A. flavus*, *A. tamarii* and *A. parasiticus*. Of the *A. flavus*isolates, L-, S-morphotypes were represented, as well as those deemed sclerotium non-producers (SNP). All the tested *Aspergillus* isolates produced measureable aflatoxins. Analysis of genetic distances by Neighbor Joining, Principal Coordinate Analysis and Structure clustered the isolates into four main groups. Group I, the largest, had 88% of the *A. flavus*, including all *A. flavus* L-strains, and *A. tamari*. It also included the highest aflatoxin B_1 (77.9µg/mL) producer *A. flavus* (N1436). Group II contained 52.4% of *A. flavus* S-strains and 47.6% of *A. flavus* SNPs. Group III primarily included *A. parasiticus* (87.9%); among which, twenty produced aflatoxins B and G, with up to 50.3 µg/mL of G_1, whilst nine produced only B aflatoxins. Group IV was represented by four *A. flavus* S-strains that produced aflatoxin B and G types, and two *A. flavus* SNPs. This was the first report on screening of aflatoxigenic *Aspergillus* genotypes from groundnut fields in Ethiopia. Predominant genotypes were identified as candidates for genome sequencing, and to generate a database of Ethiopian *Aspergillus* genomes for the development of effective aflatoxin control strategies in groundnut.

Keywords: *Aflatoxins, Aspergillus, genetic diversity, groundnut, Insertion/deletion markers.*

ANTIFUNGAL ACTIVITIES OF THE LEAF AND SAP EXTRACTS OF TWO ENDEMIC ALOE SPECIES AGAINST SEED BORNE FUNGAL PATHOGEN (ASPERGILLUS SPECIES) OF GROUNDNUT (ARACHIS HYPOGAEA L.)

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Abstract

The methanol, ethanol and aqueous crude extracts of A. harlana and A. megalacantha leaves and sap were tested against A. flavus and A. niger isolated from surface sterilized groundnut (Arachis hypogaea L.) seeds for their zone of inhibition , percentage of inhibition and activity index using the disc diffusion method. Even though the methanol and aqueous extracts of Aloe harlana leaves were not effective against Aspergillus flavus and Aspergillus niger the ethanol extract of its leaves resulted in a small zone of inhibition (10.3±0.8mm) against Aspergillus flavus while also its sap extracts showed relatively larger zones of inhibition against Aspergillus flavus (21.3±0.3mm) and Aspergillus niger (21.3±1.5mm) at the concentration of 1530mg/ml. In contrast, the methanol extracts of Aloe megalacantha leaves showed antifungal activities against both Aspergillus flavus (12.3±1.07mm) and Aspergillus niger (26±2.3mm). Similarly, the ethanol extracts of Aloe megalacantha leaves showed activities against Aspergillus flavus (13.8±1.5mm) and Aspergillus niger. In addition, the aqueous and sap extracts of Aloe megalacantha leaves were effective against Aspergillus flavus (24±1.3mm and 17.5±3.5mm, respectively) and Aspergillus niger (30.2±0.7mm and 22.5±2.0mm, respectively) at the concentration of 1530mg/ml. The results showed that Aspergillus niger was more susceptible to Aloe megalacantha leaf and sap extracts than A. flavus. Characterization of the ethanol extracts of A. harlana and A. megalacantha leaves was done using spectroscopic analysis of NMR (1H, 13C-NMR, DEPT) and IR spectra for possible structural elucidation and identification of functional groups of bioactive compounds.

Keywords: A. *harlana, A. megalacantha, Aspergillus flavus, Aspergillus niger, leaf and sap extracts, NMR, IR spectra.*

CONTROL OF MEDITERRANEAN FRUIT FLY, *CERATITIS CAPITATA* (WIEDEMANN) (DIPTERA: TEPHRITIDAE) WITH VARIOUS ATTRACTANTS ON CITRUS IN TURKEY

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Abstract

The Mediterranean fruit fly (Medfly), *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae), is a serious pest on citrus in Turkey. The study was conducted to control the Medfly with various attractants at Satsuma and W-Murcott orchards in Hatay province of Turkey. Two studies were conducted in Dörtyol and Reyhanlı districts of Hatay province with different attractants: ammonium acetate (AA), ammonium carbonate (AC), trimethylamine (TMA), putrescine (P), Diaminoalkane or cadaverine (C). A homemade plastic wipes were prepared containing 25 ml concentration from mixed attractants, propylene glycol (10%) and DDVP (4%). The Decis traps were used as traps hanged with homemade plastic wipes at 1-1.30m above ground on the tree branches. The study was conducted as randomized complete blocks design with five treatments and five replicates. The first study was carried out on Satsuma mandarin in Dörtyol district. A total of 1899 Medfly adults were caught by attractant traps during the sampling periods. The highest number of Medfly adults was caught by TMA+AA+P attractant traps, while the lowest was caught by AC attractant traps. The second study was carried out on W-Murcott mandarin in Reyhanlı district. A total of 1813 Medfly adults were caught by attractant traps during the sampling periods. The highest number of Medfly adults was caught by AA attractant traps, whereas the lowest number was caught by AA+AC attractant traps.

Key words: *Medfly, Ceratitis capitata, citrus, attractant traps, Turkey.*

A THICK SNOW LAYER PROTECTS THE VINES FROM FREEZING

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Abstract

This study set out to find how snow affects ground surface temperature and to evaluate what kind of influence this has on grapevine growing. Temperatures were measured with digital maximum-minimum thermometers that saved the recordings in memory. The research shows that in winters when there is little snow, the correlation between ground surface temperature and air temperature is strong (R^2 = 0.92–0.99) because there is not enough snow to act as an insulator. In winters when there is plenty of snow, no such correlation exists (R^2 = 0.0001–0.3) because the thick layer of snow acts as an insulator and controls changes in ground surface temperature and air temperature. In very cold weather (-25.0 to -27.4°C), a thick layer of snow (61–67 cm) kept the ground surface minimum temperature at -0.5 to -1.3°C. A thin snow layer (18–32 cm) did not stop the ground surface temperature from falling; the ground surface temperature fell to -10.8°C when air temperature stayed within the same temperature range. In north Europe, central Europe and other cool wine-growing regions, a snowy winter prevents the ground from freezing and thus protects the vines from very cold temperatures.

Keywords: *cool climate viticulture, snow insolation, soil surface temperature.*

NANOENCAPSULATED DELTAMETHRIN POTENTIATING THE EFFECT OF AN OXADIAZINE INSECTICIDE INDOXACARB AGAINST INSECTS

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Abstract

The challenge of feeding a growing population in a scenario of limited resources caused by climate changes and food crisis needs the development of innovative alternatives that allow us to protect more efficiently the agricultural productivity and the quality of food safety with minimum impacts on our environment. The over-use of pesticides has represented a concern not only for its consequences against the environment but also for the increase in resistance mechanisms in pest insects. In this context, our research project is focused on the development of a nanoencapsulation technique of a pyrethroid insecticide: deltamethrin, as synergistic agent, combined with a non-encapsulated oxadiazine, indoxacarb which is a pro-insecticide bio-activated in insect. We have performed *in vivo* toxicity studies on adult cockroaches (*Periplaneta americana*) to determine the lethal dose 50 (LD_{50}) for each insecticide. The next step has been to develop lipid nanocapsules (LNCs) that contain deltamethrin. Toxicity studies have allowed to determine: 1) the effective lowest doses of the mixture of deltamethrin (loaded in LNCs) and indoxacarb and 2) a synergistic effect between LNC-deltamethrin and indoxacarb on whole insects. We have also compared the observed effects with those obtained with piperonilbutoxide, a compound currently used in classical insecticide formulations. Our toxicological studies clearly revealed that deltamethrin, protected by LNCs from detoxification enzymes involved in the metabolization of pyrethroids, could enhance the toxicity of indoxacarb while reducing doses. This promising innovative approach seems to be more efficient than the *current alternative* insect control *strategies used against pest insects.*

Keywords: *Insecticide, Nanoencapsulation, Synergistic effect, Agricultural productivity.*

OCCURRENCE OF POTATO WART IN GEORGIA

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Abstract

Potato is one of the most important food crops in Georgia. Average yield of potato in Georgia is still low (8-11 tons/ha). Potato diseases are the main reason for yield losses. Potato wart (causal agent *Synchytrium endobioticum*) is a very harmful quarantine disease distributed in nearly 60 countries of the world including Georgia. According to official results of the observations of potato plantations and depositaries undertaken in 2009-2012 in Khulo mountainous region (western Georgia) potato wart was detected for the first time and identified in samples collected in several villages (Ghorjomi, Tkhilvana, Danisparauli, Diakonidzeebi) of Khulo municipality which was the economically important place for potato production (Gorgiladze et. al., 2014). However, the potato growers from villages Tabakhmela and Didajara observed wart symptoms earlier, in 2006 on potato cv. 'Agria', which was widely grown there for home consumption. According to the disease survey results obtained in the frame of the PhD work the incidence area of potato wart was extended. Namely, in 2016-2017 the disease was also found in 13 villages of Khulo municipality on varieties Briz, Impala, Finka, Picasso and Marfona, Saturna and in one Mestia village of the highland Zemo Svaneti region (northwest Georgia). The disease symptoms were observed on the tubers, stolons and root neck. All samples obtained were identified as *S. endobioticum* based on the morphological descriptions (OEPP/EPPO, 2004) and a specific PCR test using primers F49 and R502 (van den Boogert *et al*., 2005). The research has been continued under PhD grant of Shota Rustaveli National Science Foundation.

Keywords: *Potato wart, Georgia, Incidence area.*

SENSOR IDENTIFICATION OF FUSARIUM INFESTATION IN WINTER WHEAT

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Abstract

Infestation from *Fusarium* spp. in winter wheat fields has increased during the last years, due to the rotation with maize and reduced tillage practices. If there is no timely fungicide application, and there is moist, rainy weather, then the infestation can develop quickly. The grains can be infected and mycotoxin content can be accumulated in them. Current test procedures cannot identify mycotoxin contents before harvest. For many toxins there are already established acceptable toxin levels that should not be surpassed if the product is meant for edible use. Therefore, identifying the *Fusarium* spp. infestation in the field is important for enabling the separation between infested and not infested grains. Moreover it is the first step towards creating a prediction model for mycotoxin levels. In the current experiment, nine different winter wheat cultivars were used to monitor the *Fusarium* spp. infestation in Southern Germany in 2018. Cultivars ranged from mildly resistant to completely sensitive to *Fusarium* spp., with two different treatments per cultivar. These were: a) an untreated control and b) a treatment with two fungicide applications, from when the first flag leaf was visible until the beginning of anthesis. Ears were harvested from the beginning of anthesis on wards every three weeks, along with manual estimations of the infestation level. These ears were measured with an RGB camera, to identify the infested wheatears, thus creating an infestation index. Using image processing the separation of fungi infested from not infested ear regions was feasible at the medium milk stage.

Key words: *infestation index, mycotoxins, RGB camera, wheat cultivars.*

REDUCING THE DAMAGE OF FUSARIUM HEAD BLIGHT ON DURUM WHEAT USING BIOLOGICAL CONTROL AGENTS UNDER FIELD CONDITIONS

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Abstract

In the current study we investigated the potential of some beneficial microorganisms to combat FHB on durum wheat under field conditions in two locations: Oberer Lindenhof (OLI) and Heidfeldhof (HOH). Biological control agents (BCAs) were applied 1 d after inoculating the spikes with *F. culmorum*. Subsequently, two additional inoculations with the pathogen at 1-3 day intervals were conducted and disease development was monitored weekly. Results revealed that FHB indices (%) were significantly decreased in all BCA treatments after inoculation in OLI. The infection developed to reach 11.1%, 18.9%, 22.2% and 25.6% in case of Folicur, EM1, *Bacillus subtilis* GH77 and *Trichoderma* spp., respectively, compared to the control (33.3%), 14 day post inoculation (dpi). Contrary to OLI, disease in HOH did not develop until the second week after inoculation due to a decrease in rainfall in the first week in HOH. In the second week FHB indices were 22.2%, 22.2%, 25.6%, 30% and 33.3% in case of Folicur, *Trichoderma* spp., EM1, GH77, and the control, respectively. By the end of the second week, both *Trichoderma* spp. and Folicur treatments suppressed the disease development by 25.0% compared to the control. In OLI, while *Trichoderma* and EM1 treatments reduced the disease incidence by 33.3%, this value was 44.5% in case of Folicur, 14 dpi. At the same time, the disease incidence by *T. asperellum* treatment did not significantly differ from that of Folicur in HOH.

Keywords: *Biological control, Bacillus, Fusarium, Trichoderma, Wheat.*

ANTIFUNGAL ROLE OF PLANT DEFENSIN PROTEIN PDF 2.2 AGAINST *VERTICILLIUM LONGISPORUM*

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Abstract

Functional characterization of a plant defensin protein, *PDF 2.2*, was conducted to evaluate its biotechnological potentiality in transgenic *Arabidopsis thaliana* plants against the causal agent of wilt disease, *Verticilium longisporum*. To determine the antifungal activity of this gene, PDF 2.2 knockdown lines were generated. The knockdown gene expression was confirmed by q-PCR in different independent lines. These knockdown lines were tested for their activity against *V. longisporum*, resulting in approximately 80-90% inhibition of fungal resistance. To develop transgenic *Arabidopsis* plants resistant to wilt disease, *PDF 2.2* cDNA under the control of 35S promoter was introduced into *Arabidopsis* via Agrobacterium-mediated genetic transformation method. PCR analyses confirmed that a copy of the transgene in selected transgenic plants was normally expressed and also stably transmitted to subsequent generations. The constitutive expression of *PDF2.2* in transgenic *Arabidopsis* plants provided strong resistance to the *V. longisporum* fungus that was associated with highly reduced lesion formation and fungal colonization. Moreover, knockdown lines after infection seemed to be highly sensitive to *V. longisporum* infection. Furthermore, to examine the regulation of *PDF 2.2* gene expression, promoter: GUS lines was produced. Homozygous lines were selected and general GUS expression for *PDF 2.2* was assessed in different plant tissues of non-infected and infected plants e.g. seedlings, leaves, roots, flowers, and siliques. Interestingly, GUS histochemical staining of transgenic plants revealed that the expression of *PDF 2.2* gene, which was not present after 6 days post-infection in roots, gradually accumulated after 12 and 18 days post- *V. longisporum* infection in most of the transgenic lines. This data was further confirmed by q-PCR. These results implied the significance of the antifungal protein, *PDF2.2*, as a useful agronomic trait to control fungal disease.

Keywords: *Verticilium longisporum, PDF 2.2, Over expression, knockdown, GUS assay.*

PREVALENCE OF THE TARO LEAF BLIGHT (TLB) DISEASE IN THE BIBIANI-ANHWIASO-BEKWAI DISTRICT OF GHANA

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Abstract

A study was conducted in the Bibiani-Anhwiaso-Bekwai district in the western region of Ghana to assess the prevalence of the taro leaf blight (TLB) disease. The study comprised of a field and household survey. Thirty farms from five communities, namely: Bibiani, Domineabo, Anhwiaso, Asawinso and Bekwai, were randomly screened for leaf blight incidence and severity. The result from the study showed that the incidence of the taro leaf blight disease in the district was very high, ranging from 87% to 93%, while its severity was between 39-45%. There was no significant difference in the incidence and severity of the taro leaf blight disease among the various communities in the Bibiani-Anhwiaso-Bekwai district. All the farmers were able to identify the TLB disease and give some description of its symptoms, but majority (60%) of the farmers did not manage the disease. The few (37%) that managed the disease used fungicides and pruning of infected leaves and plants. Taro leaf blight reducedtheir production as well as their income and, it was therefore important to develop strategies to manage it properly.

Keywords: *Ghana, Leaf blight disease, Taro, Incidence, Severity.*

INFLUENCE OF CROP DIVERSIFICATION ON POPULATION AND DAMAGE OF MILLIPEDES IN CASSAVA CULTIVATION

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Abstract

Millipedes are common pests of cassava and often cause serious economic losses. Pesticide application remains the first option that farmers choose to minimize the damage caused by the myriapods. The result is high health risk, increased cost of production and also environmental pollution. A field experiment involving false horn plantain (Apantu) as component crop, an improved cassava (Ampong) and landrace cassava (Afia Abaayaa), base crop was conducted on farm at two hot spot areas in 2015 and 2016. Plantain based intercrops and sole cassava were tested for their ability to reduce the population and damage caused by millipedes to cassava and the effect on root yield of cassava. The results followed a similar pattern in both locations. Plantain intercropped with both improved and local cassava proved the most effective intercrops. In these two intercrops, the incidence of the millipedes and the extent of damage to cassava roots were the lowest ($P<0.05$). The intercropping could not influence the yield of cassava however, the yield of plantain was negatively affected ($P< 0.05$) in the intercrop plots recording 50% low yields compared to the sole plantain. A total of 44 contact farmers were sensitized on using intercropping as a strategy to manage the activity of millipedes in cassava cultivation.

Keywords: *Cassava, incidence intercropping, millipedes, monocultures, pesticides, plantain.*

THE MICROBIOLOGY OF GREEK/CYPRUS TRAHANAS AND OF TURKISH TARHANA: A PRESENTATION OF SOME LITERATURE DATA

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Abstract

Greek and Cyprus Trahanas are the most popular fermented milk-cereal products of Greece and Cyprus, and are produced during summer from fresh ewes', goats' milk or a mixture of them. Broken wheat is then added to the fermented milk and heated to cook the mixture and then a thick paste is left to cool and cut into small pieces and left to dry (sun or oven drying). In Greek trahanas, fermentation of the lactic acid bacteria *Streptococcus lactis, Streptococcus diacetylactis, Leuconostoc cremoris, Lactobacillus lactis, Lactobacillus casei, Lactobacillus bulgaricus* and *Lactobacillus acidophilus* plays the major acid- and aroma - producing roles. A great biodiversity of microorganisms was observed during Cyprus trahanas fermentation. Lactic acid bacteria (LAB) were the predominant group, followed by yeasts. *Lactococcus*, *Lactobacillus*, and yeast species contribute greatly to its fermentation. Turkish Tarhana is the dry form of yoghurt-cereal mixture that is produced by mixing cereal flour, yoghurt, baker's yeast (*Saccharomyces cerevisiae*) and cooked vegetables, salt and spices followed by fermentation for one to seven days. The fermented slurry is then air-dried and used in soup making. LAB species found in Tarhana fermentation vary depending on the raw materials, fermentation time and techniques used for its production and play an important role in lactic acid and aromatic compounds formation. *Lactococcuslactis* spp. *lactis, Leuconostoc mesenteroides, Lactobacillus acidophilus, Enterococcus durans, Pediococcus* spp., *Lactobacillus delbrueckii* ssp. *lactis* and *Lactobacillus paracasei* bacteria played a role during the fermentation of Tarhana dough. Yeasts were mainly represented by *S. cerevisiae*.

Keywords: *Trahanas, Tarhana, Microbiology.*

MANAGEMENT OF BANANA PSEUDO STEM WEEVIL *(ODOIPOROUS LONGICOLLIS* OLIVER) (COLEOPTERA: CURCULIONIDAE) BY USING CASSAVA BIOPESTICIDES- A PACKAGE OF CONTROL

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Abstract

Injudicious use of chemical inputs in agriculture poses challenge to sustainable agriculture. Cassava (*Manihot esculenta* Crantz) is a climate resilient crop cultivated in tropical and subtropical countries for its tuber as food, feed, and industrial products. Nevertheless, owing to the presence of cyano-glucosides, leaves and tuber rinds are often thrown as waste or rather underutilized. The insecticidal principles from such bio waste have been isolated and made formulations to manage certain important pests of agricultural crops. Banana pseudostem weevil, *Odoiporus longicollis* Oliver, a noxious pest in plantain causes 100% yield loss due to its premature falling. The current management strategy relies upon application of very toxic synthetic insecticides, despite complete control of the pest could not be achieved. An extensive field study revealed that the infestation by *O.longicollis* normally occurred from fifth month onwards in conjunction with the emergence of inflorescence. Management of this noxious pest with cassava based biopesticides was achieved by a package of control using prophylactic and curative measures. Doses and application strategies of the bioformulation have been standardised, 15ml of cassava biopesticide produced by ICAR-CTCRI, Trivandrum, at a concentration of 300ppm to an exposure period of 2 days was found very effective for the control. In the study large scale validation was done at the farmers' fields, over 180000 banana plants (*Musa AAB* Cv. *Nendran*) in three districts of Kerala-India thereby establishing its potency to manage the dreaded pest in field.

Keywords: *Banana cultivation, Pest management, Cassava utility, Pseudostem weevil.*

EFFICACY OF BOTANICAL INSECTICIDE ORIGINATED FROM NEEM TO CONTROL OF *SYRINGOPAIS TEMPERATELLA* LED. IN FIELD CONDITION

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Abstract

The cereal leaf miner, *Syringopais temperatella*, is an important pest of wheat in Iran. Applications of chemical insecticides cause many serious problems in environment and non-target organisms. Due to fewer side effects of bio-pesticide residues, the pesticides are good alternative of chemical insecticides in integrated pest management programs. In this study, field short and long term efficacies of a botanical insecticide, Neem Azal®, which originate from seed extract of *Azadirachta indica* against *S. temperatella* were evaluated and compared with a synthetic chemical insecticide, Diazinon, for first time in field condition. One liter per hectare of the insecticide was applied in the experiments. Sampling from the pest larval density was done during 1, 3, 7, 15 and 21 day after treatment (DAT). Results showed that short term (1 DAT) effect of Neem Azal® was lower than Diazinon. But, long term efficacy of the botanical insecticide (3-21 DAT) was similar to Diazinon during several days after treatment. Therefore, insecticides extracted from seed of *A. indica* can be used against the pest in wheat fields.

Key words: *Azadirachta indica, Leaf miner, Wheat, IPM.*

INSECTICIDAL PROERTIES OF SOME PLANT EXTRACTS AGAINST *EPHESTIA KEHNIELLA* LARVAE IN LABORATORY

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Abstract

Larva of Mediterranean flour moth, *Ephestia kehniella* Zeller (Lepidoptera: Pyralidae), is a main pest causing quantitative and qualitative damages in stored products. Use of botanical pesticides is good alternative for the chemical insecticides because the phytochemicals reputedly pose little threat to the environment or to human health. Efficacy of extracts of *Conocarpus erectus*, *Portulaca oleracea* and *Pistacia atlantica* leaves against the larvae were evaluated in laboratory condition. For this purpose, LD_{50} values of ethanolic extracts of the plants were determined. Results of the study indicated that leaf extracts of *C. erectus* was more toxic to the larvae in comparison with *P. oleracea* and *P. atlantica* leaf extracts. The LD_{50} values of *C. erectus*, *P. oleracea* and *P. atlantica* were 192, 350 and 400 mg/kg, respectively. In conclusion, ethanolic extract of *C. eretus* can be used as botanical insecticide against the stored product pest in storage and silage.

Key words: *Stored pests, Mediterranesn flour moth, Botanical insecticides, LD_{50}.*

SEASONAL POPULATION DYNAMICS OF *SITOBION AVENAE* (HOMOPTERA: APHIDIDAE) ON TRITICALE

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Abstract

Aphids (Homoptera: Aphididae) is the most destructive pest of cereals in many regions of the world including Iran. *Sitobion avenae* is one of important aphid pests in Iran. Seasonal population dynamics of the aphid on triticale was evaluated in Mollasani region, Khuzestan province, Iran, during 2018. Samplings were weekly carried out in experimental field of Khuzestan Agricultural Sciences and Natural Resources University. Results showed that the pest was firstly observed atthe end of December 2017. The peak of population density was recorded in mid-January 2018 (22.5 aphids per shoot) whenmean environmental temperature was 17.5 ºC. The population density dramatically decreased after the end of January and disappeared at 18 March 2018 when mean environmental temperature was more than 20 ºC. Results of the study can be useful for developing integrated pest management program of *S. avenae* in south west of Iran.

Key words: *Population fluctuation, IPM, Cereal aphid, Environmental condition.*

THE ESSENTIAL OIL ISOLATED FROM *THYMUS KOTSCHYANUS* BOISS. & HOHEN AS A NATURAL AGENT FOR MANAGEMENT OF THE LESSER GRAIN BORER, *RHYZOPERTHA DOMINICA* F.

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Abstract

Plant essential oils as promising bio-rational agents have been considered for management of detrimental insect pests because they are naturally bio-degradable and safe to the non-target organisms. In the present study, the fumigant toxicity of essential oil from *Thymus kotschyanus* aerial parts was assessed against a major Coleopteran insect pest *Rhyzopertha dominica* and this bio-effect was optimized and modeled using Response Surface Methodology (RSM). Optimization of the fumigant toxicity displayed a concentration of 51.720 µl L-1 was adequate to kill 72.752% of insect population after 60.0 h exposure time. The best model for predicting of insecticidal effect was third grade model. Results of the present study recommended a great potential of *T. kotschyanus* essential oil for management of a major stored-product insect pest *R. dominica* and prediction of this bio-effect using response surface methodology.

Keywords: *Essential oil, fumigant toxicity, response surface, Thymus kotschyanus.*

SEASONAL DYNAMISM OF *THRIPS TABACI* (THYSANOPTERA: THRIPIDAE) IN COMMON BEAN FIELDS

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Abstract

Onion thrips, Thrips tabaci Lindeman, is one of the most serious pests of many crops such as common bean, *Phaseolus vulgaris* L. It has been responsible to considerable economic damage to common bean plants which are important leguminous vegetables grown extensively in Boroujerd, Lorestan province, Iran. Seasonal dynamism of the pest was studied in growing season of 2017. Populations of T. tabaci were relatively low in mid-July and rise rapidly at the end of July. Highest densities of developmental stages of T. tabaci on common bean were consisted of 34.5 larvae, 3.28 pupae, and 9.33 adults at the end of July. Then larvae and adult densities were gradually decreased and the lowest densities were observed at the beginning of September. The results of the study could be practical for developing an integrated pest management programme against the pest.

Keywords: *Onion thrips, Phaseolus vulgaris, population fluctuation.*

EVALUATION OF SOIL ARTHROPOD ABUNDANCE IN SUGAR BEET FIELDS

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Abstract

Soil arthropods, sometimes called bugs, are the most diverse group of invertebrates on earth which are vital link in the food chain as decomposers. This study was performed to determine the abundance of soil arthropods in sugar beet fields of Kiar County, Chaharmahal and Bakhtiari Provinces, Iran. In this research, population abundance of the soil arthropods was studied by using Pitfall trap method in seasonal growth during 2015-2016. In the study period, a total of 1098 individuals of soil arthropods were sampled. The most dominant taxa was Araneae (46.54%) followed by Hemiptera (26.41%), Coleoptera (14.98%), Dermaptera (5.65), Hymenoptera (3.19) and Orthoptera (2.64%). Due to the fact that soil arthropods play essential role in the soil ecosystem, decomposition, nutrient cycling and pest suppression, their population should be preserved by using integrated pest management programs.

Keywords: *Soil invertebrates, Pit fall trap, Population.*

THE EFFECTS OF SOME BIOLOGICAL AND CHEMICAL PESTICIDES ON BEET ARMYWORM

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Abstract

The beet armyworm, *Spodoptera exigua*, is one of the important polyphagous crop pests causing economic damage. In order to optimize the application of insecticides, azadirachtin as a botanical insecticide, dust formulation of Bt, emulsion formulation of Bt and deltamethrin as a chemical insecticide were investigated in an area of 0.5 hectares. Experiments were carried out in a randomized complete block design with 5 treatments and 4 replications in Chaharmahal va Bakhtiari province, Kiar city, during 2015-2016. Spraying was done according to the peak of the population which was monitored by installing 2 pheromone traps. Four pit fall traps were installed in each treatment for catching the larvae of the pest. Results showed that deltamethrin significantly decreased pest population 1, 3, 5, 7 and 10 days after treatment (DAT). Dust of Bt and emulsion of Bt with similar effects were placed in next position. Azadirachtin did not significantly decrease the population. Results of the experiment can be used in IPM programs.

Keywords: *Spodoptera exigua, Azadirachtin, Bt, Deltamethrin.*

INVESTIGATION OF POSSIBLE *IN-VITRO* METHODS TO MANIPULATE PLOIDY OF *CROCUS SATIVUS*

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Abstract

Crocus sativus is a triploid plant with restrictions on conducting successful breeding programs to increase its productivity and quality. In order to evaluate different In vitro methods in manipulating saffron ploidy, direct androgenesis of pollen grain and different colchicine treatment on calli were tested on half strength medium supplemented with different combinations of growth regulators. Callus was induced in a medium supplemented with 1 mg/lit 2,4D. Then, produced calli was transfered to medium containing 0.5, 1. 2 and 4 mg/lit colchicine. Treated callus cells were then subcultutred into half streng then ms medium containing NAA, 2,4D and BAP to induce embryogenesis. Results revealed that 2 mg/lit NAA with 0.5 lit BAP, and 1mg/lit 2,4D with 0.5 lit BAP had the highest and lowest embryogenesis percentage, respectively. At the meanwhile, treated callus cells were tested for their ploidy level, and result of flow cytometry showed that all cochicine combination successfully changed the ploidy level, although 1 and 2 mg/lit of colchicine were significantly better. Because of callus morphology, embryogenesis may result in producing chimer plantlets with different ploidy level in different parts. In another test, pollen grains of saffron were cultured in full strength ms medium supplemented with different concentration of sucrose (30, 60, 90 gr/lit) in combination with 2,4D (0.5, 2 and 4 mg/lit) or NAA(1, 3 and 5 mg/lit) for direct androgenesis in both semi solid and liquid condition. Unfortunately treatments were not successful indirect androgenesis.

Key words: *In vitro, Crocus Sativus.*

ACTIVE SOLUBLE SOYBEAN POLYSACCHARIDE FILMS: PREPARATION, CHARACTERIZATION AND IN VITRO APPLICATION

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Abstract

In this study, we developed the new bioactive film from soluble soybean polysaccharide (SSPS) incorporated with different concentrations of cinnamon essential oil nanoemulsions (CNO) and the functional properties of them were evaluated. Then CNO-SSPS film was applied on the meat during refrigerate for 8 days. The use of CNO in film production has reduced thickness, water vapor permeability, water solubility, lightness (L*), redness (a*) and whiteness (WI) and increased antioxidant activity of SSPS-films. Also, the SSPS- film containing 0.6% CNO activity only on gram-positive bacteria (Staphylococcus aureus and Streptococcus pyogenes) and SSPS- film containing 0.8% CNO had antimicrobial activity on gram-positive and gram-negative bacteria. In vitro application, the pH of the meat treated with CON remained in the natural pH of meat during storage (8 days). Based on the results, the highest and lowest hardness values were for the samples of CNO- 0.8 and control, respectively. Incorporating CON at 0.6 and 0.8% concentration of cinnamon reduced 4.14 and 5.71 log cycle in the total aerobic viable count compared to uncoated and decreased of yeast and molds on 8th day by 1 log cycle compared uncoated. These resulted showed CNO-SSPS film can be used as a good preservative in meat products.

Keywords: *Edible film, Cinnamon essential oil, Meat, SSPS.*

COMPARATIVE PERFORMANCE OF THE DIAMOND BACKMOTH, *PLUTELLA XYLOSTELLA* (L.) (LEP.:PLUTELLIDAE) ON VARIOUS BRASSICACEAE HOST PLANTS

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Abstract

The effect of various host plants such as broccoli, canola, cauliflower, kohlrabi, red cabbage and white cabbageon the life table parameters of the diamondback moth, *Plutella xylostella* (L.) (Lep.: Plutellidae) were evaluated under laboratory conditions (25 ºC, 60 % RH and a 16:8 h light:dark photo period). Records for larval period, pupal period and development time of *P. xylostella* were longest on kohlrabi (12.84, 5.09, and 21.12 days, respectively) and shortest on cauliflower (9.96, 4.5, and 17.6 days, respectively). The longest and shortest female adult longevity and male adult longevity were recorded on cauliflower (9.7 and 8.29 days, respectively) and kohlrabi (4.68 and 4.47 days, respectively), respectively. Among various host plants fecundity (total number of eggs laid per female) was highest (163.7 eggs) on cauliflower and the lowest (47.68 eggs) on kohlrabi. The net reproductive rate (R_0) was significantly affected by various host plants being highest on cauliflower (65.16) and lowest on kohlrabi (12.71 females/female/generation). The highest and lowest intrinsic rates of natural increase (r_m) were observed on cauliflower (0.2 day^{-1}) and kohlrabi (0.1 day^{-1}), respectively. Cluster analysis of the life table parameters of *P. xylostella* on various host plants indicated that kohlrabi, in comparison to other plants was an unsuitable host to *P. xylostella*.

Key words: *Diamond Backmoth, host plant.*

FACTORS AFFECTING AVOID TO USE PESTICIDES IN GREENHOUSE VEGETABLES IN BANDAR ABBAS DISTRICT (IRAN)

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Abstract

Despite huge environmental, economical, health, and societal costs of pesticides, evidence revealed that farmers in developing countries would continue to use pesticides. The present annual use of pesticides in Iran is about 24,000 tons, of which the highest amounts are related to insecticides, herbicides, and fungicides. The root of the problem appears to be related to the way of farmers' decision making. As such, it is crucial for policy makers to understand how farmers think and behave with regard to these inputs. Therefore, the aim of this research was to accrue empirical evidence about greenhouse owners' attitudes and intention toward avoid to use pesticides in the Bandar Abbas District. To achieve our goal, The Theory of Planned Behaviour was used. The Theory was quantitatively tested using the survey methodology to understand greenhouse owners' attitude and intention. The study sample consisted of 110 greenhouse owners selected through a random sampling method. Data were collected through a questionnaire structured to assess the central components of the theory. The five-point Likert-type scaling was used for all the variables. The questionnaire's internal reliability and the validity was approved. Results indicated that the greenhouse owners' attitude was the main predictor of their intention to avoid pesticide application followed by subjective norms and moral norm. Furthermore, adding moral norm and self-identity as the additional constructs to the theory significantly increased the explanatory power of the standard model. The present study provides a justification for policy and decision making that intend to encourage farmers' avoid pesticide application.

Keywords: *Subjective Norm, Moral Norm, Self-Identity, Chemical Pesticides, Greenhouse Owners.*

OPTIMIZING POLYSACCHARIDE EXTRACTION FROM OLIVE LEAVES AND EVALUATING ITS ANTIOXIDNAT AND RHEOLOGICAL PROPERTEIS

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Abstract

Box-Benken design response surface methodology was used to optimize polysaccharide extraction from olive leaves. Effect of three independent variable of extraction time (3-7 hours), extraction temperature (60-100 °C) and water to raw material ratio (5-25 ml/g) were studied on extraction yield. Extracted polysaccharide was evaluated for antioxidant properties, total phenolic and flavonoid content and its structure and functional groups were studied using FTIR. Rheological properties and flow behavior of polysaccharide were determined by fitting to power law model. The most important parameter in experimental ranges was temperature and the lowest effect was seen in extraction time. Highest extraction yield was obtained at extraction time of 2 hours, extraction temperature of 80.96 and water to raw material ratio of 17.94 ml/g. Antioxidant properties of extracted polysaccharide were measured using DPPH radical at 517 nm that showed notable antioxidant properties. Rheological properties of extracted polysaccharide were studied at 1, 2.5 and 5% concentration. Results showed that at high concentrations polysaccharide showed shear thinning behavior. One of the most important obstacles in native polysaccharide applications is their extraction yield. Extract of olive leaf polysaccharide is highly affected by extraction temperature. Extracted polysaccharide showed good antioxidant properties comparing to BHT and phenolic extract of olive leaf. Moreover it could be used for increasing solution viscosity at higher concentrations.

Keywords: *Olive leaf polysaccharide, optimization, response surface methodology, FTIR, antioxidant properties.*

ASTIGMATA MITES AND THEIR SPECIES DIVERSITY IN JUNGLES OF HAMEDAN PROVINCE, IRAN

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Abstract

Fauna and species diversity of astigmatid mites in four regions including Asad Abad, Toyserkan, Nahavand and Hamedan at three different seasons (May, August and October) in Hamedan province (Western Iran) were investigated. The astigmatid mites were collected and extracted form soil and litter under forest trees by using a Berlese funnel andthen directly mounted on permanent microscope slides in Hoyer's medium. In this survey, 11 species belonging to four genera from 2 families were collected and identified. Among them a species was recorded as new species for astigmatid mites and also one species as new for Iranian mite fauna that marked by * and **, respectively. The scientific names of species are presented below: Acaridae Latreille, 1802, + *Tyrophagus* Oudemans, 1924, *Tyrophagus perniciosus* Zakhvatkin, 1941, *Tyrophagus* sp. nov.*, *Tyroglyphus longior* Gervais, 1844, *Tyrophagus similis* Volgin, 1949, *Tyrophagus vanheurni* Oudemans, 1924, *Tyrophagus neiswanderi* Johnston & Bruce, 1965, *Tyrophagus putrescentiae* (Schrank, 1781), + *Rhizoglyphus* Claparède, 1869, *Rhizoglyphus robini* Claparède, 1869, *Rhizoglyphus echinopu s*(Fumouze& Robin, 1868), + *Cosmoglyphus* Oudemans, 1932, *Cosmoglyphus*s p., Glycyphagidae Berlese, 1897, + *Austroglycyphagus* Fain & Lowry, 1974, *Austroglycyphagus* (*Austroglycyphagus*) *hughesae*Fain, 1975**. The species diversity's indexes were calculated for sampling regions by using the Ecological methodology 6.0 software and data analysis was performed by using SPSS 20 software. Base of one-way ANOVA, the highest species diversity and richness were shown in Toyserkan region. The Nahavand region was at the second place after Toyserkan region. The Smith-Wilson's evenness index in Nahavand region was categorized between Toyserkan and Hamedan regions. Also, the Nahavand and Toyserkan regions had the highest species similarity index whiles the AsadAbad and Hamedan regions had the highest species similarity. The members of *Tyrophagus perniciosus* had the highest species stability in all regions especially in Toyserkan region (65.49 > 50).

Key words: *fauna, species diversity, mite, astigmata, Iran.*

EFFECT OF WILD PISTACHIO AND PURSLANE EXTRACT ON PERFORMANCE OF BROILER CHICKENS UNDER HEAT STRESS CONDITION

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Abstract

The aim of this experiment was to investigate the effect of vitamin E, wild pistachio and Purslane extract on the performance of broiler chickens reared under heat stress condition. For this purpose, 200 one-day-old broiler chicks (Ross 308) were used in a completely randomized design with five treatments, four replicates and 10 chickens per replicate. The dietary treatments were: 1) control diet (CO; basal diet + no additives), 2) CO + 200 mg/kg vitamin E (α-Tocopherol) (VE) , 3) CO + 1000 mg/kg of wild pistachio extract (WPE), 4) CO + 1000 mg/kg of Purslane extract (PE), 5) CO + 1000 mg/kg WPE + 1000 mg/kg PE (WPEPE). The results of this experiment showed that feed intake, body weight gain and feed conversion ratio of broiler chicken during starter, growth and total phase of rearing periods were not affected by feed additives (P>0.05). The serum glucose concentration (mg/dl) was reduced with inclusion of WPE in broiler diets. Cecal undesirable bacteria (E-Coli and Coliforms) were decreased by addition of PE and WPEPE to broiler diets compared with other groups. It was concluded that the addition of Purslane extract and Purslane + wild pistachio extract to broiler diets might improve cecal microflora composition of broiler chickens reared in heat stress condition.

Keywords: *Wild pistachio extract, Purslane extract, Broiler, Cecal microflora composition.*

EFFECT OF THE CALYX COATING AND STORAGE CONDITIONS ON ANTIOXIDANT SUBSTANCES IN THE *PHYSALIS PERUVIANA*

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Abstract

Physalis peruviana is a climacteric and temperature-sensitive fruit from the Solanaceae family whose quality and quantity of phenolic and antioxidant substances depend on the temperature and storage conditions. In this research, the effects of calyx coating and storage conditions were investigated on storage life of Cape gooseberry fruits. For this purpose, the fruits were kept in with and without calyx conditions at three temperature levels of 10, 15 and 20 ° C for 30 days. Vitamin C, total phenol, flavonoid and total antioxidant contents were measured and evaluated during the time of storage. The results showed that, at the end of storage, vitamin C, total flavonoid, and total antioxidants decreased significantly, However, total phenol content increased during storage period, The increase in phenol content during storage can be due to a significant reduction in the destruction of the fruit cell, as well as due to cold damage (for total phenol). In addition, at the end of the storage period, the fruits covered with calyx under conditions of temperature of 10 degrees Celsius had a good physicochemical and antioxidant quality.The highest vitamin C, total antioxidants (59.33%) in fruits covered with calyx under storage conditions 10 ° C were observed.

Keywords: *Storage temperature, post-harvest physiology, vitamin C, Physalis peruviana.*

EFFECT OF THE CALYX COATING AND STORAGE CONDITIONS ON SHELF-LIFE AND FLAVOR INDEXIN THE CAPE GOOSEBERRY FRUITS

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Abstract

Cape gooseberryis a plant from the *Solanaceae* family. The fruits of this plant have high nutritional value due to high vitamin content, minerals and antioxidants. In this research, the effects of calyx coating and storage conditions were investigated on storage life of Cape gooseberry fruits. For this purpose, the fruits were kept in with and without calyx conditions at three temperature levels of 10, 15 and 20 ° C for 30 days. Total soluble solids, titratable acidity, flavor index, vitamin C, were measured and evaluated during the time of storage. The results showed that, at the end of storage, the titratable acidity, total soluble solids, and vitamin C, decreased significantly, However, flavor index increased during storage period, The increase in total flavor during storage can be due to a significant reduction in the titratable acidity (for the flavor index). In addition, at the end of the storage period, the fruits covered with calyx under conditions of temperature of 10 degrees Celsius had a good physicochemical and antioxidant quality.The highest titratable acidity (0.633%), soluble solids (14.96%), vitamin C, in fruits covered with calyx under storage conditions 10 ° C were observed.

Keywords: *Storage temperature, post-harvest physiology, vitamin C, Cape gooseberry.*

PYRAMIDAL BUILDING OF FOUR PARTIAL RESISTANT GENES TO ZUCCHINI YELLOW MOSAIC VIRUS IN ONE PRODUCTIVE HYBRID OF SQUASH

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Abstract

Zucchini Yellow Mosaic Virus (ZYMV) is one of the very important viruses causing highloses of yield of cucurbit in Iraq and the world. The high biological variability of ZYMV provide opportunities for heterogeneity which could be observedin multiple aspects of genetic direct partial resistance in some variants of several genotypes of squash previously introduced in a program of self-pollination and selection. Four different direct partial resistance aspects were isolated and breaded to pure lines in different genotypes. Collection of these partial resistance traits of ZYMV in one genotype of squash to increase resistance genes intensity was achieved by pyramidal building of resistance genes controlling these traits with a program of two stages. In the preliminary stage pollination between the pure line 2023 (distinguished with auto recovery of ZYMV infection) and the pure line 2018 (distinguished with slow mosaic of ZYMV infection), and so the hybridization of the pure line 2026 (characterized by the minor and unclear infection symptoms of fruits, as not get chromatic heterogeneity or obvious deformities), with the pure line 2017 (characterized by the nonappearance of infection symptoms on the fruits) was conducted. In the second stage hybridization between the two dual hybrids was achieved to produce quadrilateral hybrid. Evaluation of the dual and quadrilateral hybrids resistance efficiency explained that it raised gradually with the increase in number ofresistance traits, as it rise from 62.3 to 84.2% and then to 95.4% in the final hybrid. That justifies a careful evaluation of the combination of partial genetic resistance in order to increase their durability.

Key words: *squash breeding, virus resistance, cucurbits viruses, squash diseases, genetic resistance, ZYMV.*

ISOLATION AND IDENTIFICATION OF *BRENNERIA NIGRIFLUENS* AS CAUSAL AGENT OF BARK CANKER DISEASE ON WALNUT IN IRAQ

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Abstract

Walnut is a traditionally important tree in the Iraqi kurdistan mountains. Bark canker disease has recently been found in those mountains (Sulaimani). Disease incidence reached to 17.2% in Tawella. Bacterial isolates were identified by their morphological and biochemical characteristics using the API 20E system. Fifty-one and half percent of the isolates were identified as *Brenneria nigrifluens* and 36.3% as *Pantoea spp*. *B. nigrifluens* .Isolates formed circular colonies with entire margins and creamy color on nutrient agar. They appeared as circular dark purple with green metallic sheen colony with entire margin on EMB. Biochemical tests classify *B. nigrifluens* isolates into seven groups. VitekGN system was further used to confirm the identification. The isolates produced necrotic lesion of different size on artificial inoculated walnut branches, but no symptoms on detached leaves. Isolates 22, 28 and 31 induced typical symptoms on two-year-old seedlings. *B. nigrifluens* was successfully re-isolated from the inoculated seedlings. All *B. nigrifluens* isolates were resistant to erythromycin and cephalexin, most of them (16/17) were resistant to ampicillin, (13/17) were resistant to vancomycin, (12/17) were resistant to rifampin and amikacin,while (10/17) were moderately resistant to penicillin,(7/17) were moderately susceptible to streptomycin and (6/17) to gentamicin. Chloramphenicol, tobramycin, and tetracycline showed high efficiency in bacterial growth inhibition. Minimum Inhibitory and Minimum Bactericidal Concentrations of five chemicals against 17 bacterial isolatesshowed high efficiency of Kocide in killing 94.1% and inhibiting of 100% of the isolates at 0.31g/L *In vitro*, followed by Nordox which killed 70.6% and inhibited 76.4% of the isolates at 0.65 and 0.32 g/L respectively. *In vivo* studies confirmed high efficacy of Kocide in disease control and restriction of vertical and horizontal extension of the cankers followed by Nordox. No significant differences were detected between Champion, Courey and Melody.

Key words: *Juglans regia, Bark kanker, Brenneria nigrifluens, Bacterial diseases, Iraq*

EFFECTS OF *MELIA AZEDARACH* L. EXTRACTS ON THE SAWTOOTHED GRAIN BEETLES *ORYZAEPHILUS SURINEMENSIS* (COLEOPTERA: SILVANIDAE)

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Abstract

Methanolic and aqueous extracts of dry seeds from the chinaberry tree, *Melia azedarach* L. (Meliaceae) were performed against adults and larvae of *Oryzaephilus surinemensis* (Coleoptera: Silvanidae) under laboratory condition. The seed extracts showed high bioactivity at all doses. Results obtained from the present experiment showed that the seed extracts suppressed the adult and larvae activity of *Oryzaephilus surinemensis* even at low dose. In general, larvae were more susceptible to seed extracts more than the adults. The methanolic extract showed strong impact on larvae and adults.Clear effect on mortality % could be seen with the increasing concentrations of the extract, and the highest concentration 50% showed 90% mortality of adults, and 100% of larvae. The aqueous extract was less effective on mortality, adults 76.7%, and larvae 90% at the same concentration. The less expensive and naturally occurring biopesticide may be an alternative for synthetic pesticides.

Key words: *Oryzaephilus surinemensis; Melia azedarach*; *Plant extract; Mortality.*

EVALUATING SOME INSECTICIDES FOR CONTROLLING THE SUNN PEST *EURYGASTER* SPP. PUTON UNDER FIELD CONDITIONS IN THE MIDDLE REGION OF IRAQ

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Abstract

The Sunn pest *Eurygaster* integriceps (Hemiptera: Scutelleridae) is the most present insect in cereals in Iraq and other countries. In this study, the field efficacy of 10 different kinds of insecticides with brand name and recommended concentration: Desis 75 mL /100 L, Megaalpha 30 mL/ 100 L, Alphasin 30-40 mL/ 100 L, Levo 4 L/ha. ULV, Flash 35-40 mL/ 100 L, Matrixin plus 60 mL/ 100 L, Golan 75-100 mL/100 L, Talstar 100-150 mL/100 L, Bestoy 150-200 mL/100 L, Best Seller 100-150 mLl/100 L with various mode of action was evaluated against Sunn pest *E. integriceps* infested wheat on field at middle region (Wasit and Salahaldin governorates) of Iraq. Experiments were conducted in 11 wheat fields each measuring 0.5 ha located in the Middle region of Iraq (Wasit and Salahaldain governorates) during season 2015- 2016. The wheat fields contained common varieties of wheat planted in Iraq. The population density of the pest was at its highest level (the beginning of April 2015) of mostly nymphs, adults and eggs. The results indicated that the recommended dose for each insecticides used showed high efficacy (80.1 – 93.8) in reducing numbers of *E. integriceps* adults after one week of treatment, reaching 0.2 - 0.8 insects /m^2 compared to 3.6 insects /m^2 in the control treatment. These results would assist the control program of this pest and in implementing pest management practices to reduce resistance development chances.

Keywords: *Efficacy, insecticides, Sunn pest, Eurygaster spp., Wheat.*

"DIFESAMAIS": AN ITALIAN PROJECT FOR THE MANAGEMENT OF AFLATOXIN CROPS CONTAMINATION

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Abstract

Corn aflatoxins contamination is one of the main issues that farmers of large areas of Europe have to cope with. Different strategies have been implemented to try to reduce, if not eliminate, toxin contamination at the pre-harvest level. However, a careful analysis of the costs/efficacy of each of the various inputs must be performed in order to provide an acceptable income for the farmers. On the other hand, there is an increasing market demand for food and feed commodities obtained with environmentally low-impact practices possibly through the experimentation of innovative and organic defense techniques. Minimization of mycotoxin risk requires a multifactorial approach since climatic, agronomic and phytoiatric factors are found to interact with each other in complex, local ecological realities. The "DIFESAMAIS" project intends to design and validate an innovative combined approach addressed to the development and the valorization of organic farming/integrated production of corn, with particular attention to the maintenance of biodiversity. Both academic and industrial partners (PROGEO S.C.A. and AGRITES s.r.l.) were involved in the present project. The main stakeholders were farmers who would have the opportunity to acquire the economic expertise and the technical tools to implement an ecologically sustainable maize cultivation by a reduction of chemical inputs. Among the various activities performed in the framework of the Project, we will report the validation of a sustainable procedure to reduce aflatoxin contamination by bio-competition approaches, based on: 1) the use of non-aflatoxigenic strains of *Aspergillus flavus*, and 2) the validation of technologies for *Ostrinia nubilalis* control.

Keywords: *Aflatoxin containment, biocontrol, maize protection.*

Acknowledgement

Funding have been provided by the Emilia Romagna Rural Developing Program (PSR 2014-2020), Project n. 5004325 "DIFESAMAIS: Development of innovative defense technologies to increase environmental sustainability of corn production".

CONTROL OF *CERATITIS CAPITATA* (WIEDEMANN) (DIPTERA: TEPHRITIDAE) WITH MASS TRAPPING ON SPRING NOVEL ORANGE IN ADANA PROVINCE OF TURKEY

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Abstract

The Mediterranean fruit fly (Medfly), *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae) is one of the important pests on citrus in Turkey. The Medfly is a polyphagous tropical fruit fly which attacks more than three hundred and fifty botanical species from sixty five different families. The females puncture the fruits and lay eggs below the skin of the host fruits, which are destroyed by larval feeding. The study was conducted in 2015-2016 to control of *Ceratitis capitata* (Wiedemann) (Diptera:Tephritidae) with mass trapping on spring novel orange in Adana province of Turkey. In 2015, a total of 350 Decis traps and in 2016 a total 350 SEDQ traps were used to control Medfly on spring novel orange. After two years of studies, the average number of the catches per trap varied in each of the sampling year. In 2015, a total of 10326 adults were caught by traps and the average number of the catches per trap was recorded as 29.50 percent. In 2016, a total of 16406 adults were caught by traps and the average number of the catches per trap was recorded as 46.87 percent. The control of medfly with mass trapping significantly decreased the damage rates of the medfly on the spring novel orange in both years.

Keywords: *Medfly, Ceratitis capitata, spring novel orange, mass trapping, Adana province.*

PROJECT AFLATOX®: A NEW APPROACHFOR THE DEVELOPMENT OF ANTIFUNGAL AND ANTIMYCOTOXIGENIC COMPOUNDS

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Abstract

Aflatoxins represent a major issuefor a food and feed economy based on cereal cultivations, and aflatoxins contamination constitutes a health emergency because these mycotoxins, besides being toxic, are among the most carcinogenic substances known. Although *Aspergillus* species were dominant in tropical regions, due to the climatic change they recently became a serious concern also in Europe. In Italy, this problem is particularly relevantin the Po Valley, in which maize market is strictly linked to dairy products such as the well-known Parmigiano Reggiano cheese. Despite of countless efforts, to date the problem of food and feed contamination remains unsolved, since the essential factors affecting aflatoxins production are various and difficult to handle together. In this scenario, the exploitation of bioactive natural sources to obtain new agents with novel mechanisms of action may represent a successful strategy to minimize at the same time mycotoxin contamination and the use of harmful pesticides. In 2015, Aflatox® Project was granted from Cariplo Foundation. The purpose of our project was the development of new-generation inhibitors of aflatoxigenic Aspergillus spp proliferation and toxin production, through the modification of naturally occurring molecules.Panel of at least 180 compounds, based on a class of molecules named thiosemicarbazones, were analyzed for their antifungal and antiaflatoxigenic ability. Cytotoxicity, genotoxicity and epi-genotoxicity of new-synthesized compounds wereassessed on both human cell lines and *in vitro* model systems, and finally data were assembled in a Quantitative Structure-Activity Relationship (QSAR) database correlating chemical structures with biological/toxicological activities.

Keywords: *Crop protection, new generation antimycotoxigenicbioactives, human health protection.*

Acknowledgement

This study was supported by a grant from “Fondazione Cariplo” (Project N. 2014-0555).

SPATIAL AND TEMPORAL DISTRIBUTION OF GROUND BEETLES (CARABIDAE: COLEOPTERA) IN TWO AGRO-ECOSYSTEMS IN JORDAN

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Abstract

Ground beetles are important predators in the different ecosystems which are frequently used in ecological studies. Pitfall traps containing vinegar were placed from March 2015 to April 2016 in two locations differing in vegetation cover, agricultural practices and elevation. The first location was in the University of Jordan Campus (UJC) in the high lands of Jordan, in which a pine forest, fruit trees field and olive trees field were sampled. The second location was in the Central Jordan Valley (CJV), in which pumelo, *Whashingtonia*, date palm and alfalfa fields were sampled. The results showed that the total number of collected specimens was 1432 beetles belonging to 26 species, of which 1242 belonged to 16 species in UJC, while 190 beetles belonged to 14 species in CJV. Each of the two locations had its own species composition, but few species were found in both locations. The most common species in UJC were *Calathus* (*Calathus*) *syriacus* Chaudoir, followed by *Calathus* (*Neocalathus*) *melanocephalus*, and *Microlestes maurus* (Sturm), while *Anulacus* (*Aephnidius*) *ruficornis* Chaudoir was the most common in CJV. The population dynamics for the common species was presented. However, available biological and ecological data were given for all species. The differences in the number of specimens and species among the habitats and locations could be due to the different number of host species and their densities in the habitats rather than the difference in agricultural practices.

Keywords: *Carabidae, ground beetles, Coleoptera, Jordan.*

DEVELOPING A COMPUTER APPLICATION FOR THE IDENTIFICATION OF SIMILAR BUTTERFLY SPECIES USING MATLAB IMAGE PROCESSING

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Abstract

Identification of insect pests to the species level is very important in the field of plant protection. The species name is a filing and retrieval system which enables us to store and/or retrieve all data for a species such as host plants, life cycle, damage, or pesticide resistance. However, identification of insects to the species level requires special knowledge and training. We aimed in this research to develop a computer application for the untrained person to identify digital images for three morphologically similar butterfly species. The first was the cabbage butterfly, *Pieris rapae leucosoma* Schawerda, a common pest of Cruciferae, while the other two (*Euchloe ausonia melisande* Fruhstorfer, *Pontia daplidice daplidice* Linnaeus) were generally considered non-pest species. Matlab 2017 software was used to build an implementation of the developed image processing technique. The insect digital image processing steps included resizing, orientation, filtering, extracting wing colors, and finally calculating the ratio of colors. Some images were used to train the computer to identify the images and the rest of images were used for identification by the computer. In addition, Graphical User Interface Application was developed to let any user (computer programmer or amateur) to upload, process and identify an image. More than 99% correct identifications were obtained. The developed application may be a promising tool for insect image identification when more species are included and refinement of the technique is achieved.

Key words: *Computer identification, insect images, MATLAB.*

APHICIDAL ACTIVITY OF AQUEOUS EXTRACTS OF *EPHIDRA SINICA* MEDICINAL PLANT AGAINST THE PEACH TRUNK APHID, *PTEROCHLOROIDES PERSICAE* (CHOLODKOVSKY) (HOMOPTERA: LACHNIDAE), ON CHERRY

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Abstract

The peach trunk aphid is an important insect pest attacking stone fruits in Jordan and worldwide. It attacks almond, cherry, apricot and peach. Insecticides represent the main solution to control this insect pest, but they proved to pose many environmental problems and cause toxicity to human. In addition, many insects developed resistance to insecticides that lead farmers to raise their application rates and increase their frequency. So, it is not recommended to use these chemicals to control this insect particularly at home gardens. Using botanical insecticides proved to have success in controlling insect pests. The purpose of this research project was to test the aphicidal activity of the aqueous extracts of *Ephidra sinica* medicinal plant on the peach trunk aphid using the shoot-cut bioassay technique and different concentrations prepared to determine the Median Lethal Concentration rate (LC_{50}) of the plant extract. Results revealed that high concentration of aqueous extract of *Ephidra sinica* medicinal was toxic as Imidacloprid to the peach trunk aphid, *Pterochloroides persicae.*

Key words: *Botanical insecticide, Peach trunk aphid, Integrated pest management, Botanical insecticide.*

DETECTION OF FIVE POTATO VIRUSES IN KAZAKHSTAN

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Abstract

Potatoes are fourth important crop in the world with an annual production of 300 million tons. Nevertheless, large losses of seed material during storage up to 20%, as well as yield reduction of up to 50% are associated with potato viruses. The most common viruses in the potato regions of Kazakhstan are: *Potato leafroll virus* (PLRV), *Potato virus X* (PVX), *Potato virus Y* (PVY), *Potato virus S* (PVS) and *Potato virus M* (PVM). For detection of 5 viruses we developed test-system based on RT-PCR. To increase specificity of diagnostic we developed primers for reverse transcription and PCR separately. Capsid proteins genes of viruses were used for primers development because these genes are subjected to negative selection processes. Currently, we have been checking 90 samples collected from 3 potato fields in south region of Kazakhstan. Potato leaves as samples were collected in August of 2017. According to our RT-PCR results, all samples were infected with PVY and up to 90 % of samples with PLRV and PVM. PVS was detected only in 40% of samples. PVX was not detected at all. Thereby, it can be noted that PVY, PLRV and PVM are dominant potato viruses in South region of Kazakhstan. In the future, we will investigate genetic diversity of these viruses to compare with isolates from all over the world (NCBI).

Keywords: *Potato, Viruses, Primers, RT-PCR.*

THE EMERGENCE OF RED PALM WEEVIL LIBYA (2009) (OLIVIER) RHYNCHOPHRUS FERRUGINOUS

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Abstract

Al-Nakheel is one of the most important fruit trees in Libya. The number of palm trees is about 6 million trees distributed in the south and north. Libya has a unique location among the neighboring countries. It is considered a continent of palm trees from the beginning (June) until October for a long time. In the middle of the country, the production of dates is annually about (2) million tons, according to the latest statistics and therefore it is necessary and for us very interesting to know the secrets of organisms associated with palm trees, including red palm weevils.Their first appearance was recorded in 2009 and it was the first infection in Tobruk. In 2010, the second infection was recorded in the city of Tarhona (the Sunday Market). All the stages of the insect were identified on the farm by the National Center for Quarantine and Prevention in 2016. It was also registered in the following cities in the following period: Benghazi in the region (Kweifiya) on 20/11/2016,in the region Tripoli inthe spring of2017, and in Benghazi in Sayed Farajon 02/03/2017.

Key words: *Red palm, Libya.*

THE GREEN CRUSTY INSECT ON PALM TREES IN LIBYA (2016) PALMASPIS PHOENSLCIS (RAMASHANDRA RAO)

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Abstract

Phoenix dactylifera, commonly known as date or date palm,[2] is a flowering plant species in the palm family, Arecaceae, cultivated for its edible sweet fruit. One of the most important date palm production site in Libya is the southern Libyan region, where most of the date palm cultivation produced from the finest varieties in the Arab world, is concentrated. In 2016, the green crust insect began to appear by transferring the infected parasites from one of the infected countries where the insect was recorded. The damage caused by this pest is the injury of the whole parts of the palm of the leaf, chickpeas, food and fruits, where the disease causes more than 50% of the fruits of the palm and causing a reduction in the quality and value of dates and the impact on marketing.

Key words: *Green Crusty, Palm trees, Libya, Libya.*

THE DIFFERENCES OF ANTIOXIDANT INDICES OF HEALTHY AND INFECTED LETTUCES

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Abstract

The aim of the research is to find the changes in antioxidant indices to evaluate plant defence action. Therefore, green leafy lettuce (*Lactuca sativus* L.) cv. 'Lollo Bionda' and pathogenic fungus *Botrytis cinerea* Pers. (BC) were chosen. The lettuces were grown for 5 weeks in the growth chamber. Day/night temperatures were 21/17±2°C, 16-h photoperiod and relative humidity was 50–60 %. The single-spore BC isolate LT13B_FRA_76 maintained on Potato Dextrose Agar (PDA) at 22 ˚C in the dark for 7 days. The 2 mm diameter isolate was used for inoculation of plants. After inoculation chlorophyll and flavonols indices, the total phenolic content (TPC), 2,2–diphenyl–1–picrylhydrazyl (DPPH) free-radicals by spectrophotometer and leaf's reflectance of healthy and infected lettuces were evaluated. Measurements were done each day until 10 days after inoculation (DAI). The results showed that chlorophyll index of infected lettuces became lower than in healthy lettuce after the first and second DAI. At the fourth DAI infected lettuce chlorophyll index arised more than in healthy ones. In contrast, flavonols index of infected lettuce were higher from the second DAI till tenth DAI. TPC was increasing in infected green lettuces after first DAI but at the third DAI both infected and healthy TPC drastically decreased. We observed that, till the tenth DAI, TPC of infected and healthy plants increased and reached approximately the same level. DPPH radical scavenging strapping ability was increasing in infected plants in the beginning of research but at the third DAI decreased. To sum up, flavonols index, TPC, DPPH radical-scavenging changed distinctly into higher side on infected lettuces first DAI, but chlorophyll indexes decreased and leaf reflectance became lower into 500–700 nm intervals. TPC were found out as one of the earliest disease indices, but it depended on various conditions needing more researches.

Keywords: *Lettuces, Botrytis cinerea, inoculation, antioxidant indices.*

QUALITY OF TOMATO SAUCE MADE FROM DIFFERENT VARIETIES OF TOMATOES DURING STORAGE

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Abstract

Tomatoes fruit and processing products are valued not only for good taste, but also for nutrition. They contain vitamins and other materials that not only improve people's diet, but also prevent from many diseases. The main purpose of this work is to compare the quality of the tomato sauces produced from the different varieties of tomatoes during storage. Tomato sauce has been made from different tomato varieties: 'Tolstoi F1', 'Orkado H' and 'Benito H'. Tomato sauce quality was evaluated 24 hours after preparation and every seventh month. Upon the completion of the assessment and comparison of the chemical composition of the produced tomato sauce it was established that there were no essential changes in dry matter content during storage. The greatest lycopene and β-carotene contents were determined in the tomato sauce produced from tomato fruits of ′Benito H′ variety. The carotenoid content in the tomato sauce of all assessed varieties substantially decreased, especially lycopene content in the sauce produced from tomato fruits of ′Tolstoj F1′ variety. The research showed that pH content wasn't differ in tomato sauce depending on variety and storage time. Upon the assessment of the colour of tomato sauce it was established that the reddest colour (a*) was of the sauce produced from tomato fruits of ′Benito H′ variety, and the yellowest colour (b*) of the sauce was produced from tomato fruits of ′Orkado H′ variety. After the assessment of the texture of tomato sauce it was established that the greatest stability, best consistency, maximum viscosity and binding ability were of tomato sauce produced from fruit of ′Benito H′ variety.

Keywords: *tomatoes, sauce, variety, quality.*

INTRODUCTION AND PHYTOCHEMICAL ANALYSIS OF MEDICINAL AND AROMATIC PLANTS IN VYTAUTAS MAGNUS UNIVERSITY 1924-2018

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Abstract

Medicinal (aromatic) plants (MAPs) are playing an important role for the solution of WHO problem Health for everyone in 21st Century. In Lithuania, since 1924 until, medicinal plants collections have been developed in the Sector of Medicinal and Aromatic Plants in Botanical Garden at Vytautas Magnus University. In Europe unique collection of MAPs is a base for scientific researches, project-based activities, national and international studies and the object of public education. The topics and tendencies of the research on MAPs have varied since that time quite a lot. Collections of medicinal plants are still an important constituent and object of the phytochemical scientific research process. The methods of chemical investigations have been changing during the distinct research periods (I – 1924–1949, II – 1949–1984, III – 1984–1999, IV – 1999–2018). The main objective of research is the introduction and phytochemical investigation of MAPs. Biodiversity of plant resources, scarce information on biologically active compounds and their properties in many species including those naturally growing in Lithuania or introduced, as well as increasing demand for natural food, food supplements and homeopathic medicine have been the main motivation aspects of the ongoing study. MAPs are sources of raw materials, required in pharmacy and phytotherapy are a part of genetic resources of Lithuania. Phenological observation, phytochemical investigation of raw material of MAPs from Sector of Medicinal and Aromatic Plants of Botanical Garden at Vytautas Magnus University revealed that new species from foreign and local flora can be successfully introduced in Lithuania. Lithuania has good growing conditions for a great variety of medicinal and aromatic plants.

Keywords: *Medicinal, aromatic plants (MAPs), introduction, phytochemical analysis, Lithuania*

STRONTIUM CONTENT IN SANDY SOILS IN AGRICULTURE FIELDS (CASE STUDY: MOUNDOU, CHAD)

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Abstract

During evaluation of physical and chemical properties of sandy soils and their fertility in Southern part of Republic of Chad it has been revealed that some soils have very high content of strontium. Its content varies from 10 to 270 mg/kg of soil depending on type of soil, depth of soil layers, clay and organic content. Strontium content negatively correlates with total content of calcium and phosphorus in layers of soil. Low CEC (CEC - Cation-exchange capacity) of soil may be a reason of possible translocation of strontium from higher to lower layers of soils. Strontium content in soils do not relates with level of radioactivity of soil measured. The highest content of strontium has been found in soils developed on some eolian and colluvio-alluvium deposits. Some researchers hypothesize that some endemic and chronic diseases such as Kashin-Beck disease, `Dysostosis enchondralis endemic`, endemic hoiter, osteoarthritis might be caused by high content of strontium in water and plant foods contaminated with it. Absence of consensus on etiological factors of these diseases confirms that it is worth considering necessity of further studies of different affects of high content of strontium in water and foods on human health directly or indirectly through causing misbalance in mineral nutrition.

Keywords: *strontium, sandy soil, Ca/Sr ratio, radioactivity, eolian deposit.*

DETERMINATION OF PESTICIDE RESIDUES IN WATER SAMPLES

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Abstract

The modern agriculture cannot be imagined without the use of pesticides, and the widespread use of pesticides leads to pollution of water, soil and air, as well as their accumulation in agricultural crops. Monitoring of pesticide residues in water samples is of particular importance in order to protect people's health from potential adverse effects. This study presents an application of a new analytical method for qualitative and quantitative determination of some herbicide and organophosphorus insecticide residues in water samples. The analysis was conducted using high-performance liquid chromatography (HPLC) method and UV diode array detection. Prior to HPLC analysis, a solid-phase extraction (SPE) was used for concentration of analytes and sample clean-up. The method was validated by testing specificity, selectivity, linearity, precision, accuracy, limit of detection (LOD) and quantification (LOQ). The method had a good linear relationship and the obtained values for multiple correlation coefficients for calibration curves for all components were $R^2 \geq 0.99$. The precision was evaluated for the retention times and peak areas, and the estimated values for relative standard deviations (RSD) were below 6 %, indicating an excellent precision of the proposed method. This method was successfully applied for determination of two herbicide and three organophosphorus insecticide residues in water samples. Detectable residues of examined pesticides were not found in the analysed samples.

Keywords*: HPLC method, pesticide residues, water samples.*

FUNGISTATIC AND FUNGICIDAL EFFECT OF AQUEOUS PLANT EXTRACTS AGAINST SOME PHYTOPATHOGENIC FUNGI

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Abstract

Every year a lot of crop damage is caused by various diseases and among them fungal diseases are very common. The fungistatic and fungicidal effect of aqueous plant extracts were evaluated on several phytopathogenic fungi (*Fusarium oxysporum, Rhizoctonia solani, Alternaria alternata, Botrytis cinerea* and *Plasmopara viticola)*. Fresh aerial parts of *Pinus nigra* J. F. Arnold, *Pinus sylvestris* L and *Juniperus communis* L. were collected for the preparation of aqueous extracts. The poisoned food method was used in the preliminary screening of aqueous extracts for their antifungal properties evaluation (for 20 and 10% of aqueous extracts of each plant), and broth-microdilution method was used to determine the minimal inhibitory concentrations (MICs) and the minimal fungicidal concentrations (MFCs) of the extracts (with 10% of starting test concentrations of aqueous extracts of each plant). This study showed that all the aqueous extracts obtained from the aerial parts of the tested plants had strong fungistatic and fungicidal activities against the phytopathogenic fungi. Anyway, the extract from *Juniperus communis* L. showed the strongest activity against *Alternaria alternata* with MICs of 2.5% and MFCs of 5%, and *Alternaria alternata* was shown as most sensitive fungus against tested plant extracts. The antifungal properties of *Pinus nigra* J.F. Arnold, *Pinus sylvestris* L and *Juniperus communis* L. make these plants of potential interest for the control of fungi affecting plant yield and safety. These preliminary results, obtained from *in vitro* experiments, may be supplemented by other more comprehensive studies *in vivo,* both in controlled greenhouse conditions and in open field to practically evaluate the use of these extracts.

Key words: *plant extracts, phytopathogenic fungi, poisoned food method, broth-microdilution method.*

PHYTOPHAGOUS PENTATOMIDS ON TOBACCO

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Abstract

The continued global warming could advance the presence of new crop pests on tobacco plantsin Macedonia. The phytophagous pentatomids feed on wide variety of habitats and plants. During 2016/2017, a sweep net method was used around the tobacco plots, and method of survey of 100 randomly selected tobacco plants in the region of Prilep. Laboratory investigation was made by standard laboratory methods. Dry warm weather 2016/2017 allowed development of three species of Pentatomidae (Hemiptera) on tobacco: *Nezara viridula, Dolycoris baccurum* and *Eurydema ornata*. The nymphs and adults fed on the upper or lower surface of the tobacco leaves. They injected saliva into the leaf tissue and suck up nutrients from plant juices. Tobacco leaves were pierced and deformed. *N. viridula* is a new pest on tobacco fields in Macedonia. The female lays yellow-pink eggs in groups (14-30) on the upper or underside of tobacco leaves. Every larval instar has specific color and patterns. In L_1 the larvae are black spherical and they look like a small spiders. The fifth instar nymphs are green with a pink, yellow or white abdominal spots. At the end of August 2017 bigger attack of *N. viridula* on the margins of the tobacco fields and surraunding weeds was noted. *N. viridula* and *D. baccurum* were established in all development stadiums on tobacco and *E. ornata* only as an adult. In 2016, *D. baccurum* attacked 627 tobacco stalks, and 1044 in 2017. In 2016, *E. ornata* attacked 282 tobacco stalks, and 489 tobacco stalks in 2017.

Keywords: *Nezara viridula, Dolycoris baccurum, Eurydema ornata, tobacco.*

MODIFICATION OF ACIDITY AND PEROXIDES CONCENTRATION DURING STORAGE OF WALNUT OIL (*JUGLANS REGIA* L.)

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Abstract

Walnut (*Juglans regia* L.) is one of the most valuable nuts rich in nutrients and biologically active substances. In our previous studies it was shown that the kernels of Moldovan walnuts contain a huge amount of essential polyunsaturated fatty acids: linoleic (53-70%), linolenic (9.0-1.3%), docosahexaenoic, including eicosapentaenoic acids (omega-6, ωmega-3); as well as saturated fatty acids such as palmitic acid (6.5-7.0%); proteins (15-18%); phenolic substances and microelements. The most complicated problem is to protect the quality of extracted walnut oil from oxidative changes in polyunsaturated fatty acids. The purpose of this research was to assess the impact of triglycerides hydrolysis on the oxidation of walnut oil during storage at various temperatures: 20, 40, 60°C. The oil was obtained from Moldovan variety of walnut by cold pressing method. The oil yield was 30-35% of kernels mass. The changes in concentration of peroxides as primary derivates of polyunsaturated fatty acids oxidation were analyzed depending on the changing oil acidity predetermined by triglycerides hydrolysis. The most profound modification of peroxides content was found at temperatures of 40, 60°C; but the triglycerides hydrolysis and accumulation of free fatty acids was quite slow and not depended on storage temperatures. During 40 days of storage, the oil acidity and concentration of peroxides varied in limits 1.17-0.83KOH/g and 1.65-16.25μmol/kg, respectively. There was not established any correlation between the concentration of peroxides and oil acidity. Possibly the formation of peroxides occurred in the structure of triglycerides, as a result of the oxidation of polyunsaturated fatty acid residues.

Keywords: *Juglans regia L, oil, storage, acidity, peroxides concentration.*

EFFECT OF CARBON STRESS ON THE PHYSIOLOGY OF *P. AURANTIOGRISEUM*

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Abstract

P. aurantiogriseum is a post-harvest pathogen causing significant losses in agricultural production during storage. It plays an important role in food and feed spoilage and it contaminates agricultural products with potential mycotoxins harmful to human and animal health. *P. aurantiogriseum* is one of the most toxic species of the genus *Penicillium*, often isolated from foods, vegetables, fruits, and permafrost sediments from the Arctic and Antarctic. It has also been isolated from the marine environment which confers resistance to several types of stress related to nutrients and growing conditions. Our work aimed to study the effect of carbon source on the physiology of *P. aurantiogriseum* in order to control its growth as well as its toxigenesis. Our results showed a close relationship between physiological state of *P. aurantiogriseum* and the secretion of mycotoxins under carbon stress condition. The physiological state of the strain revealed a correlation between the increase in sucrose concentration and the aging signs intensity. The aging signs begin to disappear at the concentration of 400 g/l of sucrose allowing the normal characters of *P. aurantiogriseum* to reappear. This transformation was suggested being an escape phenomenon to the action of sucrose. Terrestric acid production was recorded at the time of appearance of aging signs. Terrestric acid was always maintained even after returning to the normal physiological state of the strain, yet its production was diminished. We could control the growth of *P. aurantiogriseum* by modifying the sucrose concentration in the growth medium. This allowed us to attain the critical concentration from which the strain suffered and thus reached the phase of decline earlier and in parallel, the mycotoxins production was minimal.

Key words: *P. aurantiogriseum, sucrose, physiology, aging signs, terrestric acid.*

DIVERSITY OF ROOT-KNOT NEMATODES (*MELOIDOGYNE* SPP.) ASSOCIATED WITH VEGETABLE CROPS IN MOROCCO

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Abstract

The root-knot nematode group is one of the most important pathogen affecting vegetable crops in protected cultivation in the Souss region of Morocco. Correct and confident identification of *Meloidogyne* species is of major importance in nematode control strategies. Out of the 110 samples collected from different greenhouses, 91 (81.7%) were found to be infested with root-knot nematodes. Therefore, thirty-seven populations of root-knot nematodes were morphologically identified based on perineal patterns as well as molecularly using species–specific primers. Perineal patterns of females demonstrated the occurrence of *M. javanica* in 32 of the 37 populatons. *M. incognita* was detected in 5 populations. Species-specific primers Fjav/Rjav and Finc/Rinc confirmed the morphological identification. The results showed that *M. javanica* was the prominent root-knot nematode species in the Souss region of Turkey. These findings provide information and guidance for planning effective management strategies.

Key words: *Root-kont nematodes, Vegetables crops, Survey, Souss- Massa.*

CURRENT STATUS OF THE ROOT-LESION NEMATODES (PRATYLENCHUS SPP.) IN MOROCCO

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Abstract

Root-lesion nematodes (RLNs; *Pratylenchus* spp.) are widespread and one of the most important genera of plant-parasitic nematodes implicated in significant economic yield loss globally. The occurrence and distribution of those bio-aggressors have been recently surveyed in Morocco under a research project supported by the Islamic Development. All RLN species were identified based on their morphology and morphometric characters, followed by molecular tools including: species-specific primers and D2D3-rDNA sequences. The following two RLN species; *Pratylenchus penetrans* and *P. thornei*, were the most prevalent species, occurring in 69% of the fields, and were associated with wheat crop in the four regions. *Pratylenchus pseudocoffeae* and *P. pinguicaudatus* were detected only in two different samples originating from Mediona and Settat provinces, respectively, and they were reported here for the first time in Morocco. However, *P. penetrans* was the most dominant species throughout the four surveyed regions. Two-reel time quantitative PCR assays were developed for the accurate detection and quantification of Moroccan RLN (*P. penetrans* and *P. thornei*). New lines of wheat developed by CYMMIT were selected for their resistance against both *P. thornei* and *P. penetrans* populations from Morocco. In view of the estimates of nematode densities obtained in this survey, no one can assume that these nematode probably damage cereals in many cases. Therefore, field studies on the population dynamics and the damage function are necessary to estimate the economic impact of these nematodes on cereals.

Keywords: *bio-aggressors, morphology, morphometrics, qPCR, Root-lesion nematodes.*

INFLUENCE OF APPLICATION OF SILICON ON BLACK CUMIN (*NIGELLA SATIVA* L.) CULTIVATION IN SALT STRESSED ENVIRONMENTS

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Abstract

Black cumin can refer to the seeds of either of two quite different plants, both of which are used as spices: (i) Bunium bulbocastanum, black cumin is considered similar to caraway, but they are two distinctly different plants. The seeds differ dramatically in shape, color and size (ii) Nigella sativa, black caraway is also called kalonji or nigella, and more common in the Far East, Mideast, India and Africa. Salinity is a harmful abiotic factor to agricultural production particularly in arid and semi-arid regions. In salt conditions almost every physiological and biochemical pathway in the plants are affected. The application of siliconis considered as an alternative approach to mitigate salt stress in plants. For that, this research aims to study the influence of silicon on Black Cumin *Nigella sativa* (L) cultivation grown under three concentrations of salinity (0,50 and 100 mM). The results showed a significant decrease in photosynthetic pigments contents, the ratio K/Na and biomass in salt conditions. While the addition of silicon acted positively in *Nigella sativa* (L).

Keywords: *Silicon, Nigella sativa (L), Salinity, Tolerance.*

SOLAR DRYING PROCESS OF DELLAHIA *OPUNTIA FICUS INDICA* FRUITS FROM NORTHERN MOROCCO

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Abstract

Opuntia ficus-indica, commonly known as cactus pear or prickly pear, presents a very important role on the economical and ecological scales. Indeed, it contributes to stop land erosion and desertification while being an important source of wealth. In Morocco, the prickly pear is mainly grown for the oil extraction from its seeds. The Dellahia variety, caracterized by its green pulp color and the low oil content of its seeds, widely spread in northern Morocco, is among the lowest valorized varieties. Therefore, its fruits are mainly used for fresh consumption resulting to a high loss of the production due to their high perishability. In this study, we have been assaying the solar drying of the fruits picked up from two sites localized in northern Morocco at different altitude, Boujibar (119m) and Targuist (1109m). The drying has been carried out in Meknes in October. Fruits were cut in small discs of 5mm and 10mm and dryied until their water content reaches 4.79%. Then we have been discussing the drying kinetic according to the size of samples. We found that with the 5mm diameter samples a 25% of the drying time is saved and the drying process is more complete compared to the 10mm diameter ones.

Key words: *Opuntia ficus-indica, prickly pear, Dellahia, solar drying, drying kinetics.*

EVALUATION OF TOMATO GENOTYPES FOR WILT TOLERANCE, HIGHER YIELD AND STORABILITY IN ABEOKUTA, NIGERIA

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Abstract

Fungal wilt, insect pest and storage challenge are major problems facing tomato value chain in Nigeria. The objective of this work was to identify tomato genotype(s) with the best combination of wilt tolerance, high quality fruit and storability. Tomato seeds from thirty-one genotypes were processed for extraction and purification of DNA using the GeneJET Plant Genomic DNA Purification Mini Kit (Thermo SCIENTIFIC®). Twenty eight genotypes produced ampilicons with the *TAO1* primer used and seven gave two-band polymorphism at 410 and 390 bp, characteristic of homozygous resistant gene with restriction enzyme *Fok1*. Seven genotypes with inherent *I2* resistant gene were: FUNAABTO/0017, FUNAABTO/0040, FUNAABTO/0098, FUNAABTO/0106, FUNAABTO/0111, FUNAABTO/0123 and FUNAABTO/0135. Field evaluation associated low fusarium wilt severity index with FUNAABTO/0106, FUNAABTO/0123 and FUNAABTO/0135. Entomological study recorded thick fruit pericarp of 2.40 mm and a low 1.42% insect damage for FUNAABTO/0135. Fruit storage study recorded least weight loss in FUNAABTO/0017, FUNAABTO/0106, FUNAABTO/0111 and FUNAABTO/0135. Average fruit size of 130.34 g and fruit volume of 30.67 cm^3 were associated with FUNAABTO/0111, FUNAABTO/0123 and FUNAABTO/0135. The work identified four genotypes which met the conditions of field disease resistance, inherent possession of resistant gene, thick pericarp and low insect damage, low weight loss in storage and high fruit size and fruit volume. The four genotypes - FUNAABTO/0106, FUNAABTO/0111, FUNAABTO/0123 and FUNAABTO/0135 were recommended to farmers and researchers for further evaluation.

Keywords: *Fungal wilt, insect infestation, Nigeria, storability, tomato.*

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COMPARATIVE STUDY OF PHYSICO-CHEMICAL AND SENSORY QUALITY ATTRIBUTES OF PEACH FRUIT TREATED WITH 1-MCP, CALCIUM CHLORIDE SALICYLIC ACID AND ALOE VERA GEL DURING COLD STORAGE

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Abstract

Peaches are climacteric fruits and are spoiled rapidly at ambient temperature after harvesting due to high respiration and ethylene production. Cold storage is an option to slow down the spoilage of peaches. However, the shelf-life of peaches is shorter even in cold storage because of susceptible chilling injury, decay and sensory quality degradation. Chemical treatments before storage of peaches are needed to increase the shelf-life. The aim of this study was to investigate the effects of 1-methylcyclopropene (1-MCP), calcium chloride, salicylic acid and aloe vera gel on the physicochemical and sensory properties of peaches during cold storage. Physiological matured peach fruits were treated with 1-MCP (500 µg/L), calcium chloride (3%), salicylic acid (0.10 g/L) and in combinations with 1-MCP and calcium chloride and 1-MCP and salicylic acid along with aloe vera wax. The treated samples were dried for 30 minutes by dry air. The samples were analyzed at 10 days interval for physicochemical (total soluble solids, pH, acidity, sugar acid ratio, reducing sugar, non-reducing sugar, vitamin C and firmness) chilling injury, decay index and sensory attributes (colour, flavour, texture and over all acceptability) were evaluated and compared among various treatments. The research study observed that that the various chemical treatments and aloe vera gel treatments prior to cold storage of peach fruits had positive significant effects ($p < 0.05$) on chilling injury, decay index and overall quality of the peaches. All chemical treatments demonstrated potential to increase the storage-life of peaches. However, the treatment with a combination of 1-MCP, calcium chloride and aloe vera gel illustrated the best results increasing storage-life of the peaches up to 30 days by decreasing chilling injury, decay and maintaining firmness, physicochemical and sensory attributes of peaches. These treatments were most effective and can be used for commercial storage of peaches, which increase the export potential of peaches.

Keywords: *Peach storage-life, Postharvest chemical treatments and aloe vera gel, Chilling Injury, decay of peaches in storage.*

DEVELOPMENTOF SHORT DURATION AND DROUGHT TOLERANT MUSTARD CANOLA FOR THE FOOD SECURITY OF ARID AREAS

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Abstract

Food security is the crucial global issue, especially in developing countries like Pakistan. Edible oil requirement of Pakistan is accomplished through huge import of low quality palm oil. The aim of present study is qualitative and quantitative evaluation of short duration and drought tolerant *Brassica juncea* lines ZBJ-06012 and ZBJ-08051 having canola quality developed through pedigree method of plant breeding. Thirteen lines were evaluated in randomized complete block design (RCBD) for seed yield, oil quality, maturity period and drought tolerance under different agro-climatic zones both in irrigated and arid areas across the Punjab province at eight locations during winter 2012-13 and 2013-14. Grown non-canola mustard varieties Khanpur Raya and Anmol Raya were used as check varieties. *Brassica napus* cultivars Punjab canola and Faisal canola were also included in the trials for comparison study of mustard and rapeseed genotypes. Data for all traits under observation was analyzed through Principle Component Analysis (PCA) to evaluate the best performing lines in irrigated as well as in rain fed areas. Principal Component Analysis showed first 2 PCs having Eigen value >1 explaining 76.4% and 72% of the total variation at irrigated areas and rain fed areas respectively. The mean seed yield was also compared by Least Significant Difference (LSD) test to study the significance at 5% probability level. Canola quality *B. juncea* lines ZBJ-06012 and ZBJ-08051 showed good adaptability, early maturity, non-shattering, disease and drought tolerance traits with high yield potential in comparison with presently grown *Brassica napus* cultivars “Punjab Canola” and “Faisal Canola”. Due to these prominent features, these lines had a great scope for motivating farmers to grow canola quality *B. juncea*in arid areaswhich would ultimately enhance edible oil production in the country.

Keywords: *B. juncea; drought tolerance; food security; genetic variability; short duration.*

HOST PREFRENCE AND EFFECT OF DIFFERENT TEMPERATUREAND RELATIVE HUMIDITY ON WEIGHT LOSS AND INFESTATION PERCENTIN DIFFERENT STORED GRAINS BY *CALLOSOBRUCHUS MACULATES*

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Abstract

To study the host preference and to determine the best humidity and temperature for grain storage pest *C. maculates* the present research work was conducted at the Research Laboratory of Department of Entomology, the University of Agriculture Peshawar (Pakistan) during 2012. Three sets of the experiment were conducted at 20 ^{0}C and 65 % R.H, 30 ^{0}C and 75 % R.H at room temperatures. The experiments were carried out in randomized complete block design comprising of five treatments (Kidney bean, mung bean, gram, chickpea and wheat) with three replications. Results showed that the most preferred food of *C. maculates* was kidney bean and mung bean whereas the least preferred food of *C. maculates* was gram, chickpea and wheat. The percent infestation recorded at 20 $\pm$ 2 ^{0}C and 65 $\pm$ 5% R.H. was higher in wheat i.e 4.60% followed by gram, kidney bean, mung bean and wheat which recorded percent infestation of 3.79, 3.16, 3.00 and 1.04%, respectively. At 30 $\pm$ 2 ^{0}C and 75 $\pm$ 5 % R.H. the highest (23.75%) percent infestation was recorded in kidney bean followed by mung bean, wheat gram and chickpea i.e 11.51, 7.43, 4.61 and 1.50 respectively. Results further showed that at room temperature the percent infestation was highest (7.62, 6.63 %) in kidney bean and mung bean as compared to the chickpea where the percent infestation was recorded lowest i.e. 1.15. In conclusion the present study revealed that the most preferred food of *C. maculates* was kidney bean and mung and highest percent infestation was recorded at 30 $\pm$ 2 ^{0}C and 75 $\pm$ 5% R.H whereas the lowest was recorded at 20 $\pm$ 2 ^{0}C and65 $\pm$ 5% R.H. The study recommends that grains should be stored at 20-25 ^{0}C and 70-75 % R.H to reduce the losses in grains.

Key Words: C. maculates, Humidity, Temperature, Stored grains.

UTILITY OF YEAST HYGROMYCINE SENSITIVITY AS A TOOL TO CHARACTERIZE ION TRANSPORTERS

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Abstract

The aminoglycoside antibiotic hygromycin (hyg), inhibits yeast growth by hyperpolarization of cell membrane. Wild type and *trk1, trk2* yeast (*Saccharomyces cervisceae*) strains growing on solid yeast peptone dextrose (YPD) media show growth sensitivity when supplemented with hyg. Growth of potassium uptake deficient yeast strain deprived of its two major K^+ transporters: Trk1 and Trk2, was used to show the K^+ uptake activities on expression of *LfHKT2;1*. Loss of growth activity of *trk1, trk2* yeast was observed on expression of empty control vector in the presence of hyg while expression of *LfHKT2;1* complemented the growth activity of *trk1, trk2* yeast cells. Increased concentration of Na^+ resulted in cellular Na^+ toxicity which elevated on supplementing hyg in the media. Hypersensitivity of *trk1, trk2* yeast cells to Na^+ on expression of *LfHKT2;1*, clearly showed an additional Na^+ uptake system operating on membrane as confirmed by transient GFP expression studies. Relative abundance of transcripts under low K^+ concentration revealed the high affinity K^+ uptake system on expression of *LfHKT2;1*.

Keywords: *Hygromycin assay, functional characterization, HKT transporter, K^+/Na^+ transport, yeast expression, induced gene expression.*

EFFECTIVENESS OF INSECTICIDES IN MANAGEMENT OF *LEUCINODES ORBONALIS* GUENEE ON *SOLANUM MELONGENA* L. (BRINJAL) UNDER FIELD CONDITIONS

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Abstract

Brinjal (*Solanum melongena* L.) is a very popular and delicious vegetable cultivated in all regions of world as poor man crop. More than 140 species of different insects attach on brinjal such as *Aphis gossyppii*, *Bemisia tabaci*, *Epilachna vigintiocto punctata*, *Amrasca bigutulla*, *Thrips tabaci* and *Leucinodes orbanolis* Guenee, but among these pests *Leucinodes orbanolis* Guenneis a notorious pest of brinjal which causes 70-80% yield loses in crop. A single larva can damage up to 4-7 fruit in the whole life period. Effectiveness of some selected insecticides were evaluated in present study for the management of BSFB. The study was conducted with Nirala variety of brinjal in sparing season of sowing crop at Entomological Research Farm, UAF, Faisalabad, Pakistan during year 2017. The nursery was transplanted in field on 20th Feb, 2017. The experiment was carried out in (RCBD) design in which each treatment was replicated four times. Four insecticides were evaluated; (Spinosad 240SC @ 60ml/ acre), (Flubendiamide 48SC @ 50ml/acre), (Bifenthrin 10EC @ 200/acre), (Emamectin benzoate 1.9 EC @200ml/acre) and one (Control). Insecticides were applied four times at the interval of 14 days during the whole season of the crop. Data were recorded after 7 and 14 days of insecticides application form five selected plants from each plot. The results were significant for all the insecticides as compared to control but Flubendiamide 48SC @ 50ml/acre proved superior in terms of maximum reduction in shoot infestation (90.5%), while in terms of maximum reduction in fruit infestation (91.5%) and maximum number of healthy fruits Emamectin benzoate 1.9 EC @200ml/acre was the best. The research revealed that these both insecticides could be used for the management of BSFB.

Keys words: *Solanum melongena, Leucinodes orbanolis, effectiveness, insecticdes, management.*

ASSESSMENT OF VARIOUS COST-EFFECTIVE CARBON AND CALCIUM SOURCES ON WHEAT (*TRITICUM AESTIVUM* L.) PHYSIOLOGY IN CD CONTAMINATED SOIL

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Abstract

Heavy metal pollution is among threats to biosphere and its sustainability. Among heavy metals, Cadmium (Cd) is extremely toxic for ecosystem due to its higher mobility. In agricultural soils, Cd accrual occurs through application of sewage sludge, agrochemicals and Cd loaded waste water. The major path of Cd toxicity in human is through dietary, there is dire need to inhibit the entrance of Cd into food chain. Many organic and Ca containing materials have been shown to immobilize bioavailable fraction of Cd during the remediation process. Thus, a pot experiment was designed to evaluate the effectiveness of FYM, rice husk biochar and gypsum as C and Ca source respectively. Two wheat genotypes (Lasani-2008 and Inqalab-91) were used to evaluate the phyto-availability of Cd influenced by 0.25, 0.5% of C-containing materials and by Ca 0.75 and 15 meL^{-1} respectively. Results of this experiment explained that all the treatments significantly increased the physiological performance of wheat plants as compared to control. Application of Ca @ 15 $meqL^{-1}$ increased the SPAD index, vegetative dry biomass (shoot length, shoot dry weight, root length and root dry weight) by 56.40, 85.67, 24.63, 24.1, 13.93% respectively in Lasaani-2008 and 50.03, 68.33, 13.20, 11.37 and 3.91% respectivelyin Inqalab-91 as compared to control. The minimum increase among applied amendments was observed where Ca was applied at rate of7.5 $meqL^{-1}$. The results suggest that Ca containing soluble materials increased the plants productivity by supporting physiological processes under Cd stressed environment.

Key words*:* *Cd toxicity, Wheat genotypes, Physiology, Ca-amendments.*

COMPARING DIFFERENT SOURCES OF BIOCHAR AT TWO LEVELS TO ASSESS NI PHYTOAVAILABILITY TO *ZEA MAYS* L. IRRIGATED WITH NI-LOADED WATER

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Abstract

Contamination of agricultural soils with excessive nickel (Ni) is an extreme environmental issue to the world, which is highly imperative to address for the mitigation of its adverse impacts on plant productivity, food chain safety, and human health. Major source of Niin agricultural lands is the use of Ni loaded industrial effluents for crop production. Electroplating and vegetable-ghee industries are the leading sources of Ni. Hazardous effects of Ni on biota can be alleviated by the application of organic amendments as immobilizers to reduce its uptake in plant-based food chain. Biochar materials (BCs) are increasingly advocated as best organic sources for remediation of polluted sites. Thus, a pot study was conducted and efficiency of two BCs; rice husk biochar (RHB) and cotton stick biochar (CSB) applied at three rates (5, 10 and 15t/ha), was evaluated on *Zea mays* L. plants irrigated with Ni-loaded water in naturally Ni-contaminated soil. The maximum decrease observed in soil AB-DTPA Ni concentration (33.03 $mgkg^{-1}$) was in RHB treatment applied at 0.75% (w/w) as compared to control (61.1 $mgkg^{-1}$). Similarly, minimum root Ni contents (0.97 mg kg^{-1}) and shoot (0.18 $mgkg^{-1}$) as compared to control (4.39 and 2.85 $mgkg^{-1}$) respectively was also found in same treatment. Among the applied BCs, the CSB 0.75% (w/w) was less efficient in decreasing Ni uptake in roots (15.9 $mgpot^{-1}$) and shoots (38.1 ug pot^{-1}), respectively. On contrary, the lowest root (4.9 ug pot^{-1}) and shoot (0.22 mg pot^{-1}) Ni uptake was observed in RHB 0.75%. Among all treatments, RHB@ 0.75% showed the maximum decrease (45%, 78% and 94%) of AB-DTPA Ni concentration in soil, root and shoot, respectively compared to control. This glasshouse study suggests that using RHB at higher rates in Ni contaminated soils could decrease Ni transfer into food chain, but field scale studies are suggested to evaluate the economic efficiency of higher application rates.

Key words: *Ni, Zea mays L., Rice husk biochar, Cotton sticks biochar, Application rate.*

EXPLOITATION OF ANTAGONISTIC POTENTIAL OF FUNGAL SECONDARY METABOLITES AGAINST *BOTRYTIS CINEREA*

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Abstract

Botrytis cinerea is the most studied species of the genera *Botrytis* because of its high economic value causing diseases in over 200 crop species mainly dicotyledonous plants. Ornamental plants like rose and gerbera flower are prone to damage and adversely affect the cut flowers industry. This pathogen is basically a necrotroph but also acts as a saprophyte and gets food from dead decaying matter. Grey mold caused by this pathogen show typical symptoms of blight or rot of immature tissues. Lesions of brown color start developing which later converts into grayish color and dried out. The best way to control any disease is the use of resistant cultivars but resistant cultivars are not yet available and chemical method is the prime source to manage this problem. However, extensive fungicides application may cause drug resistance in this pathogen. As an alternative to synthetic fungicides, the use of fungi and their secondary metabolites is a smart method to control fungal diseases which could lead towards the development of specific bio-fungicides against several plant diseases. Thirty different fungal species, isolated from different sources were tested for their physical antagonism activity against the fungal pathogen *B. cinera* using PDA media. Five of them, which restricted *B. cinerea* mycelial growth, were later grown in PDB media and their crude extracts, containing all of their secondary metabolites, were obtained. These crude extracts, in a concentration of 4.5 mg/mL, were tested as *Botrytis* spore germination inhibitor in a serial dilution assay, using 96-well plates filled with a spore suspension of 6.7x 10^5 spores/ mL in PDB medium. Two of them (*Petriella guttulata* and *Lewia infectoria*) showed a Minimum Inhibitory Concentration below 75 µg/mL. The results of effective molecules on *B. cinerea* showed the potential to control gray mold. This study was intended to evaluate comparatively less popular fungal species against *B. cinerea* which could be used to develop new methods/biological fungicides to control plant diseases inciting no or least environmental hazards.

Key words: *Botrytis Cinerea, disease, antagonism activity.*

INSECTICIDAL ACTIVITY OF EMAMACTIC BANZOATE AND BOTANICAL EXTRACTS TOWARDS TOMATO FRUIT WORM, *HELICOVERPA ARMIGERA*

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Abstract

The experiment was conducted in field on tomato crop grown in the research area of College of Agriculture, Bahauddin Zakariya University, Bahadur Campus Layyah in Pakistan during 2016. Investigations were aimed to study the effect of different botanicals: Neem leaves extracts (2%), Turmeric extracts (2%), Ginger extracts (5%), Tobacco extracts (4%) and a synthetic insecticide (Emamectin benzoate) (5 ppm) against tomato fruit worm, *Helicoverpa armigera*. Lowest mean number of larvae of *H. armigera* (0.49 and 0.57) in Emamectin benzoate and in neem leaves extract respectively was recorded in control plant^{-1} of *H. armigera* (1.19), as well as greater number of larvae. Fruit damage was less (11.1%) and in neem leaves extracts were 12.5%. Neem leaves extracts based on high yield, lower fruit infestation percent, eco-friendly and easy to used were most operative source for managing fruit worm larvae. Turmeric, Ginger did not show effective control of it.

Keywords: *Helicoverpa armigera, botanicals control, synthetic insecticide.*

GLOBALIZATION, THE MAJOR CAUSE OF FOOD CONTAMINATION, NEEDS PROMPT ACTION

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Abstract

Alarmingly increasing globalization is not only wiping out the resources, but also cause health concerns of domesticated people. Food contamination happens either accidently or chemicals are added intentionally in form of food additives, preservatives and taste enhancers. Food contamination causes food borne diseases. Chemical contaminants are various from the field to the plate, namely soil, environment, disinfection by-products, personal care products, air, water, and packaging material. Chemical contaminants inhibit almost all the mass-produced everyday use products such as disinfectants, plastics, detergents, deodorants. Extensive use of plant protection chemicals produces contamination right from the field. Microbial contamination has been increasing due to unavailability of storage facilities at farm level and lack of awareness of farming community. Similarly, administration of veterinary drugs during rearing of livestock for milk and meat purpose creates hormonal disturbances among human being (Early puberty because of administration of oxytocin). The US Centre for Disease Control and Prevention recorded about 11,000 foodborne infections in 2013 with several agents such as viruses, bacteria, toxins, parasites, metals, and other chemicals causing food contamination. Chemical contamination of food creates mild gastroenteritis or even fatal cases of hepatic, renal, and neurological syndromes. Ingestion of contaminated food with pesticides and heavy metals could cause gastrointestinal diseases. Extensive monitoring of whole food chain is needed to eradicate food contamination.

Keywords: *food contamination, chemical contaminants, pesticides, food control, toxins.*

EFFICACY OF DIFFERENT INDIGENOUS PLANT EXTRACTS AND A CHEMICAL INSECTICIDE AGAINST WHITEFLY, *BEMISIA TABACI* (GENNADIUS) ASSOCIATED WITH SUNFLOWER, *HELIANTHUS ANNUUS* L. IN PESHAWAR VALLEY (PAKISTAN)

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Abstract

Susceptibility to a large number of different insect pests is one of the most important concerns towards the prosperous production of sunflower across Pakistan. Among these insect pests, whitefly, *Bemisia tabaci* (Gennadius) is the most prospective and key pest which adds to enormous losses in the production of sunflower. The current research project was conducted at New Developmental Farm (NDF), University of Agriculture Peshawar, (34.01° N, 71.53° E) Pakistan during the year 2012 and 2013 in order to study the effectiveness of different indigenous botanicals and a new chemical insecticide i.e. emamectin benzoate 1.9 E.C against whitefly associated with sunflower Hysun-33 in Peshawar Valley of Khyber Pakhtnkhwa. The data on the population density of whitefly was recorded one day before and then 1 day, 2 days, 3 days and one week after application of each spray material on the crop. The results revealed that chemical insecticide, recorded the least count of whitefly, whereas among the plant extract treatments, *D. alba* was the most effective treatment in term of population reduction of whitefly, which was further followed by *Azadirachta indica* oil and *A. indica*seed extracts. The maximum population density of the pest was recorded on control plot, where no pesticide material was applied. The present results point out that plant derivative i.e. *D. alba* and *A. indica* have the potential to be used for the positive control of whitefly on sunflower.

Keywords: *Sunflower, Bemisia tabaci ,population, pontrolmeasures, chemical insecticide, plant extracts.*

EVALUATION OF DAMAGE RATES OF LEOPARD MOTH, *ZEUZERA PYRİNA* L. (LEPIDOPTERA: COSSIDAE) IN WALNUT ORCHARD IN HATAY PROVINCE OF TURKEY

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Abstract

The leopard moth, *Zeuzera pyrina* L. (Lep. Cossidae), is one of the important pests of the walnut trees in Turkey. The leopard moth larva is a xylophagous species that attacks the shoots and branches of numerous fruit-bearing in larval states, and may cause the death of young trees or loss of the branches in old trees. The signs of damage in walnut trees include dark fluid coming out of bark and also larval orange feces coming out of larval tunnels. The larval tunnels can reach up to 50 cm. Damage results in tree weakness, attraction of bark beetles and finally tree death. The study was conducted in 2016-2017 to evaluate damage rates of the leopard moth on walnut 'chandler' variety orchard in Yayladağ district of Hatay province of Turkey. The walnut orchard contained 3345 walnut trees (380 da) and evaluation of the damage rates were done to count number of the damages branches and truck of walnut trees. As a result of investigation, the damages rates of this pest varied in each of the sampling years. The damages rates of the leopard moth were observed in 2016 with 16 pecent and in 2017 with 8.87 percent.

Key words: *Leopard moth, Zeuzera pyrina, walnut trees, damages rates.*

EFFICACY OF NEEM SEED AND ROCKET SALAD EXTRACTS AGAINST THE RED FLOUR BEETLE, *TRIBOLIUM CASTANEUM* HERBST (COLEOPTERA: TENEBRIONIDAE) UNDER INVITRO CONDITIONS

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Abstract

The red flour beetle, *Tribolium castaneum* Herbst (Coleoptera: Tenebrionidae), causes both quantitative and qualitative damage to cereal and other stored grains. *T. castaneum* feeds on the grain and cause significant reduction in weight. Qualitative damage is due to product alterations such as loss of nutritional and aesthetic value, and loss of industrial characteristics such as baking. Control of *T. castaneum* through synthetic chemicals is hazardous especially in stored grains. In this study, we used two different types of extracts extracted from neem (*Azadirachta indica*) and rocket salad (*Eruca sativa*) plants for the control of *T. castaneum*. Results showed 95% adult and 96% larval mortality by the highest concentration (5%) of Neem extract after 96 hrs of application. On the other hand, 86% adult and 85% larval mortality was recorded after 96 hrs of exposure to the highest concentration (5%) of rocket salad extract. Filter paper-based free choice tests indicated maximum repellence of neem extract which repelled more than 85% of adults and 96% larvae of *T. castaneum* compared to 72% adult and 75% larval repellence of rocket salad extract within 96 hrs period. This indicates that neem extract has a much greater potential to be used as an environment-friendly control of *T. castaneum* in stored food products.

Key words: *Azadirachta indica, Eruca sativa,* botanicals, control, *Tribolium castaneum.*

PREPARATION AND QUALITY EVALUATION OF FLAVOURED ALOE VERA READY TO SERVE (RTS) DRINK

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Abstract

Nowadays therapeutic ready to serve (RTS) drinks that are based on the blends of natural juices extracts are getting the great attention, which reflects the faster growing awareness about these products in market place. Objective of this study was to formulate and prepare the aloe vera flavored RTS drink. Aloe vera juice was mixed with water, and three different flavours *i.e.* mango, strawberry and peach were added to make the aloe vera flavored drink. Different concentration of aloe vera juice and water were blended to formulate five different treatments *i.e.* T1 was 14% aloe vera and 86% water, T2 was 17% aloe vera and 83% water, T3 was 20% aloe vera with 80% water, T4 consisted of 23% aloe vera with 77% water and T5 had 26% aloe vera with 74% water. Aloe vera flavored drink was analyzed for mineral contents, vitamin C concentration and reducing sugars. Moreover, the pH, acidity and total soluble solids of the drinks were also determined. Finally, the data was subjected to statistical analysis to evaluate the level of significance. Results showed that with the increase in aloe vera juice in the formulation of RTS drink, the acidity was increased from the 0.25 to 0.34, °Brix was increased from 2.49 to 2.60 and pH decreased from 3.67 to 3.59. It was concluded that T4 was the best RTS drink containing 23% aloe vera and 77% water showing highest organoleptic characteristics.

Key words: *Flavoured drink, sensory characters, aloevera, ready to serve.*

FORMULATION AND QUALITY ASSESSMENT OF ALOE VERA-PAPAYA FUNCTIONAL JUICE

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Abstract

Aloe vera (*Aloe barbadensis Miller*) from the *Lileacea* family is conventionally used as a curein the contemporary society. The plant of aloe vera has firm, plump, dim green, spear formed leaves containing a clear gel in a focal adhesive mash. The phytochemical properties of the Aloe vera gel comprise nearly 95% of water that contains 75 important nutrients, 210 active mixtures, 17 amino acids, 19 minerals, 11 vitamins, sugars, anthoaquinones of phenol mixes, saponins, lignin, amino acids and sterols, etc. The gel also has marvelous properties like wound healing, anti-inflammatory, anti-diabetic, laxative, anti-microbial and anti-fungal effects. The papaya (*Carica papaya L*.) belongs to the *Caricaceae* family that is commonly found in tropical and subtropical countries. The portion of ripe papaya fruit hasboth micro and macro nutrients. The objective of this study was to use the aloe vera and papaya juice to formulate a suitable aloe vera-papaya drink. The aloe vera-papaya drink was analyzed for proximate composition, mineral contents, vitamin C concentration, anti-nutritional substances like tannin and saponins, reducing sugars, and for flavonoids occurrence. Moreover, pH, acidity and total soluble solids of the newly developed juice were also analyzed. Finally, the data weresubjected to a statistical analysis to evaluate the level of significance. The results showed that the recipe containing 80% aloe vera and 20% papaya pulp showed good quality and the highest sensory scores.

Key words: *Functional food, aloe-vera, papaya, organoleptic, physico-chemical properties.*

ENDOMYCORRHIZAL FUNGI AND THEIR EFFECT ON THE YIELD AND HEALTH STATUS OF TOMATO FRUITS

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Abstract

The aim of the studies was to assess the effect of two endomycorrhizal fungi on the yield and health status of tomato fruits. The experiment was carried out (2015-2017) in the horticultural farm situated in Grady (N51°20', E22°49'), Poland. Tomato plants were the objects of research. This experiment was set up as one-factor in 5 replications (25 plants grown in each plot). Arbuscular mycorrhizal fungi (AMF): *Claroideoglomus etunicatum* (CE) and *Rhizophagus intraradices* (RI) were used for the inoculation of tomato seedlings. AMF was introduced to a depth of about 5 cm in the rhizosphere zone of plants (inoculum 25-30 spores/ plant). The control were the plants without AMF. Plants were grown in plastic tunnel using a drip irrigation. No pesticides were used. The total, marketable and diseased fruits yield ($kg \cdot m^{-2}$) were estimated. The percentage of root colonization by AMF (%) was assessed. The percentage of root colonization by endomycorrhizal fungi was statistically greater in the combination with CE and RI than in control. Regardless of the growing season, data showed that non-inoculated plants had root colonization on the level of 18-30%, whereas inoculated plants had root colonization on the level of 30-70%. The data showed statistical differences in the total fruit yield between control and the plants inoculated with AMF. The highest total and marketable yield were obtained from plants inoculated with CE (respectively 13.39 and 12.21 $kg \cdot m^{-2}$) and the lowest ones from control plants (respectively 10.61 and 9.6 $kg \cdot m^{-2}$). Application of AMF had also a positively impact on the weight decrease of diseased fruits. The average yield of diseased fruits was the highest for control plants (0.973 $kg \cdot m^{-2}$), and the lowest one for plants inoculated with AMF (0.155 $kg \cdot m^{-2}$).

Keywords: *Mycorrhiza, Tomato yield, Root colonization, Diseased fruits.*

IMPACT OF THE SPRAYERS USED ON THE SPRAY DISTRIBUTION OF THE LIQUID SPRAY

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Abstract

The quality and effectiveness of the treatment are two basic issues related to spraying plants, and when combined with care for the environment and compliance with legal provisions, there will be conditions leading to the production of high-quality and large amount of food. The assessment of the quality of the procedure is based on three indicators. One of them is the uneven distribution of precipitation and atomization of the liquid. The paper presents the results of research of the spraying liquid fall process for various types of double-stream nozzles that worked in variable conditions and spraying parameters. The experiments were carried out in laboratory conditions in two stages. First, the size of droplets produced by nozzles used in the tests was determined, and in the second phase, the longitudinal distribution experiments were carried out. The basic element of the test stand was an aerodynamic tunnel. It was found that the longitudinal distribution of the spray drop was dependent on the design of the tested nozzles and the speed of the air stream. It was also noticed that as the speed of the air stream increased, the volume of liquid caused by the phenomenon of drift decreased. It was found that the type of atomizer used and the speed of the air stream had the greatest influence on the tested parameter.

Keywords: *uneven distribution of precipitation liquid, double-stream nozzles, quality of spraying.*

THE QUALITY OF THE SPRAYING IN TERMS OF THE DEGREE OF COVERAGE AND APPLICATION

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Abstract

Pesticides used in agriculture during chemical plant protection against pests pose a significant threat to the environment. Spreading in the environment by air and water pose a serious threat to living organisms. Pesticide should be characterized by: high toxicity in relation to pests and low toxicity compared to other organisms, adequate durability and high susceptibility to degradation. In practice, the achievement of these goals is often impossible. There is, currently, another effective and relatively inexpensive method such as crop protection chemical method. There is, also, no basis to change the current programs of protection and resignation from the use of this method would lead to lower yields (up to 70%). At present, the priorities of the spraying operation are striving to achieve the highest possible yields of the highest quality and the elimination of threats (point and diffuse pollution). The quality of the process performed is assessed on the basis of indicators such as: uniformity of distribution of precipitation and spray liquid, coverage of sprayed objects and application of liquid spray. However, no relationship between the degree of coverage of the sprayed objects and the application of a usable liquid has been determined. Therefore, the aim of the work was to present the relationship between the treatment quality indicators. The results of these tests enable selection of the most suitable sprayer for crop spraying under specific conditions, thus significantly increasing the efficiency of applying the active substance and reducing the losses of plant protection products.

Keywords: *degree of coverage, application of liquid spray, nozzle, quality of spraying.*

LABEL AS A MAIN SOURCE OF ALLERGEN INFORMATION - IS A CONSUMER SAFE?

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Abstract

According to World Health Organization, food allergy is considered as the sixth problem in the classification of human pathology. In accordance with European Union Regulation No. 1169/2011, food products must be labeled for the presence of allergens. On the list of 14 allergens there are grains containing gluten. Gluten is used in the meat industry, as a texturing additive, affects the cohesiveness and viscosity of meat products. It is used as a carrier of spices or a component of smoke. We can find gluten in foods under the name of wheat fiber (cottage cheese, sausage), vegetable proteins (sauces, meat products). There can be a contamination of gluten-unrefined starch from cereals containing gluten (cream thickening substance). The study consisted in the analysis of the composition of selected meat products divided into 3 product groups: smoked meat, sausages and offal products. 300 labels of meat products were analyzed in terms of the correctness of their labeling according to the current European Union law. The research covered widely available products, not marked as a special nutritional purpose product. Attention was paid to: the label readability, the aforementioned raw material composition, list of used additives, presence of supplementary substances, allergens (name, source) and the method distinguishing them on the label. Studies had shown errors in the labeling of allergens in foods that can mislead consumers and lead them to adverse reactions.

Keywords: *allergies, food safety, gluten, food of animal origin*.

Acknowledgement

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CONSUMERS SAFETY AWARNESS – ANALYSIS OF GLUTEN PRESENCE IN CHOSEN PROCESSED MEATS

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Abstract

According to current data, it is estimated that food allergy, manifesting in particular as an undesirable reaction of the immune system, occurs in 3-7 million people in the EU. In highly developed countries, it is estimated in 8% children and 4-5% adults. In recent years, an increasing number of patients suffering from various gluten-related disorders (celiac disease, wheat allergy and NCGS - non-celiac gluten sensitivity) have been observed worldwide. The only effective treatment is a gluten-free diet throughout the life of a patient. Consumer with food restrictions can choose to compose meals from basic raw materials naturally free of allergens or to trust food companies, that they labeled products in accordance with the EU Regulation No. 1169/2011 on the provision of food information to consumers, which orders placing information about allergens on the labels. Is the lack of such information synonymous with the lack of allergens? Our research on processed meat products (products chosen to the analysis did not contain information about the presence of gluten in the product on the label) showed that over 17.5% of the tested products contained > 20 ppm of gluten.40 samples of processed meat products were tested by real-time PCR. Our results suggest, that consumers suffering from various types of gluten-related disorders should approach with limited confidence to foods intended for general consumption without labeled allergens. Unfortunately, producers do not fully comply with the EU rules on the need to inform about allergens or are not aware that these allergens are found in their food products.

Keywords: *gluten, celiac disease, real-time PCR, food safety, allergens.*

Acknowledgement

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EVALUATION OF THE DEGREE OF SURFACE COVERAGE DURING SPRAYING WITH SELECTED DOUBLE-STREAM NOZZLES

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Abstract

The use of plant protection products has been the most effective way to protect crops against pests. The basic aim of the spraying operation is to achieve the highest possible effectiveness in combating pests. This effectiveness, as well as the level of pesticide consumption and safety during the treatment, depends largely on the quality of spraying usable liquid. One of the three determinants of the quality of the treatment is the degree of coverage of the sprayed objects. The quality of the treatment is influenced by many technical and technological factors, among them nozzles used. This study about the degree of coverage on sprayed objects using selected nozzles assessed which of the tested sprays had the best properties in terms of covering both horizontal and vertical surfaces on sprayed plants. The tests were carried out in laboratory conditions. The object was an artificial plant, to which water-sensitive papers were attached vertical and horizontally and sprayed surfaces were determined. After the experiment, the probes were subjected to computer image analysis. On the basis of the analysis of the obtained test results, it was found, that the characteristic feature for tested nozzles was the range in the degree of coverage of surfaces marked as vertical and horizontal.

Keywords: *degree of coverage, nozzle, quality of spraying.*

LABEL SURVEY IN ROMANIA: A STUDY ON HOW CONSUMERS USE FOOD LABELING

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Abstract

The aim of the study was to evaluate the consumers' degree of confidence in food labeling, how they use and understand the label and food labeling elements respectively. The label is a bridge between producers, suppliers and consumers. It has to offer enough information in terms of public health and food safety, statement of ingredients, nutritional information, warnings and advisory statements, producing date and shelf-life, instructions for storage and preparation (if required). The survey was conducted on 500 consumers group in Romania, aged 15+, males and females, from urban and rural areas and with different graduation levels. The questionnaire was distributed face to face and online. It had single or multiple choices questions and label images for the efficiency and best understanding of the question. The law 1169/2011 applied to food products from 13 of December 2016 improved and adapted the requirements for labeling in a clear manner. The questions were divided on following topics: interest and general trust in labeling, use and understanding of label elements, understanding of the ingredient list and safety information, nutrition information, advisory statements, serving sizes, best before / use by meanings, intelligent labeling and demographic data. Three choice selection exercises were also included. In this case the consumers had to choose between two similar products and evaluate which label element was most important in product choice. The data were analyzed using GRETL statistics. Most of the respondents trusted the food label, taking into account some elements especially when buying the product for the first time.

Keywords: *consumers, food safety information, labeling, nutritional information.*

ACTION OF MULTIFUNCTIONAL BIOPRODUCTS ON *MOMORDICA CHARANTIA* L. MORPHO-PHYSIOLOGICAL AND PHYTOCHEMICAL CHARACTERISTICS.

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Abstract

We evaluated the effects of a range of multifunctional bioproducts on: (1) morpho-physiological (leaf area, chlorophyll fluorescence, stomatal conductance, fresh yield) and (2) phytochemical (polyphenols, flavonoids and antioxidant activity) characteristics of M. charantia and on (3) the biocompatibility and anti-tumoral effects of alcoholic extracts of the treated plants. The tested multifunctional bioproducts were: suspensions of a Trichoderma consortium, 10^7 cfu/ml (V2) and 10^8 cfu/ml (V3); Satureja hortensis (thyme) essential oil, 5 ml per liter of water (V4A), and thyme oil + NPK 1:1:1 nutrients 1% (V4B); humic acids (V5) and porous ceramic granules (V6), compared with untreated plants as control (V1). The Trichoderma and thyme oil based bioproducts were applied as foliar treatment. Humic acids and porous ceramic granules were applied as soil treatment, equiv. 200 kg/ha. The biocompatibility and anti-tumoral effects of plant extracts was tested in NCTC mice fibroblast cell line (clone L929) and HEP2 tumoral cell line (standard SR NN ISO 10993-5). Morpho-physiological parameters had the highest values in V2 and V3 (Trichoderma suspension), for leaf area and stomatal conductance, and on V4 (thyme oil) for leaf area and fruit yield, followed by V5 (humic acids). The extracts of M. charantia treated with thyme oil (V4A, V4B) and humic acids (V5) accumulated the highest amounts of flavonoids and polyphenols. M. charantia plants from V4A, V4B and V5 variants exhibited the highest antioxidant activity. All treated plant extracts were non-cytotoxic in NCTC fibroblast cell culture, at concentration of. 50-150 µg/mL. A significant anti-proliferative potential was revealed for V4A, V4B and V5-treated plants in the concentration range of 100-1000 µg/mL. The results demonstrated a correlation between the effects of multifunctional bioproducts on plant morpho-physiological characteristics and content in biologically active compounds of M. charantia treated plant extracts.

Key words: *Momordica, multifunctional bioproducts, bioactive compounds, antitumoral effect.*

Acknoledgements

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DEVELOPMENT OF CURD PRODUCT ENRICHED WITH OAT BRAN

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Abstract

The most important task of any state is the preservation and promotion of the population'shealth.The health of every person and nation is mainly determined by their rations. The malnutrition impairs metabolism and functional capacity of the digestive, heart-vascular system, nervous system and other systems. The unfavorable ecological situation, extensive use of antibiotics and chemicals, stress and other factors leading to a violation to of normal intestinal microflora, digestion and metabolism, reduce immune activity in the human body and provoke growth of the disease. The article deals with the problem of dietary food deficit. Curd product with the addition of bran was developed for the solution of this problem. The advantages of using curd product and oat bran are analyzed,andthe main properties such asproduct-quality index, vitamin and mineral composition are shown. The quality indicators for the acceptance of raw milk and oat bran are presented. When working with a curd productphysicochemical and sensorystudies were carried out. All the studies were carried out in the laboratories of the Perm State Agro-Technological University, Russia.

Keywords: *Curd products, Oat bran, Diet, Dairy products, Health.*

MACRONUTRIENTS CONTENT IN WHEAT STRAW AND ITS YIELD AS AFFECTED BY BACTERIAL AND MINERAL FERTILIZATION

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Abstract

Regardless of their major role in crop productivity, increased and long-term use of mineral fertilizers in agricultural production has raised concerns causing numerous environmental problems. This could be overcome by partial replacement of mineral fertilizers using bacterial inoculants, which could lead to the improvement of physical, chemical and biological soil properties, as well as help to ensure that the supply of nutrients contributing to optimized yield of crops. The study evaluated the effect of application of different rates of composite mineral fertilizers and their combination with bacterial inoculants (N-fixing *Klebsiella planticola* and *Enterobacter* spp.) on macronutrients content in straw of winter wheat and its yield. Unfertilized treatment was used as a control. The contents of nitrogen, phosphorus, potassium and crude proteins in plant samples were determined at the beginning of tillering and in full grain maturity stage, at the end of the wheat vegetation. Measuring of the straw yield was carried out at the end of the vegetation. The results of the study showed that the use of high rates of composite mineral fertilizers and their combination with bacterial inoculants resulted in increased contents of nitrogen, phosphorus, potassium and crude proteins in the wheat straw, which was noticeably observed in the stage of tillering. The highest increase in the straw yield was obtained by the same mentioned treatments, although the combination of bacterial inoculants and low rates of mineral fertilizers resulted in higher yields comparing to the use of solely low rates of mineral nutrients.

Keywords: *Wheat straw, yield, chemical composition, bacterial inoculants, composite mineral fertilizers.*

CONTRIBUTIONOF FRESH COMMON NETTLE ADDITION TO MINERAL CONTENT OF BREAD

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Abstract

Common nettle is a medicinal plant that accelerates the exchange of matter, positively influencing human health. It is rich in iron, phosphorus, magnesium, calcium and silicon. In addition, nettle also contains vitamins A, C and K, tannins, numerous amino acids, and it is a natural medicinal plants. Bread is a food product that occupies a significant role in human diet and it is represented in all diets. It is characterized by the high content of carbohydrates, lower content of protein, low content of fat without cholesterol, mineral matter and dietary fibers. Nutritionists, the World Health Organization, and the Organization for Agriculture and Food recommend a minimum daily intake of mineral matter (zinc, copper, magnesium, calcium and iron content 15; 2; 400; 1000; 18 mg, respectively for a functioning of organism and metabolism. In developed countries and in our country demand for food rich in mineral substances is high. Modern nutritionist viewpoint is that daily meals have to be composed of mainly cereal, mineral and fiber components, to achieve health balance and improvement. For this reason, bread is a suitable food that can be enriched with a nettle in order to satisfy the minimal daily intake of mineral matter sinceit is constantly consumed. The aim of this research was to determinate the influence of nettleaddition on qualityand mineral characteristics of bread. Different shares of nettle (2.55% and 5%) as flour supstitution were added in dough formula. Presented data point that investigated bread with nettle is a new product with improved nutritional properties due to higher level of mieral content of Zn, Cu, Mg, Ca and Fe (11.73; 3.04; 587.29; 1996; 22.68 mg/kg respectively).

Keywords: *nettle, berad, mineral characteristics, quality.*

MEDICINAL PROPERTIES OF MUSHROOMS *GANODERMA LUCIDUM* AND *CORIOLUS VERSICOLOR*

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Abstract

The mushrooms are the part of the tradition in the countries of East Asia such as China, Japan, Korea as well as in the areas where Slavs have lived. The medicinal mushrooms are used against cancer in China, Russia, Japan, Korea, USA and Canada. In this paper a special review of medicinal properties of mushrooms *Ganoderma lucidum* and *Coriolus versicolor* is given. *Ganoderma lucidum*-oak gloss is one of the most important mushrooms used in China and Japan in the last 4000 years like medicine, auxiliary medicinal product and elixir. The fruiting body of this fungus consists of plenty bioactive components such as polysaccharides, terpenoids, amino acids, and in a smaller quantity, it contains proteins, steroids, lipids, alkaloids, adenosine, riboflavin, ascorbic acid, inorganic ions (Mg, Ca, Zn, Mn, Fe, C) and organically bound germanium. In mushrooms belonging to the genus *Ganoderma* there are heteropolysaccharides, hetero-ß-D-glucans containing ß (1-3) -D-glucan which has pronounced anticancer activity. They stimulate the formation of T-lymphocytes and macrophages-cells of carcinogenic tissue killers. The mushroom *Coriolus versicolor*-turkey tail (L. Ex Fr.) Pilat, sin. *Trametes versicolor* (L., Fr.) Lioyd, exhibits significant antitumor and immunostimulatory properties, and because of this it is medicinal mushroom. Active components of this mushroom are β-glucan proteins that exhibit antitumor, antiviral, antibacterial, antioxidant and immunomodulatory properties, and ergosterol. Studies have shown that *Coriolus versicolor* mycelium contains two of the most important bioactive components of PSK (polysaccharide krestin) and PSP (polysaccharide peptide). In addition to these two components, there is also a polysaccharide coriolane for which it has been proven to have a high antitumor effect. Due to all of these useful properties, further research should be focused on the possibility of using substances from these mushrooms in the treatment of some other diseases.

Key words: *Ganoderma lucidum, Coriolus versicolor,medicinal properties.*

EFFICACY OF INSECTICIDES ON *THRIPS TABACI* LINDEMAN ON ONION

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Abstract

In recent times a new technology of onion production has been introduced with getting high yields by sowing at 5cm spacing, the onion is obligationally foliarly treated with a growth hormone, maleic hydrazide in order to inhibit sprouting of stored onion bulbs in warehouses for purposes of favourable sales. In vegetation one of the most important pests is *Thrips tabaci* Lindeman, which regularly appears, it lives hidden, but the damage from *Thrips* many pathogens use as an open window for infection. The onion is used fresh for human consumption. In order for the onion production to be safe, the control of the onion demands the use of ecological and toxicological favourable insecticides. In field micro assays of 2016 and 2017 we setup assays and examined the efficacy of formetanate hydrochloride, abamectin, spirotetramat and spinosin active ingredients'. Efficiency of insecticides used in these assays depended on their persistence and ecotoxicological characteristics. On basis of the assay results, respecting the modification modes of insecticide mechanisms, formetanate hydrochloride is used at the beginning of the flight. Spirotetramat is added, which affects the new hatching of larvae, and for the time close to sowing of onion bulbs, abamectins and spinosins are used.

Key words: *onion, trips, Thrips tabaci, suppression, spirotetramate.*

ANTIBACTERIAL ACTIVITY OF TRIFOLIUM REPENS

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Abstract

White clover (*Trifolium repens*) is a perennial herbaceous plant. Due to its potential to yield high quality biomass, white clover is not exploited enough. Total phenols, flavonoids and antibacterial activity were examined on three samples of white clover (leaf, flower and mixed parts of the plant). Samples were left in ultrasonic bath for 30 minutes at 50°C. Determination of total phenols was performed spectrophotometrically by Singleton method. The highest content of phenol was noted in extract of flower (8,868 mg GA/g), and the lowest in extract of leaf (3,944 mg GA/g). Total flavonoids were determined spectrophotometrically, by Markham. The highest content of total flavonoids was noted in extract of flower (11,3704 mg RE/g), while the lowest was in extract of mixed parts (5,497 mg RE/g). The antibacterial activity of plant extracts was tested by minimum inhibitory concentration (MIC) method on 7 bacterial strains. Flower extract inhibited the growth of all 7 examined strains while extracts of leaf and mixed parts of the plant inhibited the total growth of 3 bacterial cultures. The presence of tested compounds in certain parts of the plant is characteristic to the specific function that they possess, and the next research should be directed towards the examination of the composition of the chemical compounds in different plant parts.

Keywords: *Trifolium repens, total phenols and flavonoids, antibacterial activity.*

ALLELOPATHYC EFFECT OF ESSENTIAL OIL OF CANNABIS SATIVA L. ON SELECTED VEGETABLE SPECIES

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Abstract

Examination of pesticidal effect of essential oil in agriculture is increasingly important due to tendency to reduce use of synthetic pesticides. The aim of this study is to determine allelopathic effect of *Cannabis sativa* L. essential oil on the initial development of selected vegetable species. Applied concentrations are 200µl/l, 400µl/l, 600µl/l i 800µl/l. Used vegetable species are *Allium cepa* L., *Solanum lycopersicum* L. and *Daucus carota* L., while observed parameters are length of hypocotyl and epicotil. Experiment was carried out in laboratory conditions, each variant of experiment had two repetitions, control variant used distilled water. By processing data, all applied concentrations attach inhibitory effect to monitored parameters. Highest inhibitory effect on average length of hypocotyl *A. cepa* L. of 2,73mm had highest applied concentration of essential oil of 800µl/l, as opposed to 9,97mm in control. Length of epicotil *A. cepa* was 13,6mm in control, while the highest inhibitory effect gave the highest concentration of essential oil with a length of 2,4mm. Length of hypocotyl *S. lycopersicum* L. was 30mm in control while in variant with 600µl/l it recorded the highest inhibitory effect with a length of 10,67mm. Length of epicotil *S. lycopersicum* L. in control was 13,03mm while in variant with 600µl/l was 3,2mm. Length of hypocotyl *D. carota* L. in control was 8,73mm while concentraion of 200µl/l gave the highest inhibitory effect with length of 5,97mm. Length of epicotil *D. carota* was 16,3mm in control but varianth with 200µl/l gave the highest inhibitory effect with 11,07mm.

Key words: *essential oil, Cannabis sativa L., Allium cepa L., Solanum lycopersicum L., Daucus carota L.*

PRELIMINARY SURVEY OF ENTOMOPATHOGENIC NEMATODES IN SERBIA

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Abstract

Entomopathogenic nematodes (EPN), Steinernematidae and Heterorhabditidae, are important biocontrol agents of insect pests. Initial survey of EPN in northern Serbian province were done by Talossi *et al.* in early 90's of the last century yielding discoveries of one new and several known Steinernema species. The aim of this study was to test methodology for a broader survey in further exploration of biodiversity of EPN in Serbia. Sixty four (64) soil samples were taken from seven locations in Serbia, mainly natural forests and meadows. Last larval instar of *Galleria mellonella* was used as a nematode trapping insect and single larva was inserted into the multiply pierced 1.5 ml Ependorph tube. In the laboratory, soil samples were placed in 1000 ml plastic containers with two tubes at different depths (one on the soil surface, and the other deeper in soil). After 10 days a dead larvae were placed on a white trap to obtain infective juveniles (IJ). Isolated IJ were then used for re-inoculation of insect larvae. Seven (10.94%) soil samples were positive for EPN. All isolated populations, based on brownish coloring of dead insect larvae and preliminary observations of IJ were identified to belong togenus *Steinernema.* The re-inoculated insect larvae were dissected for the presence of males and females of the first and second generations for further morphological identification. Molecular characterization of isolated populations is planed as well as continuing of a EPN survey in Serbia.

Key words: *Entomopathogenic nematodes, Galleria mellonella, Steinernema, Serbia.*

IDENTIFICATION OF LEPTOSPHAERIA MACULANS AND LEPTOSPHAERIA BIGLOBOSA ISOLATES BASED ON PATHOGENICITY AND PRODUCTION OF SIRODESMIN PL

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Abstract

The aim of this study was to identify isolates within the pathogenic species of *Leptosphaeria maculans* and *Leptosphaeria biglobosa*, based on the pathogenicity and phytotoxin production. The fungus cultures were isolated from rapeseed plants showing the symptoms of stem canker. They were collected from nine locations in rapeseed growing region of northern Serbia. In the study were used 119 local isolates from Serbia and two reference isolates from the Center for Agricultural Research, Rothamsted, Great Britain, (L. m. for *Leptosphaeria maculans*, and L. b. for *Leptosphaeria biglobosa*). The pathogenicity of the isolates was examined on the Westar, Glacier and Quinta rapeseed cultivars. Eight isolates caused small necrotic spots on cotyledons in all tested cultivars, while 111 caused large necrotic spots in which the formation of pycnidia was observed. Four local isolates (K-113, C-3, St-5 and S-11) and reference isolate L.m. were used for the extraction and isolation of phytotoxins, based on their morphological and pathogenic characteristics. Isolates C-3, St-5, S-11 and L. m. did not produce a yellow brown pigment in the Czapek medium but produced sirodesmin PL while the K-113 isolate produced a yellow brown pigment and did not produce sirodesmin PL.

Keywords: *Leptosphaeria maculans*, *Leptosphaeria biglobosa*, rapeseed, phytotoxin**.**

ECONOMIC JUSTIFICATION OF BIOLOGICAL MEASURES FOR POTATO TUBER MOTH CONTROL

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Abstract

Potato tuber moth (PTM), *Phthorimaea operculella* Zeller, represents a very dangerous potato pest in the warmer parts of the world. The harmfulness of the insect impact is reflected in the high level of tuber damage (up to the complete yield loss), as well as the complexity of its control. The damages caused by PTM to the potato production are considered to be quite significant at the locations with highest potato yields and production in Serbia. This paper will show the results of the monitoring of the occurrence and the number of imagoes (moths) of pests by using pheromones traps during 2016 and 2017 within the field experiments in the Rasina District (Serbia). The field experiment was set up at four locations. Pest control was based on the application of agro-biological and biological measures, starting from planting the potatoes, through the entire vegetation period, harvesting and storage of the tubers. The obtained results show the economic justification (13 percent lower cost of production) of agro-technical and biological measures of potato moth control in order to obtain a quality and both health and safe product, while preserving the environment at the same time.

Keywords: *Potato tuber moth, Potato, Rasina District, Biological measures, Economic justification.*

ANTIBACTERIAL ACTIVITY AND TOTAL PHENOL CONTENT IN WHEAT EXTRACTS

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Abstract

Wheat (Triticum species) is a cereal grass, the world's most used grain for human consumption. It is source of various phytochemical molecules. Studies have shown that many of the phytocompounds possess anti-inflammatory, anti-diabetic and antimicrobial activities. Wheat products contain high levels of antioxidants from phenols which confer protection against diseases. The aim of the study was to determine the phenolic content in extracts of wheat varieties from Serbia (Pobeda, NS-40 and Illico). Antimicrobial activity was determined in sample which showed the highest Total Phenolic Content (TPC). Ground grain was defatted with hexane and air dried for 12 h. The extracts were prepared by extracting the ground wheat (5 g) with 50 mL of solvent (50% ethanol) with two extractions: ultrasonic and maceration. TPC was determined by using a Folin-Ciocalteau method. Gallic acid (GA) was used as standard. Total flavonoid content was determined using a colorimetric method. Antibacterial activity was determined by method of minimal inhibitory concentration (MIC). Concentrations of extracts from 100 to 0.0976 mg mL^{-1} were used. The total phenol and flavonoid content were higher in extracts obtained by ultrasound extraction compared to the maceration in all varieties. NS-40 extract obtained by ultrasound extraction showed the highest content of total phenols (2.59 mg of GAE/g) and flavonoids (102 μg RE g-1 DW). Wheat extract (NS-40) did not show antimicrobial effect in any concentration to *Bacillus spieizenii* ATCC 6633; *Salmonella typhimurium* ATCC 14028; *Pseudomonas aeruginosa* ATCC 27853 and *Proteus mirabilis* ATCC 35659. Thus, extract showed antimicrobial effect on *Staphylococcus aureus* ATCC 25923 (range 100 to 0.0976 mg mL-1). The minimal inhibitory concentration for *Listeria ivanovii* ATCC 19119 and *Escherichia coli* ATCC 25922 was 1.5625 and 0.3906, respectively.

Keywords: *Wheat, Phenols, Flavonoids, Antibacterial activity.*

THE BIOACTIVE MENU OF *ARTEMISIA* AS HOST OF FUNGAL ENDOPHYTES—ANTAGONISTS OF PATHOGENS

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Abstract

Fungal endophytes were isolated from 20 species of *Artemisia* and 373 endophytic fungi were tested against six fungal phytopathogens (i.e. *Alternaria alternata*, *Fusarium oxysporum*, *Fusarium solani*, *Fusarium moniliforme*, *Botrytis cinerea* and *Sclerotinia sclerotiorum*) in dual culture assays. 239 showed at least one case with criteria "0", "1", "2" or "5" (i.e. 0 - mycelia grow until making contact with each other; mutual inhibition, 1 - both mycelia stop growing at a certain distance; 2 - mycelia grow until making contact with each other and in the area where the contact is produced morphological changes occur / the growth of the pathogen mycelium stops in a convex form; 5 - the growth of the endophyte remains at a certain distance from the pathogen). 67 endophytic fungal strains revealed criteria "3" and "4" (i.e. the growth of the pathogen remains at a certain distance from the endophyte ≤ 2mm and the growth of the pathogen remains at a certain distance from the endophyte > 2mm, respectively) against only one fungal phytopathogen, 20 strains revealed the same criteria against two pathogens, 23 strains against three pathogens, ten strains against four pathogens, eight strains against five pathogens and only six strains against all six pathogens. In order to determine the plant species with high number of active endophytic fungi strains, cases of criteria "3" and "4" together as well as criterion "4" only were grouped and counted. *Artemisia thuscula* was the plant host species with the highest number of active fungi considering both criteria "3" and "4" as well as only criterion "4" with 97 cases and 69, respectively. In second place was *Artemisia austriaca* with 47 and 35 cases, respectively followed by *Artemisia reptans* (43 and 22 cases, respectively) and *Artemisia gorgonum* (38 and 28 cases, respectively).

Keywords: *bioactivity, biological control, fungal interactions, medicinal plants.*

ANTIBODIES, BIOCONJUGATES AND RAPID ASSAYS FOR AGROCHEMICAL RESIDUE ANALYSIS IN FOOD

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Abstract

The presence of toxic agrochemical residues in food constitutes a main social concern nowadays. Chromatographic methods are the most powerful techniques for surveillance and control programmes due to their low limits of detection and high capacity for multiresidual analysis. Nevertheless, the development and application of antibody-based methods has meant a step forward to attaining more rapid, simple and inexpensive strategies for new or alternative analytical applications. Immunochemical systems include extremely versatile techniques which can be adjusted to different analytical requirements, such as minimum sample pretreatment, portability, on-line monitoring and automation, eye-read results, etc. The aim of our laboratory was to create a collection of high-quality immunoreagents (antibodies and bioconjugates) and the development and validation of immunoassays in different formats for the analysis of relevant chemical residues and contaminants in food. Rational design was applied for the preparation of an assortment of functionalized haptens for each target compound with different linker tethering sites, and controlled bioconjugation strategies were used in order to achieve adequate hapten densities. Animals were immunized following regular procedures and high-affinity polyclonal and monoclonal antibodies with the desired specificity generated with diverse kinetic properties. Additionally, immunoassays were developed, particularly employing the competitive ELISA method, for the sensitive analysis of a variety of agrochemicals and biotoxins in food. Our multi-synthetic hapten approach has afforded antibodies with excellent binding properties, so rapid immunoassays with advantageous analytical parameters could be developed.

Keywords: *Hapten design, Antibody, Immunoassay, Pesticide, Food safety.*

BIOLOGICAL INSECT PEST MANAGEMENT IN CROPS OF BRASSICACEAE FAMILY

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Abstract

Synthetic insecticide use in vegetable cultivations in Sri Lanka leads to extinction of faunal diversity, resistance development and caused detrimental effects on the environment and human health. Brassicaceae crops have a larval pest complex of which Diamondback moth (DBM), *Plutella xylostella* L. is the most destructive. The availability of parasitoids locally and field release techniques were investigated to develop a protocol for insect pest management of cabbage. Experiments were conducted in farmer's fields in Marassana, Thalathuoya and Nuwara Eliya, Sri Lanka. Survey identified four parasitoids; two larval parasitoids (*Cotesia plutellae* and *Diadegma semiclosum*), a pupal parasitoid (*Diadromus* sp.) and an egg parasitoid (*Trichogramma* sp.). Project concentrated on *C. plutellae,* being adapted for intermediate and cold climates as well .Field experiments were carried out on test crop cabbage. Release rate of 1500 parasitoids/ha at 2-3 weeks after transplanting cabbage was the best and the highest parasitism was obtained in Marassana, Nuwara Eliya and Thalathuoya was 100%, 66% and 80% respectively. Cost of cultivation using the developed protocol indicated a saving of Rs.100, 355.00 (699.03 USD @ Rs.150.00/USD)/ha/crop. The protocol was used in Integrated Pest Management (IPM), Organic Agriculture and Good Agriculture Practices (GAP) programs. Results showed that a biological insect pest management protocol to manage cabbage pests was 1500 parasitoids/ha of *C. plutellae,* introduced at 2-3 weeks after transplanting to control DBM and neem seed kernel (24 kg/ha) water extract for the control of other insect pests. The protocol could be extended safely to all crops of Brassicaceae family since the insect pest complex is similar.

Key words*:* *Brassicaceae, Plutella xylostella* (L.), *Cotesia plutellae, Biological insect pest control, Parasitization.*

EFFECT OF ACEQUINOCYL AND MILBEMECTINON TWO -SPOTTED SPIDER MITE (*TETRANYCHUS URTICAE* KOCH.) AND THE PREDATOR (*PHYTOSEIULUS PERSIMILIS* ATHIAS- HENRIOT)

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Abstract

The study aimed to determine the effect of acaricides, Acequinocyl and Milbemectinto the *Tetranychus urticae* Koch. and the predator *Phytoseiulus persimilis* Athias-Henriot after 24 and 48 hours of exposure to pesticides residues used according to the field use rate, and determine the relative potencyof both studied pesticides. This research was conducted at the center of research and studies of biological control in the Faculty of Agriculture, University of Damascus and at the Center for breeding and multiplication of natural enemies in Lattakia province in 2017 byusing disc dipping technique. The results indicated that the use of pesticides decreased the number of *T. urticae* and the predator stages significantly compared to the control after 24 hours. There were no significant differences between the pesticides, and the mortality rate reached 100% after 48 hours for *T. urticae* and *P. persimilis*. Based on the LC_{50} value and relative potency, the Milbemectin (LC_{50} = 1.41 ppm) was found to be more toxic to *T. urticae* 28.23 times than the Acequinocyl pesticide (LC_{50} = 39.81ppm). As well as Milbemectin (LC_{50} = 3.38 ppm) was more toxic to predator *P. persimilis* than Acequinocyl (LC_{50} = 69.18 ppm). Both of Acequinocyl and Milbemectin achieved effective control of *T. urticae*,but they were toxic to the predator, Therefore, it must be treated with caution in integrated pest management programs against *T. urticae.*

Key words: *Acequinocyl, Milbemectin, spider mite, predator, P. persimilis, relative potency*

EFFECT OF BIOMASS DRYING METHODS ON OMEGA-3 FATTY ACID CONTENT OF GIANT RED SHRIMP (*ARISTAEOMORPHA FOLIACEA*) BYPRODUCTS

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Abstract

Giant red shrimp (*Aristaeomorpha foliacea*) is commercially valuable shrimp species found in Mediterranean Sea. During the shrimp processing, depending on the species, size, and shelling procedure, about 40-50% of the raw material weight is discarded as non-edible parts and named as byproduct. Byproduct of shrimp consist of meat, peels and other residues. These byproducts still contain valuable nutrients and functional compounds such as fatty acids, mineral salts, proteins, chitin, and pigments. The important human health benefits are associated with Omega-3 fatty acids particularly eicosapentaenoic (EPA, 20:5 n-3) and docosahexaenoic acid (DHA, 22:6 n:3). Recovering of bioactive compounds such as Omega-3 fatty acid rich oils has increased greatly during past few decades due to the its commercial value. The aim of this study was to recover of Omega-3 fatty acid rich shrimp oil from byproducts by applying of different biomass drying methods including freeze drying method (FDM) and conventional oven drying method (ODM). The results showed that Omega-3 fatty acid content and health lipid indices (AI and TI) of shrimp byproducts were significantly ($P<0.05$) affected by biomass drying methods. Omega-3 fatty acid content of oil extracted from freeze dried shrimp byproducts was significantly higher than oils extracted from conventional oven dried byproducts.

Keywords: *Aristaeomorpha foliacea, Omega-3 fatty acids, Shrimp byproducts, Freeze drying,*

THE RELATION BETWEEN *ASPHODELUS AESTIVUS* AND *CAPSODES INFUSCATUS* IN GRASSLANDS OF ÇANAKKALE (WEST OF TURKEY)[1]

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Abstract

Asphodelus aestivus Brot. (Asphodelaceae) is a common weed in grasslands of Mediterranean countries, which is not preferred by grazing animals and limits the efficiency of grasslands. *A. aestivus* is common (3-43%) in grasslands of Çanakkale province (Western Turkey). In this study, the relationship between *A. aestivus* and monophagous herbivore insect *Capsodes infuscatus* Brulle (Hemiptera: Miridae) was investigated in Central, Bayramiç and Biga districts (Turkey) having different ecological properties and in Ayvacık district (warmer climate). *C. infuscatus* was observed on *A. aestivus* plants in all sampling areas. Population density of *C. infuscatus* was found to be especially high in the grasslands of Biga and Ayvacık districts. In Ayvacık district, phenological development and the relationship between the plants and the insects started in mid-February. The highest population density of *C. infuscatus* was observed in mid-march with the flowering of *A. aestivus* plants. Development of *C. infuscatus* was completed and *A. aestivus* plants started to die in the 2nd week of April. In Biga district, nymphs of *C. infuscatus* started to emerge in February, the highest insect population was reached in the 1st week of April and population development was complete in the 1st week of May. Longer period of spring rains in Biga caused the phenological period of *A. aestivus* to be longer, which resulted in a longer relationship between the insects and the plants. In Central and Bayramiç districts, population density of *C. infuscatus* was lower than in Biga and Ayvacık caused by the low population of *A. aestivus* plants in these districts.

Keywords: *Grassland, Asphodelus aestivus, Capsodes infuscatus, West of Turkey, Çanakkale*

Acknowledgements

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SEASONAL FLIGHT OF PEACH PEST *GRAPHOLITA MOLESTA* BUSCK (LEPIDOPTERA: TORTRICIDAE) IN ÇANAKKALE (WESTERN TURKEY)

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Abstract

Çanakkale province is in the 2nd place in peach production quantity in Turkey. The most important pest of the peach is Oriental fruit moth, *Grapholtia molesta* Busk (Lepi.: Tortricidae) and its control is essential for efficient production. The relationship between flight periods of this pest and climatic data is important for the success of pest management. Thus, the relationship between adult population development of *G. molesta* and climate was investigated in 2015-2016 in this study. With this purpose 1 pheromon trap per 5da was placed on trees in two peach orchards on 15th of March. Adults captured in the traps were counted two times a week periodically, pheromone lures were changed every 4-5 weeks and sticky cards were changed when they became dirty. Climate data were gathered from a climate station 1km away from the orchards. With a 7,22°C development threshold, first adults were captured in the traps in 24th of March, when sum of effective temperatures reached 102 day-degrees. A total of 4 peak points were reached in 16th of April, 10th of June, 15th of August and 21st of September throughout the season. Adult flight ended at the beginning of October. In 2016, first adults were captured when the sum of effective temperatures reached 257 day-degrees in 15th of March. Similar to the first year there was a total of 4 peak points of adult flight in 10th of April, 1st of June, 31st of July and 13th of September throughout the season in 2016. Adult flight ended in the 26th of September. Adult flight peaks were reached in 2016 with the reason being that mean daily temperatures of January, February and March in 2016 were a little higher than in 2015. Total number of adults captured in 2015, when daily mean temperatures were lower than in 2016, was higher than in 2016.

Key words: *Peach, Grapholita molesta, Seasonal flight, Western Turkey, Çanakkale.*

POSSIBILITY OF USING INTEGRATED PEST MANAGEMENT TO CONTROL *BACTEROCERA OLEAE* (GMELIN) IN ÇANAKKALE (TURKEY)

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Abstract

Olive is largely produced in Aegean Region of climate conditions in West of Turkey. 35,28% and 37,12% of the olive area in Çanakkale province is located in Ayvacık and Ezine districts, along the Aegean coast. It was recorded that olive product loss was approximately 60% when there was no pest management to control olive pest (*Bacterocera oleae* Gmelin, Diptera: Tephritidae). This study was conducted to determine the effects of winter tillage and mass trapping on the olive fruit fly population. The number adult olive fruit flyand infested olive fruit by larvaein tillage and no-tillage experiment plots were recorded to compare. The number of adult was reduced by 11% under tilled plots and the ratio of infested olive fruit was recorded under tilled and no-tillage plots by 2% and 3%, respectively. The five-yellow stick traps (Kairemone Lure +Sex Lure) of Trece company were used to record pests in five decare area to determine the effect of mass traps plots (MT) compared with conventional plots (CP) in 5-decare during period of August-November. The pest adults caught in traps were counted once a week and then removed from the traps. During the harvesting period in both MT and CP, the rate of infested olive fruit was recorded in 1000 olive fruit per five trees. A total of 3214 adults were caught to traps under MT with 5.2% rate of infested olive, while it was 5% under CP without insecticide application. It has been concluded that the combination of integrated pest management with MT and tilled orchard may be suitable for olive pest control.

Key words*: Olive, Bacterocera oleae, Pest control, West of Turkey, Çanakkale.*

PERFORMANCE OF TRICHOGRAMMA (HYMENOPTERA: TRICHOGRAMMATIDAE) PARASITOIDS *FEEDING ON* HONEY SOURCES

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Abstract

Honey is the miraculous product of honeybees and a naturally delicious. Its flavor and texture vary with the type of flower nectar from which it was made. Apart from natural food source, the well-known functional properties of honey are its antioxidant and antimicrobial activities. The efficacy of natural enemies as biological control agents is sometimes limited by food sources and phenological asynchrony with their host or prey populations. Most parasitoids depend on carbohydrate-rich foods to maximize their longevity and reproduction potential. We conducted a preliminary study on the use of different honeys as food sources for *Trichogramma* (Hymenoptera: Trichogrammatidae) species. The worth of honey as a food source for *Trichogramma* was evaluated in the laboratory by testing the effect of different honey diets on the longevity, parasitism and other parameters. The most commonly available honeys are made from a variety of flowers, pine, citrus, chestnut, sunflower and cotton in Turkey. *Trichogramma* females fed on sunflower and citrus honeys lived significantly longer than females fed on cotton and flower honeys. The females fed on pine and chestnut honeys had the shortest longevity. *Trichogramma* females fed on chestnut and sunflower honeys parasitized significantly more than fed on flower honeys. Females fed on cotton honey were had the lowest parasitization. These results showed that providing *Trichogramma* with sunflower and chestnut honey resulted in greater longevity and total fecundity, respectively.

Keywords*: Trichogramma, honey, parasitization, nutrition, longevity, fecundity.*

EFFECT OF FORCED CONVECTION DRYING ON THE THIN LAYER CHARACTERISTICS OF PEAR SLICES

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Abstract

The pear is one of the most preferable pome fruit species in Europe and the 'Deveci' variety (Pyrus communis L.) is the main one in Turkey. In this study, drying behaviors of pear slices with three different sizes were investigated in forced convection dryer. For this reason, pear samples were cut into slabs with 2x2x1 cm and 2x2x0,5 cm and a cylindrical shape with 2 cm inner, 4 cm outer diameter and 1 cm thickness. Then the effect of two different drying temperatures (50-60°C) and the slice shape on the drying time were investigated. The drying data were fitted to the 11 different models and best suitable thin layer mathematical model which express the drying behavior was investigated for both, three sizes and two different temperature levels. Results indicated that drying periods of pear slices decreased with an increase in drying temperature. The final moisture contents (0,10 kgw/kgdm) of samples for thin slab, thick slab and cylindrical shape were obtained at the end of 270, 380, 360 min drying time for 50 °C, and 220, 340, 305 min drying times for 60°C, respectively. The conformity of these models was compared with respect to regression value (R^2), chi-square (χ^2) and root mean square error (RMSE) between the experimental and theoretical humidity ratios. It was observed that the Logarithmic and Two Term models appropriately described the drying characteristics of pear slices.

Keywords: *Pear Drying, Thin Layer Drying Kinetics, Drying Characteristics, Forced Convection Drying, Modelling.*

EFFECTS OF VARIOUS DRYING METHODS ON THE DRYING CHARACTERISTICS AND COLOR PROPERTIES OF POMELO FRUIT (CITRUS MAXIMA) PEEL

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Abstract

Drying is a method broadly used for food preservation and it is one of the critical steps for by-products stabilization from agricultural products. In this study, the effects of three different drying methods as forced convection drying, freeze drying, and microwave drying on the drying characteristics of Pomelo fruit (Citrus Maxima) peel for albedo in two different thicknesses slabs (1x1x5 cm and 0,5x1x5cm) were investigated. In addition, color degradation and reaction kinetics were calculated for three different drying methods for both sizes. For this purpose, the fruit peels were dried without any pretreatment until completely dry. Drying time of samples were calculated as 24 min, 34 min, 410 min for thin slabs and 30 min, 44 min and 540 min for thick slabs for microwave, forced convection, and freeze drying respectively. Drying data were modelled with 11 different thin film drying models. According to mathematical modeling the best fitted thin film drying kinetics models were determined as Page and Newton Models those with the highest R-squared (R^2) value and the lowest root mean square error (RMSE) and chi-square (χ^2) values. Fresh pomelo peels were used as reference and minimal E change represented the minimal color change from reference material. As a result of the color measurements, it was determined that the L *, a *, b * values generally had different reaction kinetic degrees for each drying methods and the color change kinetics was well-matched with the zero-degree and first-degree kinetic models. Also, the closest color values to the fresh product were obtained from the freeze drying method.

Keywords: *Pomelo Peel Drying, Freeze Drying, Microwave Drying, Forced Convection Drying, Color Change.*

AN UPDATE ON HERBICIDE RESISTANCE AGAINST WEED AND RELATED STUDIES IN TURKEY

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Abstract

It is necessary to produce quality and abundant crops because of the rising population of the world and the requirement of nourishment of the existing human population. It is necessary to control plant damage factors (diseases, insects and weeds) in restricted agricultural production areas to get abundant and high quality crops. One of the most effective ways to manage weeds is chemical control. As a result of the irregular and uncontrolled use of herbicides in the management programs, resistance problems have emerged in weeds. Resistance is a naturally occurring, inherited ability of some weed biotypes to survive a herbicide treatment that should, under normal use conditions, effectively control a weed population. Herbicide resistance was first detected in the world in 1957, and nowadays resistance in 493 plant species (1045 different files) against 163 different herbicides in 92 different weed species in 70 different countries has been reported. Globally, in the mid-1990's, there was a rapid increase in the number of reported weed biotypes resistant to ALS inhibitors, ACCase inhibitors and synthetic auxins. In Turkey, the resistance has been reported in 17 different studies on 14 different weed species. Resistance was detected in 23 different herbicide action groups in the world and the highest resistance was observed in herbicides of ALS group with 160 plant species. A review study on the herbicide resistance concept put forward for the first time in Turkey in 1986 that have focused on herbicide-plant resistance studies with bio assay methods. As a result of the studies done, resistance has been detected against ALS and ACCase group herbicides in wheat and rice plant.

Keywords: *Herbicide, resistance, ACCase, ALS.*

ENDOPHYTIC *FUSARIUM OXYSPORUM* AND *F. SOLANI* THE AFFECT ON PLANT GROWTH AND THE REDUCTION OF COMMON ROOT ROT OF WHEAT CAUSED BY *BIPOLARIS SOROKINIANA*

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Abstract

This study was conducted to determine the efficacy of endophytic *F. oxysporum* and *F. solani* isolates isolated from healthy wheat plants against *B. sorokiniana* that cause common root rot (CRR) disease on wheat,. A total of 18 *F. oxysporum* and *F. solani* isolates were used in the study and the effects of *B. sorokiniana* were investigated by pre-pathogenicity and pot experiment in the green-house. Endophytic *F. oxysporum* and *F. solani* isolates have also been investigated to situmulates plant growth. First, a pre-pathogenicity test was conducted to investigate whether *F. oxysporum* and *F. solani* isolates were pathogenic and they were selected for use in testing endophytic isolates that do not cause disease in wheat plants. The plant fresh weights were recorded by weighing in order to determine the effect of the isolates obtained in the experiment on the plant growth. It has been determined that 15 of the isolates cause an increase in weight compared to control. In addition, in a dual test run in in- vitro conditions, it was determined that ten of the isolates slowed down the development of *B. sorokiniana* and caused zone formation, while eight of them developed hyperparasitic effect on the pathogen. In pot experiments, isolates providing increased plant weight and plant height in endophytic *F. oxysporum* and *F. solani* infected wheat plants were determined. *B. sorokiniana* and 4 different endophytic Fusarium infected plants were found to increase plant wet, dry weight and height and less disease severity than control plants infected with *B. sorokiniana* alone. As a result of the experiment, it is concluded that two *F. oxysporum* and two *F. solani* isolates are potentially useful in biological control against CRR disease in wheat.

Key words: *biological control, antagonism fresh weight, dry weight.*

PATHOGENICITY STUDY ON BIPOLARIS SPP. OF WHEAT PLANTS

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Abstract

Bipolaris sorokiniana is one of the most important diseases that cause root rot in wheat and barley. Wheat and barley seed, spike, leaf and root are affected with the fungus causing significant loss of yields in plants. In this study, diseased plants were collected from six different agro-ecological zones from 288 wheat fields in Turkey. *Bipolaris* spp. was isolated from root and crown parts of plants and morphologically and molecularly *B. sorokiniana, B. spicifera,* and *B. australiensis* species were identified from showing root and crown rot on wheat. Out of total of 67 *Bipolaris* spp. isolated from wheat plants, 49 of the isolates were identified as *B. sorokiniana. B. sorokiniana* was not found especially in the cool and rainy northern regions. The disease appeared especially in low-rainfall dryland environments prevailing. As a result of the pathogenicity study, it was found that all *B. sorokiniana* isolates were pathogenic and the disease severity changed from 50% to 90%. Only two isolates of *B. spisifera* were weak pathogens and none of the isolates of *B. australiensis* found in wheat plants did not constitute symptom of disease on root and crown parts of plants. This study shows that *B. sorokiniana* isolates obtained from different agro-ecological regions in Turkey could cause severe disease and crop losses. Other *Bipolaris* spp. isolates are either weak pathogens or are not causing any root and crown rot disease symptoms in wheat plants.

Key words: *Common root rot, Agro-ecology, Bipolaris sorokiniana, B. spicifera, B. australiensis.*

THE BIOLOGY OF THE BANDED DYE MUREX (*MUREX TRUNCULUS*) IN THE MEDITERRANEAN SEA

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Abstact

In total 813 mollusks species belonging to 6 classes (Caudofoveata, Polyplacophora, Gastropoda, Bivalvia, Cephalopoda, Scaphopoda) live in the Turkish Mediterranean Coasts. Muricidae is one of most popular families in the Gastropoda. 543 species belonging to this family occur in the Mediterranean. Muricidae, the largest family among the marine snails, have extremely variable shells. All family members are active predators and live in tropical or semi-tropical habitats. Most of them have radula's adapted for tearing flesh and capable of drilling. *Murex brandalis* is a medium-sized sea snail, a marine gastropod mollusk in the family Muricidae, the murex shells or rock snails. It occurs in shallow, sublittoral waters of Mediterranean Sea and the Atlantic coast of Europe and Africa, especially in Spain, Portugal, Morocco, the Canary Island, Azores. They generally feed on other mollusks and barnacles. Commonly, access to the soft parts of the prey is obtained by boring a hole through the shell by means of a softening secretion and then scraping action of the radula.

Keywords: *Murex brandalis, Banded dye murex, Distribution, Mediterranean mollusk.*

MARINE ORIGIN BIOACTIVE COMPOUNDS: HEALTH BENEFITS & APPLICATIONS IN FOOD INDUSTRY

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Abstact

The ever-increasing market of functional food is always demanding new bioactive ingredients that can be used by the food and pharmaceutical industry for the development of functional products with scientifically sustained claims. Aquatic species is a good source of health promoting compounds, defined as bioactive compounds. In order to survive in the severe surrounding of aquatic system, marine organisms synthesize a huge number of functional metabolites to fight with severe conditions such as high salinity and pressure, extreme temperature, mutation, and hazardous pathogens. These metabolites can offer health benefits to human beings when human beings digest them. Marine bioactive compounds could be obtained from different categories, including algae (microalgae and seaweeds), invertables (crustaceans, sponges, sea cucumber, ascidians, etc.) as well as seafood by-products. Marine organisms provide a rich source of functional ingredients with health benefits, including omega-3 fatty acids (DHA and EPA), chitin, alginate, bioactive peptides, polysaccharides, polyphenols, saponins, sterols, pigments, astaxanthin, canthaxanthin, fucoidan, fucoxanthin, phlorotannins, etc.. Investigation of new bioactive components from ocean seems to be an unlimited field. Currently, one of the principal research interests in food science is the extraction and identification of bioactive compounds from biomaterials. Current research on the source, screening, extraction, purification of marine origin bioactives are discussed in this study with a specific focus on health benefits and applications of marine origin bioactive compounds.

Keywords: *Bioactives, Marine origin compounds, Health benefits, Functional products.*

INHIBITION OF *STAPHYLOCOCCUS AUREUS* IN COOKED GROUND BEEF WITH SODIUM LACTATE, ENCAPSULATED OR UNENCAPSULATED POLYPHOSPHATES

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Abstract

This research evaluated the effects of sodium lactate (2.5%; SL), encapsulated (e) and unencapsulated (u) polyphosphates (PP; sodium tripolyphosphate, STP; sodium acid pyrophosphate, SPP), and their combinations on the growth of *Staphylococcus aureus* in ground beef during storage (0, 15, 30 days) at 4°C and 10°C. pH, water activity (wa), oxidation-reduction potential (ORP) and *Staphylococcus aureus* counts were determined during storage in both storage conditions. The results indicated there was a gradual decrease in *S. aureus* counts during storage at 4°C determined in all treatments groups, where as there was a significant increase in *S. aureus* counts at the end of the storage at 10°C in the groups of the control and the samples produced with uSTP ($P<0.05$). On the other hand, there was no significant changes in *S. aureus* counts of the samples incorporated with eSTP or uSPP, or uSTP and eSTP combination during storage at 10°C, whereas there was a significant decrease in *S. aureus* counts during storage at 10°C in the other groups. The lowest *S. aureus* counts were determined in the samples produced with a combination of SL with uSPP or eSPP at the end of the storage for both storage temperatures ($P<0.05$). The lowest wa levels were generally detected in all SL containing groups at both storage temperatures ($P<0.05$). The lower ORP values were determined in all STP added groups during storage at both storage temperatures compared to the other groups ($P<0.05$). The pH values of samples with STP were higher than of the samples with SPP and the control ($P<0.05$).

Keywords: *Staphylococcus aureus, encapsulation, polyphosphates, sodium lactate.*

THE EFFECTS OF USING GUELDER-ROSE (*VIBURNUM OPULUS*) CONCENTRATE AT DIFFERENT LEVELS ON PHYSICOCHEMICAL PROPERTIES OF COOKED GROUND TURKEY MEAT

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Abstract

This study investigated the influences of guelder-rose (*Viburnum opulus*) concentrate (65%) at different levels (ranging from 1 to 10%) on physicochemical properties of cooked ground turkey meat during storage (0, 7 and 14 days) at 4^{o}C. pH, CIE L*, a*, b* and TBARS levels were determined during storage at 4^{o}C. Cooking loss was also measured on the production day. The results showed that the lowest cooking loss was detected in the control group (P<0.05). The addition of the guelder-rose concentrate increased cooking loss (P<0.05). Whereas the cooking loss increased gradually up to 6% (P<0.05), there were no further increase after 6%. Even though there were no significant differences between the groups in terms of pH values, the pH values in all treatments increased with storage (P<0.05). The results indicated that the addition of the guelder-rose concentrate resulted in an increase in the a* and b* values (P<0.05). However, it caused a decrease in the L* values (P<0.05). Additionally, the a* and b* values increased and the L* values decreased with increasing the level of the guelder-rose concentrate (P<0.05). There were no significant changes in the color values during storage. The TBARS values increased gradually during storage in all groups (P<0.05). The highest TBARS levels were detected in the control group during all storage days (P<0.05). The addition of the guelder-rose concentrate reduced the TBARS levels, this effect was further increased at increasing the levels of the guelder-rose concentrate (P<0.05). The study results suggested that the guelder-rose concentrate can be used in order to delay oxidative changes in meat products.

Keywords: *Guelder-rose, concentrate, antioxidant, turkey, meat.*

DETERMINED ENDOPHYTIC FUNGI FROM HEALTHY WHEAT PLANTS AND THE AFFECT ON CROWN ROT OF WHEAT CAUSED BY *FUSARIUM CULMORUM*

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Abstract

Endophytic fungi have been considered important in recent years, in particular in the control of diseases and pests, with also some abiotic factors. *Fusarium culmorum* is major pathogens of wheat and barley causing head blight and crown rot (FCR) in cool transitional regions in the world. The fungal material to be used in the project was collected from 76 wheat fields in Samsun, Amasya, Tokat, Sivas, Kayseri, Konya,Yozgat and Eskişehir provinces (Turkey) in 2014. Fungi were isolated from wheat samples then identified according to their morphological characteristics. Endophytic fungus isolates, which are stored in -80°C deep-freeze, those have been tested for their antagonistic activity against *F. culmorum.* Chitinase activity in some of *Trichoderma, Verticillium, Chaetomium, Septonema* and *Acremonium* isolates were determined using colloidal chitin. In this study we investigated the effect of selected endophytic fungi on the pathogen *F. culmorum* and sitimulated plant growth of wheat plants. The isolates that could promote wheat growth and the ability to reduce FCR disease have been identified by the rDNA ITS sequence. In addition, the distribution of endophytic fungi in wheat production areas has been determined with this study. It has been concluded that two isolates of the genus *Acremonium* and one isolate of the genus *Curvularia* and *Trichoderma* can reduce crown rot disease severity that is caused by *F. culmorum* and promote wheat growth ratio.

Key words: *Biological control, Chitinase, Acremoniun, Trichoderma, Curvularia.*

Acknoledgement

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USE OF EDIBLE FILMS AND COATINGS IN MEAT AND MEAT PRODUCTS

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Abstract

Meat and meat products are commonly consumed foods around the world due to their high nutrients availability. However, these foods also provide a suitable environment for growth of pathogenic and spoilage microorganisms. In addition, lipid oxidation causes a reduction in the nutritional value and the formation of undesirable flavor, color, odor and toxic compounds in the meat and meat products. Therefore, some natural or synthetic food additives are used in meat and meat products. However, the effectiveness of these additives which are added to the products by using traditional application methods decreased over time and the meat industry suffers some problems in maintaining product quality. In addition, nowadays consumers demand high quality foods with an extended shelf life and without chemical additives. Edible films and coatings obtained from vegetable or animal sources and applied to the food surfaces by various methods to improve the quality characteristics of food and extend the shelf life. Besides, edible films and coatings can prevent the undesirable color formation, lipid oxidation and microbiological deterioration when they are combined with antioxidant and antimicrobial compounds. Edible films and coatings applied to meat and meat products have some advantages such as the reduction of moisture losses during the storage period, the confinement of water in ready-to-eat meat, the limitation of lipid and myoglobin oxidation, the elimination of spoilage and pathogenic microorganism contamination, the reduction of volatile flavor loss and the prevention of undesirable taste and odor formation. In this review study, research about edible films and coatings prepared with antioxidant and antimicrobial compounds are reviewed.

Keywords: *Edible films and coatings, antimicrobial, antioxidant, meat and meat products.*

EFFECTS OF PRE-HEATED FUNGICIDE SUSPENSIONS ON *NEOFUSICOCCUM PARVUM* AND ENDOPHYTIC FUNGI IN DORMANT CANES OF GRAPEVINES

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Abstract

Neofusicoccum parvum is a highly virulent plant pathogenic fungal species causing decline and canker disease of grapevines. Due to latent infections, this species could be disseminated to many grape growing areas by infected dormant canes. Hot water treatment is a promising method for grapevine producing industry to eradicate *N. parvum* infections. But most of the producers avoid standard hot-water treatment (50ºC-30 min), because of adverse effects (losing bud vitality, growth retardation, plant stress and failure) of the treatment in Turkey. The aims of the study were to offer an alternative hot-water treatment protocol for grapevine producing industry and to investigate probable eradicative effects of pre-heated fungicide suspensions on latent infections of *N. parvum* and other endophytic fungi. Dormant grapevine canes (*Vitis vinifera* cv. prima) were cut from Tarsus County in January 2018. Their inside fungal flora was determined by standard mycological isolations and molecular tools (PCR and ITS gene sequencing). A virulent isolate of *N. parvum* was drill-inoculated into the canes and inoculated cuttings were planted in plastic pots. The plants were grown in greenhouse conditions for two months. After that, the plants were uprooted, their roots and shoots were removed and they were dipped into pre-heated fungicide suspensions (cyprodinil+fludioxonil, tebuconazole and thiophanate-methyl at 30, 35, 40 and 50ºC for 12, 6, 2 hours and 30 minutes respectively). After cooling stage, re-isolations were done from inside wood tissues and re-isolation rates were calculated. The results indicated that water temperature could increase penetration of fungicides into the canes and cure latent infections of *N. parvum* in some extent. The most promising results were obtained from the pre-heated tebuconazole treatment (40ºC-2 hours) with %44.9 curative efficacy. However, most of the treatments had negative impacts by decreasing re-isolation frequency of endophytic fungi. The beneficial and adverse effects of the treatments were discussed.

Keywords: *Grapevine, Neofusicocuum parvum, Canker, Hot water traeatment, Fungicides.*

Acknowledgement

The study was part of a master thesis and it was supported by Çukurova University, Scientific Reserch Projects Unit (project number: FYL-2018-10507).

EFFECTS OF PROBIOTICS TO SOME BIOLOGICAL PROPERTIES OF *TRIBOLIUM CONFUSUM* J. DU. VAL. (COLEOPTERAN: TENEBRIONIDAE)

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Abstract

The confused flour beetle *Tribolium confusum* J. Du Val (Coleopteran: Tenebrionidae) is the most destructive pest of stored products worldwide. It is harmful as adult and larvae secondary. Probiotics are microorganisms that have many health benefits to their host, such as promoting normal intestinal microflora, inhibiting the growth of pathogenic microorganisms, improving digestion and stimulation of gastrointestinal immunity. Probiotics are used as functional food for human health and as an adjuvant and preservative for growth in animals. Microorganisms, especially bacteria, have positive or negative effects on the vital activities in insects. In this study, it was aimed to investigate the effects of probiotics on some biological properties of *T. confusum* larvae and adult individuals. Wheat flour and yeast (95% flour and 5% yeast g/g) were used as nutrient medium when *T. confusum* was grown in the laboratory. Insect larvae and adults were exposed to 5 different treatments (flour, flour + yeast, ½ capsule, 1 capsule and 2 capsules probiotics). The probiotic used in practice was commercially available. Each capsule (*L. acidophillus, L. rhamnosus, L. reuteri, B. bifidum, B. longum, B. breve, S. thermophilus*) contained 5 x 10^9Kob . Then statistical analyzes were carried out on male and female adult weights, pupae weights, egg yield, mature outcome and mortality rates.

Keywords: *T. confusum, probiotic, bıologıcal propertıes.*

INTRASPECIFIC INTERACTION OF METATHORACIC SCENT GLAND SECRETION OF *EURYGASTER MAURA* (L.) (HETEROPTERA: SCUTELLERIDAE)

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Abstract

This study was carried out in order to determine the intraspecific interaction of metathoracic scent gland (MSG) secretion of *Eurygaster maura* (L.) (Heteroptera: Scutelleridae) in 2013-2014 in laboratory conditions. For this purpose the MSG secretions, obtained separately from adult males and females, were diluted with hexane and six different concentrations were prepared. The experiments were performed in Y tube olfactometer with 3 replicates and each replicate involved 10 adult male/female. A single adult male/female was introduced into the stem of the olfactometer and allowed 5 min to choose one of the arms of the olfactometer. Adult male/female that moved 4 cm and remained 15 s in the olfactometer arm recorded as having made a choice. Hexane and distilled water were used for control. In all experiments, each adult male/female was used only once and discarded and all experiments were conducted at 26±1°C, 65±5% RH. The results indicated that low concentrations of MSG secretion of male attracted male individuals but showed a repellent effect as the concentration increased. The females did not show significant response to low concentrations of MSG secretion of male and it was determined that female individuals were attracted as the concentration increased. Although low and high concentrations of MSG secretion of female did not significantly attract male individuals, they were attracted by intermediate concentrations. Low concentration of MSG secretion of females were not attractive to female individuals, however, repellency was detected as the concentration increased.

Keywords: *Eurygaster maura, Heteroptera, intraspecific interaction, metathoracic scent gland, Y tube olfactometer.*

EUGENOL LEAD TO ENZYMATIC, EPIGENETICS, APOPTOTIC AND TRANSCRIPTOMICS ALTERATIONS ON *CERCOSPORA BETICOLA*

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Abstract

Leaf spot disease is the most destructive disease of sugar beet worldwide. The major causal agent of leaf spot disease of sugar beet is *Cercospora beticola*. In this study, *C. beticola* 13-45 isolate, obtained from diseased sugar beet leaves planted in Turkey was used. The increased concentrations of eugenol, 0, 0.1, 0.2, 0.4 and 0.8 mg/mL, were amended to PDA media. Ten-day-old cultures were used to determine the inhibitory concentration of 50% (IC_{50}) values. gDNA was extracted from fresh cultures of 10-day-old cultures. Randomly Amplified Polymorphic DNA (RAPD) and coupled restriction enzyme digestion-random amplification (CRED-RA) methods were used in epigenetic profiling of eugenol treated and non-treated fungi. *C. beticola* isolates grown on PDA and 0.1 mg/mL eugenol amended (IC_{50}) PDA media were subjected to gene expression analysis. *cyp51, mc1, aif1, pod/cat/sod* genes were the target genes. The catalase activity was obtained spectrophotometrically at 240 nm. The aggressiveness of the isolate was confirmed via pathogenicity test. Eugenol with 99.39% purity was obtained via chromatography. 79 RAPD bands were obtained. The genomic template stability value was recorded as 56.92%. Seven RAPD primers showed the presence of epigenetics alterations. Fold changes expression levels of cyp51, mc1 aif1, cat, pod and sod genes were determined as 2.639±0.41, 7.047±0.35, 2.858±0.44, 1.253±0.25, 1.482±0.04 and 3.719±0.47, respectively. Apoptosis and oxidative stress was confirmed via mono and dual staining. The fold change in catalase activity was detected as 1.18±0.1 in experiment set. The findings showed that eugenol could lead to damage on phytopathogenic fungi at different molecular levels.

Keywords: *Cercospora beticola, Epigenetics, Eugenol, Gene expression, Sugar beet.*

INVESTIGATION OF STRAINS OF TOMATO YELLOW LEAF CURL VIRUS (TYLCV) IN CUKUROVA REGION

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Abstract

Tomato yellow leaf curl virus (TYLCV) is a viral agent causing significant economic loss worldwide on tomato (*Lycopersicum esculentum*) cultivation in greenhouses. The symptoms caused by TYLCV at infected tomato plants are stunting, small chlorotic leaves with upward curling. Many different strains of TYLCV have been reported from various parts of the World. There are many difficulties in the symptom based differentiation of this virus. This study was carried out for the identification and characterization of TYLCV strains in Cukurova region, south-eastern Mediterranean coast of Turkey during the period of 2017. With this aim, in total 83 leaf samples were collected from infected tomato plants and presence of TYLCV was confirmed by PCR. Two different strains of TYLCV (TYLCV-IL, TYLCV-Mild) were identified by using strain specific primer sets (TYLCV-IL, TYLCV-Mild) in Cukurova region. Similar symptomatic plants were tested with V1 primers amplifying the coat protein (CP) coding gene (777 bp) which had no PCR products for both TYLCV-IL and TYLCV-Mild specific primers. Phylogenetic analysis of TYLCV-IL and TYLCV-Mild proved that these isolates were related to other isolates from several countries. Although, phylogenetic analysis of CP (777 bp) of two isolates from Mersin province had similarities with most of the TYLCV strains and isolates from various countries all around the World. These results showed that TYLCV had many viral variants being a threat for tomato cultivation in greenhouses in the Mediterranean region of Turkey and should be investigated in detailed manner.

Keywords: *TYLCV, PCR, Characterization, Tomato, Turkey*

NOVEL CHELATED FE COMPOUNDS AS MICRO-NUTRIENTS AND THEIR PHOTOSYNTHETIC ACTIVITY IN A TURKISH MAIZE GENOTYPE (ADA9510)

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Abstract

In this study, the effects of two newly synthesized iron-chelate compounds (TAR148 and TAR159) and commercial EDDHA-Fe molecule on photosynthetic activity in a Turkish maize genotype (ADA9510) were comparatively studied by using chlorophyll (chl) Afluorescence transient (OJIP) measurements. TAR159 increased $PI_{abs.}$ (performance index) and ϕ_{Ro} (quantum yield of reduction of end acceptors of photosystem I) as compared with control and EDDHA-Fe applications. EDDHA-Fe led to the lowered S_M (energy necessary for the closure of all reaction centers), N (the number indicating how many times quinone A is reduced while fluorescence reaches its maximum value) and Ψ_0 (the fractions of electrons transported beyond quinone A per exciton trapped by the open reaction centers) in maize leaves, as compared to control, TAR148 and TAR159 applications. Our results showed that EDDHA-Fe increased ABS/RC (light absorption flux per reaction centers) and TRo/RC (trapped energy flux per rection centers) but did not affect ETo/RC (maximum electron transport flux per reaction centers) and decreased DIo/RC (dissipated energy flux per reaction centers), indicating that absorbed and trapped light energy could not be used for electron transport and dissipated as heat in maize leaves. EDDHA-Fe also caused decrease in $SFI_{abs.}$ (an indicator of photosystem II structure and function), $PI_{abs.}$, ϕ_{Ro} and Δ_{Ro} (the efficiency with which an electron can move from the reduced intersystem electron acceptors to the photosystem I electron acceptors). In addition, iron content in the leaves of maize was lower than control whereas TAR148 and TAR159 led to the higher iron content as compared to EDDHA-Fe application. As a result, we can clearly conclude that TAR148 and Tar159 provide better iron nutrition than commercial EDDHA-Fe in maize plants and lead to higher photosynthetic activity.

Keywords: *Chlorophyll a fluorescence, photosynthesis, iron, maize.*

EVALUATION OF DIFFERENT ENTOMOPATHOGENIC NEMATODES ISOLATES AGAINST SOME MAJOR STORED PRODUCT PESTS UNDER LABORATORY CONDITIONS

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Abstract

In this study, the efficacies of three entomopathogenic nematode (EPN) isolates that belong to different species (*Steinernema bicornotum* MGZ-4-S, *S. feltiae* KCS-4-S and *S. carpocapse* E-76) against *Rhyzopertha dominica* (F.) (Coleoptera: Bostrychidae), *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae), and *Tribolium confusum* (J.) (Coleoptera: Tenebrionidae) were examined under laboratory conditions (60±5% RH and at 25^{o}C±1). The isolates were applied at 100, 250, 500, and 1000 infective juveniles (IJs) doses, and mortality rates were recorded on the 4th, 6th and 8th day of exposure times. The results showed that *Steinernema bicornotum* MGZ-4-S isolate caused mortalities on the adults of *T. confusum* that ranged from 47.5% to 67.5% whereas 92.5% and 95% mortalities were noted for *S. feltiae* KCS-4-S and *S. carpocapse* E-76 treatments, respectively at 1000 IJs/adult on the 8th day after treatment. The maximum mortality rate (100%) for *R. dominica* was obtained by *S. feltiae* KCS-4-S isolate and the mortality rates caused by the other two EPN isolates were between 55% and 92.5% for *S. bicornotum* MGZ-4-S and *S. carpocapse* E-76 isolates, respectively. The mortality of *S.oryzae* adults were ranged from 47.5% to 95% with significant differences between the doses regardless of the EPN isolates. Generally, mortality rates increased with the increasing doses and exposure times. These results indicated that EPNs had a significant potential in the biological control of these pests under controlled conditions and should be further studied in the storage conditions.

Key words: *Entomopathogenic nematode, Rhyzopertha dominica, Sitophilus oryzae, Tribolium confusum.*

EFFECT OF PARASITISM PERFORMANCE *TRICHOGRAMMA PINTOI* REARED ON THE EGGS OF *EPHESTIA KUEHNIELLA* STORED AT LOW TEMPERATURES

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Abstract

Trichogramma spp. (Hymenoptera: Trichogrammatidae) are frequently used against Lepidoptera pests in biological control. Although several groups of egg parasitoids are commonly employed for biological control throughout the world, Trichogramma spp. have been the most extensively studied. In this study, the storage performance of *T. pintoi* at low temperatures and the parasitoid interference performance of this storage were investigated. In this study, host *Ephestia kuehniella* eggs were stored in the refrigerator at +4 ± 1°C and in liquid nitrogen (-196°C) for 6 weeks for use in mass production of *Trichogramma.* Accordingly, in both methods, as storage period was extended, the number of parasitic eggs of *T. pintoi* decreased. More parasiticides were detected than eggs stored at +4 ± 1 ° C.

Key words: *Cold storage, T. pintoi, mass rearing.*

EFFECT OF *E. KUEHNİELLA* EGGS PATTERN ON PARASİTOİD PERFORMANCE OF *TRİCHOGRAMMA*

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Abstract

Trichogramma spp. (Hym:Trichogrammatidae) mass-rearing and storage of natural enemies assure their availability in sufficient numbers at the time of release. For the research, *Ephestia kuehniella* (Lep: Pyralidae) eggs were glued as disperse and undisperse of 10 units. The distribution was random in groups. In the experiments, two newly emerge *Trichogramma pintoi*, *T. evanescens* and *T. brassicae* females were placed into pass glass tubes of 16x100 size. *E. kuehniella* eggs of 40 units of glued different combinations. The female parasitoids were removed after 24 h. The experiments were carried out at 25±1°C temperature, 65-70% relative humidity, 16:8 hour light:dark period and 10 replications. As a result of this study, significant difference was not observed statistically between the undisperse of eggs. However, the highest parasitic performance was seen in *T. evanescens* in disperse eggs. *T. evanescens* was parasitized statistically by 15.7 ± 0.8 eggs. *T. brassicae* and *T. pintoi* parasitized respectively10.3±1.18 and 11.7±1.87 eggs.

Key words: *Trichogrammatidae, parasitized, Trichogramma brassicae, Trichogramma pintoi. Trichogramma evanescens.*

EFFECTS OF DIFFERENT DIETS ON PARASITIZATION PERFORMANCE OF *TRICHOGRAMMA* SPP. (HYMENOPTERA: TRICHOGRAMMATIDAE)

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Abstract

Although several groups of egg parasitoids are commonly employed for biological control throughout the world, Trichogramma spp. have been the most extensively studied. This study was conducted to determine whether various food resources enhance the longevity and parasitoid performance of the egg parasitoid *Trichogramma brassicae*, *T. evanescens* and *T. pintoi* (Hymenoptera: Trichogrammatidae) under laboratory conditions 25°C, 65% RH, 16L:8D h photoperiod or not. Newly hatched female wasps were fed on *Ephestia kuehniella* Zeller, (Lepidoptera: Pyralidae) eggs with either honey, grape molasses or royal jelly. Longevity of all three parasitoids fed with honey was *T. brassicae* 16,25 days, *T.evanescens* 15,42 days, *T. pintoi* 14,20 days, respectively. All three parasitoids showed the lowest longevity when feeding with royal jelly (*T. brassicae* 3.04 days, *T.evanescens* 4.01 days, *T. pintoi* 4.03 days).

Key words: *Trichogramma spp., food, biological control.*

THE PARASITISM PERFORMANCE OF TRICHOGRAMMA PINTOI IN STORED MATERIALS

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Abstract

This study was aimed to determine the parasite capacity of Trichogramma pintoi in the biological struggle of Ephestia kuehniella. The experiments were carried out at 26±1°C temperature, 65-70% relative humidity, 16:8 hour light:dark period. In the study, crackers were placed in small boxes (5 cm length, 9 cm width), 25 non-parasitized E. kuehniella eggs were placed on both the upper and lower parts of these crackers. Then to the side of these boxes the last stage of the pupa period T. pintoi were attached to the papers which are glued with arabic gum. Experiments was carried out in 15 replications. T. pintoi was placed in different numbers (15, 20 and 25) in each box. According to the experiments, E. kuehniella eggs at the upper part of the box were more parasitized than those in the lower part. The highest parasitic performance was obtained in experiments with 20 and 25 T. pintoi (18,86 ±2,55 and 18,33±2,13 units).

Key words: *T. pintoi, E. kuehniella, Biological control.*

POSSIBILITY OF USE OF ENCAPSULATED PROPOLIS IN CHEWING GUM FORMULATION AS ANTIMICROBIAL AGENT

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Abstract

Propolis is a special resinous blend, which has strong antiviral, antibacterial, antifungal, antioxidant, anticancer, anti-inflammatory effect. It is collected from the cones of the trees, leaves, young shoots, shells and buds of various plant oils, pollen, resin and waxy materials by honey bees (*Apis mellifera L.*). It is harmonized through metabolic secretions. The potential of usage of propolis in pharmaceutical and food industries as a natural antioxidant and antimicrobial appears to be high. However, the use of propolis in foods is limited, because of its dissolution of alcohol and strong flavor and aroma. In recent years, encapsulation technology is applied for protection, controlled release and shelf life extension of active lipophilic food components used in functional foods. This method enables the controlled release and increases the stability of the formulation of the active ingredients where, also, bad flavor can be masked. It is reported that propolis prevents tooth decay, due to the fact that it has good *in vivo* and *in vitro* antimicrobial activity against *Streptococcus mutans* bacteria which is effective in tooth decay. In this study, propolis was used in amount of 1%, 3%, 5% and 9% in chewing gum formulations by microencapsulation by spray drying method. Particle structure by scanning electron microscope (SEM), hygroscopity, moisture content, microencapsulation yield by gravimetric method, free radical scavenging ability by DPPH (Diphenyl-1-(2,4,6-trinitrophenyl) hydrazyl) method, total flavonoid content by spectrophotometric method, total phenolic content by Folin-Ciocalteu method were determined in microencapsulated propolis and chewing gum samples. In addition, the in vitro antimicrobial effect on *Streptococcus mutans* by the Disc Diffusion method was investigated in microencapsulated propolis and chewing gum samples. As result of the study, a new functional product was formed by adding different amounts of microencapsulated propolis. It has also been demonstrated once again that the spray drying process protects the bioactive components added externally to the structure of foodstuffs against technological conditions during production.

Keywords: *Propolis, microencapsulation, chewing gum, phenolic compound.*

FREE AND BOUND PHENOLICS AND ANTIOXIDANTS IN RAW AND INFRARED STABILIZED IMMATURE RICE GRAIN

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Abstract

Total phenolics, phenolic acid composition and antioxidant capacity of immature rice grains which were stabilized at 1200 W (8.0 and 10.1 min), 1400 W (7.0 min), and 1600 W (4.4 and 5.0 min) with medium wave and 1200 W (10.1 min), 1400 W (6.2 and 7.1 min) and 1600 W (5.0 min) with short wave infrared emitters were investigated and compared with unprocessed immature grains. Although a decrease in the content of phenolics and antioxidant capacity was observed in some stabilized grains, it was concluded that these decreases might not be directly related with stabilization conditions since they are not consistent with radiation intensity or process time. Furthermore, the content of the phenolics and antioxidant capacity were higher in some stabilized grains when compared to unprocessed immature grains. Instead, the variations were attributed to random error. In conclusion, it was found that infrared radiation can be used to stabilize immature rice grains without negatively affecting the content of phenolic compounds and antioxidant capacity.

Keywords: *Rice bran, infrared, stabilization, phenolics, antioxidants.*

ISOLATION OF LACTIC ACID BACTERIA FROM BUTTER SAMPLES AND INVESTIGATION OF THEIR INDUSTRIAL PROPERTIES

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Abstract

Butter is a dairy product made by churning fresh or fermented cream or milk. The culture normally consists of a mixture of mesophilic lactic acid bacterial strains of *Lactococcus lactis* subsp. *lactis* and *Lac. lactis* subsp. *cremoris* providing lactic acid while citrate positive strains of *Lac. lactis* subsp. *lactis* biovar *diacetylactis* produce flavor compounds, predominantly diacetyl and its precursor, acetoin. In this research one hundred one lactic acid bacteria (LAB) isolated from 20 butter samples collected from local markets were used. These LAB were investigated for being starter cultures for industrially butter production. The selected best cultures were genetically identified.As a result of the analysis it was determined that all of the isolates developed well at 15, 30 and 45°C. While the bacteria were able to grow well at a concentration of 2 and 6% NaCl, 27% of bacteria grew well, 41% of bacteria show weak growth and 32% of the bacteria was not able to tolerate concentration of 10% NaCl. It was observed that 70 of the strains showed fast coagulation in milk, 36 isolates produced diacetyl rapidly in the first 10 minutes. Thirty eight of LAB tested showed colony formation on citrate agar media. It was determined that 57 of the bacteria had amylolytic activity and 19 of the bacteria had lipolytic activity. The selected 13 bacteria were identified as one strain of *Enterococcus faecalis*, three strains of *Ent. faecium*, one strain of *Lactobacillus casei* and eight strains of *Pediococcus acidilactici*.

Keywords: *Lactic acid bacteria, Butter, Starter culture.*

Acknowledgements

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DETERMINATION OF RESISTANCE OFLACTIC ACID BACTERIA ISOLATED FROM DAIRY PRODUCTSUNDER STRESS CONDITIONS

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Abstract

Lactic acid bacteria (LAB), which are widely used in the industry, are exposed to adverse environmental conditions during fermentation. Therefore, LAB has to be resistant to these adverse effects. In this research, 100 LAB which were previously isolated from cheese and yoghurt samples were used. For determining industrial production compatibility of these bacteria, thermotolerant capacity, heat adaptation, autoaggregation and coaggregation abilities were investigated in detail. Thermotolerant capacity of each of the 100 LAB was determined in water baths at different temperatures (50°C 30 min, 50°C 45 min, 60°C 30 min and 60°C 45 min). The viability of LAB at 50°C heat treatment for 30 min was at least 10^6 CFU\mL. Results indicated that 38 bacteria were able to survive at the same level with their initial load after 50°C for 45 min application. According to the thermotolerant capacity results at 60°C for 45 min, *L. bulgaricus* PLc3A, *L. fermentum* YLa18B and YLc12B, *E. faecium* YLj25A showed the highest resistance and these bacteria were selected for other further experiments. Results revealed that heat treatment reduced vancomycin resistance. It has been determined that all of the heat-treated and not heat-treated bacteria could not able to survive in the presence of penicillin. Isolates were also investigated for their autoaggregation and coaggregation abilities. After 5 h incubation at 37°C, five isolates exhibited autoaggregation ability between 73.08 and 75.03. The lowest values of coaggregation were determined against *Stapyhlococcus aureus*, *Escherichia. coli* and *Salmonella* in *L. fermentum* YLc12B as 27.7, 26.4 and 13.7%, respectively.

Keywords: *Lactic acid bacteria, Thermotolerant capacity, Autoaggregation, Coaggregation.*

Acknowledgements

This work was supported by The Scientific and Technological Research Council of Turkey (TUBITAK), Project 2209 A.

BLENDED OILS IN THE VEGETABLE OIL SECTOR

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Abstract

The vegetable oil sector is an industrial sector that brings raw materials from agriculture to more durable and ready-to-use conditions through various preparation, processing, preservation and packaging techniques. Values such as monounsaturated fatty acids, polyunsaturated fatty acids, saturated fatty acids, smoke point are of great importance for use in the food industry and industrial vegetable oils. Stability and nutritional characteristics of oils are the most important factors in food technology. There is no pure oil with high functional and nutritional properties and high oxidative stability. For this reason, blended oils are prepared to improve commercial applications and functional properties of vegetable oils. New specific products with desired nutritional properties can be created. Blending oils lead to improved industrial applications. The economic, high nutritional value and strong stability properties of blended oils, which are offered at a more affordable price to the market, have become quite common in recent years. Blended oils have advantages such as low cost, reduced complexity of varieties, ideal and desired performance for applications, high smoke point, helping to establish omega 6/3 balance. The disadvantages are; unfavorable oils and unfavorable blends may cause undesirable results in taste, odor, color and function. In this study, a literature review about blended oils was presented and samples from domestic and foreign markets were showed. The commercial examples of oil blends in the market are generally comprising of olive, canola, sunflower, hazelnut, soybean and grape seed oils, while scientific research are more focused on blends containing palm oil and some specialty oils with functional properties such as rice bran oil, black cumin oil etc. In the future, there will also be many economical and health reasons for the production of new oil blends using new and conventional oil sources to be introduced to the market.

Keywords: *Edible oils, Oil blends, Vegetable oil sector.*

THE IMPORTANCE OF ORGANIC AGRICULTURE-BASED FOODS IN HEALTHY NUTRITION

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Abstract

It has been shown in various studies that the nutritional values of organic agricultural products are not superior to the nutritional values of normal foods. It is also known that the use of animal manure instead of chemical fertilizers in organic agriculture also pose a variety of food safety risks. Being a source of pathogenic bacteria such as *E. coli* it can lead to significant health risks. This situation increases the risks to be eliminated in the food safety program for the preparation of organic agricultural products. In contrast to all these issues, using alternative methods instead of toxic chemicals in organic farming makes the foods safer. Intensive and unconscious use of pesticides, pesticide itself or conversion products may lead to the fact that they remain in agricultural products, soil, water and even air. It has been reported that pesticide rates analyzed in various countries are over the safe levels. It has been shown in various studies that pesticide residues accumulated in the body as a result of consumption of food stuffs may be carcinogen and endocrine disruptor. There are effective and widely used technologies (UHT, pasteurization, sterilization, etc.) developed to eliminate microbiological risks caused by raw materials in food production. However, it is seen that the methods that can remove the risk of chemical remnants in food production processes are extremely inadequate and uncommon. For this reason, organic foods are still important for healthy nutrition. In addition, it is extremely important to carry out intensive studies to remove the risk of pesticide residues in normal foods.

Keywords: *Organic food, Nutrition, Health.*

MOLECULAR AND HOST REACTION STUDIES ON RESISTANCE-BREAKING *BEET NECROTIC YELLOW VEIN VIRUS* ISOLATES IN TURKEY

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Abstract

Rhizomania is a soil-borne disease caused by *Beet necrotic yellow vein virus* (BNYVV) and is a major threat to sugar beet production throughout the world including Turkey. Four RNA species have been identified in the roots of sugar beet plants in nature. However, some BNYVV isolates have been shown to contain the fifth genomic RNA segment. The disease control is mainly based on the use of resistant sugar beet cultivars. BNYVV was first identified in Turkey in 1987. Commercial beet cultivars containing the BNYVV-resistant *Rz1* gene was introduced into infested fields in Turkey in 1994 to control rhizomania. However, in 2011, severe rhizomania symptoms were observed in several sugar beet fields planted with partially resistant *Rz1* plants in the northern and central parts of Turkey. Our previous study indicates that the *Rz1*, *Rz2* and/or *C48* resistance genes have been defeated by some of BNYVV populations. In this study, ten of the resistance-breaking BNYVV populations were selected and used in host reaction studies using eleven different plant species. Host reaction studies demonstrated the presence of wide biological variability in BNYVV isolates. Six BNYVV populations differed from the others with respect to positive reaction in five plant species including *Nicotiana benthamiana, N. rustica, Beta maritima, Chenopodium quinoa* and *Spinacia oleracea*, and one of them was able to move systemically through *C. quinoa*, which is normally local lesion host of BNYVV. Also, RT-PCR assays showed that three of BNYVV isolates contained RNA-5 segment while the others were identified as A-type strain without RNA-5.

Keywords: *Rhizomania, RNA-5, Chenopodium quinoa, ELISA, RT-PCR.*

USING SOME WEEDS IN TOKAT PROVINCE AS PLANT-DERIVED DYE

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Abstract

Natural dyeing is the process of making use of the dye stuff from the root, stem, leaf and floret of the plants. This process is almost as old as the human history; and throughout the history, different plants have been used in different styles to dye. It's likely that natural dyeing was informed by cooking, as the process of extracting pigment is exactly like boiling food. There are many naturally occurring plants, minerals and crustaceans from which you can extract color and produce natural dyes. Plant dyes use no toxic or polluting chemicals, and the organic matter left over from dye plants can be put on the compost. In Anatolia, carpets and rugs have been dyed by using different plants. This research has been done to detect the color codes of the dyes which were derived from the use of the 8 different plants [wild rue (*Peganum harmala* L.), safflower (*Carthamus tinctorius* L.), thyme (*Thymus sp.*), gopher plant (*Euphorbia helioscopia* L.), golden marquette (*Anthemis tinctoria* L.), yellow bedstraw (*Galium verum* L.) in 2 different methods (with and without mordant) on wool and cotton in Tokat province. Copper sulphate and cider vinegar has been used as mordant substance. Pure cotton dyed with the dyestuff derived from the plants has been specified according to the color codes in pantone color scale. Besides that, it has been observed that the cotton has eye-pleasing colors. In accordance with the results, it has been confirmed that natural dyeing's importance is gradually rising, considering the harms to environment and human health caused by the chemicals and synthetic dye stuff.

Keywords: *Stain plant, weed, mordant, copper sulphate, apple vinegar.*

VERTICAL AND HORIZONTAL DISTRIBUTIONS OF PLANT PARASITIC NEMATODES IN VINEYARDS IN NORTHWESTERN MARMARA REGION OF TURKEY

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Abstract

Plant-parasitic nematodes are important soil pests transmitting feeding in grapevine roots and causing significant crop losses. Becides damaging potential on plants some species has the ability to transmitt important grapevine virus diseases.. During our six years nematode studies up to 43 plant parasitic nematode species were identified in vineyards of Northwestern Marmara Region. Mostly distributed nematode species in the region were *Xiphinema pachtaicum, Xiphinema index, Helicotylenchus digonicus, Merlinius brevidens* and *Mesocriconema xenoplax*. A study on vertical and horizontal distributions of plant parasitic nematodes was carried out in seven vineyards each with distinctive nematode populations from *Xiphinema* spp., *Longidorus* spp., *Helicotylenchus* spp., *Tylenchorrhynchus* spp., *Paratylenchus* spp., *Merlinius* spp., *Radophulus* spp., *Macroposthonia* spp. and *Pratylenchus* spp. genera. On this purpose soil samples were collected regularly from these vineyards at 0-20, 20-40, 40-60, 60-80 cm and in row at 25, 50, 75 cm distance from trunk base. Higher population of *Xiphinema pachtaicum* was found in 40-60 cm whereas *Xiphinema index* and *Longidorus elongatus* was mostly isolated from 60-80 cm soil depth and population increased in spring and autumn. *Mesocriconema xenoplax, Radophulus similis, Boleodorus tylactus, Helicotylenchus dihystera, Helicotylenchus digonicus* and *Paratylenchus* sp. were present in upper soil surface depending on the grapevine root distribution and population increased between 20-40 cm depth. The highest number of *Mesocriconema xenoplax* was counted in summer while peak population of *Paratylenchus* and *Pratylenchus* was observed at the end of autumn and in winter. The highest variability of nematode population in row was determined for *Paratylenchus* spp. and *Helicotylenchus dihystera*. Over all species, the number was greatest in row at 0-40 cm.

Keywords: *Plant parasitic nematodes, Vertical and horizontal distribution, Vitis vinifera L., Turkey.*

MICROPROPAGATION OF SOME AMERICAN ROOTSTOCKS USING MERISTEM TIP CULTURE

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Abstract

An in vitro propagation protocol was developed for the production of Teleki 8B, 140 Ruggeri, 110 Richter, Kober 5BB, 99 Richter and SO4 (Selection Oppenheim 4) grapevine rootstocks through meristem tip culture. These plants will be used in nematode virus transmission baits. Meristem tissues were isolated from apical shoot-tips with 5-10 mm in length collected from plants maintained at greenhouse and grown on liquid and solid Murashige Skoog Medium (MS) supplemented with 1 mg/L^{-1} 6-Benzylaminopurine (BAP). The tubes and petri dishes with meristematic tissues were incubated in growth chamber at 24°C during a 16 h light period 8 h dark period. After eight weeks, newly emerged shoots were transferred into MS medium and stored in growth chamber for further growth. At final stage adequate grown shoot were transferred into MS medium with 1 mg/r L^{-1} Indole Butyric Acid (IBA) for root formation and growth. When root formation and growth were completed, all plantlets were transferred to 8 cm pots filled with peat and soil. Total of 153 plants were propagated with this method from 6 grapevine rootstocks.

Keywords: *Meristem tip culture, Grapevine rootstocks, Murashige and Skoog Medium.*

INVESTIGATION OF THE ENERGY BALANCE COMPONENTS OVER WINTER WHEAT CANOPY BY BOWEN RATIO ENERGY BALANCE APPROACH IN THE NORTHWEST OF TURKEY

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Abstract

As the major indicator for crop water consumption, the evapotranspiration has been of a globally increasing importance for future agriculture especially for estimating the irrigation needs. Requirement of corresponding research studies is also on the rise in agricultural regions, which are under semi-arid climatic conditions currently. Representing the northwestern boundary of Turkey, the Thrace Region is such a semi-arid region, on which agricultural activities are broadly done with quite high production rates compared with the country's averages. Within this frame, major seasonal crops like rice, winter wheat and maize are widely grown in the region. Concordantly, it is essential to measure and calculate reliable data of the surface energy balance components (net radiation, sensible heat flux, latent heat flux, soil heat flux) on a regular basis both spatially and temporally. In addition to today's broadly used remote sensing data and information, application of in situ measurements is also necessary because of the high number of environmental factors that affect dynamically on the surface energy budget. As a combination of field measurements and calculation, the Bowen Ratio Energy Balance (BREB) Method was applied to winter wheat planted field during the 2014-2015 growing season in the Kırklareli City of Thrace Region. Required data for the execution of this globally approved micrometeorological method measured at experimental area of Atatürk Soil Water and Agricultural Meteorology Research Institute. In this study, variation of energy balance components over winter wheat crop will be discussed.

Keywords: *Winter wheat, ratio energy balans, Turkey.*

ANTIFUNGAL ACTIVITY OF ORIGANUM ONITES L.ESSENTIAL OIL AGAINST SOME PLANT PATHOGENIC FUNGI

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Abstract

Diseases in agricultural areas cause significant losses regarding quality and yield. To reduce these losses, intensive pesticides are used. Extreme pesticides use causes many problems. For this reason, alternative control methods have become necessary. This study was conducted to determine the antifungal effect of *Origanum onites* L. essential oil against *Sclerotinia sclerotiorum* (Lib.) de Bary, *Alternaria solani*, *Verticillium dahliae* and *Fusarium oxysporum* f. sp. *lycopersici*. Essential oils were applied by impregnation with a micropipette on filter paper adhered to the covers of petri dishes.In the antifungal study 0 (control), 0.5, 0.7, 1, 1.5, 2 and 4 µlpetri^{-1} dish doses were used. In the antifungal study, mycelium diameters in the petri dishes were measured by automatic caliper at the end of the 7th day of incubation period. As a result, essential oil of *O. onites* was inhibited mycelial growth in *A. solani*, FOL, *S. sclerotiorum* and *V. dahliae* at a dose of 1.5 µlpetri^{-1} dish by 100%. It was found that 1.5 µlpetri^{-1} dose of *O. onites* essential oil inhibited the mycelium growth of *S. sclerotiorum* by 13.33%. The essential oil of *O. onites* inhibited the mycelium growth in *A. solani, S. sclerotiorum*, FOL and *V. dahliae* at a dose of 4 µlpetri^{-1} dish by 100%. These findings showed that the *O. onites* essential oil has high antifungal activity. This result showed that *O. onites* essential oil had a potential to replace synthetic pesticides.

Keywords: *Origanum onites, antifungal, essential oil.*

ALLELOPATHIC EFFECT OF *ORIGANUM ONITES* L.ESSENTIAL OIL

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Abstract

In this study allelopathic effect of essential oil obtained from ground parts (shoots + leaves +flowers) of *Origanum onites* L. plant on seed germination and seedling growth of different plantspecies were investigated. Essential oil was obtained with the use of the hydro-distillation method by a Clevenger apparatus from *O. onites* plant collected from Mersin province. The two layers of filter paper were placed at the bottom of 9 cm diameter disposable petri dishes, and then seeds of *Amaranthus retroflexus* L., *Triticum vulgare L.* and *Lepidium sativum* L. were homogeneously distributed on filter paper. Filter papers were thoroughly moistened using distilled water. Piece of filter paper was glued with its inner parts to lid of each petridish. The different concentrations (0, 0.5, 1,1.5, 5, 15 µl/petri dishes) of the essential oil were applied to the filter paper pieces. Then lid of each petridish was closed immediately and sealed with parafilm. Petri dishes were incubated at 12 hours dark -12 hours light periods with an average temperature of 24±1^{o}C for 3 weeks. At the end of incubation period, germination rates, root and shoot lengths of the test plants were determined. The 15 µl/petri concentration of *O. onites* essential oil completely inhibited seed germination, root and shoot growth of *A. retroflexus*, *Triticum vulgare* and *Lepidium sativum* plants. The results showed that *O. onites* essential oil had a potential to be used in the control of *A. retroflexus*, which had high allelopathic effect on seed germination and seedling development of *L. sativum*, *T. vulgare*, *A. retroflexus* plants.

Keywords: *Essential oil, Allelopathic effect, Origanum onites.*

INVESTIGATION OF THE ANTIMICROBIAL EFFECTS OF DIFFERENT PLANT EXTRACTS AGAINST PEA BACTERIAL LEAF BLIGHT DISEASE CAUSED BY PSEUDOMONAS SYRINGAE PV. PISI

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Abstract

Pseudomonas syringae pv. *pisi* causing pea bacterial leaf blight disease in pea production areas all over the world is a seed-borne [bacterial] pathogen. The initial symptoms of the disease are observed as water-soaked stains on the cotyledon leaves and turn into necrotic stains at a further stage. This study tested the antibacterial properties of plant extracts in terms of their biological fight against *Pseudomonas syringae* pv. *pisi*, the pathogen of pea bacterial leaf blight disease. For this purpose, 34 different medicinal and aromatic plant extracts were investigated *in vitro* conditions by using diffusion disc method and the degree of inhibition on inoculum was determined through applying effectual plant extracts to seed before planting in the pot and field experiments. In the petri-experiments, nine plant species with antibacterial effects against the pathogen were identified. Three plant extracts (*Allium sativum* L., *Cistus creticus* L. and *Syzygium aromaticum* L.) which showed the highest antibacterial effect *in vitro* experiments conducted by application of different doses were investigated in terms of their impact on disease outbreak in controlled pot and field experiments. By suppressing disease outbreak, *Syzygium aromaticum* extract showed the highest effect by 95% in pot experiments and 98% in the field experiments. When the impact of seed application on seed germination was investigated, it was identified that seed applied with *Syzygium aromaticum* extract was 100% germinated and had 5% germination enhancing effect. The use of plant extracts as seed application in the integrated management of this disease has been considered as one of the successful management strategies.

Key Words: *Pisum sativum L., Pseudomonas syringae pv. pisi, Seed treatments, Organic agriculture.*

IDENTIFTICATION OF THE SPOILAGE FACTOR YEASTS BY PCR- RFLP METHOD

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Abstract

Yeasts, except for some strains which are used as starter or taste and flavor enhancer, have played a role in spoilage of food. In some cases, strains with positive function for several products can be cause of spoilage in some other products. However, yeasts found in the natural flora of food or contaminated from outside cause the food to deteriorate due to improper production, inadequate storage and transport conditions as well as improper storage methods by consumers during the consumption phase of these products. As a result of various food developments of yeasts, food-borne diseases can be seen, and in particular changes in sensory and chemical properties can be seen. For this reason, the detection and identification of yeasts has become very important. In recent years, the considerable changes have been in yeast identification methods depending on rapid increase of basic biological knowledge, industrial use of yeasts and rapid technological developments. It is known that conventional methods used for identification of yeasts were time-consuming, having low accuracy and repeatability rates. For this reason, in recent years DNA based methods that give rapid and accurate results gradually become widespread. One of most frequently used methods for this purpose is "Restriction Fragment Length Polymorphism" (RFLP) which is based on cutting with particularly Polymerase Chain Reaction (PCR) amplified DNA with restriction endonuclease. In defining this yeast the way in which the PCR-RFLP method is performed will be referred to the gene regions (ITS, IGS, D1/D2 etc.) used, the restriction enzymes (*Hae* III, *Cfo* I, *Hinf I* etc) and the temperature cycles.

Keywords: *Yeast, PCR-RFLP, ITS Gene Regions, Restriction Enzymes.*

OLFACTORY RESPONSE OF THE GENERALIST PREDATOR *ORIUS LAEVIGATUS* (FIEBER) TO SOME VEGETABLE AND FRUIT PUREE

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Abstract

Natural enemies use information cues, mainly plant odors, in their foraging behaviour. The predatory bug *Orius laevigatus* is one of the effective predators against many herbivores in greenhouse vegetables. In mass rearing programs, a diverse variety of natural food stuffs have been employed in artificial diets. For this purpose we analyzed the response of *O. laevigatus* to tomato, carrot, zuchinii and mixed vegetable puree and plum, peach, pear and mixed fruit puree. These products were offered to *O. laevigatus* adult females in 1g quantities in experiments involving a dual choice Y-tube olfactometer. Female predatory bug showed the highest preference for carrot puree to clean air (control) in one replicate (100%). In three replicates female showed high preference for carrot puree (90%), too. *O. laevigatus* did not show a preference in one replicate of zuchinii (30%), but at all replicates preference were 57%. The predatory bug oriented similar preference to tomato puree in three replicates (67%). Mixed vegetable puree attracted *O.laevigatus* in three replicates (83%). However in one replicate predatory bug showed high preference (90%). The predatory bug was attracted to peach, plum, and pear puree 73%, 67%, 40%, respectively. *O. laevigatus* showed high preference (80%) in one replicate for peach and plum puree. Additionally, predatory bug showed 67% preference for mixed fruit puree. However, *O. laevigatus* showed 63% preference when we mixed carrot and peach puree. A better knowledge of the role of olfactory response of predatory bug to different diets will improve the efficiency and utilization of the food in mass rearing programs.

Keywords: *Orius laevigatus, Fruit puree, Vegetable puree, Y-tube olfactometer, Attraction.*

RHIZOBIUM VITISISOLATED FROM THREE NOXIOUS WEEDS XANTHIUM STRUMARIUM, DATURA STRAMONIUM AND CENTAURIA SOLSTITIALIS

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Abstract

The crown gall disease (*Rhizobium vitis*) is an important and common pathogen of grapevine and it causes serious loss in nurseries and plantations worldwide. A survey was carried out in vineyards located in three provinces of Thrace Region of Turkey to determine the occurrence and distribution of *Rhizobium vitis*. Thrace Region is very important for including grape growing areas for producing table grape and wine grape. We can say especially wine grape has high quality. This bacterium was isolated from various varieties of grapevines such as *Merlot, Alphonse Lavallee* L.,*Cinsout, Sangiovese* and three noxious weeds i.e.,common cocklebur (*Xanthium strumarium* L.), jimsonweed (*Datura stramonium* L.) and yellow star-thistle (*Centauria solstitialis* L.). We took some samples gall took place on the stem of plant both of grapevine and noxious weeds and also took some samples from symtompless grapevine and noxious weeds samples and isolated from conductive tissues.These weed species are commonly observed in vineyards of Edirne and Kırklareli with more than 90% frequency of occurrence for *Datura stramonium* in Kırklareli. A Total of 216 vineyards were surveyed for the presence of bacteria and host weed species. *Rhizobium vitis* was isolated from17 of 29 samples of jimsonweed, 4 of 9 samples of common cocklebur and 2 of 4 samples of yellow star-thistle. Small galls were observed in all of weed species.Bacterial isolates were streak on King's B and PDA media. The bacterium were streaked on King's B and not flashed fluorescence under UV were chosen. Pathogenicity tests were conducted in carrot discs and gall formation was observed.

Keywords: *Rhizobium vitis,weeds, Thrace Region, Turkey.*

DETERMINATION OF ANTAGONISTIC AND ANTIBACTERIAL ACTIVITY OF *TRICHODERMA* SPP. AGAINST *RHIZOBIUM VITIS* ISOLATES

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Abstract

Biological plant protection is an important component in the eco-friendly management of plant diseases all over the globe. *Trichoderma* spp. is a strain which is known to produce a number of antibiotics and lytic exoenzymes. The aim of the study is to evaluate the antagonistic and antibacterial activity of *Trichoderma* spp. by agar well method against *Rhizobium vitis*. Seven isolates of *R.vitis* were obtained from Northwestern of Marmara. *Trichoderma spp*. fungi were *isolated* from grass and wood taken from several habitats in Istanbul province. Eleven isolates were chosen among 23 isolates collected for isolation of *Trichoderma* spp. For determination of antagonistic activity, agar well diffusion method was used. In the study, the density of *Trichoderma* was prepared approximately $1.5x10^8$cells/ml and examined in five different doses 5,10,15,25 and 30 µl/ml placed into the wellson potato dextrose agar (PDA).Before placing into the wells, pure colonies of *R.vitis* were transferred to test tube containing *sterile distilled water*to get a final concentration of 1×10^8 CFU/mland uniformly spread on PDA.The experiment was conducted five times. Sterile water was used as negative control and streptomycin was used as positive control. After incubation for 48 h at 28°C, the diameters of the inhibition zones were measured with a millimeter scale and recorded to evaluate antagonistic activity.*Trichoderma* spp. applied at a dose of 30 µl/mlwas the most antagonistic againstfour isolates of *R. vitis*among the other tested doses. Particularly, significant inhibitory effect was observed at 30 µl/ml against one of *R.vitis* isolate with inhibition zone diameter of 56 mm.

Keywords: *Rhizobium vitis, Trichoderma spp., biological control.*

DETACHED LEAF TEST FOR EVALUATION OF RESISTANCE TO POWDERY MILDEW IN PEPPER

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Abstract

Tests of resistance against powdery mildew (*Leveillula taurica*) during pepper (*Capsicum* spp.) breeding studies were carried out by spraying a conidia suspension on whole potted plants grown in the greenhouse. High amounts of inoculum, labour and large experimental areas were needed for these tests. The aim of this study was to investigate the possibilities to use of detached leaves placed on different media and maintained under different conditions. Detached leaves of an 80-day-old from sensitive cultivar (Moonset F1) were used during the experiments. Leaves were surface-sterilized with 70% ethanol, then rinsed in sterile distilled water. After drying on sterile filter paper, leaves were placed bottom side up in petri dishes containing water agar (A) or moistened filter paper (B). Leaves were inoculated with conidia using three different methods: slight brushing of conidia from sporulating zones onto the leaf (a), spraying conidia suspension ($1X10^5$ conidia/ml) in distilled water (b) and in sterilized distilled water (c). Petri dishes sealed with parafilm were kept in two different conditions: 16^oC for 24 h in dark, then at 22^oC for 14 h light/10 h dark photoperiod (I) and 21^oC for 12 h light/12 h dark photoperiod in a climatically controlled room (II). The methods were combined with each other. First limited sporulation was observed on leaves in the method combination AbI at one week after inoculation, but symptoms then developed slowly. Sporulation started at 15 days after inoculation in the method combinations, AaII, AbII, BaII and BbII, and these methods gave infected leaf area of 50% or more with powdery mildew at 25 days after inoculation. The authors suggest that detached leaves test might be very practical to assess the resistance of pepper lines against to powdery mildew disease for breeding programme.

Keywords: *Pepper* (*Capsicum annuum*), *Powdery mildew, Resistance, Detached leaves.*

DETERMINATION OF SEED-BORNE FUNGI IN SOME SUNFLOWER LINES WITH DIFFERENT TOLERANCE DEGREE TO DOWNY MILDEW DISEASE

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Abstract

The aim of this study was to identify fungi species on pericarps and seeds of sunflower genotypes, which were highly sensitive and tolerant against downy mildew, and their pathogenicities in this study. Five genotypes from each group were tested. Pericarps with seeds were surface sterilized with sodium hypochlorite of 2% for 7 min. and then rinsed in sterile distilled water for two times. Pericarps and seeds were separated using scalpel and were separately placed on Petri dishes containing Potato Dextrose Agar. They were incubated at 23^{o}C in dark for a week. *Alternaria alternata* was determined in seeds and perikarps of all sensitive genotypes. The presence of *A. infectoria*, *Bipolaris cynodontis*, *Cladosporium cladosporioides* and *Fusarium oxysporum* differed to sensitive genotypes, pericarps and seeds. The highest pericarp and seed rate contaminated with fungi was recorded on sensitive genotypes 2517-A (19%) and 9728-A 16(%), respectively. The pericarps and seeds of tolerant genotypes against sunflower downy mildew were commonly contaminated with *F. culmorum*. However, *A. alternata* was present in three tolerant genotypes and *A. infectoria* was found in one genotype. Among the tolerant genotypes, pericarps and seeds of 13-TR-001 (19%) and TTAE-13-19 (6%), respectively, were contaminated with fungi at the highest rate. In pathogenicity tests by inoculation of pericarps with seeds, *A. alternata* caused disease severity ranged from 24.03% to 33.3%. This range was between 6.31% and 22.7%, 19.37% and 30.7%, 22.25% and 26.27%, 29.03% and 52.03%, 19.37% and 38.7% for *A. infectoria*, *B. cynodontis*, *C. cladosporioides*, *F. culmorum* and *F. oxysporum*, respectively.

Keywords: *Sunflower (Helianthus annuus L.), Seed-borne fungi, Pathogenicity*.

SPORULATION AREA ANALYSIS FOR RESISTANCE ASSESSMENT TO DOWNY MILDEW IN GRAPEVINE LEAVES

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Abstract

Foliar test in the laboratory is a practical way to ensure the need of a specific environment for disease development and to screen a large number of genotypes. In this study, fifty genotypes were tested for their resistance to downy mildew (*Plasmopara viticola*) on detached leaves by measuring sporulation area (mm^2) and determining sporulation severity as visual. F_1 individuals of Alphonse Lavallée (table grape cultivar and sensitive) x Regent grape (wine grape cultivar and highly resistant) crosses were used as plant material. Sporangia of the pathogen isolate were collected from a single sporulation lesion on Cabernet Sauvignon. The detached leaves were surface-sterilized with 70% ethanol, then rinsed in sterile distilled water. After drying, leaves were placed upside down on water agar in petri dishes. Ten droplets (20µl each) of sporangia suspension ($4X10^5$ sporangia/ml) were deposited on leaves. Sealed petri dishes were held at 22^oC and 100% relative humidity for 24 h in the dark, then under 16 h light and 8 h dark photoperiod for 7 days. Sporulation severity (%) was rated using a 0-4 scale based on the level of sporulation ranging from no reaction at all and necrotic reaction to profuse and unlimited sporulation. Area of sporulation (mm^2) was measured using analysis software program under a stereomicroscope. No sporulation was revealed in five genotypes. The genotypes had different resistance levels ranging from 0% (extremely resistant) to 100% (extremely sensitive) and 0 mm^2 (extremely resistant) to 28.60 mm^2 (extremely sensitive) for sporulation severity and sporulation area, respectively. There was highly significant correlation between two evaluation methods ($r=0.92$, $p<0.01$). However, some of the genotypes showed high sporulation severitybut narrow sporulation area, or vice versa. Authors suggest that the measurement of sporulation area is an efficient method for the rapid and reliable assessment of genotypes for their resistance to downy mildew.

Keywords: *Grapevine, Downy mildew, Foliar resistance, Sporulation area.*

Acknowledgements

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THIOPHANATE METHYL SUSCEPTIBILITY AND ALTERATIONS IN GENE EXPRESSION OF *FUSARIUM GRAMINEARUM* AND *F. CULMORUM* ISOLATES

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Abstract

Fusarium graminearum and *F. culmorum* show great variation in terms of phenotypic, biochemical and genetic characteristics. In this study, survival and toxin production related gene expressions, linear growth rate, thiophanate methyl (TPM) resistance, and beta-tubulin nucleotide sequence knowledge of *F. graminearum* from Turkey and Iran and *F. culmorum* isolates from Turkey were explored. The mean linear growth rate values of the isolates varied from 7.58 to 15.16 mm/day. In TPM implementing analysis, each isolate was characterized as highly sensitive to TPM, with IC_{50} values between 2 and 4 µg/mL TPM. TPM applied isolates showed increased *Mgv* and *StuA* expression and decreased tri5 gene expression. Amino acid conservations at 198 and 200 codons in the beta tubulin gene were investigated to confirm the TPM resistance. Each isolate showed conserved amino acids at 198. and 200. codons, resulting in sensitive genotypes. The bootstrap support value for genetic similarity was more than 70%. This study showed that *Fusarium* isolates that cause head blight and crown rot in Turkey had a low level of variation in terms of phenotype and genetic characteristics. Moreover, this study is the first report to show that TPM lead to a potential decrease in toxin production associated genes and increase in potential of sexual/asexual reproduction genes. These results could provide comprehensive data on the fight against Fusarium pathogens.

Keywords: *Antifungal, Crown rot, Fusarium head blight, PCR, Real time PCR.*

EFFECT OF COOKING PROCESS ON THE FISH FILLETS HAVING DIFFERENT INITIAL QUALITY

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Abstract

Food safety and awareness are important issues for the consumers. In this sense, besides raw material quality, the quality of cooked fish is important for the consumers as well. In this study, fish samples without gut and head were stored at refrigerator conditions and the samples were taken out from the refrigerator and analyzed to determine the microbiological, sensory quality and the changes in pH value during the analysis period. Raw material quality of the samples was rapidly deteriorating, but the quality of the cooked samples obtained from the mentioned raw material was found to be open to the trick in terms of food safety. The growth in coliform and total mesophilic bacteria (TMAB) of the cooked samples was found <1 log CFU/g. pH value of the cooked samples was defined as higher depending on the cooking process. Sensory scores including odor, color, and texture of the cooked samples were higher compared to the raw materials ($p<0.05$). Taste parameter of the cooked samples was liked by the trained panelists until the 7^{th} day of the analysis period. In this respect, cooking temperature (70 ºC and 140 ºC) might inhibit microbial load in the raw material, but at that moment cooked fish samples could be hazards in terms of toxins or spores of the bacteria for the consumer in the outdoor. In this sense, the study results revealed that sensory evaluation of the cooked samples was much more important for the consumers while taking a service in outdoor.

Keywords: *Fish, cooked fish, raw material, quality, food awareness.*

MONITORING OF ROSEMARY PLANT STRESS BY USING REMOTE SENSING

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Abstract

Remote sensing and its terrestrial components are great importance in detection and monitoring of plant health in agricultural applications. Remote sensing could bring about rapid, effective and cost-effective solution to agricultural issues. In addition, remote sensing is also extremely effective in determining the amount of fertilization, irrigation and stress applied to the plant. In this study, it was aimed to determine the stress applied to the rosemary plant (*Rosmarinus officinalis*) and the change in the spectral signatures of the plants accordingly. In this context, 0, 5.76 g, 11.52 g and 23.04 g salt solution with 100 ml scales were given to the rosemary plants grown in the greenhouse environment in a controlled manner. Experiments were conducted as a randomized complete design method with three replicates. Spectroradiometer measurements were then made on the leaves of rosemary plants in order to monitor the change in spectral signatures depending on the stress level of each plant. In addition, chlorophyll (LAB) values of plants were measured and it was determined how much the applied stress affected the LAB content.

Keywords: *Remote sensing, Spectroradiometer measurements, Salt stress, Rosemary*

ACTIVITY AND BIOLOGICAL EFFECTS OF NEEM (*AZADIRACHTA INDICA*) DERIVED ON INSECTS AND ENVIRONMENT

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Abstract

In the next 20–30 years, pesticides actually in use will probably lose their effects. In particular, alert concerns the main resurgent mosquito-borne diseases, including malaria, dengue, yellow fever, as well as the very recent Zika virus outbreaks. In these cases, the two aspects of resistance can synergize each other, amplifying the danger. Indeed, insecticide resistance has developed in mosquito vectors and antimicrobial drug resistance in pathogens. Researchers are looking for novel active substances and adapting strategies. Plant-derived natural products are considered valuable sources of novel bioactive substances. Neem (*Azadirachta indica* A. Juss, Meliaceae) has been used extensively against an array of pest species in the recent years as a plant biopesticide. *A. indica*, contains at least 35 biologically active principles. Azadirachtin is the predominant insecticidal active ingredient in the seed, leaves, and other parts of the neem tree. Azadirachtin and other compounds in neem products exhibit various modes of action against insects such as antifeedancy, growth regulation, fecundity suppression and sterilization, oviposition repellency or attractancy, changes in biological fitness, and blocking development of vector-borne pathogens. Nevertheless, the amount of information on the activity, use, and application of neem products for the control of disease vectors and human and animal pests is limited. Additional research is needed to determine the potential usefulness of neem products in vector control programs. Here it is reviewed, synthesized, and analyzed published information on the activity, modes of action, and other biological effects of neem products against the environment and insects of medical and veterinary importance.

Keywords: *Azadirachta indica*, *Neem-derived pesticides, Plant biopesticide, Biological activity, Health evaluation.*

ERIOPHYOID MITES AND THEIR POPULATION DENSITIES ON WEEDS OF THE FAMILY POACEAE IN WHEAT FIELDS IN THE CENTRAL ANATOLIAN REGION OF TURKEY

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Abstract

Eriophyoid mites have generated considerable interest in their usefor the biological control of weeds.This study investigatederiophyoid mites on weeds in 112 wheat fields in Ankara and Nevşehir Provinces in Turkey between April and July from 2010 to 2015. The survey was conducted with a quadrat sampling method. A total of six weed species belonging to Poaceae were collected. Twenty five shoots and fifty leaves from each field were checked for mites with a stereomicroscope. All of the mites were mounted on slides and identified. Additionally, eriophyid mites were counted in a 4 cm^2 area of both the upper and lower surfaces of the 50 leaves to determine the population density of each species. Three species of Eriophyidae were found on four weed species, namely *Aceria tenuis* (Nalepa) on *Poa annua* L., *Abacarus hystrix* (Nalepa) on *Alopecurus myosuroides* Huds. and *Bromus tectorum* L., and *Aceria tosichella* Keiferon *Hordeum murinum* L. *Aceria tenuis* and *Abacarus hystrix* were found on *Poa annua* and *Alopecurus myosuroides*, respectively, for the first time. *Abacarus hystrix* on *B. tectorum* and *A. tenuis* on *P. annua* had the highest and lowest population densities, respectively.

Keywords: *Acari, Eriophyidae, Poaceae, biological control, wheat.*

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PROPETIES OF SOME PLANTS USED AS FOLK MEDICINE BY TYPE 2 DIABETES MELLITUS PATIENTS

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Abstract

Diabetes mellitus (DM) is described by World Health Organisation as "Chronic, metabolic disease characterized by elevated levels of blood glucose (or blood sugar), which leads over time to serious damage to the heart, blood vessels, eyes, kidneys, and nerves". Oral antidiabetic agents, insulin, diet and lifestyle changes are conventional therapy in DM. However, patients also prefer complementary therapies including plants. In literature there are various studies on this subject. Culture, geographic location, religion etc. effect the type of plants commonly used. According to the studies, the most widely used plants are *Nigella sativa*, *Cinnamomum sp*, *Prunus Amygdalus amara*, *Thymus vulgaris*, and *Olea europaea L. folium*. Bioactive compounds (thymoquinone, cinnamaldehyde, catechin, epicatechin, cyaniding, procyanidin etc.) found in these plants have antidiabetic properties. In vitro and experimental animal studies have showed these plants improve fasting glucose, HbA1c and insulin sensitivity, stimulate insulin secretion, and inhibit carbohydrate digestion. There are also interventional studies indicating beneficial effects of the folk medicine plants on DM patients but due to the lack of strong research evidence there is no primary recommendation for usage in the management of diabetes.

Keywords: *Type 2 diabetes mellitus, Plants, Folk medicine.*

SOME QUALITY PARAMETERS OF HONEY FROM BALKAN REGION

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Abstract

Honey, which is a sweet food product, is produced by honey bees *(Apis Mellifera)* via collecting nectar from flowers and plant secretions and transforming it with their own secretions. Honey is mainly composed of carbonhydrates but it also contains aroma compounds, minerals, flavanoids and vitamins. Since ancient times, honey has been used due to its nutritional and medical value around the world. Countless researches have been done about worth while properties of honey such as antioxidant, antimicrobial, antiinflammatory properties. Honey has been one of the most important products of apitherapy, complementary medicine discipline which use hive products, through current researches. Balkan region has proper conditions for beekeeping activities and beekeeping is a common activity in this region. However adulterated or fake honey can be found easily in market. In this study, samples from different countries (Turkey, Macedonia, Bulgaria, Serbia, Montenegro, Kosovo, Bosnia and Herzegovina) of Balkan region were analyzed. Sugar composition analysis, moisture analysis and HMF analysis were implemented for 35 honey samples from harvests in 2015, 2016 and 2017. Mean values of fructose+glucose, sucrose, maltose, moisture, brix and HMF were 69,40%, 2,02%, 2,93%, 17,71%, 80,45% and 126,74 ppm respectively.

Keywords: *Balkan, honey, HMF, sugar composition.*

EFFECT OF ENTOMOPATHOGENIC NEMATODE ISOLATES FROM TURKEY AND KYRGYZSTAN AGAINST *CULEX PIPIENS* L. (DIPTERA: CULICIDAE)

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Abstract

Entomopathogenic nematodes (EPN) are widely used in the control of many insects. For this purpose, isolated *Steinernema feltiae* (Aydin isolate-1), *S. carpocapsa* (Black sea isolate) and *Heterorhabditis bacteriophora* (Aydin isolate-2) obtained from Turkey and *S. feltiae* (KG3) and *H. bacteriophora* (KG81) EPN's obtained from Kyrgyzstan were applied to *C. pipiens* larvae in laboratory conditions. The *C. pipiens* larvae used in the study was obtained from natural populations. The EPN suspension used in the study was determined as 500 IJs ml $^{-1}$,1000 IJs ml $^{-1}$ and 1500 IJs ml $^{-1}$. In the study, 0.5 liters of water were taken from the water obtained from the environment where the *C. pipiens* larvae were taken and put into 1 kg plastic containers along with 10 larvae. EPNs were transferred to these containers at the doses indicated above. On the 5th day of the study, at the dose of 1500 IJs ml^{-1} KG81 and Black sea isolate EPN isolates resulted in 100% mortality, while Aydın isolate-1, KG3 and Aydin isolate-2 was found to be effective at 70%, 66.7%, and 13.3%, respectively. When the LD90 values of the EPNs used in the study were also examined at the end of the 5th day in 1500 IJs ml^{-1} dose, KG81, Aydin isolate-2, Black sea isolate, KG3 and Aydin isolate-1 were determined as 2.74, 15.03, 15.8, 17.9, and 21.7IJs ml^{-1} dose, respectively. As a result, KG81 and Black sea isolate EPN isolates at a dose of 1500 IJs ml^{-1} were found to be highly effective against *C. pipiens* larvae.

Keywords: *C. pipiens, Entomopathogenic nematodes (EPN), Steinernema spp., Heterorhabditis spp.*

EFFICIENCY OF SOME BACTERIAL ISOLATES AGAINST GREEN SHIELD BUG (*PALOMENA PRASINA* L., HEMIPTERA: PENTATOMIDAE)

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Abstract

Green shield bug (*Palomena prasina* L., Hemiptera: Pentatomidae) is a very common pest species in Turkish hazelnut orchards.*P. prasina* causes serious loss of yield by damaging quality and quantity in the edible parts of the hazelnut. Usually, chemical control methods are applied against this pest. Due to the adverse effects of insecticides on the environment and human health, alternative control methods are gaining importance and microbial control methods are taking central stage in the field. For this purpose, four different entomopathogenic bacterium isolates 271a (*Bacillus thuringiensis*), Akçakoca2 (*Bacillus megaterium*), HMA5 *(Bacillus megaterium*), FPN2 (*Pseudomonas putida*)) were applied against nymphs and adults of *P. prasina* under laboratory conditions (24° C, 70% humidity). The study was conducted in two iterations and three replications, and each replication was composed of 5 individuals of the same age and was observed for 12 days. All isolates were used at 10^8cells ml $^{-1}$ concentration. Percent effects were calculated via the Abbott formula. In the study, Akçakoca2 and FPM2 isolates were found to be 100% effective, followed by HMA5 isolate at 96% and 271a isolate at 73%. When the effects of entomopathogenic bacterial isolates against the adults were examined, it was found that Akçakoca2 isolate was 75% effective, followed by 271a isolate at 70%, FPM2 isolate at 50%, and HMA5 isolate at 41%. As a result, Akçakoca2 isolate was identified as most effective against both adults and nymphs of *P. prasina*, and this isolate had close effects to chemical drugs. All of the isolates used were found to be more effective on *P. prasina* nymphs when compared to the adults.

Keywords: *Palomena prasina, Green Shield Bug, bacterium, control.*

ACCUMULATION OF HEAVY METALS IN *CAMELLIA SINENSIS* PLANTS GROWN ON DIFFERENT LOCATIONS

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Abstract

Plants can be easily contaminated with heavy metals in all stages of their development from the environment (soil, water, or air-rainfall, atmospheric dust) and also later, during the manufacturing processes. Additional sources of heavy metal contamination are plant protective agents and fertilizers. Tea plays a major role in terms of the intake of a number of nutritional trace elements and biologically active compounds in humans. The current study aimed to determine the Co, Pb, Ni, Cr, Cu, Fe, Zn and Mn concentrations in tea and soil at sixteen sampling areas and to identify how the traffic factor effect on tea samples. This research was conducted at Artvin, Rize, Trabzon and Giresun provinces, located in north eastern of Turkey. Sixteen sampling areas were set at "polluted area (8 different areas)" located near the main traffic roads and "non-polluted area (8 different areas)" far from the main traffic roads with a relatively low anthropogenic impact and hardly any industry. A total of 48 tea leaf samples (a bud and two leaves) were collected at all mentioned areas in May, June and August 2013. Soil samples were taken only once in May. All tea and soil samples were prepared for analysis and measurements were performed by the ICP-OES. There were significant differences ($P < 0.01$) for Co, Ni, Fe, Zn and Mn except for Cr and Cu ($P < 0.05$) in terms of the leaf among the localities. There were statistically important differences for Pb, Cu, Fe, Zn and Mn ($P < 0.01$) and for Co ($P < 0.05$) according to harvested time of tea plants. There were significant differences ($P < 0.01$) for all elements between soil samples from all localities. Results showed that heavy metal concentrations of tea plants grown in traffic based areas were higher than non-polluted areas. Heavy metal contents of soil increased remarkably in traffic based areas.

Keywords: *Heavy metal, ICP-OES, Soil, Tea, Turkey.*

EFFICACY OF BIOLOGICAL SEED TREATMENTS ON BACTERIAL SEEDLING BLIGHT AND FRUIT BLOTCH OF MELON

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Abstract

The seedling blight and fruit blotch of melon caused by *Acidovorax citrulli* (*Ac*) is a devastating disease all over the world including Turkey. Since all cucurbit plants are the host of *Ac*, the seed-borne pathogen causes severe disease symptoms on watermelons and melons. Initial symptoms are water-soaked irregular spots, light brown to reddish spots advancing through veins on leaves, small water-soaked lesions, greasy, dark olive green colour areas on the surfaces of melon fruit followed by brown lesions, softening, and cracks. Pathogen-free seeds are crucial for disease control. In this study, efficacy of 14 putative antagonistic bacterial strains on disease development of melons as seed treatments was evaluated. Artificially pathogen and bacterial antagonist treated melon seeds were sown in pots and kept in chamber rooms under 30ºC 85% humidity. Disease symptoms were visualized daily and disease severity and incidence were evaluated ten days after germination when first disease symptoms appeared on control plants. Fourteen individual antagonistic bacteria inhibited disease development and disease severity from 10 to 93% and 30 to 94%, respectively. Five out of fourteen antagonists reduced disease incidence and disease severity over 70% and 75%. The antagonists were identified as *Pseudomonas oryzihabitans* strain 12, *Microbacterium oxydans* strain 79, *Proteus mirabilis* strain 147, *Curtobacterium flaccumfaciens* strain 198 and *Pseudomonas fluorescens* strain 273. This study concluded the biocontrol efficacy of antagonistic bacteria on melon seedling blight and fruit blotch. The potential of antagonists for disease control are recommended to be tested under greenhouse and field conditions for further studies.

Keywords: *Melon, seed, Acidovorax citrulli, biological control.*

RING NEMATODE MESOCRICONEMA XENOPLAX RASKI, 1952 AND SOME HOST PLANTS IN TURKEY

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Abstract

Mesocriconema xenoplax (Raski, 1952) (Nematoda: Tylenchida) is a cosmopolite nematode damaging several crop plants. Damage by this nematode has been most extensively studied on Prunus spp. and Juglans spp. It causes pruning and necrosis of fine feeder roots, especially on young plants, but also feeds on older parts of the root. The species can be reproduced from 20 fold times in 5 months on host plants. Specimens of M. xenoplax were frequently observed deeply inserted inside roots and an extensive area of epidermis erosion was also visible surrounding me lesions. The feeding of M. xenoplax was found to be a more complex process than regular ectoparasitism and was characterized as an eeto-endoparasitic behaviour. A survey on the incidence of nematode species were conducted in vineyards and orchards in northwestern Marmara Region and oil samples were collected from 0-40 cm soil depth. Nematodes were extracted by Jenkins (1964) sugar centrifuge method from 200 gr soil subsamples. At the end of the study *M. xenoplax* was found in olive, walnut, almond, peach, cherry orchards and vineyards. Nematode population in 100 gr soil was measured as 10-70 individuals. Morphometric measurements of eight females were: L= 486-612 µm, Stylet= 70-83,6 µm, body width= 32,1-37 µm, tail length= 29,9-44,9 µm, vulva % 88-94.

Key words: *Vineyards, Mesocriconema xenoplax, Thrace.*

INFLUENCE OF TEMPERATURE ON DEVELOPMENT AND REPRODUCTION OF DITYLENCHUS DIPSACI ON CHICKPEA

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Abstract

6 accession of wild *cicer* sp (3 of *Cicer reticulatum* and 3 of *C.echinospermum*) and 3 accession of *cicer arietinum* were conducted for study the effect of temperature and time on life cycle of *Ditylenchus dipsaci*. The current study examined nematode life-stage progression and generation time on chickpea as affected by temperature with the related pest, *D. dipsaci* used as a positive control. Egg hatch of *Ditylenchus dipsaci* was influenced by temperature. The effect of temperature on egg production, hatching and the life cycle of *Ditylenchus dipsaci* isolated from chickpea in South Turkey was investigated in vitro. It took place at all temperatures within the range 15–25°C and was optimal at 20°C. Root penetration was steadily rising with increasing time of incubation up to the end of the experiment 10 days after inoculation. The result of study indicated that temperature affected penetration rate in chickpea (*Cicer arietinum*) genotype was more than wild cicer sp genotype. But there was no significant difference observed between wild chickpea genotype in percentage penetration. Also, this study indicated that the optimum temperature for the development of *D. dipsaci* was 25°C. At this temperature, most eggs were produced and egg hatch started earlier. As the temperature decreased below 25°C, fewer eggs were produced, egg hatch started later, the time required for hatching increased and egg viability was decrease.

Keywords: *Ditylenchus dipsaci, Chickpea, Reproduction, Temperature.*

BACTERIAL PATHOGENS ON EGGPLANT IN TURKEY

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Abstract

Eggplant is an essential grown plant in the greenhouses and open fields in Turkey. Two important cities in Turkey, Mersin and Diyarbakir, have an important place regarding eggplant production area. In recent years, different bacterial pathogens have been observed on the eggplants. For this reason, bacterial wilt and leaf blight were addressed in this study. Pathogen isolations were performed from infected eggplant leaves and stems. Isolated samples were streaked on Nutrient agar, King's Medium B and incubated at 27ºC for a single bacterial colony growth. Totally, 14 bacterial strains were purified, and all strains were stored on Yeast Dextrose Calcium Carbonate (YDC) medium. Following bacterial pathogen storage, pathogenicity assay was performed for both bacterial pathogens. As result of pathogenicity assay for all strains, similar symptoms appeared on 25 days old healthy eggplant seedlings cv Kemer. Many classical and molecular methods can be tested for identification of plant bacterial pathogens. Classical methods were applied as following steps: gram reaction, starch hydrolyzes, the hypersensitive response (HR) on four o'clock plant (*Mirabilis jalapa)* leaves. The sequence analysis was also carried out for unknown strains based on 16S ribosomal RNA as molecular method. The BLAST analysis demonstrated that the isolated strains fromblighted eggplant leaves were found as *Xanthomonas* sp., and the bacterial strainsisolated from wilted plants resulted as *Clavibacter michiganensis* subs. *michiganensis*. Consequently, the presence of bacterial pathogens on the eggplant is proved in Turkey.

Key words: *Eggplant, phytopathogen, Clavibacter, Xanthomonas.*

IN VITRO ANTIBACTERIAL EXPLORATION OF *SALIX ALBA* AGAINST GRAM-POSITIVE AND GRAM-NEGATIVE BACTERIAL STRAINS

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Abstract

Salix alba, the white willow, is a species of willow native to Europe and western and central Asia. Antibacterial properties of *Salix alba L.* were explored against seven selected bacterial strains. Methanolic extracts were prepared separately for both bark and leaves of the plant and used in different doses (100mg/ml and 75mg/ml) against seven Gram-positive and Gram-negative bacterial strains *Streptococcus pyrogenes, Staphylococcus aureus, Staphylococcus aureus, Shigella sonnei, Escherichia coli, Escherichia coli* and *Neisseria gonorrhoeae*. The agar well diffusion method was used for the determination of MICs, MBCs and zones of inhibition against dreaded bacterial pathogens. Good average activities in comparison to the standard antibiotic used (gentamycin) were agents that can help to control diseases of plants, animals and can also result in development of natural food preservatives.

Keywords: *In Vitro, Salix Alba, Bacteria.*

DETERMINATION OF RESISTANCE TO *STRIGA ASIATICA* L. KUNTZE USING AGAR GEL ANALYSIS AND SAND CULTURE IN *SORGHUM BICOLOR* L. MOENCH AND *SORGHUM ARUNDINACEUM*IN ZIMBABWE

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Abstract

Resistance through reduced strigolactones is one of the sustainable ways of managing *Striga asiatica*. To verify the existence of reduced strigolactone production in sorghum genotypes, an agar gel assay was carried out on seven sorghum bicolor lines and one *Sorghum arundinaceum* sourced in Zimbabwe. In the first experiment, pre-germinated *Striga* seeds were pipette into a petri dish with drying agar gel and pre-germinated sorghum seedlings were grown across the petri dish. The eight sorghum genotypes were also grown in a sand culture and the number of *Striga* that attached were recorded. The results indicated that Sorghum genotypes varied significantly ($P<0.05$) with respect to maximum germination distance (Mgd) with wild sorghum and SC Sila having the largest mgds indicating that they produced the largest quantities of strigolactones. The genotypes Mukadziusaende had the highest tiller numbers while SC Sila had the lowest. *Striga* counts were the highest on Wild Sorghum, Ruzangwaya and Hlubi. There was a negative correlation between mgd and tiller number showing that the highest strigolactone producers had low tiller numbers. A correlation coefficient of 0.564 between mgd and *Striga* counts showed that as Strigolactones increase *Striga* counts also increase.It can therefore be concluded that resistance through reduced strigolactones was found in the sorghum genotype Mukadziusaende. The direct relationship between mgd means that tiller number can be used to select for reduced strigolactone production in the field.

Keywords: *Striga, sorghum, parasite, resistance, maximum germination distance.*

THE PARASITIC WEEDS SCOURGE IN NORTHERN ZIMBABWE: EFFECTS OF LAND DEGRADATION, MANAGEMENT, FARM INVESTMENT AND THEIR FOOD SECURITY IMPLICATIONS ON RURAL FARMERS

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Abstract

A survey was undertaken to determine the economic status of parasitic weeds, the host crops, management and soil conditions that perpetuate the *Striga* and *Alectra* weeds. Descriptive statistics were largely used for describing the results. The results found that the major crops grown by farmers in the area were maize, cowpeas, sorghum, groundnuts, bambaranuts, millets, tobacco and common beans. The parasitic weeds identified in the fields were *Striga asiatica*, *Striga gesneroides* and *Alectra vogelii*. In at least 50 % of the fields survey the three weeds co-occurred in the same field and that makes management of the parasites difficult. Both *Striga asiatica* and *Striga gesneroides* had a wild host which supported the parasite even when crop hosts were not grown. More than 90 % of the farmers who inherited the fields from their parents reported that the weeds were there when they got the land. The farmers who cleared new fields reported that the weed has appeared spontaneously. The weeds were rated as very serious weeds which usually lead to total crop loss. The major management technique has been rotation with cotton but due to the falling of world cotton prices farmers are forced to grow tobacco which is a host to *S gesneroides*.

Keywords: *Parasitic weed, food security, rotations, cereals, legumes***.**

ROLE OF CHITOSAN-BASED NANOPARTICLE ON SOME QUALITY INDICES OF MINCED FISH

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Abstract

Fish is highly perishable food, furthermore, minced fish can be more easily deteriorated as compared to whole fish samples. Therefore, preservation of the initial quality of minced fish is harder. The fish flesh was wholly separated from bones and skin before mincing process. Electrospun nanoparticles successfully obtained from chitosan were utilized to be a nano-scale additive in order to delay the rapid deterioration of fish mince. 100-g samples were minced for a minute and then 0.015 g chitosan-based nanoparticles were added to 100-g the minced fish samples. The samples containing nanoparticles and control group samples (not containing nanoparticle) were stored at 4 ºC and analyzed in terms of some quality parameters such as sensory quality changes. In this sense, the use of nano-scale material, providing larger contact area and having cost-effective, delayed the rapid deterioration especially in the initial storage period of minced fish. The results revealed that initial quality (such as in odor and pH) of the samples containing nanoparticle < 637.4 nm was successfully preserved. Also, the study suggested that the use of biopolymer-based nanoparticle is promising and cost-effective material to delay the rapid deterioration of the more easily perishable processed samples. Thus, the study can guide the further study regarding provide cost-effective preservation in the food sector. The use of nano-scale material, instead of micro and macro scale material in food preservation, can serve as a role model for the further food preservation applications.

Keywords: *Nanotechnology, chitosan-based nanoparticle, fish, pH, sensory.*

3. ORGANIC AGRICULTURE

CHEMICAL COMPOSITION AND ANTIOXIDANT FEATURES OF THREE LEAFY CULTURES – BROAD LEAVED DOCK, CURLED DOCK AND LEAF BEET

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Abstract

The paper analyzes the chemical composition and antioxidant features of three leafy cultures: broad leaved dock (*Rumex obtusifolius* L.), curled dock (*Rumex crispus* L.) and leaf beet (*Beta vulgaris* L. ssp. *vulgaris*). Plants were grown in an organic garden with a random distribution and approximately equal cover density. The analysis encompassed following parameters: mineral composition (As, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Mo, Na, Ni, P, Pb, Se, Zn), anthocyanins (total and monomeric), β-carotene, vitamin C, phenols, flavonoids and flavonols. Antioxidant capacity was evaluated through ABTS and DPPH tests. The researches have shown that all three species have almost equal content of β-carotene, while the broad leaved dock is inferior to the content of anthocyanins. With regards to phenols, flavonoids and flavonols, curled dock is ahead. Next in order is broad lived dock, while leaf beet shows the poorest results with observed features. The same case is with vitamin C and antioxidant properties. Only in the case of macro- and microelements, the results are polycentric. So, leaf beet predominates in the selenium content. Broad lived dock has the advantage in the content of copper and sodium while curled dock is superior in terms of calcium and iron.

Key words: *leaf beet, curled dock, broad leaved dock, chemical composition, antioxidant properties.*

IMPORTANCE OF ORGANIC PRODUCT CHARACTERISTICS FOR CUSTOMERS IN THE REPUBLIC OF CROATIA

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Abstract

The growth trend of the number of organic producers and of the areas with organic farming in the Republic of Croatia has not been accompanied by the increase in consumer awareness when it comes to the characteristics of organic farming or by the strengthening of the market for organic products in the Republic of Croatia. This paper focuses on determining the motivation, limitations and preferences of consumers regarding their intention to buy organic products as well as their choice of distribution channels. The research covers questions about understanding the differences between organic and conventional products, the meaning of the term "organic product", as well as issues related to the attitudes of the respondents trust in organic products, and the understanding of legislation on organic farming. The survey, conducted between January and April 2018, covered 218 social network users from the Republic of Croatia. The sample was gender balanced, consisting of 52% men and 48% women, of whom 57% were employed, 21% were self-employed and the rest were students and senior citizens. Out of the total number of respondents, more than a half grew up in towns and suburban areas. The results of the research indicate that consumers are insufficiently informed about the legal framework for organic farming with less than a half of the respondents giving a correct definition of an organic product, even though 90% of the respondents believe that there is a difference between organic and conventional farming. When deciding on buying organic products, most respondents consider the health aspects, taste, quality and supporting local production to be more important than the certificate, producer/brand and the packaging/design of an organic product. The results of the research identified the basic limitations that influence the decision to buy organic products and underline the need to strengthen consumer involvement in the enforcement of marketing activities.

Keywords: *organic products characteristics, customer knowledge, preferences, willingness to buy, Republic of Croatia.*

EFFECT OF CHEMICAL FERTILIZERS REPLACEMENT BY COMPOST ON PEANUT PRODUCTIVITY GROWN UNDER WATER DEFICIT IN EAST OF EL-EWINAT (EGYPT)

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Abstract

Crops productivity is limited due to low fertility level, water holding capacity, organic matter of soil and higher evaporation rate when the crops grown in sandy soils. For these reasons application of compost in sand soil can improve crop production and their resistance to abiotic stress such as water deficit, salinity and extreme temperature. Two field experiments were carried out at Agricultural Research Station, East of El-Ewinat (Egypt) during 2015 and 2016 seasons to investigate the effects of the replacement of chemical fertilizers by compost on peanut productivity grown under water deficit conditions. A randomized complete block design (RCBD) using a split-plot arrangement with three replications was applied. Two water treatments (100% and 70% from the amount of water consumption for peanut) were randomly assigned in the main plots. Five treatments of chemical fertilizers, compost and their combinations were randomly allocated in the sub-plots. The results showed that the peanut yield and its attributes were significantly increased in all studied parameters in both seasons with the replacement of chemical fertilizers by compost. This result indicated that compost improved plant resistance to water deficit due to water availability and use, and improved nutrients availability which appeared critical in improving peanut performance.

Key words: *Compost, chemical fertilizers, nutrient, peanut, water deficit.*

INTERCROPPING POTATO UNDER CITRUS TREES AS ECOLOGICALLY-BASED INSECT PEST MANAGEMENT CONDUCTANCE

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Abstract

Potato can be cultivated in various environments at many different times a year, which makes it acceptable to numerous insect pests. The use of intercropping system provides an alternative option as a nonchemical solution for the controlling of insect pests. Therefore, this study was carried out to evaluate the impact of intercrop potato under sweet orange *Citrus sinensis* (L.) trees at different cultivation times on four main sap-sucking insect pests and their associated predators. Results indicated that intercropping potato under citrus trees supposedly could be an appropriate technique for exploitation of dissipated space under such trees, however, this way strengthens the infestation of green peach aphid *Myzus persicae* (Sulzer). Nevertheless, this intercropping system significantly reduced the infestation of whitefly *Bemicia tabaci* (Genn.). It was noticeable that the targeted insect pests were influenced by the change of the planting dates among the same planting system. Climatic temperature and precipitation directly lead to alteration in the population dynamics of such pests. Differential in the population fluctuation detected in the current study, probably explain the impact of cultivation system interacting with biotic and/or a biotic factors on potato piercing-sucking insect pests.

Key words: *Intercropping, piercing-sucking insect pests, population fluctuation, horticulture trees.*

NOBLE SUGARCANES AND MODERN CULTIVARS IN TAHITI RELATIVE TO ORGANIC RUM PRODUCTION: DESCRIPTION AND KEY CHARACTERISTICS

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Abstract

Since the beginning of the twentieth century, various actions regarding sugarcane improvement were implemented. Researchers and breeders created new varieties for the sugar industry, more resistant to pests and diseases and more productive than noble sugarcanes. Today, modern cultivars are used for both sugar industry and distillery and noble sugarcanes are no more cultivated for this purpose. However, they could be cultivated in some particular contexts such as the organic cultivation, where the production costs are similar for both cane varieties. In Tahiti, a company decided in 2015 to produce organic rum from both noble sugarcanes and modern cultivars. A 2 835 m² experimentation was installed on a machineable land, representative to agriculture requirements. Six noble sugarcanes plus three modern cultivars all found locally (315 m² / variety) were tested. The agronomic yields reached were around 70 tons/ha for the best noble sugarcanes and around 100 tons/ha for the modern cultivars while at small-scale industrial processing, the noble sugarcanes present a greater juice extraction about 10 to 25% more than the modern varieties. In this situation, the organic cultivation of noble sugarcanes could be a valuable improvement regarding the whole agriculture and sugarcane industry in French Polynesia. In the future, we will also study the aromatic contents within the noble sugarcane plants and determine if it can improve the quality of the rum.

Keywords: *Noble sugarcane, sugarcane variety, organic cultivation, French Polynesia, Tahiti.*

ORGANIC SUGARCANE CULTIVATION IN TAHITI

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Abstract

Organic sugarcane has a strong economic potential in Tahiti. However, there is no model for small-scale organic cultivation, and the rules enforced by the applicable standards don't always respect the agroecological principles. To determine whether a small organic sugarcane farming system is profitable or not, especially in terms of productivity, control of bioagressors (weeds, rats and pests) and human resource costs, a 1ha field of sugarcane was planted in 2015, with nine different varieties, in a machineable context under European organic standards. After two years, the cultivars used showed yields from 40 up to 100 tons/ha of cane. Regarding the control of bioagressors results were the following: 1) manual removing of weeds required 4 to 6 months after planting or after the first ratoon; 2) study of rat attacks during the maturation period showed that in a dirty field, for early varieties (18° Brix at ten months of cultivation), the cane stalks can be entirely damaged, and these attacks can even occur on canes with sugar content lower than 10%. Finally, the hand labor hoeing represented around 75% of the production costs. This result demonstrates that such organic cultivation is possible even when facing pest and weed problems. In further investigations, to improve hand labor efficiency, we will first focus on weed control using small mechanized treatments; secondly, we will aim at reducing rat infestations by the use of some unique early maturated varieties to attract and treat them locally.

Keywords: *Organic cultivation, Agroecology, Sugarcane, French Polynesia, Tahiti.*

ORGANIC FARMERS' MARKETING STRATEGIES IN TUSCANY, ITALY

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Abstract

Organic products reach the Italian consumers through several channels, from on-farm sale to internet, from Solidarity Purchase Groups to supermarkets. Nearly 85% of Italians affirm to have purchased organic food in the last month, with fruits and veggies being the most mentioned, but most consumers admit being very occasional buyers. A survey was performed in the province of Arezzo (southern Tuscany), including 55 producers, randomly extracted from a list of 550 organic farmers belonging to the Italian Confederation of Agricultural producers, a union of small and medium size mostly conventional farmers. With a questionnaire covering 16 variables, data collection was realized from June 2017 through February 2018, via face to face interviews, telephone calls and emails. These farms are mostly family run, with the support of some workers. Most farmers converted only recently, with a minority being organic before 1992. 25 percent did not yet entirely convert. The production systems are diversified, with vineyards, olive and fruit trees, pastures and arable fields, used for several crops. Many have animals: dairy cows, cattle, goats, sheep and small animals. This allows the on-farm production of wines, olive oil, cheeses, jams, breads and cakes, and other foods, frequently used in the on-farm restaurants. That helps the on-farm sale, considered the best modality by 26% of respondents, followed by local markets, specialized organic shops, SPGs and internet. Advertising is done via website, participation in local and national fairs, printed media, small billboards along the roads, and participation in international fairs. 56 percent say that the local market is growing, and 45 percent consider positively the presence of organic foods in the supermarkets.

Keywords: *Direct marketing, Diversification, Agritourism.*

THE INFLUENCE OF LIQUID ORGANIC FERTILIZERS FORMS ON ECOLOGICALLY GROWN POTATOES

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Abstract

Investigation of the effect of liquid organic fertilizers on organically grown potatoes were carried out in light clay loam, shallow gleysol carbonaceous illimerised soils - *Calc(ar) i-Epihypogleyic Luvisol - LVg-p-w-cc* - at the experimental station of Aleksandras Stulginskis University in Lithuania in 2013-2014. The experiments were carried out with liquid organic fertilizers Biokal 1 and Fitokondi, in the manufacture of which herbal extracts were used; fertilizers Fertenat and Ruponis made from biohumus, and fertilizers Humistar rich in humic and fulvic acids. The forms of liquid organic fertilizers had an uneven influence on organic potatoes. The potatoes, which were sprayed with Biokal 1 fertilizer, total yield of potato tubers essentially increased by 0.89-1.47 t ha^{-1} or 5.34-9.14%, and marketable yield increased by 0.89-1.54 t ha^{-1} or 10.24-19.15% compared to spraying with fertilizers Fitokondi, Humistar, Fertenat and Ruponics, and no significant differences in the output of marketable yield were determined. Under the influence of Biokal 1, the content of dry matter in potato tubers compared to spraying with Ruponics and the starch content compared to spraying with Ruponics, Humistar and Fertenat substantially increased, and the content of nitrates in potato tubers significantly decreased compared to potato spraying with fertilizers Ruponics and Humistar. After spraying potatoes with fertilizer Biokal 1, the number of one-stem tubers compared to spraying with Humistar, Fertenat and Ruponics, substantially increased.

Keywords: *potatoes, organic farming, liquid organic fertilizers, yield, chemical composition.*

ORGANIC FARMING IN MOLDOVA - SOLUTION FOR REBALANCING THE SOIL RESOURCES AND ENVIRONMENT

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Abstract

Organic farming is quite developed around the world, but in recent years it has begun to increase in the Republic of Moldova, with relatively modest results compared to EU countries. At present, only 2% of the land is managed as "organic", and organic products exports account more than 11% of agricultural exports. Organic farming recorded a significant increase, from 80 ha in 2003 to 61280 ha in 2012, due to state support (subsidies) and a decrease with the reduction of subsidies. For these reasons, a significant number of agricultural farmers have renounced to organic farming, which has led to a reduction in the number of organic farmers, from 185 in 2009 to 27 in 2016. Another issue of expanding organic farming is irrational use and degradation of soil resources, resulting in lower productivity and profitability of this sector, especially for small farmers, and for rebalancing the soil resources and environment. Organic farming is performing well in this respect, it keeps all technological components, but corrected according to soil requirements, as: conservation tillage, without the physical degradation of soil; organic fertilization based on the use of local organic waste, plant debris and residues from agriculture; biological methods for the control of pests and diseases, as well as agro- and phytotechnical methods for weed control. All actions during a fairly short period have been established and are being used successfully. So the soil is healthier and at the same time the human health, consuming an organic natural product is ensured, and the environment and soils are in an ecological balance.

Keywords: *Organic farming, Subsidies, Soil Degradation, Moldova.*

ORGANIC FARMS IN POLAND AFTER ACCESSION TO THE EUROPEAN UNION

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Abstract

In the last decade, the Polish agriculture experienced significant changes related to the number of agricultural holdings, production potential, agricultural production organization, as well as production and economic outcomes. These changes were driven by both market and institutional factors. Among the important factors that determine this transformation, technological progress and the growing dependence of agricultural production on industrial factors of agricultural production should be also indicated. In the case of conventional agriculture, this activity often contributes to environmental degradation. Organic production is the alternative system of agricultural production. Organic production provides benefits to society (food safety) and environment (respect for natural resources). In the view of increasing society awareness, consumers more likely choose organic products. This system of agricultural production is also supported within the rural development programme, which improve the difficult economic situation of organic farmers. The aim of paper is the indication of changes in number, production potential and economic efficiency of organic farms. The paper focuses on the presentation of the development direction of organic farms, which has taken place in the last decade. These results were illustrated on the background of all individual farms in Poland allowing identification of the ranges of convergence and diversity in the development of farms in total and organic ones. Central Statistical Office data for 2005 and 2016 were used. These data allowed formulation of conclusions representative for farms` population in Poland. Research indicated, that after the accession of Poland to the EU, there has been the dynamic development of the organic production system, as indicated by the multiple growth of the number of organic farms and their production and economic potential. Changes regarding production simplification and specialization which are taking place in organic farms should be deemed more intense when compared to those in conventional farms. In the case of organic farms, they additionally resign from the livestock production.

Keywords: *Organic farms, Central Statistical Office data, Poland, accession to the EU, production profile, farms' specialization, farms' concentration.*

IMPACT OF VERMICOMPOST EXTRACTS ON STRAWBERRY PRODUCTION AND SUSTAINABILITY OF AGROECO SYSTEMS

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Abstract

Quality and balanced fertilization is one of the most important orchard management practices in fruit production. However, fertilization in conventional production systems is mainly focused on obtaining the highest yield. This usually requires increased utilization of synthetic nitrogen fertilizers, which significantly contributes to a series of undesirable effects and results in excessive environmental pollution. Since organic production system is considered as an important factor of the strategy for the development of agricultural sector, it is necessary to increase this kind of production. To find a way to overcome the mentioned problems, the use of vermicompost extracts is appeared as potential solution. Therefore, we conducted a study on the effects of vermicompost extract on yield-related characteristics (yield per plant, yield per unit area), physical (fruit weight, length, breadth, and firmness) and chemical fruits properties (total phenolics and antioxidant capacity) of 'Senga Sengana' strawberry cultivar, as well as microbiological properties of strawberry rhizosphere (total microbial count, numbers of soil fungi, actinomycetes, aminoheterotrophs, oligonitrophilic bacteria and *Azotobacter*). The obtained results indicate that application of vermicompost extracts in organic strawberry production had a positive effect on plant yield and fruit quality. Positive effects on soil biogenicity have also been observed. Therefore, vermicompost extract application can be considered as an appropriate practice in production of healthy and environmentally safe strawberries with satisfying basic postulates of sustainable agriculture.

Keywords: *Vermicompost extracts, Microorganisms, Organic strawberry production, Yield, Fruit Quality.*

RESEARCH ON ORGANIC IMPORT REGULATION REGIME SHIFTS OF SOME IMPORTANT COUNTRIES (EU AND US) REGARDING TURKEY ORGANIC FOREIGN TRADE

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Abstract

In this paper, the developments in the organic product import regimes of the EU countries, which constitute more than 50%, and of the USA, which constitute about 20% of Turkey's export value of organic agricultural products, are researched in terms of the quantity, price, quality and market access of Turkey's organic product export. For this purpose, a questionnaire study was conducted with all 'foreign trade authorized' control and certification bodies (CBs) and 41% of the companies selling organic products in 2015 in the province of Izmir, which has a significant share in the production and export of organic products in Turkey. The results of this research indicate that there has been a rapid increase in the export of organic agricultural products of Turkey, presumed to be a third country by the EU, with the new Regulation (EU) No 834/2007 abolishing the Regulation (EU) No.2092/91. This regulation has resulted in a positive effect on exporting organic agricultural products because it has paved the way for rapid commercialization, a wide range of suppliers and plenty of opportunities for clients. In recent years, some countries such as the EU, the USA and Japan have made important strides in the development of world organic commodity trade by making mutual recognition agreements that facilitate the trade of organic products. Mutual agreements made in developed countries have facilitated and increased the trade of organic products among these countries. Therefore, it is suggested that either a mutual recognition agreement should be made between Turkey and the EU and the USA, which are important countries for the export of organic products, or the acceptability of Turkey's own standards in these countries should be established.

Keywords: *organic agriculture, organic product trade, organic product import regime, organic agriculture legislation, list of third countries.*

SELECTION AND CHARACTERIZATION OF INHIBITOR AGENTS (BACTERIOCIN LIKE) PRODUCED BY RHIZOBIAL STRAINS ASSOCIATED TO MEDICAGO IN WESTERN ALGERIA

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Abstract

The effect of inhibitory substance (bacteriocins) produced by rhizobial strains isolated from Medicago nodules sampled from saline soils in the westrn region of Algeria and belonging to the genera Rhizobium, Sinorhizobium and Agrobacterium was evaluated. This study characterizes the inhibitory substances produced by these strains and determinates their activity spectrum against soil bacteria. The demonstration of their inhibitory effect permits the selection of two strongly inhibitory strains (Rhizobium sp. STM 1081, Rhizobium sp. STM 1823). These substances are characterized as bacteriostatic. The physicochemical characterization of these inhibitory substances reveals their thermolabile nature and resistance to acidic pH, but they are sensitive to basic pH, organic solvents and proteolytic enzymes. Analysis by SDS-PAGE electrophoresis of protein fractions indicates that the strain Rhizobium sp. STM 1823 has four brands with different molecular weight (46kDa, 44KDa, 26KDa and the 20kDa) and the strain Rhizobium sp. STM 1081 shows a single band (28 KDa). The inhibitory effect of these substances against soil bacteria revealed a broad spectrum activity.

Keywords: *Bacteriocin, Competition, Innhibition, rhizobia, spectrum of activity*.

STUDY OF THE EFFICIENCY OF VERMICOMPOST AGAINST PESTS OF EUCALYPTUS (*EUCALYPTUS CAMALDULENSIS*)

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Abstract

Eucalyptus trees belong to the Myrtaceae family and they are native to Australia and neighboring islands. The 700 species of this kind have very different paces and ecological requirements. Their ability to colonize bare or devastated land is remarkable since the nineteenth century. Eucalyptus currently covers 13 million hectares in 80 countries. For a long time, eucalyptuses have been found useful, beneficial and satisfactory. Eucalyptus plantations suffer from various attacks by insects and fungi that occur on stem and leave with different types of symptoms. Vermicompost have a beneficial effect on plant growth by stimulating inducible defense mechanisms in the host, making it less likely against pest attacks. In this context our study focuses on the effect of vermicompost SDN by different application types (control, T3J and T7j) on tree resistance of Eucalyptus (*Eucalyptus camaldulensis*) against pests, and demonstrate its effect on the population dynamics of these pests. Our results have led to globally expressed existence of a significant difference for the vermicompost capacity at reducing the overall rate of pest populations (*Blastopsylla occidentalis)*, (*Leptocybe invasa*), (*Glycaspis brimblecombei* Moore), (*Ophelimus maskelli*). The results of the temporal effectiveness of biological treatments applied by the vermicompost juice denote a significant difference in different ways of applying the treatment on populations of pests of Eucalyptus (*Blastopsylla occidentalis)* compared with other populations of pests.

Key words: *Eucalyptus camaldulensis, SDN, pests, vermicompost juice.*

EFFECTS OF THE BIOFERTILIZERS ON THE BIO SUPPLY OF *APHIS FABAE*

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Abstract

The integrated production in sustainable agriculture aims to improve the effectiveness of the biological inputs through formulations, prolonging remanence in the field or by incorporating synergistic products. These, being themselves non-toxic at the doses used, increase significantly the protective action of the viability of crops. In this context, the vermiculture represents an appropriate technology that develops the residues of the crops and manages plant health sustainably. The use of vermiculture is recent in Algeria. The objective of our study was to examine the impact of the treatments with solutions resulting from vermiculture on the production and the protection of a vegetable crop (bean) in natural conditions. Different biofertilizers, raw and formulated based on vermicompost tea, were tested in order to evaluate their potential to cover nutritional requirements and reduce parasite attacks on the crops studied. Thus, raw and fermented bioproducts showed deleterious effects on the abundance and numerical recovery of the biological forms of *Aphis fabae*. Finally, the plants treated with the different forms of vermicompost tea showed higher growth rates, early flower induction, and higher numbers of flowers and pods compared to the control. The present results allow us to validate the possibility of using vermicompost tea as a foliar fertilizer on various crops in order to increase productivity and reduce losses due to parasitic attacks.

Key words: *Aphis fabae, vermicompost tea, abundance, formulation, population structure.*

PHYTOREMEDIATION ABILITY OF SOME CROPS AT CULTIVATION ON THE SOILS POLLUTED BY HEAVY METALS

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Abstract

Due to the fact that soils contaminated with heavy metals have features on the intensity and type of contamination (lead, cadmium, mercury, tin, titanium, chromium, etc.) in various regions of Belarus, and plants differ significantly in the ability to accumulate heavy metals, it is necessary to show the effectiveness of sorbents on the basis of calcinated sugar beet production defecate on the example of growing a technical colza. The use of cheap sorbents based on a defecate on contaminated soils can facilitate their return to an agricultural circulation. The method of X-ray fluorescence analysis (XRF) has been used to assess the environmental safety of soils and plant organs, as well as to determine the level of their accumulating capacity. The analysis of the obtained data has shown that the accumulation of cadmium and lead in colza leaves significantly increases on the contaminated soils (by 82%). The levels of the accumulation of manganese, zinc, zirconium, and strontium significantly increase in a phytomass. A decrease in the accumulating capacity (with respect to copper and iron) of colza plants grown on the contaminated soils has been revealed. It has been shown that spreading heat treated defecate to the soil permits reducing the accumulation of arsenic, copper, manganese, and lead by a technical colza phytomass.

Keywords: *environmental safety, X-ray fluorescence analysis, heavy metals, technical colza, sugar beet production defecate.*

LAND AND AGRARIAN REFORM IN RWANDA: ORGANIC FARMING PERSPECTIVE

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Abstract

Since 2004, Rwanda has been carrying an important land policy and a fundamental program of its farming systems transformation. The pillars of the government plan highlight the change in land use management and tenure combined with improved inputs utilisation to ensure optimum productivity in the right line of the market-led agriculture. When they mention improved input, someone may understand essentially commercial seeds and mineral fertilizers. However, organic fertilizers are being promoted by the crop and livestock intensification program as well as the necessary techniques mobilised in the high quality of organic fertilizers production and use. This article aims to analyse how organic agriculture can coexist with conventional agriculture and allow agriculture operators to benefit of the market liberalisation. The literature review shows that during the agrarian system evolution, Rwandan peasants are involved in the program of land consolidation and agriculture intensification. Their level of performance has been appreciated throughout their active involvement in the commercial circuit. The main conclusion of this article is that organic farming prospects are inherent to optimal biomass valorisation especially crop residue, agro forestry and livestock dejection incorporated in the production systems. The most performing producers are those who own a minimum of 1ha of farm land and who are using a mixture of organic manure and chemical fertilizers. It has been demonstrated that the farmers who are enthusiastically participate in cooperatives have also an open mind to consolidate their commercial relationship. Moreover, they have constant ability to take advantage of the market.

Key words: *Land reform, Organic farming, Rwanda, Pyrethtum, Potatoes.*

ORGANIC PRODUCTION OF WILLAMETTE

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Abstract

Raspberries in BiH are grown on an area of 1,628 ha, from which total production of 13.631t is realized. This places raspberries onto the fourth place among fruits. The largest percentage of raspberry production is of conventional type. In recent years, significant activities have been undertaken to introduce the concept of integral production and organic raspberry production. Interest in organic raspberry production is growing in the world, as well as in Republika Srpska, not only in the field of science and profession, but also in farming. This represents a good and safe way for economical production of quality fruits for which there is a safe and stable market. This area is becoming attractive because relatively small areas achieve significant revenues, i.e have positive economic effects that contribute to the sustainability of production. Organic agriculture is based on the minimal use of materials that do not originate from the farm and on the production practice that establishes, maintains and improves the ecological balance. The rules of organic agriculture are defined in the Law on Organic Production of Republika Srpska and the standards and regulations of the EU and other countries. The aim of this paper is to determine the characteristics of Willamette produced according to the concept of organic production, by analyzing the specificity of the technological production process and the basic parameters of fertility of the investigated fruit variety in agro-ecological conditions in the territory of the municipality of Srebrenica.

Key words: *organic production, raspberries, variety Willamette.*

CHROMATOGRAPHIC QIAGEN ISOLATION METHOD OF THE DNA MOLECULES BY USING COLLECTION WITH SILICA MATRIX

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Abstract

Quality separation and purification of DNA molecules from the other cell elements is enabled using chromatographic methods in the analysis of DNA. Chromatographic columns with a silicon dioxide matrix (Qiagen Mini Spin Columns) have wide application in the DNA isolation process. An isolate in which the DNA molecule is purified and ready for further analysis can be obtained washing the DNA molecule from matrix columns using the AE buffer. This work aims to determine the optimal volume of the elution AE buffer needed to wash the maximum quantity of isolated and purified DNA molecule from the membrane column in controversial samples. The thirty samples were taken for the experiment. The Fifteen samples head a small amount of biological material which was putted on the microscope plate by short contacts. The remaining 15 samples were with a higher amount of biological matrix. The sample concentrations were read by the RealTime PCR method. Ten samples were eluted with 200 µl of eluting AE buffer in the isolation process, the next 10 samples were eluted with 100 µl, while the last 10 samples were eluted with 50 µl. The experiments showed that 100 µl of elution AE buffer is optimal volume needed to wash (from the column) the maximum quantity of isolated and purified DNA molecule from the samples which contained very little biological material. The condition for the release of the molecules from silica matrix is its complete hydration. This can be done using required quantity of AE buffer. The silicon dioxide matrix turned out to be excellent sorbent in solid-liquid chromatography. It also satisfied lysing of the cells and release of DNA in the first steps of Qiagen isolation.

Keywords: *DNA molecule, AE buffer, Qiagen Mini Spin Columns.*

INOCULATION EFFECTS OF COMMERCIALLY AVAILABLE AMF INOCULA ON POTATO ROOT-ASSOCIATED MYCOBIOME

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Abstract

Arbuscular mycorrhizal fungi (AMF), the most widespread symbionts in plants, has long been associated with increased plant mineral nutrition. Although the principal benefit from their use is improved plant growth through increased nutrient uptake and support for soil formation, there is an additional evidence that they play an important role in enhanced pathogen tolerance of host plants. Given these organisms are naturally present in the soil, the extensive commercialisation of mycorrhizal fungi has already led to their practical application in agriculture. An organic field trial was conducted in two growing seasons to evaluate the effect of commercially available AMF inocula on potato (*Solanum tuberosum* L. cv. Esmee). Potato root samples were collected in the years 2015 and 2016 at the plant flowering stage. AMF and pathogenic fungal community composition were assessed by using Illumina MISeq sequencing of ITS2 region. Sequence reads of AMF were compared between inoculated and not inoculated plants, to evaluate inoculation success, by analysing the frequency of occurrence and relative read abundance. The results showed that AMF abundance was unexpectedly high in both, inoculated and non-inoculated field plots indicating favourable conditions for indigenous AMF. The outcome shows that it is unnecessary to increase AMF population by targeted manipulation as an abundance of naturally present AMF assemblages is found in the soil.

Keywords: *arbuscular mycorrhizal fungi, fungal diversity, commercial AMF inoculum, Solanum tuberosum L, sustainable agriculture.*

THE EFFECT OF DIFFERENT FERTILISATION TREATMENTS AND APPLICATION RATES ON PLANT PATHOGENIC FUNGAL AND OOMYCETE COMMUNITIES

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Abstract

To retain yield in increasing demographics, modern conventional agriculture depends mainly on mineral fertilisers and pesticides, which can have a severe long-term impact on surrounding environment. Therefore, there is an increased interest in the use of organic fertilisers. In addition to raising soil nutrient efficiency and organic carbon content, it has been suggested that organic fertilisers could suppress pathogen activity by enhancing microbial competition in the soil. This phenomenon has been shown in previous studies with single pathogenic species. However, many plant pathogens form an assembly of different species. Therefore, it is essential to study them not only on the single species level, but also to analyse pathogen communities. The objective of this study was to compare the effect of different fertilisation treatments and their application rates on pathogenic fungal and oomycete communities in soil. The studied fertilisation treatments were following: mineral fertilisation, cattle manure amendment and alternative organic fertilisation. Each fertiliser was given in five different application rates. Soil samples were collected three times during the growing season from potato field grown in an experimental field for a long-term fertilisation experiment. Soil samples were analysed by sequencing full ITS region using PacBio SMRT technology. In our study, none of the studied variables substantially altered soil pathogen richness. However, PERMANOVA analysis revealed that there were significant differences in pathogen community composition dependent on the fertilisation treatment. Our results thus indicate that different fertilisation treatments harbour diverse pathogen communities. Disease suppression could, therefore, be an elaborate response on a community level.

Keywords: *fertilisation management, plant pathogens, high-throughput sequencing, Solanum tuberosum L.*

THE CONSUMPTION OF ORGANIC PRODUCTS IN GREECE

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Abstract

Organic farming is a rising agro-economy with many aspects. Sustainable agriculture, environmental-friendly techniques, healthier foods, and low inputs are some of them. Although it seems that there are many benefits for both producers and consumers, the rate of development is rather low. The present study started with a core of 32 randomly selected consumers and later 100 more were added. Cross-tabulation and X^2 tests were widely performed. The basic findings followed, with the remark that this research was still running. The greater proportion of sample could easily distinguish between organic and conventional products. They preferred to buy fruits and vegetables at least once in a month and they believed that consumption could be increased with better information. The certification body was very important for them and the price of organic products was of high priority, along with the condition and presentation of such products. They believed that development of the certain market would be slow. They bought organic products near their home (up to 1 Km), due to many organic shops and Super Markets and some specific open markets. People buying rarely such products thought that prices were relative high and they might stop buying if their income would be decreased. People of an annual income over 12000 Euros were the main supporters of organic products. They thought that promotion was not satisfactory and organic products were indeed available in the market spots. Lower prices, better information and promotion, and greater variety of organic products would expand the certain market.

Keywords: *Organic farming, consumers, Greece, low rate.*

CONSUMER BEHAVIOR TOWARDS ORGANIC PRODUCTS OF ANIMAL ORIGIN: CASE STUDY: CONSUMERS FROM GREEK REGION OF THESSALY

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Abstract

Greece is a country with a great tradition in livestock farming, which contributes decisively to the country's regional rural development. In recent years, consumers' demand for organically grown products of animal origin has increased. An appropriate legislative framework has been set up, both in primary (plant and animal production sectors) and secondary (processing, standardization and distribution units) to ensure compliance with requirements and production of safe and quality organic products. The present study was conducted in April through May 2018, in central Greek region of Thessaly, which covers an area of about 14000 square kilometers. The region was selected because livestock farming was and still is the basis of the regional economy. In order to explore the knowledge and preferences of Thessalian consumers about organic products of animal origin, four hundred questionnaires were completed by randomly selected individuals, in which respondents were asked to answer key questions about their willingness to trust organic products of animal origin. Results indicate that 92.6% of the respondents are aware of organic products of animal origin, 40.1% of the respondents claimed to purchase organic products of animal origin once a month, mainly directly from the producers, while most (25.4%) have been informed about organic products of animal origin from the internet. An inhibiting factor for organic product market is shown to be high prices. The present research provide detailed statistical information in order to develop an integrated picture of the market and availability of organic products of animal origin in the region of Thessaly.

Keywords: *Organic farming, organic products of animal origin, consumers.*

ORGANIC PRODUCTION SYSTEM: AN ASSESSMENT OF PRODUCTION, SOIL AND ECONOMIC SUSTAINABILITY IN *TARAI* REGION OF UTTARAKHAND (INDIA)

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Abstract

Organic farming practices are gaining importance as farmers have realized the benefits of organic farming in terms of production, soil and economic sustainability. Researches on organic farming have been going on at G.B. Pant University of Agriculture and Technology, Pantnagar, India since one decade to explore possible outcomes of sustainable production of organic basmati rice and rice based cropping system in terms of productivity, soil health and economic feasibility. Among different nutrient sources, use of Green manure (GM) + Vermicompost (VC) recorded higher dry matter production as well as grain yield and system productivity of basmati rice as compared to other sources and chemical fertilizers. Among the different basmati rice crop establishments, system productivity in terms of basmati rice grain equivalent was observed higher in System of Rice Intensification (SRI) as compared to conventional planting with continuous flooding. Among the resource conservation practices followed in organic production system, higher system productivity (8783 kg/ha) was observed in DSR- chickpea- moong under broad bed and furrow system. Organic mode of cultivation resulted in 8.03% decrease in bulk density with 58.4, 31.1, 61.9, 18.7 and 85.0 % increase in available N, S, Zn, Cu and Fe over initial values, respectively. There has been a build up of soil organic matter under organic farming system which is almost doubled after one decade of continuous organic farming as compared to chemical farming. The soil organic carbon stocks after one decade were 24.18, 23.42, 21.58 and 20.22 t ha^{-1} in 0-15, 15-30, 30-45 and 45-60 cm depth, respectively which were 21.69, 25.40, 28.96 and 31.65 per cent higher than their respective inorganic counter parts. Soil microbial biomass carbon was higher under organic production system (648 and 1225 µg/g soil) as compared to chemical one (644 and 1151µg/g soil) during monsoon and winterflowering stages, respectively. Likewise, dehydrogenase activity was also higher under organic production system (190 and 335 TPF/g/24 hr) as compared to chemical one (170 and 277 TPF/g/24 hr) during monsoon and winter flowering stage, respectively. Economic analysis of different organic resource conservation treatments also revealed that maximum net returns (Rs. 199488/ha) and B:C ratio (3.49) in DSR-chickpea- moong under broad bed and furrow system followed by DSR-vegetable pea-cowpea on broad bed and furrow system. Experiences gathered in this regard emphasizeinnovate research in different directions particularly in the field of sustainable organic management practices to maintain or improve the quality of environment and conserve the present natural resources as well as future agriculture scenario in India.

Keywords:, *Broad bed and furrow system, Direct seeded rice, Organic production, Sustainability, System of Rice Intensification.*

EFFECT OF ORGANIC SOURCE OF NUTRIENTS ON GROWTH, YIELD AND QUALITY OF TURMERIC (*CURCUMA LONGA* L.) UNDERLOWER SHIVALIKS FOOT HILLS OF JAMMU

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Abstract

Turmeric (*Curcuma longa* L.) is one the most important and ancient spices of India grown over a wide range of latitudes and its cultivation is widely distributed geographically. In India it is being cultivated in more than 20 states in an area of 1,94,000 ha with an annual production of 9,71,000 MT. The investigation was carried out to evaluate the effect of organic source of nutrients on growth yield and quality of turmeric (*Curcuma longa* L.). Field experiment was conducted during consecutive years 2015-2017 using high yielding variety of turmeric PB. Haldi no.2, using different organic sources of nutrients at Organic village, Talwara, District Reasi, J&K, India under KVK Reasi, SKUAST, Jammu. Different organic sources of nutrients along with biofertilizers influenced differently on turmeric in terms of yield and quality. Plant with neem cake application along with *Phosphobacteria* had the taller plant (101.67 cm), maximum number of tillers per plant (8.85), leaf number (6.66), leaf area (46.25) leaf area index (0.459), fresh weight of halum (201.48g), fresh weight of root (52.79 g), fresh weight of rhizome per plant (307.45 g) and dry weight of halum (18.35g), dry weight of root (8.43 g), dry weight of rhizome per plant (46.15 g), total dry matter yield (7.46 t ha-1) than those receiving other types of organic source of nutrients application. Moreover, yield attributes such as number of mother rhizomes per plant-1 (2.43), more number of primary rhizomes per plant-1 (7.13), secondary rhizomes per plant-1 (18.85) and tertiary rhizomes per plant (8.45) were also highly accelerated by neem cake+*Phosphobacteria* application. Similarly, the same treatment expressed the best in terms of size of mother rhizome (8.90 cm), primary rhizome (22.76 cm) and secondary rhizomes (8.07 cm).All these parameters cumulatively contributed to production of the highest estimated fresh rhizomes yield and cured rhizomes yield (38.65 t ha-1, 7.88 t ha-1 respectively). The highest curing percentage (22.12) was also observed in Neem cake application with *Phosphobacteria*. Thus, organic manure like neem cake along with *Azospirillum* or *Phosphobacteria* was best fitted natural fertilizer for turmeric cultivation under lower Shivalik foot hills conditions of Jammu, J&K.

Key words: *Turmeric (Curcuma longa L.), FYM, Vermicompost, Growth, Yield, quality.*

PRODUCTION OF SOLUBLE DRIED MOLASSES ENRICHED BY FULVIC ACID

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Abstract

Molasses is used as a soil amendment to feed and stimulate microorganisms. It is perfect in dry applications where product constraints prevent use of liquid molasses. In most studies dry molasses is actually dried grain hulls that have been sprayed with liquid molasses that is not soluble in water and cannot spray foliar.In this work, by mixing liquid molasses and calcium lignosulfonate a kind of dry molasses was produced. Low cost and eco-friendly nature of it increased popularity in agricultural industry. Also their benefits in agricultural soils were well established. Since the calcium lignosulfonate is anionic polymer that is typically soluble in water and contains a relatively high concentration of fulvic acids, this product is completely soluble in water and enriched by fulvic acid.

Keywords: *molasses, calcium lignosulfonate, fulvic acid.*

ORGANIC AND CHEMICAL FERTILIZERS AFFECTING YIELD AND ESSENTIAL OIL OF TWO MINT SPECIES

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Abstract

Two species of mint Mentha piperitha (peppermint) and M. arvensis (*Japanese mint*) are widely cultivated in Iran but have not been evaluated regarding their response to fertilizer regimes. A field experiment was conducted to investigated the effects of different organic and chemical fertilizer treatment [Control, 100% urea (95 kg N ha^{-1}), 75% urea (71.25 kg N ha^{-1}) + 25% Vermicompost (3.3 ton ha^{-1}), 50% urea (47.5 kg N ha^{-1}) + 50% Vermicompost (6.75 ton ha^{-1}), 25% urea (23.75 kg N ha^{-1}) + 75% vermicompost (10.1 ton ha^{-1}) and 100% vermicompost (13.5 ton ha^{-1})] on essential oil contents, yield and yield component of two species of mint (peppermint and Japanese mint) at Tarbiat Modares university during 2015 growing season. Peppermint provided grater plant height, number of internodes, number of leaf and oil percentage than Japanese mint. The results indicated that, irrespective of mint species, plants treated with chemical and organic fertilizer together presented taller plant, higher oil contents and oil yield compared with solo chemical or organic fertilizers. Oil percentage and essential oil yield of mint increased significantly up to 25% urea (23.75 kg N ha^{-1}) + 75% vermicompost (10.1 ton ha^{-1}). Plant height and number of leaf increased along the replacement of organic fertilizer with chemical fertilizers. The results showed that there was positive and significant correlation with leaf number and essential oil yield. Application of vermicompost combination with chemical fertilizer increased plant height, oil percentage and essential oil in both species suggesting that organic and chemical fertilizer combination improved performance and environmental sustainability.

Keywords: *Integrated fertilizer, Japanese mint, Nitrogen, peppermint, Vermicompost.*

THE EFFECT OF SILICATE-SOLUBILIZING MICROORGANISMS ON MICRONUTRIENTS RELEASED BY MICA MINERALS AND THEIR UPTAKE BY CORN PLANTS (*ZEA MAYS L.*)

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Abstract

Mineral weathering is a major source of the most essential nutrients, including micronutrients. Some soil microorganisms (bacteria and fungi) are able to dissolve and release elements from soil silicate minerals. The goal of the present study was toisolatesilicate-solubilizing microorganism from rhizosphere soil and evaluatethe micronutrients released by strains from different sources of silicate, and their uptake by corn plants. It was carried out as a factorial based,completely randomized design with three replications. The greenhouse factors included potassium sources (control (without mica), potassium solution, phlogopite, illite, biotite, and muscovite) and microbial inoculation (control (without microbial inoculation), inoculation with bacteria (KSB), inoculation with fungi (KSF) and inoculation bacteri+fungi (KSB+KSF)). The results showed that the use of silicate minerals and microbial inoculation had a significant effect on the content of the micronutrients. The highest iron content (544.2 µg/pot) was obtained from microbial inoculation of phlogopite (KSB+KSF), and it was not significantly different from the inoculation of illite (KSB+KSF). The bacterial inoculation(KSB) increased the zinc content in the shoot in illite 1.50 times higher than in the control treatment. The highest copper contentin the shoot (150 µg/pot) was obtained by bacterial inoculation (KSB) of phlogopite. Moreover, the meanshoot manganese content in silicate mineral treatments of the microbial inoculation was 1.36 times higher than in the control treatment. It could be concluded that the use of inoculum microorganism has a significant effect on micronutrients release of silicate minerals and plant growth. In general, biological potassium fertilizers can be a good substitute for chemical fertilizers.

Keywords: *Silicate minerals, plant, microorganism.*

AN OVERVIEW OF THE ORGANIC FARMING SITUATION IN IRAN (CHALLENGES AND SOLUTIONS)

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Abstract

Having a long history of agriculture and the prerequisites for organic farming, Iran can become one of the major Asian countries in the production of organic products. However, it has not succeeded in this. In order to investigate the state of organic agriculture in the country, analysis the problems and solutions; the information collect through examination of various scientific and research articles carried out by universities, organizations and private individuals. There are many reasons why Iranian farms have a good potential for the transfer of traditional agriculture to organic farming. Therefore, it is necessary to expand the cultural dimensions of organic agriculture, which is the optimal exploitation of resources and the protection of the environment and the production of healthy food. The main worries for producers are i) the yield decline of products due to the lack of fertilizers and chemical pesticides effective in increasing yield, ii) reduced farmers' income during the early years of organic farming, and iii) the easy access of farmers to chemicals. Consumers' problems include i) lack of familiarity with organic products, ii) uncertainty about the organic nature of products, and iii) lack of product ID. Proposed answers to these difficulties include training farmers in organic production, supporting producers' costs, monitoring production in farms and warehouses by the Agricultural Ministry, monitoring packaging and stores by the Standards Institute and Health Ministry, identification of organic products, promotion of organic products distribution and consumption culture, excerpts for the removal of subsidies belonging to fertilizers and chemical pesticides with the aim of preserving the environment, identification of virgin areas to produce organic crops in them, and developing long-term codified programs in the above-mentioned issues.

Keywords: *organic agriculture, difficulties, resolution, Iran.*

EVALUATION OF QUANTITATIVE AND QUALITATIVE CHARACTERISTICS OF RICE TAROM HASHEMI VARIETY IN CONVENTIONAL, LOW-INPUT AND ORGANIC FARMING SYSTEMS IN MAZANDARAN PROVINCE

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Abstract

The present study was conducted to evaluate quantitative and qualitative characteristics of rice in various conventional, low-input and organic agricultural systems. The study was conducted in 2014 and 2015 in three different regions of Mazandaran province (Babol, Fereydunkenar and Amol). For organic, low-input and conventional used agricultural systems, three, four and six fields were selected in these cities, respectively. The same agricultural system was usedat selected fields for at least three years. In organic agricultural systems, poultry manure and biofertilizers includingAzotobacter and Barvar2 were used and in order to fight pests and diseasesTrichogramma bee, sex pheromones, fungicides and biological insecticides were used as well. Also, the controlling of weed in organic system was done manually. In low-input system, external inputs such as chemical fertilizers and pesticides were minimized compared to conventional cultivation. At the beginning of the growing season, the necessary justification was done with farmers, and all agronomic operations were carried out from the preparation time of the main land and the treasury up to harvest in accordancewith instructions and supervision. Agronomic characteristics and physical qualitative properties such as conversion efficiency, hull percentage, complete rice percentage and chemical including protein content, amylose percentage and gelatinization temperature were determined. Results showed that in two regions of Babol and Amol, the conventional and low- input system had more grain yield than organic system. Among of three regions, the highest grain and biological yield were obtained in Fereydounkenar region and low input system. These yields were 4.73 and 2.80 percent, and 29.99 and 29.12 percent more than conventional and organic system, respectively. In terms of qualitative characteristics, despite higher percentage of protein content in 1394 and 95 (6.27, 1.04) in conventional culture, the most conversion efficiency (68.05, 69.05) and complete rice percentage (64.70), seed length after baking (13.46), the least percentage of crust werealso observed in 1394 and 95 (22.47, 21.86), bran (9.47, 9.08) and broken rice (4.00, 2.14) was obtained in organic culture. In the present condition, considering the obtained grain yield and quality production, low-input agricultural system can be recommended to farmers, but in the long time, regarding issues of food and environmental health, the organic agricultural system will be advisable.

Keywords: *Organic culture, Conventional, Rice, Yield, Amylose.*

EFFECTS OF TRIPLE SYMBIOSIS OF MYCORRHIZA FUNGI, RHIZOBIUM BACTERIA, AND VERMICOMPOST ON SOME QUANTITATIVE AND QUALITATIVE CHARACTERISTICS OF BEAN (*PHASEOLUS VULGARIS* L.)

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Abstract

The late Norman Borlaug, the founder of the Green Revolution in the agricultural industry in 1970, changed the conditions governing global agriculture in such a way that maybe another revolution with a new approach was necessary in this industry. Despite the promises made by the developers of genetically modified organisms (GMOs), sustainable agriculture is the best option for feeding the growing world population. Therefore, the triple symbiosis between fungi, bacteria, and plants is one of the main strategies in achieving sustainable agriculture. A factorial greenhouse experiment in the format of the completely randomized design with three replications was carried out in 2017 to study the effects of mycorrhiza fungi, symbiotic Rhizobium bacteria, and vermicompost on some qualitative and quantitative features of beans (*Phaseolus vulgaris* L.). The experimental treatments were plants inoculated and non-inoculated with mycorrhiza fungi (*Glomus etunicatum*), plants inoculated and non-inoculated with symbiotic bacteria (*Rhizobium leguminosarum* dv. Phaseoli), and various levels of vermicompost (0%, 5%, and 10% of the culture bed weight). Results showed that the treatments had significant effects on most of the studied features so that the highest protein content, 100-seed weight, and seed yield (42.24%, 25.51 g, and 42.30 g, respectively) were achieved in the treatment with vermicompost level of 10% by weight, inoculation with Rhizobium bacteria, and inoculation with mycorrhizal fungi. Correlations between the features also indicated that seed yield had significant positive correlations with all the studied features except for the 100-seed weight.

Keywords: *Mycorrhiza fungi, Rhizobium bacteria, Vermicompost, Bean.*

THE ASSESSMENT OF COMPOST AND COMPOST TEA EFFECTS ON AN AGRICULTURAL SOIL THROUGH A MULTI-INDICES APPROACH

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Abstract

The search for ecofriendly nutrient sources is fueled by the concerns stemming from the adverse environmental impact that conventional agriculture exerts on soil quality. Fertility management based on the use of synthetized fertilizers has been found to promote soil degradation and fauna habitat reduction. The use of alternative fertilization scenarios should be scrutinized also considering both the agricultural yields and the effects on soil and the edaphon. The objective of this study was to assess the influences of compost (C), compost tea (CT) and conventional (CON) fertilization practice on spinach and zucchini, soil characteristics, soil microbial biomass and soil fauna. Furthermore, crop performance was measured using agronomic and ecophysiological parameters. The results showed: I) an organic carbon enhancement in all treatments, II) a higher electrical conductivity and lower pH in CON III) a better phosphorus availability in C and a higher exchangeable potassium in CT, IV) a higher microbial metabolic quotient (qCO2) in C, V) a lower microbial biomass carbon to soil organic carbon ratio in CON and control, VI) a slightly low cumulative respiration rate in control, VII) a fast negative response of the total hydrolytic activity in control and CON after the harvest of the first crop, VIII) a highest abundance of well-adapted micro-arthropods in control treatment and a lower one in CON, IX) a better leaf gas exchange rates in CT. The arthropods soil biological index (QBS-ar), used here as indicator of soil quality, confirmed its usefulness as a rapid and sensitive tool in soil health studies.

Keywords: *Compost tea, Compost, Ecophysiological parameters, Soil quality, QBS-ar.*

EFFECTS OF ORGANIC FARMING PRACTICES ON YIELD AND QUALITY OF "BARATTIERE", A LOCAL VARIETY OF CUCUMIS MELO L. FROM PUGLIA (SOUTHERN ITALY)

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Abstract

The "Barattiere" is a local variety of Puglia (Southern Italy) belonging to Cucumis melo L. species. Its fruits are consumed at the immature stage, fresh and raw, like cucumber, due to their better quality profile. They are characterized by being refreshing and digestible as well as having high potassium and low reducing sugar and sodium contents. The organic farms in Puglia are usually small and without livestock productions. Under these conditions it is very difficult to preserve or improve the soil fertility only through the previously recommended practices. Therefore, the use of some organic fertilizers may be an alternative to satisfy the nutrition needs of plants in this condition of organic farming. This study reports first results of a field research that evaluates the effects of some organic farming practices on yield and quality parameters of Barattiere fruits. The trial compared eight treatments deriving from factorial combination of four soil management practices/weed control (SMWC) (conventional tillage/mechanical weed control; conventional tillage/no weed control; conventional tillage/green manuring/mechanical weed control; no tillage/mulching/no weed control) and two fertilizer treatments (FT) (0 and 150 kg ha-1 of blood based liquid fertilizer – Nitrogen = 5%; C/N ratio = 3,5; Iron = 500 mg L-1). Vetch (Vicia sativa L.) was used as cover crop. Morphological traits, number and weight of fruits, dry matter, CIE Lab colour traits, content of nitrogen, Na, K, Ca, Mg and Fe in fruits were analyzed. Results showed that different FT as well as the interaction SMWC x FT did not significantly affect yield and quality. On the other hand, conventional tillage and green manure, integrated with mechanical weed control, gave a yield about 100% higher in comparison with no tillage and mulching without weed control. Differences regarding morphological traits, dry matter, colour parameters as well as content of nitrogen and elements were detected. In conclusion, organic production of Barattiere fruits in Puglia could be usefully carried out by using practices that maintain or increase soil organic matter, such as green manure, although weed control plays an important role.

Keywords: *Cover crop, Green manure, Mulching, Organic fertilizers, Tillage.*

THE INFLUENCE OF ORGANIC AND MINERAL FERTILIZERS ON THE AGROCHEMICAL PROPERTIES OF SOIL IN THE AGROECOSYSTEM OF ECOLOGICAL AGRICULTURE

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Abstract

Researches were carried out in Lithuania in the ecological production farm and in the Test station of Aleksandras Stulginskis University in the soils of *Calc(ar)i-Epihypogleyic Luvisol – LVg-p-w-cc* of different granulometric composition and indicators of agrochemical properties and in *Endohypogleyi-Eutric Planosol – PLe-gln-w*. Cereals, carrots, beetroots and potatoes were grown. Researches were conducted in 2008–2016. Ecologically grown agricultural plants were fertilized with mineral phosphorus and potassium fertilizers of natural origin certified in ecological farming system. Using these fertilizers it was possible to increase the amount of mobile phosphorus and potassium in the soil. Their accumulation in the soil depended on the present levels of phosphorus and potassium. The amount of humus in the soil decreased when agricultural plants were fertilized only with fertilizers of phosphorus and potassium. Having implemented the researches with various organic fertilizers of granulated pig bristles, flour of meat bones, cattle manure, friable horn shavings, horn gelatine flour, cattle manure compost and vermicompost, it was determined that it was possible to increase the amount of humus in the soil fertilizing with not all organic fertilizers. Cattle manure compost and biohumus fertilizers were the best suited for it. The amount of phosphorus and potassium in the soil did not always increase when fertilizing with only organic fertilizers. The amount of phosphorus and potassium in organic fertilizers was not sufficient to ensure the accumulation of phosphorus and potassium in the soil. In the agroecosystem of ecological agriculture the amount of humus in the soil increased, mobile phosphorus and potassium were accumulating in the soil after the usage of organic fertilizers was balanced with mineral fertilizers certified in ecological production.

Keywords: *ecological farming, fertilizers, agrochemical properties of the soil.*

EFFECTS OF *REGLALG* PLANT GROWTH REGULATOR ON SEED GERMINATION, GROWTH AND PARAMETERS OF OXIDATION-REDUCTION POTENTIAL OF *CUCUMIS SATIVUS* L. PLANTLETS

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Abstract

The use of ecological methods in agricultural production plays a significant role in reducing the risks of environmental pollution and in protecting human health. In this regard the application of plant growth regulators (PGR) separated from the vegetal raw material has an important role. The aim of this study was to investigate the effects of cucumber seeds treatment with *Reglalg* PGR, separated from *Spirogira* spp. algae, on seed germination, growth and the parameters of oxidation-reduction potential of *Cucumis sativus* L. plantlets. Optimal dose of *Reglalg* preparation was established. Used for processing the cucumber seeds before germination, *Reglalg* stimulated germination, morphological parameters of plantlets, which were more vigorous compared to those of the control. *Reglalg* application promotes an increase in the level of total polyphenols content, including flavonoids, which provides increased total antioxidant capacity in seedling roots. Analysis of the activity of peroxidase (PO) and catalase (CAT) in cucumber plantlets of the *Reglalg* application the activity level of PO in roots is higher than in stems, and vice versa, the activity level of Cat in stems is higher than in roots. In order to discover the role of *Reglalg* in regulating the state of the root cell membranes, the content of lipid peroxidation products in the root cells was estimated. It was shown that the application of *Reglalg* decreased the intensity of peroxidation processes in the cucumber roots, as compared to the control samples, which indicates the beneficial effect of its utilization for seeds processing before germination.

Key words: *plant growth regulator Reglalg, cucumber, germination, parameters of oxidation-reduction potential, seedlings.*

ORGANIC COMPOST IN COMBINATION WITH PGPR IMPROVE WHEAT YIELD AND SOIL PROPERTIES

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Abstract

Phosphorus deficiency in alkaline calcareous soils is a major constraint to get better crop growth and yield. A two-year study based on pot experiment was conducted at National Agricultural Research Centre (NARC), Islamabad to evaluate the availability of phosphorus from PGPR augmented rock phosphate enriched composts on wheat crop and post-harvest soil properties. The treatments included: control (no amendment), simply poultry litter @ 50 mg P kg^{-1}, rock phosphate @ 50 mg P kg^{-1}, rock phosphate enriched compost ($RPEC_1$) augmented with *Pseudomonas* sp. @ 50 mg kg^{-1}, rock phosphate enriched compost ($RPEC_2$) augmented with *Proteus* sp. @ 50 mg kg^{-1}, half dose of chemical P fertilizer @ 25mg kg^{-1}, full dose of chemical P fertilizer @ 50 mg kg^{-1}. The treatments were applied in combination with seed inoculated with PGPRs: *Pseudomonas* sp. and *Proteus* sp. The results showed that $RPEC_1$ increased thousand grain weight by 20%, dry matter yield (189%), number of tillers (279%), flag leaf chlorophyll content (22%), Gibberellic acid content (13%), and flag leaf Indole Acetic Acid increased by 14% over untreated un-inoculated control treatment. The *Pseudomonas* sp. alone and in combination with treatments showed better impact on the agronomic and physiological parameters of wheat crop over *Proteus* sp. The $RPEC_1$ also showed maximum increase in post-harvest soil available phosphorus with 401% increase, Nitrate nitrogen (57%), alkaline phosphatase activity (1075%), microbial biomass carbon (15300%), and microbial biomass phosphorus was increased by 1203% over un-inoculated untreated control. It can beconcluded that compost prepared with rock phosphate and PGPR inoculation, can be the best solution to fulfill crop P requirement for better yield and to improve soil chemical and bio-chemical properties.

Key words*:* *Compost, PGPR, Rock Phosphate, Wheat, Soil Properties.*

ORGANIC AND INORGANIC MULCHING AS A POTENT WEED MANAGEMENT STRATEGY FOR WHEAT PRODUCTION UNDER RAIN FED CONDITIONS

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Abstract

Mulching is an eco-friendly and organic weed management approach, which may be effectively used as a tool in controlling weeds. A field research study was conducted at District Harpiur, Pakistan to investigate the effect of various mulch materials on weed suppression in wheat under rain-fed conditions in 2014. Six mulching treatments including one live mulch (lentil), Buctril super spray at 500 mL/acre and no mulch (control) for comparison under randomized complete block design with four replications were applied. The analysis of data revealed significant decrease in weed density, relative weed density, fresh and dry biomass in all the wheat weed species at 25, 50 and 75 days after sowing (DAS) where Buctrilsuper @ 500 mL/acre and black plastic mulch were used followed by dry leaves of mulberry, sugarcane bagasse when compared with control where no mulch was applied. Maximum weed density, relative weed density, fresh and dry biomass was recorded in the test weed species where lentil was intercropped with wheat and dry leaves of mulberry were used. Maximum net economic benefits in the form of benefit cost ratio (2.55) were recorded where grass clippings were used followed by mulberry leaves (2.49), sugarcane bagasse (2.43) while low net economic benefits (1.72) were noted where lentil was intercropped with wheat. It can be inferred that grass clippings and sugarcane bagasse can be used for controlling weeds in the wheat field with reduced cost of production at Haripur, Pakistan and similar conditions.

Key words: *Wheat, Weeds control, Mulches, economic benefits.*

CHANGE OF PHOSPHATES CONTENT ALONG SOD-PODZOLIC SOIL PROFILE INFLUENCED BY LONG-TERM FERTILIZERS APPLICATION

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Abstract

The degree of soil supply with phosphorus is the most important indicator of the cultivation level and fertility of soils. The objective of the research was to study the effect of long-term use of organic and mineral fertilizers on phosphate regimen of sod-podzolic soil along the profile. The study was carried out on the basis of a long-term stationary experiment on sod-podzolic soil (*Umbric Albeluvisols Abruptic*). We studied application of non-traditional organic fertilizer (sewage sludge) with a systematic application and after effect. The effect of sewage sludge was compared with the cattle manure. The supplies of various phosphorus forms in the soil were calculated. The rising of total and mineral phosphorus content in meter soil layer, organic to a 20-40 cm depth and mobile to a 40-60 cm depthwith application of sewage sludge during five rotations of crop rotation was noted. Manure application (from III to V rotation) promoted the rising of total, mineral and mobile phosphorus content in the soil to a 40-60 cm depthdecreasing the percentage of organic phosphorus in soil layers 0-20 and 20-40 cm. Phosphate regimen of sod-podzolic heavy loamy soil was affected by long-term application of organic (sewage sludge) and mineral fertilizers.

Keywords: *phosphate chemistry, sewage sludge, mineral nutrition, fertilizer, manure.*

MOBILE PHOSPHORUS CONTENT IN SOD-PODSOLIC SOIL AFFECTED BYLONG-TERM APPLICATION OF FERTILIZERS

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Abstract

The mobile phosphorus content in the soil is one of the most important indicators of fertility. We studied the dependence of dynamics of mobile phosphorus content from fertilizers application in a long-term experiment. Studies showed that the use of super phosphate at a 30-120 t/ha^{-1} rates during five rotations of crop rotation promoted the rise of phosphorus mobile forms content in the soil. Accumulation of phosphorus mobile forms in sod-podzolic soil rose with increase in the rates of super phosphate compared with the background of nitrogen-potassium fertilizers. The phosphorite flour application in rate of 90 kg/ha^{-1}with soil pH 4.3-4.5 was not concede to super phosphate in equivalent quantity. A single application of 40-60 t/ha^{-1}of manure during rotation did not significantly increase the mobility of phosphorus content. The greatest positive effect was observed with the combined use of mineral and organic fertilizers. The content of phosphorus mobile forms in sod-podzolic soil significantly depended on the systematic application of phosphorus fertilizers. A significant effect of liming on the mobile phosphorus content was found in the second rotation of crop rotation in a treatment of the lime rate, based on half of the hydrolytic acidity. Higher rates of lime did not promotethe further rise of this indicator.

Keywords: *mobile phosphates, super phosphate, phosphorite flour, manure, liming.*

SUSTAINABLE AGRICULTURE IN ORGANIC WHEAT (*TRITICUM AESTIVUM* L.) GROWING IN ARID REGION

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Abstract

Qassim region is considered to be an urban area of agriculture in the Kingdom of Saudi Arabia. Climate in this region is predominantly arid. Low fertility soil is considered a major challenge for sustainable growing wheat (Triticum aestivum). The objective of this study is to assess some agronomic characters of wheat genotypes growing organically in low fertility soil. This experiments were conducted in 2010 and 2011 growing seasons at two different locations. In each location, eight bread wheat genotypes were used for this study. Parameters measured were: Plants height (cm); Chlorophyll content, Flag leaf area (cm^2) and Harvest Index. Our finding results demonstrated a variation between conventional and organic systems in the parameters under the study. However, Plant height data showed that local genotype recorded the highest plant height under the conventional system among all genotypes. Chlorophyll content data showed that the greatest Chlorophyll content was in IC 17 genotype. Flag leaf area (cm^2) presented only one genotype was highly significantly for conventional versus organic systems. Harvest index was high in two wheat genotypes in the organic system (YR and Side 12). Therefore, promising bread wheat genotypes for organic production systems in low-fertility soil were observed.

Keywords: *Wheat genotype, Conventional system, Organic system, Yield performance, Quality.*

SUPEROXIDE DISMUTASE ACTIVITY AND MDA CONTENT IN *BROMUS MOLLIS* L. SEEDLINGS TREATED WITH *ORIGANUM VULGARE* L. AQUEOUS EXTRACT

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Abstract

Secondary biomolecules of plants (allelochemicals) can offer an alternative method to the chemical control of pathogens on agricultural crops and reduce the use of synthetic herbicides reducing environmental pollution. One of the main invisible effects of allelochemicals on target plant is uncontrolled production and accumulation of reactive oxygen species (ROS). Excessive production of ROS is accompanied by the activation of enzymatic defenses. Activity of antioxidant enzymes is frequently used as indicator of oxidative stress in plants, while increase of lipid peroxidation is a widely used stress indicator of plant membranes. Effect of different concentrations (0.1 and 0.2%) of *Origanum vulgare* L. aqueous extract on lipid peroxidation process (LP), as well as the activity of superoxide dismutase (SOD) in leaves and roots of bromus (*Bromus mollis* L.) seedlings were examined 24 h, 72 h and 120 h after the treatment. In the treatment with 0.1% *O. vulgare* extract, SOD activity showed an increase in a range of 30-55%, in the bromus roots. The higher concentration caused higher increase of SOD activity (in a range of 40-75%). Statistically significant increases in malondialdehyde accumulation, an end-product of LP, were recorded in leaves and roots of bromus 120 h after the treatment (in a range of 13-20%). Increase in the activity of antioxidant enzyme superoxide dismutase and accumulation of MDA in bromus leaves and roots probably occur in response to stress induced by *O. vulgare* aqueous extract. It indicates that plant extracts should be explored in the development of natural control of pathogens.

Keywords: *Allelochemicals, Bromus mollis* L., *Origanum vulgare L.*

THE EFFECT OF *ORIGANUM VULGARE* L. AQUEOUS EXTRACT ON POD ACTIVITY IN SOYBEAN PLANTS

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Abstract

Application of secondary biomolecules of plants, called allelochemicals, into agricultural practice may reduce the use of synthetic herbicides. These compounds are easily biodegradable, environmentally-friendly, and often cheaper than the synthetic ones. The use of secondary biomolecules as weed control agents becomes widely investigated, however the impact of these molecules on cultivated plants is less known. The objective of this study was to examine the effect of oregano (*Origanum vulgare* L.) aqueous extract on soybean antioxidant properties to assess its possible side effects when applied as bioherbicide in soybean organic production. The effect of two concentrations (0.1% and 0.2%) of *O. vulgare* aqueous extract on the activity of pyrogallol peroxidase and guaiacol peroxidase (POD) in leaves and roots of soybean (*Glycine max* L.) cv. Venera plants were examined 24 h, 72 h and 120 h after the treatment. Our results showed that the significant increase in the pyrogallol peroxidase and guaiacol peroxidase activity was recorded in leaves of soybean plants 120 h after the treatment. On the other hand, in the roots of soybean plants both concentrations of *O. vulgare* aqueous extract stimulated the significant decrease of the pyrogallol peroxidase and guaiacol peroxidase activity. The results indicated that *O. vulgare* aqueous extract had both, inhibitory and stimulatory effects on POD activity in soybean plants. Furthermore, the effect of *O. vulgare* aqueous extract was different between leaves and roots of soybean and it could be concluded that allelopathic effect was dependent on the plant tissues.

Keywords: *Bioherbicide, Glycine max L., Origanum vulgare L.*

THE YIELD AND CONTENT OF ESSENTIAL TRACE ELEMENTS OF WINTER WHEAT GRAIN IN ORGANIC AND CONVENTIONAL GROWING TECHNOLOGY

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Abstract

The choice of winter wheat cultivation technology affects the quality of the processing. The selected cultivation technology should ensure optimal yield of grain of maximum quality. The paper examines the influence of organic and conventional winter wheat production on yield and content of essential trace elements of winter wheat grain. The trial was set in 2016/17 on the experimental field "Radmilovac" of the Faculty of Agriculture of the University of Belgrade" (Serbia), on chernozem luvic soil type. In conventional technology, the variety of common soft wheat Ilina (*Triticum aestivum* ssp. *vulgare*) was growing in conventional tillage systems. In addition to basic fertilization with NPK fertilizers in the autumn, together with the basic cultivation of soil, in spring added two different amounts of nitrogen (60 and 120 kg/ha N) in top dressing. There was control treatment (without N), also. Standard cultural practices in wheat production were applied, and the harvest was carried out on June 29th. In the organic technology variety Nirvana (*Triticum aestivum* ssp. *spelta*) was the object of investigation. Organic growing technology included conventional soil tillage, fertilization with microbiological fertilizers without chemical protection of crops. In addition to grain yield, the content of the most important trace elements in grain in both technologies was examined. The grain of yield was statistically very higher in conventional than in organic production. The Fe, Mg and Zn contents were higher in wheat grain from organic growing technology and the content of other elements and grain yield were higher in conventional growing technology.

Keywords: *grain of winter wheat, growing technology, elements, yield.*

A BUDDHIST APPROACH TO ECOLOGY

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Abstract

The teachings of the Buddha, although foremost focused on the struggle with the human psychological features of greed, hatred and delusion, nevertheless pay attention to the preservation of nature and the ecological system by engaging in promoting and spreading a non-violent teaching for the preservation of the ecological system – the protection of nature, the forests, wild animals, the earth, etc. Humankind faces a direct threat, once the living conditions on earth are damaged. With regard to the protection and safeguarding of the ecological system and its animals the rule of non-harming or no-killing is the most observable precept for the Buddhist. In addition to the idea of non-harming, Buddhism proposes the philosophy of loving-kindness towards all living things visible and invisible, which should be protected as a mother protects her children. Ultimately, because of mercy and kindness towards living beings, Buddhism proposes a philanthropic attitude – the compassionate empathy for all forms of life which undoubtedly qualifies the conservation of the ecology. Buddhist monks who are dependent upon ecological conditions for the survival of their life-style, practice disciplinary rules to preserve the forests while living in the forests and provide good examples how to preserve nature while being with nature. In this sense, Buddhism and nature are inter-related and inter-dependent. This paper attempts to show Buddhist engagement in ecological systems and how Buddhist thought and texts encourage followers to be with nature. Furthermore, this paper will examine how Buddist concepts of a simple but contented life with few belongings, expressing love towards all, caring and sharing, contemplative of inward and outward circumstances and developing a comprehensive understanding of oneself and the world in general – challenge and confront today's ecological challenges. Explores the ecological and environmental teachings of Buddha, particularly Dhamma (nature) and their relationship with deep Ecology as well as with effective public participation in the context of this book, dhamma (also known as Dhamma by many Buddhists) is nature, natural truth, natural law and the teachings of Buddha. The lack of effective communication and citizen participation in environmental affairs, especially between westerners and the people of Asian, has been the cause of needless environmental, societal and economic problems and costs. Buddhism, especially thought Dhamma and Deep Ecology offers a means to secure that participation in the decision making process in both Buddhism and non-Buddhism nations. Technical experts offer countless opinions, pros and cons, on the development that may change forever a stream, stand of rain forest, or other fragile ecological settings. But although technical comment abound, it is,unfortunately, for sale or hire by highest bidder. Public opinion is scarcely heard over the cacophony chorus of vested interests. The author trusts the Buddhism and deep ecology will bring some harmony to the discordant voice of all those concerns with the life on this planet.

Keywords: *Buddhism, ecology.*

KINETIC OF MINERAL NITROGEN AND PHOSPHORUS: COMBINING EFFECT OF CONSERVATION AGRICULTURE AND ROTATION IN SEMI-ARID REGIONS

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Abstract

Adoption of conservation agricultural practices, reduced tillage and crop rotation resulted in a gradual build-up of fertilizing soil properties. It was expected that the increase in organic matter cover would influence soil mineral nitrogen and phosphorus content and their cumulative?? effect/rate/level?? of the topsoil. The effect of crop rotation and tillage practice on soil mineral nitrogen (MN; $mg.kg^{-1}$) and phosphorus (MP; $mg.kg^{-1}$) under three soil layer (0-10, 10-20 and 20-30 cm) were assessed. The cumulative rate and the mineralization kinetic were also studied. The experimental site was followed during a growing season. It is situated in Garn Halfaya in Northest of Tunisia. Three soil layers were the subject of this work: 0-10cm, 10-20cm and 20-40cm. Crop rotation, Barly monoculture (B/B), Sulla–Barly (S/B) and Barly-Sulla (B/S) were studied. Results showed that the higher content of mineral nitrogen was obtained at 0-10 cm particularly under (B/S). Also we recorded in CA, whether for B/B or B/S, the NN rate increased with depth. It went from 113.69 ppm (0-10cm) to 173.73 ppm (20-40 cm) for B/ S and 151.82 ppm (0-10cm) to 182.17 ppm (20-40cm) for B/B. The mineralization rate was very low for both cropping systems and for three depths. The cumulative levels of mineral phosphorus recorded showed a generally higher concentration in the 0-10 cm level compared to the other two depths. The linetic of MP was more important for conventional agriculture compared to CA for the two crop rotations.

Key words: *conservation agriculture, mineral nitrogen, phosphorus, kinetic, crop rotation.*

DETERMINATION OF CORN VARIETY CANDIDATES DEVELOPED FROM INBRED LINES WITH HIGH COMBINATION ABILITY

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Abstract

It was aimed to determine the yield and quality performances of single hybrid variety candidates obtained from high combination ability and high efficiency dent corn lines developed by different institutes carrying out maize breeding researches in this research. The experiment was carried out in three replications according to randomized blocks trial design in the experimental area of Karadeniz Agricultural Research Institute (Turkey) in 2014 and 2015. In the experiment, 17 kinds of candidates, 4 standard varieties, were used in the first year and 22 types of candidates and 4 standard varieties were used in the second year. Properties investigated in the research were: tasseling, plant height, height of first ear, moisture content in grain, ear/grain ratio, grain yield, protein, oil and starch ratios. Statistical analysis obtained the results showing significant differences ($p<0.01$) between the genotypes in terms of the characteristics investigated. The yield values per da varied between 820.0-1278.6 kg/da in the first year and 791.5-1380.5 kg/da in the second year. As a result of the experiment, applications for registration were made taking into consideration the results in the different locations types of candidates coming out of the Samsun location.

Keywords: *Dent corn, yield, plant height, grain moisture.*

THE YIELD AND QUALITY CHARACTERISTICS OF WIDELY GROWN GRAPE VARIETIES UNDER LOWLAND AND HIGHLAND CONDITIONS IN MERSIN, TURKEY

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Abstract

This study was carried out in Mersin (Turkey) in 2012-2013. Mersin, a city of Mediterranean Region, has very high potential for viticulture, while the early ripening table grapes are cultivated in the lowlands, late ripening table grapes and raisins grapes cultivation is done widely at highland regions. In this study, it was understood that Yalova İncisi, Tarsus Beyazı, Ergin Çekirdeksizi, Trakya İlkeren and Victoria grape varieties were cultivated at the lowland (≤500 m) and Kişniş, Göğüzüm, Takkara, Dilmit and Tilkikuyruğu grape varieties were cultivated at the highland of the Mersin. Grape growing maturity period in Mersin begins with in the second half of June at lowland (Trakya İlkeren) and ends with at the end of November (Tilkikuyruğu) at highland. The highest yield of grapes per vinestock was determined at Ergin Çekirdeksizi (10.42 kg) at lowland and, on the other hand, in Tilkikuyruğu (16.93 kg) at highland. Varieties' cluster of grapes weights was determined between 318.09 g (Trakya İlkeren) and 410.48 g (Ergin Çekirdeksizi) and a hundred berry weight was found out between 285.0 g (Ergin Çekirdeksizi) and 759.4 g (Victoria) at lowland. However, cluster of grapes weights showed a change between 192.00 (Kişniş) and 446.61g (Tilkikuyruğu) and a hundred berry weight was from 93.6 g (Kişniş) to 651.8 g (Tilkikuyruğu) at highland. TSS contents of varieties differed from 14,8% to 13.1% (except Tarsus Beyazı) at lowland. On the other hand, that showed an alteration between 15.6% and 19.2% at highland.

Keywords: *viticulture, yield, quality, lowland, highland, Mersin.*

THE EFFECTS OF PARAFFIN AND PARAFILM APPLICATIONS AND DIFFERENT ROOTSTOCKS ON YIELD OF GRAFTED VINEIN'BLACK MAGIC' GRAPE CULTIVAR

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Abstract

This research was conducted in 2016 at the Department of Horticulture of Mustafa Kemal University. The scions belonging to 'Black Magic' grape cultivar were grafted on '41B', '1103 P', 'Fercal' and 'SO4' American rootstock cuttings using omega grafting method in the experiment. Paraffin was applied to one half of the grafted cuttings.The other half was wrapped with parafilm and then paraffin was applied. Grafted cuttings were planted in perlite medium at 3.0 x 3.5 cm intervals inside plastic buckets and kept in the stratification room for 4 weeks. Grafted cuttings, which had been maintained under room conditions for one week, were then grown for 2 months under unheated greenhouse conditions. In order to determine rootstock and application effects, sprouting ratio (%), callusing rate at grafting point (%), callus degree (0-4), rooting ratio (%), rooting degree (0-4), shoot length (cm), shoot diameter (mm) and grafted grapevines (%) were examined. According to the results of the study, it was determined that paraffin+parafilm application yielded better results than paraffin application in terms of sprouting ratio (respectively 70.83%, 53.33%), callus formation (respectively 83.75%, 69.58%), callus degree (respectively 2.79, 2.54) and yield of grafted-vines (respectively 68.33%, 51.67%). In terms of the rootstocks, sprouting ratio was determined to be the highest in SO4 rootstock (71.67%) and the lowest in Fercal (54.17%). 1103 P rootstock yielded a highest value than other rootstocks in terms of shoot length (26.17 cm) callusing rate at grafting point (88.33%), and rooting ratio (97.50%). The effect of rootstocks on shoot diameter, number of shoot nodes, rooting degree, and grafted grapevines was found to be similar.

Key words: *Grafted vine, Rootstocks, Paraffin, Parafilm.*

A SHINING STAR IN TURKEY AS A NEW PROFITABLE ANIMAL PRODUCTION OPPORTUNITY IN TURKEY: THE RED WIGGLER

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Abstract

Vermicomposting can be called as a kind organic fertilizer of nature. Vermicomposting is based on using earth worms and microorganisms to help stabilize active organic materials. It also converts active organic materials to a valuable soil amendment and a source of plant nutrients. If vermicompost is added to a soil, it enhances the nutrients available to plants. It has also be demonstrated that vermicompost increases plant growth and depresses plant diseases and pest insect attacks. Vermicomposting products have many applications, in vegetable production, home gardening, fruit gardening, landscaping, vinegrowing, and in agriculture in general. This survey study was conducted in July, August and September 2016. During the survey, about 19 vermicomposting enterprises were visited and business owners were asked to fill in a questionnaire . According to the data, the vermicomposting enterprises were not organized. The business owners complained about some difficulties, such as lack of public information. also complained about a red tape for the Ministry of Food, Agriculture, and Livestock.

Keywords: *Red wiggler, Eisenia fetida, earthworm, vermicast, organic fertilizer.*

ENVIRONMENTAL ASSESSMENT OF LAND OF AGRICULTURAL ENTERPRISE IN UKRAINE

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Abstract

The main aim was to assess the land of the farm in Ukraine for parameters in the environmental passport and to discuss how the results comply with the requirements of special raw material zones. We assessed the land of the farms by applying several methodologies (the methodology of agrochemical passportisation for agricultural land, the methodology to assess whether agricultural land of Ukraine is suitable to form environmentally friendly zones). We analysed arable soil layers of the several fields in Ukraine (Chernigivska, Kyivska and Sumska regions). This analysis included the following parameters of the environmental passportisation: soil fertility via the content of humus, the content of nitrogen, phosphorus and potassium. Main results indicate that levels of soil fertility differ among the studied fields. The very low content of humus is found in field 7 (<2%) and the medium content of humus is in field 6 (4-6%). The rest fields have the low content of humus (2-4%). The content of nitrogen also differs among the fields. Furthermore, the content of exchangeable potassium is classified as medium for field 5 (81-120 mg/kg), high for field 2 (121-180 mg/kg) and very high for the rest fields (>180 mg/kg). Based on the results, the fields of the farm are classified as «suitable» and «suitable, but with limitations».

Key words: *environmental assessment, soil fertility, environmental passportisation*.

MANUAL FOR PROPANE-FUELED FLAME WEEDING IN CORN, SOYBEAN, AND SUNFLOWER

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Abstract

Flame weeding is an approved method for weed control in organic cropping systems, with the potential for use in conventional agriculture. From 2006-2013 we have conducted a series of over 50 experiments, which resulted in over 20 journal and proceeding articles about crop tolerance to heat and weed control with flame weeding in field corn, popcorn, sweet corn, sunflower, soybean, sorghum and winter wheat. We compiled the above research information into a training manual that describes the proper use of propane fueled flaming as a weed control tool in six agronomic crops (field corn, popcorn, sweet corn, soybean, sorghum, and sunflower). Flame weeding manual contains 32 pages of text and color pictures. The pictures provide visuals of crop growth stages when flaming can be conducted safely without having side-effects on crop yield. Pictures of weeds provide visuals of appropriate growth stages when weeds need to be flamed to achieve good weed control. There are six chapters in the manual: (1) The need for alternative weed control methods; (2) Propane fueled-flame weeding; (3) How flame weeding works; (4) Equipment and configurations; (5) Propane dosage at different weed growth stages, and (6) Crop Tolerance to post-emergent flame weeding. Manual is free, it can be downloaded in a pdf format from the following website: http://www.agpropane.com/ContentPageWithLeftNav.aspx?id=1916;

Keywords: *Flaming, organic, flame weeding, propane, weed, crop, heat.*

4. ENVIRONMENT PROTECTION AND NATURAL RESOURCES MANAGEMENT

THE AGRO-ECOLOGICAL PRESERVATION OF APRICOT VARIETIES BY THE BIOLOGICAL CURTAINS IN THE BOUKHMISSA AREA, HODNA PLAIN (M'SILA), ALGERIA

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Abstract

The varietal potential of the apricot in the agricultural area of Boukhmissa in the arid Hodna plain north of the town of M'sila has five varieties. This plant genetic resource contributes economically, socially and ecologically to the region. The overall protection of this potential is imperative and the biological curtains as an indirect protection is more than necessary. The biological curtains (windbreezes) installed for agronomic and environmental reasons. It consists of one or more rows of trees. The Boukhmissa (M'sila) perimeter, where the fruit plantation with apricot tree is the most important speculation, illustrates this practice well. A diagnosis of the situation in 29 study stations showed that the biological curtains in this area were installed in a subjective and anarchic way within the apricot orchards, the five most replicated varieties in the study area are: Red Louzi, Bullida, Paviot, Tounsi and Polonais. The results obtained at the end of this study are: -The use of conifers is dominant in more than 62% of study stations. -The biological curtains have a relatively young age (less than 20 years), which shows that this agroforestry protection system in this area is recent. -The low porosity of the system (28%) due to the relatively high planting density. -With respect to the height of the wind breezes of our stations, and given the relatively young age in most stations, the height is less than 10 m. - Most of the stations have small biological curtains, which are to say less than 3 meters, is more than 86% of the study stations, because of their composition of a single row of plant species Protection. In order to better exploit the biological curtains (wind breezes), an optimal height of protection, a porosity of 40 to 50%, A minimum width of 03 meters, an orientation perpendicular to the direction of the winds and finally a choice of fast growing, long-lived and multi-use species.

Keywords: *Biological curtains, Diagnosis, Varietal potential, Apricot, Boukhmissa*.

CAN WATER QUALITY INFLUENCE THE CHOICE OF BLACK BELLIED SANDGROUSE DRINKING WATER IN ARID REGION?

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Abstract

The black bellied sandgrouse (*Pterocles orientalis*, L. 1758) appears to be one of the most adapted species to extreme conditions of arid regions. However, implementing actions to promote in situ conservation based on understanding the behavioral ecology of the black bellied sandgrouse populations. this study was conducted in the south east of Algeria between 2014 and 2015, we sampled water from 20 watering sites of the black bellied sandgrouse, and we conducted water tests on the following parameters: the hydrogen potential pH, conductivity (EC) and the rate of: potassium (K), sodium (Na), copper (Cu) and zinc (Zn). The results show that the variation in pH between 6.17 and 7.61 with an average of 7.19 ± 0.3 (n = 20), while the EC varies between 0.18 and 24.2 mS / cm with an average of 3.73 ± 6.89 mS / cm. Our results show that the concentrations of potassium varies between 1.27 and 93.92 ppm, with an average of 18.61 ± 24.22 ppm, while the changes in sodium concentrations is between 0.13 and 3799.73 ppm, with an average of 668.72 ± 1023.06 ppm . the concentrations of copper vary between 0.12 and 0.24 ppm, with an average of 0.19 ± 0.03 ppm, while the variations in concentrations of zinc is between 0.86 and 1.68 ppm, with an average of 1.31 ± 0.21 ppm. The black bellied sandgrouse uses has no preference, it drinks readily available water, whether fresh or brackish.

Keywords: *black bellied sandgrouse, drinking behavior, salinity, heavy metals, south east of Algeria.*

A SYSTEM OF SENSORS AND ACTUATORS PREVENTING ANIMALS FROM INJURIES DURING THE GRASSLAND HARVESTING

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Abstract

During the harvesting process-especially in spring time-animals are in danger of being injured or killed by agricultural machines e.g. mowers cutting and collecting grass. Every year a large number of fawns are killed because their instinct does not allow them to flee from the approaching machines. There are some important reasons to protect fawns: not to contaminate the grass, not to blunt the knives, and last but not least not to kill the very young animals. Several systems for detecting animals in a hayfield are available. They differ in usability, comparativeness, sensor technology, and automation capabilities. Our approach consists of a row of optical sensors mounted in front of a grassland mower. The measuring line corresponds to the total working width of the mower. While the measuring line crosses live animals, they are detected within a time period of 20 ms by means of their certain optical features. The detection signal immediately triggers the hydraulic lifting process of the mower mounted at the tractor. This procedure prevents the injury of the animal up to a tractor speed of 13 km/h. The optical sensor detects the live animal due to its surface reflectance in certain wavelengths. The sensor system also includes an artificial light source to be independent from the ambient light (morning/evening light conditions). Several tests have been carried out in the last few seasons to ensure the reliability of the system.

Keywords: *animal protection, grassland harvesting, optical sensor, hydraulic actuator.*

A SYSTEM OF OPTICAL/ACOUSTICAL SENSORS/ACTUATORS PREVENTING ACCIDENTS BETWEEN WILD LIFE ANIMALS AND VEHICLES ON ROADS

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Abstract

Roads across free wild landscape pose a permanent danger of accidents in which vehicles collide with wild-life animals. In most cases animals are aware of the sound and visibility of approaching cars. In rare situations, however, either at dawn/sunset or rare traffic, or at specific topologic situations, collisions happen between vehicles and animals. We propose a sensor/actuator system that prevents these collisions by warning animals. This system consists of active electronic components and is operated by solar power. Tests with the previous generation of this device showed a reduction of accidents by 89% and under certain conditions by more than 95%. The system consists of devices that can operate alone or as a group. The device is operated by a microcontroller, it contains optical/acoustic sensors and actuators, a wireless communication facility, and is supported by a power harvesting/storage/control system. One device is 18 cm in height, 9 cm in width and 7 cm in depth, weighs about 400 g and it is mounted on any guide post in the street. One device detects approaching vehicles either by their sound (microphone sensor) or head light (solar cell used as light sensor) and emits a tone of about 4 kHz directing off the street warning the animals. A LED flash light gives an additional optical warning. The tone makes animals observe their environment carefully and keeps them staying several seconds preventing them crossing the street at the same time when a vehicle comes by. A group of nearby devices is connected wireless. They are placed about 30-50 m apart. One can stand in the street and another one 50 m away upwards or downwards remotely from the street for keeping aisles and curved areas safe.

Keywords: *Animal protection, accident prevention, optical sensor, acoustic sensor, energy harvesting.*

BIODIVERSITY OF THE BUSKO LAKE FRESHWATER FISH AS A PART OF DIVERSITY OF ICHTHYO FAUNA IN THE KARST FIELDS OF BOSNIA AND HERZEGOVINA

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Abstract

The Busko Lake forms a large karstic, surface freshwater accumulation in the southwest of Bosnia and Herzegovina, at the foothills of Dinaric mountains massif. From the scientific standpoint, especially recognisable is the species diversity of freshwater ichthyofauna, while a significant number of endemic fish species that inhabit the underground karst aquifers, by their status, witness the unexpected changes in composition and diversity of ichthyopopulation. The Cetina River basin encompasses surface and underground waters of Glamocko, Kupresko, Suicko, Livanjsko, Duvanjsko and Sinjsko karst fields. The total number of recorded species is 35, with the greatest diversity in the main waterway of the Cetina River (27 species), followed by the waters of Livanjsko field (18 species). More than half the fish species (18 species; 51%) were introduced and are potentially invasive. Out of the 17 native species, five (29%) are stenoendems. The research task represents continuation of a long-term investigation of qualitative and quantitative traits of the Busko Lake ichthyopopulation. The latest, thoroughly defined ichthyological research was conducted during 2007, 2008, and 2009 on the Busko Lake. The rationale of the current research can be found in a marked extinction of many species, specific for a particular ecosystem, which have either completely disappeared or have had their numbers significantly reduced, while there is a simultaneous, gradual increase in numbers of introduced species. These evident changes in qualitative and quantitative profiles indicate that the observed ecosystem has undergone significant changes, the cause of which has yet to be eradicated. Initially, in this paper, it is essential to conduct a survey and ascertain areal of each individual species, determine distribution of endemic species, and establish protection measures.

Keywords: *Busko Lake, freshwater fish biodiversity, endemic species, Bosnia and Herzegovina.*

STATE OF VASCULAR FLORA IN THE NATURAL PART OF BUSKO LAKE IN BOSNIA AND HERZEGOVINA AND SUSTAINABLE DEVELOPMENT

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Abstract

From the aspect of biodiversity, in the broadest sense of comprehension, Bosnia and Herzegovina is one of the most unique regions of Europe. One such natural resource is the area of the present-day Tomislavgrad municipality. The special attraction, for botanists, is the aquatic complex of the Busko Lake.The research was conducted during vegetation season in spring 2018, in order to determine diversity and distribution of plant species inhabiting coastal parts of the Busko Lake. Using the Braun-Blanquet method (1964), phytocoenological analysis was performed at selected sites. Lowland forests and shrubs have developed in coastal parts of the lake and its tributaries, the most prominent of which are: *Crataegus monogyna, Rhamnus alpinus ssp. fallax*, while less represented species are*: Cornus sanquinea, Salix alba, S. fragilis* and *Populus nigra.*Tertiary vegetation is also present in the area where anthropogenic impact occurs to a greater or lesser extent. This type of vegetation is located around human settlements, rich in habitats and nitrites, edges of roadsand other similar habitats. The species of this vegetation present at researched sites are: *Senecio vulgaris, Lolium strictum, Poa annua, Sonchus oleraceus, Erigeron canadensis, Fumaria officinalis, Lamium purpureum* and others. Macrophytic vegetation is well developed in the coastal belt and shallow waters, represented by species: *Veronica beccabunga, Glyceria fluitan, Veronica anagallis-aquatica* and others. Many human activities lead to the rapid disappearance of rare and ecologically specialized species as well as the fragmentation of their habitats. Environmental protection guarantees the complete preservation of environmental quality, the preservation of natural communities, the rational use of natural resources and energy in the best way for the environment, as a basic condition for healthy and sustainable development.

Key words: *Buško Lake, phytocoenological analysis, floristic composition of vegetation, anthropogenic factor, sustainable development.*

AMBIENT OF HEALTH LIFE IN THE LIGHT OF USING THE HEALTHCARE FOOD

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Abstract

One of the most important environmental factors, which affect the environment of a healthy life is diet. About 75% of new diseases that have occurred since 2000 in the population of Bosnia and Herzegovina have come from animals or products of animal origin. So-called zoonosis are diseases that can be transmitted from animals to humans most often through food. In addition to zoonosis, contamination of soil, water, air and plants also affects, to a large extent, directly or indirectly the environment of a healthy life. Soil, air, water and plants can be contaminated with pollutants such as heavy metals in the soil or dangerous substances that produce certain types of mushrooms, all of which are transferred in many ways to food production processes. This research will define the characteristics of a healthy living environment, complemented with healthy food, then explain and demonstrate, on appropriate examples, what the hazardous places in food production are, and how to reduce the likelihood of their occurrence by applying the standard and applicable regulations.

Keywords: *Healthy environment, health-correcting horns, zoonosis, heavy metals, standards in food production, hazards.*

REVERSE OSMOSIS, AS MEMBRANE TEHNIQUE FOR CONSUMPTION OF INCIDENTAL DEPONIUM WATER/FILTER

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Abstract

The opening of landfills in our country, as a result of production and consumption, is spontaneous and unprofessional, without taking into account hazardous processes of waste degradation in landfills, or dangerous and harmful matters that are continuously released in form of gases, and in particular of filtrate, causes significant pollution, mostly contaminating river flows and groundwater and other environmental media. One of the most important project tasks in the construction and exploitation of the landfill is the controlled management of the landfill and precipitation waters through the construction of a system that allows separate collection, treatment and discharge of these waters into natural watercourses. Treatment of leachate/leachate filtrate includes purification or non-neutralization of the harmful effect. Raw landfill leachate cannot be discharged into the recipient without prior treatment, due to its exceptional pollution ability. Reverse osmosis, as a membrane technique for filtering leachate filtrate, has been increasingly used to separate and filter organic and inorganic matter from the filtrate. The principle of the process is very simple. The aim of this paper is to examine the fact that the landfill filtrates are among the most problematic types of wastewater, viewed from the aspect of toxicity, and selection of appropriate techniques for their purification.

Keywords: *filters, pollution, reverse osmosis, purification, cleaner technologies.*

PRINCIPAL COMPONENT ANALYSIS (PCA) IN ASSESSMENT OF THE LANDSCAPE IN HERZEGOVINA REGION (BOSNIA AND HERZEGOVINA)

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Abstract

The aim of the research was to reduce a large number of attributes in subjective visual assessment of landscapes. Determination of the significance of the main traits in landscape assessment is important for better understanding of the observer and intensifying of landscape changes. Numerous traits influence landscape perception but some of them can overlap. The question is if they can be grouped into components. We have studied which attributes are important for respondents to value landscapes. Principle component analysis (PCA) was done, and the Kaiser criteria was used to determine how many meaningful components should be retained for the interpretation. The presented methodology was applied to the real data obtained from the questionnaire on a sample of students attending the University of Mostar (Bosnia and Herzegovina). Statistical package SPSS 16.0. was used. The statistical analysis of nine variables showed four relevant main components that should be used for more precise decision-making and improvement of landscape development. The first PC could be named component of environmental and biological value, with traits: environmental value 0.872, biodiversity preservation 0.902 and biogeographic position 0.727 (correlation coefficients). The second PC is spatial and developmental component, and it emphasizes the importance of traits: rural development 0.848, spatial planning 0.838 and technological value 0.752. The third PC component is sociological value with traits of the same name 0.937. The fourth PC cultural tourism with traits: cultural heritage 0.944 and development of tourism 0.677. Interpretation of data through principal components shows some hidden connections and interrelations of data.

Key words: *PCA analysis, landscape, components, traits.*

WASTEWATER GOVERNANCE IN URBAN TERRITORY – CHALLENGES TO THE CIRCULAR ECONOMY IN BULGARIA

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Abstract

The uncontrolled growth of the cities and urban population has led to need to sustainable governance of natural resources and the waste. One the most important of these resources is water, which becomes a scarce commodity because of its use not only by the households, but also by the industry. In this regard, wastewater recycling is an essential element of the circular economy. Wastewater treatment is a process where extra resources are extracted - remain biogas and sand, sludge and purified water respectively. Generally, the resulting biogas is used for heat and electricity, the sand in the construction, and the purified water is discharged into hydro-basins. In practice, there are several options for utilizing sludge. These are known for improving agricultural or non-agricultural soils. Apart from agriculture, sludge is also used in forestry, reclamation of disturbed terrain - mines and eroded areas, fuel, and construction technologies. The aim of this paper is to analyse the benefits or threats for the society and the economy, as a result of the wastewater governance in urban territory, at the same time, paying attention to the environmental challenges arising from the circular economy. Does the circular economy harm the environment and society?

Keywords: *sustainable governance, circular economy, natural resources, wastewater recycling, Bulgaria*

SOIL AND AIR TEMPERATURE DURING THE SOWING PERIOD OF SPRING CROPS IN THE REGION OF SOUTHERN BULGARIA

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Abstract

The whole ranges of spring crops are traditionally cultivated in Bulgaria. Over the last thirty years, temperature and precipitation have been studied in Eastern Europe and, in particular, in Southern Bulgaria, with changes in both the average values of meteorological elements and their frequency and extreme event. Rainfalls are irregularly distributed and sometimes are heavy. In the same time droughts are intense and prolonged. These changes influence basic agrometeorological indices and are the subject of a study in detail. High temperatures start very early in the spring, they last long in the summer and negatively affect the growth, development and productivity of plants. All these make the cultivation of spring crops in some regions of South Bulgaria risky. To a great extent, the influence of anthropogenic factors is limited or minimized. However, the correct sowing time is a passive method for avoiding adverse meteorological effects. Initially, the plants begin their development in the soil and in this respect the conditions of heat and humidity in the layers of 2 cm to 20 cm during the sowing and germination period are of scientific interest. There is dependence between air temperature and soil, which is particularly strong during the spring period. The aim of the present study is to analyze the relation between air and soil temperature during the spring period paying attention to using and predicting the sowing time of spring crops in the southern Bulgaria area at the beginning of the 21st century.

Keywords: *spring crops, air temperature, emergence, soil temperature, sowing period.*

POTENTIAL OF CALENDULA OFFICINALIS FOR PHYTOREMEDIATION OF SOILS CONTAMINATED WITH HEAVY METALS

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Abstract

A field study was conducted to evaluate the efficacy of Calendula officinalis for phytoremediation of contaminated soils. The experiment was performed on an agricultural fields contaminated by the Non-Ferrous-Metal Works near Plovdiv, Bulgaria. The content of heavy metals in different parts of Calendula officinalis (roots, stems, leaves and flowers) was determined by ICP. The essential oil of the Calendula officinalis was obtained by steam distillation in laboratory conditions and was analyzed for heavy metals and its chemical composition was determined. Calendula officinalis is a plant which is tolerant to heavy metals and can be grown on contaminated soils. Based on the obtained results and using the most common criteria, Calendula officinalis can be classified as Pb hyperaccumulator and Cd, and Zn accumulators, therefore, this plant has suitable potential for the phytoremediation of heavy metal contaminated soils. Favorable is also the fact that heavy metals do not influence the development of the Calendula officinalis, as well as on the quality and quantity of the essential oil. For oil obtained from the processing of Calendula officinalis flowers grown on highly contaminated soils, its key odour-determining ingredients meet the quality requirements of the European Pharmacopoeia Calendula officinalis oil and/or have values that are close to the limits of the standard. The ability to process the calendula flowers in oil and its use in perfumery makes it extremely suitable for phytoremediation of heavy metal contaminated soils.

Keywords: *Calendula officinalis, Heavy metals, Phytoremediation.*

USING OF FUZZY LOGIC FOR DETERMINING THE APPROPRIATENESS OF PLANTING DIFFERENT AGRICULTURAL CROPS

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Abstract

Selection of a particular agricultural crop for the food production is a complex problem. This is usually conditioned not only by the financial claims, but also other requirements should be taken into the account, i.e. environmental criteria, sustainability, etc. Fuzzy Logicis one of the many appropriate tools/procedures for solving such task(s).Such a procedure will be implemented within decision-making algorithm for the selection of an appropriate agricultural crop. The paper deals with the implementation of the mentioned tool/procedure for selection and ranking of the particular sort of crops, regarding different decision-making structures. Within this, there is an intention to reduce all possible biases and subjectivities to minimum by using Fuzzy Logic. This will be applied with input parameters, which are extracted and correlated with real requirements and conditions regarding actual needs of the market and farmers. Along with the offered agricultural crops and possibility of their selection, final ranking and selection of the most appropriate crop can be supported for different possible scenarios (dry or wet period of the year, accents on the financial, environmental of other criteria, available financial resources, market availability, etc.). Presented methodology will contribute to the final goal, which is systematic agricultural planting and sustainability of the food production.

Keywords: *Fuzzy logic, Agricultural crop, Decision making, Criteria, Sustainability.*

WARMING BEE HIVES BY USING SOLAR ENERGY STORED IN WATER

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Abstract

The aim of the present study is to investigate the possibility of utilizing solar energy stored in water for warming the environment of beehives and its effect on hive temperature, honey area, pollen area, sealed brood area and the number of occupied frames. Six *Langstroth* hives were used containing honeybee colonies of equal strength from the species of hybrid *carniolan*. Two groups as follows: (G_1) control group (untreated hive), and (G_2) modified beehives that treated with solar energy system. The solar energy system consists of insulated wooden drawer located under the beehive, contained tied water bags and covered with polyethylene sheet. Solar energy stored in water was used to minimize the variation of inside air temperatures between the daylight and night times. The highest degrees of hive temperature, honey area, pollen area, sealed brood area and number of occupied frames (37.9 °C, 916 cm^2, 842 cm^2, 3688 cm^2 and 9 frames, respectively) were showed at the end of March for the modified beehives, while the lowest degrees (22.7 °C, 98 cm^2, 219 cm^2, 911 cm^2 and 3 frames, respectively) were recorded at January for the control groups of beehives, respectively. There was a significant increase in hive temperature, honey area, pollen area, sealed brood area and bee population in modified beehives that treated with solar energy system.

Keywords: *Warming, Honeybee colonies, Modify, Solar energy, Sealed water bags.*

THE EFFECTS OF LEONARDITE ON THE DISTRIBUTION OF CHEMICAL FORMS AND ZINC AVAILABILITY IN SOME SOILS OF WEST AZERBAIJAN

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Abstract

The aim of this study was to investigate the influence of leonardite on availability of Zn (Zn-DTPA) and its relationship with chemical forms of Zn in some calcareous soils. Physico-chemical properties of cultivated soils were determined. Soil samples were treated with 50 $mgkg^{-1}$ of Zn and kept for two months on field capacity. The different rate of leonardite (0, 2 and 4%) were added to the soils after incubation. Chemical forms of soil Zn was determined using the Tessier method following 20, 90 and 120 days. Laboratory evaluations were carried out as a factorial in a completely randomized design with three replications. The results showed that the leonarditehad different functional groups and a significant effect on chemical forms of Zn ($P<0.01$). The effect of leonardite and incubation time were different in chemical Zn forms on studied soils. About 44 to 60% of the Zn chemical forms were exchangeable, carbonate, organic carbon and Fe-Mn oxides forms, and 40 to 56% were in the residual form. The application of leonardite significantly ($P<0.01$) increased exchangeable, Fe-Mn oxide, carbonate and organic carbon forms of Zn the residual form, however, decreased in all soils. There was a significant correlation between some chemical forms and available zinc (Zn-DTPA) ($r=0.631^{**}$). It can be concluded that leonarditeas a biodegradable material can improve soil fertility and provide micronutrient for plant growth.

Keywords: *Chemical forms of Zn, DTPA, Leonardite.*

MITIGATION OF GREENHOUSE GAS EMISSIONS BY REPLACEMENT OF WHEAT CULTIVATION BY SAFFRON IN THE AGROECOSYSTEMS OF NORTH-EAST IRAN

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Abstract

The aim of this study was to evaluate the greenhouse gas emissions based on energy consumption in the saffron and wheat fields in Khorasan Razavi Province, Iran. For this purpose, the information needed was collected from the saffron fields (43 growers) during the 8 years of growing this crop and irrigated wheat production (65 growers) within 1 year by designing and completing a questionnaire through face-to-face conversations. The results revealed that the total and average annual energy consumptions in the saffron fields were 304.60 and 38.08 GJ/ha, respectively, while the total energy consumed in the wheat fields was 43.10 GJ/ha. The total and annual energy efficiencies based on saffron stigma yields were 0.002 and 0.003, respectively, while energy use efficiency and productivity of the wheat fields were calculated to be 1.95 and 0.16, respectively. The total emissions of greenhouse gases over 8 years of saffron growing season were 33099.1 kg of equivalent carbon dioxide per hectare (kg CO_2-eq ha^{-1}) and 1125.4 (kg CO_2-eq) per kilogram of the stigma. Also, the total emissions of greenhouse gases produced in the irrigated wheat fields 3408.2 (kg CO_2-eq ha^{-1}) and 0.81 (kg CO_2-eq) per kilogram of seed. From among the inputs of saffron fields, electricity (68.20%) and manure (28.80%) accounted for the highest shares in greenhouse gas emissions, respectively, so that the amounts of greenhouse gas emissions were 22574.4 and 9531.4 (kg CO_2-eq ha^{-1}), respectively, whereas in the fields of irrigated wheat production, electricity (88.5%) and nitrogen (4.2) had the largest shares in their emissions. Although organic fertilizers were from renewable energy sources, the greenhouse gas emitted from them allocated a high amount because of their immense consumption in the saffron fields.

Keywords: *Climate change, Greenhouse gases, Direct energy, Renewable energy, Energy efficiency.*

COMPARATIVE ANALYSIS OF SOIL VARIABLES IN DIFFERENT LAND USES OF THE SHAZAND WATERSHED, IRAN

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Abstract

Different land uses affect physical, chemical and biological properties of the soil and hence change the quality of soil. However, limited researches have been conducted in due course on the basis of high resolution field surveying. Therefore, the current study aimed to evaluate the effects of land use types on different variables of the Shazand Watershed (Iran) with a calcareous soil in central semi-arid region of Iran with an area about 1740 km^2. Towards this, five different main land uses viz. irrigated farms, rain fed farms, rangelands, orchards and outcrops dominant areas were primarily selected. Some 140 soil samples were then taken from the top 30-cm of the soil from homogeneous units representing an area about $\geq$ one km^2 and various soil properties such as sand, silt, clay, gravel, bulk density (BD), soil organic carbon (SOC), pH, electrical connectivity (EC), calcium carbonate ($CaCo_3$), nitrogen (N) were analyzed. The findings indicated that land use types had no significant effect ($P > 0.05$) on different soil variables. Nevertheless, the SOC and $CaCo_3$ in irrigated farm with respective values of 0.69 and 29.88 % were found to be more than those of other land uses. It is suggested from the results that other factors of slope, elevation and micro-climate might affect inter-variation of the study soil variables. These findings can be used for designating proper soil management strategies in the study watershed.

Keywords: *Land use/Land cover change, Land degradation, Soil organic carbon, Watershed management.*

SPATIO-TEMPORAL DYNAMIC OF LAND DEGRADATION USING REMOTE SENSING-BASED INDEX

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Abstract

Land degradation is the major issue which affect watershed sustainability and following social, economic and environmental of livelihood people. So, early detection of land degradation is necessary for policy-makers to make appropriate decision. In this way, remote sensing method is a candidate choice for assessments and monitoring. In this study, land degradation was assessed using Rain-Use Efficiency (RUE) in the Shazand Watershed, Iran in 1986, 1998, 2008 and 2016. Thus, annual rainfall was calculated using inverse distance weight (IDW), net primary productivity (NPP) were calculated using Landsat images. The results indicated that RUE had increasing and then decreasing trends which were 10.66, 33.77, 20.03 and 9.47 kg C ha^{-1} yr^{-1}. The results also illustrate that the mean value of RUE in different land uses varied between the irrigated land and orchard that had the highest value and outcrop dominant areas and bareland had the lowest value of RUE among land use categories. It is also established that spatio-temporal analysis of RUE can provide valuable information about the trend of watershed's sustainability over years.

Key Words: *Land use/cover, Watershed Sustainability, Watershed Health, Watershed Management.*

LAND COVER BASED WATERSHED HEALTH ASSESSMENT

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Abstract

The adoption of appropriate managerial approaches mainly depends upon proper monitoring and consequent assessment of ecosystems health. Towards that, the watershed health monitoring has gained recognition among regulating agencies such as Environmental Protection Agency (EPA). However, its importance has not been considerably taken into account by authorities in developing countries where the outcome of such approach is essentially needed for effective and efficient management of the ever-degrading ecosystems. To this end, the present article introduces a simple and standardized approach of describing the overall watershed health situation using risk based $R_{el}R_{es}V_{ul}$ framework. Towards this, three indicators of reliability (R_{el}), resilience (R_{es}) and vulnerability (V_{ul}) have been conceptualized and calculated based on the normalized difference vegetation index (NDVI) for the Shazand Watershed, Markazi Province, Iran, as a case study. NDVI is an important and commonly used vegetation index in research on global environmental change. The primary data collected to create NDVI maps was multi-spectral satellite images of path 165 and rows of 36 and 37, with a spatial resolution of 30 m from the Landsat Satellite images for the sample year of 2014. The results of $R_{el}R_{es}V_{ul}$ analysis showed that the overall condition of the Shazand Watershed health in terms of R_{el}, R_{es} and V_{ul} was healthy, un-healthy and moderately healthy, respectively with scores of 0.82, 0.17 and 0.50 out of 1.0. The average watershed health index based on $R_{el}R_{es}V_{ul}$ framework was also obtained 0.34 varying from 0.04 to 0.46. Hence, it can be concluded that the Shazand Watershed was in relatively un-healthy state from view of vegetation cover. The maintenance and recovery of the Shazand Watershed health should be considered as fundamental step to reach the integrated watershed management objectives.

Keywords: *Health indicator, Land degradation, Productivity assessment, Remote sensing, Watershed best management.*

VARIETY AND STATE RESEARCH OF ENERGY PLANTS IN LITHUANIA

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Abstract

Article presents the review of introduction studies on energy plants (variety and state of plants) cultivated at the collection at Kaunas Botanical Garden of Vytautas Magnus University. Collection was formed of 72 samples of plants: 40 genus, 53 species, 33 cultivars, 1 varietes, 3 hybrids. Plants are grown separately depending on their life form – woody plants, perennial herbaceous plants, annual (biennial) plants and introduced plants. Also non-infectious diseases (necrosis, dry branches), fungal disease agents (7 genus, 10 species), pests (2 genus and species) are described.

Keywords: *energy plants, state, variety, Kaunas Botanical Garden of Vytautas Magnus University*

EFEECTS OF CONTROLLED DRAINAGE ON SOIL WATER REGIME AND QUALITY IN LITHUANIA

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Abstract

Lithuania remains one of the most extensively drained of the Baltic and Nordic countries. The overall drained area (ditches plus tile drains) totalled 87% of the agricultural land area. Many nutrients from soil are leached through drainage resulting in polluting streams (drain flow receivers) water. Drain flow is treated as a major determinant of water quality. Therefore, the reduction of nutrients entering the drains is very important. Controlled drainage conception, when the outflow height is increased at the mouth, helps reduce drainage runoff and partially purify water. The aim of the research was to establish controlled drainage influence on the soil moisture regime, nitrogen and phosphorus leaching. Investigations were carried out in sandy loam and loam soils in the Middle Lithuanian Lowland. Based on studies, several tendencies were observed: when drainage outflow began, the amount of soil moisture in subsoil (50-80 cm layer of the soil) of controlled drainage plot was higher than in the conventional drainage plot, and higher moisture supplies stayed for a longer period of time. Controlled drainage had no direct impact on phosphorus and nitrogen concentrations but they were influenced by the leaching quantities of plant usable nutrients. The reason that in many cases lower nitrate nitrogen (54% of all measurements) and phosphorus concentrations (77% of all measurements) were found in the conventional system rather than in the controlled drainage might be connected to the fact that the latter area contained predominantly lighter textured soils (sandy loam) making it easier to wash away the nutrients unused by plant.

Keywords: *drainage water, nitrogen, phosphorus, sandy loam, soil moisture.*

POTENTIAL OF OPPORTUNITIES FOR REUSING SLUDGE, PRODUCED IN RECIRCULATING AQUACULTURE SYSTEMS

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Abstract

Aquaculture, just like any other economic activity, has effects on environment. This can be seen through the eutrophication and quality decrease of surrounding surface waters, due to being polluted by waste. One of the main advantages of recirculating aquaculture systems (RAS) is the absence of dispersed waste, i.e. the possibility to produce concentrated waste and thus simplify the decontamination process. This paper presents a review of RAS waste characteristics, global practices and tendencies of waste decontamination and their potential reuse, as well as recommendations, based on waste characteristics gathered through an analysis in an aquaculture farm. Sludge, produced in RAS, as well as the generated pollution, depends on the volume of feed. The main parameters, determining waste pollution – organic pollution index and dissolved nitrogen and phosphorus compounds - were measured in the analysed farm. The following results were obtained: biologic oxygen usage, showing the pollution of waste with organic material, was 106 mg/l, ammonium nitrogen concentration was 29 mg/l. This was significantly higher than 12 mg/l, found in literature. However, because the water pH index in the system oscillated between 6.27 and 6.7, in 23^0C water temperature; non-dissolved ammonium part was only 0.2%. Nitrite values were from 0.38 to 0.69 mg/, measured RAS phosphate values oscillated between 12 and 14 mg/l, which would correspond to phosphorus concentration of 3.9 – 4.6 mg/l. After determining the volume of sludge, produced in the RAS, relevant techniques for sludge reuse were suggested. The main features of these techniques are that they are eco-friendly, prevent pollution of surface water, are able to create added value and increase the profit of the company.

Keywords: *aquaculture sludge, environmental protection, recirculating aquaculture system, pollution, sludge reuse.*

CHANGES IN NUTRIENTS IN THE DOTNUVELE AND SMILGA STREAMS

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Abstract

Due to the intensifying agricultural activity, the leaching of nitrogen and phosphorus compounds from the soil to water has been increasing each year. According to the data of Helsinki Commission, the largest river in Lithuania – Nemunas, which Nevezis flows into, is considered to be one of the nutrient suppliers to the Baltic Sea. The tributaries of the Nevezis River - Smilga and Dotnuvele, collect the water saturated with nutrients from agricultural land, thus degrading the quality of the water of Nevezis, Nemunas and the Baltic Sea. Research data from 2013-2017 has shown that the average N_{total} and NO_3-N concentrations in Dotnuvele and Smilga streams' water in March (12.6 mg l^{-1}, 11 mg l^{-1} as well as 8.5 mg l^{-1} and 8.7 mg l^{-1}, respectively), May (11 mg l^{-1}, 9.1 mg l^{-1} as well as 5.4 mg l^{-1} and 4.6 mg l^{-1}, respectively), and November (4.5 mg l^{-1}, 8.7 mg l^{-1} as well as 3.5 mg l^{-1} and 7.4 mg l^{-1}, respectively) mostly corresponded to a very bad and poor ecological status, and only in August they corresponded to a good and very good water ecological status (2.4 mg l^{-1}, 3.2 mg l^{-1} as well as 1.1 mg l^{-1} and 1.3 mg l^{-1}, respectively). P_{total} and PO_4-P concentrations in the researched streams' water were usually low (0.04 – 0.08 mg l^{-1} and 0.02 – 0.05 mg l^{-1} in Dotnuvele, 0.03 – 0.08 mg l^{-1} and 0.01 – 0.03 mg l^{-1} in Smilga, respectively) and corresponded to a very good ecological status of water bodies, except in August, when the water quality in Dotnuvele was found to be average (0.19 and 0.14 mg l^{-1}).

Keywords: *Concentration, Ecological status, Nitrogen, Phosphorus.*

TRADITIONAL OLD FLOWER GARDEN IN LITHUANIA AND POLISH BORDER

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Abstract

Lithuanian-Poland border is a special territory, which belonged to Grand Duchy of Lithuania for 300 years long. Only in the 20th century state borders separated this territory. Still 20-30 km from the border on both sides the bigger part of inhabitants are Lithuanians. Decorative and medical plants were inventoried in 16 farmsteads (8 on each side) in Lithuania and Poland. The aim of this research was to assess how well the traditions of Lithuanian old traditional gardens were kept for around one hundred years in territories separated by state border. Altogether 95 species, now classified as traditional Lithuanian gardens plants, were found. These plants have been grown in flower gardens in Lithuanian villages from old times. 83 species of these plants grew on Lithuanian side of the border and 76 species on Polish side. There are no records telling when flower gardens have been established from in Lithuanian rural homesteads, but it is thought that it was done around 15th-16th centuries. According to their growth time plants were divided into three groups: 1) plants which were grown from 15–16 centuries – 14 species of such in Lithuania grown plants and 16 species in Poland; 2) from 17–18 centuries – 12 species in Lithuania and 13 species in Poland; 3) from 19–20 century – it was found 57 species in Lithuania and 47 species in Poland.

Keywords: *Lithuania-Poland border, traditional Lithuanian gardens; decorative and medical plants and herbs.*

STUDY THE IMPACT OF CLIMATE CHANGES ON VEGETABLE CROPS FROM THE FARMERS POINT OF VIEW IN GAZA STRIP

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Abstract

This paper discusses the impact of climate changes on vegetable farmers in Gaza Strip. The objective of this study is to highlight the awareness of vegetable growers in different regions about the concept and elements of climate changes and how these changes effect on different types of vegetables in terms of growth rates, productivity and change of shape and color. Also, the objective of this study also is to highlight the impact of climate changes on the consumption quantity of water needed for vegetables growth. To achieve these objectives, the study relied on descriptive comparative analytical approach for various data collected from its primary sources through distribution of a questionnaire form to 104 farmers in the northern, central and southern Gaza Strip. This study has a lot of results, but the most important result is the existence of sufficient knowledge among the category of vegetable growers in Gaza Strip of the concepts and dimensions of climate changes, as 79.8% of them have sufficient knowledge of the concept and the dimensions of these changes. Also the results indicate that 96.2% of the vegetable growers have been affected by climate changes during the last period, 41.3% of them believe that the impact of these changes has been significant on the volume of agricultural productivity and on the quantity of water consumed for agriculture, 65.4% of them note that the climate changes have led to increasing in water consumption for agriculture. The results also indicate that 53.8% of vegetable growers believe that the wrong agricultural practices, as burning agricultural waste and excessive use of fertilizers and chemical pesticides have direct impact of climate changes, The study recommends the needed for facing the climate changes from vegetable growers by enhancing the concept of dealing with climate changes for these category of farmers and using new technologies to overcome these changes such as regular pressure irrigation techniques and water harvesting techniques.

Keywords: *climate change, vegetable farmers, pesticides, water harvesting, water consumption.*

ECOSYSTEM SERVICES WITHIN A KEY SUBTROPICAL REGION AFFECTED BY THE YACYRETA DAM IN PARAGUAY

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Abstract

One of the most striking features of the ecosystem concept is that their components, through natural structures and processes, render ecological functions, which are valued by society. The objective of this research was to identify and describe ecosystem services provided by the Natural Reserve Yacyretá, in accordance with the goal of Paraguay's National Law Nº 3,001 of 2006 of conservation, protection, recovery and sustainable development of national natural resources and biological diversity through fair, timely and adequate valuation and payment for ecosystem services. The study was conducted during an environmental monitoring campaign in October 2016 in the reserve, using an ecosystem services checklist constructed based on the classification provided by *The Economics of Ecosystems and Biodiversity*. This reserve is part of the conservation, protection and compensation actions carried out by the Yacyretá Binational Entity in the area of influence of the dam constructed between Paraguay and Argentina for the Hydroelectric Power Station Yacyretá. Its purpose is the protection of ecosystems, communities of biological elements that, due to their rareness, fragility, importance or singularity deserve a special assessment. This reserve has a high representativeness of the resources of the Ñeembucú eco-region, and the presence of two ecosystems scarcely represented in Paraguay, such as forests of arary (*Callophyllum brasiliense*) and a small formation of vegetated dunes. The reserve provides all four categories of ecosystem services, directly and indirectly. These results will be practical for stablishing conservation strategies to update its management plan and assess access to the system of valuation and payment for ecosystem services.

Key words: *Conservation. Ecosystem services. Yacyretá dam.*

THE INFLUENCE OF LIMING ON THE ACIDITY LEVEL OF DYSTRIC CAMBISOL AND CONTENT OF AVAILABLE FORMS OF: IRON, ZINC AND COPPER

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Abstract

Limited fertility of acid soils is caused by a high concentration of H^+ and Al^{3+}ions, presence of some organic acids and heavy metals, but also by a low accessibility of some nutrients (P, Ca, Mg, B, Zn, particularly Mo) and a low microbial activity. This study has been conducted to determine the effects of three levels of liming (partial – 1/3 Y1, half – 1/2 Y1, and complete liming) on the neutralization of the acid reaction, a high content of mobile Al^{3+}, and changes in the concentrations of available forms of Fe, Zn, and Cu in a Dystric Cambisol soil. The complete liming almost completely neutralized the acid reaction, and decreased the level of mobile Al^{3+} below 1.0 mg kg^{-1}. There has been a satisfactory degree of decrease in pH and Al^{3+} in partial (1/3 of Y1) and half (1/2 of Y1) liming. No level of liming had a significant influence on the content of available forms of Fe and Cu, while the content of Zn decreased in accordance to the level of applied lime material and it was the lowest at the maximum doses of CaO applied. The level of changes caused by partial and half-liming has justified these levels of acid repairing, which can be of significant ecological and economic importance.

Keywords: *Dystric Cambisol, liming, aluminum, micro nutrients.*

THE CONTENT OF TRACE ELEMENTS IN ALFALFA CULTIVATED ALONG THE HIGHWAY E75 - ROUTE SECTION LOZOVIK-GRDELICA (REPUBLIC OF SERBIA)

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Abstract

On the section of the highway E75 through Republic of Serbia from Lozovik to Grdelica, the content of trace elements in soils and alfalfa cultivated on Vertisol Eutric cambisol and Fluvisol was studied. The content of Pb, Ni, Cr and Cd were determined in soil and plant material. In all tested soil samples the content of trace elements was below the MPL (maximum permissible levels) values for agricultural soil. The content of analyzed elements in the samples of alfalfa varied depending on the pH value, the content of clay fractions and organic matter in soil on which it was cultivated. The obtained results showed that the values of trace elements in plant species of alfalfa were not above the toxic concentrations values (TC). The content of studied elements in plant material was increased in the soils with lighter texture probably because of the pH value, content of clay fractions and organic matter in soil contributing to their binding, indicating that the soil-plant translocation was affected by the physical and chemical properties of the soil, the location of accumulation as well as the physiology of plant.

Keywords: *Alfalfa, Trace elements, Translocation, Soil, Physico-chemical properties.*

PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE IN SERBIA

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Abstract

Serbia is characterized by a high level of genetic diversity and cultivated plant species which are used as food amount to 4.5% of used biodiversity (193 species). Plant genetic resources (PGR) can be used in breeding programs as a source of specific genes for the development of new varieties, adapted to the new environmental conditions and to expand the genetic base of breeding material, as well as food, in food industry. The paper presents the activities involving the conservation, management and utilization of Plant Genetic Resources for Food and Agriculture (PGRFA), and state of PGR in Serbia. What is the exact number of PGR in Serbia is not known precisely because there is no national inventory of PGR. It is estimated that about 25.000 samples of old landraces and cultivated plants are stored in the form of seeds and about 3.500 samples of fruit and vines are in *ex situ* collections. In Serbia, there are around 20 collections at the National Gene Bank and in institutes. The National Plant Gene Bank have 4.300 samples of 249 plant species: cereals and maize (2.983 sample-7 types), industrial crops (387 samples - 6 types), vegetables (214 samples - 11 types), fodder crops (285 samples - 9 species), medicinal and aromatic plants (389 samples - 216 species). In order to preserve genetic resources it is necessary to plan management activities and efficient and directed usage.

Keywords: *plant genetic resources, conservation, management, Serbia.*

SOIL NITRATE AND ORGANIC CARBON IMPROVEMENT BY USE OF LEGUMINOUS PLANTS AS COVER CROPS IN AN ORGANIC OLIVE ORCHARD

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Abstract

The organic olive orchard represents about 0.5 Mio ha in EU and 36% are located in Spain. This production system implies an economic opportunity for rural areas. The use of cover crops between the rows of olive trees is an agricultural practice that farmers are progressively adopting since they reduce soil erosion while improve soil quality. Due to an usual fertilisation strategy in organic farming is the use of leguminous plants, three legumes (*Vicia sativa*, *Vicia ervilia* and *Vicia villosa*) used as cover crops were compared to study their capacity to protect the soil and improve soil fertility during 4 years. Two soil managements were considered after mowing cover crops: plant residues left on surface or incorporated into the soil. Soil nitrate and coverage were monitored monthly and soil organic carbon (SOC) was analysed at the end of every growing season. Despite not being the best species to protect the soil, the coverage at the end of decomposition period increased by 32% in 4 years in the management without incorporation, providing values over 30% of cover. The soil nitrate recorded in May, when the demand for N by the olive tree is greater, increased in the study period by 70% with the residues left on surface and by 50% when the residues were buried. A carbon sequestration rate of 1.08 Mg C ha^{-1} y^{-1} was reached by *V. villosa* without incorporation. Where residues were incorporated, *V. sativa* obtained the highest carbon fixation with 1.21 Mg C ha^{-1} y^{-1}.

Keywords: *Soil protection, Soil nitrogen fixation, Carbon sequestration, Mulching.*

THE UTILIZATION OF FOOD WASTE IN FEED AND FERTILIZER PRODUCTION IN TURKEY: NEEDS AND CHALLENGES

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Abstract

Large quantities of food waste (FW) are emerging as a result of the increased production in the food industry, which often processes agricultural products. Reduction and utilization of FW is important not only for food security but also for the sustainable use of resources. The slow progress of reducing FW and developing effective waste management strategies can be a problem for almost every country. FW contains complex carbohydrates, proteins, lipids and nutraceuticals, and can be a source of raw materials for commercially important metabolites. The wastes generated during the food supply chain can be used to produce nanoparticles between biofuels, enzymes, bioactive compounds, biodegradable plastics and many other molecules. The utilization of FW for agricultural applications such as animal feed and fertilizer is a common waste management practice. These two waste management practices focus on the reuse and recovery of valuable components in the FW. However, the FWs obtained from different sources involve rich nutrients is accompanied by the risk of unbalanced nutrient composition and the risk of toxic substance presence as well. Topics are up-to-date in Turkey as well as on a global scale. Alternative utilization methods can bring risks as well as opportunities. Many countries are prohibiting or limiting, in particular, some animal feed production, by their legislations on the reduction of FWs. Increasing opportunities for fertilizer production continue with value-added practices. In this study the current situation in Turkey regarding the use of FW as animal feed and fertilizer has been examined. Moreover, the needs and challenges were evaluated by considering the practice in other countries.

Keywords: *Food waste, feed, fertilizer, Turkey*.

BIOGAS GENERATION FROM ANIMAL MANURE: AN ASSESSMENT OF ITS POTENTIAL AND FEASIBILITY IN ÇANAKKALE, NORTHWESTERN TURKEY

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Abstract

Population growth and technological advancement mean that human activities are now consuming increasingly higher levels of energy. This causes serious problems, such as depletion of fossil fuel resources. Renewable energy resources and technologies is a good solution to these problems. Livestock manure can be a viable alternative source of energy and is the best way to obtain sustainable biogas energy. This study reports on biogas production from livestock manure and considers the evaluation of the districts in Çanakkale province. Data were collected from available databases relating to district livestock farms and using statistical data on the number of livestock, the amount of produced manure and the volume of created biogas per kilogram of animal manure. The biogas production was calculated using a theoretical method. By using the livestock numbers from the last agricultural census (2017), biogas potential from the available livestock manure was 1.77 10^7 m^3 per year, 30.5% of which was obtained from heavy livestock (cattle, horse), 26.8% of it from light or small livestock (sheep, goat), and only 42.7% from poultry. Biga district had the greatest biogas production with 7.83 million m^3. The centre district had 1.64 million m^3 biogas, followed by Yenice, Ezine, Lapseki and other districts (7-district) with 1.34, 1.30, 1.11 and 4.51 million m^3, respectively. Annually, biogas energy equivalence was approximately 425.3 million MJ and 8.33 10^7 kWh electricity generation in all districts using livestock manure. The findings of this study indicate that the manure to produce biogas can be used as a source of sustainable renewable energy.

Key words: *Biomass production, biogas, livestock manure, Çanakkale.*

ENDANGERED *COLCHICUM* SPECIES OF TURKEY

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Abstract

Turkey is one of the major centers of diversity in *Colchicum* species from Colchicaceae family. The genus *Colchicum* L. is represented by 47 species, of which, 35 are endemic to Turkey and some are under threat. Turkey has 3 *Colchicum* species in different categories of IUCN Red List. *Colchicum balanse* and *Colchicum troodi* are in Least Concern, *Colchicum leptanthum* is in Critically Endangered of IUCN Red List categories. Major threats of *Colchicum leptanthum* are dam and road construction. The threats to *Colchicum balanse* and *Colchicum troodi* are unknown according to IUCN Red List. Collection of the all *Colchicum* species is prohibited in the wild at national level by regulation in Turkey. Some morphological and anatomical studies, description of new species, in-vitro propagation and karyotype studies on *Colchicum* were carried out in Turkey. *Colchicum* species have been used as a medicinal plant for more than 3000 years. *Colchicum* species have valuable alkaloids especially colchicine used in medicine. *Colchicum* species have also potential as ornamental plants. Their pharmacological usage and potential as ornamental plants increase their importance. Therefore, it is very important to protect genetic resources of these species. Some of these species are endemic. Lost of these endemic species in the Turkey flora, means their lost from the world. We aimed that emphasize the importance and take attention to the endangered *Colchicum* species of Turkey. In this review, conservation actions and some information about the endangered *Colchicum* species in the flora of Turkey that are IUCN Red List categories were given and discussed.

Key words: *Endangered Colchicum spp, IUCN Red List, Endemic, Threats, Conservation.*

HONEY PLANT NATURAL RESOURCES - A VITAL PART OF BIOLOGICAL DIVERSITY

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Abstract

The worldwide trend of declining biological diversity of plant resources exacerbates the problem of food security. Therefore, the study of the state of honey plants, which allows determining the full range of their species diversity, is relevant. Our studies of honey plants on the territory of the state of Mississippi, USA, found more than 180 species of 99 genera from 41 families, the most numerous of which are *Asteraceae* – more than 39 species (21%), *Fabaceae* – more than 20 species (11%), *Rosaceae* – 18 species (10%). The majority of honey plants studied – 123 species (near 68%) are native species, 53 (29%) – introduced, and 6 (3%) species widely distributed throughout the world. The most of the species are native forest plants, characterized by high level of endemism for the North American region. The bulk – 103 species of all registered (55%) – are evenly distributed throughout the territory of the state of Mississippi. By the place of growth, the registered honey plants are divided into: forestry ones – 79 species (37%), forest belts and ornamental plantations plants – 54 species (24%), field and fodder plants – 20 species (9%), plants of meadows, pastures and wetlands – 53 species (24%), garden and berry plantations plants – 9 species (4%), and plants of vegetable and melons fields – 4 species (2%). Totally, more than 87 species of honey plants from 57 genera of 35 families are cultivated. But the majority of species (more than 60%) are represented only in the wild state, mainly on forest lands.

Keywords: *Biological diversity, State of Mississippi, Honey plant.*

SOCIO-ECONOMIC AND INSTITUTIONAL FACTORS DETERMINING WILLINGNESS TO PARTICIPATE IN CONSERVATION OF FOREST

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Abstract

Zimbabwe underwent a resettlement programme to address the imbalance in land access. It is hypothesized that the resettlement programme exacerbated deforestation in Zimbabwe. Existing research on resettlement has focused mainly on gender, land tenure, productivity and livelihoods. Less attention has been paid on issues concerning willingness and socio-economic and institutional factors which determine participation in conservation of forest in resettlement areas hence study objective. A survey was conducted in Shamva, Zimbabwe. A sample of 247 respondents was randomly selected and stratified as 98 A1 farmers, 50 A2 farmers and 99 Old resettled farmers. The data was collected using structured questionnaires, interviews and observation. Willingness to participate was analyzed using Knowledge, Attitude and Practical (KAP) analytic framework and the socio economic and institutional factors were analyzed using the binary logistic regression analysis. The KAP analytic framework showed that resettled farmers were willing to conserve forests with 75.5 for A2, 69.12% for A1 and lastly Old resettled farmers at 73.18% Results of the binary regression model revealed that significant factors which explain willingness to participate in forest conservation at 10% level of significance for the A1 resettlement model were secondary education (p -0.02), gender (p-0.011), fuel (p-0.001), extension (0.011), Environmental Management Agency (0.001) and the Old resettlement scheme had marital status (0.015), culture (0.005), community leaders (0.006) and A2 had no significant factors at this level. Strategies to encourage conservation of trees on the three models should differ, but include rural electrification, education, use of renewable energy and creation of income generating projects.

Keywords: *Deforestation, Resettlement, Household, Willingness, Zimbabwe.*

IMPROVEMENT OF GERMINATION OF *RETAMA RETAEM* (FABACEAE) SEEDS UNDER TREE

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Abstract

The Fabaceae or Leguminosae, commonly known as the legume, pea, or bean family, are a large and economically important family of flowering plants. It includes trees, shrubs, and perennial or annual herbaceous plants. The study of the interaction between plants in the desert begins with the study of their influence within the same family to understand the effect of the stimulation or decreasing of some tree on the herbarious strate in the area. The purpose of this paper is to quantify the effect of aqueous extract of different organs of *Acacia raddiana* with different doses (0.25%,0.5%,1%) on the germination rate of *Retama retaem* (Fabaceae) seed in laboratory conditions.

Key-words: *Aqueous extract, Dose, Germination rate, Fabaceae, Sahara.*

ASSESSMENT OF WATER QUALITY OF BLIDA'S WATER TOWERS AND DETERMINATION OF TRIHALOMETHANES BY GC METHOD COUPLED TO HEADSPACE

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Abstract

In Algeria, water chlorination is the most widely used disinfection method to reduce the incidence of waterborne diseases and ensure good quality water for the population without health risk. However, the reaction between chlorine and organic matter present naturally in water causes the formation of by-products of disinfection, among these by-products one finds in particular the Trihalomethanes, which have a carcinogenic potential. The physicochemical analyses in the water of Blida (50 Km from Algiers) showed values between 12.5 °C and 25.2 °C for the temperature (the Algerian standard sets an indicative value of 25 °C), 7.28 and 8.15 for the pH (the Algerian standard mentions an indicative value of pH ≥ 6.5 and ≤ 9), 0.08 and 1.04 mg/L for oxidability (the Algerian standard sets a limit value of 5 mg/L), 0.12 and 1.34 mg/L for total organic carbon (the French standard indicates a value of 2 mg/L), and levels between 0 and 0.7 mg/L of chlorine (the Algerian standard indicates a value of 5 mg/L. The determination of Trihalomethanes in water was carried out by gas chromatography method coupled to Headspace. The results showed concentrations less than 5 µg/L for the four parameters of Trihalomethanes (the executive decree N° 14-96 of 4 march 2014 on the quality of drinking water in the official journal of the republic of Algeria sets a value of 200 µg/L for the Chloroform, 100 µg/L for Bromoform, 100 µg/L for Dibromochloromethane and 60 µg/L for the Bromodichloromethane.

Keywords: *chlorination, disinfection, by-products, Trihalomethanes, reservoirs, organic matter.*

ATRIPLEX HALIMUS AND ATRIPLEX CANESCENS STEMS AND LEAVE EXPLANTS ONTOGENESIS

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Abstract

Atriplex genus species represent excellent livestock forage and are widely used for degraded soils rehabilitation in arid and semi-arid regions. *Invitro* tissue culture offers an alternative for these species rapid multiplication. Histological study helps to determine callus proliferation cellular origin of *Atriplex halimus, Atriplex canescens* cut stem and leaf explants. Histological cuts were made from leaves and stems explants cultured on MS medium added with 2,4-D/KIN at different concentrations, then colored with Naphtol Blue Black (NBB) and Periodic acid/Schiff's reagent(PAS). For *Atriplex halimus* and *Atriplex canescens,*calli ontogenic study showed an internal origin reactivation for leaves and cut stems explants, seen after 7 days of culture. It was close to and inside transport beams or cambial cells with the neoformation of different cell masses. After 15 days, several neoformed tissues were observed including the parenchyma and tracheids. After one month of culture, the histological study showed that different calli were formed by parenchymatous cell masses within which we observed meristematic foci neoformation but no nodular formations were observed in both Atriplex species. Stems explants cambial tissue divided actively and gived meristematic cells and parenchymal cells, and in leave explants case, the reactivation following the dedifferentiation of target cells were observed in conductor beams resulting in tracheids and meristematic foci formation. However nonodular organization was observed. Other plant growth factors balances are needed to induce the maturation of these mesistematic foci.

Key words: *Atriplex halimus, Atriplex canescens, callus, stem, leaves.*

ASSESSING CROPPING SYSTEMS SUSTAINABILITY USING INDICATORS IN SOUKAHRAS HIGH PLAINS (ALGERIA EAST)

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Abstract

The use of indicators for assessing the sustainability of cropping systems is a common practice over the past few years.The relevance of the indicator has a great importance in the evaluation process where each indicator deals with one aspect of sustainability (soil management, diversity etc.). The aggregation of indicators to a single sustainability index is paramount because it makes the interpretation of results easy and accessible to all stakeholders. The aim of this work was to integrate 12 agro ecological, soil management and socioeconomic indicator values into a global sustainability index (Sg) ranking from 0 to 1, to evaluate the sustainability of cereals-based cropping systems in eastern Algeria (Souk Ahras region). Data needed to calculate the indicators was gathered from face to face interview with farmers for 140 fields. The 12 indicators cover the three scales of sustainability: agro ecologic, social and economic performance. Each scale was represented by at least three indicators. The application of the methodology started by the conversation of the values of each individual indicator in terms of sustainability Si applying continuous non-linear sustainability functions using thresholds defining what was sustainable, unsustainable, orintermediate. Finally, we got 12 Sg value per crop that would be aggregated to global sustainability Sg using indicatorspecific weights provided by different stakeholders. Supported by high incomes which results in high economic sustainability and good contribution to employment other crops systems have the highest global sustainability, wile cereal has the lowest one, due to poor economic performance, and inadequate soil management. Cereal grain legumes system was intermediate, with high agro ecological performance, and moderate economic sustainability.This method is relevant (uses quantitative indicators adapted to the context and the chosenscale), transparent (uses a mathematical equation) and, at the same time, it is flexible and mouldable because we can add indicators or change the weights assigned by the stakeholders to the indicators.

Key words: *cropping systems, sustainability, assessment, indicator agro ecology, socio economic.*

STUDY ON AGRO-ENVIROMMENTAL INDICATORS FOR DETERMINING LAND DEGRADATION AND THEIR IMPACT (PHYSICAL, CHEMICAL, BIOLOGICAL)

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Abstract

In the town of Tissemsilt in Algeria, the techniques of tillage are mechanized showing their limits for the sustainable management of soil resources for two reasons, the insufficient matrix of the erosion and the loss of the stock in soil organic matter. In other words, these techniques are not adapted to the pedoclimatic constraints of our study area. The techniques of tillage that are mechanized engender excessive fragmentation, soil compaction, erosion, runoff, impoverishment and drying lands not allowing a sustainable agricultural development. The challenge is double: the culture system should permit the production a melioration and at the same time the preservation of natural resources in the soil and the environment. This challenge cannot be completely satisfied unless the no-tillage is performed at a high technological level. This technological development must be connected to the management of harvesting residues and at the seedling time, the crops implantation, the fertilization of fundus and the weeding practices. This technological development of crops chess in relation to the edaphic conditions. The direct seeding preserves the environment by reducing the loss of soil and nutrient elements and practices the treatment products for the improvement the quality of the water and the air. The no-tillage is the privileged mean to combat water erosion and wind. In fact, the cover by crops residues controls the losses in water by runoff and by wind.

Key words: *Water, soil, degradation, town of tissemsilt, Agricultural Development.*

GENETIC STRUCTURE OF ALGERIAN DATE PALM CULTIVARS (*PHOENIX DACTYLIFERA* L., ARECACEAE) REVEALS EXTENSIVE GENE POOLS ADMIXTURE IN NORTHERN-CENTRAL SAHARA

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Abstract

Date palm (*Phoenix dactylifera*L.) is the mainstay of oasis agriculturein the Saharan region. It is cultivated in a large portion of the Mediterranean coastal area of the Sahara and in most isolated oases in the Algerian desert. We sampled 10 oases in Algeria to understand the structure of date palm diversity from the coastal area to a very isolated desert location. We used 18 microsatellite markers and a chloroplast minisatellite to characterize 414 individual palm trees corresponding to 114 named varieties. We found a significant negative inbreeding coefficient, suggesting active farmer selection for heterozygous individuals. Three distinct genetic clusters were identified, an ubiquist set of varieties found across the different oases, and two clusters, one of which was specific to the northern area, and the other to the drier southern area of the Algerian Sahara. The ubiquist cluster presented very striking chloroplast diversity, signing the frequency of haplotypes found in the most eastern area of the occurrence of the date palm in Saudi Arabia. Exchanges of Middle Eastern and Algerian date palms are documented and might have led to the introduction of this particular chlorotype. However, Algeria nuclear diversity does not highlight an eastern origin at the nuclear level. Our study strongly suggests that the peculiar chloroplastic diversity of date palm is maintained by farmers and could originate from date palms introduced from the Middle East a long time ago, which since then, has been strongly introgressed. This study illustrates the complex structure of date palm diversity in oases and the role of farmers in shaping such cryptic diversity.

Keywords: *Phoenix dactylifera, genetic diversity, microsatellite, chloroplast minisatellite.*

BOSWELLIC RESIN DECREASE ALUMINUM CONCENTRATION IN BRAIN, IMPROVE MEMORY &LARNING (EXPERIMENTAL STUDY IN MICE)

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Abstract

Neurodegenerative diseases of the human brain comprise of a variety of disorders that affect an increasing percentage of the population. Alzheimer's disease (AD) is a complex, multifactorial, heterogeneous mental illness, which is characterized by an age-dependent, loss of memory and impairment of multiple cognitive functions. Current treatments on the market do not go beyond reducing the symptoms and they include the cholinesterase inhibitors, which lead researchers to think about other remedies including herbal medicine. This study is based on the effect of the boswellic resin which is a medicinal plant, known for its antioxidant effects and demonstrated some efficacy on nerve cell damage. The objective of this study was to evaluate *in vivo* protective effect of the boswellic resin on Alzheimer's disease induced by D-galactose and aluminum tetrachloride in Swiss mice with its concentration decreasing in brain. The present study proves that boswellic resin modulates the oxidative stress and is involved in the protective effect against high metal concentration in brain, oxidative damage and neurodegenerative diseases in mice.

Key words: *Neurotoxicity, Alzheimer's, Memory, Double-H, Atomic Absorption Spectroscopy.*

THE ECOLOGY OF DUNG BEETLES AND THEIR ROLE IN SUSTAINABILITY

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Abstract

Temporary resource patches include animal dung pads, leaf packs in streams, fruits, mushrooms and carrion. Dung pads are scattered microhabitats of high quality resources of relatively small size and short existence that support complex communities. Dung composition, which is dependent on the producer, namely herbivore, omnivore or carnivore, influences community composition. In addition, the physical and chemical composition of a dung mass change continuously over time, e.g., there are reductions in the moisture and nitrogen content, emission rate of volatile compounds and dry dung mass. These changes are usually reflected in a continuing change in the associated species complex and in the abundance of individual species. The most obvious group of dung users are the insects, with members of more than 25 families of coprophages, mycophages, saprophages, predators and parasitoids recorded. Dung beetles (Coleoptera: Geotrupidae, Scarabaeidae) can be found in most environments from the tropics to the coolest temperate regions and up to extremely high altitudes. Most dung beetles use one of three broad nesting strategies: tunnelling species dig burrows and construct nesting chambers, most ball rolling species form and roll balls some distance before burial, and dung dwelling species live in or brood their offspring inside the dung mass. Dung beetles collectively provide a suite of ecosystem services and interconnected ecological functions (multifunctionality) that include dung degradation, bioturbation, secondary seed dispersal and reduction in the numbers of pests and parasites of humans and domestic animals. In addition, they have been used as indicator species of the integrity of ecosystems. Together with all biodiversity, their conservation must be of the highest priority.

Keywords: *Biodiversity, Ecosystem, Dung Beetles, Scarabaeidae, Geotrupidae.*

TRANSITION FROM SURFACE TO DRIP IRRIGATION IN MOROCCO: ANALYSIS THROUGH THE MULTI-LEVEL PERSPECTIVE

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Abstract

Agriculture uses more than 80% of water resources in Morocco. The sector is inefficient in terms of water use because of the dominance of surface irrigation. To address this issue, there have been efforts in Morocco to convert to localized Irrigation. This paper analyses the dynamics of conversion from surface irrigation to drip irrigation in Fes-Meknes region (north-eastern Morocco) through the lens of the Multi-Level Perspective (MLP) on socio-technical transitions. MLP framework suggests that transitions are the result of dialectic interactions among a niche (cf. novelty of drip irrigation), a regime (cf. traditional system of surface irrigation) and the socio-technical landscape (e.g. policies). MLP was complemented with a multi-capital approach to better assess transition impacts. Results show that the area equipped with drip irrigation in Fes-Meknes region increased from 2174 ha in 2008 to 39290 ha in 2016. Different programs have been implemented in the framework of the Green Morocco Plan to foster irrigation transition e.g. the National Irrigation Water Saving Program (PNEEI), launched in 2009, aims to convert 550,000 ha to localized irrigation in 15 years. Thanks to these programs, financial and technical support has been provided to farmers to foster adoption ofwater-saving irrigation techniques and practices. Farm-level results show that transition to localized irrigation decreases irrigation water use, increases yields and profitability (cf. gross margin per ha), and improves water productivity. Despite an enabling policy landscape and positive transition impacts, surface irrigation is still maintained in the region and farmers are reluctant to change for many reasons (e.g. age and education level, unclear land tenure, financial and administrative difficulties). Further research is needed to better understand current bottlenecks in the irrigation transition process and design appropriate and context-specific transition governance strategies.

Keywords: *Sustainable agriculture, Irrigation, Multi-Level Perspective, Sustainability transitions, Multi-capital model.*

EFFECT OF HARMFUL AGENT ON PRODUCTION, INCOME AND BIODIVERSITY OF SHRIMP FARMING IN BANGLADESH

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Abstract

Shrimp is one of the leading exportable seafood products from which Bangladesh earns about UD$ 500 million yearly contributing 3.78% to the GDP. Shrimp farmers follow the traditional and extensive farming practices and the average productionis 275 kg/ha which is the lowest compared to other shrimp producing countries around the world. Reasons of this low production are lack of better technology, dearth of qualityseed and feed, and effect of shrimp disease. Small-scale organic shrimp farming practice introduced recently has shown better production and profitability in four coastal subdistricts (Upazila) of Sathkira district in the southwest part of the country.Three different farming practices were studied: I) organic (II) traditional and (III) extensive or control farming where farmers were interviewed to collect different data. The data showed that organic farmersproduced 10.64% higher than the traditional farmers and 20.84% higher than in extensive or control farming systems. Cost-benefit analysis showed that organic farming was more profitable compared to other practices because of low input cost and premium price received for organic shrimp. Percentage of gross sale of organic cultured shrimp was 10% higher than traditional and 19.37% higher than control or extensive shrimp farming. It is also found that the organic production (kg/ha) was little bit higher than the control and the traditional farming practices. On the other hand traditional farming production cost was higher than the organic and control production. Considering the biodiversity conservation, organic farming is more ecofriendly culture system than control and the traditional practices.

Key words: *Harmful agent, Production, Income, Biodiversity conservation, Shrimp farming practice, Bangladesh.*

ECONOMIC RETURNS OF VARIOUS EXISTING SHRIMP FARMING PRACTICE IN SOUTHWEST REGION OF BANGLADESH

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Abstract

Shrimp is one of the leading exportable seafood products from which Bangladesh earns about UD$ 500 million yearly contributing 3.78% to the GDP. Shrimp farmers follow the traditional and extensive farming practices and the average productionis 275 kg/ha which is the lowest compared to other shrimp producing countries around the world. Reasons for this low production are lack of better technology, dearth of quality seed and feed, and effect of shrimp disease. Small-scale organic shrimp farming practice introduced recently has shown better production and profitability in four coastal subdistricts (Upazila) of Sathkira district in the southwest part of the country. Three different farming practices were studied: (I) organic (II) traditional and (III) extensive or control farming. Farmers who are used to practice these farming systems were interviewed to collect different data. The data showed that organic farmers produced average 451 kg/ha which was 10.64% higher than the traditional, and 20.84% higher than extensive or control farming systems. Costbenefit analysis showed that organic farming was more profitable compared to other practices because of low input cost and premium price received for organic shrimp. Percentage ofgross sale of organic cultured shrimp was 10% higher than traditional and 19.37% higher than control or extensive shrimp farming.

Key word: *Economic Returns, Shrimp Farming Practice, Bangladesh.*

MODELLING ON-FARM DIVERSIFICATION THROUGH MULTIPLE CRITERIA DECISION MAKING AND GOAL PROGRAMMING. A CASE STUDY FROM BOLIVIA

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Abstract

Modern Portfolio Theory provides a theoretical framework and powerful yet accessible tools have been developed to optimize scarce capital/labor allocation to increase returns and reduce correlated risks via diversification. Such tools are used to assess rural livelihood diversification induced by an incentive-based program for watershed conservation piloted between 2003 and 2011 in a context of rural poverty in Bolivia. The tools assembled and tested in this study may provide low-cost diagnostics to improve our understanding of risks and returns in a specific rural context. Comparing alternative efficient portfolio frontiers may represent a useful and transformative tool to better understand socio-ecological systems such as watersheds and facilitate regime shifts that benefit both ecosystem services and livelihoods.

Key-words: *Socio-Ecological Resilience, Modern Portfolio Theory, Goal Programming.*

ANALYSIS OF QUALITY QUALITY OF FRUIT FRUIT TO HEALTHCARE

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Abstract

In recent years, marketing activities on the market of Bosnia and Herzegovina related to marketing of berries have increased. This implies intensifying production and management of small plantations to increase yields, which requires increased fertilization, savings, and the use of chemicals for plant protection. The market of Bosnia and Herzegovina is unprotected from the presence of fruits of suspected origin, and the health correctness of the fruit is not ensured, and the merchants are not obliged to enclose the declaration with the product. In order to ensure consumer protection and ensure the permissible level of quotas for the presence of risky substances in and on the berries, it is necessary to analyze the basic parameters of the quality of the product. Quality and its characteristics are not measurable, so researchers and experts in measurement laboratories use quality parameters that can be measured or evaluated by certain methods. This work will break down the external and internal characteristics of the quality of berries, systematized parameters and methods of their measurement.

Key words: *berry fruit, quality, risky substances, consumer protection, health correctness of fruits.*

WEED SURVEY IN HERZEGOVINA REGION OF BOSNIA AND HERZEGOVINA

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Abstract

This paper has studied invasive weed population of row crops, vineyards, orchards and olive groves in Herzegovina. If the list of weed species is compared to the list of invasive plant species in Bosnia and Herzegovina, it can be seen that 10 species belong to the group of invasive species in BIH. Out of 6 families, 5 families belong to Dicotyledons. The most numerous family is Asteraceae (6 species), and Fabaceae, Rosaceae and Poaceae families are represented by one species each. By analyzing life forms, domination of terophyta and hemicryptophytes can be seen, while phanerophytes and geophytes are represented by one species each. According to the origin, the largest number of species is from America (five types). Analyzing invasive weed species in Herzegovina and their strategies it can be concluded that species with CR strategies and C strategies are dominant. This condition is particularly worrying because C species strategies are more successful in natural and semi-natural vegetation and they negatively effect on native species. The results of this research suggest that it is necessary to conduct further research of C-S-R strategy of invasive species (not only weed species) which will help better understand mechanism and successfulness of their spreading.

Keywords: *weeds, Herzegovina, Grimme CSR plant strategies.*

URTICA KIOVIENSIS ROGOV. NEW SPECIES IN THE FLORA OF BOSNIA AND HERZEGOVINA

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Abstract

The protected habitat „Gromizelj“ is located in the northeast of Entity of Republic of Srpska and Bosnia and Herzegovina, in the municipality of Bijeljina. It is located on the lowland between two rivers, the Sava River in the north and the Drina river in the east. The basic value of the protected habitat "Gromizelj" is made of wetlands Gromizelj with Laketic sources. *Urtica kioviensis* Rogov. was recorded in the flora of Bosnia and Herzegovina in 2008 in Laketic sources and in 2010 in the locality of Prugnjaca. It grows on the periodically flooded lakes of Laketic sources, along with species *Phragmites communis*, *Salix cinerea*, *Alnus glutinosa* and species of genus Carex sp. It is distributed in Austria, Belarus, Bulgaria, Croatia, the Czech Republic, Denmark, Germany, Hungary, Moldova, Romania, the Russian Federation, Serbia, Slovakia and Ukraine. This species is classified as endangered and it is included in the Red List of Europe in the category of Vulnerable Species (VU).

Keywords: *Urtica kioviensis, vulnerable species, Bosnia and Herzegovina.*

RUDERAL ASSOCIATION *ECHIO-MELILOTETUM* TX. 1942 OF THE EAST SARAJEVO (BOSNIA AND HERZEGOVINA)

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Abstract

Plant community Echio-Melilotetum has been isolated during the exploration of the ruderal vegetation of East Sarajevo (Entity of Republic of Srpska, Bosnia and Herzegovina). The community in the syntaxonomic position belongs to alliance Onopordionacanthii Br.-Bl. 1926, order Onopordetalia Br.-Bl. et Tx. 1943 and the class Chenopodiete Br.-B. 1951. This paper presents the floristic composition, ecological and phytogeographic characteristics of the community. The floristic composition of this phytocenosis consists of 105 species. Dominant species *Melilotus officinalis* and *Echium vulgare* have the highest degree of presence and coverage. The analysis of the areal spectrum shows the dominance of the Euroasian species and community has hemicryptophytic character.

Keywords: *ruderal community, areal spectrum, biological spectrum, East Sarajevo.*

HABITAT TYPES OF EUROPEAN IMPORTANCE IN THE AREA OF THE MOUNTAIN JAHORINA (BOSNIA AND HERZEGOVINA)

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Abstract

The paper presents the habitat types of the mountain Jahorina which is of European importance. The review is made on the basis of studies of flora and vegetation and the Guide of the types of habitats according to the EU Habitats Directive. Jahorina Mountain is located in the central part of Bosnia and Herzegovina and Entity of Republic of Srpska, southeast of Sarajevo. It belongs to continental Dinarides with the direction of the main ridge from northwest to southeast. During the research the following habitats have been isolated: 4060 (Alpine and Boreal heaths), 6170 (Alpine and subalpine calcareous grasslands), 6230 (Species-rich Nardus grasslands), 6410 (Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*), 6430 (Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels), 6510 (Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*), 6520 (Mountain hay meadows), 7110 (Active raised bogs), 7120 (Degraded raised bogs still capable of natural regeneration), 7220 (Petrifying springs with tufa formation (*Cratoneurion*), 7230 (Alkaline fens), 9140 (Medio-European subalpine beech woods with Acer and *Rumex arifolius*), 9410 (Acidophilous Picea forests of the montane to alpine levels (*Vaccinio-Piceetea*).

Keywords: *habitat, mountain, Jahorina.*

TREATMENT OF FILTERS ON SANITARY LANDFILL

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Abstract

Sanitary landfills are specific places where municipal waste disposal is carried out using sanitary landfilling technology. Biochemical, physico-chemical and geological processes in aerobic and anaerobic conditions take place at sanitary landfills. Anaerobic decomposition of waste matter in the body of the landfill occurs at temperatures of 35-55 ° C and passes through several transformation phases to the final mineralization. In the body of the landfill a very high degree of pollution is formed, which together with the formed gases make the main emission factors of the harmful substances in the environment. The filtrate in the body of the landfill should be collected by the appropriate drainage system, which is lying on a waterproof natural or artificially formed substrate that protects the groundwater. Purification of the landfill filtrate is done by various methods, most often in combination of several types of technological procedures. The aim of the paper is to determine the quality of the filtered filtrate from the Ramici landfill that is released into the water stream. The tests were carried out in January, April, September and December 2016. In order to determine the quality of the filtered filter, the determined parameters are: temperature, pH value, electrical conductivity, HPK, BOD, total phosphorus, nitrates, sulfates, chlorides, heavy metals (Mn, Fe, Pb, etc.), toxicity test Daphnia Magna Straus. The obtained data have been processed and analyzed in accordance with the legal requirements set out in the Regulation on limit values for wastewaters discharged into surface waters (Official Gazette RS No. 44/01).

Key words: *landfill filtration, treatment, sanitary landfill.*

LIFE CYCLE ASSESSMENT (LCA) AS A TOOL TO DETERMINE THE IMPACT OF PRODUCTION AND FOOD CONSUMPTION ON ENVIRONMENT

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Abstract

Clean environment is a priority in maintaining a healthy life, and the effects of food production and consumption lead to environmental degradation in all three media, which includes water, air and land. Developing cleaner technology or cleaner production can still be considered counterproductive for industrial and economic development. The positive effect of clean technology is not achieved in the short term, as the development and implementation of such technologies lead to cost. The tool for producing a particular product with a previously identified environmental impact is called LCA (Life Cycle Assessment), that is, life cycle assessment. The LCA technique monitors the entire life cycle of the product, from the analysis of the material, emissions and waste that emits the product to the final disposal. With this tool, each phase of the life cycle is identified, but also all processes in-between which are defined as input (resources, materials and energy) and output (emissions into water, air and solid waste). Given all phases and processes, this tool uses all identified data in the impact assessment. The aim of this paper is to look at the possibilities of setting up the LCA technique in order to reduce the impact of production and consumption of food on the environment.

Key words: *Clean technology, clean production, LCA (Life Cycle Assessment).*

LANDSCAPE ECOLOGICAL PRECONDITIONS FOR RICE PRODUCING IN BULGARIA

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Abstract

The current research is focused on the landscape ecological preconditions and the restricting role of the rice-growing environment in Bulgaria. The analysis of landscape ecological conditions is a fundamental step in characterizing of specific features of rice production as agro-economic activity. The specific research focuses on the relationship between the agro-environmental requirements of rice crops and the specific landscape ecological conditions in the Pazardzhik-Plovdiv field. The specific combination of the main natural components in this part of Bulgaria is a major factor for the development of rice production since the second half of the 14th century. The favorable climatic, hydrological and soil conditions in the Pazardzhik-Plovdiv field determine the process of growing rice crops as the main one in the agrarian profile of this part of Bulgaria. The natural combination of landscape forming factors, interrelationships and interactions between them, predetermines the existence and functioning of specific hydromorphic landscapes, typical of the lowland territories located around the Maritsa River and its tributaries. On the other hand, the specificities of the anthropogenic workload of these landscapes in historical and geographic aspect are a major factor in the development of anthropogenised rice field agricultural landscape. These agricultural landscapes are characterized by a qualitatively new spatial-temporal structure, functioning and development, which are determined by the restricting role of the natural environment. From landscape ecological point of view, the main focus of rice growing in the Pazardzhik-Plovdiv field is the existence of such specific agricultural landscapes, typical for this part of Bulgaria only.

Keywords: *agriculture, anthropogenic activity, landscape components, landscapes, rice producing.*

ASSESSMENT OF THERMAL CONDITIONS FOR AGRICULTIRAL CROPS GROWN IN BULGARIA

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Abstract

The established and predicted temperature changes, especially the minimum temperatures, affect the agricultural production of Bulgaria. This trend is typical for the winter months. In addition, the frequency of extreme weather events has increased, resulting in production losses. The wintering conditions determine to a large extent the productivity of both winter cereals and perennial crops. In Bulgaria, as a result of temperature anomalies in winter and spring, during the first 15 years of the 21st century there were registered damages to varying degrees, but of economic importance in all the main agricultural production areas. In 13 years, the damages are caused by the extremely low temperatures. The resumption of spring vegetation and the date of the spring frost limit the productivity of spring crops, perennials and vegetables. Damages of economic importance, but in limited areas caused by frosts were registered in 9 of the first 15 years of the 21st century. The purpose of this article is to evaluate the thermal conditions and the risk of damages during the winter rest period and spring vegetation in the agricultural regions of Bulgaria. The results will be used for zoning the main types of agricultural crops in Bulgaria.

Keywords: *air temperature, frost, GDD, winter cereals, perennials.*

CD, CU, PB AND ZN IN TERRACED SOIL ON FLYSCH DEPOSITS OF KAŠTELA BAY, CROATIA

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Abstract

The aims of this paper were to establish the concentration of Cd, Cu, Pb and Zn in the terraced soils on Flysch deposits of Kaštela Bay, Croatia under different land use and to compare obtained concentrations to the guideline values set up in Croatian Regulation on the protection of agricultural land (NN 9/14). The study was conducted on terraced soils under permanent crops (olive groves, vineyards) and abandoned agricultural land under natural vegetation (grassland and shrubs in transition to Aleppo pine forest). In a total, twenty topsoil samples (0-25 cm) were analyzed for basic chemical properties, particle size distribution and Cu, Cd, Pb and Zn concentrations. The elements were extracted with aqua regia and determined by inductively coupled plasma - optical emission spectrometry (ICP-OES). The following median values of concentration were determined: Cd 0.35 mg kg^{-1}, Cu 39.57 mg kg^{-1}, Pb 13.32 mg kg^{-1} and Zn 44.77 mg kg^{-1}. The maximum concentrations of Cd, Pb and Zn (0.82, 34.34 and 105.94 mg kg^{-1} respectively) were below maximum admissible concentration (MAC) value according to the Croatian Regulation. The Cu concentration in only one sample (149.82 mg kg^{-1}) exceeded the MAC value.

Keywords: *abandoned agricultural land, maximum admissible concentration, permanent crops.*

SUSTAINABILITY OF THE CONSTRUCTED WETLANDS FOR WASTEWATER TREATMENT USING RENEWABLE ENERGY SOURCES

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Abstract

Constructed wetlands for the waste water treatment represent not only effective facility for the removing of contamination, but they also fit good into the environment. Natural and artificial swamps, lakes or accumulations are usually used for these purposes. Despite of their positive characteristics for purification of the wastewater, there is a need for the electric energy which is in the most cases used for the re-pumping of the waste water, cleaning of the grid on the entrance in constructed wetland, re-pumping of the purified wastewater, heating during the winter period, illumination and safety reasons. There are many renewable energy sources, which may be used for such purposes. Availability, with accent on intensity and duration of the renewable energy sources depends mostly on the climate characteristics of the observed location in the world. This research will explore which of the renewable energy sources can be used for the production of the electric energy for the constructed wetlands for wastewater treatment, where the primary orientation would be achieving of the systematic sustainability of such constructed wetlands from the energy and hydraulic aspects. For the purpose of the research, there is an intention to present model which will take into the account all situations which could happen during procedure of the wastewater treatment. During the operational work of the constructed wetlands, there is a possibility for a surplus of a produced electric energy, which can be used for different purposes or to be sold into existing electric energy grid.

Keywords: S*ustainability, Wetlands, Waste water treatment, Renewable energy sources.*

IMPACT OF ENVIRONMENTAL IDENTITY ON PERCEPTION OF DIFFERENT TYPES OF FLOWER BEDS

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Abstract

Urban green areas have a significant role in city landscape due to their impact on environmental, social, psychological, economical and health-related aspects of life. Flower beds are an important part of urban green areas. Majority of flower beds in Zagreb are planted with annuals and biennials. Although this seasonally restricted type of flower beds stands out due to distinguishable colors, conventional flower beds leave an impression of being monotonous and are also expensive to maintain. Unlike conventional flower beds, selection of flower species for sustainable flower beds is based on the respect of environmental conditions, thinking about planting according to the principles of plant sociality, not only by the height, timing and color of blooming. To establish a correlation between individual psycho-sociological characteristics of public green area users (N=348) and characteristics of flower beds, a measurement of environmental identity was conducted using EID scale. The correlation between the level of environmental identity and preference for certain type of flower bed was proven to be statistically significant. Namely respondents with higher score on EID scale preferred characteristics of sustainable flower beds in comparison to traditional (conventional) flower beds and favor sustainable development and sustainable landscaping.

Keywords: *Urban green areas, Conventional flower beds, Sustainable flower beds, Environmental identity, Perception.*

UNSATURATED WATER MOVEMENT AND POTENTIAL CONDUCTIVITY IN THE ROOT ZONE OF AGRICULTURAL SOILS

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Abstract

The unsaturated condition of soil water is a major state in nature after irrigation process or rain fall. Hydro-physical equations were conducted to estimate unsaturated hydraulic conductivity, $K(\theta)$[LT^{-1}], water diffusivity, $D(\theta)$ [L^2T^{-1}], intrinsic permeability, k [L^2] and water flow, q[L^3T^{-1}] in soil pores of plant-root zone. Two alluvial clay soils located at northern Nile Delta were used to apply the assumed equations. The two soils were cultivated with cotton yield during 2014 season. The equations which assumed to predict soil-water movement parameters considered only the matric potential as a driving force in capillary pores, and gravitational potential that is critical for the large, non-capillary pores. Data of pore size distribution were obtained for the investigated soil profiles using water retention data. The calculated $K(\theta)$, $D(\theta)$ and k values were conformable to the common measured ranges, indicating the applicability of the proposed equations for predicting water movement parameters in agricultural clay soils. A suggested equation for so called potential conductivity, $Kp(\theta)$ was predicted in units [M $L^{-1}T^{-3}$] (erg. cm^{-3}.sec^{-1} or joule. m^{-3} sec^{-1}). The calculating $Kp(\theta)$ values of soil water filled pores were obtained for each pore size class.

Key words: *hydraulic conductivity, intrinsic permeability, diffusivity, conductivity potential, soil pore classes, clay soils.*

SEAWATER DESALINATION USING SOLAR ENERGY SOURCES

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Abstract

The origin and continuation humankind based on water. Water is one of the most abundant resources on earth, covering three-fourths of the planet's surface. However, about 97% of the earth's water is salt water in the oceans, and a tiny 3% is fresh water. This small percentage of the earth's water supplies most of human and animal needs—exists in ground water, lakes and rivers. The only nearly inexhaustible sources of water are the oceans, which, however, are of high salinity. It would be feasible to address the water-shortage problem with seawater desalination; however, the separation of salts from seawater requires large amounts of energy which, when produced from fossil fuels, can cause harm to the environment. Therefore, there is a need to employ environmentally friendly energy sources in order to desalinate seawater.After a historical introduction into desalination, this paper covers a large variety of systems used to convert seawater into fresh water suitable for human use. It also covers a variety of systems, which used to harness renewable energy sources; these include solar collectors, photovoltaics, solar ponds and geothermal energy. Both direct and indirect collection systems are included. The representative example of direct collection systems is the solar still. Indirect collection systems employ two sub- systems; one for the collection of renewable energy and one for desalination. For this purpose, standard renewable energy and desalination systems employed. Only industrially tested desalination systems are included in this paper and they comprise the phase change processes, which include the multistage flash, multiple effect boiling and vapors compression and membrane processes, which include reverse osmosis and electro dialysis. The paper also includes a review of various systems that use renewable energy sources for desalination. Finally, some general guidelines given for selection of desalination and renewable energy systems and the parameters that need to considered.

Keywords: *Hollow fiber membrane, water desalination, solar energy*.

POLYMER/NANOCOMPOSITES SOFT COATING FOR PAPER-BASED PACKAGING MATERIALS

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Abstract

Pigment coating is widely used to enhance the optical and mechanical properties such as gloss, tensile, elongation at break and print quality of paper and paperboard. This work aims to characterize the structure of soft coatings and to validate models for the optical response and interaction of coating based on optical measurements of physical samples. This work targets to enhancement the optical and mechanical properties of paperboard through coating with flexible copolymer nanocomposites in presence and absence of calcium carbonate, TiO_2 and Kaoline. Different types of inorganic filler were combined together and compared with each type alone. Optical and mechanical properties were improved with coating in compared with paperboard and high effective improvement was detected with combined fillers. It was shown that modifications of the surface properties account for the gloss increase when substrates coated. Coated samples were investigated with thermal gravimetric analysis (TGA), transmission electron microscope (TEM), scanning electron microscope (SEM), Gloss meter and mechanical properties. Coating enhances mechanical properties of coated paperboard along machine direction and cross direction.

Key Words: *Polymer composites, Soft coating, Surface behavior, Gloss.*

ACTIVE BIOMONITORING OF AIR POLLUTION LEVELS USING THE BIOINDICATOR–SPHAGNUM BAG

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Abstract

Air pollution by heavy metals is huge problem in the world today. The traffic load indicator has been significantly increased in Georgia over the past decade, which in turn increases the pollution of the environment, the emissions of heavy metals into the atmosphere. It is important to detect the pollution source and hot spots. The purpose of our study was South Adjara, the most populated and crowded areas with transport of Batumi. To this end, the studies of bioindicator were conducted using the so-called Sphagnum bag during the year in Batumi (2016-2017). Sphagnum bag was made by using the genus Sphagnum L. (Sph. palustre) which had a high adsorption capacity. The bag was placed in polyethylene envelope having the size 20 cm X 20 cm. Samples of "Sphagnum Bag" were installed in the area of Batumi with the high risk of air pollution with heavy metals (places where transport is overloaded). Bags were installed during all four seasons of the year. Four heavy metals such as chromium (cr), copper (cu), lead (pb), and vanadium (Vn) were studied. As a result of atomic absorption spectroscopy (AAS) of the samples, it was found that in summer the condensation of heavy metals in the air was s higher than in winter which was associated with an increase in the flow of cars. Correlation with air ventilation was also revealed. Higher levels of heavy metals were found in areas of overloaded traffic and high-rise buildings than on a highway located on the seashore.

Keywords: *Sphagnum Bag, bioindicator, heavy metals, Batumi, air pollution.*

WHEN WORDS TURN INTO ACTION IN SEARCH FOR EVIDENCES ABOUT THE PRACTICAL RELEVANCE OF BUENVIVIR IN BOLIVIA

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Abstract

In the last decades, concerns about environmental issues have generated the proliferation of environmental discourses, which have motivated vast environmental policies. However, in most cases, these environmental policies, and thereby the environmental discourses, have had minor impact on the ground. Despite vast action, the low practical relevance of environmental discourses highlights the need to improve the implementation of environmental policies on the ground. So, what are the factors that influence the practical performance of environmental policies? In Bolivia, the environmental discourse of BuenVivir reflected into policy after its adoption in the Constitution. BuenVivir (good living) is an indigenous ideology and introduces a novel perspective of collective well-being based on harmony between nature and people. This study searches for evidence about the practical relevance of BuenVivir by looking at policies deriving from the discourse, and practices on the ground, within the agricultural context of Santa Cruz, Bolivia. The aim is to study these evidences and explore the factors that influence the impact of environmental discourses (through policies) on the ground. The study expects to contribute to increasing the practical relevance of environmental discourses and hence policies. The two main methodological steps of the study consist of (1) an assessment of the practical relevance of BuenVivir in Bolivia, and (2) the exploration of its underlying factors. Preliminary results show that particularly factors such as political power, local economy and individual belief systems play an important role in defining the practical relevance of environmental discourses and their corresponding policies.

Keywords: *Buen Vivir, policy implementation, environmental discourse, environmental policies, agriculture.*

ENVIRONMENTAL COROLLARIES OF FOOD SECURITY AND SUSTAINABLE AGRICULTURE IN CITRUS FARMINGATASSIN NORTH AND SOUTH DISTRICTS OF CENTRAL REGION, GHANA

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Abstract

The backbone of human existence, food security, has prominently featured in the Sustainable Development Goals, as well as in the Millennium Development Goals. Meeting household food demand requires major changes in agricultural production systems. Improvement in farmland management is pertinent to increasing crop productivity without further degrading the environment. The prospects of sustainable agricultural production systems co-benefiting from environmental sustainability and contributing to climate change extenuation cannot be overstressed. This study as sayed the correlates of food security and sustainable agricultural practices, and their associated implications to the environment in the Assin North and South Districts of the Central Region of Ghana. Cross-sectional survey was conducted to select 170 household sthrough stratified sampling, 85 from each district. Structured interview schedule was administered to respondents through face-to-face approach. Adapting the World Food Programme's Consolidated Approach for Reporting Indicators of Food Security, households were classified into one of four food security categories. The perceptions and sustainable practice were also estimated. Both descriptive and inferential statistics were employed in data processing and presentation. The findings reveal that 16.5% of the households were food secure, 54.7% were marginally food secure, while 15.3% and 13.5% were moderately and severely food insecure respectively. Though households from Assin North were more food secure and use less coping strategies compared to Assin South, the differences were not statistically significant. However, there were significant differences in the mean perceptions and practices of sustainable agriculture. Besides, there was a significant association between food security and sustainable agricultural practices, indicating that farmers who practice sustainable agriculture were more likely to be food secure than those who did not. Factors found to have positive statistical significant association with food security were sex, age and coping strategies while those that had negative correlations were pesticides use, citrus farm income, formal education level, yield and sustainable agricultural practices. On the other hand, age, pesticide use and coping strategies had negative significant relationship with sustainable agricultural practices while, citrus farming experience, level of education and mean perceptions had positive and significantassociation with sustainable agricultural practices. In order to improve food security and at the same time protecting the environment, it is recommended that stakeholders train farmers on the proper use of pesticidesand other good agricultural practices. Policies for empowering citrus farmers should be engendered with adult education and pro-female strategies that will up-scale food security and improve environmental sustainability.

Keywords: *Food consumption scores, coping strategies, environmental sustainability*.

THE EFFECT OF COMPACTION ON WATER RETENTION IN THE VINEYARD'S ROOT ZONE

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Abstract

In vineyards, frequent machinery traffic between the vine rows results in spatial and temporal changes in soil structure that affect the water retention properties in the root zone. Compaction effects on the soil water characteristic curve in the root zone were evaluated in three vineyards of different soil type (a Cl, a ClL, and a SiL with increased sand percentage). Soil cores were collected from a) the tilled soil on the vine-row and b) the compacted soil of ruts produced by machinery traffic within the inter-row distance. Sampling was carried out at two depths (0-15cm and 15-30cm) and at two time intervals, the first in spring when agricultural vehicles had accomplished 6-8 passes and the second in autumn, after ca 20 passes. The results of the first sampling in the beginning of the cultivation period revealed that compaction increased soil bulk density of the three vineyards in both depths. Drainage pores collapsed to smaller ones while plant available water and textural porosity increased. The effect of compaction was more pronounced on the surface (0-15 cm) of the more fine textured soils. In autumn, at the end of the cultivation period, it was found that the soil water retention characteristics in the vineyards root zone were not substantially further affected by machinery traffic. We concluded that machinery traffic impact on the studied properties was intense in spring when the soil in vineyards was loose from tillage before the cultivation period and had temporally increased moisture content which results in decreased strength.

Keywords: *vineyard, soil compaction, bulk density, available water, porosity.*

UNAUTHORIZED (ILLEGAL) GOLD MINING IN RIAU PROVINCE, INDONESIA

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Abstract

Mineral resources as natural resources will contribute to the economic development of the country in accordance with the mandate of the 1945 Constitution. Governments as resource authorities must regulate their use to prevent wastage and optimize revenues from resource exploitation to gain the greatest benefit for the welfare of the people. The regulation on mining is referred to in Article 33 paragraph (3) of the 1945 Constitution and Law No. 4 of 2009 on Mineral and Coal Mining. In this case illegal mining in Riau based on 2014 were 12 cases, 2015 were 15 cases and 2016 were 16 cases.The main problem in this research is how to solve from the side of law and from the government side.There are many news about illegal gold mining in various places in Indonesia and especially Riau. Riau region has the potential of natural resources in the form of gold is large enough with good quality. This makes local entrepreneurs and communities start doing gold mining and most of them are illegal. These mining activities causes conflicts between communities in the areas near the mine with gold mining actors who did not care about the aspects of environmental sustainability and carried out without permission. The perpetrators of gold mining without permission is not only from the Riau region but begin to develop from outside the Riau region as well. Although efforts to control and prosecute perpetrators have been carried out, they do not have any significant effect on these illegal mining activities. Unauthorized mining business activities shall be subject to criminal sanction as set forth in the criminal provisions of Article 158 of Law No. 4 of 2009 concerning the mining of Minerals and Coal, states that: Every person who engages in mining business without Mining Business license, Mining Permit, Special Mining Business License as referred to in Article 37, Article 40 paragraph (3), Article 48, Article 67 paragraph (1), Article 74 paragraph (1) shall be imprisoned for a maximum of 10 (ten) years and a maximum fine of Rp. 10,000,000,000 (ten billion rupiahs).

Keywords: *Legal Mining, Gold Mining, Illegal Mining, Mining Law.*

USING GEOSTATISTICAL METHODS IN MAPPING SOIL SALINITY OF BOULAGH (SAVEH) SALINE LANDS

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Abstract

Salinity is one of the most destructive processes in soils, particularly in arid and semi-arid areas. In order to use and exploitation of such soils, the soil monitoring and mapping is necessary. In this study, in order to perform zoning and mapping of soils, sampling was collected based on network method from Bolagh (Saveh) saline lands and the electrical conductivity of saturated soil extract were determined. Then, the data were transferred to the GS+ software and soli mapping was drawn. The exponential model of Semivariogram showed the best cross-validation and efficiency compared with other models (spherical, linear and gaussian). Also, the amount of nugget effect to the threshold was 84/43% indicating that the medium spatial correlation for soil EC amounted in study area. Also, the variogram effect range was calculated about 261 meters. Assessment of the resultant index indicated that the geostatistic was suitable for soil salinity mapping with moderate accuracy and precision. The results showed that among five soil salinity classes, the soils of study area were classified in four classes (including non-salinity, low salinity, medium salinity and high salinity) which highest quantities were related to middle southern regions. These results show that soil salinity in this area has high variability.

Keywords: *Soil mapping, Geostatistic, Soil salinity, Kriging, Saveh.*

EFFECTS OF LOW SLOPE INTERNAL AREA OF THE CATCHMENT ON SEDIMENT DELIVERY RATIO

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Abstract

The present study was aimed to estimate soil loss and SDR in various spatial scales using RUSLE model in a small watershed in Zagros Mountains, west of Iran. For this purpose the annual soil loss was estimated and mapped by RUSLE model in two spatial scales of the watershed and one of its subwatersheds with the area of 4900 and 100 ha, respectively. The suspended sediment discharge was then measured daily for one year at the outlets of both studied areas. The mean estimated annual soil loss by RUSLE model for the whole watershed and subwatershed were 18.53 and 22.35 t ha^{-1} y^{-1}, respectively. The sediment delivery ratio (SDR) was then calculated through dividing total observed sediment load and soil loss resulted from RUSLE. The results indicated that SDR was estimated very low (2.21%) for the whole watershed while the estimated SDR for the subwatershed was clearly higher (13.68%). Investigating watershed topography showed that low-slope internal area in the middle and downstream of the watershed probably was the main factor of sediment trapping which decreased sediment transport and delivery ratio to the watershed outlet.

Keywords: *Sediment delivery, Sediment transport, Sediment trapping, Slope degree, Soil loss.*

COMBINING ABILITY ANALYSIS OF TUBER YIELD AND RELATED TRAITS IN POTATOES

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Abstract

In potatoes (*Solanum tuberosum* L. 2n=4x=48) both the general combining ability (GCA) effects of parents and specific combining ability (SCA) of crosses are important in conditioning traits of economic importance. The objective of this study was to determine the combining abilities for tuber yield and its components on seven high-yielding commercial cultivars of potato and advanced potato clones. Significant differences were found between the parents in the all of traits that are associated with high genetic diversity between parents. GCA for tuber form, length of stolon and number of tuber per plant was high and for stem height, tuber skin appearance and eye depth was low. Heritability estimated from 49 percent in the number of stem to 84 percent in tuber skin appearance. Both heritability and genetic advance as percent of mean estimates were high for tuber yield, tuber form, length of stolon, tuber size, number of tuber per plant and tuber size uniformity. AS10, AS12, AS14 and UT43 clones was best general combiner for the tuber yield, tuber size uniformity, eye depth, tuber dry matter and length of stolon. The SCA effects were the highest in the cross Savalan×UT43, Luca×AS20, Stbr2×Savalan and Picasso×HS in the traits were considered. Savalan and UT43 parents used in the crosses also have high GCA in studied traits. Finally results showed that Savalan, UT43, AS10, AS12 and AS14 in the studied traits was the high GCA and better than other parents.

Keywords: *Potato, GCA, SCA, Heritability, Genetic advanced.*

EFFECTS OF BIOCHAR ON SOIL HYDRAULIC PROPERTIES IN SUGAR CANE AGRO-INDUSTRY OF IRAN

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Abstract

The aim of the present study was to investigate the impact of biochar prepared from agricultural residues as a modifier of soil physical properties, including aggregate stability, water retention, porosity, and air and water capacity indices on sugarcane agro-industries in Khuzestan province, Iran. To this end, in each of the three agro-industries of Amirkabir, Haft Tapeh, and Karun, a factorial experiment in a completely randomized design with factors such as soil texture at three levels, biochar type at three levels (sugar cane bagasse, wheat straw, and sugar cane leaves) was conducted with three replicates. Subsequently, soil pH, soil electrical conductivity, mean weight diameter of soil aggregates, and soil moisture curve in suctions with pF of 0, 0.4, 1, 1.8, 2, 2.52, and 4.17 were measured. The results showed that by increasing biochar, mean weight diameter of soil aggregates decreased significantly in Amirkabir and Haft Tapeh agro-industries. However, increasing biochar did not affect mean weight diameter of soil aggregates in Karun agro-industry. Furthermore, adding biochar to soil improved soil electrical conductivity and pH. However, its effects on soil salinity and pH in each agro-industry varied according to the type of biochar. Adding different amounts of biochar to soil increased soil moisture in all suctions, but wheat biochar increased soil moisture more significantly. Biochar had different effects on other soil physical properties such as porosity, air capacity, plant available water, and relative field capacity. The results showed that biochar increased soil moisture and decreased plant available water, relative field capacity, porosity, and air capacity. In general, sugarcane biochar, compared to wheat biochar, results in lower soil moisture and higher plant available water.

Keywords: *Biochar, Water retention, Porosity, Aggregate stability.*

EFFECTS OF EPHEMERAL GULLY EROSION ON SOIL QUALITY IN SOUTHWESTERN IRAN

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Abstract

Ephemeral gully erosion is one of the most important erosion processes which greatly affects soil quality. The purpose of this study was to investigate the effect of ephemeral gully erosion on soil quality of agricultural fields of Shahid Modarres sub-watershed in Karun watershed. To this end, fifty ephemeral gullies in this sub-watershed were selected, and sampling was done at the head cut (at the soil depths of 0-30 and 30-60 cm) and the soils around it (the inter-gully area). A number of soil physical properties (soil texture, bulk density, and aggregate stability) and soil chemical properties (organic matter, soil salinity, pH, sodium absorption ratio, and cation exchangeable capacity) were measured. Subsequently, soil quality of the region was studied using analytic hierarchy process, fuzzy logic, and IQI method. The results of this research indicated that pH, salinity, organic matter, cation exchangeable capacity, and mean weight diameter of soil aggregates and clay at the head cut decreased by 0.67, 8.7, 9.34, 14.6, 33.33, and 14% compared to the inter-gully area, respectively. However, the bulk density of soil, sand, and silt at the head cut increased by 3.7, 4.5, and 10% compared to the inter-gully area, respectively. The most important parameters affecting soil quality were aggregate stability and soil erodibility. Assessment indicators of soil quality showed that the soils of this region have been severely eroded and are in Grade 4, indicating that these soils cause serious limitations to plant growth. Restoration of these soils is possible through erosion control and conservation tillage.

Keywords: *Soil quality, Ephemeral gully erosion, Shahid Modarres sub-watershed.*

DESALINIZATION OF IRRIGATION WATER BY BIOCHAR IN SOUTHWESTERN IRAN

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Abstract

To study the effect of biochar of agricultural residues on water desalinization, a factorial experiment in a completely randomized design with biochar treatments (at three levels of sugar cane bagasse, rice straw, and wheat straw), equilibrium time (at five levels of 2, 4, 6, 12, and 24 hours), and salinity (at five levels of 0, 10, 20, 30, and 40 dS/m) was performed with three replications. Salinity, sodium, potassium, magnesium, calcium, and chlorine were measured after the treatments and the absorbance capacity of these elements and the desalinization capacity were calculated. The results of this study showed that sugar cane bagasse at the equilibrium times of 24, 12, 6, 4, and 2 hours reduced the salinity of water 1.03, 1.09, 1.04, 1.10, and 1.06 and 1.08, 1.10, 1.1, 1.13, and 1.15 times more than rice straw and wheat straw, respectively. Moreover, sugar cane bagasse reduced the salinity level at the equilibrium time of 24 hours 1.01, 1.09, 1.08, and 1.05 times more than at the equilibrium times of 12, 6, 4, and 2 hours, respectively. Water desalinization of sugar cane bagasse at the equilibrium times of 24, 12, 6, 4, and 2 hours was 1.48, 1.42, 1.06, 1.03, and 1.40 and 1.31, 1.29, 1.24, 1.33, and 1.42 times more than that of rice straw and wheat straw, respectively. In addition, water desalinization at the equilibrium time of 24 hours was 1.42, 1.77, 2.86, and 4.84 times more than that at the equilibrium times of 12, 6, 4, and 2 hours, respectively. The findings of this study revealed that sugar cane bagasse could be utilized as a sorbent for pre-purification of drainage water of agro-industries.

Keywords: *Biochar, Sugercane, Drainage water, water purification.*

CADMIUM REMOVAL FROM AQUEOUS SOLUTION BY GRAPE AND APPLE BIOCHARS: ADSORPTION EQUILIBRIUM AND KINETICS

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Abstract

In order to study the effect of the initial concentration and contact time on cadmium adsorption capacity and removal efficiency by grape pruning residue (GPR), apple pruning residue (APR) and GPR and APR biochars from aqueous solutions, a batch experiment was conducted with the initial concentration of cadmium (0 to 200 mg L^{-1}) at various times (0 to 240 minutes) with the ionic strength of 0.03 MNaNO3. The pseudo-first order, pseudo-second order, Elovich and fractional power kinetic models were used to find out the kinetic parameters. To describe the equilibrium isotherms the experimental data were analysed by the Langmuir, Freundlich and Temkin models. The results showed that the removal efficiency (RE) ofthe adsorbents was decreased with increasing the initial concentration. Among the adsorption kinetics models, the pseudo second order model was better fitted for experimental data (R^2=1) and adsorption capacities (q_e) for Cd(II) of the pseudo second order model, were 8.40 and 7.95 mg g^{-1} for GPR and APR and9.79 and 9.05 mg g^{-1} for GPR and APR biochars, respectively. The $k_1$and k_2 values (rate constant of adsorption) of the pseudo first order and pseudo second order models were greater at GPR and GPR biochar, compared to APR and APR biochar. The experimental data were well fitted with the Freundlichb(R^2=0.98-1.00) model compared to the Langmuir (R^2=0.94-0.97) and Temkin (R^2=0.72-0.92) models, with the obtained sorption intensity (n) 2.38 and 2.17 for GPR and APR biochars, respectively. The separation factor of the Langmuir (R_L) indicated that the sorption reaction of Cd^{2+} by grape and apple biochars (R_L=0.14-0.50) is favorable.

Keywords: *Grape and Apple Biochar, Adsorption Kinetics, Adsorption Isotherm, Cadmium.*

STUDY OF ZINC SORPTION BEHAVIOR IN SOIL IN PRESENCE OF ORGANIC ACIDS-HUMIC AND CITRIC ACIDS

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Abstract

Zinc (Zn) concentration in soil solutions and its bioavailability are controlled by sorption reactions. The batch technique was used to study the influence of humic acid (HA) and citric acid (CA) on the sorption of Zn in three soils that were different in clay and calcium carbonate contents. Three levels of citric acid (CA) (0, 0.5, 1 mmol L^{-1}), three levels of humic acid (HA) (0, 200, 500 mg L^{-1}) and various Zn concentrations (0 to 450 mg L^{-1}) were applied at constant ionic strength (0.05 mol L^{-1}NaCl). The sorption isotherms on the soils could be well described by the Freundlich equation (R^2= 0.93-0.99). All sorption parameters including the maximum sorption of the Langmuir (q_{max}), the Freundlich capacity and intensity factors (K_F, n), and coefficients of the Temkin equation (A, K_T)were increased by adding HA, but the application of CA decreased all the mentioned sorption parameters. CA decreased the Freundlich sorption capacity (K_F) up to 52-68%, but it was increased in the presence of humic acid by 73-95%. It is concluded that CA could significantly reduce Zn sorption by soil particles, probably through the formation of soluble CA-Zn complexes, but HA increased Zn sorption and decreased its mobility, probably due to increasing exchangeable sites and forming insoluble soil-HA-Zn complexes.

Key words: *Soil, sorption isotherm, organic acids, humic acid, citric acid.*

INVESTIGATING THE EFFECTS OF POULTRYMANURE ON RUNOFF COMPONENTSAT PLOT SCALE

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Abstract

Land surface cover affects runoff generation and soil loss processes. Runoff causes soil loss and finally leads to sedimentation in water bodies. Water erosion as a selective process generally removes the smaller components of soil particles with lower density. Organic amendments in one hand increase the cohesion of soil particles and on the other hand, increase the soil infiltration rate and finally reduce the runoff and soil loss. The present study has been conducted to examine the efficiency of poultry manure with the rates of 62.5 and 125 grm^{-2} on time to runoff, runoff volume and runoff coefficient in slope of 20 percent, plot area of 25×50 cm^2 and the laboratory condition. A portable rainfall simulator was used to simulate rainfall with the intensity and duration of 50 mm h^{-1} and 10 min, respectively. The results showed the poultry manure had significant effect on reducing time to runoff, runoff volume and runoff coefficient in level of 99 percent.

Keywords: *Poultry Manure, Soil Conservation, Soil Loss, Rainfall Simulator.*

RESPONSE TO RISK OF DROUGHT: EMPIRICAL ANALYSIS OF SMALL FARMERS' DROUGHT ADAPTATION IN THE SOUTH-WEST IRAN

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Abstract

The agriculture sector is most vulnerable sector regarding drought. Drought cause reduction in soil moisture levels and increase in salt concentrations. It reduces crop productivity and quality, increases production costs, and reduces farm income. However, empirical evidence has revealed that farmers can effectively manage the negative impact of drought by adapting their farming practices. Therefore, adaptation is a key to reducing the sector drought vulnerability. Knowledge of what farmers do in response to these events can broad adaptation options and improve resilience within the sector. In order to design effective public drought adaptation strategies, it is seen as crucial to understand farmers' adaptive decision making at the farm level. Therefore, the aim of this study was to investigate the farmers' ongoing adaptation measures, and to identify factors influencing their choice of adaptation methods. To achieve this goal and identify the factors influencing farmers' decisions to engage in adaptation behavior, we borrowed protection motivation theory from health domain. The study was designed as a cross-sectional survey. The population of interest consisted of farmers in the Dehloran, Illam in south-west Iran. Study sample consisted of 320 farmers who were selected through a multi-stage random sampling method. Regression result revealed that the protection motivation theory accounted for 38% of variance in intentions and 33% of variance in behavior towards drought management. From the practical point of view, the present study provides a justification for using constructs of the theory in policy and decision making that intends to encourage farmers to adaptation behavior.

Keywords: *Drought, adaptation, Protection motivation theory, agriculture extension.*

DIVERSE IMPACTS OF DUST STORMS ON FARMERS: THE STUDY OF SEVERITY AND INCIDENCE

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Abstract

During recent years, negative impacts of dust phenomenon on environment, economic, human health and social mechanisms threat the livelihoods of communities notably in rural areas. Accordingly, a survey study was conducted in Susa County, southwest Iran, to investigate the dust impacts on farmers who were frequently exposed to it. To make sure of dust real impacts, the transcripts of a Focus Group Discussion conducted with 12 local farmers in combination with those founded in the literature were used to constitute a framework for the study questionnaire in terms of severity and incidence. Validity of the instrument was confirmed by a panel of faculty members, and to approve its reliability, a pilot study was carried out in which the Cronbach's alpha showed acceptable values (a= 0.65-0.94). Then, by accepting the cluster random sampling manner, data were collected. Results showed that while the most sever damages of dust were related to the economic, social and environmental dimensions, the highest incidence of effects occurred in environmental, social and economic sectors, respectively. Also, the top three severe environmental damages of dust were the increase of air temperature, decrease of air quality and increase of surface water pollution, respectively. While the most severe economic damages of dust storm included devastation of home furniture, increase in household's cost for cleaning, and reduction of crop yields, from a social perspective they encompassed transmission of human diseases pathogens, reduction of clean and sunny hours, as well as distrust to organizations in charge of dust control. To mitigate the impacts some interventions both in policy and action are advised.

Keywords: *Dust Storm, Farmers, Environmental Impacts, Socio-Economic Impacts, Iran.*

WHO HAS BETTER KNOWLEDGE? STUDY OF THE RELASHIONSHIP BETWEEN WATER MANAGEMENT KNOWLEDGE AND LEVEL OF RURAL DEVELOPMENT

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Abstract

Agricultural water management is a broad area which has been appreciated in agricultural development plans. To maximize the efficiency of these plans, improving farmers' knowledge on water management as an essential prerequisite is acknowledged. Simultaneously, rural development plans to improve the life quality of people living in rural areas have focused on providing physical and social infrastructures. Having this in mind, a survey study was carried out to investigate if there is any difference in water management knowledge between those living in rural areas with different development level. The study was conducted on a random sample of farmers living in less developed and undeveloped rural areas of Gotvand County, west of Iran. Numerical taxonomy ranking was the base method to differentiate rural areas in terms of development level. Data was collected using a questionnaire after making sure of its validity and reliability. Results indicated that there were some significant differences between water management knowledge of farmers with respect to the level of rural development. Those living in less developed areas showed higher level of knowledge regarding water management than those in undeveloped areas. Farmers' knowledge of water management, however, appeared low in general. Moreover, the number of water management techniques applied at farm level was positively associated with the farmers' knowledge level. The paper concluded that there were some areas need to be enhanced like ongoing extension and educational programs on farm level water management techniques as well as making attempts to improve the standard of living in rural areas.

Keywords: *Water Management Techniques, Numerical Taxonomy, Rural Development Level, Iran.*

BARRIERS TO FARMERS' PARTICIPATION IN ESTABLISHING WATER USER ASSOCIATIONS: THE CASE OF IRRIGATION AND DRAINAGE NETWORK OF NORTHEAST AHWAZ, IRAN

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Abstract

Concern about water resources in semi-arid areas of the world has led to the introduction of a participatory management system of water, which potentially challenges farmers' willingness to involvement. Establishing water user associations has altered the water management system in irrigation and drainage networks. Undoubtedly, promoting these changes in rural areas, where the new social changes are slowly accepted, is encountered with various obstacles. As such, this study was conducted to recognize the impediments of establishing water user associations through the eyes of those working in an irrigation and drainage network. Data were collected through a questionnaire which consisted of questions regarding social, financial, cultural, organizational, management and attitude barriers. Analysis of data revealed that management barriers were ranked at the first place followed by the cultural, attitude and social ones. However, lack of motives to stimulate users into participatory system of water management, farmers' inabilities to combat with those who illegally extract water, inability to equal and justice-based allocation of water to different users, farmers' preferences to instant individual advantages instead of future common advantages, negative attitude of farmers toward efficacy of local associations, lack of informative opportunities for making farmers aware of the WUAs' benefits were recognized as the strongest barriers, respectively. The results also showed that there was significantly positive correlation among four categories of barriers including social, cultural, management and attitude. This means that they were interrelated and any intervention to change one could affect the others. Hence, to initiate involvement of the local people into decentralized systems of water resources management, salient attempts are needed to empower farmers for removing the barriers, mainly management and social.

Keywords: *Water User Association, Participation, Barriers, Iran*.

BIOCHAR EFFECT ON PB BIOAVAILABILITY AND LETTUCE (LACTUCA SATIVA L.) PLANT GROWTH IN A PB SPIKED SOIL

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Abstract

Accumulation of heavy metals, such as lead (Pb), in soils has increased as a result of human activities. Biochar application is an effective pathway for removing toxic metals due to its high efficiency and low price. In this study, impact of different biochar types including apple pruning waste (AB), grape pruning waste (GB) and wheat straw waste (SB) at levels of 0, 2 and 5% w/w were examined on lettuce plant growth in a calcareous soil contaminated with 0, 100 and 500 mgPb kg^{-1} in greenhouse condition. At the end of the plant growth period, plant dry weight, Pb concentration in root and shoot, plant transfer factor (TF), and Pb bioavailability in soil were measured. The results showed, the addition of 5% biochar to soil significantly ($p<0.05$) increased the biomass of lettuce. At the highest level of Pb spiking (500 mg Pb kg^{-1} soil), the NH_4NO_3-extractable Pb at 2 and 5 % added biochar reduced 32.57 and 98.31% compared to the control (without biochar), respectively. Furthermore, Pb concentration in shoots and roots decreased with AB, GB and SB application rates. In conclusion, the influence of biochar on Pb accumulation in lettuce root and shoot varied, with the feedstock and rate of biochars.

Keywords: *Apple pruning, biochar, Grape pruning, Lead, Wheat straw.*

EFFECT OF DEFICIT IRRIGATION AND SUPER ABSORBENT ON THE QUALITY AND QUANTITY YIELD OF RAPESEED (*BRASSICA NAPUS*)

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Abstract

In Iran, water is a scarce resource, due to the high rainfall variability. The water stress effects depend on deficit timing, duration and magnitude. This study investigated the effects of low irrigation and super absorbent on the quality and quantity yield of rapeseed (Brassica napus cvs Zarfam). Research was conducted with complete randomized block experimental design with factorial arrangement with three replications. In this experiment, the main factors consisted of water deficit with 3 levels: normal irrigation, cut irrigation in flowering, cut irrigation in silique feeding, while secondary factor of super absorbent (zeolite and superabsorbent polymers) application were performed at three levels: (control) non super absorbent, zeolit 10 ton per hector, superabsorbent polymers 8 kg per hector. Results of analysis of variance indicated that the interaction effects of water deficit and super absorbent on the characteristics the number of silique per plant, the number of grain in silique, grain yield, biological yield, harvest index and oil percentage were significant. The maximum grain yield (4228.4 $kgha^{-1}$) was obtained from normal irrigation and not application super absorbent. Water stress at silique feeding reduced oil content of seed.

Keywords: *Canola*, zeolite, superabsorbent *polymers*, *water deficit.*

VARIATION OF SOIL SEED BANKS IN GRASSLAND AND FOREST HABITATS DISTRIBUTED ALONG AN ALTITUDINAL GRADIENT

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Abstract

Future plans and decisions for restoration of degraded sites in grasslands and forests require more information on the potential capacities of soil seed banks. Therefore, in this study we investigated the variations in soil seed banks along an altitudinal gradient, covering three habitats from lower to upper altitudes: forest, forest-grassland and grassland. In each habitat, 20 quadrats were established and the above-ground vegetation and the germinable seed banks were measured. Similarity between seed bank and vegetation was lowest in the forest-grassland located at intermediate altitudes. Together with the contrasting highest density and species diversity of seeds at these altitudes, the ecotonal role of this habitat was confirmed. We found evidence that lower altitudes could act as storage for seeds of some species growing at higher altitudes; the role of the forest-grassland was more prominent as a reserve for the grassland seeds than the role of the forest as a reserve for seeds of the grassland and forest-grassland habitats.

Key words: *Rangeland management, Forest, Seed bank, Subalpine grassland.*

GULLY EROSION IN ARDABIL PROVINCE (NORTHWEST OF IRAN)

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Abstract

This research has been focused on gully morph-climatic classification as a first stage in evaluating gully processes for control of gully erosion in Ardabil province (NW of Iran). In Ardabil province there are 8 climates in which more than 55 percent of it is under influence of ultra-cold semi-arid and cold-arid. Also totally 7 areas, which were affected by gully erosion, were found, covering an area, which amounts to 465 km^2 and have 2 different types of climates. Most of the gullies are located on hills and some on plains; they belong to discontinued gullies group. The view plan of gullies is dendritic and linear. The headcuts of gullies are rounded, notched and pointed, the vertical plan of headcuts are generally vertical and cave. The width section of these gullies is U-shaped in northern areas and V-shaped in southern areas. The gullies have depths between 1 and 10 m. The gullies are formed in rangeland and in dry farmlands area. These areasare in 2 classes (one with ultra-cold semi-arid climate and the other with cold-arid). The first class consists of Hashtjin, Kandiraq, Qezaz and Mersht-Bodalalu area and the other Moghan 1, 2 and 3. Gullies can be prevented in the studied area by maintaining ground cover, prevention of surface runoff concentration, land rehabilitation, controlling over grazing by livestock and improper road constructions.

Keywords: *Gully erosion, Morph-climatic, classification.*

CHARACTERISTICS, CAUSES AND HAZARD ZONATION OF LANDSLIDES IN SOUTH OFARDABIL PROVINCE (NORTHWEST OF IRAN)

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Abstract

The study area is located in northwest of Iran and southern part of the Ardebil province. It covers an area of 1645.84 km^2; while over 9.52% of it is stricken by landslides. A total of 175 landslides were mapped in the region covering 156 km^2. Landslides of the region are classified as translational and rotational slides and combinations of the two, and landslide zones. Currently, 103 cases of the landslides (58.9%) are active in the region. Interestingly, at least 60% of the studied landslides showed signs of activities over the last 55 years. The rocks range from Paleozoic to Recent. The major structural trends of area are N50˚W to N25˚W. Expanded fault zones and fold structures were developed by compressional Alpine movement directed from northeast. Landslides, which happen usually in rural regions, not only cause a considerably economic loss, but also provide social and cultural damages. The landslide susceptibility zonation map has been prepared, with 84.1% accuracy, by logistic regression. Paleogene Red Bed Formation, alteration zones of Eocene volcanic are the most landslide-prone units. Landslides hazard has been analyzed in two stages. The degree of landslides hazard has been determined by estimated magnitude and frequency in landslides area. The second estimates the probability of landslide occurrence in each pixels and total of area, by applying post of 1960 landslides. In this research, two logistic regression and favorability function models have been used. The most hazardous 20% and 40% of the area contain 62.52% and 84.1% of the landslide area, respectively; these results are good. Results based on fuzzy set theory show 13.4% of total area under very high to high risk zones. Quantitative risk models with a monetary meaningwere obtained for each element by integrating landslide hazard and vulnerability models. The methods proposed allow the identification of the areas where greater damages are to be expected and prevention efforts would have better benefit/cost ratios.

Keywords: *landslide, damage, probability, hazard and risk.*

HEAVY METAL CONTAMINATION OF SOIL, WATER AND VEGETATION AROUND A MINE IN NORTHWEST OF IRAN

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Abstract

Contamination of the soil, surface and underground water resources and plants with metallic and nonmetallic elements poses a serious problem for the environment. Since the mineralized and alterated region of GarehDagh-Tarom is known to be a metal rich zone, and includes the important part of the Azerbaijan area, and also due to heavy mining which has been and is taking place in some areas of this region, it is vital and necessary to study the contamination of the environment of such regions with some of poisonous elements. Moreover, it is necessary to investigate the soil, water and plants restrictions caused by heavy concentrations of such elements in the north of Meshkinshahr in Gareh-Sue basin (Doostbeigloo area) and a part of this zone. The various samples of soil, water and plants were taken and analyzed using ICP method. The concentrations value of elements was compared with the target and intervention limits set by international regulatoryagencies and the contamination quantity of samples were assessed. The pollution indices, enrichment factors and bio-concentration factor were calculated to investigate the level of the pollution in soil and plants samples. The results of soil analysis were analyzed using one-way analysis of variance and the sources of variation with meaningful "F", the mean comparison using Duncan method, and T-test was conducted. The results have been grouped by factor and cluster analysis. The concentrations of Au, Ba, Be, Fe, V, S, Cu, Mo and Sb aresignificantly above the permissible levels in the shallow soil horizons;the Al, As, Pb and Zn value are considerable above. The Cr, Mn, Hg and Co concentration in some of soil samples is concerned. The total hardness of water is generally high in altered zones of this area; however, total hardness of river, spring and well waters is the permissible levels in no altered zones of beyond the research area. Altered and mineralized region waters fall mostly within the field of undesirable or poor quality waters, and these are saline and harmful to drinking and irrigation. Chloride levels in water samples are generally below the standard limit. The highest value of total dissolved salts (TDS) were found in the some of the altered zone ground waters, these not only are significantly above the allowed limit but very toxic as well. Excessive concentration of toxic and pathogenic elements in the soil, water, and plant is alarming in this region; this water is not only used as drinking water for people and animals but also watering of gardens and agricultural lands takes place. Therefore, spread of diseases such as skin diseases, liver toxicity and cancer in the region can be linked with pollution of water and plants. So in order to prevent worsening of the condition, corrective action should be implemented. Drinking water should immediately be filtered.

Keywords: *Contamination, soil, water, plant, environment, mineralization, alteration.*

EEFECT OF CHANGE IN LAND USE FROM A FOREST INTO A FARMLAND ON PHOSPHOROUS FRACTIONS IN AGGREGATES OF DIFFERENT SIZE

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Abstract

Land-use change and management practices may affect soil properties, which play a critical role in sustaining crop production. Here, we examined the effect of change in land use from a forest into a farmland on phosphorous fractions in Gorgan Province's Shast Kolay and Gilan's Par-e- Sar regions in the north of Iran. For this purpose, composite soil samples were taken from 0-20 cm depths in three replications from these two regions; then, the mean weight of the diameters of the soil aggregates and three fractions of phosphorous (Fe–Al bound P, Reductant soluble P and Ca-bound P) were determined. According to our data variance analysis in both regions, this change had a significant influence on the mean weight of soil aggregate diameters and the amount of phosphorous. Change in land use in Gorgan's Shast Kolay and Gilan's Par-e-Sar regions led to a reduction in the soil aggregates mean weight diameters: 4.5 and 4.7%, respectively. In the former region, such a change resulted to an increase in the total amount of phosphorous, but, in the same region, to a decrease in the amount of reductant soluble P. In the latter region, this change in land use led to a decrease in the total amount of phosphorous and phosphorous fractions as well. Moreover, based on the results, in both regions, for the soil aggregates with a diameter between 0.6 and 4.75 mm, the amount of phosphorous in the forestland use was higher than that in the farmland use. However, for the soil aggregates with the diameters smaller than 0.6 mm, this amount was the opposite: higher in the farmland uses.

Key words: *Aggregate, Farmland use, Forestland use, Land-use change, Phosphorous fractions.*

A BLUEPRINT FOR ELEMENTARY REPRESENTATIVE WATERSHED SPECIFICATION

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Abstract

Provision of ecosystem services is necessary for our quality of life. In this vein, it is critical to develop a baseline to monitor the ecosystem behavior using monitoring, mapping, and modeling indicators of landscape condition. The representative watersheds (RWs) can therefore be considered as such decision blueprint to implement the best management practices to conserve and consequently improve ecosystem services. There are few researches for the selection of RWs. However, the comprehensive and of course applicable methodologies still are lacked particularly in developing countries where concentration and proper directing of conservation measures are further needed owing to investments constraints. Therefore, in the present study, an intensive watershed selection process was undertaken to identify RW across the Gharesoo-Gorgan River Basin (ca. 12987 km^2), Golestan Province, Iran. This study aimed to adopt the Laize's approach in Gharesoo-Gorgan Watershed for identifying the representative sub-watershed. Towards this, four GIS-based layers of elevation, slope, rainfall erosivity and land use were selected for sub-watersheds characterization. The representative watershed index (RWI) was then calculated and mapped using MATLAB 2016 and ArcGIS 10.3 softwares, respectively. The RWI was calculated pixel wise for all nine individual sub-watersheds and the entire watershed as reference area with the help of matrix combinations of four study layers. Ultimately, RWIs obtained from 21.3 to 62.6 with mean of 44.94±14.49 and coefficient of variation of 32.25% were used for sub-watershed prioritization. Accordingly, the sub-watershed 8 in north east with RWI of 56.8 was proposed as the final RW for the whole Gharesoo-Gorgan Watershed. The results of the study is helpful to be used by authorities for launching monitoring systems in the RW to collect behavioral indicators leading to designation of reasonable eco-environmental restoration strategies.

Keywords: *Environment protection, Geographic information system, Integrated watershed management, Watershed prioritization.*

THE EFFECTS OF GLOBAL WARMING ON THE PRODUCTION OF STRATEGIC CROPS SUCH AS RICE IN THE NEAR EAST COUNTRIES (IRAQ MODEL)

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Abstract

Iraq has been classified among the five countries, most affected by global warming on earth. It means that this phenomenon will have a serious environmental impact on the nature of population distribution and the nature of agricultural diversity in this country. Attempts to obtain rain rates variables have declined over the last five years compared to the years before. This is naturally accompanied by high temperatures especially in the long summer in the countries of the Near East, which contributes seriously to the low water levels in the Tigris and Euphrates, backbone of agricultural activity in this country especially in the summer. This situation threatens the cultivation of rice regarding high efficiency and quality. As a result, the government is working to reduce the flow of water to strategic agricultural projects because they are not available in lakes, which are large water stores. All of that reduces the green cover in general and leads to desertification in large agricultural areas in the Euphrates River basin. In addition it leads to low rate of production of strategic agricultural crops, such as rice in particular. The effects of global warming include not only Iraq but also the countries of the region such as the Republic of Turkey, where mountains are also the source for the Euphrates and the Tigris Rivers Turkey has taken steps to increase its water security, building dozens of dams along the Euphrates River. The Republic of Syria has also done the same and for more than 30 years. That global warming, low rainfall, high temperatures and the construction of giant dams on the Euphrates River in Turkey and Syria have led to a decline in water rates in the Euphrates River significantly. This paper is based on accurate information collected through field study in the areas of growing Iraqi rice of high quality known as Amber. The research pointed to the extinction of many varieties of this crop as a result of the effects of global warming and water decline in the Euphrates River and the government's inability to support agricultural plans because of the political problems in this country.

Key words: *Rice crop, plot of land, river water, rain water and desert environment.*

e-NEWTRIENTS: BIO-ELECTROCHEMICAL SYSTEMS AT THE SERVICE OF AGRICULTURAL SCIENCES, NUTRIENTS RECOVERY AND ELECTRO-ACTIVE SOIL CONDITIONERS

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Abstract

Inorganic salt deposition and biofouling hinder long-term operation of bio-electrochemical systems (BES) used in wastewater treatments (Santini et al., 2015). Here, an innovative type of BES is proposed, where we take advantage of these phenomena. These BES are fabricated with low-cost, biocompatible, and fully-recyclable materials (clay, pyrolysed biomass) which, after getting clogged, could be directly reused as soil conditioners in agriculture. We propose to name these novel BES "Microbial Recycling Cells" (MRC). We use terracotta as porous air-water separator and electro-active char-coal electrodes (*e*-biochar) fed with different wastewater types to treat. In such systems, conductive materials are colonized by microbial electro-active communities and microbial redox reactions drive to COD and mineral nitrogen (NH_4^+, NO_3^-, NO_2^-) removal. Considerable fractions (up to 60%) of the main organic and inorganic nutrients (C,N, P, K, Fe, Mn, Ca, Mg) are removed from the wastewater and deposited on the MRC structural materials. Terracotta and *e*-biochar, enriched of nutrients, can be fully recycled as organic/inorganic nutrients-rich soil conditioners, in a view of circular economy. Biochar has been deeply studied as mean of carbon storage in agricultural soil, as strategy to mitigate climate change and preserve soil fertility. Biochar electro active properties were also demonstrated to directly influence soil microbial habitats and communities.

Keywords: *bio-electrochemical systems, microbial recycling cell, electro-active char-coal, terracotta, electro-active soil conditioners.*

WEED BIODIVERSITY IN INNOVATIVE RICE FIELDS MANAGEMENT

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Abstract

In Italy, rice is cultivated in about 227,000 hectares mainly in Lombardy and Piedmont where about 70% of the rice area is sown on submerged rice paddy. This study is a part of the research project "*SUBRIS - sub-irrigation, an innovative technique for sustainability in rice farming"* currently underway and funded by Lombardy Region, Directorate-General for Agriculture, within the Rural Development Plan (RDP) 2014/2020. The project involves the application of sub-irrigation technique to rice cultivation with the aim of assessing its effectiveness in increasing water use efficiency by promoting water saving, in reducing the impacts deriving from the use of pesticides and the greenhouse gas emissions. The complementarity of the sub-irrigation to the mulching technique is evaluated as an alternative strategy to the chemical means for the weed control , improving rice farming environmental sustainability. The project also assesses the benefits that the introduction of sub-irrigation could bring in terms of crop diversification of the production system thanks to the possibility of introducing rice farming in areas where rice is not cultivated. . Phytosociological investigations were carried out according to the Braun-Blanquet method in weed communities growing in different types of paddy field management: mulched sub-irrigated, organic, integrated and conventional. Specific biodiversity was evaluated for each weed community using STADIV pc-program. Species average cover-abundance values were subjected to importance-values distribution analysis using DIVFIT pc-program, producing dominance-diversity curves. Preliminary results show lower weed biodiversity in conventional and in mulched sub-irrigated management compared to integrated and organic ones.

Keywords: *Rice farming, Sub-irrigation, Mulching, Water saving, Weed biodiversity.*

SPATIOTEMPORAL ANALYSIS OF SMALL SCALE GREENHOUSE MICROCLIMATE BASED ON SMART AGRICULTURE SYSTEM

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Abstract

There is a need for high cutting-edge technological ICT application in agriculture in order to embark on the current decline in agriculture labor force in Japan. However, few small-scale farmers are able or willing to risk significant capital on sensing technologies. There is a challenge in horticultural greenhouse farming to provide a well-controlled microclimate environment to meet well-developed crops with high yield and quality crop production while using fewer resources. In this study, a cost-effective simplified smart agriculture system was developed and deployed in small-scale tomato greenhouse farming in Nara, Japan. The system real-time information capability is used for monitoring crop environment for proper crop management. A spatiotemporal analysis was done to assess variations and understand the underlying microclimate conditions in the partitioned tomato greenhouse (blocks). Crop production is done all year around (An average of 2.5 times cropping cycle per one greenhouse block). Spatiotemporal analysis and statistical analysis results show well-defined micro-climate control strategies that could relatively be used in greenhouse facility management to enhance crop cultivation while using less energy resource that is relatively cost-effective. The reliability of the system data makes it efficient and consequently it could be used for accurate crop production planning, improvement in cultivation management and support in decision-making regarding cultivation activities.

Keywords: *Smart Agriculture, Small Scale Farmer, Greenhouse, Spatiotemporal.*

PERFORMANCE OF A MODIFIED SEPTIC TANKTREATING DOMESTIC WASTEWATER

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Abstract

In arid countries, using reclaimed water in irrigation is a widespread practice.Therefore, strong treatment designs must achieve effluent quality in accordance to standards, legal requirements and guidelinesfor reuse and health. Further, reliable wastewater treatment systems, including decentralized facilities, are needed. Among different decentralized wastewater systems, Modified Septic Tank (MST) has been found to be an eco-technology which is robust, reliable and cost effective as well as suitable for the treatment of domestic wastewater. The aim of this research was to test the treatment performance of two innovative designs of septic tanks used for onsite wastewater treatment. The designs were implemented and tested as part of a research project focused on innovative decentralized wastewater treatment solutions to optimize nutrient removal using sustainable and low-cost options to guarantee the safe reuse according to the reuse of Jordanian Standards (JS). In Jordan at the Fuhais research facility, two Modified Septic Tanks with dual operational conditions (anaerobic and aerobic) have been designed, constructed and operated in parallel, and investigated considering category-A in the (JS) for reuse in irrigation (JS 893/2006). The Attached Septic Tank and Suspended Septic Tank designs have shown high removal efficiency of COD, BOD_5, and TSS over two years of monitoring. The quality of treated wastewater has complied with the Jordanian Standard 893-2006. The mean removal efficiency for COD, BOD_5 and TSS in Attached system has been found (94 %), (98.6 %), and (97.4 %) respectively under the lowest loading rate, while in Suspended system the mean removal efficiency has been found (90 %), (97.1 %), and (94.1 %) under the same hydraulic loading rate, respectively. The two technologies exhibited the highest TN, and removal was achieved (60 %) in attached system at the lowest loading rate which indicated that the TN removal was limited by denitrification process implying that the systems conformed to the JS (class A: 45 mg/L and B: 70 mg/L).

Keywords: *Decentralized wastewater treatment, Small wastewater treatment plants, Onsite treatment.*

DECOMPRESSION VERSUS COMPRESSION FOUAR ANTELIAS: A GUSHING WATER RIVER

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Abstract

The adopted theme in this study is the re-conquest of the Fouar Antelias river scape, the river with gushing water. After exploiting its resources in an irreversible way, today humans are facing a stage of reconciliation with the river. The materials and methods used to understand the site Fouar Antelias were firstly a speleological analysis of its springs. Then, the numeric study of the historical evolution of the bank interventions and elements using arcGIS showed the landscape lost spirit of place. Taking pictures from the same place during a year, after monthly visits, revealed the river scape dynamic temporalities. And the Cultural Value Method and Knowledge Attitude Practice method determined the social perception of the river. For the results, the suggested project on the river borders was based on the gushing water, its unique element. The adopted concept was provoking the Decompressions *vs*. Compressions explained in the speleological analysis. Deconstruction by means of Land as Art, referring to the breaking of the earth by the water Decompressions and Compressions, is the project architectural movement. The obtained plan is divided into four thematic zones from downstream till upstream. The sloped passages, the furniture emerging from the ground, the choice of plantations falling and rising and the presence of water strengthened the chosen concept. Zones of meetings, kiosks, playing area and finally a festivity zone will lead to the purpose of our linear promenade: the gushing water. Details, sections, perspectives and sketches specific to each zone supported the schematization of the concept.

Keywords: *Riverscape, Fouar Antelias, gushing water, decompression, compression.*

DYNAMIC STUDY OF A LANDSCAPE THROUGHOUT THE LANDSCAPE OBSERVATORY- THE CASE OF CASA NORTH METN, LEBANON

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Abstract

The European Landscape Convention 2000 has given new inputs to landscape research and action especially by inviting the parties in its article 6-C to identify its own landscapes throughout its territory, to analyze their characteristics, dynamics and the pressures that modify them to eventually study their transformations. Therefore, it enhances the importance of the Landscape Observatory as a tool in each country. Despite its small area (10452 km²), Lebanon has a large variety of landscapes. However, it faces several natural and anthropogenic pressures stressed by the nonexistence of a national landscape law. Beirut Northern Suburb, *North Metn* is one of the most affected districts. Its 51 localities are distributed from the coastline to the highest mountains representing different Lebanese geographical characteristics in only 2.5% of the national surface. The current research aimed to explore the landscape transformations within the case study area. The research theoretical base included a comparative study of the landscape Observatory's methodologies around the world. By taking into consideration the national context, the Landscape Observatory was applied by using the Landscape Indicators, the visual monitoring system, field visits, public participatory, road books containing social, cultural and natural information of each locality occurred with aerial maps study (2005 till 2017). The results showed that 45% of the landscape mutated from natural landscapes to urban/industrial/rural landscapes, while 55% of the urban landscape became even denser specially by losing most of the green areas. Hence, the Landscape Observatory is important as an analyzing tool to manage, restore and protect the landscapes.

Keywords: *Landscape, Landscape Observatory, North Metn, Lebanon.*

ROOFTOP GARDENS: A STRATEGIC GUIDE TO MOVE LEBANESE CITIES TOWORDS SUSTAINABILITY

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Abstract

In Lebanon we live in very dense urbanized coastal cities, caused by rural migration seeking employments and cultural benefits. Dense urban population contributes heavily to water pollution, noise pollution and energy waste,leading to cramped, unhealthy, and unattractive cities. This study on rooftops urban gardens offer exciting opportunities for remedying these trends in Lebanese costs affected by urbanization. New rooftop designs in our urban areas meet our need to increase sustainable green spaces ratio, energy efficiency, and sound isolation, reduce local levels of CO_2, remediate storm water runoff, and improve life style quality. To demonstrate why green spaces are pushing up to the roof, many interviews will be conducted with a real estate experts and vegetable cultivation experts concerning a same land part area in the same zone and compare them with the economic benefits of these investments. This study will validate the reason why rooftop gardens are created, to what extend they are feasible in Lebanon and what are the other benefits of implementation. To provide the proper requirements and codes an interview was conducted with a structure engineer to introduce the methodology of the buildings structure studiesaffecting directly the choice of the Green rooftop type. This new strategy has been widespread so fast in all countries due to awareness from different environmental systems.This study will provide a clear recommendation table that familiarize this new technology and help the space users in their choice making based on their needs, budget and existing specifications of their buildings roofs.

Keywords: *Rooftop gardens, urban, pollution, Lebanese coastal cities, Sustainable.*

MINERAL NITROGEN CHANGE IN LITHUANIAN HISTOSOLS IN 2016 - 2018

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Abstract

In Lithuania schedules for fertilising mineral soils with nitrogen are prepared based on the amount of mineral nitrogen ($N_{min.}$) in the soil. Annual N_{min} monitoring is performed in order to observe the change of N_{min}. Whereas, rating scales for histosols, that make 8 percent in Lithuania, are not designed, this needs extra research. Therefore, the research on how different temperature, moisture and season influence the amount of mineral nitrogen was carried out and concentration of soil organic material (SOM) in histosols compared to mineral soils. For this reason, histosols in different places in Lithuania were chosen and compared with alongside mineral soils. Twelve (12) pitches (as options) were investigated: 4 pitches in Southern Lithuania ($E24^0$41‘; $N54^0$20‘), 4 pitches in Eastern Lithuania ($E24^0$58‘; $N55^0$13‘) and 4 pitches in Western Lithuania ($E21^0$98‘; $N55^0$14‘). In histosols the sampling was done 5 times: autumn 2016, spring 2017, summer 2017, autumn 2017 and spring 2018. As it was expected, the research showed that N_{min} concentration was the highest and varied from 86 to 121 mg kg^{-1} in grassland and from 103 to 270 mg kg^{-1} in the land under the plough in all pitches in summer 2017. Moreover, the research showed that terric histosols with higher SOM concentration amassed much moisture (> 70%) in rainy autumn 2017 and therefore nitrate concentration was 35 percent higher compared to autumn 2016. While in mineral soils N_{min} concentration decreased due to high nitrate leaching into deeper soil depths.

Keywords: *Mineral nitrogen, histosols, Lithuania.*

THE INFLUENCE OF DIFFERENT LIMING MATERIALS ON SOIL NEUTRALIZATION

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Abstract

Soil acidification is an ongoing natural process in nature but it can be caused by acid rain, leaching of nutrients, using physiologically acid fertilizers and other. Soil studies carried out by the Agrochemical Research Laboratory showed an increasing amount of acid soils in Lithuania. Approximately 51.0 % of East and 66.0 % of West Lithuanian agricultural land have surface pH values less than or equal to 5.5. Liming is the most economical method of ameliorating soil acidity. The amount of liming material required will depend on the soil pH profile, lime quality, soil type, farming system and rainfall. The two factors affecting the quality of liming materials are chemical composition and physical properties. The effectiveness of a liming material also depends on their particle size. Depending on the size of the particles, they are divided into dust, granular and crushed liming materials. From the scientific point of view, the key is to look for and answer the question: How does chemical composition and structure of liming materials influence neutralization process in soil? The objective of the present study was to investigate chemical composition and structure of different liming materials, to assess their quality and the impact on neutralizing the soil. For the experiment we used five different liming materials: ground chalk, dolomitic lime, granulated cement dust (two different fractions) and granulated cement dust with potassium additive. Compressive strengths, neutralizing values, reactivity, elemental concentrations of the liming materials were measured. Field and pot experiments were carried out.

Keywords: *Liming material, acid soil, neutralization.*

HOUSEHOLD FOOD WASTE: LITHUANIA CASE

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Abstract

Food wastage in households remains a big problem in many European countries. Studies were conducted during 2017 to identify the amount of food waste in consumer households (consumers have measured the amount of avoidable food waste and identified the cause of their emergence) and a representative consumer opinion survey was conducted by a questionnaire as well as discussion was carried in focus groups. During consumer survey, 1000 respondents from various regions of Lithuania who are responsible for food purchase were questioned. It has been found that consumers are reluctant to admit that they waste food. Results revealed that main groups of food, which were wasted, were vegetables and fruits, bread. During a representative survey of Lithuanian respondents provided data on the amount of food in their households; it was estimated that the amount of food per person is 228 g per week. 100 consumers were asked to fulfill food waste diary, when all food, which was thrown, was measured and reasons for such behavior was determined. Food waste diary at consumer households found wasted amount food per person per week could reach 2 kg. Average amount of waste per person per year reach 56 kg, and near 30 % were avoidable.

Keywords: *Food waste, survey, diary, household behavior, Lithuania.*

Acknowledgements

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COMPARISON OF THE EFFECT OF PERLITE AND VERMICULITE ON MOISTURE RETENTION

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Abstract

Due to unfavourable weather, Lithuanian farmers suffered losses in 2000-2014, which amounted to an average of about 5% of total crop production. According to the HadCM3-A1B climate change scenario, a considerable decrease in soil moisture in May-August is foreseen for Lithuania in the future. Compared with 1971-2000, soil moisture for as soon as 2001-2030 has been projected to decline 15-18%. The greatest changes are expected in western, as well as north-eastern Lithuania (nation wide at 15.9%). The use of biological additives to the cultivation of agricultural products, particularly germination and rooting periods, can ensure the required moisture content of the soil. The use of additives is more economical, when growing relatively more expensive raw materials, so in most cases it is related to vegetable and berry crops. The study was carried out in two stages: the first stage was carried out in laboratory conditions, the second at the water balance research site of the Water Resource Engineering Institute (field conditions). After experimenting with a mixing substrate in different proportions with vermiculite, it was found that, at 20°C, the retention of the absorbed moisture content is dependent on the amount of the vermiculite in the mixture (the retention of moisture reserve effect is +9 days). Perlite was the most effective at 20°C with 50:50 ratio of the substrate and perlite, all soil moisture reserves evaporated after 36 days. The tendency that a higher number of moisture-retaining additives leads to higher yields was not determined, vice versa - to grow larger onion heads it is enough a small (1 cm) thick of biological additives.

Keywords: *Evaporation, Soil moisture, Biological additives, Substrate.*

KRIGING METHODS AS A TOOL TO ESTIMATE SPRING FLOOD PEAK DISCHARGE IN UNGAUGED WATERSHEDS IN LITHUANIA

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Abstract

Responsible and efficient management of water resources relies on accurate hydrological data, but changing economic situation results inthe fact that natural researches are becoming more and more expensive. Decrease in network of water gauging stations leave many small watersheds ungagged and with no ability to assess and understand local hydrology. Ordinary Kriging might be used in order to assess the values between measuring points and to connect the hydrologic data with the other types of regional spatial information. Kriging algorithms use various mathematical functions for the spatial modeling of the variability of z values between known points. The parameters of these functions are then optimized for the best fit of the experimental semivariogram. The interpolated surface is then constructed using statistical conditions of unbiasedness and minimum variance. The objective of this study was to investigate the suitability and accuracy of ordinary kriging to predicted spring flood peak discharge 1% probability in ungagged watersheds. The study used data of 74 water gauging stations (WGS) on 55 rivers almost totally covering the area of Lithuania. It is concluded that ordinary kriging was useful for prediction of spring flood peak discharge data in ungauged watersheds in Lithuania. Applying the Ordinary Kriging selected all parameters with probability p=0.95.The model describedabout74 % of all investigated values.

Keywords: *Ordinary Kriging, spring flood peak discharge, water gauging stations.*

DENITRIFICATION BIOREACTORS – AN APPROACH FOR REDUCING NITRATE LOADS FROM TILE DRAINAGE WATER

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Abstract

Excess water from agricultural areas in Lithuania is mostlyremoved by tile-drainage systems. Flowing into drains,water washes out inorganic nitrogen (mainly nitrates) compounds from the soil. The load of nutrients entering open streams results to eutrophication process that disturbs natural trophic relationships of aquatic ecosystems. To reduce the pollution of nitrate-nitrogen from drainage systems, nature-basedsolutions- denitrification bioreactors –have been developed. The operation of these biotechnologies is based on the biological nitrogen removal process. The rate of transformations of nitrates into gaseous forms depends on biological activity, inflow water temperature, pH, dissolved oxygen content, flow velocity and hydraulic retention time. Therefore, three bioreactors (1 m^3each)were installed under field conditions at Aleksandras Stulginskis University, Lithuania. The bioreactors were filled with mixed woodchips along with three types of additives (10% v/v). Woodchips in denitrification bioreactors create a suitable environment for the development of heterotrophic bacteria. Nitrogen removal efficiency along with measurements of various water parameters at the inlet and outlet of each bioreactor were conducted during the period from June to December 2017 with irregular time intervals. The study showed that the average nitrate removal efficiency in bioreactor with no additiveswas 44%. The average removal efficiency in bioreactor with activated carbon additive was 48%, while in bioreactor with the flax-seed cake additive - 43% of nitrogen load was removed. During the cold seasonal period, when water temperature at the inlet varied between 2.1^0C, and 12.2^0C, the average removal efficiency of 32%, 36% and 34% was observed in bioreactor with no additives and in bioreactors with activated carbon and flax-seed cake additives, respectively.

Keywords: *nitrate-nitrogen, denitrification, woodchip bioreactors, additives.*

THE EFFECT OF ASH AND COMPOST MIXTURES ON SOIL AND PLANTS

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Abstract

Biofuel ash is alkaline waste (pH ~ 13). Biomass (5-10 %) returns to the environment in the form of ash. Ash is seen as waste. It contains a lot of nutrients (K, P, Ca, Mg), which are necessary for plants and soil. Before the use of biofuel ash, it is necessary to investigate it. The amount of heavy metals should not exceed the permissible limits. The aim of the study was to evaluate the influence of biofuel ash and ash with compost mixtures produced on soil pH, phosphorus, potassium, calcium, magnesium and heavy metal concentrations in time and their impact on plant growth and quality. This study measured neutralizing values and elemental concentrations of the ash. The concentration of heavy metals in ash was low enough to be used in agricultural fertilizers. Experimental plant selected was spring barley. The ashes were mixed with compost in different amounts (7%, 13% and 18,4% ash in mixture). Fertilization was carried out two weeks before sowing. During vegetation, the consumption of minerals was recorded, which confirmed that the growth of spring barley absorbed most of the nutrients from the soil. Meanwhile, the loss of material was reduced to the end of vegetation, and therefore the concentration of minerals increased again. After measuring the concentrations of Cd, Cr, Cu, Pb, Ni, and Zn, it became clear that the soil was not contaminated with heavy metals, proving that these materials did not damage plant vegetation.

Keywords: *Biofuel ash, Compost, Fertilizer.*

ARIDITY AND SOIL MOISTURE DEFICIT TRENDS

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Abstract

A change in climate may cause either or both precipitation and potential evaporation to change. The one binding factor to all arid areas is aridity. Aridity is usually expressed as a function of rainfall and temperature. A useful description of aridity is the following climatic aridity index - P/PET. Climatic data (monthly air temperature and sum of precipitation) for four meteorological stations (Kaunas (Lithuania), Horki (Belarus), Sisak (Croatia) and Sarajevo (Bosnia and Hercegovina) for the period 1996–2016, were used for analysis of agro-hydrological balance components by Thornthwaite-Mather method (TM). The movement of temperature and aridity zones could trigger ecosystem migration and land use change. According to the aridity index, based on temperature and rainfall as weather parameters, the climate dryness risk was analyzed. The biggest monthly potential evapotranspiration was in July in all stations in the last 20 years. Monthly soil water balance was found negative in all stations: quantity amount bigger in Sisak and Sarajevo, but continuous longer in Kaunas and Horki. Yearly soil moisture deficit was observed nearly every year at all meteorological stations too. Results showed increasing trends in surface air temperature (in all four meteorological stations) and precipitation (decreasing in Sarajevo). The annual summer P/PET of the study areas varied between 0.6 and 0.9. A drought coefficient has been increasing in Kaunas and Sarajevo in the last 20 years. Information regarding changes in P/ET_o index as a result of climate change is necessary for policy makers and managers within the context of water resources management, hydrology, agriculture, and environment.

Keywords: *Aridity, Climate change, Meteorological parameters.*

GOVERNANCE REGARDING THE SERVICE OF POTABLE WATER

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Abstract

Social representations are visions of the everyday world that is historically constructed alongside the dissemination of media intensifies their audiences. In this sense, the printed media availability and water policy has not only been systematically reduced to opinions by the press, but also two logics have been grown on the credibility of the information and the verifiability of it. In this sense, this study exposes the lines of discussion for the analysis of tandem policies and agenda setting in the availability and supply of water. The results show frames from newspaper audiences are considered promoters of a relative deprivation that is the conformism of the service quality of public water supplies.

Keywords: *compliance, performance, availability, supply rate*

AGROECOLOGY AND HIGHER SECONDARY EDUCATION: EDUCATIONAL PRACTICES FOCUSED TO CURRICULUM GREENING

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Abstract

The problem of the environmental pollution and the indiscriminate abuse of natural resources as a result of the human practices, have affected many parts of the world through the global warming. In the last few decades it has been observed that climate variation affects to diverse ecosystems; the increase or decrease of the temperature in geographical zones that use to have a constant temperature, the water shortage, droughts and floods in places where these phenomena did not occur, are some examples caused by the irresponsible human actions. Although it is acknowledged that the large majority of the countries has a capitalist economic system has been an important cause of the environmental deterioration, is possible to make a change starting with social groups to replace these habits of consumerism and to raise awareness about care and environmental conservation. Against this background, as educational institution as an agent for change it is proposed the development of a curricular proposal that links the agroecology disciplinary knowledge in educational practices. A curriculum greening is achieved through the curricular contents of the subjects offered at high school, where the entire school community participates on sustainable practices that encourage their development and a students comprehensive education. In this paper, we present the case of the development of this project in the No. 100 Official High School, located in Texcoco, Mexico, likewise, demonstrates the progress, issues and challenges that have arisen.

Key words: *Agroecology, environmental education, curricular environmentalization, curriculum greening, sustainability.*

ENVIRONMENTAL USE OF WATER IN MEXICO

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Abstract

Mexico is located between 12° and 32° north latitude and 84° and 121° west longitude, in the world's tropical deserts area. With almost 2 million km^2, a third of its total surface lies in the desert and semidesert areas. Desert areas are characterized by: rainfall volume lower than 500 mm/year (in the northernmost parts of the country this is less than 200 mm/year), extensive hours of sunlight, real evaporation and evotranspiration (1500 mm/year); around 80 % of Mexico's population lives in desert areas, although 57 % of the total population lives in the meridional part of the country, a semidesert area, with rainfall volume ranging between 400 and 500 mm/year. The focus of the present analysis is on the geographic characteristics of the region in terms of water, lack of education and environmental awareness of its inhabitants, as well as the erratic government policies of neoliberal governments that keep the country in a chronic state of poverty, broken-down agricultural fields, unequal distribution of wealth, reasons that make groups of people live in extreme poverty. The methodological process used in the project was research-action, because, as members of society, we are part of the problem. Besides reviewing literature, informal surveys were carried out among the people involved, municipal authorities, school principals and teachers from the elementary and high school levels. The result is an educational proposal and a personal alternative to collect rain water.

Keywords: *shortage, arid areas, environmental education, chronic poverty.*

RESEARCH TRAINING IN THE MASTER'S AND DOCTORATE DEGREES ON ENVIRONMENTAL SCIENCES PROGRAM OF THE AUTONOMOUS UNIVERSITY OF THE STATE OF MEXICO

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Abstract

Research training on environmental sciences, in relation to climate change, is an issue that requires immediate attention. Around the world there is but a few researchers on environmental issues for every 100, 000 inhabitants. In Mexico, particularly in public universities, researchers working on the topic barely make up 0.9% of every 1000 inhabitants of the economically active population and, due to the neoliberal government that has ruled over this country, no medium-term improvement to the current situation is foreseen. Considering the circumstances, the present study addresses the case of research training in one of the most important state universities in Mexico: The Autonomous University of the State of Mexico (UAEMEX), regarding in particular the general experience in the Master's and Doctoral Degrees on Environmental Sciences Program. Through documentary research, a review of all theses developed during an eight-year period was carried out, using as indicators the lines of investigation that were developed, the number of theses presented each year, the type of study that was conducted in each of those papers, and the research techniques that were employed. The relevance of these programs in terms of research training in the field of environmental issues was analyzed , as well as its accomplishments, bringing it all to a conclusion with suggestions that may guide and improve the processes of research training on environmental issues related to climate change, in which the relevance of the epistemological construction of knowledge of environmental science with a holistic perspective is emphasized.

Key words: *knowledge generation, environmental research, environmental science, climate change.*

THE PRESENCE OF AMPHIPODA (CRUSTACEA) IN THE SUBTERRANEAN DRINKABLE WATERS OF BOSNIA AND HERZEGOVINA

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Abstract

Bosnia and Herzegovina is very rich with the subterranean clean fresh water presented in the subterranean lakes, various types of springs, subterranean hyporheic waters under the bed of the rivers, wells, caves, subterranean rivers and other subterranean water reservoirs, and the quantity and quality of these water depend of numerous different factors.In the nature, all clean drinkable water is inhabitet by various small invertebrate animals: worms, gastropods, Hydroacarina, small Crustacea (Copepoda, Ostracoda, Amphipoda, Isopoda), Nematoda, Oligochaeta, etc., and all these animals exist in pure oxygenate subterranean water and they are not dangerous for the people. Exactly, these animals are good indicators for clean good subterranean drinkable water, and the absence of these animals suggests the deterioration of water quality.Among various animals, the very common are the members of Crustacea Amphipoda in the water in Bosnia and Herzegovina: *Niphargus illidzensis* Schäferna 1922 in Sarajevo, *N. ozimeci* G. Karaman 2011 in springs of Mokranjska Miljacka, *N. bilecanus* S. Karaman 1953 in Bileća, *Hadzia drinensis* G. Karaman, 1984 in riverbed of the Drina river near Višegrad, *Bogidiella albertimagni* Hertzog 1933 in hyporheic water of Bosanska Dubica, *B. semidenticulata* Meštrov 1961 in the subterranean water in Travnik, Blažuj near Sarajevo, etc. Many of these amphipods are endemic for Bosnia and Herzegovina or western Balkan. As the contamination of the subterranean water is very intense in the present time by various factors, the purification of the subterranean water in the pipe-line systems is very important and necessary, despite the destruction of numerous endemic or rare animals in water during the water purification.

Keywords*: subterranean animals, drinking water, Amphipoda, Bosnia and Herzegovina, purification.*

CHANGE OF SOIL PHYSICAL PROPERTIES OF VERTISOLS AFTER 12 AND 33 YEARS UNDER NO-TILLAGE SYSTEM

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Abstract

The future of resource sustainability in Mediterranean soils appears to be threatened due to inferior soil management techniques. In Morocco, the irregularity of the climate along with the adoption of conventional tillage (CT) are the main causes of the soil physical degradation,i.e., soil organic matter (SOM) is being depleted. However, no-tillage (NT) system has emerged as a reliable, effective, and profitable remedy against this degradation. The aim of this work was to study the medium- and long-term effectsof NT compared to CT of two Vertisols on structural stability, bulk density (BD), and soil infiltration at the soil surface and on SOM in the deep layers. Significant differences (P-value <0.05) were recorded for SOM under NT system versus CT after 12 (NT_{12}) and 33(NT_{33}) years of testing. However, no significant differences (P-value > 0.05) of SOM contents were observed after 12 years of testing in layers below 10 cm deep compared to those obtained after 33 years of testing. At 0-10 cm in deep, NT system improve significantly (P-value <0.05) soil structural stability versus CT for both Vertisols. The BD measurement did not show any significant effect (P-value >0. 05) between the two treatments. The coefficients of permeability recorded under CT were high and slightly high compared to NT_{12} and NT_{33} respectively. In conclusion, the NT system affected the soil physical properties, but it had varying effects, depending on the duration of the adoption of this system.

Keywords: *No tillage, soil organic matter, physical properties, Vertisol,Morocco.*

WATER AND SOIL CONSERVATION TECHNIQUES, FACING HUMAN CONSTRAINTS IN THE ATLANTIC PLATEAUS OF MOROCCO

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Abstract

Despite its location in the more favourable parts of Morocco in terms of climatic conditions, the semi-arid plateaus of the Atlantic coast consist of marginal land with a high poverty and important indicators of degradation. There are, however, several measures, like assisted regeneration of cork oak in forest land, crop rotation in the rainfed agro-pastoral, ploughing along the contours which signify the will to restore soil fertility and reduce soil degradation. But the indicators of degradation are much more important than those of conservation. In our study area, the signs of degradation are important, but there is a high potential for sustainable land management. But the human constraints face this management. The goal of this paper is to select the more promising options for management and to find solutions for their implementation in order to minimize their constraints. Results of research showed that the techniques implemented (Gullies correction by atriplex plantation; Mulching and minimum tillage) presented the advantages as following: -Decrease in the erosion rate from >50t/ha/y to <10t/ha/y; -Increase in biomass: from 10 to 25 times after 10 years implementation; -Economic profit on the long term: Reduction of the need for stubble from the croplands and for forest grazing; -Off site hydrological effect (decrease of reservoir siltation), due to gullies cicatrisation. The stakeholders meetings showed the importance of bringing solutions to this degradation trend which threats both the environment and the farmers' income. The choice for more integration between croplands and pastures represents the less costly and the most profitable option.

Keywords: *Sustainable land management, Environment protection, human constraints.*

IMPACTS OF PUBLIC-PRIVATE PARTNERSHIP ON THE FARMS AND VALORIZATION OF IRRIGATION WATER

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Abstract

The Public-Private Partnership (PPP) in irrigation is a mode of collaboration and governance that allows the Government to entrust to a private enterprise the design, financing, construction, operation and maintenance of irrigation equipment. This type of partnership in the irrigation sector was initiated in 2005 concerning the El Guerdane project to safeguard a perimeter of 10 000 ha of citrus. In this research, we went through several aspects to evaluate the impact of this public-private partnership program. These aspects concerned the farmers' net income and the financial and the agronomic valorization of irrigation water. The sampling method used was that of the propensity score matching (PSA) carried out by the software R3.1.0 and SPSS 23. The impact evaluation was carried out by the double difference method (DDM). The analysis of the irrigation water valorization determinants was carried out using an ordinary regression model by the GRETL. This partnership program was able to improve the financial valorization of irrigation water by 2.1 Dh/m^3, the agronomic valorization by 1.05 Kg/m^3 and the farmers net income by 10 902 Dh/ha. The mode of governance of public-private partnership and the level of supervision had a positive impact on the financial and agronomic valorization of the irrigation water as well as on the farmer's income, and this was true for the majority of the farms surveyed. In view of these results, the technical supervision component and its impact on the level of valorization of agricultural water remains a reflection that deserves to be deepened.

Keywords: *Public-Private Partnership, Water's valorization, Double Difference, Propensity Score Matching, Irrigation.*

WATER QUALITY INDEXATION FOR ORCHARDS AND OTHER CROPS IN RAWALPINDI DISTRICT (PAKISTAN)

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Abstract

Water plays a key role for different physiological functions like maintenance of turgidity, nutrient uptake and metabolic processes in plants, while irrigation water quality is of great concern for the farming community to get safe and secure food. A four-year (2013-2017) study was conducted to categorize suitability of surface and underground water for irrigation purpose in different tehsils of Rawalpindi District. A total of 504 water samples were collected in six Tehsils of Rawalpindi, analyzed and categorized according to suitability criteria of irrigation water quality evaluation. Mean data showed that 60% of the total samples were fit, 14% marginally fit and 26% were found unfit for irrigation purpose. Rawalpindi tehsil data showed maximum (30%) of total unfit samples whereas majority samples of Kahuta Tehsil were fit compared to other Tehsils of the District. About 33% water samples were unfit due to Electrical conductivity (EC). Sodium Adsorption Ratio (SAR) of almost 92% samples were within safe permissible limits while 8% samples were beyond the marginal limits and were found unfit. However, mean values of the dominant cations: Ca^{2+} + Mg^{2+} and Na^{+} were 7.2 and 3.5 me L^{-1} while HCO_3^{2-} and Cl^{-} were dominant anions with mean values of 4.6 and 3.2 me L^{-1}, respectively. Depending upon water quality, farmers were advised to use good water for high value crops (orchards/vegetables) and marginally fit/unfit water for general crops after mixing high EC water with good quality water.

Key words: *Water Quality, irrigation water, SAR, Ec, Orchards.*

GEOCHEMICAL ASSESSMENT OF HEAVY METAL POLLUTION IN SOILS OF KOHAT CITY IN PAKISTAN USING MULTI-STATISTICAL APPROACHES

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Abstract

A geo-accumulation based assessment of heavy metals was carried out in three main areas of Kohat city, namely Hangu Road (HR), Nehar Road (NR), University Road (UR) along with Check (CK) site. Soil and plant samples were analyzed for various physic-chemical, enzymatic and heavy metals determination. Soil pH of the target sites HR, NR and UR showed lower value than neutral pH value 7 compared with neutral pH of CK. Electrical conductivity (EC) mean value of CK was found 179.33 µs/cm, comparatively lower than target sites regarding 1037.30, 749.67 and 528.00 µs/cm respectively. Total dissolved solids value for CK was 33.74 less than target sites HR, NR and UR as 85.06,60.36 and 57.75 respectively. Elemental analysis conducted for elements cadmium (Cd), lead (Pb), chromium (Cr), manganese (Mn), zinc (Zn) and cupper (Cu) showed maximum Pb content in the target sites i.e HR, NR and UR as compared to CK. Soil dehydrogenase and urease activity were found maximum in CK than HR,NR and UR. The collected samples of Bermuda grass were analyzed for various antioxidants. Maximum peroxidase (POD) 464.18 value was found in UR followed by NR, HR and CK 462.19, 458.23 and 65.34 respectively. Highest value for oxidative stress markers (Melondialdehyde (MDA), hydrogen peroxide (H_2O_2), total soluble protein (TSP)) were observed in UR 92.00 followed by NR, HR and CK 70.00, 77.00 and 47.78. A significant positive correlation at $P< 0.01$ was found among the elemental pairs Cd-Pb (0.933), Cd-Mn (0.999), Cd-Cu (0.999), Pb-Cu (0.990) and Mn-Cu (0.998). The study concluded that heavy metals came from common sources like anthropogenic, pedogenic, agricultural wastes and industrial pollution.

Key words: *Heavy metals, polution, soil, Pakistan, multi-statistical approach.*

COMPARATIVE RESPONSE OF LEGUME AND NON-LEGUME CROPS TO APPLICATION OF EDTA IN NI-CONTAMINATED SOIL

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Abstract

Nickel (Ni) sources range from natural (weathering of mineral rocks) and anthropogenic (fossil fuels burning, mining and smelting etc.). Due to its adverse effects on plant and human health, a study was conducted to phytoremediate Ni-contaminated soils by using EDTA and its hyperaccumulator plants to control its entry to food chain. Each treatment was contaminated with Ni @ 150 mg kg^{-1} soil including control. All four treatments were treated with EDTA levels (0, 02, 04 and 08 mmol kg^{-1}). Maize and mung bean were sown as test crops and harvested at physiological maturity. Plant root and shoot samples were subjected to analysis after digesting them by using di-acid mixture of HNO_3 and $HCLO_4$ of ratio 2:1. The results suggested that EDTA applied @ 04 and 08 mmol kg^{-1} showed maximum and minimum root fresh and dry weights respectively in both crops. The same result was observed in the case of shoot fresh and dry weight in both crops enhancing potential to uptake Ni in both crops as both crops showed maximum shoot and root fresh+ dry weight. Maximum Ni concentration in mung bean was seen in treatment where EDTA was applied @ 02 and minimum @ 0. In case of maize, maximum and minimum Ni concentrations were observed in treatment where EDTA was applied @ 08 and minimum @ 0. From above results it can be concluded that EDTA can be used to accelerate the phytoremediation process in heavy metals contaminated soils.

Keywords: *EDTA, Heavy Metals, Hyper accumulators, Phytoremediation, Remediation.*

PRELUDE ESTIMATION OF CLIMATE CHANGE IMPACTS ON SUGARCANE PRODUCTIVITY IN SINDH PROVINCE OF PAKISTAN

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Abstract

The sector of agriculture and its production system in Sindh province of Pakistan is primarily irrigated, and research results conclude that it derives 60 to 80 percent of its availability of water from melted snow-ice for the land cultivation. Now, it is completely under threat because of shifting in the weather pattern due to the climate change with its impact either in negative or positive way. Negative impact left footprints and it has showed drasticsuffering of agricultural production in Pakistan since last decade specifically. Exploratory research method with the VAR econometric model "Vector Auto Regression" was used. The model revealed and analyzed the impacts temperature and precipitation causing the climatic variation. The projected figure for sugarcane availability/production would be 33,987.223 thousand ton. The country's need is approximately 35 thousand tonnes. The intact results of the study screened that the somewhat negative impact of climate change and harm would be on productivity of the sugarcane crop for next years. The statistical calculated values were not significant enough of t-statistics for study variables but in other hand the F-statistics value were higher to make all the lag terms of study model statistically significant. Furthermore, the R-squared values of coefficient of determination for variables were within 0 to 1 which basically showed the integrity of fit in study model. The VAR study model for lag 2 was more suitable. The predicted values for overall sugarcane crop production and productivity growth rate would be reported as -1.673 and -0.587. Likewise, the parameters of the study viz β0, β1, β2, β3 described the dependent study variable and its change per unit for the independent study variables (Production practices) were damaged due to shifting weather trend. In addition projected climate change factors affecting on sugarcane indicated that the higher temperature and unexpected shifting of weather activities such as unwanted rainfall, higher temperature had negative impact on production practices and resultantly the productivity went into uncertainty due to climate change. Overall the 01°C to 01.8°C temperature will be increase and 10% to 18% precipitation will be decrease in the upcoming years up to 2030.

Key words: *Climate Change, Sugarcane, Productivity, Vector Autoregression (VAR), Sindh.*

GREEN AND BLUE WATER FOOTPRINTS OF IRRIGATED CROPS IN PESHAWAR BASIN, PAKISTAN: A BASELINE STUDY FOR SUSTAINABILITY AND FOOD SECURITY

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Abstract

Over the last few decades,the demand for agricultural products has increased due to population and economic growth. Pakistan is an agrarian country where the majority of the people directly or indirectly depends on agriculture for their livelihood. The country is situated in a (semi-)arid climatic region that has been facing severe problems of water shortage. Further, the growing population has exerted immense pressure on available water resources that has turned Pakistan into a water-stressed country. Peshawar basin covers an area of 5623 km^2 and has 9.78 million inhabitants. Major crops grown in Peshawar Basin are wheat (43%), maize (24%) and sugar cane (24%) while tobacco (4%), barley (2%), sugar beet (1%) and rice (1%) are minor crops. These crops cover more than 80% of irrigated area and 60% of the land use cover of Peshawar basin. In this study, the annual green and blue water footprints of seven crops for each district have been quantified using FAO's AquaCrop model for the last 30 years (1986-2016). The AquaCrop output was post-processed to partition the ingoing and outgoing water fluxes and soil water content into green and blue water components, considering blue water fluxes from irrigation and capillary rise. Consequently, ET originating from irrigating water, capillary rise and rain water were tracked out. Results showed that maize had the highest green and blue water footprints followed by wheat, tobacco, rice, barley, rice and sugar beet. This study is the first of this kind providing baseline information for Pakistan's future studies on sustainability, food security and water productivity of crops. The findings of this study also provide information for policy makers to introduce efficient irrigation schemes in the basin.

Keywords: *Greenwater footprint, Blue water footprint, AquaCrop, Irrigated crops, Pakistan.*

RESPONSIBLE RICE CONSUMPTION: POSSIBLE PROGRAMS AND PROJECTS

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Abstract

Everyone feels hungry on a daily basis. Most people are able to satisfy this craving and need. Even if not immediately, they can count on having a meal or snack within hours. This is not the type of hunger that the world is concerned about. Over the past few decades, an increasing number of people have had access to sufficient food. Many people in developing countries may get their calories, but proteins, vitamins and minerals are a different story altogether. Due to a lack of variety and the monotonous diet, between one and two billion people suffer from deficiencies of essential nutrients such as vitamin A, iron and zinc. In the Philippines, stunting among children under five has decreased since 2000, nutrient deficiencies have improved since 1995, and public spending on agriculture has significantly increased. This study aimed to answer the following problems: a.) What are the products that can be made from rice, rice bran, rice hull, and rice straw? b.) What are the existing programs addressing responsible rice consumption?This action research made use of interview to the farmers of Brgy. Bet-ang, Balaoan, La Union. As a result, the researchers came up with an action plan for addressing the SDG number 2, zero hunger, which focuses on Responsible Rice Consumption. With the said program, the maximization of rice consumption will be of great help in combating hunger as well as in ensuring productivity among the farmers in the country.

Keywords: *Hunger, rice consumption, rice, farmers, agriculture.*

OCCURRENCE OF ANTIBIOTIC RESISTANCE BACTERIA IN ACTIVATED SLUDGE

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Abstract

Wastewater treatment plants (WWTPs) are considered as an important reservoir of antibiotic-resistant bacteria (ARB) also representing a major source of their dissemination in the environment. The aim of the study was an assessment of ARB occurrence in two WWTPs. Samples of activated sludge were collected from 2 WWTPs located in Warmia and Mazury District (Poland). WWTPs took only domestic sewage and used the different modification of sewage treatment system: A - WWTPs with Sequencing Batch Reactors (SBR), B – WWTPs with mechanical-biological system with elevated removal. To obtain 30 - 300 colony forming units (CFU) per plate, samples were decimal diluted with saline water and determined on plates containing the TSA medium (Oxoid) with/without antibiotic supplementation. The total number of bacteria and bacteria resistant to a β-lactams (ampicillin, cefuroxime) and tetracyclines (oxytetracycline, doxycycline) were incubated at 30° C for 48 h. In WWTP- B the amount of the total number of bacteria and bacteria resistant to the tested antibiotics was higher by an order of magnitude compared to the WWWTP-A. The average total number of bacteria in activated sludge ranged from $1.7x10^6$ to $2.10x10^7$ CFU/mL, in WWTP A and B respectively. In both WWTPS, the most dominant bacteria resistant were those to ampicillin (up to 41% of all bacteria), which belonged to the older generation antibiotics. The lowest percentage (to 0,8%) were bacteria resistant to doxycycline, which belonged to a new generation of drugs from the class of tetracyclines. The presented results indicate that wastewater treatment plants can be an important source of antibiotic-resistant bacteria.

Keywords: *wastewater treatment plant, antibiotic resistance, tetracycline, beta-lactams.*

Acknowledgement

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NEW DATA ON THE OCCURRENCE OF DUNG BEETLES (*COPROPHAGOUS SCARABAEOIDEA)* IN ALBANIA AND THEIR PROTECTION

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Abstract

Dung beetles (*coprophagous Scarabaeoidea*) play an important role in the functioning of forests and pastures. All over the world, including Europe, there is a dramatic drop in the number of pastures, while the acreage of an individual pasture is increasing. Simultaneously, forest areas are shrinking in many countries. Those factors are responsible for the impoverishment of the species composition and abundance of dung beetle communities. Albania is a European country where, due to the traditional form of grazing, dung beetle communities characterised by a considerable species richness and the presence of rare species have survived. The studies on the Albanian dung beetle fauna were conducted at the end of May and at the beginning of June in 32 localities in 8 Albanian counties (Shkodër, Kukës, Dibrë, Elbasan, Fier, Korçë, Vlorë, and Gjirokaster). Dung beetles were looked for in pastures, in the excrements of domestic (horse, mule, donkey, cattle, sheep and goat) and wild (boar, stag, roe deer) animals, and traps baited with faeces were set. As a result,76 species of dung beetles were collected, including 9 species new for the Albanian fauna. Among the collected species there were 4 rare ones (*Trypocopris alpinus, Amidorus cribrarius, Onthophagus dellacasai*, and *O. panici*), and 1 endemic species (*Ahermodontus bischoffi*) inhabiting old pine forests in the Çikës Mountains. According to the observations, those species are endangered with extinction even if they are abundant, due to their unique habitat requirements and small ranges of occurrence.

Key words: *Geotrupidae, Scarabaeidae, coprophagous beetles, conservation, Albania.*

THE EFFECT OF ALLOCHTHONOUS MATTER ON THE DEVELOPMENT OF PLANKTON IN THE AUTOTROPHIC LAKE

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Abstract

Autotrophic lakes are regarded to function as net autotrophic system in which mobilization of solar energy by phytoplankton, benthic algae, and macrophytes forms the base of primary production. However, they are also subsided by allochthonous inputs. The aim of the study was to find whether subsidies of allochtonous matter may affect trophic structure in lakes. We hypothesized that when large amounts of terrestrial resources were transferred to lakes, trophic dynamics change, thus large variation in the loading of allochtonous subsidies might have considerable effects on biostructure and productivity of autotrophic lakes. The study reveals that allochthonous biogenes significantly affect the biomass of phytoplankton and bacteria, and by that they indirectly influence the biomass of heterotrophic nanoflagellates. Subsidies of allochthonous organic matter hamper grazing pressure of omnivores on phytoplankton and by that might support seasonal blooms of phytoplanktonic biomass. Bacteria compete with phytoplankton for allochthonous biogenes and effectively utilize allochthonous organic matter. Notwithstanding, availability of allochthonous subsidies for autotrophic and heterotrophic plankton is related to environmental variables, particularly pH and temperature. Loads of allochthonous subsidies do not have a direct influence on feeding preferences of omnivorous Ciliata. Among Crustacea, *Eudiaptomus graciloides* and *Daphnia galeata×longispina* are feeding opportunities as they utilize all sources of food, and thus inputs of allochthonous subsidies indubitably foster high biomass of these species in the periods of low availability of autochthonous sources of food.

Key words: *Total Organic Carbon, bacteria, nanoflagellates, Omnivores.*

Acknowledgement

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THE INFLUENCE OF SELECTED PLANT SECONDARY METABOLITE ON THE ZUCCHINI AND CUCUMBER CULTIVATION AFTER APPLICATION OF PHENOXY HERBICIDE (MCPA)

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Abstract

The interactions between plants and rhizospheric bacteria can enhance the biological processes of the removal of organic pollutants from an environment. Plant secondary metabolites (PSMs), which are structurally related to xenobiotics, can stimulate the growth of beneficial bacteria. PSMs are recognized as an efficient and environmentally friendly tool for enhancing the biodegradation. The selection of plants releasing the right PSMs is an essential aspect of developing new biological remediation strategies. The aim of this study was to evaluate the general role of cucurbits and their PSM (syringic acid- SA) in the degradation of selected phenoxy herbicides (MCPA-2-methyl-4-chlorophenoxyacetic acid), in a complex interaction system between: xenobiotic (MCPA), selected plants (cucumber cv. Cezar and zucchini cv. Atena Polka), PSM (SA) and rhizospheric bacteria. Plants were grown in pots containing vegetable soil amended with MCPA (0.1mM) and/or SA (0.25mM). Control plants were potted with vegetable soil. Plant material was collected after 7 and 28 days of incubation in grow box, for the analysis of plant biomass, leaf morphological parameters and chlorophyll content. Soil subsamples were subsequently subjected to a series of molecular analysis, confirming the presence of phenoxy acids degradative genes from *tfdA* cluster. The obtained results showed different response to the addition of MCPA and SA between studied plants species. The growth of cucumber was entirely inhibited after the addition of herbicide, whereas zucchini exhibited only slower growth rate in samples containing both: MCPA and SA. The chlorophyll content was not considerably different between controls. The molecular analysis showed that samples amended with MCPA and SA were enriched with microorganisms harboring the genes belonging to *tfdA* gene cluster. The obtained results show that the PSMs have a selective influence on the stimulation of biodegradation potential of bacteria in terms of the removal of structurally related herbicides.

Keywords: *phenoxy herbicides, phytoremediation, rhizodegradation, plant secondary metabolites.*

EFFECTS OF CONVENTIONAL AND REDUCED TILLAGE ON SOIL STABILITY IN WATER AND MICROBIAL ACTIVITY UNDER WINTER WHEAT

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Abstract

The effects of different tillage systems on soil stability in water and soil microbial activity were investigated. Analyses of soil properties were performed in 2016-2017 on a long-term field experiment at the Rzeszów University (UR) Experimental Station in Krasne, Poland, on a Haplic Luvisol formed on loess with a silt loam texture. Winter wheat cv. Bogatkawas grown under two tillage treatments: 1.) conventional tillage with a mould board plough and traditional soil tillage equipment, and 2.) reduced tillage based on soil crushing-loosening equipment and a rigid-tine cultivator. Chopped wheat straw was used as mulch on both treatments. Soil stability in water was measured in terms of readily dispersible clay (RDC) (g 100 g^{-1} of soil) using a Hach 2100 AN ratio turbidimeter. Ten replicates were used for each year and depth at each field. The analysis of the quality status of soil biochemical environment included activity of dehydrogenases (DEH) with TTC as a substrate and hydrolysis of fluorescein diacetate (FDA). Reduced tillage decreased the content of readily dispersible clay (RDC) and therefore soil stability increased in the top layers compared with conventional tillage. Beneficial effects of reduced tillage were reflected in higher soil microbial activity measured with dehydrogenases and hydrolysis of FDA compared with conventional tillage. Reduced tillage improved soil stability in water and microbial diversity, both of which were good indicators of soil quality.

Keywords: *soil stability in water, soil enzymatic activity, soil tillage systems.*

EFFECTS OF CONVENTIONAL AND REDUCED TILLAGE ON SOIL STABILITY IN WATER AND MICROBIAL ACTIVITY UNDER WINTER WHEAT

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Keywords: *soil stability in water, soil enzymatic activity, soil tillage systems.*

DIVERSITY OF DIATOMS AND YIELD OF WINTER WHEAT UNDER DIFFERENT TILLAGE SYSTEMS

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Abstract

The aim of this study was to quantify the effects of different tillage systems on soil physical and chemical properties and on the diversity of diatoms under winter wheat in monoculture. Field experiments were done in 2015- 2016 on the Krasne Research Station near Rzeszów, Poland; latitude 50°03'N; longitude 22° 06' E. The soil was a Haplic Luvisol formed on loess (IUSS Working Group WRB, 2006) with a silt loam texture. Winter wheat cv. Bogatka was grown in monoculture under 1). conventional tillage (CT) based on the mouldboard plough (to 25 cm depth), and 2). reduced tillage (RT) based on a rigid-tine cultivator (to 10 cm depth). Chopped wheat straw was used as mulch on both treatments. The experiment was set up in 2008 on 1 ha plots arranged as a randomized block with 4 replications. In conclusion, this study showed that soil under RT had greater soil organic carbon, soil water content, especially in the upper layers, and greater diversity of diatoms than soil under CT. The soil under RT had greater diversity of diatoms (148 taxa) than that under CT (98 taxa). Under RT, dominant species exceeded 20%, but under CT they were less than 20%. In RT was observed greater domination (> 20 % occurrence) taxa of diatoms (*Eolimna minima; Hantzschia amphioxys; Mayamaea atomus* var *atomus; Pinularia obscura*) in comparison with CT. Yields of winter wheat were positively correlated with soil organic carbon and soil water contentand precipitation.

Keywords: *soil tillage, diversity of diatoms in soil, soil properties; Bacillariophyceae, grain yield of winter wheat.*

RECYCLING OF BIOGENS AS AN ELEMENT OF BIOCIRCURAL ECONOMY IN ACCORDANCE WITH THE PRINCIPLE OF SUSTAINABLE DEVELOPMENT

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Abstract

Nowadays people live in an industrial age with so-called linear economy. The philosophy of this economy is the production line according to the scheme: we produce, use and then throw away. This scheme applies not only directly to industrial production but also agriculture or even households. How does it look like in case of water? The scheme is the same. We collect it, use it and then throw away it enriched with various substances including organic ones. The proposed system of dealing with water pollution is based on recycling of biogens. Assumptions: 1. The maximum possible cutoff of biogens inflow to water. The use of, among others, polders with extra treatment, ecotone zones, sewage systems with wastewater treatment. 2. The withdrawal (reposition) of biogens accumulated in water reservoirs by natural methods. The assumptions of this method can be compared to the application of processes that led to the degradation and soil exhaustion in farmland. Intensive use of farmland without continuous fertilization leads to soil exhaustion that is deprivation of biogenic substances. In this case, we deliberately use this process in order to exhaustion of eutrophicated (over-fertilized) water reservoirs. This means that we need to "cultivate" them so intensively that the loss of biogens in obtained biomass is greater than inflow of biogens with surface waters and from bottom sediments of the reservoir. This method is an original technology developed by Greecon. 3. Production of phosphorous-carbon organic fertilizer from biomass obtained from reposition with application of special microorganisms, using technology developed by Greecon. The obtained natural fertilizer, in the first place, could be used in sensitive areas that are the catchments of lakes and dam reservoirs. In addition, this approach to water management could be an impulse to creating a strategy of small retention. Small reservoirs on small watercourses would fulfill the retention functions and also would be biofiltration polders improving the condition of flowing water and, at the same time, the source of biomass. The proposed solution is dedicated especially to those areas where there is a lack of effective sewage systems and where intensive farming is conducted. Described method is relatively cheap in investment and operation phase.

Key words: *Water, eutrophication, biogens, biocircural economy, recycling of biogens, organic fertilizers.*

APPLICATION OF NANO-ZINC FOR SPRAYING WINTER OILSEED RAPE IN THE ASPECT OF THE DEGREE OF COVERAGE

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Abstract

The aim of the experiment was to determine the average coverage of total winter rape with zinc foliar fertilizer and nano-zinc in three development phases (according to the BBCH scale: 12, 14 and 16). For the test degree of coverage, water sensitive paper was used, which was attached to horizontal and vertical surfaces of artificial plants. Samplers were sprayed at a speed of 0.86 $m \cdot s^{-1}$, in the Aporo1 chamber, at a pressure of 0.20 and 0.28 MPa. Two conventional nozzles were selected for the tests: flat fan XR 110-02 and double flat fan DF 120-02. The degree of coverage was determined using the computer image analysis method. Then, in order to determine the projections of horizontal and vertical surfaces of the tested winter rape plants, photographs of these surfaces were taken in each development phase. The photographs were transformed into a raster image in the Scan2Cad program, and then in the AutoCad 2015 program the surface area of the projections was read. The highest values of the average coverage of total winter oilseed rape were recorded during spraying with a double flat fan nozzle (DF 120-02), regardless of the development phase of the plant. Increasing the pressure to 0.28 MPa during the spraying of plants did not cause a significant increase in the average coverage of total plant. Higher values of the average coverage of total winter oilseed rape were recorded during spraying with Mikrovti Cynk 112 foliar fertilizer, except phase 14 BBCH, where the higher average total coverage was recorded during spraying with the nanopreparation.

Keywords*: foliar fertilizer, nozzle, spraying, nano zinc, plant development phase.*

ACTIVITY OF HYDROLASE IN SOIL CONTAMINATED WITH BISPHENOL A

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Abstract

The toxicity of phenolic compounds, particularly bisphenol A, is controversial. Efforts have been taken in Europe and in other parts of the world to eliminate them from the environment, but at the same time opinions have been expressed that bisphenol A should be removed from the list of hazardous substances. Therefore, the aim of this study was to examine the effect of bisphenol A on soil biological activity. Soil contaminated with BPA at 0; 0.1; 2; 40; 800 mg BPA kg^{-1} d.m. of soil was the object of the study. Ramnolipid 90 and *Chlorella* sp. were used as mitigating substances. The comprehensive nature of the approach to the issue is shown in the fact that the determined parameters included the activity of urease, acid phosphatase, alkaline phosphatase, arylsulfatase and *β*-glucosidase. The sensitivity of nitrogen-fixing bacteria, ammonifying bacteria, *Pseudomonas* sp., *Arthrobacter* sp., *Azotobacter* sp. and spring barley to bisphenol A was also determined. Bisphenol A moderates the biochemical activity of soil. It inhibited the activity of urease and *β*-glucosidase and stimulated the activity of alkaline phosphatase and arylsulfatase at 800 mg BPA kg^{-1} d.m. of soil. It did not generate any significant changes in acid phosphatase activity. The application of the largest dose of bisphenol A resulted in an increase in the population of ammonifying and nitrogen-fixing bacteria, *Arthrobacter* sp. and *Pseudomonas* sp. *Chlorella* sp. were a better biostimulant of soil fertility than Ramnolipid 90. An analysis of the metagenomes occurring in soil, determined from 16S RNA fragments identified three dominant divisions of soil microorganisms: *Proteobacteria, Actinobacteria, Firmicutes.*

Keywords: *Bisphenol A, Soil enzymes, Microorganisms, Chlorella* sp., *Rhamnolipid.*

Acknoledgements

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CHARACTERISTICS OF HUMIC SUBSTANCES IN SOIL AFTER APPLICATION OF SEWAGE SLUDGE AND *HELIANTHUS TUBEROSUS L.* CULTIVATION

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Abstract

The wastewater treatment process is inevitably associated with production of sewage sludge, which is a high-nuisance waste in the natural environment due to its numerous chemical and biological contaminants. Large volumes of sludge need to be disposed of or treated in some manner. One way of sludge disposal is its application on land. The aim of the study was to assess the effect of a single application of sewage sludge pads with varied thickness (0, 10, 20 and 30 cm) used in fallow silty soil on the humic substances properties in soil during the 6-year study period. The sludge application was carried out once, before the experiment was established, using them in the form of inserts of various thickness (0, 10, 20 and 30 cm), which were introduced under the sod-humus level. The obtained results indicate that the single introduction of sewage sludge influenced the content and quality of the humus compounds in the soil. Introducing sewage sludge pads of different thickness clearly increased the content of soil organic carbon (SOC). The used sewage sludge influenced the fractional composition of the humus compounds, humic acids, fulvic acids and humins, along with the increase of sewage sludge dose. On the basis of 6-year studies, it was found that a single introduction of sewage sludge in the form of inserts is a good alternative in the fertilization of *Helianthus tuberosus* L. and it positively affects the quality parameters of soil organic matter.

Keywords: *Sewage sludge, soil organic carbon, humus compounds, Helianthus tuberosus L.*

EFFECT OF HERBICIDE (GLYPHOSATE) ON MICROBIAL GROWTH

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Abstract

Glyphosate is one of the most commonly used herbicides in agriculture worldwide (125,38 tons in 2014). Entering the herbicide into soil may cause changes in the structure and abundance of microorganisms inhabiting this environment. Glyphosate inhibits protein synthesis via the shikimic acid pathway in bacteria and fungi, and one of its surfactants (polyoxyethylene tallow amine) is toxic to different species of bacteria and protozoa. The aim of the study was to evaluate the effect of herbicide Roundup Ultra 170 SL on microbial growth assessed based on OD600. The herbicide was added at four doses: a control (without Roundup) and three treatments 2,5 g/L, 5 g/L and 10 g/L of the active ingredient (glyphosate). Microbiological growth was measured on the basis of OD 600 in a culture media for 10 days. Results showed that Roundup Ultra 170 SL decreased microbial growth very fast in all treated samples and that this decrease was correlated with the dose of the herbicide. In the sample with the highest dose (10 g/L) of herbicide after 10 days of measurements the OD600 decreased from 1.145 to 0.088. The observed changes in the microbial growth indicated that glyphosate in the applied doses had a negative impact on the microbiological community in soil.

Keywords: *glyphosate, herbicide, Roundup Ultra 170 SL, microbial growth.*

PHENOLIC COMPOSITION AND ANTIOXIDANT ACTIVITY OF GREEN-SOLVENTS-BASED EXTRACTS OF RED ONION WASTES

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Abstract

Onion represents one of the most important crop, based on its production, consumption and high pharmacological potential supported by its chemical composition. Phytochemicals of phenolic structure, in particular anthocyanins, are among the strongest antioxidant compounds with large biological and industrial applications. Because their conventional extraction involves the use of high amounts of polar organic solvents, there is a strong requirement for development of new strategies based on greener solvents. The aim of the present paper was to extract valuable compounds of polyphenolic structure from red onion wastes using deep eutectic solvents, as green strategy for their isolation. In addition, the total antioxidant activity as measured by ferric reducing antioxidant capacity assay was investigated. Extraction performed at 40^{o}C in the selected solvent system was optimized for two parameters, solvent/sample ratio and extraction time. The obtained results showed the highest content of anthocyanins and antioxidant activity at a solvent/sample ratio of 30/1 and the extraction time of 90 min, at 40^{o}C. Regarding the total phenolics and flavonoids, the optimal extraction parameters were 20/1 solvent/sample ratio and 90 min, at 40^{o}C. Compared to conventional extraction in organic solvent, the values of the antioxidant activity were similar, while those of the content of bioactive compounds were higher in extracts obtained in ethanol solution. By further optimization of the extraction process, the obtained products may find useful application in obtaining natural ingredients intended for different purposes.

Keywords: *Red onion wastes, deep eutectic solvents, phenolics, anthocyanins, antioxidant activity.*

A MELIORATIVE EFFECT OF NITRIC OXIDE ON SOME OXIDATIVE METABOLITES IN SALT TREATED MAIZE SEEDLING

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Abstract

Salt stress is considered to be a major limiting factor for plant growth and crop productivity. The present study was conducted to assess whether using nitric oxide (NO) molecule could alleviate the adverse effects of salt stress in maize (*Zea mays* L.) seedling. Sodium nitroprusside was used at level (0.06µM) which was added as a donor of NO in the nutrient solution of maize seedlings grown hydroponically under salt stress conditions (0.0, 150 NaCl and 200mM). Specimens were collected on the 5^{th} and 10^{th} day from the start of treatment. Data for growth morphology, chlorophyll contents, and activities of some antioxidants enzymes were recorded. Nitric oxide provoked a significant increase in the main antioxidative enzymes including peroxidase (POD) and catalase (CAT) activities, and also a raise of some another secondary metabolites such as proline and ascorbate but lower content of H_2O_2. These data indicated that the exogenous NO application was useful to mitigate the salinity-induced oxidative stress in maize seedling during short term of growth.

Keywords: *Antioxidant enzymes, proline, malondialdehyde, salt stress, signaling messenger.*

COMPARISON OF CAMELS, SHEEP AND CHICKEN MANURES INFLUENCES ON GROWTHANDFRUITS QUALITY OF OLIVE TREES IN ALJOUF REGION, SAUDI ARABIA KINGDOM

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Abstract

Effect of Camel manure on growth and fruit quality of 15 years old Nepal olive tree was evaluated and compared with sheep and chicken manuresas natural fertilizers. This research was carried out from December 2015 till January 2016. Landscape for this research was divided into 14 squares with planting density of 20 trees in each square; the distances between squares were 15 meters under regular drip irrigation system and without any chemical fertilizers or pesticides additions. According to the obtained results, the shoot growth rate (cm), fruit yield, fruit physical characteristics (length (cm), diameter (cm), weight (g), volume (cm), flesh weight (g) and oil percentages were significantly increased and affected by camel manure utilization compared to sheep and chicken manures.

Key words: manure, olive trees, Saudi Arabia.

MICROENCAPSULATION OF DATE SEED OIL BY SPRAY DRYING FOR STABILIZATION OF OLIVE OIL AS FUNCTIONAL FOOD

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Abstract

Amongst food processing by- products, date seeds which are rich in precious nutrients like oils, antioxidants and other compounds with properties can be improved by incorporating into human diet. Date seeds have shown a potential application in the food industries. The aim of this study was to investigate the influence of microencapsulated date seed oil by spray drying on the oxidative stability of olive oil. Microencapsulation of date seed oil obtained by hexane extraction was carried out in gum arabic and maltodextrin (1:1 w/w) using spray dryer. Microencapsulated powder (DSP) with maximum encapsulation efficiency of 86.2 ±4.7% was obtained. The morphology of the encapsulated powder was determined from scanning electron microscopy (SEM), while its physical properties, phenolic content and antioxidant capacity were determined. Food application in olive oil was designed using the encapsulated date seed powder as a source of natural phenolic antioxidants. The oxidative stability of fotificated olive oil with date seed oil powder (ODSP) was determined using Rancimat method. Significant oxidative stability of olive oil was fortified with date seed powder, expressed as the oxidation induction time (more than 45h) compared to olive oil only (10h). The addition of microencapsulated date seed oil to olive oil not only provided additional protection to the oil against oxidation, but also improved the nutritional values and functionality of the final olive oil product in terms of elevated total phenolic content (TPC) and desired unsaturated fatty acids (UFAs).

Keywords: *Olive oil, Microencapsulation, Date seed oil, Antioxidant , Thermal stability*

THE INFLUENCE OF LIMING WITH FLY-ASH OF KOSOVO POWERPLANTS ON CHEMICAL AND PHYSICAL PROPERTIES OF DISTRIC CAMBISOL

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Abstract

Increased acidity is very often a limiting factor for decreased soil fertility and unfavorable chemical and physical soil properties. Fly-ash of Kosovo power plants appears as the waste material after burning in the reactors. Material itself causes serious environmental consequences, especially because it is hardly remediated, due to its chemical and physical properties. Since 1963. Kosovo power plants have formed huge fly-ash dumps of very poor remediability, with over than 200.000 mt of fly-ash. But, despite of its low remediability, the material has properties to be used in liming of acid soils. Afact that fly-ash of Kosovo power plants is alkaline, with relatively high content of CaO and $CaCO_3$, recommends it as a material which can be successfully used in melioration of acid soils. In our experiment we have used soil type Distric Cambisol, as a typical acid soil for the region of Kosovo. The results show applied liming material as proper material for use in liming the acid soils. By use the fly-ash for amelioration of acid soil, we have reached significant improvement of pH and other chemical properties, as well as the stability of soil structure.

Key words: *Fly-ash, Kosovo powerplants, liming, acid soils.*

SOCIO-DEMOGRAPHIC CHARACTERISTICS AND ENVIRONMENTAL AWARENESS OF FARMERS

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Abstract

Environmental awareness is an important factor that affects the state of the environment. The development of environmental awareness of rural inhabitants is a significant challenge that should be implemented through informing and transferring knowledge on environmental protection and through motivation of farmers to behave differently and act in accordance with nature. Identification of environmental awareness is defined through its basic elements: attitudes, behavior and readiness of respondents to participate in solving environmental problems. This paper focuses on the impact of socio-demographic characteristics such as age, gender and education on the level of environmental awareness of farmers. Our research has shown that the level of concern for the environment is highly correlated with the level of education. The largest percentage of those concerned was recorded among the most educated (college or university), while the other attitudes of the respondents, who were related to the environment, did not show a significant impression on education. The level of formal education also directly affects the elimination of ecological harmful examples, provided that infrastructure equipment permits. Such results point to the necessity of improving the formal and informal education of farmers in order to raise the level of environmental awareness and improve the quality of the environment.

Keywords: *farmers, environmental awareness, education, gender, age.*

CHEMICAL AND MICROBIOLOGICAL QUALITY OF PUBLIC WATER SUPPLIES IN MUNICIPALITY OF ZAVIDOVIĆI (BOSNIA AND HERZEGOVINA)

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Abstract

Due to the fact that drinking water is the key factor of food production, lack of water directly affects the food production, as well as public health. Except for the sufficient amount of water necessary for the normal functioning of the organism, it is also necessary to ensure the quality of water. The aim of this research was to estimate the quality of drinking water from public supplies in urban and suburban sites (Ibrina voda, Sutjeska, Hadžijina voda, Zmajevac and Mirkova voda) at municipality of Zavidovići (Bosnia and Herzegovina). Water samplings were performed in May, July and September 2017. From chemical parameters, pH value, content of phosphates, nitrates, nitrites, sulfates, Fe, Ca, Mg, Zn, Na and K were examined using standard techniques. Microbiological studies included determination of the total number of coliform bacteria, number of fecal streptococci, total number of mesophilic bacteria at 37ºC, number of psychrophilic bacteria at 22ºC, number of *Pseudomonas* sp., and presence of *Escherichia coli*, *Salmonella* spp., anaerobic bacteria from the genus *Clostridium* sp. The results showed that pH value of water samples was neutral to slightly alkaline. The values of examined chemical parameters were under the limits proposed by regular local legislative. Microbial prevalence in water samples depends on location and season of sampling. However, in most of samples poor microbiological water quality was registered. This research confirms the importance of chemical and microbiological parameters in estimation of water originated from public water supplies.

Key words: *water quality, public water supplies, coliform bacteria*.

EFFECT OF HERBICIDES ON CELLULOLYTIC ACTIVITY OF SOIL MICROMYCETES

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Abstract

This study examines the effect of different rates of 2,4-D and Paraquat herbicides under *in vitro* conditions on the cellulolytic activity of 20 strains of cellulolytic fungi isolated from the chernozem soil taken from Mount Fruška Gora. Results showed that high rates of 2,4-D (60, 120 and 240 μg/ml) inhibited the cellulolytic activity of *Fusarium aquaeductum* var. *dimerum, Fusarium solani var. argillaceum, Aspergillus candidus, Aspergillus ustus* and *Fusarium* sp. (L-7). Lower rates of 2,4-D (30 and 60 μg/ml) stimulated the cellulolytic activity of most *Penicillium* species. Paraquat exhibited higher toxicity to cellulolytic micromycetes and their cellulose degradation ability. Its inhibitory effect was observed at rates as low as those above 3μg/mL. Inhibition increased with increasing rates of the herbicide, with only eight fungi retaining at least some degree of cellulose degradation ability at 24 μg/mL Paraquat. Most species of the genera *Aspergillus* and *Penicillium* showed high sensitivity to Paraquat at rates as low as 6 μg/mL. At 24 μg/mL, none of them had the ability to degrade cellulose. A considerable degree of resistance to Paraquat was exhibited by *Fusarium* spp. (*Fusarium nivale* and *Fusarium solni var. argillaceum)* and *Hormodendrum sp.* (L-11), which retained their cellulolytic activity even at Paraquat rates of 6 μg/mL, whereas *Hormodendrum sp.* (L-10) retained its cellulolytic activity even at twofold higher rates of Paraquat (12 μg/mL).

Keywords: *cellulolytic fungi, 2,4-D, Paraquat*.

ORGANIZATION OF PROTECTED AREA MANAGEMENT SYSTEM IN SERBIA

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Abstract

The organization of the protected area (PA) management system includes interaction of different frameworks, the structural characteristics of the PA management, and the mechanisms for financing the PA management system. This interaction is carried out at different levels and involves the involvement of various stakeholders in the decision-making process. PA managers in Serbia come mostly from the public sector, but part of the PA management is delegated to the private sector. Considering the fact, that in the following period it is necessary to establish twice more areas of PA, the question of the existing organization is raised, as well as the need to improve the existing organization of the PA management system. The aim of this research is to determine the organization of structural characteristics of the PA management and financing mechanisms. The primary data used for this research were collected during 2014-2015 period, through a survey. The results of the research indicates that public enterprises (PE) that manage national parks and PE "Vojvodinašume" in terms of structural components of PA management, show the best results, as is the case with financing mechanisms, unlike other groups of managers. As a proposal for the improvement of the existing management system, it is proposed to improve management and protection, through more efficient cooperation with the users of the area in terms of preparation of the planning documents, organization of the ranger service, more intensive cooperation with the stakeholders in terms of promotion and protection of the PA. It is also proposed to improve the use of national and international financing sources, as well as efficient collection of PA fees.

Key words: *organization, management system, managers, structural characteristics, Serbia.*

HOW WE CAN USE BURLEY TOBACCO STALKS AS BIOFUEL

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Abstract

World population expansion puts energy production and development, as well as waste disposal in focus. Biomass produced in agriculture could be a good solution. In the Republic of Serbia, wheat straw is traditionally used as biofuel, but significant source of biomass is tobacco stalks produced as waste after leaf harvests (approximately 70 000 tons of stalks remains as waste every year). For this research, energy briquettes from raw materials (Burley tobacco stalks and wheat straw) were made, as well as briquettes from tobacco stalks and wheat mixed in a 50:50 ratio. Contents of the lignin and ash were determined, and from these HHV was calculated. Calculated HHV values were compared with experimental HHV values obtained in a calorimetric bomb. The results showed that there was no significant difference between the HHV calculation using an equation based on lignin content relative to the one using the ash content. According to the results of calculated (18 300,35 kJ/kg) and experimentally determined HHV (17515,18 kJ/kg) of tobacco stalks, it can be concluded that tobacco stalks waste has an important biomass potential. The calorific value of wheat straw was similar. Mixed briquettes (tobacco stalks and wheat straw) shown about 5% more results of HHV compared with the briquettes made from tobacco stalks and wheat straw. This results open opportunity for future research.

Keywords: *Burley tobacco, ash, lignin, HHV, biofuel.*

CONTENT OF NATURALLY OCCURING AND ARTIFICIAL RADIONUCLIDES IN CULTIVATED SOIL IN BELGRADE (SERBIA)

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Abstract

Radioactivity of soil is one of the main source of human exposure and an important subject of environmental monitoring. The present study was conducted in order to determine the content of naturally occurring radionuclides (U and Th series and ^{40}K) and artificial radionuclides (^{137}Cs and ^{90}Sr) in the surface layer of cultivated soil. The soil was sampled twice a year, in the spring and autumn season of 2017 on 5 locations in Belgrade (Serbia). The concentrations of naturally occurring radionuclides, as well as the artificial radionuclide of ^{137}Cs were measured using HPGe gamma detectors, while the concentration of artificial radionuclide ^{90}Sr was conducted by low level gas proportional counter. The average values of naturally occurring radionuclides were: 43.3 Bq kg^{-1} for ^{226}Ra, 45 Bq kg^{-1} for ^{232}Th, 552 Bq kg^{-1} for ^{40}K, 42.1 Bq kg^{-1} for ^{238}U and 2.1 Bq kg^{-1} for ^{235}U, while the average values of artificial radionuclides were 15.7 Bq kg^{-1} for ^{137}Cs and 0.74 Bq kg^{-1} for ^{90}Sr. The obtained concentrations of investigated radionuclides were in the range of the concentrations reported in the literature for the cultivated soil. No significant variation was noticed between concentrations of naturally occurring radionuclides with respect to the sampling period, while for ^{137}Cs, slight variations were noticed with respect to the location and season. Based on the average values of the activity concentration of gamma emitters in investigated soil samples, the health hazard indices were estimated. The values obtained are comparable with the corresponding world permissible values.

Keywords: *Radionuclide, Gamma spectrometry, Beta spectrometry, Cultivated soil.*

COMPARISON OF AGRONOMIC CLASSIFICATION OF THE IRRIGATION WATER QUALITY: THE CASE OF MORAVIČKA AREA, CENTRAL SERBIA

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Abstract

Evaluation of the irrigation water usability in Serbia is carried out using a number of classifications. The analysis of the collected samples of water for irrigation in the Moravička area during 2016, at 22 locations within the existing irrigation systems or locations on which irrigation systems are planned to be developed. Comparison of an evaluation of older classifications after Nejgebauer, US Salinity Laboratory and Stebler's classifications, and contemporary classification recommended by FAO and RSC classification, was performed. In the irrigation water samples the following was determined: pH value; ECw - conductivity; dry residue gravimetrically; ion balance: CO_3^{2-}, HCO_3^-, Cl^- - volumetrically; SO_4^{2-}, Ca^{2+}, Mg^{2+} - by preparation and determination using ICP-OES; K^+, Na^+ - by flame emission photometry; SAR value-by calculation. According to the classification after Nejgebauer, the studied water samples belonged to the classes of Ia (68.2% of the samples), Ib (9.1% of the samples), IIa (9.1% of the samples) and IIIa (13.6% of the samples), respectively. In relation to the determined Stebler's irrigation coefficient all samples tested belonged to the class of good waters. According to the classification of US Salinity Laboratory the samples belonged to the following classes: C1-S1 (22.7% of the samples), C2-S1 (54.6% of the samples) and C3-S1 (22.7% of the samples). According to the classification of FAO, 50% of the samples belonged to the class of water for drinking and irrigation, while 50% was in the class of water for irrigation. All tested samples of water in relation to the classification of RSD belonged to the class of good waters, except one sample which was on the limits of usability. Concluding, contemporary classifications require more detailed estimation of the water chemical properties compared to the traditional, although they offer a more complex approach in assessing the usability of waters.

Keywords: *Irrigation water, agriculture, traditional classifications, contemporary classifications.*

EFFECT OF INDIGENOUS PSEUDOMONAS CHLORORAPHIS STRAINS ON YIELD AND MAIN CHEMICAL GROWTH PARAMETERS OF LETTUCE

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Abstract

Fluorescent *Pseudomonas chlororaphis* are able to colonize the plants roots and stimulate growth by decreasing the frequency of diseases. These bacteria use various mechanisms for their action: production of antibiotics, HCN, plant hormones, the ability to solubilize mineral phosphates and other nutrients and antagonism towards phytopathogenic microorganisms. In this study we examined the effect of two indigenous plant growth promoting rhizobacterial strains of *P. chlororaphis* (Q4 and Q10) and their mixture (mix Q4+Q10) on the main chemical growth parameters and the yield of dry biomass of lettuce *(Lactuca sativa* L.). The study was carried out with stagnosol type of soil in pot experiments under semi-controlled conditions in the glasshouse of the Institute of Soil Science (Belgrade), in the period from March to June in 2014. Phosphorus was determined by spectrophotometer, potassium - by flame emission photometry, total nitrogen and carbon - using elemental CNS analyzer Vario EL III, while calcium and magnesium were determined by AAS. The content of proteins in dry biomass was calculated on the basis of nitrogen content. The data on yield of the lettuce dry biomass showed that its treatment with both *P. chlororaphis strains,* as well as with their mixture, had positive effect on this parameter in relation to the control, whereby the strain Q10 was more effective than Q4 and mix Q4+Q10. The obtained results of the studied chemical parameters of lettuce were in accordance with the yield, meaning that their content was the highest in lettuce treated with Q10 strain. Concluding, studied *P. chlororaphis* strains have high potential in promoting the yield and main chemical growth parameters of lettuce.

Keywords: *Pseudomonas chlororaphis, Lactuca sativa L., dry biomass yield, chemical growth parameters, Stagnosol.*

RESERVES OF ORGANIC CARBON IN PROTECTED NATURAL AREA "VELIKA PLEĆ - VRAŽIJI VIR" ON THE MOUNTAIN MALJEN, SERBIA

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Abstract

In this paper the results of analysis of organic carbon content in topsoil layers (0-30cm) of forest soils are presented: eutric ranker and eutric cambisol on serpentinite. The content of organic carbon in the soil and his changes are presented as one of the basic indicators of the state of terrestrial ecosystems. The survey was conducted in Strict Nature Reserve "Velika Pleć – Vražiji Vir", on the mountain Maljen. In order to preserve and valorize the biological and landscape diversity of protected natural resources, a systematic approach to the sustainability of the state of diversity, specificity of vegetation and pedological coverage is necessary. Using the laboratory methods, appropriate physical and chemical properties of the soil were analyzed, necessary for the determination of soil organic carbon in organic and mineral layers of soil. From the physical properties of the soil, the granulometric composition (fractions <2mm) and soil density were analyzed, and the chemical content of the pH of the soil solution in H2O, the content of humus, the total nitrogen content and the content of organic carbon (g / kg).The mean value of soil organic carbon density (SOCD) in the studied soils varies between 5.24 $kg \cdot m^{-2}$ (eutric ranker on serpentinite) and 4.11 $kg \cdot m^{-2}$ (eutric cambisol on serpentinite). The paper deals with the specific values of protected natural resources for providing the necessary information on organic carbon reserves, with the aim of further up-to-date monitoring of protected natural assets.

Key words: *humus-siliceous soils, brown soils, Strict Nature Reserve, organic carbon.*

VARIABILITY OF MAIZE LINES IN NITROGEN USING EFFICIENCY

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Abstract

Nitrogen is important macro-nutrient that influences various physiological processes in plants. It is responsible for protein synthesis and their role in plant metabolism. However, nitrogen is ambiguous element that is highly metabolisable by soil microorganisms and could be loosed from the soil by leaching and evaporation. To prevent this devastation, low nitrogen inputs are required. Maize genotypes exhibit various susceptibility to low nitrogen level in soil. From that reason, variability in reaction of 30 maize lines to grow in conditions with optimal (fertilization with urea), and with low nitrogen (without fertilization) was examined. All other growing measures and fertilization with other elements was applied at the same manner on whole experimental plot. The values of maize grain yield and 1000 grain weight were slightly lower in the field without nitrogen fertilization. It is significant to highlight that high variability between maize lines in term of efficacy of yielding was present, with values varying up to 152.31%, indicating that some lines under the low nitrogen conditions reached even higher grain yields, than in conditions with optimal nitrogen in soil, declaring them as genotypes with high nitrogen using efficiency. However, these lines achieved moderate yields (in both fields) in comparison with all tested lines. Lines with better nitrogen using efficiency, as well as higher grain yields will be introduced into further research, i.e. breeding of maize hybrids with better nitrogen usage from soil, even in the conditions with low nitrogen.

Keywords: *Maize lines, Nitrogen using efficiency, Grain yield.*

THE FUNCTION OF THE PERIURBAN FORESTS IN THE ENVIRONMENTAL CONNECTIVITY: ECOLOGICAL BELT, LUGO CITY, SPAIN

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Abstract

The Green Infrastructure (GI) Strategy is a "planned European network of natural and semi-natural ecosystems with other environmental features designed to offer a wide variety of ecosystem services (ES)". The periurban forests carry out a vital role in improving and increasing ecological conditions and biodiversity conservation. Also, these ecosystems must face a triple function: I) a fluctuating ecological environment, II) a lack of technical tools to assess environmental perturbations due to its proximity to cities, and III) a favourable social perception. Our research is founded on the knowledge of right planning of the benefits of these areas, in an environment where urban pressure on them should be controlled. The aim is to create a debate studying the main functions of periurban forests in the sustainable development of the urban world, in a particular case: Ecological Belt of the Lugo city (Spain). This problem is complex because it includes diverse aspects –social, economic, and environmental− where an adequate coordination between all stakeholders is necessary. Too, the urban forests and green open spaces have progressively more importance in the quality of life of an urban society. In fact, growing evidence indicates that the presence of natural elements (e.g., urban and periurban forests, greenbelts) in an urban context, provides increase in the life quality. In addition, to basic environmental services such as cleaning of air and water, noise reduction, or maintenance of the microclimate, natural areas provide social services essential to the livability of the cities and the welfare of its inhabitants.

Key words: *Green infrastructures, Biodiversity, Urban development, Life quality*.

URBAN AND PERIURBAN FORESTS AS AREAS OF VITAL IMPORTANCE FOR CONSERVATION: LUGO CITY, SPAIN

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Abstract

Urban and periurban forests and their landscape boundaries have varied socioeconomic roles, from the offer to the inhabitants with leisureliness and playtime opportunities, the occasion of doing diverse sports and of course, the happiness that generates enjoy nature near an urban environment, to its microclimatic effect. Also, these forests play a vital function in expanding green infrastructures for the sustainable development of the cities. For it, these areas have to face a multiple challenge: I) a modifying ecological environment, II) a lack of technical tools to assess ecological-environmental problems due to their proximity to urban areas, and III) a mostly positive public perception. Knowledge regarding right planning of the potential should be the basis of our research, within a context where urban pressure on them is increasing. Our goal is to create a reasoned discussion analysing the socioeconomic functions of urban forests as areas of particular significance for conservation in the study case of the Lugo city, Spain. Urban forests and its landscape can be thought of as green infrastructures. Research has established that forests benefits are optimized by long-term management so that urban forests reach their highest efficiency. Awareness on forest resources and land use enables planning for multi-functional use of urban lands to multiply economic returns. For instance, lands dedicated to other infrastructures, such as power lines, can be managed to obtain products for nearby neighbourhoods, from fuel wood to food.

Keywords: *Leisure activities, Social ecosystem services, Cultural and urban landscapes, Rural cities.*

AGRICULTURAL WASTE CODIGESTION VERSUS INDIVIDUAL ANAEROBIC DIGESTION: EFFECT OF TEMPERATURE

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Abstract

The agricultural industry generates tons of organic wastes, which are placed in landfills or used for animal feed, causing environmental problems. Anaerobic digestion of organic waste is a feasible solution that allows getting valuable products like biogas (energetic valorization) and compost (agronomic valorization). The process can be operated at different temperatures: mesophilic (35ºC –M35-), and thermophilic (55ºC –T55-); and, lately, the intermediate (42ºC –I42-) is being tested. In this study, agricultural wastes were assessed: artichoke, beans, green beans, carrot, cabbage and green peas. Additionally, the codigestion of all of them was compared with the respective monodigestion. The study of individual biomethanization at different temperatures indicated that I42 obtained better average removals of Volatile Solids (VS) -59%- than M35 -44%- and T55 -49%-. I42 showed the highest removals of all the vegetables studied. Methane yields ($L\text{-}CH_4/g\text{-}VS_{removed}$) for all the monodigestion were better at M35. The codigestion was the best configuration for biogas production compared to individual treatments. Comparing the codigestion values, theoretical performance was calculated based on the results obtained for the biomethanization of isolated vegetables and the composition in the codigestion reactor. These results were compared with the experimental data. To this regard, for M35, the biogas was 50% higher than the theoretical production. The increment of I42 and T55 was 54% and 113%, respectively. According to methane productivities, codigestion reactors reached higher yields than those predicted: 66% for M35, 82% for I42 and 137% for T55. Related to VS removal, results showed that there is no mathematical difference between codigestion and monodigestion. In short, the best productivities of methane for thermophilic codigestion and similar VS removals to all the studied conditions were recorded. Therefore, it can be concluded that this is the most suitable configuration.

Keywords: *Agricultural waste, anaerobic codigestion, individual anaerobic digestion, temperatures.*

TEMPERATURE-PHASED ANAEROBIC DIGESTION OF LIGNOCELLULOSIC WASTES: ARTICHOKE AND ASPARAGUS

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Abstract

Lignocellulosic wastes are organic substrates that present low availability to biological degradation like anaerobic digestion (AD), but their structure and composition makes of them a potential lignocellulosic biomass for biogas production. Additionally, sustainability plans encourage their biodegradation. Temperature of operation has been widely studied and proposed as a determinant parameter for process optimization. This study approaches the temperature of operation using artichoke and asparagus as representatives of lignocellulosic waste. Temperature-phased anaerobic digestion (TPAD) studies with thermophilic (55ºC) –first phase- and mesophilic (35ºC) –second phase- were carried out in two configurations: 5 days thermophilic-range (TPAD5) and 7 days thermophilic-range (TPAD7), both followed by the total biodegradation at 35ºC. Related to artichoke, TPAD got better results than single-stage AD from previous studies, being TPAD7 the most efficient (7.8 L, 441.6 mL-biogas/g-VS, 375.3 mL-CH_4/g-VS). The kinetic modelling with the experimental data, considering VS and biogas, fitted accurately (R^2 > 0.9697). The non-$_{biodegradable}$ substrate (S_∞) was lower in TPAD systems (around 15.4 mg/L), compared to single-stages (average 17.4 mg/L). Additionally, maximum specific growth rates (μM) were higher for TPAD7 (0.0630 d^{-1}). Regarding asparagus TPAD biomethanization, the configuration showed, through kinetic modelling, a considerably higher maximum specific growth rate (TPAD7: 0.0956 and TPAD5: 0.1172 d^{-1}) compared to single-stage temperature processes. Moreover, the CH_4 biogas ratio was the best in TPAD with productions of 84 and 79 % CH_4 of total biogas for TPAD7 and TPAD5, respectively. Based on the obtained results, TPAD configurations have shown better performance dealing with lignocellulosic waste (artichoke and asparagus) in front of single-stage temperatures, being the TPAD7 the best condition studied.

Keywords: *temperature-phased anaerobic digestion (TPAD), lignocellulosic waste, artichoke, asparagus.*

COMPARATIVE BIODIVERSITY BETWEEN NO-TILL AND CONVENTIONAL TILL ON A CROP ROTATION

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Abstract

The technological development that agriculture has suffered in recent decades has affected biological diversity in agricultural fields. In particular, the life on the soil surface, that is mainly constituted by invertebrates. This loss of biodiversity entails the disappearance of natural processes that this organisms support. For this reason, it is necessary to implement agronomic management that reduces impacts on agricultural soils. One of these alternatives is no-tillage system, which is characterized by the absence of soil ploughing and the maintenance of crop residues on soil surface. In this sense, the present work has compared the existing biodiversity in a crop rotation (sunflower-wheat-legume) between plots under no-tillage and plots under conventional tillage systems. With this objective, insects, arachnids, crustaceans and myriapods have been captured through pitfall traps. Four plots have been sampled, 2 under no-tillage and 2 under conventional tillage. In each plot have been placed 4 sampling areas, consisting of 5 pitfall traps each. The catches made have shown higher biodiversity values in no-tillage compared to conventional tillage. These differences have been significantly higher in terms of number of species captured and with respect to the biodiversity indices of Margalef, Simpson and Shannon. However, the increases in number of individuals captured has not been significant as well as the uniformity indices of Pielou and Simpson.

Keywords: *Biodiversity, Arthropods, No tillage, Biodiversity indices, Pitfall traps*

EFFECT OF WATER HARVESTING TECHNIQUES ON THE SOIL PROPERTIES IN THE SOUTH OMDURMAN AREA- SUDAN

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Abstract

This study was conducted at Khartoum New International Airport, South Omdurman area Khartoum State, Sudan, following a complete randomized block design, to study the effect of Holes and Crescents of two water harvesting techniques.The soil moisture content was measured prior and immediately after rains and it was measured at three weeks intervals. The results indicated that the holes and crescents water harvesting techniques affected positively some soil physical properties especially at the upper soil layer (0 – 30 cm) which was subjected to excavation by a loader. These properties included porosity, field capacity, infiltration rate and hence moisture content. The holes water harvesting techniques showed better improvement of the soil physical properties compared to the crescents water harvesting techniques as it resulted in increase of 15.1% in soil moisture content.

Keywords: *Holes and Crescents, two water harvesting techniques, infiltration rate, moisture content.*

CAPILLARY IRRIGATION

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Abstract

Capillary irrigation is a new technique of irrigation which depends on the Capillary action of the water. Capillary irrigation systems use patent-pending technology to mimic the natural capillary action of soil to move water to plants efficiently and precisely to significantly reduce water usage, plant loss, and overall cost while improving plant quality and the bottom line for our customers. Capillary watering system delivers water directly to the root zone of the plant, where it is needed most. This technique is developed in ourfield and obtained several benefits of it: - decreasing the water consumption by evapotranspiration action, - decreasing the power required for other irrigation techniques, - elimination of the spread of foreign and undesirable plants in the field, - decreasing the cost of the irrigation systems. The main materials required were plastic containers and cotton threads. This paper presents some empirical calculations to design and operate this new irrigation technique.

Keywords: *Capillary irrigation, new technique, benefits.*

GUIDELINES FOR PARTICIPATORY WATER RESOURCE MANAGEMENT OF THE PEOPLE SECTOR: A CASE STUDY OF NAN RIVER BASIN, THAILAND

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Abstract

This study was a mixed-method research with the following objectives: (1) to study and analyze the participatory water resource management process at the local level of the organizations, local institutions, and people sector; (2) to study and analyze the success factors of the participatory water resource management at the river basin level of the Nan River basin area; (3) to develop a connection model and mechanism of participatory water resource management at the local level with the higher levels; and (4) to study guidelines for development of participatory water resource management. The researchers collected data from concerned people residing in the areas of Nan River basin and basins of its tributaries via the use of questionnaires, interview forms, note taking forms, and tests. Research findings were as follows: (1) the participatory water resource management process (2) the success factors of the participatory water resource management were the success factors at the group level and the success factors at the working agency/supporting organization level; (3) the connection model and mechanism of participatory water resource management at the local level with water resource management at the higher levels: there was the need for creating the mechanism for connection of participatory water resource management processes of every level, from the village level up to the country level; and (4) guidelines for development of participatory water resource management: there were guidelines at two levels, namely, guidelines for development of participatory water resource management at the community group and networks, and guidelines for development of participatory water resource management by community organizations, state sector, private sector, river basin sub-committees, and river basin committees.

Keywords: *Participatory water resource management, Nan River basin.*

LOCAL COMMUNITY NETWORK EMPOWERMENT FOR PREVENTION AND PROTECTION OF COASTAL EROSION IN CHACHOENGSAO PROVINCE, THAILAND

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Abstract

Coastal erosion is a major problem in Thailand, in both the Gulf of Thailand and the Andaman Sea coasts. Land erosion occurs along the 200 km coastline with average rate of 5 meters/year. It affects public and government properties, as well as the socio-economy of the country, including emigration in coastal communities, loss of habitats, and decline in fishery production. To combat the problem of coastal erosion, projects utilizing bamboo sticks for coastal defense against erosion were carried out in Ban Song Klong Sub-District, Bang Pa Kong District, *Chachoengsao* Province, Thailand by Marine and Coastal Resources Department. Local Community Networks was involved in the project. The objectives of this research were to 1) increase the efficiency of community network management in coastal prevention and protection of Ban Song Klong Sub-District, Bang Pa Kong District, Chachoengsao Province, 2) create a management guideline of Ban Song Klong community network fund for prevention and protection, 3) increase Ban Song Klong community network members' competency for coastal prevention and protection. The research was a participatory action research in Ban Song Klong sub-district alongside coastal zone of Chachoengsao Province. The information was gathered based mainly on the participation among community leaders and community network members via household visiting, group discussion, seminar, study tour and particular planned activities. Information was analyzed by the researchers, community network members in Ban Song Klong, Chachoengsao Province and representatives from agencies concerned. The research revealed that 1) the community management network in coastal prevention and protection efficiency could be increasing by formulating Ban Song Klong community network's regulations together with administrator committee structure revising. 2) regulation for Laem Fa Pha community network fund management should be formulated and 50,000 Baht should also be initiated as community network fund, 3) in order to increase the competency of coastal prevention and protection network members', study tours to Chon Buri, Rayong and Chanthaburi provinces had to be formulated. Moreover, the connection among Samut Songkhram, Samut Sakhon, Samut Prakan and Chachoengsao networks had to be carried out.

Keywords: *Ban Song Klong community networks, coastal erosion, empowerment, Chachoengsao province.*

WASTEWATER REUSE FOR IRRIGATION: CURRENT STATUS IN TUNISIA AND CHALLENGES

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Abstract

One of the most critical challenges nowadays is the drastic decrease in water availability per capita in Tunisia. Natural water resources in Tunisia are faced with big issues related to their quantity and quality. Therefore, in lack of conventional water resources, especially for agricultural irrigation, water of marginal quality has to be considered as a valuable option to be used in this sector. The reuse of treated wastewater could play a major role in the agriculture. In fact, apart from preserving freshwater resources, wastewater reuse indirectly allows the postponement of potentially more costly water supply approaches. Wastewater reuse is already a planned activity in Tunisia. Reclaimed wastewater is produced in sewage treatment plants (STP) and 80% of them operate with an activated sludge process. But secondary treatment processes are not designed to remove trace contaminants from wastewater. Accordingly, effluents are expected to carry persistent and semi-persistent emerging pollutants. Reuse is then exposing the agricultural environment to numbers of pollutants, some of them still unknown, having non-assessed impacts on the agro-ecological environment. That is why it is of prime importance to give the government bodies evidence that these practices are either safe or can damage the quality of the water resources. The stakeholders are not aware of the risk that might be induced. Existing regulations for water reuse include some routine parameters, but not emerging pollutants, for which more reliable data are needed and risk assessment should be performed beforehand.

Key words: *Wastewater, irrigation, Tunisia.*

ASSESSMENT OF PHENOTYPIC DIVERSITY IN TUNISIAN CARROT (*DAUCUS CAROTA* SUBSP. S*ATIVUS*) AND SQUASH (*CUCURBITA MAXIMA* DUCHESNE) ACCESSIONS

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Abstract

Tunisia is one of the most important diversity centers for cultivated carrot and squash accessions characterized by their adaptation to climatic changes. The morphological characterization of plant is the basic criteria in order to provide fundamental information for plant breeding program. The main objective of the present work was to characterize 33 accessions of carrot from 13 different regions of Tunisia, based on 34 agro-morphological characters related to leaves and roots, and 15 local accessions of squash collected from northern, Sahel and central regions of the country using 30 morphological parameters related to seeds, growth, flowers and fruit characteristics. For carrot accessions, the Shanon-Weaver Diversity (H') index was used to study the phenotypic diversity in carrot. The estimated H' ranged from 0.19 for core colour compared to cortex colour to 0.99 for leaf division traits. Analysis of variance revealed significant differences among accessions for all quantitative characters. Stepwise multivariate analyses were carried out in order to identify the useful characters that can distinguish among accessions. The study showed that qualitative characters were the best for the delimitation of accessions by statistical analysis. Cluster analysis permitted the subdivision of carrot accessions into four distinct groups independently on their geographic distribution; while for squash the agro-morphological characterization was carried out based on UPOV and IPGRI descriptors. Results revealed a considerable genetic variability for most traits.Morphological variation was the most apparent in fruit characteristics. Most accessions had transverse broad elliptical fruit (75.6%), a medium skin thickness (89.12%), a medium flesh thickness (57.89%) and a big cavity diameter (94.7%). PCA classified these accessions into three homogenous groups. These results represent the first report on the characterization of carrot and squash in Tunisia, which will serve to the management, conservation and use of local genetic resources.

Keywords: *Carrot squash, Morphological Characterization, Genetic diversity, Multivariate analyses.*

AGRONOMIC CHARACTERIZATION OF GARLIC (ALLIUM SATIVUM L.) AND PEPPER (CAPSICUM ANNUUM L.) INTERCROPPING SYSTEM

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Abstract

Apart from optimizing production and obtaining good quality, the intercropping system has several agronomic, economic and environmental advantages. The objective of this study was the characterization of two local varieties in Tunisia of garlic (*Allium sativum* L.) and pepper (*Capsicum annuum* L.) conducted on monoculture or intercropped. The study of the intercropping Garlic-Pepper system essentially concerned its effect on vegetative growth, the production of dry matter and fruit as well as its effect on soil fertility. The performance analysis of Garlic-Pepper intercropping system showed that vegetative growth was more affected for peppers. Indeed, the maximum plant height was 73.6 cm when it was carried out on monoculture against 80.6 cm when it was intercropped with a maximum leaf area index of 1.53. As for the production of total biomass, it was equivalent in both systems for pepper, while for garlic, it was more important in the case of monoculture. The crop yield of pepper increased by 41% to reach a value of 8.49 t/ha. The value of the LER (Land Equivalent Ratio) was calculated to be 2.2 showing that the combination of the two cultures was beneficial in terms of resource use and that the main profitable crop was the pepper. Except for the benefits on the plant, we proceeded to a study of the microbial mass of the soil in order to know the effect of the Garlic-Pepper intercropping system on the biological fertility of the soil. The results found showed that microbial activity was affected by the chosen system. In fact, it was 1246 mg/kg of soil for the intercropping system while of the monoculture it was 644 mg / kg of soil.

Keywords: *Allium sativum L., Capsicum annuum L, intercropping system, soil fertility.*

APPLICATION OF THE “PLANT MILKING” TECHNIQUE FOR THE EXTRACTION OF TOTAL POLYPHENOLS IN "RUTA CHALEPENSIS"

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Abstract

In order to promote and evaluate an innovative and non-destructive extraction technique: “the plant milking”, plants of *Ruta chalepensis* were grown in hydroponic conditions. Two treatments T1 and T2 consisted of raising the plants in MS/4 nutrient solution and for control C the plants were grown in pots. Two milkings were carried out at D30 and D60. For T1, the roots were permeabilized by Tween 20 (3%) for 24h before milking and for T2 the roots were not permeabilized. The milking consisted in extracting and quantifying the total polyphenols in the nutrient solutions of T1 and T2. On the other hand, the roots were leached after each milking in order to measure the level of total polyphenols in the recovered leachates (L1 and L2, respective leachates of T1 and T2). For the control, a conventional extraction was performed at the end of the test to determine the level of polyphenols in the roots. The results show that the polyphenol content in T1 is significantly greater than that of T2 and the control (218.28µg/ml, 36.22µg/ml and 150.94µg/ml for T1, T2 and C, respectively). Regarding the leachates, the polyphenol contents in L1 and L2 are respectively 20.44µg/ml and 81.33µg/ml. The experiment was stopped after two milkings and the plants remained alive with a normal growth, moreover, the amount of polyphenols of the second milking is higher than that of the first. This increase is thought to be due to root growth, so subsequent milkings could yield even larger amounts of phenolic compounds.

Keywords: *Plant milking, polyphenols, Ruta.*

ANTIOXIDANT PROPERTIES OF WATER EXTRACTS FROM TWO SILENE SPECIES: S. ALBA AND S. ITALICA

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Abstract

Silene, the largest genus of the Caryophyllaceae family, is comprised of about 700-750 species distributed over the globe. Ethnobotanical evidence indicates that several *Silene* species have been used for medicinal purposes and are consumed as food in Anatolia, Turkey. We aimed to determine antioxidant properties of water extracts from two *Silene* species (*S. alba* and *S. italica*). Different assays were performed to detect antioxidant properties. These are free radical scavenging (ABTS and DPPH), reducing power (CUPRAC and FRAP), phospehomolybdenum and metal chelating. Also, total phenolic and flavonoid contents were calculated for each extracts. *S. alba* contained higher level of phenolics (26.94 mgGAE/g extract) than *S. italic* (24.00 mgGAE/g extract). Also, *S. alba* extract displayed considerable antioxidant abilities (78.95 mgTE/g for DPPH; 113.10 mgTE/g for ABTS; 107.43 mgTE/g for CUPRAC and 123.43 mgTE/g for FRAP). The presented results could be opened new avenues for designing novel functional formulations from tested *Silene* species.

Keywords: *Silene species, Anatolia region, antioxidant properties.*

ENZYME INHIBITORY EFFECT OF *KITAIBELIA BALANSAE* EXTRACTS

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Abstract

Nowadays, knowledge of ancient botanical medicinal practices and application of modern phytochemical techniques have provided the excellent tools for the purification and structural elucidation of various phyto-compounds, which, in turn, has given insights into their mode of action on the human body (Khan et al., 2017). This study has been designed to investigate for the first time the effects of the ethyl acetate, methanolic, and water extracts of *Kitaibelia balansae* on key enzymes. Enzyme inhibitory properties were detected against cholinesterase, tyrosinase, α- amylase and α- glucosidase. The ethyl acetate extract was more potent against cholinesterases (2.24 mgGALAE/g extract for AChE and 2.01 mgGALAE/g extract for BChE) and α-amylase (0.70 mmolACAE/g extract), while the methanol extract were most active against α-glucosidase (18.42 mmolACAE/g extract). The present findings suggest that *Kitaibelia balansae* can be considered as a potential source of bioactive compounds for novel phytopharmaceuticals development in the treatment and/or management of noncommunicable diseases.

Keywords: *Enzyme, Kitainelia Balansae, extracts.*

ANALYTICAL SOLUTIONS OF THE THERMAL CONDUCTIVITY EQUATION ON THE SOIL

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Abstract

Heat flow in a soil profile occurs by heat conduction. Mathematical theory of thermal conductivity in soil is developed for the problem of the convection of heat waves and to explain a variety of natural events. Equations in mathematical theories must be solved by using appropriate initial and boundary conditions to explain the soil temperature in a specified soil depth and time. Generally, equations with the boundary condition were used for homogeneous environments. However, the solutions of this equation are dimensionless forms without the initial conditions. For the theoretical description of the quasistationary regime problem (e.g., the daily or annual variation of the soil temperature), the initial condition is available. To find a single solution of changes in the depth of a time-varying soil temperature as a result of the influence of various factors, analytical or numerical solution should be obtained. For this purpose initial and boundary conditions should be set. In this study, initial condition which correspond to the state of the variable at the zero (initial) time moment and 1^{st}, 2^{nd}, 3^{rd} and 4^{th} type of boundary conditions at a given soil depth were discussed.

Keywords: *Thermal conductivity, initial condition, boundary conditions, mathematical theory, analytical solution.*

DETERMINATION OF THERMAL PROPERTIES IN SOIL SURFACE UNDER GRASSLAND AND FOREST CANOPYIN SEMIARID ANATOLIA

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Abstract

The productivity in crop production is closely related to the soil temperature. The effect of soil temperature on germination rate and duration, root formation and plant growth, uptake of water and plant nutrients by plant roots, biological and microbial activities in the soil, degradation of organic matter, plant diseases and harmful populations, soil aeration, soil moisture and evaporation is important. The most important soil thermal property is thermal diffusivity, which is a mutual function of soil specific heat capacity and soil heat conductivity. In practice, knowledge on the relations between soil thermal diffusivity and other soil characteristics is an important resource for modeling plant development in different soil and climatic conditions. In this study the performance of layer, point 1, and point 2 methods to model soil thermal properties in soil surface under a mixed forest and grassland were compared in Cankırı Province in Central Anatolia of Turkey. Soil temperature was measured with water-proof portable thermal sensors (Thermochro the iButton DS1921G) placed at 5 cm soil depths for each canopies.Surface parameters τ_0 (average temperature at soil surface), τ_a (wave amplitude), and ε (phase angle) were found as τ_0: 24.5,τ_a: 17.88, and ε: 2.51 for grassland, τ_0: 15.42,τ_a: 3.37, and ε: 2.01 for forest canopy. Measured and predicted values of air temperature at soil surface of under grassland and forest canopies were $\eta = 0.91$ and 0.98 respectively. Even though the results were indicated by strong correlation coefficients, this difference between grassland and forest canopies was attributed to that the fact that plant canopy controlled the vertical distribution of light in different canopy and heat loss from the soil during heating and cooling times. Similar studies should be conducted with under different canopies plants and different soil conditions to generalize the results.

Keywords: *Soil thermal properties, layer method, points method, grassland, forest canopy.*

THE EFFECTS OF REDUCED TILLAGE ON PEST MANAGEMENT IN WHEAT-VETCH ROTATION IN RAINFEED CONDITIONS

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Abstract

The study was conducted under rain feed conditions with 650 mm annual precipitation with winter wheat-winter vetch crop rotation for a long-term to determine some pest population in both conventional and reduced tillage systems. Average over 10-year conventional tillage increased vetch biomass, wheat straw and grain yield, while reduced tillage. However, reduced tillage had some disadvantages to increased plant protection problems such as weed infestation that increased the cost of weed control. In addition, reduced tillage, which left 30% crop residues on the soil surface, created a more suitable environment for the survival of pest which commonly lived in surface residues and in depth of soil. However, the positive effect on the population increased of the pests of the reduced tillage system varied according to crop-rotation. The population density of monophagous pest types depending on wheat crop for their survival, usually living in residues and soil such as *Zabrus* spp., *Cephus pegmeus*, *Porphyrophora tritici*, *Syringopais temperatelle*, *Anisoplia austriaca* decreased due to lack of hosts under wheat-vetch rotation. On the other hand, the residues under reduced tillage mostly created more survival conditions for beneficial insects. Thus, reduced tillage also provided favourable conclusions under both wheat and vetch growing conditions to keep the population of Aphids by beneficial insects. It was observed that *Coccinella septempunctata* shortly suppressed the population of *Acrythosiphum pisum* recorded in early spring under vetch growing plots. *Eurygaster integriceps*, which was taken into the pest management programme for wheat growing, did not reach the population density to do damage in experiment plots. In results, it was observed that reduced tillage system could be applied for sustainable agriculture in wheat-vetch rotation of rainfeed conditions.

Key words: *Reduced tillage, Wheat-Vetch rotation, Pest control.*

YIELD RESPONSE OF QUINOA TO VARIOUS IRRIGATION STRATEGIES APPLIED THROUGH SURFACE AND SUBSURFACE DRIP SYSTEMS

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Abstract

This study was conducted on an experimental farm of the Cukurova University in Adana, Turkey in 2017 to determine optimal irrigation strategies for surface and subsurface drip- irrigated quinoa (*Chenopodium quinoa* Wild. cv. Titicaca) in the Mediterranean climatic conditions. Irrigation treatments considered were full irrigation (FI), regulated deficit irrigation (RDI), partial root-zone drying (PRD), deficit irrigation DI-75 and DI-50, and rain-fed (RF). Soil water deficit was replenished to field capacity when 50% of available water at 60 cm was depleted in FI. RDI received 50% of FI-100 until the flowering growth stage, there upon received 100% of water requirement. PRD received 50% of FI but irrigated alternately. Deficit irrigations DI-75 and DI-50 received 75 and 50% of FI, respectively. The amount of irrigation applied to the surface drip irrigation plots varied form 51 mm in DI-50 and PRD-50 to 103 mm in the FI treatment; the corresponding values for the subsurface drip plots varied from 46 to 92 mm. The surface drip plots received slightly more water but the difference were not significant. The crop water use (ET) values ranged from 254 mm in RF to 350 mm in FI in the surface drip, and varied between 250 mm in RF and 339 mm in FI in the subsurface drip plots. The quinoa under the surface drip plots used slightly more water than the subsurface drip plots for the corresponding irrigation treatments. The greatest quinoa grain yield was obtained from the FI plots in the surface drip and subsurface drip plots. There was no significant difference in the grain yields between the drip irrigation systems. However, the irrigation treatments resulted in significantly different yields. FI, DI-75, and RDI resulted in similar yields and significantly greater yields than DI-50, PRD and RF. Although the PRD and DI-50 treatments received the same amount of irrigation water, PRD resulted in higher yields than DI-50. The WUE values ranged from a low of 0.69 kg/m^3 in the DI-50 under surface drip system to the greatest value of 0.76 kg/m^3 in the PRD-50 treatment in the subsurface drip system. In general, the WUE values decreased with increasing water stress, thus the RF and DI-50, PRD-50 treatments resulted in greater WUE as compared to FI, RDI. There was no significant difference in the WUE values between the irrigation systems, but the irrigation regimes did have a significantly different effect on WUE. In conclusion, the RDI and FI treatments can be recommended for higher quinoa yields in the Mediterranean region.

Key words: *Quinoa, deficit irrigation, regulated deficit irrigation, partial rootzone drying*.

RECYCLING OF AGRICULTURAL PHARMACEUTICAL PACKAGING WASTES BY FARMERS IN KILIS (TURKEY)

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Abstract

The importance of pesticides use is so great in agricultural production. The unconscious and uncontrolled use of agrochemicals applied in agricultural struggle can lead to problems reaching dangerous dimensions concerning human, animal and environmental health.After crop protection packages have been emptied, there are drug residues in them. These boxes and packages are used by unconscious farmers for other purposes, and they are also randomly thrown away causing environmental pollution as well as soil and water pollution. Ground water and soil resources involved in drug residues that contaminate the fruits and vegetables used in human nutrition, passes to animals watered from these sources. With this study, it was aimed to determine the applications that would prevent this situation and suggestions were made. This study was carried out with 20 producers and farmer training in Musabeyli county and neighboring villages where pepper and grape cultivations were performed. Pilot study was applied on this subject in our country. It started in the Kumluca district of Antalya. It was aimed to protect the environment and plant health by preventing the use of pesticide packaging. It is known that the packaging and waste of plant protection products could be harmless by applying "triple washing method", which is valid in international publications, and are collected and recycled according to environmental legislation. As a result of farmer trainings, farmers who use pesticides in Kilis province showed a relevant and supportive approach to collecting and recycling waste packages. This study emphasized the importance of these studies in the farmers' training conducted by the agricultural engineers of the Kilis Agriculture Provincial Directorate in the villages.

Keywords: *Environmental pollution, pesticide waste, recycles agriculture.*

INVESTIGATION OF USE OF OUTDOOR ORNAMENTAL PLANTS ON EROSION CONTROL IN SEMI-ARID CLIMATIC CONDITIONS

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Abstract

As erosion is all over the world, it causes negative effects in every part of our life, especially agricultural activities in our country. The main cause of erosion in our country is considered to be the destruction of our natural assets. In our country, 14% mild, 20% moderate and 63% severe and very severe erosion processeshave been observed. Plants are used in many applications for reduction of erosion. In particular, outdoor ornamental plants that cover the soil surface are of great importance visually as well as protecting the soil against erosion. In particular ground cover of the outdoor ornamental plants and shrubs are preferred due to barriers to transport soil and sediment clutch. Some species are thought to cover the surface of the soil faster than pine species and prevent the surface from moving (e.g. Capparisspinosa (caper), Thymus (thyme), Thymbra spicata (thyme) at 20-30% sloping areas, Atriplex (salt bush), Carissa grandiflora (Formation plum), wild almond (Amygladus) shrubs such strains). In this study, it is stated that erosion affected areas in Kilis province were exemplified and that some pine and shrub species could be used for rehabilitation. The proposed ornamental plants were determined to be in the foreground with the visual form and the green area covered by the existing plants used against erosion. Placing one or several of the Plain and Shrub species among the pine species that are frequently used in erosion control efforts will be a new application form to provide erosion control.

Key words: *Ground cover plants, shrub, soil erosion, drought.*

PLANT SPECIES OF A RANGELAND CHARACTERIZED BY A LARGE AND RUGGED TOPOGRAPHIC FEATURE

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Abstract

Grasses species increase yield and stability of a rangeland, while legumes increase both productivity and nutritional value. Some species of other families may contribute to yield and quality of rangelands. The aim of this study was to provide information on species of a rangeland characterized by a large and rugged topographic feature and open to public grazing. Therefore, four rangeland communities were selected and sampled in 2015 and 2016, in Ladik-Akdağ in the Black Sea region of Turkey. Sampled species were classified as family group, response to grazing, growth form and grazing preference. Besides, quality categories of groups based on family and response to grazing were compared. A total of 105 plant species were identified within communities. Of the total species, 20 were of the family *Poaceae* (19.0%), 30 were *Fabaceae* (28.6%). Rests of the species belonged to other families (52.4%) dominated by families such as *Asteraceae* (23.6%) and *Lamiaceae* (10.1%), of which 26 species were weeds harmful to animals. While the percentages of decreaser, increaser and invader species were 19.1, 9.5 and 71.4, those of annual, biennial and perennial species were 29.5, 2.9 and 67.6, respectively. The legume (3.3±0.34) and other families (3.1±0.35) of species showed higher quality than grass (7.7±0.32) species. Decreaser (4.8±2.26) and invader (3.6±2.85) species had higher quality categories than increaser (5.5±3.06) species. These results can be used as a management tool to improve the rangeland quality and sustainability, because this dataset demonstrates the capacity for rangelandsas in the present study.

Keywords: *Rangeland improvement, Forage species, Response to grazing, Quality category*

FORAGE QUALITY OF CULTIVATED AND WILD-TYPES OF SOME PLANT SPECIES

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Abstract

During cultivar development, nutritive value and forage quality of cultivated forage species might be differed from that of wild-types. We tested this prediction by using nine forage species those were either wild-type collected from their native rangeland or cultivated-types grown in two field conditions. These species consisted of four legumes (*Lotus corniculatus*, *Medicago sativa*, *Trifolium pratense* and *Trifolium repens*), three grasses (*Dactylis glomerata*, *Festuca ovina* and *Lolium perenne*) and two other families (*Cichorium intybus* and *Sanguisorba minor*). The samples of both types were collected at five times by 15-day intervals from before-flowering stage to after-flowering stage in 2015 and 2016 and analysed for neutral detergent fiber (NDF), acid detergent fiber (ADF) and crude protein (CP). Then, forage quality indicators (FQI) such as digestible dry matter (DDM), dry matter intake (DMI), metabolizable energy (ME), relative feed value (RFV) and relative forage quality (RFQ) of species were calculated. The nutrient content and FQI differences between cultivated and wild-type species were in many variables significant. Despite higher vegetative development in most of the cultivated species, types did not reflect higher concentrations of ADF, CP and DMI in them. Most notable was the lower NDF content of cultivated species. In addition, DDM, ME, RFV and RFQ detected in these species were higher than in wild-types. The evidence from this study is that this difference is not only merely a result of forage species being cultivated, but also this might be a general native difference that deserves further study.

Keywords: *Fodder, Cultivation of species, Nutritive value, Forage quality indicators.*

EFFECT OF COCOA BEAN HULLS ON SENSORY PROPERTIES OF POUND CAKES AS FAT AND FLOUR REPLACER

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Abstract

The effects of raw and leached cocoa bean hulls were investigated as flour and fat replacer in pound cakes. While fat substitutions were applied for raw (RCBH) and leached (LCBH) grinded cacao bean hulls in the ratios of 30/70, 40/60 and 50/50, flour substitutions were also applied for 20/80, 30/70 and 40/60, respectively. Descriptive sensory analysis of raw and leached cocoa bean hull replacing fat and flour substituted cakes were evaluated and compared by principal component analysis. In both fat and flour substituted cakes, crumb brownness increased as the amount of cocoa bean hulls increased. Crumb brownness of flour substituted cakes produced with LCBH was higher than in those produced with RCBH, while fat substituted cakes produced with LCBH was found to be lower than those produced with RCBH. Cell uniformity and bitter taste of both fat and flour substituted cakes decreased when leached cocoa bean hulls were used. For fat substituted cakes, oiliness was perceived higher in RCBH cakes than in LCBH cakes. Hardness (hand) was also higher in fat-substituted LCBH cakes than in RCBH cakes, while it was lower in flour substituted LCBH cakes than in RCBH cakes. According to the principal component analysis, flour substituted RCBH cakes were separated from LCBH cakes in terms of sweetness, adhesiveness, cell uniformity, hardness (hand), cacao taste and bitterness. In fat substituted RCBH cakes were separated from LCBH cakes in terms of crumb brownness, cacao taste, bitterness, moistness, oiliness, cell uniformity properties. In conclusion, cocoa bean hulls as raw and leached types effected on descriptive sensorial properties. Those properties also showed difference in terms of substitution type. RCBH cakes had more advantages based on descriptive sensory analysis for flour and fat substituted cakes.

Keywords: *Cocoa bean hulls, Fat substituted cakes, Flour substituted cakes, Descriptive sensory analysis, Principal component analysis.*

TEMPORAL TRENDS OF REFERENCE EVAPOTRANSPIRATION IN AEGEAN REGION, TURKEY

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Abstract

The determination of reference evapotranspiration (ET_0) is essential for hydrological and water management studies. Especially, knowledge of temporal variation in reference evapotranspiration is critical to water resource management strategies, irrigation scheduling and water allocation to meet current and future crop water demand under changing climatic conditions. In this study, the data from 31 stations, with 42 years of data during the period of 1975–2016, were used for calculation of ET_0 in Aegean Region, Turkey. Reference crop evapotranspiration was calculated with the Penman–Monteith equation and statistically significant annual ET_0 trends were determined using nonparametric Mann-Kendall (MK) test at the 0.05 significant level. Additionally, the slopes of trend lines were computed using the Theil–Sen's slope estimator. The long-term average reference evapotranspiration in the Aegean Region is 1212,80 mm. Results showed that both statistically significant increasing (positive) and decreasing (negative) trends were observed in the annual ET_0. The trend analysis showed 15 of the 31 stations in the region had an increasing trend, which in 10 of these 15 stations was statistically significant. On the other hand, statistically significant decreasing trends were determined in 8 stations. The strongest positive trend was found in Bornova station with Theil–Sen's slope equal to 5.75 mm $year^{-1}$, and the strongest negative trend was found in Bodrum station as -5.00 mm $year^{-1}$.

Keywords: *Reference evapotranspiration, Trend analysis, Mann-Kendall, Temporal variability.*

CHEMICAL-FREE PARKS: A DEVELOPING CONCEPT

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Abstract

Parks and recreational places serve a wide range of aims for urban life, such as absorption of rainwater, reduction of urban heat, centre of community, clean air, mental health boost, physical activity, playground for kids and protection of the natural ecosystems in the cities. Because of their green structure, they host many pests and beneficial organisms. However, to create a general protection strategy for urban biodiversity is a very complicated issue, due to both natural processes and also antropogenic activities. The studies which were carried out in the cities were mostly and mainly focused on the natural habitats that were shattered by urban expansion such as forest areas and woodlands. But, the majority of the urban green areas consist of recreational areas and parks. Even if they have been modified and degraded, these unique areas are thought as an important source of the local biodiversity. Pests can cause not only unpleasant visuality and damages on the vegetation but also disturbance of visitors. In general, pest control is mainly based on chemicals which are very toxic for all living things especially for children and animals. Although there is a decrease in pesticide treatments in parks, synthetic pesticides are still used when necessary to control serious pest infestations. But, it is necessary to take precautions against pests with environmental friendly methods. These methods include cultural, mechanical, physical, biotechnical control and using of biopesticides (microbial organisms, plant extract and essential oils etc.). In recent years, the idea of chemical-free parks has become more attractive and widespread. In this study, alternative management methods and essentials of chemical-free parks will be discussed.

Key words: *Parks, recreational areas, pesticides, chemical-free, pest control methods.*

SUBSURFACE DRIP IRRIGATION SYSTEM

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Abstract

Irrigation is needed when rainfall is inadequate to meet plant water needs to increase efficiency in agricultural production. However, the water to be used in irrigation should be given to the root of the plant at the right time and in the right amount. For this purpose, various irrigation methods and systems have been developed. One of the systems that enables to save irrigation water within the developed irrigation systems and helps water directly reach the root zone is the subsurface drip irrigation (SDI) system. On the other hand, SDI systems, besides their many advantages, cannot provide expected benefits especially due to malpractices in operation, maintenance and installation of the system. Due to the simple faults and carelessness in the installation and operation of SDI systems generally installed with high costs and high expectations, SDI systems can sometimes become unusable. Designing a successful SDI system facilitates management and maintenance. It is not enough to design SDI systems properly. Besides the correct installation of the system, high efficiency can be obtained from the products grown under correct maintenance and operation conditions. In addition, it is possible to save irrigation water used in production. For this reason, the issues that need to be considered in the design and operation of subsurface drip irrigation systems (SDI), which have been widely used in irrigation in recent years, are discussed in this study.

Keywords: *Agricultural production, Irrigation method, Plant root zone*.

IRRIGATION IN MELON CULTIVATION

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Abstract

As in many cultivated plants, the irrigation of the melon plant when the water needs cannot be met in natural ways causes significant increases in crop yield. However, when the water resources are limited or the irrigation costs are high and when the amount of irrigation water used is reduced, the water requirement of the plant is incomplete. In such cases, there is a need to develop practices that can save irrigation water without causing a significant decrease in the yield and the yield quality. One of the practices that can save irrigation water is irrigation schemes. Particular irrigation schemes can be applied during the whole developmental period of the plant and at certain stages of the developmental period. There are many pieces of researches conducted on melon cultivation under deficit irrigation practices. The aim of this study is to determine the periods during which the plant is most sensitive to the water shortage. Thus, irrigation schedules that will save the most irrigation water used, with the least possible loss in yield and yield quality are determined. In addition, possible responses of the melon plant such as water consumption under furrow and drip irrigation methods have been investigated. Thus, it is aimed to determine the best irrigation method in melon cultivation. In this article, some researches on melon cultivation under different irrigation methods and different irrigation treatments have been evaluated.

Keywords: *Crop yield, Water resource, Deficit irrigation.*

EFFECT OF WATER STRESS ON THE CHLOROPHYLL CONTENT OF THE PEPPER PLANT

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Abstract

Pepper which belongs to *Solanaceae* family *Capsicum* variety is one of the most consumed vegetable in Turkey and in the world. The most consumed species is *Capsicum annuum* L. Food and Agriculture Organization stated that the irrigation needs to be more efficient in order to meet the water needs of the year 2050. For this reason, it is important to develop new irrigation methods to prevent excessive water use. Deficit irrigation is one of these strategies that effect the yield in minimal and water-saving by increasing the water use efficiency. Drought is one of the factors affecting photosynthesis and chlorophyll content. Previous studies have shown that leaf water potential, leaf relative water content and photosynthesis are affected with water stress in pepper plant. Photosynthesis are directly related with chlorophyll fluorescence. Chlorophyll is a green molecule in plant cells which plays important role in photosynthesis process. It absorbs sunlight and uses its energy to synthesis carbohydrates from CO_2 and water. Due to decrease in leaf water content chlorophyll synthesis rate is slow and chlorophyll degradation rate is increased. Chlorophyll a and b are the most important kinds of chlorophyll situated in plants. Chlorophyll fluorescence is a measure of the efficiency of photosynthesis and can be used, therefore, as an indicator of vegetation health and vitality. Therefore, chlorophyll content is one of the important factors that should be examined to determine plant stress conditions. For this purpose, the aim of this study was to compile the studies about the effect of water stress on the chlorophyll content of the pepper plant.

Keywords: *Chlorophyll, pepper, photosynthesis, water deficit, water use efficiency.*

SWOT ANALYSIS OF STUDENTS IN TERMS OF ENVIRONMENTAL PROBLEMS

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Abstract

As globalization and global problems are increasing, the burden of responsibility for environmental problems is increasing. Individuals are not competent to recognize environmental problems, focus on the environment, develop positive attitudes towards the environment, and be environmentally conscious or to minimize environmental problems or minimize their impact. In this context, SWOT analysis was carried out in order to realize the aim of university students in order to cope with environmental problems in this research. When they encounter an environmental problem, they try to uncover it by grouping them with strong (S), weak (W) directions and opportunities (O) and threats (T) that they feel they have to remove it or reduce their impact most. This research was carried out for students in different departments at Kastamonu University. A personal SWOT analysis scale was used to collect data in the study. Research data were analyzed by content analysis and grouped and revealed how university students identified themselves to deal with environmental problems.

Keywords: *Environmental problems, Environmental Perceptions, SWOT Analysis.*

NON-PARAMETRIC ANALYSIS ON VARIABILITY IN HYDROLOGIC VARIABLES

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Abstract

The unnatural change in the globe under influence of devastating global warming has been quashing the overall functioning of ecosystem since industrial revolution. Thus, the human-induced disaster caused by proportional increase of greenhouse gases in the atmosphere has affected the normal functioning of hydrologic cycle. Under the undesirable condition, the amount of hydrologic variables began to diverge over time. Hydrologic variable should be homogeneous for the reliability of hydraulic structure while predicting necessary design criteria for its construction. Therefore, the test of whether this requirement is true should be performed in the context of any given hydrologic data's homogeneity before being passed to the implementation of statistical approaches to the data. The study carried out in Yesilirmak basin was realized on homogeneity of seasonal maximum streamflow data from eight gauging stations operated by The General Directorate of State Hydraulic Works (DSI). Yesilirmak River basin area is approximately 5% of surface area of Turkey. Yesilirmak River is one of the major rivers of Turkey and its long is 519 kilometers. There are three main tributaries of the Yesilirmak River, named as Kelkit, Cekerek and Tersakan. Its water is mostly used for purposes as irrigation, drinking, fisheries and wildlife. The non-parametric procedures, called as standard normal homogeneity, Pettitt, Buishand range and von Neuman ratio were used for this reason. Statistically significant inhomogeneity with respect to the all of the statistic tests taken into account in the study was detected in the considered streamflow data sequences presented.

Keywords: *Streamflow, homogeneity, standard normal homogeneity, Buishand range, von Neuman ratio tests.*

ASSESSING GREENHOUSE GAS EXCHANGE OF AGRICULTURAL CROPS BY FLUX MEASUREMENTS IN THRACE PART OF TURKEY

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Abstract

Agriculture plays an important role in the global greenhouse gas (GHG) budget and its cycle. CO_2 is one of the most important greenhouse gases, and plants release CO_2 into the atmosphere by respiration and sink it by photosynthesis from the atmosphere. In addition, soil has an essential role in this exchange. Unfortunately, studies on the measurement of greenhouse gases above agricultural crops in internationally accepted methods are not sufficient, especially in developing countries. Thus, it is a clear need to determine carbon exchange of agricultural crops and activities (sink and emission) by taking into consideration of the specific conditions such as climate, crop variety, soil etc. Eddy Covariance (EC) is one of the widely used micrometeorological methods in the world for flux measurement studies. Developments in measurement and analysis by instruments have allowed this method to be applied more by researchers for the studies on GHG exchange. In this research, carbon exchanges (sink and emission) of watermelon grown in Atatürk Soil, Water and Agricultural Meteorology Research Institute located in the Thrace part of Turkey, was measured using the Eddy Covariance method. Finally, estimated gas exchange above crops will be presented.

Keywords: *Carbon, Greenhouse Gas, Micrometeorology, Agricultural Meteorology, Flux*

THE DETERMINATION OF URBAN GREEN SPACE IN TERMS OF ACCESSIBILITY ANALYSIS USING GIS FOR SINOP

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Abstract

An urban green space distribution of active and functional and aesthetic qualities of size and systematic planning will be possible with the development of an urban design concept. The adequacy of the standard value of green space is usually specified in the relevant legislation and comparing it with the amount of green space available per city are defined. Size and decreasing rates per person evaluated. Even distribution of distance and accessibility of green space throughout the city is closely related to the need to provide entertainment. Different sizes of green space, recreational activities and accessibility standards unit varies depending on the city they serve. In this research, Sinop green field distribution and distribution of the amount of green space in the neighborhood, as well as scale are analyzed. According to the digitization of parks composed of polygons in the ArcGIS attribute table for calculation, parks in the study area consist of 30 different parcels, 12 of which are 10000 m^2 or less in area. Most small parklands were 1.296 m^2; the largest urban park is at the southern entrance of the city, with an area of 5.624 m^2. Parks in the study area cover a total area of 8.358 m^2.

Key words: *GIS, Sinop, green space, urban city, sustainable*.

MACRO NUTRIENT STATUS OF SOIL AND YIELD IN RESPONSE TO COMPOST MATERIALS

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Abstract

There are large quantities of plant residuals depending on the climatic conditions and product diversity in the agricultural areas of Turkey. The purpose of this study was to compare the effects of composted plant residuals and farmyard manure on macro nutrient composition of soil and crop yield. Farmyard manure (FYM) and plant residuals (PR) were applied after composting, while mono-ammonium phosphate, potassium sulfate, ammonium nitrate, potassium nitrate, and calcium nitrate were used at different concentrations as chemical fertilizers (NPK). The treatments; (1) Control, (2) 40 t/ha FYM, (3) 40 t/ha PR, (4) 40 t/ha FYM + NPK, (5) 80 t/ha PR + NPK were arranged in complete randomized block design with three replicates. The experiment was carried out in Kutahya, Turkey. Disturbed soil samples were removed (0-30 cm) from each treatment in two vegetation periods in the study. According to the results, macro nutrient composition of soil samples increased by the treatments when compared to the control. Additionally, crop yield was positively affected by applying these organic materials to the soil.

Keywords: *Farmyard manure, Macro nutrients, Plant residuals, Yield.*

UTILIZATION OF QUINCE PEELS

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Abstract

The production amount of quince was 112 900 tons in 2015 and Turkey ranks 1st in the world production. This study focused on the investigation of phytochemicals and antioxidant properties and the evaluation of bacterial cellulose (BC) production from quince peels with *Komagataeibacter hansenii* GA2016. In addition, physical, chemical, structural and thermal properties of the BC were determined and compared with BC produced in the Hestrin-Schramm (HSBC) and plant cellulose (PC). It was determined that ethanol was a suitable solvent for the extraction of phenolic compounds and that 50% ethanol concentrations were better than other concentrations. In addition, this study showed that quince peels were an important potential source of phenolic compounds, which were cheap and reliable sources of natural antioxidants that could be used in food. The present study showed that cultivating the bacterial strain *K. hansenii* GA 2016 in the quince peel hydrolysates as the sole source of nutrients, the production of bacterial cellulose with high yield was accomplished. BC from quince peels had superior features such as high yield, high crystallinity, thermal stability, liquid holding capacity and thin fibers. In addition, it was found to have higher water, acetone, dimethyl sulfoxide and acetic acid holding capacity than HSBC, higher thermal stability than HSBC and PC and thinner average fiber diameter than HSBC and PC.

Keywords: *Quince wastes, Exopolysaccharide, Phenolic, Bacterial cellulose, Characterization.*

ANTIDIABETIC PROPERTIES AND PHYTOCHEMICAL CONTENT OF POMEGRANATE PEEL

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Abstract

Phytochemicals, which are present in fruit and vegetables, may provide desirable health benefits, beyond basic nutrition, such as reducing the risk of cancer, cardiovascular diseases, stroke, alzheimer, or some of the functional declines associated with aging. These organic compounds represent a source for the discovery and development of new types of antidiabetic molecules. Pomegranate (*Punica granatum*), member of the *Punicaceae* family, has been known since ancient times and widely consumed by many cultures for thousands of years. In this study, pomegranate peels were extracted with ethanol at different concentrations and the phytochemical screening and antidiabetic properties of the extracts were examined. It was determined that pomegranate peel was rich in carotenoid, ascorbic acid and phenolics. The phytochemicals of pomegranate peel was extracted with aqueous ethanol and it was observed that extracts contained phenolic, quinone, cardiac glycoside, terpenoid, coumarine, and tannin. Antidiabetic activities of pomegranate peel extracts were measured against two different α-amylase (pancreatic and fungal α-amylase) and α-glycosidase and the results were compared with acarbose, synthetic amylase inhibitor. The pomegranate peel extracts showed high inhibitory activity against both α-amylases and α-glycosidase. The results showed that extract was found to have antidiabetic activities, and thus it could be used to control postprandial hyperglycemia in type 2 diabetics. Pomagranate peel could potentially be used as an important source both in the food and non-food industries.

Keywords: *Pomegranate peel, Antidiabetic, Phytochemical, Amylase.*

SOME PERFORMANCE INDICATORS OF SPRINKLER IRRIGATION SYSTEMS ON THE SANDIKLI PLAIN (TURKEY)

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Abstract

Irrigation is one of the indispensable yield-increasing elements in agriculture especially in arid and semi-arid regions like Turkey. To obtain the benefit expected from irrigation, water use parameters, system designing-projecting criteria and system performances should be determined both at irrigation schemes and – on the parcel scale – in individual irrigation systems. For this purpose, this study was carried out to evaluate some performance indicators of sprinkler irrigation systems on the Sandıklı Plain in Afyonkarahisar, Turkey; to determine the performance of those systems; and to find out what precaution should be taken to increase the efficiency of the systems. The fieldwork of the study was performed on the field including the Koçhisar, Ülfeciler, Örenkaya, Kusura, and Ballık Villages of Sandıklı in 2012. For this purpose, 15 sprinkler irrigation systems were selected in regions where potato cultivation was intense, representing the Sandıklı Plain. Christiansen uniformity coefficient (CU), distribution uniformity (DU), sprinkler pressure as well as sprinkler head displacement and change were evaluated for each system. The water distribution uniformity was determined by doing single lateral line water distribution tests. Average sprinkler flow rates and soil infiltration rates were found between 6.84 and 37.46 mm/h and between 8 and 23 mm/h, respectively. Christiansen uniformity coefficient (CU) ranged from 44 to 86% and distribution uniformity from 25 to 84%. Furthermore, it was determined that the pipe diameters in 4 systems were poor and 11 operators were found within the acceptable level. Considering these obtained results, there may be increases in Christiansen uniformity coefficient and distribution uniformity values in the event that producers make improvements in their irrigation systems. These improvements in the performance indicators will enhance the efficiency in water use.

Keywords: *Sprinkler irrigation system, Christiansen uniformity coefficient, Distribution uniformity, Potato.*

MULTIPLE APPROACHES TO SUSTAIN OGALLALA AQUIFER IN THE SOUTHERN GREAT PLAINS OF THE UNITED STATES OF AMERICA

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Abstract

Ogallala Aquifer, the largest in the country, has converted Southern Great Plains (SGP) from Dust Bowl of the 1930's to one of the most productive agricultural regions in the world. However, over exploitation is depleting the aquifer very fast and without research intervention nearly 35% of the land in SGP is expected to be converted to dryland agriculture in a few decades. Our research program focuses on using multiple strategies to improve water use efficiency of our irrigated agriculture. Crop diversification is assessing lower water using, deeper rooted, broad leaf crops like winter canola, safflower and guar in predominantly cereal based cropping system region. These crops are expected to offer multiple rotational benefits and use soil water resources differently compared to traditional cereal crops. Critical growth stage based deficit irrigation management can further reduce water use and increase water use efficiency to make them suitable in a cropping system. Studies on above different alternative crops have shown that each crop has different water use strategies and their yield formation respond to irrigation strategies differently. Innovative cropping systems like Circular Buffer Strips (CBS) and cereal-legume intercropping systems have potential of improving forage quality, improve system resource use efficiency and improve many ecosystem services. Highlights of some of the studies will be summarized in the manuscript.

Key words: *Crop Diversification, Circular Buffer Strips, Deficit Irrigation, Water Use Efficiency, Sustainability.*

SUITABLE LANDSCAPE PLANNING AND MANAGEMENT OF BIOCOMFORT MAPPING FOR SINOP

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Abstract

People experience nominal temperature, precipitation, and humidity, and in certain ranges of environmental conditions, such as wind, they feel healthy and dynamic. In the appropriate range for the people of these values, it is called biocomfort. When biocomfort will be in the range of fair value, people in the area would become bothered and want to get away from the area. Hence, biocomfort areas used for tourism are important. In this study, biocomfort is examined by mapping the Sinop, and thus, this study aims to build pad similar studies in urban or forest areas with similar structures. To this end, the climatic data of Sinop are obtained; based on the equivalent temperature from the physiological index, biocomfort maps are prepared. To determine the structure of the biocomfort field, climatic data are collected from meteorological stations. The obtained data are evaluated using the RayMan 1.2 program, and geographic information system is used to produce a thermal perception map with the help of a software. As a result, the most appropriate time and area for outdoor recreation activities are identified by thermal perception maps.

Key words: *landscape plan; forest; Sinop;, biocomfort.*

TRACE ELEMENTS DISTRIBUTION IN HEIRLOOM PADDY PANDASAN CULTIVATED UNDER FIELD CONDITIONS OF DRY AND WET SOIL

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Abstract

Trace elements phytoavailability depends on the physical and chemical properties of soil. At the Crocker range of West Coast Sabah, Malaysia, the *Pandasan* paddy variety can be cultivated as flooded rice paddies or upland rice on acidic soil. *Pandasan* paddy samples were collected in Kiulu subdistrict from traditional farmer at two different locations. Available sources of trace elements were from weathering, fertilizers and pesticides. Soil and plant samples were collected after two months of seed sowing and during harvest season which was five months old for heavy metal analysis by inductively coupled plasma optical emission spectrometry (ICP-OES). Translocation factor of arsenic from root to grain indicated this trace element was very mobile in *Pandasan* paddy cultivated at dry soil compared to wet soil followed by zinc. Although, cadmium was not detected in paddy cultivated at flooded field for both, soil and plant, cadmium was detected in soil and plant roots cultivated in dry condition. Enrichment factor results suggested that *Pandasan* plant cultivated on dry soil was only a good bioindicator for lead and zinc. *Pandasan* grain was rich with iron followed by zinc. Selected heavy metals accumulation in *Pandasan* grain cultivated in flooded field did not exceeded the permissible limit of Malaysia Food Regulation 1985. However arsenic and plumbum concentration in *Pandasan* grain harvested from dry soil exceeded the permissible limit of Malaysia Food Regulation 1985. Health risk of heavy metals toxicity can be reduced if *Pandasan* paddy is cultivated in flooded field compared to dry soil.

Keywords: *Phytoavailability, food safety, heavy metal, upland paddy, Borneo.*

ESSENTIAL AND TOXIC TRACE ELEMENTS IN SOILS OF BANJA LUKA REGION IN BOSNIA AND HERZEGOVINA

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Abstract

Soil chemical composition of arable lands in RS has been analyzed, with the aim to study its potential for protein and oil crop production. In a first approach, soil samples (depth 0-30 cm) were taken at six experimental sites located in Banja Luka (BL) area, Entity of Republika of Srpska, during autumn 2017. After undergoing total acid digestion, contents of 53 elements have been determined using the ICP-OES / ICP-MS methods. Sixteen elements playing an essential role in nitrogen fixation and methanogenesis – some being toxic in high concentrations – were selected for biometrical analyses (mean values, coefficients of variance, correlation diagram). Compared with soils of other European regions, contents of the ferromagnetic elements iron (Fe), cobalt (Co) and nickel (Ni), the heavy metal manganese (Mn) and the transition element molybdenum (Mo) were 3- to 6-fold higher in BL soils. Statistically significant correlations were found between Co, Fe, and Mn each. Coefficients of variation showed a relatively high homogeneity in the distribution of these three elements. It is known that the elements mentioned are essential for *Archaeobacteria* in methanogenesis, as well as for Eubacteria *Rhizobium/Bradyrhizobium* in symbiontic nitrogen fixation. These findings open an access to new research areas in plant science based upon the geologically very specific characteristics of RS/BL soils, underlining the necessity of linking a planned National Protein Crop Strategy with advanced bioenergy production technology.

Key Words: *soil, trace elements, statistical analyses, nitrogen fixation, methanogenesis.*

5. ANIMAL HUSBANDRY

STATE OF PLAY AND RECOMMENDATIONS CONCERNING THE SANITARY QUALITY OF DRINKING WATER FOR SHEEP AND GOAT FARMS IN THE COMMUNE OF AIN ZAATOUT

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Abstract

The scientific and technical study on the sanitary quality of drinking water for farm animals is intended to assess the level of risk (identification of biological, chemical and physical hazards). In order to show the inventory of livestock (sheep and goats) of the municipality of Ain Zaatout, a field survey was carried out on a set of farms in terms of water and water installation (watering). We were interested in the origin of the drinking water, the number and the hygiene of the drinkers as well as their load. The evaluation of the sanitary quality of the water in the farms requires the carrying out of bacteriological and physicochemical analyzes at the level of the boreholes, the sources of water and the drinkers on these exploitations in order to detect the levels of contamination of the farms drinking water and degree of drinkability. The work carried out has allowed us to classify drinking water in this town as water of good bacteriological quality and of average physico-chemical quality which therefore requires giving recommendations and suggestions to ensure a good behavior of the farms through the improvement of the sanitary quality of water (nutrition) which protects animal health and animal production (sheep and goats) therefore.

Keywords: *drinking water, bacteriological quality, physicochemical quality, sheep, goats.*

PERFORMANCE CHARACTERISTICS AND THE EFFECT OF TWO-WAY SELECTION OF THE BARBARY PARTRIDGE (*ALECTORIS BARBARA*) IN CAPTIVITY

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Abstract

Since 2000, an effort has been made to obtain a Barbary partridge population for restocking. We collected data on the characteristics of the performances of our captive population during three years of experimentation (2012, 2013 and 2014) from the program initiated for the Algiers region. In addition, we conducted a detailed study on the two-way selection, based on the expression of the slow feathering allele (KK) and the fast one (kk). Our results for the performance traits showed that during the year, the average number of egg / female in 2013 (17.46) was higher than the year 2012 and 2014, because of the disturbances recorded during these years, and the fertility of eggs during the three years of our experiment with an average rate of 82.27%. The effect of bidirectional selection based on the expression of the slow feather allele (KK) and fast allele (kk) was marked by the appearance of the fast feathering genotype determined by the recessive allele (k).The results obtained from three (3) generations F12-13-14 showed that 80% of chicks belong the fast line and 20% belong the slow line.

Keywords: *Barbary partridge, line, population, allele, generation.*

POPULATION STRUCTURE OF THE ENDEMIC NERETVA RUDD (*SCARDINIUS PLOTIZZA*) FROM THE DERANSKO LAKE, BOSNIA AND HERZEGOVINA

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Abstract

The Neretva rudd (*Scardinius plotizza*) is an endemic species, which lives in the watercourses of the Neretva river basin in Bosnia and Herzegovina and Croatia. Population structure was studied on 55 individuals caught by gill nets at Deransko Lake. The aim was to determine the population structure according to length and mass, and relationship between the length of gut and total body length. The results are presented in the form of frequency histograms, linear and mass structure, and the regression relation between total body length and length of gut. Individuals with total body length of 22-24 cm were dominant, with maximum total length of 40.4 cm. The maximum recorded weight was 1127.7 g. The frequency histogram of body mass showed that weight class 100-200 g dominated, too. Positive allometric growth with high b-value of 3.25 was determined. Coefficient of correlation (r=0.99**) shows full relation connectivity between total body length and length of gut. This research provided new results on structure of population of the endemic Neretva rudd.

Keywords: *Neretva rudd, population, length, body, Deran Lake.*

EFFECTS OF TURKEY'S AGE ON THE MAIN EGG INCUBATION INDICATORS AND THEIR PHENOTYPE CORRELATION

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Abstract

With an aim to determine the phenotype correlation between certain incubation characteristics of the line hybrid British United Turkey (BUT) Big 6 eggs, a study was conducted of two groups of eggs laid by turkeys of 34 (TA_{34}) and 45 (TA_{45}) weeks of age. Average egg mass before incubation was 80.37 g (TA_{34}) and 85.71 (TA_{45}), and average mass of newly hatched turkey poults was 52.62 g and 55.80 g. Differences were statistically very significant ($P<0.001$). Absolute and relative egg mass loss until day 25 of incubation was also larger in case of the older turkey flock. Egg mass loss until day 25 was 9.20 g and 11.41% (TA_{34}), and 11.41 g and 12.38% (TA_{45}). Observed differences were statistically significant ($P<0.001$). In contrast to the previous indicators, difference in the relative share of the poult in the egg mass (0.38%) was not significant ($P>0.05$). Turkey's age significantly affected egg mass and poult mass increase, absolute and relative loss of egg mass from day 25 of incubation, while the poult percentage in the egg mass was similar in both age groups of turkeys. Apart from the turkey's age having impact on the increase of the average egg mass, the egg mass also had significant impact on other observed indicators during the incubation period. These statements are confirmed by the calculations of the phenotype correlation coefficients between the observed indicators as well as most of the results of other authors (researchers) who studied this matter related to turkey and other poultry's eggs.

Key words: *turkey age, eggs, turkey poults, phenotype correlation, British United Turkey hybrid Big 6.*

INFLUENCE OF SEX AND TYPE OF BIRTH OF THE KIDS ON THE GESTATION LENGTH OF BULGARIAN WHITE DIARY GOATS

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Abstract

The data from the records obtained of the herd books of the Research Institute of Mountain Stockbreeding and Agriculture in Troyan (Bulgaria) for the pregnancy and birth of 148 goats of Bulgarian White Diary were used to determine the influence of sex and the type of birth of kids on the gestation length of the same goats. Kidding was in February and March during the period 2017-2018. Very low variation in the gestation length of the Bulgarian White Dairy goats was established, depending on the parity, the birth weight of the kid, the sex and the type of birth.There was a difference in the average gestation length between goats kidded single and goats kidded twins. The average gestation length for all single born kids was 151.8 ± 0.4 days and for the twins was 150.8 ± 0.3 days. There was no significant difference between the gestation length between males and females single born kids (151.9 ± 0.6 days for males and 151.7 ± 0.7 days for females, respectively). There was a difference of 1 day between the gestation length for the male and female twins (male 150.3 ± 0.7 days and female 151.3 ± 0.6 days, respectively). Gestation length in twins with different sex continued on average 150.9 ± 0.4 days.

Keywords: *Goats, Gestation length, Sex, Type of birth.*

LYMPHOCYTE TRAFFICKING FOLLOWING ACUTE STRESS AND ALTITUDE HYPOXIA IN LOW AND HIGH HEMATOCRIT SHEEP

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Abstract

The object of the present study was to investigate small and large lymphocytes trafficking in sheep with low and high hematocrit values following shearing, exposure to moderate altitude and transport to low altitude. Twenty out of 101 Ile de France ewes (1-7 years old) were used in the present experiment. All ewes of the flock were artificially inseminated in May 2015 following estrus synchronization. The animals were allocated into two groups following threefold measurements of hematocrit in all ewes as follows: I- low hematocrit group (n=10) and II - high hematocrit group (n=10). The ewes were transported to the Petrohan Pass (1440 m above sea level) in June 2015 immediately after shearing, conducted at the experimental farm of the Institute of Animal Science, Kostinbrod (500 m above sea level). Blood samples were collected before shearing, immediately after shearing, 3 h after shearing, at 14 d following exposure to moderate altitude, immediately after transport to low altitude and following 7d of stay at low altitude. All leukocyte subpopulations were counted microscopically. In the current study we presented the percentage of lymphocytes only, including small and large (reactive) lymphocytes. High and low hematocrit ewes had different percentage of small lymphocytes when exposed to various acute and chronic stress stimuli. There were significant differences in the percentage of large (reactive) lymphocytes between low and high hematocrit ewes following blood collection and immediately after shearing. The observed difference in small lymphocyte dynamics among the groups in response to different stress stimuli was attributed to hematocrit related differences in the time course and magnitude of lymphocyte distribution at early and late phases of stress. The results were interpreted to mean that the differences in lymphocyte trafficking between the two groups of sheep in response to stress were related to possible difference in the share of aerobic and glycolytic pathways for energy supply.

Key words: *small lymphocytes, large lymphocytes, hematocrit, sheep, stress.*

COMPARISON OF PHYSICAL-CHEMICAL INDICATORS OF DIFFERENT MUSCLES OF CARCASS OF FATTENED CALVES OF HORNLESS HERFORD, ABERDEEN-ANGUS AND LIMOUSINE BREEDS

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Abstract

A comparative analysis of physical-chemical indicators of different muscles [*m semitendenosus*, *m. semimembranosus* and *m. longisimus dorsi*] was made from the carcass of fattened calves of Hornless Hereford, Aberdeen-Angus and Limousine in the meat farm of the Experimental Base at the Research Institute of Mountain Stockbreeding and Agriculture in Troyan, Bulgaria located in the mountain region. Breed and sex affected the main indicators characterizing the physicochemical and quality composition of the meat. Based on the water-holding capacity indicator in %, the best results were found in the fattened calves of Aberdeen-Angus in the three studied muscles. They surpassed Hornless Hereford calves, respectively with 4.09%, 7.48% and 2.36%, and Limousine calves with 11.90%, 17.38% and 13.50%. The muscles of calves from Hornless Hereford had the highest significance of tenderness in penetrant units, followed by the calves of Aberdeen-Angus and Limousine ($P<0.001$). Protein content had higher values in Limousine calf muscles. The superiority of *m. semitendinosus* is 1.85%, with *m. semimembrenosus* by 0.92% and at *m. longisimus dorsi* was 2.21% of Aberdeen Angus breed. Compared to the muscle content of calves of Hornless Hereford, the values were relatively the same for *m. semiteenosenosus*, and the superiority is 0.92% for *m. semimebranosus* and 1.07% for *m. longisismus dorsi* ($P <0.001$). The fat in the carcass muscle of Limousine calf had the highest values 1.61%, 1.71% and 2.49%, followed by the fat in the muscles of calves of Aberdeen Angus and Hornless Hereford ($P<0.001$).

Keywords: *meat, collagen, calves, meat breeds, muscles, samples.*

EFFECT OF FEEDING WEANED AWASSI MALE LAMBS WITH FABA BEANS (*VICIA FABA*) AS COMPARED TO SOYBEAN MEAL ON BODY PERFORMANCE

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Abstract

As the world population continues to increase, so does the demand for protein. Researchers predicted that traditional sources of protein for livestock would become increasingly scarce because of the need to feed a progressively larger human population that will compete with an expanding intensive livestock industry that is being forced to exclude animal protein sources in animal feeds. As a result, a considerable effort has been made to explore the use of plant proteins that can be grown in areas where soybeans are not agronomical successful. A trial was conducted in "Al Jarrah animal farm" during May- July of 2016 at Bekaa Valley for 8 weeks to fatten fifteen male Awassi sheep lams after weaning fed concentrate mix containing soybean meal (SBM) and Fava seed meal (FSM) as legume-protein source in different proportions in isocaloric and iosprotienic rations. Five different rations were under investigation were fed to five groups by three lambs each under the same management and environmental conditions: A1 (25% SBM: 75% FBS), A2 (50% SBM: 50% FBS), A3 (25% SBM: 25% FBS), A4 (100% FBS: 0% SBM) and A5 –control (0% FBS: 100% SBM). Best results were obtained in group A2 and A3 with feed conversion ratios (FCR) 4.6 and 4.4, final live body weight gain (LBWG) 10.9 and 10.8 kg and profit of 1.27 $/1 kg of LBWG and 1.19 $/1 kg of LBWG, respectively. No signs of antinutritional or gastro-intestinal disturbances were observed among all experimental groups.

Keywords: *Awassi lambs, Faba beans, Soybean, Body performance.*

DIFFERENCE IN THE CARCASS QUALITY AND MEAT CHEMICAL COMPOSITION IN TWO LINES OF SLOW-GROWING CHICKENS WITH OR WITHOUT ACCESS TO PASTURE

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Abstract

The study was carried out to compare the carcass quality and the chemical composition of breast and thigh meat in two lines of slow-growing male chickens - La Belle (LB) and Bresse Gauloise (BB) reared conventionally or outdoors, having access to pasture. The birds were slaughtered at 12 weeks of age. Two-way ANOVA was used to assess the effect of the rearing strategies as well as the line on the carcass quality and meat chemical composition. Rearing system affected significantly the carcass traits of the birds. The lines reared on pasture had lower live and carcass weight as well as lower dressing percentage ($P<0.001$). On the other hand they had higher percent ($P<0.001$) of the edible by-products (neck and giblets). The percentage of the breast meat was significantly reduced in the birds that had access to pasture ($P<0.001$), while thigh remained unaffected. The pastured chickens displayed higher part of the wings ($P<0.01$). Outdoors rearing influenced the chemical composition in the breast and thigh meat of the lines. Chickens reared on pasture were characterised by lower lipid content ($P<0.01$) in breast and reduced protein in thigh ($P<0.05$), as well as increased moisture in both kinds of meat, however depending on the line ($P<0.05$). Furthermore, pasture access resulted in reduced ash content of the breast meat ($P<0.001$), which was lower in the LB chickens ($P<0.01$), while in thigh this parameter was strongly determined by the interaction of the rearing system and line of the birds ($P<0.01$).

Keywords: *Slow-growing lines, Carcass, Meat, Indoors rearing, Pasture access.*

THE IMPACT OF DIFFERENT PROTEIN CONTENT OF POLLEN ON HONEY BEE (*APIS MELLIFERA* L.) PRODUCTIVITY

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Abstract

The objective of the study was to investigate the impact of the protein content of pollen on the productivity of the honey bee (*Apis mellifera* L.). The protein content of the pollen influenced the productivity of the honey bees. The productivity of the bee colonies is higher, when honey bees collect pollen with higher protein content. The protein should be taken into consideration as an essential factor influencing the productivity of honey bee colonies. The pollen collected in different periods of the year has a different protein value for honey bees. The protein content in the examined samples throughout the three seasons ranged from 13.9% to 27.8%, and the average value was 20.9%. During the period when flowering plants provide pollen with protein content over 23%, honey and pollen productivity are higher than during the period when they provide pollen with protein content less than 20.6%. There is a relationship between the nutritional value of pollen and the productivity of bee colonies. The dynamic rainfall leads to increasing the moisture content of the soil and as a result it influences the flowering intensity of a great number of plants. The dynamics of the ecological factors- rain, temperature and humidity can favor or hamper the development of different plant species.

Keywords: *Apis mellifera, honey bee, impact, protein content, productivity*.

EFFECT OF MORINGA OLEIFERA LEAVES SUPPLEMENTATION ON BEHAVIOUR AND GROWTH PERFORMANCE OF NILE TILAPIA (OREOCHROMIS NILOTICUS)

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Abstract

The current study was carried out to investigate the effect of Moringa oleifera leaves supplementation on behaviour and growth performance of Nile Tilapia. Fish were classified to three groups (n=20/group, 2 replicates). First group fed on commercial diet. Second and third groups fed on 10% and 20% Moringa processed diet, respectively. Behavioural patterns, body weight, weight gain, relative growth rate, feed conversion ratio, some biochemical parameters and water quality were recorded. Results revealed that adding of Moringa by two different concentrations significantly reduced aggressive behaviour of fish in general. In addition, Moringa 20% significantly decreased body weight of fish after 10 weeks of supplementation. Moringa supplementation had no significant effect on liver enzymes, total proteins, albumins and globulins. However, fish fed with Moringa had lower serum glucose level than fish that was not fed with Moringa. Moreover, adding of Moringa in both concentrations (10 or 20%) decreased nitrite and nitrate of water in comparison with control group. Dissolved oxygen and pH of water were not affected by Moringa supplementation. It was concluded that Moringa supplementation had a favorable effect on Tilapia fish behaviour by reducing level of aggression. Also, Moringa supplementation could be used in improving water quality parameters by decreasing nitrite and nitrate levels. Generally, Moringa is nutritionally rich and can be included in fish diet at 10% levels that had no adverse effect on fish body weight.

Keywords: *Moringa oleifera, behaviour, growth performance, Nile Tilapia.*

EFFECT OF PURSLANE EXTRACT AND PROBIOTIC ON ENERGY AND PROTEIN UTILIZATION OF BROILER CHICKENS IN HIGH STOCKING DENSITY

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Abstract

This study evaluated the effects of purslane extract and probiotic on energy and protein utilization, droppings characteristics and welfare related parameters of broiler chicks under high stocking density. A total of 280 one-day-old broiler chicks were used in a completely randomized design with five treatments and four replicates per each. Dietary treatments included: 1) positive control (PC; 10 chicks/m ^{2}), 2) negative control (NC; 15 chicks/m ^{2}), 3) NC + 500 mg/kg purslane extract (PE), 4) NC + 200 mg/kg probiotic supplementation (PS) and 5) NC+500 mg/kg PE + 200 mg/kg PS. The results of this experiment showed that energy efficiency ratio (EER) and protein efficiency ratio (PER) were increased as a result of increasing density in starter and overall experimental period ($P< 0.05$). Birds reared in high density and using feed additives had greater EER and PER rather than PC group ($P< 0.05$). Litter and excreta moisture were significantly increased with increasing placement density ($P< 0.05$). These data indicated that increasing the stock density positively influenced broiler EER and PER, but negatively influenced litter moisture, gait score, foot pad dermatitis and hock burns. Use of purslane extract and probiotics in high stoking density may not have clear effect on these parameters.

Keywords: *Broiler, Probiotics, Purslane, Stoking density, Welfare*.

APPLICATION OF LORAWAN TECHNOLOGY IN PRECISION BEEKEEPING

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Abstract

Beekeeping is an important production branch of the agriculture and honeybees are one of the main pollinators in the world. Therefore, for the beekeepers it is crucial to have information about the state of the bee colonies. Application of information technologies in the beekeeping lead to the foundation of the Precision Beekeeping. Precision Beekeeping is based on constant data collection of bee colonies, where collected data should be transferred to a remote data centre for further data analysis. Data transmission in the field of beekeeping sometimes can be a challenging task, because beehives can be placed in rural areas without the option to get constant power supply and Internet connection. Authors of this paper chose LoRaWAN technological solution, as it allowed low energy consumption devices to communicate with Internet-connected applications over long range wireless connections for many years with only one battery. LoRaWAN network coverage and sensors were provided by Latvian company Lattelecom. Three bee colonies were equipped with LoRaWAN enabled temperature sensors. Measurements from sensors were transmitted to the LoRaWAN network gateways and servers and access to collected data was provided through the Lattelecom IoT portal web application. This research was carried out within the Horizon 2020 project SAMS "Smart Apiculture Management Services", proposing implementation of Precision Beekeeping by allowing active monitoring and remote sensing of bee colonies and beekeeping by developing appropriate ICT (Information and Communication Technologies) solutions supporting management of bee health and bee productivity.

Keywords: *Precision Beekeeping, LoRaWAN technology, Bee colony monitoring, Internet of Things.*

DEVELOPMENT OF THE DATA WAREHOUSE ARCHITECTURE FOR PROCESSING AND ANALYSIS OF THE RAW PIG PRODUCTION DATA

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Abstract

Precision Livestock Farming (PLF) approach requires immense amount of data collection, aggregation and processing, using various hardware and software solutions, and is applied in many farms trying to achieve the most efficient and effective way of production. Hardware and software compatible systems capable of achieving this goal are called Farm Management Information Systems (FMIS), and are a necessity for a complete and successful implementation for Precision Agriculture (PA) branch approaches. However, most of commercially available FMIS do not only focus on crop management, but also have limited availability to small and average sized farms, in terms of price, supported language and specific features. Simpler FMIS, on the other hand, do not have necessary capabilities to fully support PLF. There are currently very small amount of high grade pig farm oriented FMIS, especially for farms with less than a hundred of sows. Therefore, there exists the need for solutions for managing farms with limited number of sows. To help address this need, authors proposed and developed architecture for unified data warehouse (DW), which was scalable and extendable cloud based data storage and processing system with support of individual data analysis. DW has capabilities to data interexchange and/or be integrated in existing FMIS throughout variety of data-in/data-out interfaces, like UIs, unmanned data supplier or consumer systems. The core of the DW is designed to provide data processing flexibility and versatility, whereas data flow within the core is organized between data vaults in a controllable and reliable way.

Keywords: *Data Warehouse*, *Information Systems*, *Pig farm management*, *Precision livestock farming.*

IMPORTANCE AND MEASURES OF HEALTH PROTECTION OF HONEY BEES IN MONTENEGRO

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Abstract

Beekeeping in Montenegro has a long tradition. Today, this activity has great significance not only for the preservation of nature, but also for the development of Montenegro's economy. Because of the diversity of honey plants (over 500 species), Montenegrin honey is of high quality, both in nutrition and in healing properties. Health protection of bees has a great importance for the development of beekeeping. Particular attention is focused on the prevention and suppression of infectious diseases of bees caused by bacteria, fungi and viruses, as well as parasitic diseases that most often cause ticks. In Montenegro, according to the law, seven diseases of bees are prevented and suppressed, which are on the list of dangerous infectious diseases of the OIE. The most serious infectious disease of bees is the american foulbrood of honey bees caused by *Paenibacillus larvae* bacteria. Treatment of this disease is not carried out - it is not allowed by law and diseased bee societies are destroyed. Fungal disease - the nosemosis caused by *Nosema apis* in Montenegro, also causes significant losses in beekeeping in Montenegro. Of parasitic diseases of honey bees in Montenegro, varoosis caused by tick *Varroa destructor* occurs. Varoosis is also causes enormous consequences for the health of bee colonies in Montenegro. Parasitic disease acarapisosis is not yet diagnosed in Montenegro. The program of mandatory animal health measures implemented every year in Montenegro establishes preventive measures aimed at monitoring, preventing, detecting, suppressing and eradicating infectious and parasitic diseases of bees. Non-infectious diseases of honey bees also have great significance for the beekeeping of Montenegro. Of these, the most significant is the poisoning of bees. The most dangerous poisons for bees are insecticides that are uncontrolled and incorrectly used in agriculture.

Key words: *beekeeping, honey bee diseases, Crna Gora, Montenegro.*

USE OF LOW-INTENSITY LASER RADIATION IN REHABILITATION OF HYPOTROPHIC CALVES

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Abstract

The effect of low-intensity laser radiation on the biochemical, immune and clinical status of hypotrophiccalves was studied. The studies were carried out in 2 groups (test and control ones) of 12 animals with symmetric moderate hypotrophy. The calves in the test group underwent low-intensity laser irradiation of blood within the red spectral range (wavelength of 630 nm). The animals of the control group (intact) were not treated. Clinical observations of the calves were carried out during 2 months, taking into account the incidence, duration and severity of the course of the disease, as well as the calves' weight gain. Blood sampling for biochemical and immunological studies was performed on the 1st and the 21st days of the calves' life. On the first day the biochemical status and natural resistance in the animals of the both groups did not differ. On the 21st day, the calves of the test group had higher levels of glucose, pyruvic acid, vitamin E, Blood Serum Complement Activity (SCA), Blood Serum Lysozyme Activity (SLA), Leucocyte Phagocytic Activity (LPA), Phagocytic Number (PN), Phagocytic Intensivity (PI), and lower levels of lactic acid, middle molecules and ectoglobular hemoglobin in comparison with the control group. The treatment of the animals with low-intensity laser radiation positively affected their clinical state and productivity. The calves in the test group had mild forms of gastrointestinal diseases with a shorter course duration, and the increase in body weight was significantly higher compared with the control group. The positive effects of low-intensity laser radiation on biochemical status, natural resistance and clinical condition of hypotrophic calves were established, which allows us to recommend it for their rehabilitation.

Key words: *calves, antenatal hypotrophy, low-intensity laser radiation, biochemical status of blood, natural resistance.*

QUALITY OF PORCINE MEAT

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Abstract

The impact of the Swedish Landrace and Large Yorkshire sire breeds (SL and LW), sires within the breed, of gender and the fattening season on the variability of pork quality traits was examined in the present study. The observed measurements were the pH value (pH_{45} and pH_{24}) of the *m. longissimus dorsi* and *m. semimembranosus*, the chemical composition (water, fat, ash and protein content), the water binding capacity, the colour and thickness of the *musculus longissimus* muscle fibers. The trial was conducted at the experimental farm and slaughterhouse of the Institute for Animal Husbandry, Zemun-Belgrade (Serbia). Sires were pure breeds: Swedish Landrace (SL, n=10) and Large White (LW, n=3). The pH value was measured in 410 offspring born in the winter, summer and autumn. Samples of *m. longissimus* originate from 50 offspring (29 samples taken from the offspring of SL sires and 21 samples of LW sires). It was found that the sire breed did not influence ($P>0.05$) the pH values of the muscles tested, but that the sires within the breed influenced ($P<0.01$) the pH_2 of the *m. semimembranosus*. The birth season of offspring shows high statistically significant impact on the pH_2 of the tested muscle ($P<0.001$), while the gender of the fatteners had no influence on the tested properties ($P>0.05$). The results show that *musculus longissimus* contained on average 73.10% of water, 24.09% of protein, 1.65% fat and 1.17% ash. The influence of the sire breed ($P<0.05$) on the water content and the influence of the sire within the breed Swedish Landrace ($P<0.05$) on the protein content were determined, while the gender of fatteners showed no impact ($P>0.05$) on the chemical composition of *m. longissimus*.

Keywords: *Genotype, Sire breed, Sex, Season, Fatteners.*

REPRODUCTIVE PROPERTIES OF COWS OF DIFFERENT ORIGIN AND REARING METHODS

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Abstract

The improvement of the production characteristics of the Simmental breed in Serbia is mainly done through purebreeding. Selection is a factor without which there can be no serious results in the improvement of the genetic basis and increase in the productivity of livestock production in general. In order to realize faster improvement of production performance, of the genetic composition and increase of number of cattle in Serbia, more and more farmers have recently decided to import cattle from countries with intensive breeding of Simmental cows, primarily from Austria and Germany, i.e. from countries where the average milk production ranges from 6500 to 7000 kg with over 4% milk fat. The aim of the study wasto examine how the import of the animals influences four reproductive traits (body weight of calves at birth, age at first calving, calving interval, duration of service period) in domestic and imported populations of Simmental cows. The present study included 954 cows, with a total of 3641 completed lactations. All cows were located in the area of Toplica district, reared by individual agricultural producers (tied system) and on farms with intensive rearing (free system). On the basis of the housing system (tied and free systems) and origin (domestic and imported) animals were divided into four groups: Group 1 (animals of domestic origin, reared by individual producers/farmers); Group 2 (imported animals, reared by individual producers/farmers); Group 3 (animals of domestic origin, reared on commercial farm) and Group 4 (imported animals, reared on commercial farm). In regard to the investigated traits, the highest values were recorded in the fourth group of observed cows, while all the reproductive properties varied very significantly ($p \leq 0.001$) under the influence of the unified factor of the housing method and origin, except for the age at first calving whose variation was not statistically significant ($p > 0.05$)

Keywords: *Reproductive properties, origin, housing, Simmental breed.*

THE IMPACT OF THE NUMBER OF SCOUT AND FORAGER BEES IN SPRING ON THE STRENGTH OF HONEYBEE COLONIES IN SPRING AND AUTUMN INSPECTIONS

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Abstract

The aim of this paper was to show whether the number of scout and forager bees can be an indicator of the strength of honeybee colonies. It was studied how the number of scouts and foragers in spring (March and April) influences the colony strength. Spring inspection was carried out at the beginning of April, and autumn inspection in the first decade of September. The colony strength (quantity of bees and brood) and food supplies (quantity of honey and pollen) per society were determined in each inspection. After the spring review, colonies were divided into three groups. Strong colonies had 5 frames with bees and 3 frames with brood. Medium strong colonies had 4 frames with bees and 2 to 2.5 frames with brood. Poor societies had 3 frames with bees and 2 frames with brood. The experiment was conducted in Kruševac during 2011-2012. Each group had 10 honeybee colonies that were in standard LR beehives. During March, two countings of scout and forager bees were done, and during April three countings were done. Scout bees that returned to the hive in 1 minute were counted and all forager bees that returned with the load of the pollen were counted for the same period. During the first year, the number of scouts did not reflect the strength of colonies, because the medium strong colonies had even a little more scouts and foragers than the very strong ones, while the poor were significantly behind. In the second year, scout bees did reflect the strength of colonies. The highest number of scouts (235.5) and foragers (139) was found in the strong colonies, 205.3 scouts and 107.7 foragers in the medium colonies, while poor colonies had 160 scouts and 82 foragers. In the first year, medium-strong colonies were somewhat better in autumn inspection (more bees, honey and pollen) than very strong colonies. In the second year the poor colonies reached the medium ones (higher strength and similar food supplies).

Keywords: *Honeybee colonies, colony strength, scout bees, forager bees, colony inspections.*

PRODUCTION CHARACTERISTICS OF THE PIG POPULATION IN AUTONOMOUS PROVINCE OF VOJVODINA (SERBIA)

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Abstract

The paper presented the results obtained by analyzing the population of pigs under selection pressure for Vojvodina during 2017. The data were collected from main breeding organization in Novi Sad. By monitoring the number of live-born piglets, the largest number was recorded in the genotype F1 generation, which amounted to 12.93 live-born pigs, while the smallest number of live-born piglets was recorded in the genotype Pietrain with the average number of live-born piglets 9.53. The largest number of weaned piglets was recorded in the genotype F1 generation of crossing between Yorkshir and Landrac 11.54, the smallest number of weaned piglets was recorded in the genotype Pietrain 8.98 piglets. Main breeding also implemented the performance test of breeding animals. The following values from performance test were recorded by female animals analysis by genotypes: the highest life gain was recorded in the 0.614 kg genotype Pietrain, and the smallest backfat thickness and side fat thickness (8.67; 9.00 mm), while the deepest ML (musculuc longissimus dorsi) was recorded in the genotype Yorkshire 70.88 mm. Performance of male animals testing determined the following values of the tested properties: the highest life gain was recorded in the Landrace (0.700 kg) genotype, while the smallest thickness of the backfat and side fat (8.00; 8.30 mm) was recorded in the genotype of Duroc, while the deepest ML was recorded in the genotype Duroc (78 mm). Calculation of the BLUP values for the measures from the performance test recorded the following variables: for a life gain of 17.311 to 79.674; thickness of the bacon from -4.454 to 6.381; thickness of side bacon from -4.529 to 6.163; ML from -33.584 to 19.439. The obtained results show that the selection pressure should continue because of the space that exists in terms of economically important features.

Keywords: *Live-born piglets, Weaned piglets, Genotype, Performance test.*

THE IMPACT OF POLYMORPHISM IN THYROGLOBULIN GENE ON BEEF QUALITY

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Abstract

The objective of this study was to identify the single nucleotide polymorphism in thyroglobulin gene (TG5), determine the genetic structure of the population and analyse its effect on beef quality traits in Slovak Pinzgau cattle. A total of 56 blood samples of Pinzgau steers were used to extract genomic DNA for animal's genotyping. The SNP genotyping of all individuals was performed by using PCR-RFLP method. Across analysed individuals the allele C was more frequent (0.64) than T allele (0.36). The sufficient level of allele impact effectiveness in population indicated mainly the value of allele effective number (1.849). The obtained values of expected (0.46) and observed heterozygosity (0.5) indicated balanced proportion of homozygous and heterozygous animals that confirmed similarly the values of Wright's F_{IS} index (-0.09). In addition, the negative value of F_{IS} index showed, that the population is not affected by the increase of inbreeding. The impact of thyroglobulin gene polymorphism on beef quality was tested by using ANOVA analysis. Four carcass traits were involved in association analysis: proportion of muscle, fat, bones, and drip loss within the beef three-rib section. Despite the fact that the statistical analysis showed only non-significant effect of TG genotypes on evaluated traits, it seems to be that the T allele is favourable for all traits under consideration. The results of present study could be affected mainly by the sample size and polygenic effects associated with expression of analysed traits.

Keywords: *Association analysis, beef quality, candidate gene, polymorphism, Thyroglobulin.*

AUTOZYGOSITY ISLAND RESULTING FROM ARTIFICIAL SELECTION IN SLOVAK SPOTTED CATTLE

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Abstract

The aim of this study was to identify the runs of homozygosity (ROH) segments within genome and to identify regions significantly affected by artificial selection in Slovak Spotted cattle. In total of 85 animals representing the nucleus of Slovak Spotted cattle were included in present study. The sampled population consisted of 37 AI sires and 48 dams of sires that were genotyped by using two platforms, Illumina BovineSNP50v2 BeadChip and ICBF International Dairy and Beef v3. The consensus map file, constructed to identify common SNPs within these platforms, consisted of overall 40,033 markers. Subsequently, all of loci with call rate lower than 90% and minor allele frequency lower than 0.01% were removed. The final database included genotyping information for 37,833 SNPs. The ROH segments were defined as genomic regions with 15 or more consecutive homozygous calls at density of one SNPs on every 100 kb and maximum gap between consecutive SNPs of 1 Mb. One heterozygous call was allowed for length >16 Mb. In addition, one missing call was allowed for length >4 Mb, 2 for >8 Mb and 4 for >16 Mb. The subsequent analyses of genome-wide selection signatures were based on the assumption that the most frequent homozygous regions in population (minimum ROHs with length 4 Mb) reflected the recent selection characteristic for Slovak Spotted breed. As expected due to the dual-purpose character of this breed the strongest signals of artificial selection was found direct or very close to genes associated with milk production and beef quality.

Keywords: *Autozygosity, cattle, genotyping data, selection signatures.*

RELATIONSHIP BETWEEN MILK PRODUCTION AND LAMB GROWTH IN SUCKLING PERIOD OF SICILO-SARDE DAIRY SHEEP IN TUNISIA

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Abstract

Sicilo-Sarde is the only dairy sheep breed in the North of Africa that is mainly raised in northern Tunisia. This micro-sector contributes, through a better identification of "terroir" products, to rural development. Its milk production (MP) remains low as a result of mixed milk-meat production system with suckling period exceeding two months. Furthermore, MP in the beginning of lactation is important for both total MP and lamb growth. Dairy ewes produce about one quarter of total MP during the first month of lactation. This work aimed to estimate the suckling MP (SMP) using the method of weighing lambs before and after suckling and to determine the relationship between ewe MP and lamb growth. Ten Sicilo-Sarde ewes aged 3.90 ± 0.50 years and nursing single male lambs were used to estimate SMP during the two first months of lactation. Results obtained indicated that SMP increased with suckling duration. The means of SMP were 36.18±6.6, 57.28±10.2 and 74.80±12.2 kg respectively for week 4, 6 and 8 of suckling period. Lambs weight at 28 days (10.85±1.83 kg) and Average Daily Gain between 10 to 28 days ($ADG_{10\text{-}28;}$ 222±46 g/d) were highly correlated with SMP of week 4, 6 and 8 ($0.82 \leq r \leq 0.85$; $P<0.01$). The MP regression equations on lamb's growth traits before weaning showed that $ADG_{10\text{-}28}$ was a good trait for estimating SMP. In conclusion, Sicilo-Sarde ewe has an interesting dairy potential during suckling period that may be estimated referring to lamb growth at the first month of age.

Keywords: *Sicilo-Sarde, Suckling milk production, Lambs growth, Correlation, Regression.*

EFFECTS OF WEANING SYSTEM ON MILK AND EXTERNAL MAMMARY CONFORMATION TRAITS OF SICILO-SARDE TUNISIAN DAIRY EWE

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Abstract

A better development of the Sicilo-Sarde dairy sheep in Tunisia needs a review of its behavior by adopting early weaning and generalizing mechanical milking that involves an adaptation of the external mammary morphology (MM). Thirty ewes were divided into two groups (early and late weaning; EW and LW respectively) to study the effects of weaning system (WS) and milking time (MT) on milk and external MM traits in early milking period. MM was evaluated by six measurements and three scores of udder and teat. EW group had higher milk production (MP) and lower fat and protein amounts that increased with MT advancement ($P<0.001$). WS did not affect MM traits ($P>0.05$), only teat length was higher for LW ewes ($P<0.05$). Udder depth, teat diameter, distance between teats and teat angle score decreased with MT ($P<0.01$). Significant interactions were noted between WS and MT for most traits studied. MP was negatively correlated with fat and protein amounts (-0.38 and -0.50 respectively) and moderately correlated with udder depth, cistern height, teat diameter (from 0.31 to 0.42). Fat and protein had negative correlation with udder depth, teat diameter and distance between teats. Higher correlation was determined between udder depth and distance between teats ($r=0.60$; $P<0.001$). In conclusion, EW system allows a better start of the milk production in early milking period. Cistern height, teat length and teat angle score are the prominent traits which affect milk ability and adaptation of ewe to machine milking and consequently they must be included in selection program.

Keywords: *Dairy sheep, milk composition, mammary conformation, Correlation, milkability.*

DIAGNOSIS OF TECHNICAL AND HYGIENIC MILKING CONDITIONS IN DAIRY SHEEP FARMS (TUNISIA)

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Abstract

Milking of Sicilo-Sarde dairy sheep breed in Tunisia remains always manual by calling qualified milkers who have become more and more rare. The emergence of some flocks using mechanical milking is strongly encouraged, but its use is still inefficient or inadequate. This exploratory study aimed to evaluate the technical and hygienic milking conditions in the two dairy sheep areas in the North of Tunisia. A sample of 955 Sicilo-Sarde ewes in mid and late lactation belonging to seven flocks (four public farms, three of which use machine milking in pot, and three private farms) was used to evaluate the milking conditions. The diagnosis of the milking equipment had revealed a relatively satisfactory situation of the milking machines working. The pulsation rate was between 80 and 105 cpm. Also, the average milking cadence observed for mechanical milking was relatively low (65 ewes/milker/hour), but it was acceptable for manual milking (50 ewes/milker/hour). However, farms with mechanical milking did not have a milking hallway that disturbed ewe circulation and contention during milking. For hygienic milking practices, udder preparation and teat disinfection after milking were not carried out in all farms. These results indicate that a great improvement in hygienic milking conditions must be made in dairy sheep farms. The study of the comparative impacts of mechanical milking of Sicilo-Sarda ewe on mammary health, teat integrity and milking comfort is needed to identify the appropriate settings for a best development of this system in Tunisia.

Keywords: *Sicilo-Sarde, Machine milking, Manual milking, Technical conditions, Hygienic practices.*

INCREASING OF STORAGE PERIOD ALTERS EMBRYO DEVELOPMENT AND HATCHING CHARACTERISTICS OF PEKIN DUCK EGGS

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Abstract

This research was performed to determine the effects of storage period on embryo development and hatching characteristics in Pekin ducks. A total of 360 Pekin duck eggs was divided into four groups as 5-7 d, 8-10 d, 11-13 d and 14-16 d storage period and each group were stored at 15-18 ºC. Eggs were incubated at 37,5°C and a relative humidity of 55 to 60% during the first 24 days of incubation. These eggs were transferred into hatching machine for the last four days. A hatcher temperature of 37.0°C and a relative humidity of 72% were provided during hatching period. The effects of storage period on embryo development, embryonic mortality, hatchability of fertile eggs, hatchability of total eggs and chick hatching weight were significant ($P<0.01$). Results showed that a longer storage period caused a decline in yolk absorption and therefore decline of embryo growth parameters including body weight and length during incubation period. Hatchability declined with increasing of storage duration, and a storage period less than 7 d appeared to be the best for maximum hatchability. Egg weight loss increased with increased storage length ($P<0.01$), and the chick weight tended to decline in relation with storage period longer than 5-7 days.

Keywords: *Pekin duck, egg storage, embryo development, hatching characteristics.*

HATCHABILITY OF BRONZ TURKEY EGGS AFFECTED BY BREEDER AGE AND RELATIVE HUMIDITY

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Abstract

The present study was carried out to determine the effects of breeder age and relative humidity levels on egg weight loss during incubation, hatchability of total eggs and hatchability of fertile eggs in eggs of Bronz turkeys. The eggs were collected from a Bronz turkey breeder flock at 35 (young) and 66 (old) weeks of age, and were incubated in 55-60% and 61-65% humidity during the first 24 days of incubation period. After that period, the eggs were incubated under hatching conditions during hatching period. The effect of incubation humidity and breeder age on hatchability of fertile eggs, hatchability of total eggs and egg weight loss was significant ($P<0.01$). The eggs obtained from young flock showed a higher hatchability of fertile eggs and total eggs, and a lower egg weight loss during incubation when incubated at a relative humidity of 55-60%. On the other hand, similar results were observed for the eggs obtained from old flock and when incubated at a relative humidity of 61-65%.

Keywords: *Bronz turkey, Incubation humidity, Hatching characteristics, Breeder age.*

EFFECT OF THE BROILER GPS LINE AND AGE ON EGG WEIGHT LOSS, HATCHABILITY AND CHICK YIELDS

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Abstract

The present study was conducted to investigate the influence of the grandparent stock male - female line broiler (MF-GPS) and age of hen on egg weight, egg weight loss, hatchability, hatched chick weight and chick yields. Furthermore, the study was also conducted to determine the level of correlations between GPS male and female line and age of hen for the investigated parameters. A total of 1503 hatched egg from separate hatches were obtained by MF- GPS at 27-33 (I), 34-45 (II) and 46-64 (III) weeks of age. The data of the study obtained from a private commercial grandparent stock breeder hatchery. The eggs were incubated in an incubator at 37.5°C temperature and 84% relative humidity until 18th day of incubation. Then the eggs were transferred to a hatcher at 36.6°C temperature and 87% relative humidity until the chicks hatch. In the study, the weights of eggs and chicks were found to be similar for the male (M-GPS) and female (F-GPS) lines (P>0.05). The egg weight loss during incubation and hatchability were found to be significantly higher in F-GPS (P=0.001), while the chick yield was higher in M-GPS (P=0.001). The breeder age affected the egg weight, egg weight loss during incubation, hatchability, chick weight and chick yield (P=0.001). The interactions between the lines and the ages were significant for the hatchability (P=0.001), chick weight and chick yield (P=0.031 and P=0.017). Significant positive correlations were found between the age and egg weight (r = 0.837; P=0.001), egg weight loss (r = 0.161; P=0.001), chick weight (r = 0.783; P=0.001) and chick yield (r = 0.057; P=0.028), and for MF-GPS as well. The GPS breeder line and age of hen affected hatchability, chick weight and chick yields.

Keywords: *Grandparent stock broiler breeder line, age, egg weight loss, hatchability, chick yield.*

EFFECT OF FEEDING CHAMOMILE DRY FLOWER MEAL TO WEANED AWASSI MALE LAMBS ON BODY PERFORMANCE AND MEAT QUALITY

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Abstract

An experiment was conducted on 20 lambs during 2016 using chamomile dry flower meal (CH). Animals were randomly allocated into 4 groups [CGCH (0% chamomile), EGCH2 (2% chamomile), EGCH4 (4% chamomile) and EGCH6 (6% chamomile)] by 5 heads. Animal health as well as palatability of rations was visually acceptable. Initial average live body weight (LBW) of all animals was 26 ± 1.5kg. Average LBWG/week was significantly ($P<0.05$) better in group EGCH2 (3.42±0.48 kg/week/head). FCR was higher at the end of the trial in EGCH2 (6.09±0.40) where animals were fed 2% chamomile supplemented to their daily ration in comparison to all other groups. On the other hand, after cooling L* meat samples of lamb were better in EGCH2 followed by EGCH4, CGCH and EGCH6. Redness of meat from animals slaughtered decreased insignificantly ($P > 0.05$) 24h after cooling in all groups CGCH (18.99 ± 4.53 to 15.78 ± 2.99), EGCH2 (21.6 ± 7.8 to 15.4 ± 1.14), EGCH4 (17 ± 2.7 to 14.01 ± 1.97), EGCH6 (20.2 ± 4.43 to 18.32 ± 2.16). Yellowness b* decreased after 24 hours of cooling in all groups. At 24 hours *post-mortem*, pH of fresh meat at slaughter was significantly ($P<0.05$) more acidic (5.57±0.054) in CGCH and EGCH6 (5.59) than in EGCH2 (5.75) and EGCH4 (5.67). After 1 month of freezing, CGCH became less acidic (5.79) in comparison to EGCH2, EGCH4 and EGCH6 with an average level of 5.72, 5.77 and 5.67 respectively ($P>0.05$). The study of water holding capacity showed that drip loss was minimal in EGCH6 (17.86 % ±1.47). Furthermore, tenderness of cooked meat after 24 hours of cooling was higher ($P<0.05$) in EGCH6 (8.4mm±0.7) followed by EGCH2 (5.64 mm± 2.1) followed by CGCH (5.5mm ±0.4) and EGCH4 (5.2 mm ±0.9). It is concluded and recommended to use rations containing chamomile meal in the daily feeding of Awassi sheep.

Keywords: *Awassi lambs. Chamomile dry meal, Body performance, Meat quality.*

IMPACT OF FEEDING HERBS - PEPPERMINT AND THYME ON BROILER CHICKENS BODY PERFORMANCE DURING THE GROWTH PERIOD

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Abstract

An experiment was conducted in 2017 to test the effect of using thyme, peppermint and their combination in the broiler diet on the performance of the birds. 250-one day old unsexed Ross chicks were divided randomly into five groups. For the first 19 days, all chicks were fed with the same starter basal diet (BD) without antioxidants and antibiotics. At age of 20 days, groups were subdivided into three replicates. Group I was fed on a basal diet free of any antibiotics and antioxidant, group II was fed on a basal diet and 15mg/kg of virginiamycin and commercial antioxidant, group III was fed on a basal diet without antibiotics and antioxidants supplied with 10g/kg peppermint meal, group IV was fed on BD without antibiotics and antioxidants supplied with 10g/kg thyme meal, group V was fed on BD without antibiotics and antioxidants supplied with a mixture of 5g/kg peppermint and 5g/kg thyme meals. As a result of the experiment all groups showed higher results compared to group I that have been fed BD without any additives. However group III recorded the highest live body weight (1219.4g) only through the growing period. Based on the overall period of the experiment, from day 1 till slaughter age, the feed conversion ratio (FCR) did not indicate any significant difference between the different groups. However, group III recorded the most effecient FCR (1.27) and group I had the worse (1.45). In conclusion, this experiment showed promising potential of thyme and peppermint as natural growth promoters.

Keywords: *Peppermint, Thyme, Broiler chicken nutrition.*

IMPACT OF SOYBEAN MEAL SUBSTITUTION WITH LOCALLY PRODUCED LEGUME MEALS ON "KARAGOUNIKO" EWES BODY WEIGHT AND MILK PRODUCTION

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Abstract

The cost of feed is of great importance for small ruminant production. The present study was conducted in Greece, exploring the potential substitution of imported soybean meal by legumes (beans) meals in sheep nutrition. Eighty ewes of the "Karagouniko" breed were split in five groups and four subgroups. In the first group nutrition was based on soy legumes (beans). In the second group nutrition was based on lupine legumes. In the third group nutrition was based on pea legumes. In the fourth group nutrition was based on vetch legumes. In the fifth group nutrition was based on broad bean legumes. Subgroups within groups consisted of: a) control subgroup with null substitution of soybean meal, b) 1/3 substitution of total nitrogen by the respective legume, c) 2/3 substitution of total nitrogen by the respective legume and d) full substitution of total nitrogen by the respective legume. Body weight was measured in the beginning and at the end of the trial period. Feed consumption and milk production were recorded daily and milk quality was analyzed weekly. No statistically significant differences were found for body weight and milk production. In qualitative characteristics of milk (protein, fat and lactose content), there were significant differences between subgroups, for vetch, broad beans, lupine, peas and soy legumes (beans). Digestibility showed statistically significant differences between subgroups, for vetch, broad beans, peas and soy legumes. The results showed that substitution of soybean meal with other locally produced legumes as main protein sources is possible, without affecting body weight and milk production. Especially, soybean meal substitution of 1/3 total nitrogen with soy beans led to increased protein and fat content and lower lactose content in milk.

Keywords: *Broad beans, Vetch, Peas, Lupine, Greece.*

THE CONSEQUENCE OF SEXUAL BEHAVIOR AND ANOGENITAL DISTANCE ON REPRODUCTIVE PARAMETERS IN ALGERIAN RABBIT OF LOCAL POPULATION

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Abstract

The first aim of this investigation was to evaluate the effect of anogenital distance (AGD) on certain reproductive parameters such as scent marking, sexual satiety. Number ofn = 20: 10 bucks and 10 sexually receptive females aged 6 and 7 months and weight ranging from 3.000 to 3.700 Kg were studied. Results indicated a mean measured AGD of 14.52 ± 0.37 mm. The number of 60% of the males had an AGD higher than the mean AGD, whereas 40% had a lower AGD. The AGD, on the other hand, influenced at least some parameters of reproduction, chin marking, overlaps, protrusion, and urination. The relationship between the weight and the AGD was average (r= 0.43). Our results indicate that the bucks with large AGD marked their territory more than the males with a small AGD and there was a low relationship between the AGD and the chin marking and between the AGD and the length of the chin gland. Rabbit with a lower AGD had a greater behaviour on the overlap and the number of the protrusion, while those with large AGD had significant fold behaviour on the overlap and the urination. Bucks that marked their territory had a larger diameter of their gland. Our results indicated that there was a very significant difference in the variation of the male scent marking according to their sexual satiety. Full satiety was reached after 2h when male were able to impregnate most females. In conclusion, the AGD seems to affect a large number of reproductive characteristics, especially regarding the chin marking and the sexual behavior at least the overlaps, protrusion which also serve as a parameter that helps our breeders to select breeding rabbits.

Keywords: *Rabbit, AGD, chin marking, sexual satiety, behavior.*

A REVIEW ON AVIAN SALMONELLOSIS IN ALGERIA

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Abstract

The Algerian poultry consumption has grown remarkably these last three decades because of its competitive price as well as livestock investment development in private and state sectors. This development has been associated with recrudescence of several infectious diseases, most of them are zoonosis. In this context, salmonellosis has appeared as one of the main causes of economic losses in broilers and laying hens across the country. The aim of this study was to review the principle studies on avian salmonellosis at a national level. From different poultry farms, hatcheries and slaughterhouses, the most serotypes of *Salmonella enterica subsp. enterica* implicated in broilers were S. Enteritidis, S. Heidelberg, S. Kentucky, S. Infantis and secondarily S. Typhimurium, S. Virchow and S. Albany. In return, a predominance of S. Entertidis, compared to S. Dublin, S. Typhi and S. Paratyphi was reported in laying hens. Molecular studies found the same genetic profiles in avian and human strains suggesting a transmission of *Salmonella spp.* through direct exposure or food consumption. Concerning the drug resistance, it has greatly increased and affected critically important antibiotic classes especially extended spectrum βeta-lactamases (ESBLs) and quinolones. The present data support the persistent need of conducting well designed studies, aiming the well estimation of salmonellosis prevalence in the main domestic avian species.

Keywords: *Salmonella, Salmonellosis, poultry, Algeria.*

STUDY OF POULTRY BREEDING EQUIPMENT IN BISKRA ALGERIA

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Abstract

Poultry is a valuable and economical source of animal protein, particularly for developing countries, which has justified its very rapid development worldwide over the last fifty years. This evolution was the result of the industrialization of production thanks to the contributions of the various research carried out in the fields of selection, feeding, habitat, prophylaxis and end product technology. Our work took place at the level of Zâb-chergui in the city of Biskra (Algeria) and consists on a diagnosis of buildings and equipments of poultry breeding in this region. Through a field survey, we aim to identify broiler breeders in this region either a quantitative and qualitative analysis of their activities. Our results reveal an inadequate situation of the majority of farms visited in building quality and equipment. This situation has led to mortality rates above the acceptable limit for this type of farming. We propose recommendations for improving broiler farming to have better production under better conditions in this region. A good building should be equipped with dynamic ventilation, fluorescent tubes, air heaters, flushes and the presence of a sanitary lock.

Keywords: *equipment, broiler, building, production, Zâb-chergui.*

COMPARATIVE STUDY OF THE PHYSICOCHEMICAL AND MICROBIOLOGICAL QUALITY OF COW'S MILK AND CAMEL'S MILK

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Abstract

A comparative study is based on a certain number of physicochemical and microbiological parameters of raw camel and cow milk derived from livestock in the Biskra region. The results show that pH of camel milk (pH = 6.48) is a little acidic compared to that of cattle (pH = 6.7). The acidity of camel milk (16 ° D) is practically lower than that of bovine milk (18 ° D). The density of camel milk (1031) is slightly higher than that of bovine milk (1029). The defatted dry extract of bovine milk equal to (128 g / l), it is high compared to that of camel milk (118 g / l). The fat content of camel milk is 32 g / l, lower than that of bovine milk (37 g / l). Similarly, the bacteriological results obtained reveal that cow's milk contains (4600 CFU / ml) of FMAT (Total Mesophilic Aerobic Flora), it is higher than that of camel milk (00X102 CFU / ml). The total absence of fecal coliforms, Staphylococcus aureus, faecal Streptococci, and Clostridium sulphito-reducers in both milk was also noted. From the above results, it is concluded that the studied camel and cow milk have a good physicochemical and microbiological quality, the bovine milk remains richer in fat, the defatted dry extract compared to the camel milk.

Keywords: *Comparative study, raw milk, cattle, physicochemical quality, microbiological quality.*

MORPHOLOGICAL CHARACTERIZATION OF ALGERIAN DROMEDARY CAMELS

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Abstract

The study was carried out in order to identify the body measurements of two different Dromedary camel breeds raised in Algeria. The animal material of the study consisted of a total of 115 animals belonging to Steppe (n=55) and Saharan (n=60) camel breeds. Eye and coat color along with body measurements such as head length, neck length, neck girth, tail length, distance between eyes, distance between ears, body length, withers height, chest girth and live weight were determined in the present study. Least squares means for head length, neck length, neck girth, tail length, distance between eyes, distance between ears, body length, withers height, chest girth and live weight were found 48.2, 116.9, 65.7, 55.6, 24.1, 22.5, 152.2, 184.5, 141.2 cm and 217.2 kg for Steppe and 48.1, 101.2, 56.2, 51.2, 23.4, 18.3, 135.6, 167.3, 176.8 cm and 298.9 kg for Saharan camel breeds, respectively. The distribution of brown and black eye colors for the Steppe camel breed was determined as 58.2% and 41.8%, respectively, while all of the studied Saharan camels had a brown eye color. The proportional distribution in terms of body color defined as coffee, dark coffee and red colors was observed as 1.8%, 83.6% and 14.6% in the Steppe camel and, 98.3%, 1.7% and 0.0% for the Saharan camel, respectively. As a result of this study, the morphological characteristics of two different camel breeds raised in Algeria were explained in detail.

Keywords: *camel breeds, Morphological, Characterization, Algeria.*

CHARACTERIZATION OF CAMEL BREEDING IN SOUTHEASTERN ALGERIA

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Abstract

The study of camel breeding in southeastern Algeria during 2017 and from 30 breeders surveyed, showed that it was practiced in the majority of cases by small breeders whose herds did not exceed 25 heads (46.67%), sedentary (66.68%), age between 40 and 60 (75%), with a primary education level (37%) and 80% of whom practiced it for reasons of multiplication of the species between them. Reproduction was natural, the period of struggle was from November to April. The age of the breeding of females was 4 years, of the male more than 5 years. We noticed predominance of reproductive females (66.90%) of the El Hamra breed (85%), raised especially for dress sought to manufacture the most famous Algerian Bernous and Kachabia. The production of milk and camel meat was low in the economy of the region and it was practiced only for self-consumption because of the free conduct of herds and the lack of routes in plant production and sources of water and the stringent climatic conditions of the current year.

Key words: *farm management, camel, herder, flock, range, arid zone.*

FACTORS CONDITIONING GROWTH IN SHEEP IN SEMI-ARID REGION OF ALGERIA

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Abstract

Ruminant livestock is one of the key sectors of Algerian agriculture in which the component (small ruminant) predominates. This study was carried out in a semi-arid region of Algeria with a population of 200 lambs Ouled Djellal, with the aim of analyzing growth performance and specifying factors influencing this performance. The analysis of the least squared variance was carried out and the main factors tested were the parity, the size of the litter and the sex of the lamb. The results showed that the lamb weighed 4.19 kg at birth, 6.04 after10 days, 7.29 kg after 20 days, 8.44 kg after 30 days and 18.30 kg after 90 days. The mean growth rate was 179.55 g/d between birth and 10 days, 120 g/d between 10 and 20 days, 107.41 g/d between 20 and 30 days and 149.26 g/d between 30 and 90 days. Birth weight was very strongly related to weights at typical ages (10, 20, 30 and 90 days). Also, the average daily gains were highly correlated with each other. The litter size had a very significant influence on birth weight at 10 days, 20 days, 30 days, 90 days, and all daily average gains ($P < 0.05$). On the other hand, sex and parity did not have a significant influence on live weights at different ages or on average daily gains from birth to weaning ($p > 0.05$).

Keywords: *Sheep, semi-arid region, Algeria.*

STUDY OF RISK FACTORS FOR INFERTILITY

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Abstract

The objective of our work was the study of the risk factors of infertility of dairy cows after the delivery. Our study was accomplished at the Tizi Ouzou region from 2011 to 2016 (ALGERIA). Our experimental work was devoted to the study of the metabolic, hormonal and infectious risk of resumption of postpartum cyclicity and reproductive performance in dairy cows resumption of postpartum cyclicity. The study was carried out on 50 cows belonging to 02 commercial farms between 2012 and 2016. Blood samples were taken at 15 days, 30 days, 41 days and 52 days after delivery for the determination of progesterone and certain metabolites to establish the link between biochemical profiles and reproduction.Early studies of metabolic risk by profiling have demonstrated that increased concentrations of certain metabolites have been associated with a reduction in the recovery of postpartum ovarian activity and they are responsible for infertility and infecundity. The frequency of cows with negative energy balance at day 30 after the delivery was 62%, while the incidence of subclinical ketosis up to the 52nd day post partum at the threshold of 1.2 mmol / l of beta-hydroxybutyrate was 30%. Pathologically, it appears from this study that ovarian activity is influenced by dystocia, placental retention as well as by clinical endometritis. The study of the hormonal risk by progesterone assay shortly before artificial insemination revealed a percentage of 32% of cows inseminated at a bad time compared to the heat. These results confirmed again that infertility was characterized by the multiplicity of factors involved.

Keywords: *cow, fertility, fecundity, postpartum, energy balance, artificial insemination, ovarian activity, heat.*

A RESEARCH ABOUT VIABLE *LACTOBACILLUS BULGARICUS* AND *STREPTOCOCCUS THERMOPHILUS* SPECIES IN DIFFERENT LABELS OF ALGERIAN STIRRED YOGHURTS AFTER 21 DAYS OF COLD STORAGE

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Abstract

In Algeria, industrial stirred yogurt is made wholly or partly with milk powder (recombined milk). Yoghurt is a fermented milk, obtained from fermentation of raw milk by *Lactobacillus bulgaricus* and *Streptococcus thermophilus* species. Cold storage, during sale, induces viability problems of lactic acid starters, pH, rheology (syneresis) changes, leading to decreased viability of lactic starter. This leads to defects in the organoleptic and hygienic characters. The aim of study was to verify the titrable acidity (in Dornic degree ºD), pH stability, Viscosity, after 21 days storage at +4ºC, and thermophilic lactic starters rates in colony forming units/gram (cfu/g) of eight brands of Algerian industrial yogurts (the eighth sample was a traditional cow fermented yoghurt, spontaneously fermented at room temperature) collected from dairy market in the Algerian North-Eastern arid areas (Setif and Bordj Bou Arreridj provinces). Before storage, 25% of the samples, on MRS medium, were *Lactobacillus bulgaricus* devoid. Yogurt acidity appeared stable after 21 days at low temperature storage. pH values was between 04.6 and 04.38 with average 04.22, titrable acidity values were between 93.6ºD and 121.5ºD, average 120.22ºD). Viables *S. thermophilus* numbers were determined between $05X10^6$cfu/g and 10^6cfu/g, species enumerated on M17 medium at 37ºC were predominate, and 100% samples were not in linewith the required standards ($\leq 10^6$cfu/g).

Key words: *Industrial Yogurt, Storage, Stability, Acidity, Starter, Viability.*

BACTERIA MICROFLORA OF THE HONEYBEE PARASITIC MITE *VARROA DESTRUCTOR* COLLECTED FROM ALGERIA BEEHIVE SUMMER DEBRIS

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Abstract

Varroa destructor is an important pest of the honey bee, *Apis mellifera* L. It has been causing severe damage to populations of this species world-wide in recent years. The Varroa mite can only reproduce in a honey bee colony. It attaches to the body of the bee and weakens the bee by sucking fat bodies. The Varroa mite is the parasite with the most pronounced economic impact on the beekeeping industry. The aim of this work was the isolation and identification of the bacteria microflora of the *Varroa destructor*, ectoparasite of the bee (*Apis mellifera* L). For the isolation and identification of the bacteria, the macroscopic (shape, size, appearance, etc.), microscopic (fresh examination, Gram Strain, etc.), physiological and biochemical tests were done. The results showed that the genus *Staphylococcus* sp was the most frequently strain followed by *Bacillus* sp and *Pseudomonas* sp.

Key words: *Apis mellifera L, Varroa destructor, bacterial microflora, beehive summer debris.*

BOTANICAL ORIGIN AND ANTIFUNGUAL ACTIVITY OF THREE TYPES OF ALGERIA HONEY AGAINST *CANDIDA ALBICANS*

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Abstract

The purpose of the study was to evaluate the antifungal activity of different types of Algeria honey against *Candida albicans.* Various honey types were collected from different areas of Algeria (*Lavender* sp, *Citrus sp* and *Eucalyptus* sp). To test the antifungal activity, the agar well diffusion methods was employed. For the palynological analysis, we used the methodology proposed by Louveaux *et al* (1978); a minimum of 1200 pollen grains was counted par sample. Commonly, monofloral honeys were made up of nectar belonging to a single plant in an extent of at least 45%. These were general guidelines but many pollen types were under represented (such *Citrus* and *Lavender honey*) or over represented (for example *Eucalyptus* honey). The results showed that the antifungal activity against *Candida abicans* was observed best in *Lavender* honey samples among the studied samples.

Key words: *Honey, antifungal activity, Candida abicans, Algeria.*

THE BEEF SECTOR IN ALGERIA

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Abstract

The development of cattle breeding has always been considered as an important priority for Algeria to meet the needs of the population in terms of animal protein, particularly in the northern regions of the country, which are considered to be major consumers of red meat. This analysis is based on the research that has been conducted on beef production in Algeria and which is part of the local bio-natural resources laboratory at Hassiba Benbouali University in Chlef (Algeria). For this purpose, statistical data from the Ministry of Agriculture and Rural Development, the National Statistical Office of Algeria and those of FAO have been used in this study. The self-sufficiency rate in beef is 55% compared to only 45% for milk. Beef and live animals account for only 4% of Algeria imports of agricultural and agri-food products. But they are expected to grow strongly due to growing consumer appetite and population pressure. Generally, there are two types of circuits that area short circuit, where the butcher shows up at the market and buys the animal directly from the producer and slaughters it himself, and a long circuit or intervenes a maximum of operators.The development of consumption of red meat per capita in Algeria remains one of the priority axes of the agricultural policies of the Algerian government. Innovation in all its forms is one of the means of progressive adaptation of the sector to these changes in consumption.

Key words:*consumption, beef, animal protein, self-sufficiency*.

EFFECT OF TWO PREPARATIONS BASED ON PLANT EXTRACT ON ZOOTECHNIC PARAMETERS AND HEALTH CONDITION OF BROILER CHICKEN

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Abstract

In the context of the search for alternatives to antibiotics, several non-therapeutic substitution methodscanbeenvisaged; Including the use of plant extracts, which are increasing ly being proposed and studiedwith the aim of improving the homogeneity and performance of breeding. The aim of the present study is to evaluate the effect of supplementation in plant extracts of two deferential preparations (Oregano and Garlic), and (mint and eucalyptol) to improve the zootechnical performance and biochemical parameters of the broiler. The experiment lasted 45 days, it was conducted on a total of 180 chickens divided into three groups. One control group and 2 groups received 2 different treatments. The overall results recorded showed differences in weight gain between the control group and the two experimental groups (1312 vs 2219 gr 1312 vs 2011 gr, 2219 vs 2011 gr) respectively. The mortality rate was higher in the control group compared with the two treated groups (28.33 vs. 0.0%). The results of the assay of some biochemical parameters (glycemia, cholesterol, triglycerides) appear in direct relation with the supplementation of these vegetable preparations. However, the level of glycemia decreases in group (Oregano and Garlic) compared to the control group (1.83 vs2.38 g / l) the level of cholesterol (0.79 vs0.99g / l) and the triglyceride level (0.70 vs 0.96g / l). The vegetable preparations used have a positive effect on the zoothecnic and biochemical parameters. they even improved the weight of offal (liver and heart).

Key words: *broiler, biochemical parameters, zoothecnic parameters.*

CONTENT OF MAIN MINERALS IN CAMEL MEAT IN ALGERIA

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Abstract

In Algeria, rangelands are the main source of food available for camels. These camels have a better ability to digest poor forage than other domestic ruminants. The dromedary is accustomed to the vegetation of the dry zones, it uses the ligneous resources which can be more abundant than the herbaceous resources in the margins of the desert. These resources vary over the year, in quantity and quality, and are widely dispersed in space. This study aimed to determine the concentrations of minerals and trace elements in camel meat from Algeria. Meat samples from 32 camels were collected. The concentrations of calcium and phosphorus were close to 33.1±6.1 and 655± 12 mg/100g respectively. The micronutrient contents were 14056 ± 83µg/100g for zinc, 6019 ± 45µg/100g for iron, 1297 ± 43µg/100g for copper. Ahighly significant effect of the race was observed on calcium, sodium and iron levels, but any effect of age was shown. The meat of dromedary has levels of minerals close to those reported in other farm animals.

Key words: *dromedary, minerals, meat.*

A COMPREHENSIVE CHARACTERIZATION OF GUELMOISE: A NATIVE CATTLE BREED FROM EASTERN ALGERIA

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Abstract

The present study consists of a global and the first characterization (typology, biometrics, biochemical and contribution to the genetic characterization) of the Guelmoise local cattle breed. A structured questionnaire surveys were carried out in 42 farms spread over four (4)villagesof the north-eastern region of Algeria in order to characterize the local cattle population of Guelmoise and their mode of rearing. These surveys focused on the characteristics of the farms (mode of breeding and reproduction) as well as on the socio-economic condition of the farmer.Samples of milk and blood were collected. A total of 164 adult animals were selected for morphological description and body measurements (148 females and 16 males). The livestock system has an extensive nature and the farms are exclusively kept by men. The height at withers (HW), body length (BL), heart girth (HG), spiral tower (ST) and estimated weight (We) in Guelmoise cattle were 115 ± 0.07, 118 ± 0.08, 154 ± 0.09, 187 ± 0.11 cm and 258.12 ± 43.12 kg respectively in females and 171 ± 0.16, 176 ± 0.18, 187 ± 0.08, 225 ± 0.08 cm and 462 ± 59.67 kg respectively in males. Multivariate statistical analyses allowed identifying four different classes defined by the following parameters: morphometric measurements, weight, milk production and age in females as in males. Estimated age at first calving was 39.40 months while the calving interval varied between 14 and 17 months and the reproductive life of the cows equaled 13.7 years.The average daily production of milk was 5.55 ± 1.67 liters in spring during lactation lastingfor 6-7 months. The physico-chemical characteristics of milk were: fat content (FC), protein content (PC), lactose (Lact), dry extract (DE), defatted dry extract (DDE) and freezing point depression (FPD) with 2.85 ± 0.89%, 3.60 ± 0.39%, 4.82 ± 0.13%, 11.84 ± 0.90%, 9.13 ± 0.41% and 0.56 ± 0.01°C respectively.The genotyping of 24 individuals, using the Illumina BovineSNP50 BeadChip, revealed 0.30 for the observed heterozygosity. The inbreeding index*F*iswas slightly positive (0.04) indicating the absence of selection within the population.The data contributed to the feasibility of a conservation and selection program for this breed and the results were useful for the implementation of a conservation strategy aiming to conserve the bovine livestock. The Guelmoise cattle can be used as an alternative genetic resource for production improvement programs.

Keywords:*Cattle, Guelmoise, morphological characterization, milk analysis, genetic characterization, SNP, Algeria.*

POST PARTUM CHANGES IN THE UTERUS OF THE RABBIT OF LOCAL POPULATION

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Abstract

This investigation was undertaken in order to study the mode of regeneration of the epithelium at the placental site and the time at which regeneration was completed in female rabbits. A total of 20 rabbit does of local population were set up and presented tothe males. Eight females were pregnant at the 12th day after mating, constituting thus our group of experimentation. These females were intensively observed during the last two days prior to birth in order to determine exactly the time of parturition. Females were sacrificed at different intervals between 0h to 48h *post-partum* and changes in the uterus were microscopically examined. *Post partum* changes in the uterus were studied over a period of 2 days in those eight primiparous female rabbits. In addition this study allowed us to determine two cases of pseudo pregnant rabbits at16h and 40h *post partum*, which could be explained by the fact that being kept together in the same cage after birth, these rabbits could have been overlapped, which induced the ovulation. Certain observations were made on some other changes that occurred in the uterine epithelium and the endometrial stroma in pseudopregnant rabbits sacrificed at 40h *post partum*. This state was confirmed by the presence of decidual tissue and numerous multinucleated giant cells invading the surface of the mucous membrane uterine, while this type of cells was totally absent in other rabbits. Microscopic examination of sections of the uterus revealed a rapid return to normal histological structure. At the time of the birth there was multifocal erosion of the uterine epithelium.Residual cells were small and basaloid. By 4h *post partum*, there was an intense mitotic activity within the epithelial cells of the uterine surface. Moreover, at four hours *post partum*, the endometrial was oedematous and contained scattered neutrophils. Over the following 24 hours the number of neutrophils, and the degree of stromal oedema, decreased and, by 32 hours the endometrial stroma was normal. While endometrial glands were initially simple tubular, they become more tortuous by 40 hours *post partum*. After 16 hours *postpartum* the surface epithelium returned to normal, being composed of tall columnar, ciliated cells.Nuclei became progressively basal in position. These observations showed that at birth the endometrial epithelium was almost completely degenerated, and its regeneration started at 8h *post-partum*. The uterine involution was complete at 48h.

Key words: *Rabbit, uterine epithelium, post partum.*

EFFECT OF SEXUAL RECEPTIVITY ON OVARIAN FOLLICLE GROWTH AFTER POST MATING IN RABBIT LOCAL POPULATION

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Abstract

The aim of the work was a comparative study of the ovaries of rabbits of a local Algerian population, based on their sexual receptivity at mating. A total of 60 rabbits were divided into 3 groups according to the expression of their sexual receptivity at the time of presentation to a male: receptive (R^+), non-receptive + assisted mating(R^-+SA), non-receptive + assisted mating + an injection of GnRH (R^-+SA+GnRH). They were weighed and then sacrificed 0 to 14h *p.c.* to study ovarian structures. Receptive does were heavier than non-receptive (2.010 *vs.* 1.979 kg, P <.05). Females from groups R^+ and R^-+ SA had a higher number of preovulatory follicles then does of group R^-+SA+GnRH (60%, P <0.05). The frequency of ovulation was significantly influenced by the receptivity of rabbits and the *p.c.* stage, but the ovulation intensity did not vary between groups. All receptive does ovulated at 10h *p.c.* while for non-receptive,ovulations were still observed between 10 and 14h. The diameter of antral follicles in rabbit lot of R^-+SA^++ GnRH was significantly higher (722 *vs.* 567, 604 microns) due to the injection of GnRH. The number of Call and Exner body was influenced by the group and the *p.c.*stage, it was particularly high in females of group R-+SA+ GnRH (respectively 2.81, 3.20 *vs.* 3.99, + 30%, P <0.001). In conclusion, sexual receptivity and GnRH influence ovarian structures and frequency of ovulation of nulliparous local Algerian rabbits.

Key words: *Rabbit, receptivity, GnRH, ovarian, follicles, Call Exner bodies.*

CHARACTERISTICS OF BULLS' ACCOMMODATION FOR THE BOSNIAN-HERZEGOVINIAN BULLFIGHT

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Abstract

Modern animal production is conceptually quite "ruthless" towards individuals of the male sex. They are mainly used for meat production, breeding purposes or as working animals. It often happens that the conditions of their accommodation and exploitation are very difficult. Accommodation criteria for male individuals are defined by their purpose and differ depending on whether they are fattening or reproductive animals. The male genotype, in relation to the female sex, determines physiological characteristics such as rapid growth, realistic higher body weight and better food conversion, which is decisive for the desirability of introducing them into meat production processes. This statement refers to all types of domestic animals, whether intensive or semi-intensive production. Male specimens of some species, such as pigs, cattle or small ruminants, are castrated very early in order to further accelerate the growth of body weight and eliminate the undesirable smell of meat that is the consequence of the presence of male sex hormones. In this way, male animals are deprived of the greatest number of their rights in fattening and disturb their well-being. On the other hand, reproductive animals have a much better position than fodder. Breeding bulls are usually located in artificial insemination centers, where they have achieved greater rights such as better nutrition, better accommodation conditions, manifestation of sexual behavior patterns, and so on. However, through the results of our research, we concluded that the status and preferences of bulls for Bosnian and Herzegovinian bull fight are so good that it is difficult to compare them with any other category of bulls or other male species in livestock production.

Keywords: *bull, Bosnia-Herzegovina bullfight, ethology, nutrition, accommodation.*

EFFECT OF NUTRITION ON HEMATOLOGICAL PARAMETERS OF LAMBS IN FATTENING

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Abstract

The objective of studie was to examine effect of nutrition on hematological parameters of cross-bred lambs fattening. The study was conducted on 20 cross-bred lambs from different pramenka types, divided in two groups. The lambs of one group were fed with mixture of cereals and sunflower meal without mineral-vitamin premix with 12,26% protein, but for the feeding of second group of lambs were used feed mixture for older lambs with 14,69% protein. During the fattening period the lambs from both group were fed hay *ad libitum*. Measurments of hematological parameters were measured on the 21^{st} and 35^{th} day of fattening. The results were statisticly analyzed, statistically significant differences and correlation coeficient were determined. The gain of hematological parameters was determined within the both groups according to age of lambs during fattening. The results indicated that the group lambs fed mixture of cereals and sunflower meal achieved better but not statisticaly significant ($p>0,05$) hematological parameters, comparing to lambs fed with feed mixture.

Key words: *lamb, hematological parameters, feed mixture, fattening.*

HATCHABILITY OF BROILER BREEDER EGGS STORED IN PLASTIC OR CARDBOARD FLATS

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Abstract

In practical conditions of hatching eggs production, different types of packaging for collecting, transporting or storing eggs are used. The packaging is made of different materials, mostly cardboard or various plastic materials. Cardboard flats are usually used only once, while plastic packaging materials allow multiple uses. The aim of study was to investigate the hatchability of broiler breeder eggs stored for 5 or 10 days before incubation, in plastic or cardboard flats. Study was conducted under the conditions of the commercial hatchery. A total of 1.200 eggs originated from Cobb 500 parental flock, were divided into four equal groups of 300 eggs depending on the length (5 or 10 days) and type of packaging (cardboard or plastic flats). Following parameters were analyzed: egg weight loss during storage and incubation, hatchability of all and fertilized eggs, as well as early, middle, late and total embryonic mortality. The variance analysis was used for statistical processing of egg loss, and a chi-squared test for other incubation indicators. The storage length and types of packaging has affected only egg weight loss during storage, but not during incubation ($p<0.01$). Hatchability indicators, as well as embryonic mortality had similar values among all groups ($p>0.05$). According to the data obtained from the research, it can be concluded that both types of packaging are suitable for storage of hatching eggs.

Keywords: *Hatching egg, Storage length, Storage material, Flats, Incubation.*

SELECTED QUALITY TRAITS OF TABLE EGGS ON BANJA LUKA (BOSNIA AND HERZEGOVINA) MARKET

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Abstract

The aim of the study was to analyze selected external and internal quality traits of table eggs of weight class large (L), originating from five different producers, present on Banja Luka (Entity of Republic of Srpska, Bosnia and Herzegovina) market. Three packs with 10 eggs, as repetition, for each egg producer were purchased, which encompass a total of 150 table eggs used in this analysis. All the eggs were produced in cage system and were seven days old on the day of analysis, which included determination of the following traits: egg weight, weight and proportion of main egg components (shell, albumen and yolk), egg shape index, unit surface shell weight, egg shell thickness, albumen height, Haugh units, yolk index, yolk color, and yolk albumen ratio. Data were analyzed using descriptive statistics and one-way analysis of variance (ANOVA). According to the obtained results, significant differences among the egg producers were found for egg weight, yolk weight, albumen weight, egg shape index, albumen height, yolk index, Haugh units and yolk color ($p<0.05$). However, shell weight, shell weight per unit surface, shell thickness, proportion of main egg components, and yolk albumen ratio had similar values among different producers ($p>0.05$). The samples of the eggs purchased on Banja Luka market generally showed satisfactory values regarding the external and internal quality parameters.

Keywords: *Table egg, Quality traits, Banja Luka, Market.*

ANTIOXIDANT POTENTIAL OF TRADITIONAL SERBIAN WHITE CHEESE IN BRINE

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Abstract

The aim of this study was to characterize antioxidant properties of traditional Serbian white cheeses in brine and the influence of *in vitro* digestion on these properties. Total antioxidant capacity, reducing power and iron (II) chelating properties of four different Serbian cheeses before and after *in vitro* digestion were as sayed. Due to different content and composition of proteins, low molecular weight peptides and free amino acids, investigated cheeses had different antioxidant properties before digestion. The most efficient for radical scavenging was Svrljig sheep cheese (36.43 mm ol TroloxEq/kg) whereas the lowest total antioxidant capacity expressed Homolje sheep cheese (5.82 mm ol TroloxEq/kg). *In vitro* digestion differently effected antioxidant properties of investigated cheeses. Digestion improved antioxidant capacity of cheeses up to 58.56 times and reduced power by 17.90%-99.30%. Simultaneously, digestates had unchanged or slightly reduced chelating ability. Major nitrogen compounds responsible for antioxidant properties of digested cheeses are low molecular weight peptides and free amino acids.

Keywords: *white- brined cheeses, antioxidant properties, digestion.*

THE INFLUENCE OF IN VITRO DIGESTION ON ACE-INHIBITORY POTENTIAL OF PROTEIN FRACTIONS OF TRADITIONAL SERBIAN WHITE-BRINED CHEESES

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Abstract

From the nutritional point of view, cheese is a good source of essential substances such as proteins, vitamins, minerals and short chain fatty acids. In addition, cheeses contain a great number of bioactive peptides including those with ACE-inhibitor activity. According to current knowledge, several factors including type of milk, the presence of natural microflora and natural milk enzymes, heat-treatment of milk, proteolysis during cheese making process and especially during ripening affect the level of ACE-inhibitory peptides in cheeses. Thus, the level of inhibitory peptides depends on type of cheese. In Serbia, a wide range of traditional white cheeses in brine usually named as „krishka cheese“ such as Sjenica cheese, Homolje cheese, Zlatar cheese, Svrljig cheese and other are produced. Today there is no information about their functionality. This study deals with the influence of in vitro digestion on ACE-inhibitory potential of protein fractions of traditional Serbian white cheeses in brine. Water-soluble and water insoluble protein fractions of four different traditional Serbian cheeses were subjected to in vitro gastrointestinal digestion. Water-soluble fractions of traditional cheeses had different ACE-inhibitor activity. Depending on variety IC50 of undigested water-soluble fractions ranged from 2.26 to 4.61 mg/ml. In vitro digestion significantly increased IC50 of this fraction of traditional cheeses. However, after in vitro digestion, unsoluble fractions became the major source of inhibitory peptides.

Keywords: *white- brined cheeses, digestion, ACE-inhibitory potential.*

EFFECT OF REDUCING THE CRUDE FIBER CONTENT IN FEED ON THE PERFORMANCE AND GRAZING IN SLOW-GROWING CHICKENS REARED ON PASTURE

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Abstract

The trial was carried out in the experimental poultry farm of the Institute of Animal Science- Kostinbrod (Bulgaria) to assess the effect of the reduced fiber content in the feed on the major performance traits and the grazing in slow-growing broiler chickens having access to pasture. Two groups of individually marked male chickens (♀JA57G×♂ Hubbard Yellow), each containing 50 birds were reared in extensive system, in adjacent cages at a density of 5 birds/m². All the chickens were fed starter diet until they reached 4 weeks. After 5 weeks of age, the groups received grower diets with a different fiber content – 4.61% for the control group, and reduced crude fiber content of 4.06% for the experimental group. The pasture was controlled through recording of the amounts of the grass before grazing, the rest available grass and the difference between them. The major zootechnical parameters including live weight, feed intake, weight gain and fed consumption per kilogram of live weight were recorded. At the age of 10 weeks, 6 chickens of each group were slaughtered and subjected to carcass analysis. The results of the study showed that the reduced fiber content in the feed for birds, reared in alternative systems with pasture access was associated with increased live weight ($P<0.01$) and weight gain ($P<0.001$), as well as higher weight of the ready-to-cook carcass, breast, thigh, liver, gizzard and the abdominal fat ($P<0.01$). Furthermore, feeds containing lower fiber improved dramatically (over three times) the grazing of the pasture in slow-growing chickens reared for meat production.

Keywords: *Grazing, Slow-growing chickens, Carcass analysis, Pasture.*

THE EFFECT OF SUPLEMENTING CHAMOMILE DRY FLOWER MEAL IN WEANED AWASSI MALE LAMBS DAILY RATIONS ON BODY PERFORMNACE AND MEAT QUALITY

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Abstract

An experiment was conducted on 20 lambs during 2016 using chamomile dry flower meal (ch). Animals were randomly allocated into 4 groups [CGCH (0% ch), EGCH2 (2% ch, EGCH4 (4% ch) and EGCH6 (6% ch)] by 5 heads. Animal health as well as palatability of rations was visually acceptable. Initial average live body weight (LBW) of all animals was 26 ± 1.5 Kg. Average LBWG/week was significantly ($P<0.05$) the best in group EGCH2 (3.42±0.48 kg/week/head). FCR was higher at the end of the trial in EGCH2 (6.09±0.40) where animals were fed with 2% chamomile supplemented to daily ration in comparison with all other groups. On the other hand, after cooling L* meat samples of lamb were better in EGCH2 followed by EGCH4, CGCH and EGCH6. Redness of meat from animals slaughtered decreased insignificantly ($P > 0.05$) 24h after cooling in all groups CGCH (18.99 ± 4.53 to 15.78 ± 2.99), EGCH2 (21.6 ± 7.8 to 15.4 ± 1.14), EGCH4 (17 ± 2.7 to 14.01 ± 1.97), EGCH6 (20.2 ± 4.43 to 18.32 ± 2.16). Yellowness b* decreased after 24 hours of cooling in all groups. At 24 hours *post-mortem*, pH of fresh meat at slaughter was significantly ($P<0.05$) more acidic (5.57±0.054) in CGCH and EGCH6 (5.59) than EGCH2 (5.75) and EGCH4 (5.67). After 1 month of freezing CGCH became less acidic (5.79) in comparison with EGCH2, EGCH4 and EGCH6 averaging the level of 5.72, 5.77 and 5.67, respectively ($P>0.05$). The study of water holding capacity showed that drip loss was minimal in EGCH6 where the loss was (17.86 % ±1.47). Furthermore, tenderness of cooked meat after 24 hours of cooling was higher ($P<0.05$) in EGCH6 (8.4mm±0.7) followed by EGCH2 (5.64 mm± 2.1) than CGCH (5.5mm ±0.4) and EGCH4 (5.2 mm ±0.9). It is concluded and recommended to use rations containing chamomile meal in the daily feeding of Awassi sheep.

Keywords: *Awassi lambs, Chamomile dry meal, Body performance, Meat quality.*

GENOTYPE AND ALLELE VARIETY OF THE „GAIT KEEPER" MUTATION IN THE DMRT3 GENE IN HORSE BREEDS

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Abstract

A recent study showed that a mutation from cytosine (C) to adenine (A) in the *doublesex and mab-3 related transcription factor 3* (*DMRT3*) gene had a major impact on harness racing performance of different breeds. We genotyped 117 horses representing 9 horse breeds for the DMRT3 stop mutation. French trotter (*n*=19), Italian (*n*=9) and trotters born in Bulgaria (*n*=27), Thoroughbred (*n*=25), Purebred Arabian (*n*=19), Trakhener (*n*=13) and other breeds (Pura Raza Espanola (*n*=1), Fressian (*n*=3) and Danubian (*n*=1)). The age of the horses was from 2 to 8 years. Some of harness horses had the ability to pace gait (11%). The aim of the current study was to investigate DMRT3 genotyping. The genotyping showed that the results were heterozygous (CA) *n*=6, homozygous wild-type (CC) *n*=62, homozygous mutant (AA) *n*=49. Horses with the CC genotype had higher ability for canter and gallop such as Thoroughbred and Purebred Arabian. Horses with heterozygous alleles were often typical for harness breeds - trotters and gaited – American Saddlebred, Icelandic. The heterozygous horses in ours study were French trotters and progeny of the same breed. These results indicated that this polymorphism might be useful for genotype-assisted selection for gait type within these breeds. May be the mutation is strongly associated with horses` ability to perform alternative gaits.

Keywords: *horse breeds, harness, gaits, genetic.*

A DNA-BASED METHOD FOR IDENTIFICATION OF PLANTS SPECIES IN MULTIFLORAL HONEY SAMPLES FROM BULGARIA

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Abstract

Derived from nectar and pollen, honey is a widely consumed natural product for its nutritional value and health benefits. Since ancient times, honey consumption is generally associated with its medicinal properties. The composition of honey depends on the plant species visited by the honeybees. The aim of the study was to identify plants species in multifloral honey samples from Bulgaria by using DNA-based approach. Three multifloral honey samples were collected from Bulgarian beekeepers (Sofia region) and used for isolation of total DNA. The honey samples were examined with rbcL and trnH-psbA plastid regions as barcode markers. The obtained sequences were analyzed by using Vector NTI v.10 software package (Life technology). The results suggested that rbcL region could distinguish different plant at the species level in honey samples. However, psbA-trnH spacer region for these samples was less informative. The results with rbcL region showed the presence of typical Bulgaria eudicots and monocots species. Our results indicated that multifloral honey samples were largely influenced by floristic local biodiversity and the presence of typical species such as *Helianthus annuus* (*Asteraceae*), *Rosa sp*. (*Rosaceae*), *Brassica sp*. (*Brasicaceae*), *Lavandula sp.* (*Lamiaceae*), *Melilotus sp.* (*Fabaceae*). Therefore, honey botanical characterization based on DNA barcoding might serve useful to beekeepers in obtaining bee honey with specific botanical origin or therapeutic characteristics desired by food market demands.

Keywords: *Honey, DNA-based method, rbcL, trnH-psbA.*

THE EFFECT OF FEEDING WEANED LOCAL MALE KIDS GOATS "BALADI BREED" WITH FABA BEANS (*VICIA FABA*) AS COMPARED TO SOYBEAN MEAL ON BODY PERFORMNACE

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Abstract

The fattening study was carried out during May- July of 2017 in "Ghattas goat farm" located in Bziza, North-Lebanon, for 10 weeks and involved 15 intact male kids of the local "Baladi" goat breed after weaning. The trial included a 2-week adaptation period to the diet followed by 8 weeks of fattening by feeding five experimental diets. The goats were at 13-14 weeks of age and had at the beginning of the study 14.90 ± 0.259 Kg of live body weight (LBW). Each animal group Kids (n=3 replicates) was fed with one of the five dietary treatments: Ag1- FBS (Faba bean seeds) partially replaced 25% of the soybean meal (SBM); Ag2 - FBS partially replaced 50% of the legumes (SBM); Ag3- FBS partially replaced 75% of the legumes (SBM); Ag4 - FBS totally replaced 100% of the legumes (SBM) and Ag5 (control) – this ration was composed of 100 % SBM. Apparent feed intake (aFI), live body weight gain (LBWG) and apparent feed conversion ratio (aFCR) were calculated weekly. It was found that dry fava seed meal (FBS) coarsely grind in combination with the traditional soybean meal (SBM) had no adverse effects either on live body weight gain (LBWG) and feed intake (FI) or on feed conversion ratio (FCR). A combination of 25% SBM: 75% FBS (as in-group Ag3) to be included in concentrate ratios resulted in higher live body weight gains and feed retention as well as profit.

Keywords: *Awassi lambs, Faba beans, soybean, body performance.*

THE IMPACT OF FEEDING WITH HERBS ROSEMARY AND CHAMOMILE ON BROILER CHICKENS BODY PERFORMANCE DURING THE GROWTH PERIOD

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Abstract

Two hundred fifty day-old broilers (Ross breed) were divided into five equal treatment-groups fed five assigned diets: Control Group CG-I (antioxidants-free and antibiotics-free basic diets -BD), CG-II (BD supplemented with antioxidants and antibiotics only, group-VI (1% Rosemary dry meal added to BD), group-VII (1% Chamomile flowers dry meal added to BD) and group- VIII (1% mixture of 0.5% Chamomile and 0.5% Rosemary). The highest and the lowest Feed Intake (FI) averages ($P<0.05$) were noticed in groups VII (1020±26.5) and VI (833.3±58.6 g/bird) where birds were fed on BD with 1% herb dry meal mix, respectively. Better numerical result of Live body Weight (LBW) at slaughter was achieved in group VI (1121.1 ± 79.5 g). Better numerical results in LBWGain was obtained in groups VI followed by II, VIII, VII, and I by 719.5±60.15, 704.2±97.63, 672±2.93, 642.5±173.3 and 591.2±46.85 g, respectively. The best rate of LBWG regarding feed intake was significantly ($P<0.05$) observed at slaughter in group VI (1.25±0.05). Best % NW (net weight) to slaughter weight was achieved in treatment II (75.5±1.2%) followed by groups VII (72.3±1.6), I (71.9±3.1), VI (71.6±2.3) and VIII (68.7±8.5%). Identical results of liver + heart (%) to NW were ranging between 3.9±0.56 and 3.1±0.86%. Breast weights (%) to NW were insignificantly different ($P>0.05$) and almost the same, ranging from 21.9±0.96% to 21.2±0.64%. The results showed that 1% Chamomile and 1% Rosemary could be considered as a potential growth promoters for poultry.

Keywords: *Rosemary; Chamomile; Broiler chicken nutrition.*

EFFECT OF HEAT STRESS ON PHYSIOLOGICAL PARAMETERS AND MILK PRODUCTION ON FRIESIAN HOLSTEIN COWS IN WEST BEKAA VALLEY LEBANON

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Abstract

This study was conducted in West-Bekaa valley (Lebanon) in order to evaluate the impact of heat stress on the physiological response of cows and consequently on milk production and composition. Milk samples were collected from 9 dairy Holstein Friesian lactating cows. Cows were selected based on the age (4 to 5 years), the stage of lactation (1 to 2 months) and number of lactation (1 to 3). Temperature and relative humidity were measured. Rectal temperature (RT), heart rate (HR) and respiration rate (RR) were recorded 3 times per day. Milking was performed two times in a day and milk sampling was done in the morning from teat udder and submitted to physicochemical analysis (fat, protein, total solid and solid non fat). The high ambient temperature recorded by day in July, August could have impact on the increasing RT, RR and HR. The RT, RR and RH of cows during 4 months of the study were significantly different ($p<0.05$). The overall averages of all parameters were significantly higher in July and August as compared to October. Milk composition and yield is a function of THI. Milk production decreases as THI increase. Composition of milk (TYs, SNF, protein, fat) differed significantly among the four months of the study with higher values in October (12.65; 8.83; 3.72; 4.45 %) and the lowest values in August (12.23; 8.53; 3.43 4.43 %). Milk yields differed significantly ($p<0.05$) among the different months. The average highest milk yield (20.5l/day) was found in October and the lowest (18.5 l/day) was in August. Significant positive correlations were established between the THI and the physiological parameters of the animal (RT, RR and HR) as well as between the THI and milk production and composition. However a highly significant negative correlation was established between THI and DMI.

Keywords: *Friesian cow, respiration rate, fat, solid non-fat, rectal temperature, heart rate*.

THE INFLUENCE OF THE AVERAGE MONTH TEMPERATURE AND RELATIVE HUMIDITY IN STABLE ON PREGNANCY RATE OF CZECH FLECKVIEH-SIMMENTAL

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Abstract

Czech Republic is on boarder between oceanic and continental climate. High summer and low winter temperatures are typical for the continental climate. The daily course of the temperature shows minimal temperatures in the morning and maximal after the noon. When extreme microclimate is present at stable, reproduction of animals is, of course, altered because of disturbance in hormonal secretion, which has a huge influence on physiological processes in the body. The average month temperature and humidity was analyzed in this paper. The observation was made during 2016 and 2017 on private farm Genagro Říčany (4 9°12'32.319", 16°23'42.666"). The average temperature and humidity were calculated from the data collected each 15 minutes by data logger HOBO (Onset) which were placed in stable, in height of cow withers. In total 750 cows of Czech Fleckvieh-simmental on various lactation were included to this experiment. The reproduction data were obtained both from the monthly reports of breeding company and owner of the farm. Heat stress can have long-term effect, that can be observed weeks or months after summer season. This statement can be also supported by the results of our work, which shows that worse reproduction parameters (especially pregnancy rate) was in the end of summer and beginning of the autumn.

Keywords: *Czech Fleckvieh-simmental, Pregnancy rate, Temperature, Relative humidity, Heat stress.*

INFLUENCE OF SWITCHING TEMPERATURE OF BARN FANS ON THE DAIRY COWS LYING BEHAVIOR

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Abstract

This work is targeted on the influence of switching temperature of barn fans on the dairy cows behavior. The 128 cows of Czech fleckvieh-simmental cattle in total were involved to this experiment. The experiment took place on private farm in Pyšel and lasted from July to September of 2017. The data for this paper were collected by observation of subject inside the barn. The observation determined the overall time of lying in stable. According to the time which cows lied, the welfare can be suggested. The switching temperature of fans was set to 24°C and 26°C. Cows were divided into two groups according to the switching temperature. Later, the differences between these two temperatures was established and corellated to the temperature itself. The weak relationships were discovered between amount of hours spend lying and mean temperature (r=-0.017 for 24°C; 0.006 for 26°C; P=0.05). These results suggest, that the switching temperature of the fan had very little effect on the amount of hours, that cows spend lying down. Although, a negative relationship for switching temperature 24 °C can be observed. This can mean, that when the fan switching temperature is set to 24°C, mean temperature has larger impact on the behavior and welfare. Higher fan switching temperature (26°C) may have lower impact, because of the higher level of heat stress already present in cattle. This could be supported by the fact, that cows in 26°C group spend less hours lying down in average (0.434 hour) than the 24°C group.

Keywords: *Fan setting, Temperature, Heat stress, Czech Fleckvieh-Simmental, Behavior.*

MORPHOLOGICAL AND BIOCHEMICAL ADAPTIVE CHANGES ASSOCIATED WITH A SHORT PERIOD STARVATION OF ADULT MALE JAPANESE QUAIL (COTUMIX JAPONICA)

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Abstract

The morphological and biochemical impact of a short-period of starvation on Japanese quail was investigated. Ten adult male Japanese quail were divided into two groups: control fed and starved. The control-fed group was offered food and water ad libitum and the starved group was subjected to a short-period of food deprivation. After 2.5 days, the serum was obtained and different parameters including the total protein, AST, ALT, triglyceride, HDL, LDL, creatinine and urea were assessed. Gastrointestinal tract, stomach and liver were excised and their masses were estimated. Paraffin and resin embedded sections from the proventriculus, gizzard, liver, duodenum, kidney and pancreas were examined with a light microscopy. Significant decreases in the masses of body, gastrointestinal tract, stomach and liver of the starved group were recorded. The liver and duodenum were the most affected organs. The liver showed depletion of glycogen, vacuolation, hyperemia and cellular infiltrations. Duodenal villi showed degenerative changes in lamina epithelialis and cellular infiltrations in the lamina propria. Biochemical analysis revealed a decreased level of total protein, AST and ALT, increased cholesterol, triglycerides and LDL and unchanged HDL, urea and creatinine by starvation. The current study described in details the effect of short time starvation on quail organs. Time-point adaptive responses of male quail to starvation and refeeding will be investigated in future studies.

Key words: *starvation, quail, histology, blood.*

CHEMICAL EVALUATION OF SOME BIO EXTRACTS WITH PATHOLOGICAL STUDY ON TUMOR CELL IN MICE MODEL

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Abstract

The objective of our study was to chemically evaluate some bio extracts regarding chemical composition, minerals contents, and their effects on tumor cells. Seventy seven adult Swiss female albino mice were used. A model of Solid Ehrlich Carcinoma was implanted subcutaneously into the right thigh of the lower limb of 70 mice and a palpable solid tumor mass was developed within 12 days**.** Female Swiss albino mice were divided into 11 groups with 7 animals of each. Moisture content for air dried investigated flowers was 11.16, 9.45, 12.62 and 9.76% of Cynara cardunculus, Achillea millefolium, Calendula officinalis, and Matricaria chamomilla, respectively. Ash, crude fiber, crude lipids, crude protein, total sugars, reducing sugar and non-reducing sugars were also determined and calculated as (g/100g dry weight). Cynara cardunculus and Achillea millefolium flowers had the highest values of crude fiber contents. Calendula officinalis flowers had the lower value of crude fiber, while, the same plant had the highest values of lipids and crude protein. On the other hand, M. chamomilla flowers had the higher values of ash, total sugars, reducing sugar and non-reducing sugar. These values were higher than those of A. millefolium flowers for crude fiber, total sugars, reducing sugar and non-reducing sugar contents. Calcium was the main element in all samples which ranged from 625 to 972 mg/100g on dry weight basis in A. millefolium and C. officinalis, respectively. Also, Magnesium content, of C. cardunculus, A. millefolium and C. officinalis were 525, 298 and 245.1 mg/100gm, respectively. Moreover, the methanolic and aqueous extract of all plants showed the effects as antitumor in mice when compared with doxorubicin. The methanolic and aqueous extract of all plants showed the effects as antitumor in mice when compared with doxorubicin.

Keywords: *Bio extracts, Chemical composition, Minerals contents, Cancer Cell, Mice.*

HAIR HISTOLOGY AS A TOOL FOR FORENSIC IDENTIFICATION OF DOMESTIC ANIMALS

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Abstract

In the current study, we investigate the possibility of using hair histology as a tool for animal species identification used in forensic medicine purposes. Guard hairs were collected from buffalo, camel, cow, horse, donkey, sheep, goat, dog and cat and the cuticle scale pattern, medulla, and pigmentation were examined with the light microscopy. The morphology of the hair reflects a variation between different animal species. The preliminary data shown in the current study could provide a tool for the forensic identification of the examined species. Further studies are required using hairs from other animal species to obtain a reference database for species identification.

Key words: *Hair, cuticle, scale pattern, Forensic medicine, Histology.*

EFFECTS OF SUPPLEMENTATION WITH *FICUS SYCOMORUS* ON FEED INTAKE, DIGESTIBILITY, BODY WEIGHT GAIN AND CARCASS PARAMETERS OF WASHERA SHEEP FED ON NATURAL PASTURE HAY

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Abstract

The experiment was conducted to evaluate the effect of supplementations with *Ficus sycomorus* leaf, fruit and their mixtures on intake, digestibility, body weight gain and carcass parameters of sheep fed on basal hay diet, and to assess the economic benefit of the supplementation using partial budget analysis. The experiment was carried out at Gish Abay in Sekela Woreda, West Gojjam Zone using 20 intact male yearling Washera sheep with a mean (±SD) initial body weight of 17.5±0.39kg. The animals were vaccinated against anthrax and pasteurellosis, dewormed and sprayed against internal and external parasites, respectively, before the start of the experiment. Experimental sheep were adapted for 15 days to the treatment feeds. The experiment consisted of digestibility trial of 7 days and feeding trial of 90 days followed by evaluation of carcass parameters at the end of the experiment. The experiment was laid out in a randomized complete block design (RCBD) with five blocks consisting of 4 animals per block based on their initial body weight. Dietary treatments were randomly assigned to one of the 4 treatment diets within a block. Treatments comprised of feeding natural pasture hay *ad libitum* (un-supplemented: T1) or natural hay supplementation with either *F. sycomorus* leaf (Treatment 2: T2), or *F. sycomorus* fruit (Treatment 4; T4), or a mixture of *F. sycomorus* leaf and fruit in a ratio of 1:1 (Treatment 3; T3). The amount of supplements offered was 300 g/day on DM basis. Water and salt were available on free choice. Natural pasture hay in the current study contained 8.0% crude protein (CP), 73.1% NDF and 43.6% ADF. Sheep in the un-supplemented treatment consumed higher ($P < 0.001$) basal dry matter intake compared to supplemented group (581.6 *v.* g/day). However, total DM intake was higher for sheep in the supplemented group (T2-T4) compared to the un-supplemented (control). Supplementation significantly improved digestibility co-efficient of DM, OM ($P < 0.001$) and of CP ($P < 0.001$). Supplementation highly increased ($P < 0.001$) final body weight (FBW), FCE and ADG. Those supplemented with T2 had significantly higher ($P < 0.001$), FBW (21.6 kg), FCE (0.062) and ADG (45.1g/day) compared to the un-supplemented treatment, which had 18.2 kg, 0.01 and 8 g/day respectively. Furthermore, dressing percentage on slaughter weight and empty body weight basis were high for T2 ($P < 0.01$). Sheep in T2 had significantly higher ($P < 0.05$) rib-eye muscle area compared to the un-supplemented. Though T2 showed better performance in most biological parameters, partial budget analysis indicated that better return in net income was obtained in T2. As a result, supplementation with T2 is an alternative and profitable feed in the feeding regime of endeavor sheep using the treatment diets of this experiment.

Key words: *Supplementation, feed, parameters, sheep.*

EMBRYO TRANSFER FOR BETTER CATTLE BREEDING WORK IN GEORGIA

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Abstract

Embryo transfer in livestock has great challenge in economic dimension for developing countries and is considered as best method for dairy and beef cattle genetic improvement. The Embryo Transfer (ET) Technology was developed in the 1998 by California Polytechnic State University Dairy Science International, where Dr. Kakha NADIRADZE was able to get the knowledge and relative information in frame of Internship Program funded by USDA. To compare ET with artificial insemination, this method is more effective and greatly increases the number of genetically important cows. Embryo transfer is now commonly used to produce AI sires from the top producing cows and proven bulls in many countries. In addition, new genomic techniques are being used increasingly to select embryo donors; genomic analysis has become essential for the selection of bull dams to be used in embryo transfer. Although economics would seem to preclude the use of embryo transfer techniques for anything but seed-stock production at this time, the commercial cattle industry has benefited from the use of commercial bulls produced through well designed Cattle breeding plans and schemes. The link between mainstreaming of Agrobiodiversity in agricultural sectors for better Cattle Breeding and better nutrition is very important key factor. AFRD aims to promote the science of animal embryo technology by encouraging effective research, disseminating scientific and educational information, maintaining high standards of ethics and cooperating with other organizations with similar objectives.

Keywords: *Embryo Transfer, Cattle Breeding, USDA, Georgia, Nutrition, Agrobiodiveristy.*

SUBSTITUTION OF SOYBEAN MEAL WITH LOCAL PRODUCED LEGUME FORAGES IN EWES RATIONS

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Abstract

Nutrition of intensive sheep farming in Greece is based mainly on feeding forages and concentrates in the stable, while grazing is provided in a low extend. Feeding cost is the major cost factor and from the protein supplementation side is based on alfalfa hay and soybean meal. The aim of the study was to investigate the substitution of soybean meal with local produced legumes forages. Thirty ewes of the "Karagouniko" breed were split in three groups of ten animals each. In the first group (control group), nutrition was based on alfalfa hay and soybean meal. In the second group, alfalfa hay and soybean meal were totally substituted with vetch hay. In the third group, alfalfa hay was totally substituted with peas hay and soybean meal inclusion was increased. Body weight was measured in the beginning and at the end of the trial period. Feed consumption and milk production were recorded daily and milk quality was analyzed weekly. No statistically significant differences were found for all the parameters mentioned. Substitution of imported soybean meal with locally produced legumes is possible and will be an advantage in the differentiation of Greek sheep milk. The economic analysis showed that in farm cultivation vetch and pea hay is more preferable than alfalfa.

Keywords: *Vetch, Peas, Karagouniko, Greece.*

GROWTH AND SURVIVAL RATE OF GOLD FISH, *CARASSIUS AURATUS* IN EARTHEN PONDS AND CONCRETE TANKS UNDER TROPICAL CONDITIONS

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Abstract

To compare the growth performance of gold fish *Carassius auratus* (L.), produced in concrete tanks and earthen ponds, fish larvae (0.10 ± 0.007 g) were cultured for 11 weeks and individual weight gain, survival rate and number of marketable fish produced were compared among four management regimes for each culture system: (1) live zooplankton fed to fish larvae in ponds (PLF) and tanks (TLF); (2) application of poultry manure in ponds (PPM) and tanks (TPM); (3) application of cow manure in ponds (PCD) and tanks (TCD); and (4) a control treatment for ponds (PC) and tanks (TC), where a commercial feed was applied. Weight gain of gold fish was highest in the PLF treatment, followed in decreasing order by TLF, PPM, PCD, TPM, TCD, PC and TC treatments ($P < 0.05$). There was a significant difference in the survival of gold fish among the treatments, ranging from 64.83% in TC to 93.40% in PLF. The number of marketable fish produced was highest in the PLF treatment, followed in decreasing order by TLF, PPM and PCD treatments. The results suggest that introduction of live zooplankton into culture units results in higher growth of gold fish larvae compared to manure based systems. Earthen ponds appeared to be better alternative to concrete tanks for manure application through maintenance of better water quality due to their higher assimilatory capacity and greater abundance of plankton resulting in better growth of cultured fish.

Key words: *gold fish, aquaculture management, earthen pond, concrete tank, fish production.*

MINING OF SIMPLE SEQUENCE REPEATS IN EXPRESSED SEQUENCE TAGS OF THE CAMEL BY FUNCTIONAL GENOMIC INFORMATION

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Abstract

The objective of this research was to make a character description of Simple Sequence Repeats (SSR) derived from Expressed Sequence TAGs (EST-SSR) markers of the camel and to conduct practical analysis of these sequences for their application in comparative genomics and molecular genetics studies. A total of 862 SSRs were discovered from 17,155 EST sequences using the SSR Locator software, 827 EST out of 17,155 had SSRs, that 794 (96%), 31 (3.8%) and 2(0.2%) of them contained 1, 2 and 3 SSRs, respectively. The Dimeric motifs were the most abundant SSRs (38.86%), followed by 27.15%, 21.46%, 6.96%, and 5.57% for Tri-, Hexa-, Tetra- and Pentameric motifs. The most plentiful dimer, trimer, tetramer, pentamer and hexamer motif were AC/TG (54%), GCC/GGC (19.2%), TTTA (13.3%), AAAAG (10.4%) and AACCAC (67.6 %), respectively. Most of Dimeric SSRs were located upstream of CpG islands (CGIs), whereas a higher proportion of Trimeric motifs overlapped with CGIs. Asparagine had the highest percentage of amino acids. Motifs coding amino acids could be applied as a new source of functional markers and biological studies. BLASTX was used to examine the final non-redundant EST-SSRs. Almost all of EST-SSRs were found out to be protected in the macromolecule catabolic process and RNA processing and splicing. These EST-SSR markers may be a precious resource for further molecular, genetics, and genomics research of camels and related species.

Keywords*: EST, SSR, Camel, molecular marker, Gene ontology, genomic.*

EFFECT OF FEED ADDITIVES ON ENERGY AND PROTEIN UTILIZATION OF BROILER CHICKENS IN HIGH STOCKING DENSITY

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Abstract

This study evaluated the effects of purslane extract and probiotic on energy and protein utilization, droppings characteristics and welfare related parameters of broiler chicks under high stocking density. A total of 280 one-day-old broiler chicks were used in a completely randomized design with five treatments and four replicates per each. Dietary treatments included: 1) positive control (PC; 10 chicks/m ^{2}), 2) negative control (NC; 15 chicks/m ^{2}), 3) NC + 500 mg/kg purslane extract (PE), 4) NC + 200 mg/kg probiotic supplementation (PS) and 5) NC+500 mg/kg PE + 200 mg/kg PS. The results of this experiment showed that energy efficiency ratio (EER) and protein efficiency ratio (PER) were increased as a result of increasing density in starter and overall experimental period ($P< 0.05$). Birds reared in high density and using feed additives had greater EER and PER rather than PC group ($P< 0.05$). Litter and excreta moisture were significantly increased with increasing placement density ($P< 0.05$). These data indicated that increasing the stock density positively influenced broiler EER and PER, but negatively influenced litter moisture, gait score, foot pad dermatitis and hock burns. Use of purslane extract and probiotics in high stoking density may not have clear effect on these parameters.

Keywords: *Broiler, Probiotics, Purslane, Stoking density, Welfare.*

EFFECT OF WILD PISTACHIO AND PURSLANE EXTRACT ON PERFORMANCE OF BROILER CHICKENS UNDER HEAT STRESS CONDITION

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Abstract

The aim of this experiment was to investigate the effect of vitamin E, wild pistachio and Purslane extract on the performance of broiler chickens reared under heat stress condition. For this purpose, 200 one-day-old broiler chicks (Ross 308) were used in a completely randomized design with five treatments, four replicates and 10 chickens per replicate. The dietary treatments were: 1) control diet (CO; basal diet + no additives), 2) CO + 200 mg/kg vitamin E (α-Tocopherol) (VE) , 3) CO + 1000 mg/kg of wild pistachio extract (WPE), 4) CO + 1000 mg/kg of Purslane extract (PE), 5) CO + 1000 mg/kg WPE + 1000 mg/kg PE (WPEPE). The results of this experiment showed that feed intake, body weight gain and feed conversion ratio of broiler chicken during starter, growth and total phase of rearing periods were not affected by feed additives (P>0.05). The serum glucose concentration (mg/dl) was reduced with inclusion of WPE in broiler diets. Cecal undesirable bacteria (E-Coli and Coliforms) were decreased by addition of PE and WPEPE to broiler diets compared with other groups. It was concluded that the addition of Purslane extract and Purslane + wild pistachio extract to broiler diets might improve cecal microflora composition of broiler chickens reared in heat stress condition.

Keywords: *Wild pistachio extract, Purslane extract, Broiler, Cecal microflora composition.*

REPRODUCTIVE PERFORMANCE OF RAEINI CASHMERE GOAT: IMPLICATIONS ON GENETIC AND NON-GENETIC EFFECTS

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Abstract

Reproductive traits are the main characteristics determining profitability of breeding practices of domestic animals influenced by genetic and non-genetic effects. Data collected from 1979 to 2012 at Raeini Cashmere goat breeding station, located in Baft, Kerman province, south-eastern part of Iran, were used to estimate genetic and non-genetic parameters for reproductive traits of Raeini Cashmere goat including litter size at birth (LSB), litter size at weaning (LSW), total litter weight at birth (TLWB) and total litter weight at weaning (TLWW). Genetic analyses of the studied traits were carried out under a Bayesian approach considering threshold models for LSB and LSW and linear models for TLWB and TLWW applying THRGIBBS1f90 and GIBBS2f90 programs, respectively. Both TLWB and TLWW were pre-adjusted for the effect of sex and birth type of kids. Kidding year and doe age were fitted as fixed effects and direct additive genetic and animal permanent environmental effects were fitted as random effects. All the studied reproductive traits of Raeini Cashmere goat were significantly influenced by kidding year and doe age ($p<0.01$). Posterior means (± posterior standard deviation) for direct heritability estimations of LSB, LSW, TLWB and TLWW were 0.07±0.03, 0.06±0.02, 0.05±0.01 and 0.04±0.02, respectively. Posterior means (± posterior standard deviation) for repeatability estimations of LSB, LSW, TLWB and TLWW were 0.19±0.04, 0.08±0.02, 0.14±0.01 and 0.08±0.02, respectively. Generally, it could be concluded that animal permanent environmental effects were more pronounced than direct additive genetic effects for genetic evaluation of the studied reproductive traits of Raeini Cashmere goats.

Keywords: *Litter size, Litter weight, Repeatability model, Goat.*

LIGHT LAMB PRODUCTION: EFFECTS OF SLAUGHTER AGE ON FATTY ACID COMPOSITION, VITAMIN E AND SENSORY CHARACTERISTICS OF MEAT

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Abstract

In the Mediterranean areas, lamb meat is commonly produced by dairy breed, and lambs are slaughtered at very young ages and light weights. These very light carcasses meet the preference of consumers, who consider these lambs to be of better quality. The growing interest in meat nutritional factors is shifting to a focus on fatty acid composition that is affected by the slaughter age of lambs. This study aimed to evaluate the effect of the increase in slaughter age from 45 to 60 days on the fatty acid profiles, nutritional indices, vitamin E content and sensory characteristics of the meat. In winter, twenty lambs of Leccese dairy breed, raised according to traditional production system, were randomly assigned to two slaughter age groups (45 and 60 days). All lambs received maternal milk and a supplementation of hay and commercial concentrate from 30 days to slaughter. The results showed that the *n*-6/*n*-3 fatty acid ratio was affected by the slaughter age, showing lower ($P < 0.01$) values in lambs of 45 days. The meat from 60 day lambs showed the higher ($P < 0.01$) vitamin E content and received the higher ($P < 0.01$) hedonic scores for flavour, juiciness and overall liking than the meat from lambs slaughtered at 45 days. In conclusion, age of slaughter should be considered for the traditional production of light lambs. The meat from the older lambs (60 days) had better sensory characteristics and vitamin E content.

Keywords: *Light lamb meat, Slaughter age, Fatty acid profile, Vitamin E, Sensory evaluation.*

LEGUME GRAINS IN DAIRY COWS FEED

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Abstract

Holstein-Friesian Black-and-White cows were grouped into four treatments groups according to the analogue principle (n=4×5). Lactating dairy cows were included in the trial in the initial lactation phase with the average milk yield of 30.00 kg per day, fat content 4.10% and 3.20% protein content in milk. The analyses of the chemical composition of legume grains showed, that crude protein was higher in fodder beans than in peas, respectively 29.97% and 25.04% of dry matter. The undegraded intake protein (UIP) content also was higher in fodder beans than in peas, respectively 40.51% and 39.69% of crude protein. The highest content of starch was in peas - 48.54%, beans - 43.29% but the lowest in soybean meal - 7.62% of dry matter. Even though the daily milk yields decreased for all the cow groups during the experiment, which was normal during the lactation period, yet the milk yield decreases for the trial groups. The milk yield decreases for the experimental groups (1st and 2nd) were smaller – 0.8 kg, 1.3 kg, respectively, compared with the initial stage of the experiment ($P< 0.05$). In contrast, group 4 showed a significant decrease in the average daily energy corrected milk yield (4.9 kg), compared with the initial stage of the trial. Compared with the control group, none of the dietary interventions showed significant ($P>0.05$) deviations. The fat content of milk slightly increased, on average, by 0.04% in the 3rd and 1st groups and by 0.01% in the 2nd group, compared with the control group ($P<0.05$). The protein content of milk increased in all the experimental groups. The protein content of milk increased on average by 0.31% in the 1st group, 0.17% in the 2nd group and 0.27% in the 3rd group, compared with the control group ($P>0.05$).

Keywords: *Beans, peas, chemical composition, dairy cows, milk production and quality.*

COMPARATIVE PROTEIN AND FAT COMPOSITION ANALYSIS OF GOAT MILK PRODUCED BY ALPINE AND SAANEN BREEDS IN LITHUANIA

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Abstract

The milk composition of goat milk differs between animal breeds and could present regional trends. The aim of this study was to comparatively analyze the protein and fat composition of goat milk produced by the Alpine and Saanen breeds in Lithuania. Milk samples were collected from ecological farm every month from March till November. Total protein content was determined by Kjeldahl method, total fat using butyrometer, quantification of casein fractions and β–lactoglobuline was done using RP-HPLC, fatty acid composition was determined using capillary GC. The average content of total protein and fat significantly differed among milk samples of these two breeds. Alpine breed milk contained 4.54±0.35 g/100g protein, Saanen – 3.45±0.28 g/100g. Season also had an impact on protein content, which was significantly bigger for both breed milk in autumn. The average fat content in Alpine breed milk was 4.82±0.38 g/100g, when Saanen breed goat's milk contained 3.89±0.39 g/100g. Season had no effect on the fat content in milk. Bigger content of total casein and individual fractions also was found in Alpine breed milk samples. The major fatty acids in goat milk were saturated palmitic (C16:0) and unsaturated oleic (C18:1) acid. Qualitative and quantitative composition of fatty acids in investigated goat milk samples was similar. Palmitic acid represented about 27.6% and 29.0% of total fatty acids content in Alpine and Saanen breed milk samples respectively. Oleic acid content was in line with 31.8% and 27.3%. Vaccenic acid, trans-11-C18:1, representing about 1.7% of total fatty acids.

Keywords: *Alpine, Saanen, Protein composition, Fat composition, Lithuania.*

THE EFFECT OF AUTOMATIZATION OF LICENSING STATIONARY TECHNOLOGICAL PROCESSES ONFARM COMPETITIVENESS

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Abstract

Technological innovation, market globalization, and changes in social values system change the scale and intensity of competition. Future farming technologies are intended to optimize the management of technological processes, which gives Lithuanian dairy farms a competitive advantage in the global market. Lithuanian dairy sector creates about 2% of the country's gross domestic product and is one of the most promising economic activities that can have a strong influence on economic growth. Farmers' main challenge today is to increase farm productivity, profitability and competitiveness by reducing the cost of production. This challenge forces us to look for solutions not only through the introduction of innovative technologies, but also by optimizing the management of technological processes that are related to the reduction of environmental pollution, energy consumption, labor costs and the improvement of animal welfare and product quality. Technological and managerial innovations should be used to implement this ambition, as it is not always the case when new technology is introduced into the farm that it becomes more competitive. The performance of dairy farms depends on the technological processes used, reproduction, feed quality, animal welfare and comfort conditions.

Key words: *Technology, innovation, Dairy farms, Lithuania.*

LEVEL OF NATURAL RADIONUCLIDES IN ANIMAL FEED BY GAMMA – RAYSPECTROMETRY

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Abstract

The radionuclides' presence in animal feed is due both to natural radioactivity and radioactive pollution from different sources. Controls of radionuclides in animal feed will reduce the risk of radioactive hazards to animal and human health. The study was carried out in order to detect the natural radioactivity in animal feed and feed additive. Gamma spectrometer Canberra Packard with a high-purity germanium detector and Marinelli beakers (1 l capacity) were used for the samples measurement. The most prominent gamma energies observed in the spectra belonged to the naturally occurring radionuclides ^{40}K, ^{226}Ra and ^{232}Th. Other radionuclides if present occurred infrequently at low activity concentration under the measurable level. The results show that ^{40}K had the largest contribution to the specific radioactivity in all the samples. The mean activity concentration of the ^{40}K was highest in feed additive mono calcium phosphate (245.03±17.778 Bq/kg) and lowest activity concentration of the ^{40}K was measured in concentrate feed for dairy cows (23.20±2.626 Bq/kg). The average activity of the other two detected natural radionuclides in feed samples was lowest and ranged from 0.42 to 5.81 Bq/kg for ^{226}Ra and from 0.61 to 2.55 Bq/kg for ^{232}Th. The data analysis using ANOVA showed statistical significant differences in the radioactivity concentration of ^{40}K, ^{226}Ra and ^{232}Th between feed samples ($p<0.001$).

Key words: *gamma spectrometry, feeds, natural radioactivity.*

PRELIMINARY RESULTS ON ZINC CONCENTRATION IN WILD FISH TISSUES IN VARDAR RIVER, MACEDONIA

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Abstract

The concentrations of Zinc in fish from the Vardar river have been investigated in order to assess safety for consumers and the level of contamination. The selected tissues (skin, liver and muscle)of two fish species: Europian Chub (*Squalius cephalus*) and Common barbel (*Barbus barbus*) from Vardar river stream, Macedonia. Samples are collected in nine different points (Hot Spots) in total distance of 301 km and approximate 33 km between sampling sites. The effect environmental conditions and urban discharges on zinc accumulation in skin, muscels and liver were investigated. The metal analyses were performed using flame atomic absorption spectroscopy (AAS). The average of metal concentrations (micrograms per gram wet weight) in nine hot spots (HS) occurred in the following ranges: HS-1: skin 50.89503 – liver 30.8755 – muscles 8.829244, HS -2: skin 36.88801 - liver 34.74869 - muscles 10.25356, HS-3: skin 59.80203 - liver 36.68569 -muscles 17.63045, HS-4: skin 41.53124 – liver 45.59118 – muscles 13.39171, HS-5: skin 42.93423 – liver 46.83435 – muscles 13.1662, HS-6: skin 40.45726 - liver 52.58685- muscles 8.740298, HS-7: skin 46.0954 - liver 12.607 - muscles 12.19933, HS-8: skin 39.21015 - liver 52.3832 – muscles 13.17433 and HS-9: skin 44.84977 - liver 43.03663 - muscles 13.8143.The lowest levels of the zinc were detected in the muscles. The skin and liver were found to accumulate the highest amounts of Zn. In the case of organs, the highest levels were found, as follows: skin > liver > muscles. Further investigation of heavy metals is recommended, including a survey of fish consumption frequency among the local inhabitants.

Keywords: *heavy metals, zinc, fish tissue, Macedonia*.

HEIFERS REPRODUCTIVE MANAGEMENT IN A HOLSTEIN HERD IN LOS ALTOS, JALISCO, MEXICO

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Abstract

The first calving age (FCA) reflects the speed of growth of the female and the age at puberty, whose late presentation reduces the economic value of the animal by decreasing the number of offspring in its useful life. The aim of this study was to evaluate the effect of first service age (FSA) and services per conception (SPC) on FCA. The information was obtained from the global report generated by the AGROPEC Star® LACTO software. Data of 14 years obtained from an initial average inventory of 50 replacements that were held in 2004 and ending with 330 in 2017 were analyzed. A completely random design with the factorial arrangement was used to evaluate the effect of FSA and SPC, as well as their interaction on the FCA using SAS, 2016. The results did not show significant statistical differences ($p>0.01$) in the main factors such as in the interaction, so another analysis was carried out to determine the behavior of the FCA during the evaluation time using a completely randomized design and Tukey test for means comparison. The results showed statistical difference ($p <0.01$) between the 14 years evaluated, obtaining the highest FCA of 26.91 months in 2008 and the lowest of 24.50 in 2005 ($p <0.05$) and a general average of 25.37 months. The main factor that influences FCA in the herd is the human factor (heat detection, semen and insemination process and inseminator).

Keywords: *Dairy, cattle, replacement, parturition, conception.*

EXTERNAL ASSESSMENT OF HEIFERS OF HOLSTEIN BREED

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Abstract

These are the results of studies on the assessment of the exterior of heifers of Holstein breed under the conditions of the Republic of Moldova. The aim of the presented scientific work is the study of exterior features and morphological and functional indicators of the udder of Holstein breed in the herd of Holstein cattle of the breed of SLL "DokSanCom", v. Tomay, ATU Gagauzia. Exterior features were studied at 91 heifers. The animals were assessed by eye, by taking measurements and calculating body build indices. Morphological assessment of the udder was carried out for 2 – 3 months of lactation for 0.5 – 1.0 hours before milking. As a result of the research, it was established that heifers of Holstein breed were well-defined type of dairy cattle, which is confirmed by their proportional body shape, the development of the middle part of the trunk, and strong bone structure. Heifers in the herd of SLL "DokSanCom" were quite tall – 139.1 cm height at the withers and 146.6 cm – in the sacrum. The slanting length of the trunk is 198 cm on average. The prolixity index was 117.0%, which is by 2.5% less than compared to the standard for breeds of dairy direction of productivity. A compact physique with a consistency index of 122.1% characterizes the estimated heifers. The udder of the Holstein breed was characterized by voluminous, with developed shares, mostly tightly attached. Measurements of the udder along the girth, length and width were on the average 137.1; 45.9 and 32.6 cm respectively. By eye, the outer structure of the udder of these animals is characterized by a greater length along the belly and a sufficient depth.

Key words: *Holstein breed, exterior, body indexes, udder*.

PRION PROTEIN GENE SEQUENCES ANALYSIS IN TWELVE SHEEP BREEDS OF PAKISTAN

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Abstract

Prions are considered the only agents of transmissible spongiform encephalopathies (TSEs) and are harmful pathogens of mammals. These infectious agents of host are made up through aggregation of conformational isomers (PrPSc) and encode glycoprotein (PrPC) of 33-35 kDa. TSEs are the fatal group of diseases which are neurodegenerative and include chronic wasting disease in deer and elk, Creutzfeldt-Jakob disease (CJD) and transmissible mink encephalopathy (TME) in humans and scrapie in goats and sheep. The accumulation of abnormal form of the normal protein (PrP) is common in all diseases related TSE. This abnormal form of PrP called PrPSc is resistant to proteolysis as well as infectious. Present study was conducted in order to do sequence analysis of prion protein gene in twelve breeds of the sheep. We studied this gene to elucidate 12 of Pakistani sheep breeds and to compare gene order with other mammalian species. PCR amplification of 771 bp fragment was done on selected samples from all twelve breeds followed by sequencing. Sequence analysis was done and some sites were found to be heterozygous. These findings on prion protein gene in sheep will provide assistance for further studies on pathogenesis, cross-species transmission, breeding programs, resistance and susceptibility to scrapie.

Key words: *Prions, TSEs, scrapie, neurodegenerative, sheep.*

THE USE OF MARS METHOD FOR PREDICTING DAILY BODY WEIGHT GAINS IN HARNAI SHEEP

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Abstract

The aim of the present study was to predict daily body weight gains at four different lamb ages in the indigenous Harnai Sheep of Balochistan (Pakistan) using multivariate adaptive regression splines (MARS). The dataset included 7863 lambing records containing the following predictor variables: lambing season, lamb sex, type of birth (single vs. twins), dam age at lambing, dam body weight at lambing, lamb birth weight. Daily body weight gains from birth to one month of age, two, three and six months of age were included in the MARS models as dependent variables. The dataset was randomly split into two subsets: a training set (75% records) and a test set (25% records). The best MARS model for predicting daily body weight gains at one month of age, two, three and six months of age consisted of 32, 34, 32 and 41 basic functions, respectively, with the generalized cross-validation (GCV) errors of 0.0026, 0.0026, 0.0027 and 0.0008, respectively. All the MARS models included second-order interactions between predictors. The Pearson correlation coefficients between the observed and predicted values (r) on the independent test set were 0.21, 0.21, 0.24 and 0.30, respectively ($P<0.05$). The most important independent variables (predictors) of daily body weight gains (in descending order) were dam age at lambing, dam body weight at lambing, lamb birth weight, lambing season, lamb sex, type of birth. In conclusion, the MARS models developed in the present study to predict daily body weight gains in Harnai Sheep were characterized by a relatively low predictive performance and their further improvement would be required in future research.

Keywords: *MARS, Prediction, Daily body weight gains, Harnai Sheep.*

FORECASTING THE AVERAGE MONTHLY MILK YIELD IN COWS USING ARTIFICIAL NEURAL NETWORKS

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Abstract

The aim of the present study was to develop an artificial neural network (ANN) for forecasting lactation milk yields. The dataset comprised test-day records from approx. 600 Polish Holstein-Friesian Black-and-White cows kept on one of the dairy farms located in the West Pomeranian Province. For stochastic analysis, milk yields from cows in their first lactation (from 5 to 305 days in milk divided into 10 lactation stages of approx. 30 days) were used. Only test-day records of more than 5 kg of milk were included. Two age groups (1. - 20 to 26 months of age and 2. – 27 to 32 months of age) and four calving seasons (1. – January to March, 2. – April to June, 3. – July to September, 4. – October to December) were distinguished. A total of eight age-season groups were obtained in this way. The data were collected between 2009 and 2016. The neural model was trained with the Broyden-Fletcher-Goldfarb-Shanno algorithm on records from 2009 to 2015, whereas the data from 2016 were used for verifying its prognostic abilities. The correlation coefficients between the observed and predicted milk yields ranged from 0.75 to 0.98 ($P<0.05$). The mean absolute differences between the observed and predicted values were 1.36 kg, 2.49 kg, 2.43 kg, and 3.25 kg for seasons 1 to 4, respectively, in the first age group and 1.38 kg, 1.72 kg, 2.58 kg, and 4.34 kg for seasons 1 to 4, respectively, in the second age group. Predicted milk yields did not differ significantly from the observed values.

Keywords: *Artificial neural networks, Forecast, Monthly milk yield, Dairy cattle.*

THE POLYMORPHISM OF CAST AND GDF9 GENES IN THE TUVAN SHORT-FAT-TAILED SHEEP POPULATION

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Abstract

The Tuvan short-fat-tailed sheep is a local breed spread in the Russian Federation. This breed habits in Tuva. The aim of investigation was the identification of the genetic polymorphism of calpastatin (*CAST*) and the growth differentiation factor-9 (*GDF9*) genes in the Tuvan local sheep population. Calpastatin gene was known as a candidate gene of meat quality traits, and *GDF9* gene was a potential genetic marker of prolificacy. Genomic DNA was isolated from samples of blood of 131 animals. Two primer pairs were used to obtain 622 b.p. fragment of *CAST* gene and 462 b.p. fragment of *GDF9* gene. Calpastatin locus was digested with *MspI* restriction enzyme. Two genotypes (MM and MN) of *CAST* gene were observed. The polymorphism of *GDF9* gene (CC and CD genotypes) was detected after amplicons digestion with *AspLEI* restriction enzyme. MM and MN genotypes were identified with 0.855 and 0.145 frequencies, M and N allele frequencies were 0.928 and 0.072, respectively. In this population CC and CD genotypes of *GDF9* gene were identified with 0.878 and 0.122 frequencies, C and D allele frequencies were 0.939 and 0.061, respectively.

Keywords: S*heep, Genetic polymorphism, CAST, GDF9, PCR-RFLP.*

MORPHOLOGY OF THE LIVER AND ITS BLOOD VESSELS IN PIGLETS

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Abstract

The liver of 1, 10 and 20-day old piglets was studied with a complex of morphological methods used. The liver had relative maximum mass in 1- day old piglets. The tissue of parenchyma is spongy and it contains single Hematopoietic hearth in piglets with normal body mass. An inconsiderable amount of glycogen at hepatocytes in 1-day old animals was determined, but some cells had optical enlightenment cytoplasm. The maximum amount of hepatocytes was determined in neonatal piglets at middle lobe, the least of it at left and minimum at right ones. Variability of liver in 1-day old piglets was inconsiderable, since parenchyma is a prevalent tissue component in the organ (more than 90%) and has minimum variability. The total area of the section of the hepatic blood vessels prevailed over the afferent vessels in the piglets, which caused its broadening on the contrary (0.52 : 1).The relative mass of the liver changed in 10 and 20-day old piglets. The primitive and formed or classic lobules appeared in 10-day old piglets but locations of hemopoesis almost disappeared. The structural components of afferent and efferent blood vessels cause mechanisms of regulation of the intensive blood flow into the heart away from the caudal part of animals' organisms. The asynchronous change of the morphofunctional status of the hepatic blood vessels and structure can be used as a factor that causes the origin of animals' diseases and complicate their course in the neonatal period.

Keywords: *Liver, Blood vessels, piglets.*

THE IMPACT OF ROAD TRANSPORTATION ON CERTAIN HEMATOBIOCHEMICAL PARAMETERS IN DROMEDARY CAMEL (*CAMELUS DROMEDARIUS*)

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Abstract

The unexpected percentage of elevated glucose levels in dromedary camels presented to the Veterinary Teaching Hospital at Qassim region (Kingdom of Saudi Arabia) leads to the current study. Ten healthy 3-6-year-old female camels were used as a control. Other ten female animals were transferred to the clinic by truck transportation and suffered from long standing, decrease in body weight, and progressive weakness. These animals were divided into two equal groups according to the distance of transportation, short (150-200 km) and long (250-400 km). Blood hematological and serum biochemical profiles were evaluated. Comparing to control group, glucose level, globulin concentrations, neutrophil count of camels were significantly higher in short ($P<0.05$) and long distance truck transportation ($P<0.01$). Long distance truck transportation of camels increased Creatinine ($P<0.05$) and lowered albumin ($P<0.05$). Short distance truck transportation of camel resulted in an elevation of white blood cells (WBCs) count ($P<0.05$), hemoglobin concentration ($P<0.05$) and lowering of hematocrit percentage (HCT %) and lymphocyte count compared with the control group. In contrast, eosinophil count was significantly lower in camels in both short ($P<0.01$) and long ($P<0.05$) distance truck transportations than that of the control group. This data confirmed that long distance truck transportation is considered to some extent, as drought stress. Transportation stress in dromedary camels alters the physiological metabolic profile that can be an effective biomarker of transportation stress in this species. However, for the animal in this study, it is not clear yet, whether changes resulted from truck transportation have a primary role in the pathogenesis of hyperglycemic complications, or it is simply a consequence of them. Assuaging long distance truck transportation should therefore be a principal condition for camel welfare.

Keywords: *Blood parameters, Dromedary Camel, Truck transportation, Proteins.*

HAPLOTYPE DIVERSITY IN GENES RESPONSIBLE FOR DROUGHT STRESS RESPONSE IN MAIZE

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Abstract

Great efforts have been made over the past several decades for development of improved cultivars adapted to different agro-ecological areas due to the on-going climatic changes. In order to increase further the selection gain and to accelerate breeding processes in maize, a profound knowledge is required regarding genes and genomic regions encoding for agronomically important traits. In this context, the use of haplotypes could improve selection of quantitative traits with a low heritability due to strong environmental influence. Twenty temperate drought tolerant (15) and sensitive (5) maize inbred lines from Maize Research Institute Zemun Polje (MRIZP) were subjected to SNP genotyping. Additionally, 17 maize (13) and teosinte (4) genotypes were selected for comparison from Panzea database to represent the functional diversity of maize. For SNP identification direct PCR sequencing of eight abiotic responsive candidate genes was done. A small number (3 to 8) of distinct and highly diverse haplotypes were observed in all eight (8) marker genes. Haplotype analysis based on the SNPs revealed the highest haplotype diversity in *MYBR96* (0.817) and the lowest in *MYB8* (0.3235) gene. Network analysis showed a linear relationship between haplotypes for some genes, while for the rest of genes the network graphs reflected more complex relationships between a large numbers of haplotypes. The deployment of the identified haplotypes could be a powerful complementary tool to improve accuracy and efficiency of modern breeding strategies such as marker assisted selection and genomic selection for developing drought tolerant maize genotypes.

Key words: *maize, drought, SNPs, haplotypes.*

TOTAL PROTEIN AND FAT CONTENT IN SOME CYPRINID FISH SPECIES

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Abstract

Fish meat is an important source of biologically highly valuable nutrients, especially proteins, fats and vitamins. As the result of its low amount of connective tissue and high water content, fish meat has higher digestibility than meat from other animals used in human nutrition. Total proteins (by Kjeldahl method) and fats (by Soxlet method) were analyzed in fresh meat of four cyprinid fish species – carp (*Cyprinus carpio*) from fish pond and Prussian carp (*Carassius gibelio*), bleak (*Alburnus alburnus*) and schneider (*Alburnoides bipunctatus*) from open waters. The analysis was conducted at the Laboratory of Biochemistry, Faculty of Agronomy, Čačak (Serbia). The highest protein content was found in carp meat (mean 20.92%), followed by Prussian carp (19.0%), schneider (17.12%) and bleak (17.01%). The greatest influence on total proteins in fish meat was produced by fish species and size of fish samples, whereas diet characteristics had a smaller effect on this quality parameter. Fat content was the highest in carp meat (11.53%), and significantly lower in Prussian carp (4.82%), Schneider (3.85%) and bleak (3.64%). The quality of nutrition under fish pond conditions is a crucial factor for fat content in carp, which is much higher than in open-water fish species. The results confirm that the meat of open-water fish species has satisfactory levels of protein and fats, and is therefore recommended for human diet.

Keywords: *protein, fats, cyprinid fish*

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CONTAMINATION OF COW MILK BY HEAVY METALS

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Abstract

The aim of this investigation was the analysis of the residue levels of ten heavy metals (Arsenic, Cadmium, Cobalt, Chrome, Cupper, Iron, Manganese, Nickel, Lead and Zinc) in cow milk. Milk was collected from three farms in Vojvodina, province of Serbia. A total of 150 cow milk samples were collected from 50 cows in each farm during the morning milking in the period from April to May in 2016. The highest average concentration of heavy metals in cow milk was Iron (283.9 mg/kg) followed by Zinc (60.21 mg/kg) and Copper (4.404 mg/kg), while the lowest concentration was less than 0.005 mg/kg for Cobalt and Lead. The results showed that most of the milk samples from the different farm contained all the studied metals with concentration higher than those recommended by International Dairy Federation and Codex for cow milk.

Keywords: *Cow milk, Contamination, Heavy metal.*

FAMILY OF HEAT SHOCK PROTEINS OF 70 KDA IN THE PERIPARTAL PERIOD IN DAIRY COWS

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Abstract

Peripartal period includes 3 weeks ante partum and 3 weeks post partum. It represents the most risky period for dairy cows, because the cow's metabolism faces a series of changes in homeostasis with endocrine changes, metabolic stress and development of numerous pathophysiological mechanisms (inflammation, insulin resistance and metabolic adaptation). Heat shock proteins have a significant influence in the regulation of these processes. Namely, all cells, tissues or organisms respond to different stress types (oxidative, thermal, ischemia, exercise, metabolic) by producing a specific group of proteins, heat shock proteins (HSP). The best known HSPs are: stress induced form HSP70 / HSP72 (HSPA1A), form from endoplasmic reticulum, Grp78 / BiP (HSPA5), constitutive form HSP70 / HSP73 / HSS73 (HSPA8) and a form localized in mitochondria HSP75 / mtHSP70 / mortalin / TRAP-1 (HSPA9). Also, members of the HSP70 family, unknown localization are: Hsp70-2 (HSPA1B); Hsp70-Hom / Hsp70t (HSPA1L); Hsp70-3 (HSPA2); Hsp70-6 / Hsp70B '(HSPA6); HSP70-7 / Hsp70B (HSPA7), FLJ13874 / KIAA0417 (HSPA12A), RP23-32L15.1 / 2700081N06Rik (HSPA12B), Stch (HSPA13), HSP70-4 / HSP70L1 / MGC131990 (HSPA14). In cattle, four types of HSP70 genes were identified and iRNA for this protein was found in the tissue of different cell types and in blood plasma. The most studied HSPs are HSP73 and HSP72. HSP73 is synthesized in most cellular organisms and is slightly inducible. The cytosolic inducible form of HSP72 (molecular weight 72 kDa) can represent up to 20% of the total cell protein and can mediate through cytoprotective, antiapoptotic and immunological regulatory effects. In the future, Hsp70 can be significant indicator that can be used to evaluate the metabolic adaptation of cows in the peripartal period.

Keywords: *Heat shock proteins Hsp70, dairy cows, peripartal period.*

THE FUNCTION OF HEAT SHOCK PROTEIN HSP70 IN DAIRY COWS IN EARLY LACTATION

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Abstract

In early lactation, metabolism of dairy cows faces a series of changes in the homeostasis with hormonal changes and metabolic stress. Numerous pathophysiological mechanisms (inflammation, insulin resistance and metabolic adaptation) develop during metabolic stress. Heat shock proteins (Hsp) are phylogenetically conserved and ubiquitous molecules that are synthesized in response to various forms of stress. Their expression can be induced: physiologically (growth factors, hormones), pathophysiologically (infection, inflammation, ischemia, oxidative injuries, toxins), by environmental conditions (heat stress, heavy metals). In cattle, four types of HSP70 genes were identified, and iRNA for this protein was found in the tissue of different cells types and in the blood plasma. The best known HSPs are: stress induced form HSP70 / HSP72 (HSPA1A), constitutive forms HSP70 / HSP73 / HSS73 (HSPA8), an endoplasmic reticulum form, Grp78 / BiP (HSPA5) and a form localized in mitochondria HSP75 / mtHSP70 / mortalin / TRAP-1 (HSPA9). HSP chaperones are necessary for the proper formation of the polypeptide chain and are responsible for its translocation in the cell, thereby helping to save the protein structure of the cell and its survival. Intracellular Hsp70 helps to re-establish the native conformation of denaturated proteins under the influence of various stressors, preventing their aggregation and keeping the cells from apoptosis and exhibiting an antiinflammatory effect. Extracellular Hsp70 plays the role of cytokine, immunostimulatory role and improves antitumour control. In addition to its major role in the pathophysiological mechanisms dominant in dairy cows in early lactation, as a relatively new biomarker, which is poorly tested in veterinary medicine, Hsp70 can be an important indicator that can be used to assess the metabolic adaptation of cows in early lactation.

Keywords: *Heat shock proteins Hsp70, dairy cows, early lactation.*

THE CORRELATION OF NATURAL *VARROA DESTRUCTOR* MORTALITY METHOD AND APLICATION OF "SUPERSTRIPS" PREPARATION

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Abstract

The *Varroa destructor* mite (Anderson&Trueman) inflicts a very serious damage to honeybee *Apis mellifera carnica* Poll. Apart from direct damage inflicted both to the bees and bee brood, varroa is a virus vector and promotes their spreading in bee colony. In agroecological conditions of Serbia, bee colonies start preparing for wintering in the beginning of August so it is important to obtain relevant results about the degree of varroa-infested bee colonies by late July and to supress mite with effective drug. Nine bee colonies placed in standard Langstroth hives were used in the trial. In the beekeeping season 2017 during the two last weeks of July using a screened bottom board a natural mortality of ectoparasite varroa was monitored on a weekly basis. After this period the preparation against varroa, "superstrips", was added to trial bee colonies and varroa mortality was monitored after the first, fourth, tenth, twentieth and thirtieth day. By calculating the correlation coefficient, a strong and significant relationship was established between natural mite mortality and mortality caused by "superstrips" after the first four periods which ranged from 0.69 to 075. It was determined that there was a strong degree of dependence (0.75) between the number of mites determined by natural mite mortality and total mite mortality number due to use of "superstrips" preparation. Determined dependence was statistically significant ($P<0.05$). The highest efficacy of the "superstrips" preparation was established on the tenth day after the beginning of the application when 54.6% of the total number of dead mites was counted. By using a simple natural mite mortality method, a valuable record about varroa-infested bee colonies can be obtained. The use of effective medications for the control of varroa affects the better preparation of bee colonies for overwintering period.

Keywords: *Apis mellifera, natural mite mortality, Varroa destructor.*

Acknowledgments

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ESSENTIAL OILS AS NATURAL POULTRY RED MITE (*DERMANYSSUS GALLINAE*) REPELLENTS: MIT OR REALITY?

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Abstract

In the world where technology is upcoming very fast with the production of different chemicals such as acaricides, pesticides and etc., the real question is: Could essential oils, spices and herbs serve as natural solutions in constant struggle against chemically resistant drugs? The poultry red mite (*Dermanyssus gallinae*) is a growing epidemiological problem for the poultry industry that causes losses in the performance of laying hens and consequently major economic losses. It has been suggested that adding essential oils to laying hen diets may be an efficient and natural alternative to chemical repellents and acaricides for *D. gallinae*. Although some essential oils are effective repellents, their effectiveness usually lasts a short time, which is likely related to their volatile nature. The exact mechanism of the acaricidal effect of essential oils is not yet clear, but it is thought that some essential oils could inhibit *D. gallinae* cytochrome P450 and thus reduce detoxification of xenobiotics. However, most *D. gallinae* repellent activity appears to come from neurotoxic effects, blocking γ-aminobutyric acid neurons and reducing the ability of cells in the nervous system to form cyclic adenosine 3′,5′-monophosphate. To date, most studies have been conducted in vitro and there is a lack of information on the effect of essential oils on laying hen performance under the challenge of *D. gallinae*. The paper aims to review current knowledge of *D. gallinae* biology and the possibilities and significance of inclusion of selected essential oils into laying hens diets as a natural repellent of hematophagous predator.

Keywords: *poultry, nutrition, essential oils, poultry mites, natural alternative.*

MORPHOMETRIC EXAMINATIONS OF BREAST MUSCLES OF PHEASANTS HATCHED FROM EGGS OF DIFFERENT EGGSHELL COLOUR

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Abstract

Among the pheasant eggs, huge variations between the eggshell colour exist. The aim of this paper was to examine the relation between the characteristics of breast muscles and eggshell colour. The research was conducted from May to October 2016 on the experimental farm of Faculty of Agriculture in Novi Sad. Eight hundred pheasant eggs were divided in four groups of 200 eggs. Each group consists of the eggs of the same colour: dark-brown, light-brown, olive and blue eggs. After the incubation, hatched chicks were raised up to 150th day of life. At 56th day of life, 10 chickens from all of four groups were sacrificed, and samples of breast muscle (*M. pectoralis superficialis*) were taken. After the standard procedure of preparation the samples for microscopy, following measurements were performed: diameter and nucleo-cytoplasmic ratio of breast muscle cells as well as volume density of connective tissue in the breast muscles. Results showed that diameter of breast muscle cells was smaller, while nucleo-cytoplasmic ratio of breast muscle cells was higher in pheasants hatched from blue eggs compared to all other eggs. This could be related with structural differences between eggshells of different colour, like higher porosity and water evaporation of blue eggshells affecting development of muscle tissue. There were no differences in volume density of connective tissue in breast muscles between groups. It can be concluded that between pheasant eggs of different eggshell colour, muscle tissue is the least developed in blue eggs, which is reflected in smaller diameter and higher nucleo-cytoplasmic ratio of muscle cells.

Keywords: *Pheasants, Eggshell colour, Breast muscles.*

GENOMIC AND PEDIGREE-BASED INBREEDING IN SLOVAK SPOTTED CATTLE

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Abstract

The aim of this study was to determine the level of inbreeding in population of Slovak Spotted cattle and to compare its genomic and pedigree-based estimates. The genomic data have been obtained from in total of 37 AI sires and 50 sire dams genotyped by using Illumina BovineSNP50v2 BeadChip and ICBF International Dairy and Beef v3, respectively. The genealogical information have been obtained from the database of Breeding Services of the Slovak Republic, s. e. The pedigree file consisted of 109,686 individuals (105,229 dams and 4,457 sires), while the reference population included only living animals, AI sires (129) and dams (36,949). The genomic inbreeding (F_{ROH}) was expressed as the length of the genome present in runs of homozygosity (ROH) divided by length of the autosomal genome covered by all SNPs and the pedigree-based inbreeding (F_{PED}) was calculated based on assumption that inbreeding of an individual reflects the probability that both alleles in one locus are derived from the same ancestor or are identical by descent. The ROH segments greater than 4 Mb ($F_{ROH > 4Mb}$) covered in average 2.09 % of the genome, whereas inbreeding estimates greater than 16 Mb ($F_{ROH > 16Mb}$) achieved 0.43 % that signalized recent inbreeding in analysed population. The increase of inbreeding across generation similarly signalized the average ΔF_{PED} computed from pedigree information (0.094%). However, the pedigree-based and genomic estimates of inbreeding differ from each other (in average $F_{ROH>4}$=0.02; F_{PED}=0.004). In recent generation, the obtained values of F_{ROH} indicated considerably higher degree of inbreeding.

Keywords: *cattle, genotyping data, inbreeding, pedigree analysis, runs of homozygosity.*

EFFECT OF REPLACING CORN AND SOYA BEANS BY WHITE SORGHUM AND HORSE BEANS ON MILK PERFORMANCES OF SICILO- SARDE SHEEP IN TUNISIA

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Abstract

Twenty Sicilo-Sarde ewes of local sheep were divided into two homogenous groups regarding age (5.3 vs 5.7), live weight (33.83 ± 5.63Kg vs 33.95 ± 5.58 Kg) and the rank of lactation were used to evaluate the effect of replacing corn and soya beans by white sorghum and horse beans on milk produced and quality of milk (pH, density, freezing point, fat content, protein content, lactose and fat solids). Animals were logged in two big boxes and received 1.5 kg DM / ewe / day of oat hay. Two concentrates (i) 500 g/ewe/day of concentrate that included corn (43.3%), barley (25%), soybean meal (17.7%) and mineral and vitamin supplement (4%) for the control group (RM) and (ii) a second concentrate that included white sorghum (66%), horse beans (30%) and mineral and vitamin supplement (4%) for the experimental group (RS) were used. The result showed that the diet did not affect the daily milk yield. The pH of milk was higher ($p< 0.05$) in ewes of RS group than in those of RM group. The density was affected by the diet. The freezing point was not affected. Fat content, protein content, mineral content and lactose were not affected by diet. However Solid Not Fat was affected by the diet. It is possible to replace corn and soybean by white sorghum and horse beans in the sicilo- sarde sheep.

Keywords: *Sicilo-Sarde ewes. local feed resources. milk yield and quality.*

THE UNIQUE BEEHIVE PRODUCTS AND INTERACTION WITH PROBIOTICS

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Abstract

Food industry and researchers have focused on therapeutic effects of natural additives for the last two centuries. As a result of this interest, consumers tend to change their eating habits and consume bioactive foods which have high antioxidant, antidiabetic, anticancer, antimicrobial and anti-inflammatory properties. These properties are directly related to presence of the ω-fatty acids, fiber, vitamins, minerals, phenolic compounds, flavonoids, prebiotics, probiotics, peptides and specific bioactive substances. Probiotics are living microbial food ingredients which confer health benefits to the host and are stimulated by prebiotics selectively. Beehive products such as honey, royal jelly, propolis, pollen, bees wax, bee venom have been applied for centuries in traditional medicine in view of its inhibitory activities. Their pharmacological properties are due to increased osmolality and acidity and presence the compounds of royalisin, apisin and 10-hydroxy-2-decenoic acid. Also, these products are highly nutritious and potentially prebiotic. Combining the probiotic and prebiotic is widespread application due to enhance in the survival of probiotic in the food matrix. Because, the viability of probiotics in foods is still one of the most challenging issues for food technologist. However, beehive products may affects specific beneficial strain adversely in a manner similar to that exhibited in pathogens. This review presents an up-to-date summary of the antimicrobial compounds of beehive products and behavior of probiotics against these products.

Keywords: *probiotics, beehive products, antimicrobial activity, bioactive compounds.*

COMPARISON OF LIPID, FATTY ACID, FILLET YIELD AND SENSORY PROPERTIES OF AQUA-CULTURED SEA BASS FARMED IN EASTERN MEDITERRANEAN AND AEGEAN SEA

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Abstract

Sea bass is one of the main export fishery commodities of Turkey. Marine fish farms are mostly located in Aegean Sea. The sea bass specimens were obtained from both locations where fish were fed with same brand feed (Sürsan). Sea bass were obtained from marine fish farms in Güllük-Milas and İskenderun. Fatty acid compositions were determined by Gas Chromatography and Mass Spectrometry. Sensory evaluation was carried out with trained panel with at least 5 persons. Sea bass fillets were cooked in a pre-heat oven at 220^{o}C for 20 minutes. Fish were served when it was hot, and the panellists were asked about their perception on fish meat. Duo trio test was applied to discriminate the fish flesh. Results showed that fatty acid profiles of Aegean and North Eastern Mediterranean farmed sea bass were similar except DHA: EPA ratio. This ratio was significantly greater in North Eastern Mediterranean sea bass than Aegean Sea bass. However, moisture and lipid content differed considerably in both specimens. Skin colour was much darker in Aegean Sea bass than North Eastern Mediterranean bass. Flesh colour also was much lighter in sea bass raised in İskenderun Bay than Aegean Sea. Fillet yield was much greater in İskenderun specimen (43.16%±2.38) than Aegean Sea bass (38.28%±1.6). There were no differences between Aegean farmed sea bass and North Eastern Mediterranean Sea bass in terms of fatty acid profile. However, Aegean farmed sea bass had greater amount of lipid than sea bass farmed in İskenderun Bay having 13.1%± 0.2% and 8.6%±0.21 lipid, respectively.

Keywords: *Sea bass, Lipid, Fatty acid, Sensory, Fillet yield.*

FATTENING PERFORMANCE AND SOME SLAUGHTER CHARACTERISTICS OF ANGUS CATTLE BREED

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Abstract

The study was carried out to investigate fattening performance and some carcass characteristics of young Angus bulls under intensive system. Slaughter and carcass data were obtained from 56 Angus bulls. The study carried out at cattle farm of Dort Mevsim Meat Integrated Facility in Bogaz village, Susurluk district, Balikesir province, Turkey. Angus bulls were imported at 9-10 months age, were subjected to intensive fattening. The animals were fed with an starter diet from the beginning of the fattening to the thirtieth day. Then, the animals were fed grower diet for forty-five days, and were fed with finisher diet from seventy-six days until slaughter. The slaughter weight of the animals was determined according to market conditions. For this reason, their fattening period were different. The fattening period varied from 128 to 266 days. The average fattening performance was 231 days. The animals were removed from feed 24 h prior to slaughter. Final body weight was recorded before slaughter. After slaughter, hot carcasses were weighed. Hot carcasses were stored for 24 h at +4 ^{0}C and chill carcass weights were recorded for each carcass. The initial live weight, slaughter weight, feed conversion rate, daily weight gain, hot carcass weight, chilling carcass weigt, dressing percentage and chilling dressing percentage were 305kg, 635.2kg, 9.45kg, 1.44kg, 365.5kg, 349.4kg, 57.48% and 54.93% kg, respectively. The results of the study suggested that Angus bulls performed well in terms of fattening performance and carcass weight. These results also indicate that Angus cattle can be used for beef production in Turkey.

Keywords: *Angus, Intensive system, Fattening performance, Carcass.*

FATTENING PERFORMANCE AND SOME SLAUGHTER CHARACTERISTICS OF HEREFORD CATTLE BREED

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Abstract

The study was carried out to investigate fattening performance and some carcass characteristics of young Hereford bulls raised under intensive system. Slaughter and carcass data were obtained from 38 Hereford bulls. The study carried out at cattle farm of Dort Mevsim Meat Integrated Facility in Bogaz village, Susurluk district, Balikesir province, Turkey. Hereford bulls were imported at 9-10 months age, were subjected to intensive fattening. The animals were fed with an starter diet from the beginning of the fattening to the thirtieth day. Then, the animals were fed grower diet for forty-five days, and were fed with finisher diet from seventy-six days until slaughter. The slaughter weight of the animals was determined according to market conditions. For this reason, their fattening period were different. The fattening period varied from 128 to 266 days. The average fattening performance was 231 days. The animals were removed from feed 24 h prior to slaughter. Final body weight was recorded before slaughter. After slaughter, hot carcasses were weighed. Hot carcasses were stored for 24 h at +4 ^{0}C and chill carcass weights were recorded for each carcass. The initial live weight, slaughter weight, feed conversion rate, daily weight gain, hot carcass weight, chilling carcass weigt, dressing percentage and chilling dressing percentage were 338.7kg, 690kg, 9.36kg, 1.45kg, 397.5kg, 377.5kg, 57.49% and 54.69%, respectively. The results of the study suggested that Hereford bulls performed well in terms of fattening performance and carcass weight. These results also indicate that Hereford cattle can be used for beef production in Turkey.

Keywords: *Hereford, Intensive system, Fattening performance, Carcass.*

FATTENING PERFORMANCE AND SOME SLAUGHTER CHARACTERISTICS OF LIMOUSIN CATTLE BREED

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Abstract

The study was carried out to investigate fattening performance and some carcass characteristics of young Limousin bulls under intensive system. Slaughter and carcass data were obtained from 56 Limousin bulls. The study carried out at cattle farm of Dort Mevsim Meat Integrated Facility in Bogaz village, Susurluk district, Balikesir province, Turkey. Limousin bulls were imported at 9-10 months age, were subjected to intensive fattening. The animals were fed with an starter diet from the beginning of the fattening to the thirtieth day. Then, the animals were fed grower diet for forty-five days, and were fed with finisher diet from seventy-six days until slaughter. The slaughter weight of the animals was determined according to market conditions. For this reason, their fattening period were different. The fattening period varied from 128 to 266 days. The average fattening performance was 231 days. The animals were removed from feed 24 h prior to slaughter. Final body weight was recorded before slaughter. After slaughter, hot carcasses were weighed. Hot carcasses were stored for 24 h at +4 ^{0}C and chill carcass weights were recorded for each carcass. The initial live weight, slaughter weight, feed conversion rate, daily weight gain, hot carcass weight, chilling carcass weigt, dressing percentage and chilling dressing percentage were 326kg, 643kg, 9.19kg, 1.47kg, 373.5kg, 355.9kg, 58.05% and 55.31% kg, respectively. The results of the study suggested that Limousin bulls performed well in terms of fattening performance and carcass weight. These results also indicate that Limousin cattle can be used for beef production in Turkey.

Keywords: *Limousin, Intensive system, Fattening performance, Carcass.*

THE NEW TREND IN APITHERAPY: BEE BREAD

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Abstract

Bee bread is a hive product obtain from pollen that is processed by the bees for storage with the addition of various enzymes and honey, which subsequently ferments. Although bee bread and pollen structures are very similar, it is characterized by a higher nutritional value than pollen, better digestibility, and richer chemical composition. Therefore, bee bread is a valuable food and apitherapic product. Its value is originated from the high content of proteins, essential amino acids, fatty acids, carbohydrates, mineral salts and bioactive compounds, which depends on the botanical and geographical origin. There are only few studies regarding chemical composition and properties of bee bread, but worldwide interest increases with highlighting of chemical and therapeutic properties of bee bread. Due to the antioxidant, antibacterial and antiproliferative activities of bee bread, it is stated as an immunoprotective and anticancer agent. Besides biological properties, bee bread has many benefits for health such as digestive system regulating effect. In addition, studies indicated that it regulates blood cholesterol level and reduces total lipid content. Moreover, it was reported to have an anti-aging, anti-anemic activity and regenerating effect on the cells owing to antioxidant capacity. Bee bread is mostly known to be protective and detoxicating for the liver and widely used in the purification of this organ. Future studies are required to focus on animal test to demonstrate beneficial effects of bee bread for human health.

Keywords: *Apitherapy, Bee Bread, Biological activities.*

THE POTENTIAL INHIBITORY EFFECT OF POLLEN EXTRACTS ON FUNGI

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Abstract

Pollen is a fine, powder-like material produced by flowering plants and gathered by bees. Composition of pollen depends on botanical and geographic origin and it contains carbohydrates, amino acids, proteins, lipids, vitamins, minerals, phenolic compounds, flavonoids, phytosterols and phytochemicals. Besides contribution to nutrition, bee pollen exhibits antioxidant, anti-inflammatory, anticarcinogenic, antibacterial, antifungicidal, hepatoprotective, and anti-atherosclerotic activities. Due to bioactive compounds and nutritional value, pollen is usually consumed as a therapeutic agent and functional food. Recently, studies have focused on determining on antimicrobial activity of pollen and the results strengthen the previous studies about its antibacterial and antifungal properties but still there are not adequate studies about the inhibitory efficacy of bee pollen on fungi, particularly molds. The aim of our study was to investigate antifungal activity of a multifloral bee pollen from Bursa, Turkey. Different concentrations (1%, 5%, 7.5 %, 10%) of methanol/water (3:1, v/v) and ethanol/water (3:1, v/v) extracts of pollen were tested against *Alternaria alternata*, *Aspergillus flavus*, *Fusarium culmorum* and *Penicillium chrysogenum*. Both pollen extracts showed a dose-dependent manner antifungal activity on all test fungi. The methanol/water extract was generally more effective comparing with ethanol/water extract. Considering the antifungal efficacy, further studies are required to clarify what the main bioactive compounds are, as well as its mechanisms of action.

Keywords: *Antimicrobial activity, Bee pollen, Antifungal activity.*

EFFECT OF INOVOVITAM IN E INJECTION ON TOTAL CAROTENOİDS İN YOLK SAC OF BROİLER EMBRYOSAT HYPOXİA

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Abstract

Chicken embryos are most sensitive to hypoxia, a stress factor due to increasing altitude, during incubation. Oxidized vitamin E can be converted back into the active reduced form by reacting with carotenoids associated with increased vitamin E concentration in the egg yolk sac in orderto increase resistance to oxidative stress. To prevent oxidative stress during hatching, carotenoids are transferred to developing embryonic tissues from yolk sac mainly during the last week of incubation.The study was aimedto evaluate effect of in ovo (IO)vitamin Einjected to yolk sacat day 7 of incubationon total carotenoids in yolk sac of broiler embryos/chicks athypoxia (a 1720 m high altitude). A total of 140 eggs obtained from Ross broiler breeder were divided into two groups: control was non-injected group (70 eggs) and a 25 µl vitamin E solution/egg was injected into yolk sac of the rest of 70 eggs at day 7 of incubation (IO vit E group). Total carotenoids concentration of the yolk sac was determined using HPLC method at days 13 and 19 of embryonic ages and at hatch. IO vit E injection had no effect on yolk sac' total carotenoids concentrations of embryos and newly hatchedchicks ($P=0.558$). The concentration of total carotenoids significantly increased with increasing embryonic age ($P<0.001$). IO vit E administration did not interact with embryonic age for the total carotenoids concentration of yolk sac. In conclusion, IOvit E injection may be improved to deal with hypoxic stresscaused by high altitude without effectingtotal carotenoids concentrationin yolk sac of embryo and residual yolk sac of daily chicks in broiler during hypoxic-high altitude. This improvement was due to increasing embryonic age on yolk sac' total carotenoids concentration by IO vit E injection.

Keywords: *Vitamin E, In ovo injection, Total carotenoids, broiler.*

L-TRYPTOPHAN IMPROVES SPERM MOTILITY IN BROOK TROUT (*SALVELINUS FONTINALIS*)

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Abstract

L-tryptophan is an essential amino acid that helps the body make proteins and certain brain-signaling chemicals. Experiments were designed to evaluate the effect of L-tryptophan supplementation on sperm motility of brook trout *Salvelinus fontinalis*. Activation solution was supplemented with levels of 0 mM (Control), 0.5 mM, 1 mM, 2 mM and 4 mM L-tryptophan and, motility and survival of sperm cells were determined. Significant effect of L-tryptophan addition was determined on the percentage and duration of motile spermatozoa ($p<0.05$). The maximum increment was evoked at the concentration of 0.5 mM. Here, we showed that L-tryptophan supplement could improve sperm motility of *S. fontinalis*.

Keywords: *Salvelinus fontinalis, Brook trout, Sperm quality.*

EFFECT OF SHORT-TERM STORAGE ON SPERM MOTILITY OF RAINBOW TROUT (*ONCORHYNCHUS MYKISS*) AND BROOK TROUT (*SALVELINUS FONTINALIS*)

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Abstract

Experiments were designed to determine the effect of short-term storage of rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*) spermatozoa together with seminal fluid for 6 days at 4ºC on spermatozoon motility rate. An extender (0.3 mM glucose, DMSO 10%, egg yolk 10%) for the short-term storage of semen from *S. fontinalis* and *O. mykiss* was used in this study. Motility and survival of sperm cells were assessed daily. We found that no motile spermatozoa were recorded after five days of storage for *S. fontinalis* and six days for *O. mykiss*. This study would be useful for cryopreservation and reproduction management of these species.

Keywords: *Salvelinus fontinalis, Brook trout, Oncorhynchus mykiss, Rainbow trout, Short-term storage.*

THE PASSAGE OF UNDIGESTED FEED IN BROILERS

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Abstract

Poultry farming is an important sector that enables industrial production adaptation, high feed conversion rates and short production periods to provide valuable and cheap animal products. At the same time, it is one of the most important livestock sectors emphasized for the food security problem of the rapidly increasing world population. The poultry sector has shown a big increase in the last 50 years. This increase is of great importance with genetic and breeding studies. However, as a result of the genetic studies carried out, although the performance of broiler chickens has improved, there are also some physiological and anatomical changes. In addition, an increase in growth rate has increased metabolism, increased nutrient requirements and feed consumption. The negativities caused by each positive development also appeared in broiler chickens and various diseases such as a scites, perosis, tibial dyschondroplasia and digestive difficulties have emerged due to the increased growth rate. In parallel, the incidence of fecal incidences of fecal pellets known as 'Feed Dejection, 'Feed Eject', 'Poop Reveal' or 'Raw Feed Dejection' has increased in recent years in a large number of broiler farms in the world and in our country. Passage of the feed without digestion can negatively affect the skin color and flock uniformity while reducing the performance (live weight, live weight gain, feed efficiency) in broiler chickens. It has been determined that these digested feeds have been planted from many factors under animal feeding practices. In this review, we will try to evaluate feed dejection syndrome which causes economic losses in broiler chickens under the light of literature.

Keywords: *Feed, animal feeding, feed passage syndrome.*

THE IMMUNE SYSTEM IN POULTRY

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Abstract

Preventing, ingestion, or slowing the spread of microorganisms into the body such as viruses, bacteria, fungi and parasites that cause infection is called immunity or immune system. The immune system may encounter many infectious agents throughout the life of the organism. The defense environment against these factors is directly related to the environmental conditions, immune system and nutrition. There are many microorganisms around chickens under intensive growing conditions that will adversely affect their immune system. The aim in intensive poultry farming is to provide more live weight and maximum egg production per unit feed consumption. There is a negative relationship between performance and immunity in poultry, and as performance increases, the immune system suppression of the birds also increases. Inadequate and unbalanced nutrient consumption or toxicity can affect the metabolism and performance of poultry in a negative way by weakening the immunity system. In the present day poultry farming, animal nutritionists must always consider the effects of environmental stressors on the metabolism and immune system of the poultry, and the necessity of increasing the nutrient requirements of animals in certain periods. In this review, the immune system of poultry and the effects of feeding factors on this system will be examined under the current literature.

Keywords: *Poultry, Immune system, nutrition, feeding.*

GENETIC VARIABILITY OF THE CALPASTATIN GENE IN KARAYAKA SHEEP POPULATIONS OF THE BLACK SEA REGION OF TURKEY

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Abstract

This work reports, for the first time at population level, genetic variability of the Calpastatin (CAST) gene in Karayaka sheep populations throughout the Black Sea region of Turkey. The Karayaka sheep is a breed of the most populous sheep and mainly used for meat production in the provinces of Black Sea region for centuries. Thus, we aimed to investigate the genetic variability of the CAST gene, known as a candidate gene for meat quality and quantities by using the PCR-RFLP method. Blood samples were collected from 105 animals belonging to four populations (Samsun, Ordu, Giresun and, Tokat). The genomic DNA was isolated by using extraction kit. A fragment of 622 bp on CAST gene was amplified by polymerase chain reaction (PCR) and then genotypes of the CAST gene for all individuals were obtained with the restriction endonuclease *MspI*. The results of the study showed that genotypic frequencies of MM, MN, and NN were found to be 76, 22 and 2 % for Samsun and 87, 9 and 4 % for Tokat, respectively. Furthermore, the MN and NN genotypes were not observed in Ordu and Giresun populations, respectively. This work provides the first report of the CAST gene variability at the population level for the Karayaka sheep breed.

Keywords: *Calpastatin gene, meat quality, Karayaka sheep, PCR-RFLP, MspI.*

GENETIC POLYMORPHISM OF GDF9-G1 IN KARAYAKA SHEEP

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Abstract

Ovulation rate and litter size are among the most important economic traits for sheep breeding. Reproductive traits have low heritability and are markedly affected by non-additive gene effects. Thus, marker-assisted selection studies have an important role in the genetic breeding of reproductive traits. Some mutations in growth differentiation factor 9 gene (*GDF9*) are known to increase ovulation rate. In the current study, we aimed to investigate polymorphisms in *GDF9*'s G1 variant in Karayaka sheep breed. Blood samples were collected from 100 animals and genomic DNA was isolated using the DNA isolation Kit. The GDF9-G1 fragment with the length of 462 bp was amplified by PCR. The genotypes of the GDF9-G1 variant were obtained using restriction endonuclease *Hha*l (GCG^C) and digested fragments were separated on % 2 ethidium bromide stained agarose gel. The frequencies of wild (FecG+/FecG+) and heterozygote ($FecG^{+}$/$FecG^{1}$) genotypes were found to be 82 % and 18 %, respectively and results of the study revealed that Karayaka sheep breed did not have GDF9-G1 mutant genotype.

Keywords: *GDF9, ovulation rate, PCR-RFLP, Hhal, Karayaka.*

COPPER EXPOSURE CAUSE LOSS OF SPERM MOTILITY IN THREATENED TROUT *SALMO CORUHENSIS*

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Abstract

The aquatic life has been negatively influenced by harmful effects of environmental toxic metals. The elevated concentrations of copper (Cu) may be harmful for aquatic animals while low levels are required for metabolic interactions. Salmo coruhensis is a species of trout, a freshwater salmonid fish. It lives in streams flowing into the Black Sea, in Turkey and possibly Georgia Herein, spermatozoa of threatened trout *Salmo coruhensis* were exposed to the levels of 0 mg L^{-1} (Control), 0.5 mg L^{-1}, 1 mg L^{-1} and 2 mg L^{-1} copper and, motility and survival of sperm cells were assessed. The results show that Cu exposure with increasing concentrations caused a significant reduction in sperm motility ($p<0.05$). Overall, we showed that Cu exposure could impair sperm motility of *S. coruhensis*.

Keywords: *Metal exposure, Copper, Sperm motility, Salmo coruhensis.*

EFFECT OF L-CYSTEINE, L-ALANINE, LYSIN, L-GLUTAMINE ON SPERM MOTILITY OF RAINBOW TROUT *ONCORHYNCHUS MYKISS*

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Abstract

Experiments were realized to determine the effect of L-cysteine, L-alanine, lysine and L-glutamine supplementation on sperm motility of rainbow trout *Oncorhynchus mykiss*. Activation solution was supplemented with levels of 0 mM (Control) and 4 mM L-cysteine, L-alanine, lysine and L-glutamine and, the percentage and duration of motility were determined in sperm samples. Significant increase of L-cysteine addition was determined on the percentage and duration of motile spermatozoa ($p<0.05$). L-alanine, lysine and L-glutamine addition were decreased sperm motility. In conclusion, L-cysteine supplement could improve sperm motility of *O. mykiss*.

Keywords: *Sperm quality, Oncorhynchus mykiss, Rainbow trout, L-cysteine, L-alanine, lysine, L-glutamine.*

THE PROBLEM OF NAPHTHALENE RESIDUE IN HONEY

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Abstract

Agricultural medicines used against weeds and pests, agricultural fields contaminated with industrial wastes, veterinary medicines used for the treatment of bee diseases cause the formation of residual in honey. Naphthalene is one of the most common residues in honey. Naphthalene, which is an aromatic hydrocarbon in the bicyclic structure, is obtained by distillation and fractionation of petroleum or coal tar. This component chemical formula is $C_{10}H_8$ and molecular weight is 128.17 gr., melting point is 80°C and boiling point is 218°C. Naphthalene, which does not dissolve in water but is readily soluble in alcohol, benzene and ether, is a toxic chemical that is volatile at room temperature. Naphthalene is also widely used in homes in addition to commercial and industrial applications. This chemical is also used against moth of bee wax (Galleria mellonella L.) at beekeeping. The moth of bee and larvas damage honey combs by networking. Beekeepers use naphthalene to protect honey combs from pests, especially during winter months. This substance has a beneficial effect on the bee moth but causes to form residue in bee wax due to the strong absorptive effect. This bee wax which has residue is reutilized in honey production by beekeepers resulting in formation of naphthalene contamination in honey. In this study, it is aimed to investigate researches and legal arrangements related to the problem of naphthalene residues in honey.

Keywords: *Honey, pesticide, residue.*

DUAL INFECTION OF FETAL AND NEONATAL SMALL RUMINANTS WITH BORDER DISEASE VIRUS AND PESTE DES PETITS RUMINANTS VIRUS (PPRV): NEURONAL TROPISM OF PPRV AS A NOVEL FINDING

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Abstract

Dual infection of 26 fetal and neonatal small ruminants with border disease virus (BDV) and peste des petits ruminants virus (PPRV) was reported. The animals included five aborted lamb fetuses, 19 neonatal lambs and two neonatal kids from flocks in region of the Black Sea and the Aegean region. BDV and PPRV antigens were detected immuno histochemically in the brain, oral mucosa, intestine and lung of infected animals. Reverse transcriptase-polymerase chain reaction was used to demonstrate PPRV and BDV in samples of the spleen, lymph node, lung and brain from infected animals. On the basis of observations made, it is concluded that brain damage following intrauterine infection with BDV facilitates the passage of PPRV to the brain and results in infection of neuronal and glial cells by PPRV.

Keywords: *Border disease, Dual infection, Peste des petits ruminants, Pestivirus.*

AN ENDANGERED BREED OF TURKISH TAZI (SIGHTHOUND) DOGS RAISED IN THE PROVINCE OF KONYAIN (TURKEY)

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Abstract

This survey study was realized to define the distributions of the body coat colour and some body measurements of the Turkish Tazi (Sighthound) raised in the province of Konya by comparing them with some other sighthound breeds from different regions of Turkey and the UK. To this end, a total of 41 (18 male and 23 female) Tazi dogs were analyzed with the Minitab 16 statistical software program, using ANOVA and Student's t-Test. Descriptive statistics for live weight was 18.4±0.31, withers height 62.0±0.44, height at rump 62.1±0.50, body length 60.7±0.55, heart girth circumference 63.9±0.64, chest depth 23.1±0.21, abdomen depth 13.9±0.21, chest width 17.4±0.25, haunch width 16.4±0.18, thigh width 22.3±0.26, tail length 45.7±0.37, limb length 38.9±0.31, cannon circumference 10.2±0.11, head length 24.0±0.36 and ear length 12.8±0.19 cm, respectively. In this study, the distributions of the body coat colour of the sampled Tazi, expressed inpercentages, were as follows: for black s 48.8%, dun17.1%, brown 19.5%, white7.3% and piebald 7.3%, respectively. This breed is endangered and must be conserved, not only by breeders but also bythe Turkish Government.

Keywords: *Genetic recourse, phenotypic trait, body size, cot colour, hunting dog.*

A NEARLY EXTINCT BREED OF FINO OF TONYA (KOBI) DOGS RAISED IN THE PROVINCE OF TRABZON IN TURKEY

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Abstract

This is the first document on Turkish Fino of Tonya (Kobi) dogs raised in the province of Trabzon. This study was carried out to determine the phenotypic traits of Fino of Tonya (Kobi) dogs by comparing them with German White Spitz, Japanese Spitz, and Volpino Italiano dogs. To this end, a total of 38 (22 male and 16 female) dogs was analyzed with the Minitab 15 statistical software program,by using ANOVA. Descriptive statistics and comparison results for live weight were 9.7±0.17 kg, height at shoulders 31.1±0.27, height at rump 30.1±0.27, body length 40±0.40, heart girth circumference 59.6±0.44, chest width 25±0.22, cannon circumference 10.1±0.15, and head length 20.6±0.27 cm, respectively. The overall results of the study demonstrated that Fino of Tonya (Kobi) dogs had a resemblance to Turkish Dikkulak (Erect-ear) dogs in terms of live weight and body size. Fino of Tonya (Kobi) dogs reach mature body weight and size at around 1 year of age. The overall results of the current study have also revealed that Fino of Tonya dogs could be studied genetically to define genetic relationships to other Spitz-type dog breeds of the German White Spitz, Japanese Spitz, and Volpino Italiano, which are similar in size. This nearly extinct breed of the Fino of Tonya (Kobi) dog must be conserved,not only by breeders but also by the Turkish Government.

Keywords: *Watch dog, phenotypic trait, live weight, body measurement, genetic resource, genetic relationship.*

ARABIAN HORSES USED FOR A TRADITIONAL GAME OF JAVELIN SWARM (CIRIT) IN TURKEY

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Abstract

The goal of this study was to determine the body coat colour and some morphological traits of Turkish Arabian horses used for a traditional Turkish game of javelin swarm (Cirit) in Erzurum by comparing them with some other studies on Arabians. In Turkey, Arab horses are mainly used for racing, but for about 30 years they have been also used for the javelin swarm game in Erzurum. The aim of this study was to define the body coat colour and some morphological traits of Turkish Arabian horses used for the javelin swarm (Cirit) game in Erzurum. In this study a total of 90 Arabian horses, 87 males and 3 females, wereanalysed in four age groups (3-4, 5-6, 7-8 and 9-13 years). Descriptive statistics gave the following means: withers height 158.5 ± 0.51 cm, height at rump 156.4 ± 0.48 cm, body length 152.5 ± 0.72 cm, heart girth circumferences 176.3 ± 0.38 cm, chest depth 68.5 ± 0.33 cm, chest width 39.5 ± 0.26 cm, cannon circumferences 20.3 ± 0.12 cm, head length 61.3 ± 0.37 cm and ear length 14.9 ± 0.15 cm. In this study, the frequencies of the body coat colour of the sampled horses forgrey were53.4%, chestnut 33.3%, andbay 13.3%.

Keywords: *Arabian, javelin swarm, morphologic trait, coat colour, genetic resource*.

NON-ESTERIFIED FATTY ACIDS FOR ENERGY BALANCE IN DAIRY COWS

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Abstract

The objective of this compilation is to review the reference on elevated blood concentrations of non-esterified fatty acids (NEFA) in transition period, which is commonly defined as the period from 3 weeks before to 3 weeks after calving. A lot of cow-level high NEFA increase the risk of culling in the post-partum period. NEFA hasan important rolein the metabolism of glucose, lipids, and proteins. A number of references have resulted that NEFA may have highly significant effects on the fatty acid metabolism in the liver, especially during early fresh period (early lactation) that affects negatively energy balance in dairy cows. NEFA levels can be increased through increased mobilization of stored lipids, which can there by indicate ketosis and fatty liver syndrome. In addition to fat mobilization in early postpartum cows, liver gluconeogenesis increases to provide glucose for synthesis of milk lactose. The great demand for glucose may reduce the amount of glucose available to other tissues of the body, including those involved in postpartum immuno supression. During the period of negative energy balance, dairy cows experience a decrease in blood glucose levels and neutrophil function. This review provides more important information for understanding the mechanism of tissue-specific metabolic disorders due to NEFA's level in dairy cows.

Key words: *Metabolic disorders, NEFA, dairy cows, transition period.*

BOTTLENECK ANALYSIS OF ANATOLIAN BLACK CATTLE (BOS TAURUS) USING MICROSATELLITE MARKERS

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Abstract

The present study was conducted in order to reveal the genetic diversity and bottleneck in Anatolian Black Cattle (Bos Taurus). Animal material of the study consisted of 75 cattle raised in International Center for Livestock Research and Training. The bottleneck in the cattle breed studied was checked with ten microsatellites markers, amplified in a multiplex polymerase chain reaction (PCR), were used according to recommendation of FAO (2011). A total of 116 alleles was observed from microsatellites studied. Overall value belongs to mean number of alleles (Na), effective number of alleles (Ne), observed heterozygosity (Ho), expected heterozygosity (He), the polymorphic information content (PIC), average heterozygosity ($\hat{H}$), and $F_{IS,}$ known as the inbreeding coefficient, were 11.60, 5.35, 0.80, 0.78, 0.80 and 0.012, respectively. All microsatellite markers except INRA23 and ETH3 was deviated from Hardy Weinberg equilibrium (HWE). Bottleneck was analyzed with Bottleneck software according to three different mutation models including the infinite allele model (IAM), two-phase mutation model (TPM) and stepwise mutation model (SMM). It can be said that there is not any ultimate risk in terms of bottleneck considering L–shaped curve showing normal distribution obtained from the analysis.

Keywords: *Bottleneck, Microsatellite, Anatolian Black Cattle.*

MODERN APPROACHES TO THE DIAGNOSTICS AND TREATMENT OF ANIMAL ONCOLOGICAL DISEASESIN VETERINARY MEDICINE

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Abstract

Modern diagnostics of oncological diseases, along with classical clinical and morphological methods, require the use of instrumental immunological, immuno-cytochemical and molecular genetic research methods. The main tasks of such a complex of diagnostic measures are aimed at monitoring oncological diseases at all stages of the diagnostic and treatment process, namely: the detection of a tumor at early stages of its development and the study of changes in metabolic processes in the body under the influence of neoplasms, morphological confirmation of the diagnosis, identification of the histostructure and histogenesis of the tumor, determination the degree of its malignancy, detection of a metastatic lesion (regional and distant lymph nodes and other organs) or assessment of the risk of its occurrence. It is well know that the early stages of oncological diseases are difficult to diagnose. At the same time, an early detection of the disease can save or significantly extend the life of the patient. In such cases, the determination of specific substances in the blood, produced by tumors of the respective organs, the so-called oncomarkers, has been successfully used in the world medical practice for more than 40 years to detect the affected organ. In the combination with instrumental methods (ultrasound, endoscopy, X-ray), diagnostic efficiency is sharply increasing. A successful treatment of malignant tumors is possible in the conditions of their early detection and a thorough histological diagnosis.

Keywords*: oncological diseases, histological and immuno-histochemical studies.*

THE KARYOTYPE OF UKRAINIAN POPULATION OF RIVER BUFFALO (BUBALUS BUBALIS)

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Abstract

In Ukraine, the main regions of breeding of river buffalo are the Transcarpathian region and an experimental buffalo farm «Goloseyevo» of the household of the monastery of Svyato-Pokrovska Holosiyivska Pustyn.The number of the Ukrainian population of buffaloes has decreased significantly, so that their total population is around 100. It is known that the species Bubalus bubalis is classified by the number of chromosomes as a river type (Bubalus bubalis) with a diploid chromosome set of 2n=50 and a swamp type (Bubalus bubalis var. kerabau) – 2n=48. However, there still is a lack of systematic study of buffaloes in Ukraine as well as in the world. As of now, the limits of their karyotype variability have not yet been investigated, as well as no detailed spectrum and the frequency of chromosomal aberrations have been established. We have conducted a study of the karyotype of the Ukrainian population of buffaloes bred in «Goloseyevo» in Kyiv region. It was established that the diploid chromosome set consisted of 50 chromosomes (2n=48,XX; 2n=48,XY). The researched animalshad individual chromosomal variability in the form of cells with aneuploid and polyploid chromosome sets as well as cells having structural aberrations of autosomes.

Key words: *Bubalus bubalis, karyotype, chromosomes.*

FEATURES OF THE GENETIC FUND OF THE LOCAL POPULATION OF RIVER BUFFALOES OF UKRAINE AND THE UKRAINIAN GREY BREED OF CATTLE

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Abstract

In the analysis of buffaloes' polymorphism, the quantity of alleles was found were the average quantity of alleles per locus in buffaloes was 6.7 alleles in buffalo cows and 7.2 alleles in buffalo males. In gray Ukrainian cows the number of alleles per locus was 6.1 (4 to 10) and in bulls 5.5 (4 to 9). The quantity of alleles per locus in both females and males of buffaloes was higher than in animals of the Ukrainian gray breed by 0.6 and 1.7, respectively. The index of polymorphism (PIC) in animals of gray Ukrainian breed of both sexes was the same at the level of 0.69, which exceeded this indicator of the compared population by 0.7 in buffalo cows and 0.1 in buffalo. The genealogical tree of the buffalo herd, compiled from the same microsatellite loci, showed that it did not have a pronounced differentiation of individuals by clusters, as in gray cattle. The maximum genetic distance between animals was 0.15, and the established genetic differences between the majority of them were at the level of 0.05-0.10. In studied individuals of Ukrainian grey cattle there were rather clear two multilocus clusters. The first includes three subclusters with 19, 5 and 7 animals, the second – two with 6 and 17 animals. The maximum genetic distance between the animals of the gray Ukrainian breed was 0.325.

Key words: *river buffalo, gray breed cattle, microsatellite.*

THE UNIQUE BEEHIVE PRODUCTS AND INTERACTION WITH PROBIOTICS

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Abstract

Food industry and researchers have focused on therapeutic effects of natural additives for the last two centuries. As a result of this interest, consumers tend to change their eating habits and consume bioactive foods which have high antioxidant, antidiabetic, anticancer, antimicrobial and antiinflammatory properties. These properties are directly related to presence of the ω-fatty acids, fiber, vitamins, minerals, phenolic compounds, flavonoids, prebiotics, probiotics, peptides and specific bioactive substances. Probiotics are living microbial food ingredients which confer health benefits to the host and are stimulated by prebiotics selectively. Beehive products such as honey, royal jelly, propolis, pollen, beeswax, bee venom inhibit microorganisms by increasing osmolality and acidity, including the compounds of royalisin, apisin and 10-hydroxy-2-decenoic acid. Also, these products are highly nutritious and potentially prebiotic. By combining the probiotic and prebiotic is widespread application due to enhance the survival of probiotic in the food matrix. However, the combination of beehive products and specific beneficial strain may cause to contrary to desired expectations. In this review presents an up-to-date summary of the antimicrobial compounds of beehive products, behavior of probiotics against these products.

Keywords: *probiotics, beehive products, antimicrobial activity, bioactive compounds*

TRADITIONAL AND CONVENTIONAL APPLICATION OF HERBS IN ANIMAL NUTRITION AND HEALING

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Abstract

Ethnomedicine or folk medicine is a set of experiences or their practical application to health preservation, life extension, disease prevention and treatment that people themselves have discovered. This knowledge was gained by experience and passed down through generations, first by word of mouth and then in written form. It is an experiential empirical medicine, professional to a certain extent, but most often imbued with mysticism, quackery and conservative ideas. Because of that there was infiltration of magic, supremacy, charlatanism that are difficult to separate from one another. Herbal medicine, which is linked to the lives and customs of people in the past, has been developed in all nations and has been preserved as traditional or national medicine up to the present day. This paper presents an overview of the most commonly used herbs in traditional and conventional medicine in order to protect the health of people and domestic animals.

Key words: *ethnomedicine, empirical medicine, treatment.*

6. RURAL DEVELOPMENT AND AGRO-ECONOMY

LIVING CONDITIONS OF FEMALE FARMERS IN AUSTRIA

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Abstract

Understanding living conditions is critical to the understanding of female farmers' way of life. They are fundamental to people's lives and vary from person to person. Normatively speaking, a good life cannot be achieved without having good living conditions. The term living conditions, either as a target of different political interests, agendas and priorities or closely related to private spheres of life, refers to the circumstances surrounding an individual's life. This paper: (I) aims to define the multidimensional concept of living conditions, (II) considers the importance of the concept and its application, and (III) offers statistically proven insights into the living conditions of female farmers in Austria. The analysis is based on select data from the female farmers' surveys in Austria. All in all, the results reveal the development from 2006 to 2016. The areas examined (education, financial independence, civic engagement, work-life balance, social network and job satisfaction) show a positive development but there is also room for improvement – especially in the cases of financial inclusion and work life balance. Moreover, there is clearly a need to learn more about the living conditions of female farmers – especially in connection with their lifestyle, and other concepts such as quality of life, social inclusion and standard of living. Finally this paper tries to elaborate on the need for further research and future perspectives.

Keywords: *female farmers, living conditions, Austria.*

THE INFLUENCE OF THE SPACE UTILIZATION ON THE FINANCIAL RESULT OF PRODUCTION IN GREENHOUSES

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Abstract

Vegetable production in the protected area belongs to highly intensive agricultural production, and it is followed by appropriate results of production. It brings a number of advantages as opposed to the production of vegetables in the open area and is therefore very attractive for an agricultural producer. In this paper, the production of vegetables in a protected space without heating in the territory of the city of Bijeljina (Bosnia and Herzegovina) has been analyzed, as well as the specificities and possibilities for improving the business results. The results of the research indicate that the most common way of using protected area is to cultivate one line during the year, while on two farms two crops were grown in the protected area. The highest average gross margin was achieved in the production of tomatoes in the observed model. The t-test affirmed that there is a statistically significant difference in the average gross margin between the protected space with one production line and the protected space with two production lines.

Key words: *Protected area, Gross margin, Vegetables.*

THE WINE TOURISM IN BULGARIA: AN OVERVIEW AND KEY CHALLANGES

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Abstract

Rural wine tourism is a way to diversify the mass-tourism product and bring more prosperity to disadvantaged rural areas. It is a very recent concept in Bulgaria but it is foreseen to grow in the future. However, there is a lack of research-based publications on wine tourism in the country in general and its potential role in sustainable rural development. The aim of this research is to explore the state of wine tourism in Bulgaria and to present the key challenges the country is facing. A threefold approach was used to collect information for this study: (I) literature review; (II) semi-structured interviews; and (III) winery visits (observation). Eleven wineries were visited and fourteen interviews with stakeholders were conducted. Relevant stakeholders to rural wine tourism development were identified as wineries, NGOs and associations, government and tourism businesses. The main challenges facing the development of the wine tourism industry are a lack of regional competitiveness, public awareness and recognition, a lack of regional and local infrastructure (roads and signage), service delivery skills, capacity and proactive attitude in wineries, a lack of tourism strategies (national, regional and local level), planning processes and governance structure, a lack of service quality assurance mechanisms and a lack of available market research. There is a strong potential for developing rural wine tourism in Bulgaria. The presence of wineries, cultural heritage attractions, nature, food and accommodation options, as well as the defined wine regions have all laid the foundation for it.

Keywords: *Agritourism, Bulgaria Rural Tourism, Rural development, Tourism development Wine tourism.*

SUSTAINABILITY OF UNDP PROJECTS IN EGYPT: A CASE STUDY IN SIWA OASIS (SIWA ENVIRONMENTAL AMELIORATION PROJECT)

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Abstract

The main objective of this research paper was to evaluate the effect of one of the international projects in Egypt, in order to know the benefit of such projects and to discover the reasons of their success or failure from different point of views. Siwa Environmental Amelioration Project (SEAP) was chosen as one of the famous projects in Siwa Oasis. It worked there for two phases for 6 years in order to set sustainable development activities in the oasis through loan activities in the agricultural field, in order to raise the quality of life for the oasis people and set a perfect example for the capabilities and the good effect that such projects can do. Ven diagram and pairwise ranking matrix were used to identify the linkage between different actors involved in the project and the problems importance according to their point of view , The results showed that faced the project a lot of local obstacles faced the project and didn't help SEAP in achieving its goals. Besides, the other local NGO partner (SCDEC) was not qualified enough to take over the projects after SEAP left. Even with the success of organic agriculture production as an innovation, the problem of marketing already killed the idea, and small farmers couldn't cope with it, and it ended up by cancelling the activity.

Keywords: *sustainable agriculture, innovation.*

ABATEMENT OF AGRICULTURAL GREENHOUSE GAS EMISSIONS IN THE EUROPEAN UNION: A REVISED ANALYSIS OF MARGINAL ABATEMENT COST

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Abstract

Avoiding the adverse effects of climate change has become a key priority for the European Union. In this regard, marginal abatement cost curves of greenhouse gas emissions are essential to assess the potential for efficient reduction from a cost-effectiveness perspective. Aiming at providing MACCs for the EU agricultural sector, we process simulations based on an agricultural supply-side model calibrated against six economically contrasted sets of annual data (2007-2012). The paper characterises how the year-based uncertainty surrounding the MACCs influences both the initial level of emissions, as well as the carbon price elasticity of emissions. The assessment is realised at infra-regional, regional, national and European levels. Based on the highly contrasted annual sets of data, an EU decrease of agricultural GHG emissions by 10%, 20% and 30% would require a CO_2 price ranging from around 32 to 55 €/tCO_2eq, 81 to 147 €/tCO_2eq, and 155 to 267 €/tCO_2eq, respectively. In addition, we provide distributions of abatement ratio over farm types and regions for the different years and different carbon prices, showing, over the EU, the large spectrum of individual abatement ratios against a given price. The economic context draft by annual data accounts significantly in the variations, yearly sets of prices and tax effects playing an important role when estimating the cost of GHG emission abatement.

Keywords: *Marginal abatement costs, Greenhouse gas emissions, Carbon price.*

CLIMATE EFFECT ON RURAL TOURISM DEVELOPMENT, CASE STUDY OF GUILAN PROVINCE (IRAN)

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Abstract

One strategy that has been recently considered by many countries in the world, even applied and implemented in some leading to positive results and outcomes, is tourism development in potential rural areas. Rural tourism entails diverse activities conducted by tourists in rural areas. In other words, rural tourism constitutes of all the activities that the tourists might be able to undertake in a rural area with respect to its natural attractions, culture, rural traditional context, art and handicrafts, and customs which might be classified as agricultural tourism, green tourism, farm tourism, and food and hunting Agritourism. Rural tourism encourages economic growth, diverse and sustainable livelihood, commercial and industrial productivity, promotion of income opportunities in the form of multifaceted activities, creation of new markets for agricultural crop and forms the cornerstone of developing a local productive economy. In the geographical span of Iran, Guilan province has a significant and valuable tourism status. Its geographical features and unique economy of Guilan along with ancient, historical, religious and cultural monuments make this region of Iran unique and transform it to a massive hub of tourism in Iran. The main goal of this research is planning to adapt the existing context based on climate potentials in this province to develop rural tourism industry in Guilan province. This is an applied research using descriptive-analytical methodology. In this paper the province climate is determined using climate classification method and TCI climate tourism method climate zoning is inducted. Then the issue of using climate determinants to develop rural tourism economy is addressed and potentials and new ideas are identified and strategies andrequired solutions to develop rural tourism in this region are introduced.

Keywords:*Climate, Climate parameters, Rural tourism, Guilan province.*

TERRITORY, GOVERNANCE, LOCAL COMMUNITIES AND TERRITORIAL MANAGEMENT CONTRACTS: CASE STUDY IN SARDINIA ISLAND, ITALY

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Abstract

The authors, through a vision toward new paradigms, joining tradition and innovation, the approach of the Smart Communities and Smart Territories, the bottom-up new model of Territory Governance as the Territorial Management Contracts -TMC's, design a framework of model that combine the territory risk management with solution development of driving and sharing by the local populations. The proactive involvement of population in the TMC's must be managed by the economic instruments. A model to measuring the benefits recognized by the contractors it's proposed crossing the approach of DPSIR- Drivers-Pressures-States-Impacts-Responses, oriented at the Payment of the Ecosystem Services-PES, with the techniques based in the Willing to Accept-WTA such as simplification of the contingent valuation or choice experiments. The authors demonstrate that the TMC's are concrete way to commit the Local Community the ability to design their own future in a Sustainable Strategy approach. The authors present, in this way, their own large experience in the research, than in projects, teaching and training, in this innovative approach that is strictly linked with the targets of the Sustainability Age. They show also the practical case of the *"S'Ortu de Tzviriu"* in Sardinia Island where the Local Community, driving by the QEDORA Association, is ingoing trough the contracting phase, with the Municipality of San Gavino Monreale, to achieve and set up a TMC *Multifunctional Park o Happiness* of *"S'Ortu de Tzviriu".*The implementation of the case study show that the TMC's are shared and democratic repeatable models that could be adopt in all areas of the world.

Key words: *Sustainable Development, Risk Management, Preventive Management, Territorial Contracts Management, Ecosystem Services.*

FINANCING AND LENDING TO A FARM IN LATVIA

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Abstract

Financing a business encompasses all the activities necessary to provide the enterprise with finance. This represents the process of acquiring and spending funds and making investments, as well as the cash flow. Farms could use both internal and external sources of finance. The research aim was to identify the sources and amounts of finance that ensure the successful operation of farms. The research was conducted on a medium-size commercial farm "Saulaini". The farm had 190 hectares of agricultural land. The key kind of its business was milk production. The farm "Saulaini" had access to and used both kinds of finance. Since the establishment of the farm in 2001, the total investment made in the business has amounted to EUR 317.6 thousand, of which 37% was internal finance. The farm attracted external finance (approximately EUR 200 thousand) – a loan and EU funding – in order to purchase machinery. The production costs of the farm "Saulaini" exceeded its revenues and the farm made losses. However, EU support payments improved the financial performance of the farm. In 2016, the farm received EU financial support in the amount of EUR 46.7 thousand. Effective financial management on the farm contributed to its high liquidity ratio and high rate of return on capital.

Keywords: *financing, lending, farm, sources of finance, EU support payments, Latvia.*

GASTRONOMIC TOURISM IN LATVIA: FEATURES AND OPPORTUNITIES FOR DEVELOPMENT

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Abstract

As world trends show and according to the Guidelines for Tourism Development in Latvia for 2014–2020, the tourism industry represents one of the opportunities for economic growth in the country and one of the priorities of the services sector, as it makes a considerable contribution to the gross domestic product of the country and is a significant source of export revenues. The objectives of the tourism industry of Latvia are to reduce the effect of seasonality, increase the number of multi-day visitors and to contribute to the profitability of tourism products and annual increases in exports of tourism products. The research aim is to identify the most characteristic features of gastronomic tourism and to examine development opportunities for gastronomic tourism in Latvia. Specific research tasks: 1) to characterise the position and role of gastronomic tourism as well as to identify the characteristic features of it; 2) to assess the characteristic features of gastronomic tourism and the potential development of gastronomic tourism in Latvia. *Research methods used:* monographic, graphic, data grouping, analysis, synthesis. The research concluded that the most characteristic features of gastronomic tourism in Latvia were spatial stillness, regionality, the individuality of a gastronomic tourism product, the effect of seasonality, the focus on domestic tourism and the concentration of tourism activities in historical regions and ethnographic and industrial centres. To effectively contribute to the development of gastronomic tourism in Latvia, it is required to make a number of enhancements to strengthen regional gastronomic tourism, which would link the cultural and historical heritage and gastronomic tourism.

Keywords: *gastronomic tourism; kinds of gastronomic tourism, development.*

STRUCTURAL ANALYSIS OF SOCIO-ECONOMIC DISPARITIES IN ECONOMIC DEVELOPMENT OF THE REPUBLIC OF MOLDOVA

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Abstract

The concept of regional development is in fact an European idea, one of the basic principles of the EU's functioning and a main condition for administrative reform in the Member States, candidates or associate countries. In Moldova, the real development of the economy takes place asymmetrically from a regional point of view. The regional disparities in the country are due to the uneven distribution of production factors, urbanization levels, quality of technological infrastructure and institutional. The origin of such factors may result in the creation of a potential gap within the country and in the perpetuation of existing social and economic imbalances, affecting as result the economic growth. When statistical aspects and regional accounts started to be developed, the analysis of the regional dynamics in the study focused more on the identification of the convergence or divergence processes, of the concentration poles at different sectors level as services, investments, industry and agriculture. The aim of this research is to identify the existing socio-economic disparities in regions development and to analyze its impact on Moldova's economic development. Different research methods will be used in the study such as: systemic analysis, functional approaches, retrospective analysis (historical approach), diachronic analysis (analysis of changes in the structure of object over time). Methods of scientific knowledge, such as comparison method, graphical analysis and logical thinking methods, statistical analysis will allow to carry on a systemic approach of the researched problem, to identify regularities and connections in regional development and to draw conclusions and recommendations on the researched aspect.

Keywords: *agriculture, economic development, regions, regional policy Republic of Moldova.*

COMPARISON OF POLISH DAIRY FARMS AGAINST SELECTED FARMS FROM OTHER EU COUNTRIES USING THE MALMQUIST INDEX

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Abstract

The aim of the paper was to assess the effectiveness of Polish dairy farms (type 45) against a background of similar farms from selected European Union countries and to determine their ability to compete. The studies covered farms from the following countries: Poland, Hungary, Lithuania, Austria, Germany, Denmark, the Netherlands and France. The analysed data covered the 10-year period from 2006 to 2015. The source of research materials was data from farms from the European Farm Accountancy Data Network (FADN). In order to measure effectiveness, the Malmquist productivity index was used. In terms of the Malmquist index, the Polish farms had the lowest value (-2.9%), while the Danish farms had the highest value (2.5%). Such disproportions were mainly due to very slow changes in the technical progress of the Polish farms. In the analysed farms there was a slight decrease in productivity measured by the Malmquist index (by 0.3%). The decrease in the productivity value of the dairy farms was caused by a drop in technical progress by 0.4% with an increase in technical effectiveness by 0.2%. The slight changes in productivity were a consequence of the functioning of milk quotas in the EU. This mechanism has effectively limited the increase in milk production, so the producers could only optimize the inputs.

Keywords: *Dairy farms, effectiveness, Malmquist productivity index.*

PRODUCTIVITY AND COMPETITIVENESS OF RWANDAN AGRICULTURE: A CASE STUDY OF THE MAIZE SECTOR

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Abstract

This study investigated the level of productivity and competitiveness of Rwandan agriculture by focusing on the case study of the maize sector. The data were collected through close monitoring of maize production activities on a sample of 50 producers from five maize producers' cooperatives selected in the districts of Huye, Rusizi, Gasabo, Burera and Bugesera (Rwanda) during two agricultural seasons of 2013/2014 and 2014/2015. They were supplemented by direct observation, interviews with targeted resource persons and secondary data on maize imports and exports retrieved from FAOSTAT website. The analysis was conducted using the comparative analysis, the farm-level economic performance indicators, the Net Export Index (NEI) and the Grubel-Lloyd (GL) measure. The results revealed that the yield was very low compared to theoretical expected yields for about 80% of producers. The analysis showed that the rational use of improved seeds, chemical and organic fertilizers improved the yield. The analysis of the NEI and the GL measures for maize flour and maize grain revealed that Rwanda was a net importer. For these staple foods, the results revealed that if Rwanda managed, through policy and institutional actions, to remove or alleviate the bottlenecks that prevent farmers from producing enough for export, it could have had a competitive advantage on regional markets.

Keywords: *Agriculture, Competitiveness, Maize sub-sector, Productivity, Rwanda.*

IMPACT OF KEY RESOURCES AND ATTRACTIONS ON COMPETITIVENESS OF RURAL DESTINATIONS IN SERBIA AND HUNGARY

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Abstract

All destinations are an amalgam of tourism products aimed at providing consumers with a unique, integrated tourism experience. Destination resources and attractions, as factors of tourist offer, represent real incentive force that creates a tourist demand. The aim of this paper was to explore how key resources and attractions – physical and geographic elements of the environment, cultural heritage, opportunities for sports, leisure and recreation, accommodation facilities and their authenticity, gastronomy, general infrastructure and tourism infrastructure, safety and security - affected competitiveness of rural tourism destinations in Serbia and Hungary. Tourism experts from Serbia (163) and Hungary (175) were asked to evaluate the current condition of 24 attributes affecting the competitiveness of rural tourism destination. Likert scale of five marks was used in order to determine the effect of key resources and attractions on the competitiveness of Serbia/Hungary as a rural tourism destination. The research showed that the rural tourism sector in both countries had plenty of natural resources and special attractions. However, the accompanying services and contents were very limited and this could affect the reduction of attractiveness, and therefore the ability of the sector to highlight its potential. In the absence of ancillary infrastructure and resources, possible outcomes for the destination can range from service delivery below the expectations of visitors to major failures, thereby preventing the long-term development of the destination. The three basic elements have the potential to increase the length of stay and tourist consumption, which are: folk tradition, gastronomy and opportunities for sports and recreational activities in nature.

Keywords: *key resources and attractions, rural destination, competitiveness, Serbia, Hungary.*

POTATO PRODUCTION CHARACTERISTICS – COMPARATIVE ANALYSIS: SERBIA, MACEDONIA AND ENTITY OF REPUBLIC OF SRPSKA (BOSNIA AND HERZEGOVINA)

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Abstract

The parameters of potato production in Serbia, Macedonia and Entity of Republic of Srpska (Bosnia and Herzegovina) were analysed in the period 2005-16. Sown areas, yields and total production were analysed. Quantitative analysis was performed by using descriptive statistics method, and we used average annual rate of changes to discover the tendencies of changes in the analysed period. In Serbia, there were 63,646 hectares of potato in average, in Macedonia 13,402 hectares and in Republic of Srpska 14,858 hectares. Serbia showed a trend of decreasing areas of potato with average rate of -3.38% per annum, Macedonia had tendency of increasing area by the annual rate of 2.45%, and Republic of Srpska also decreased areas of potato by average yearly rate of -2%. The average potato yield was 13.4 tons per hectare in Serbia, with variation coefficient of 29.8%, in Macedonia, 13.9 t/ha (variation coefficient 6.8%) and in Republic of Srpska 11.2 t/ha (variation coefficient 12.8%). In the observed period, there was a growth tendency in yields: 0.64 in Serbia, 2.30 in Macedonia and 1.31 percent per year in Republic of Srpska. The average annual potato production in Serbia was 803,669 tons (variation coefficient of 18.1%), in Macedonia 186,770 tons (variation coefficient of 6.2%) and 166,221 tons in Republic of Srpska, (variation coefficient of 14.9%). Potato production showed tendency of growth in Macedonia, 4.79%, while it decreased in Serbia, -2.74 and in Republic of Srpska -0.72 percent per year in average.

Key words: *potato, production, Serbia, Macedonia, Republic of Srpska.*

CARBON DIOXIDE EMISSIONS IN RETAIL FOOD

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Abstract

Increased attention has been paid recently to the analysis of the effects of applying the concept of sustainable development in retail. In that context we have particularly considered greenhouse gases emission in retail food. This is achieved through the use of modern ecological technology in business – through the whole food value chain. The ultimate goal is to achieve the planned reductions of carbon dioxide in retail food, which positively reflects the overall performance of retailers food, environmental in particular. The costs of carbon dioxide emission reduction affect the performance of retailers food. Continuous empirical research shows that almost all global retailers food achieve a significant reduction in carbon dioxide emissions from year to year. Empirical research conducted in this paper on the example of global retailers food in the United States, Europe and the European Union, the United Kingdom, and Serbia shows significant and planned reduction of carbon dioxide emissions in retail food, especially in countries with developed market economies. This empirical research is mainly based on the analysis of the original sustainable (environmental and ecological) reports officially disclosed by selected retailers food, primarily from the countries of a developed market economies, which they started to publish with regular annual financial statements. They are now an integral part of the so-called integrated reporting on performance of global retailers food. Due to the general importance, harmonized regulations on sustainable retail food reporting are being increasingly applied as a data source for more efficient environmental management. In perspective, this will ease the comparative analysis of the carbon dioxide emission of global and other retailers food. (*Jel Classification: I10, L81, M14, M41, Q42, Q56, Q57*)

Key words: *greenhouse gas emissions, carbon dioxide, CO_2 emission sources, renewable energy sources, sustainable reporting.*

PROFITABILITY AND RISKINESS OF CATTLE FATTENING OPERATION IN SERBIA

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Abstract

Cattle production is the most important type of livestock production in Serbia. Dairy production as well as cattle fattening are usually performed at family farms which dominate in Serbian agriculture. Cattle fattening has special status within cattle production because of its long tradition and export potential for baby beef. Therefore combination of dairy production and cattle fattening is common at family farms and could improve economic performance of on farm level. Nevertheless, in recent years cattle fattening is in decline. One of the reasons is that cattle fattening is activity associated with broad range of risks. Therefore, the goal of this research is to determine how some types of risks influence profit in cattle fattening operation at family farms in Serbia. To achieve this goal, profit is calculated on the basis of revenues and costs which are determined for cattle fattening on family farm. Initially, profit is calculated for usual (expected) circumstances. Afterwards, it is analyzed how profit is influenced by changes in some important factors, such as subsidies, price of fattened cattle, price of calves for fattening and corn price. It was determined that profit was influenced the most by potential absence of subsidies, because without state support cattle fattening in Serbia would not be profitable enterprise. On the basis of scenario analysis it is possible to expect that in general cattle fattening should be profitable.

Key words: *Cattle fattening, profit, risk, family farms, subsidies.*

THE PROPERTIES OF THE FAMILY FARMING DAIRY FARMING IN THE CITY OF KONYA AND THE FACTORS AFFECTING THEM

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Abstract

More than three billions of people live in rural areas in the world. Approximately 2, 5 billion of them provide for the agricultural sector. The agricultural sector is the most important element of the economic growth for most countries and especially the developing countries. The majority of the businesses in agricultural sector is conducted in family farming. In the study; stratified sampling method out of the simple random sampling method has been used for the purpose of increasing the accuracy of the findings collected from the businesses and providing the sufficient representation of the different parts in the population. Sample size has been calculated as 128 within 95% reliability range with 5% error margin and the businesses taking place in the sample size have been selected according to the principle of random volunteering. Agricultural income ratio was taken as a dependent variable. Equity capital ratio, labor force potential, land ratio, animal number, land amount were taken as independent variables. Based on the definition of the family farming, the factors affecting the properties of the family businesses have been detected. Logistic regression model has been used in the determination of the factors affecting the properties of the family farming. According to the model results, agricultural income ratio, equity capital ratio, property land ratio and labor force potential, among the factors affecting the properties of family farming, have been found meaningful. The businesses in the study region are in the state of the businesses with competent income. The fact that enterprises have sufficient level of income will facilitate the separation of budgets for the new techniques and technologies that is encountered and will lead to the development of enterprises.

Keywords: *Family Farming, Logistic Regression, Konya.*

DEVELOPMENTS ON GEOGRAPHICAL INDICATIONS AND TRADITIONAL PRODUCT NAME REGISTRATION IN TURKEY

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Abstract

Interest in the origin of products and geographical indications in Turkey has recently increased in parallel with global developments. Geographical indications have the functions of preserving traditional knowledge and cultural values, combating product imitation, supporting local production and rural development, becoming a marketing tool, and guaranteeing the production methods and product standards. Traditional products, especially in underdeveloped regions, have the potential to create new employment opportunities for women and the young people and bring new initiatives for rural development. In this respect, it is of great importance to build the capacity of cooperatives and raise producer and consumer awareness and this can be achieved through both the public and the private sector. The Decree Law No:555 was implemented in Turkey as the basic regulation on the protection of geographical indications until Industrial Property Law No: 6769 came into force on January 10, 2017. The publication of the National Geographical Indication Strategy Document and the Action Plan on July 4, 2015 in the Official Gazette has been a significant development in terms of determining national policies. Turkey has a good potential for traditional products and products with geographical indications. 329 products have been registered by the Turkish Patent and Trademark Office as of April 2018, and 329 products are currently at the application stage. This study explains the current situation in Turkey on geographical indications and traditional product names and examines the practices in the application and registration process.

Keywords: *Marketing, Food quality, Rural development.*

AUTOMATIC DETERMINATION OF ALTERNATIVE PARAGLIDING TOURISM FIELDS BY GEOGRAPHICAL INFORMATION SYSTEM (GIS)

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Abstract

In this study, alternative flying fields suitable for paragliding which is one of nature sports within the boundaries of Sivas province, Turkey were automatically determined by Geographical Information Systems (GIS) analyses and the developed user interface program by taking into account the international technical conditions required for flying. The suitability of these determined fields was checked with the flight tests performed in company with the experienced paragliding pilot, and they were proposed as nature tourism areas. With this study carried out, it was ensured that the paragliding fields, which were mainly determined by observational and experimental methods, were scientifically determined in accordance with the international technical specification criteria. Furthermore, a new method has been developed in order to automatically determine alternative paragliding fields in any city with the help of the introduced GIS-based system and user interface program.

Keywords: *GIS, Ecotourism, Paragliding, Spatial analysis, Nature-based tourism.*

SUSTAINABILITY TRANSITIONS IN BOSNIAN AGRO-FOOD SYSTEM

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Abstract

Agriculture plays an important socio-economic role in rural areas of Bosnia and Herzegovina (BiH); the rural population accounts for 61% and almost half of the rural households is still engaged in agriculture. Faced with several environmental, economic and social problems, Bosnian agriculture needs a deep transformation to achieve both food security and food system sustainability. This paper explores the dynamics of past and ongoing transition towards sustainability in Bosnian agro-food system through the lens of the Multi-Level Perspective (MLP) on socio-technical transitions. MLP heuristic posits that transitions come about through interacting processes within and between niches (locus of radical innovations), regimes (locus of established and dominant socio-technical system) and an exogenous landscape. There are different agro-food niches in BiH (e.g. organic farming) but they are still marginal both in terms of land use and market share. Bosnia is characterised by a dual agro-food regime i.e. traditional farming and intensive agriculture. Landscape factors (e.g. civil war, Common Agricultural Policy, climate change) have shaped transformation in both sub-regimes. It is argued that changing climate and harmonisation with the regulatory *acquis* of the European Union will put pressure on the agro-food regime, whose de-alignment will create opportunities for nascent agro-food niches in the country. This also implies that transition pathways will likely be diverse; from technological/input substitution, to transformation and reconfiguration. Diversity of pathways means that different, tailored policy interventions are needed to foster transition-in-the-making towards sustainable agro-food system in BiH. MLP is useful to map sustainability transitions but further refinement is needed to adapt it to agro-food systems.

Keywords: *sustainability transitions, Multi-Level Perspective, agro-food system, agriculture, Bosnia and Herzegovina.*

FINANCING AS A LIMITING FACTOR OF AGRICULTURAL DEVELOPMENT IN SERBIA

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Abstract

The problem of financing agriculture in Serbia is constantly present and represents the biggest development limitation of this economic activity. The consequences of this problem are visible on the basis of the results of the last 2012 Census of agriculture. According to these data, most farms have four or less animals, irrigation systems cover only 3% of the total arable land, i.e. only 12% farms irrigate their land. The average age of agricultural machinery is about 20 years. A small number of farms has necessary equipment for intensive agricultural production. Out of a total of 631,552 farms, only 542 farms have greenhouses, while the cold store has only on 1,804 farms. Most agricultural entities in Serbia are not profitable, with lack of their own sources of financing, and limited access to the commercial bank loans. The financial resources of the Agrarian budget, as well as other forms of the governmental financial support are insufficient for the operational and development needs of agriculture. For the future development of Serbian agriculture it is necessary to develop new models for financing agriculture in Serbia. To this end, the authors propose the establishment of a specialized (development) agricultural bank and microcredit organizations, as well as the use of securities, financial derivatives, foreign direct investments and EU pre-accession funds.

Key words: *agriculture, financing, agricultural bank, microcredit organizations, financial derivatives.*

FACTORS DETERMINING ADOPTION OF IRRIGATION TECHNOLOGIES BY FARMERS IN WESTERN MITIDJA, ALGERIA

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Abstract

Since 2000, the public authorities have aimed at encouraging the development of water-saving irrigation technologies. However the rate of adoption of these technologies has remained low in most of these areas in Algeria. This study aims at shedding some light on the potential factors influencing irrigation technology adoption in Mitidja. It does so by reviewing previous studies done on technology adoption. In the study, technological, economic, institutional factors and human specific factors have been found to be the determinants of agricultural technology adoption. This study seeks to explain the behavior of farm holders towards adopting new irrigation technologies. The modeling of drip irrigation adoption is chosen as a methodological framework. It consists of defining the determining factors of drip irrigation adoption by farmers in Mitidja farming land. In this sense, a survey has been conducted randomly on a sample of 120 farmers, taken from the irrigated area of west Mitidja. Land 1. analysis results showed that the adoption of drip irrigation was influenced by: the type of crop grown, investment cost, subsidy to drip irrigation, education level, age and agricultural extension. Other factors such as irrigator's association membership, farm status, public water price, ground water access by well-drilling are not determining factors of the adoption. The study recommends the future studies on adoption to widen the range of variables used by including perception of farmers towards new technology.

Keywords: *Irrigated agriculture, West Mitidja Perimeter, land 1, Technologies adoption, Drip irrigation, Binomial Logit model.*

CONTRACT FARMING IN THE MILK SECTOR IN ALGERIA: EVIDENCE FROM SÉTIF REGION

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Abstract

In Algeria, the integration of agricultural activity with the industrial world (transformation, conservation, and valorization) necessarily goes through incentives of the public authorities in order to preserve the interests of the agricultural and industrial operators. To do so, it is necessary to evaluate agricultural potential to serve these industries and the industrial capacity to valorize the flows coming from the agricultural pole. Our work is therefore concerned with assessing the impact of public policies aimed at integrating the milk sector into strengthening the link between agriculture and the dairy industry in agricultural regions. The main question that our study seeks to answer is: what is the impact of the contracts imposed by the public authorities on the increase in the quantities of raw milk produced? Two hypotheses were developed: the absence of the professional organizations of actors (associations and agricultural co-operatives) able to carry out the actions for the sustainable development of the sector; and the absence of the culture of ***contracting*** (in the formal way) of the relations between actors. Those actors prefer the informal contract easily cancellable by one or the other of the contractors. The absence of a formal contract, between the milk collector and the farmers, creates bargaining power for one or the other of the contractors. After passing review of previous policies, we will analyze in detail the new contracting system with ONIL, advantages and disadvantages, strengths and weaknesses. This work therefore focuses on contractual arrangements for the collection of milk in Algeria. The analysis will focus more specifically the contractual mechanism in place through the ONIL device. The convention dairy breeders contain provisions on the involvement of farmers and dairies for collection arrangements raw milk. It specifies the milk on the farm storage conditions, bonuses or penalties to the attributes of the product, the quality and quantity control, inspection arrangements, price, payment terms and financial assistance to the farmers. The work deals with contracts in agriculture and particularly to the agreement between dairy cattle farmer and the transformer. Doest his agreement play a role in incentive prizes, rewards and penalties? Does it contribute to the integration within the industry? What is the relationship between the farmer and the processor? What is the role of the collector in the device? The questions are numerous and there are the first questions on the vertical coordination in a sector that are the subject of great interest of the government. To answer the questions, we will use data from surveys conducted with various stakeholders in the dairy industry in the region of Setif, (farmers, collectors and dairies).

Key words: *dairy, contract, contractual arrangement, Sétif, livestock.*

DOMESTIC SUPPORT MEASURES FOR OLIVE FARMERS: CASE OF THE MUNICIPALITIES OF BIRINE AND BENHAR WILAYA OF DJELFA

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Abstract

The Olive Producer Support Estimate Approach in two communes of Djelfa has been applied to explain economic parameters favoring the state of Internal Support Measures (ISM). Following a 4-month survey involving 150 individuals, the SPSS model processed the data by calculating the Market Price Support (SPM), the Nominal Support Coefficient (CNS) and the NOC (Coefficient Nominal Protection). The distribution of MSI in favor of these producers was mainly favored by one of the factors of production, the agricultural area, which spread rapidly to the detriment of productivity. The total SPM (96324438457 DA) (100 DA, Algerian Dinar = 1.16 Euro) and the CNS were strongly correlated with it, which showed that there is a strong effect of the area on the distribution of the MSI. For yield, there was a significant negative relationship with the NPC (-223, 2 to -1.80). The only payments for acreage could not encourage intensification or increase in productivity will be the best precept to be observed by policy makers.

Keywords: *agricultural policy, olive growing, crop production, productivity, Algeria.*

CLIMATE CHANGES AND AGRICULTURAL AND RURAL POLICIES IN ALGERIA

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Abstract

The acceleration of climate changes, coupled with population and income growth, threatens food security and natural resources everywhere. Prospects based on climate changes pose significant risks to ecosystems and agricultural systems in the Maghreb countries, including Algeria. The MAGICC model (Hulme et al, 2000), centered on this region, estimates a warming of about 1°C between 2000 and 2020 and a disruption of rainfall patterns with a downward trend from 5 to 10% in these countries. The phenomenon of climate changes will lead,first of all,to a reduction of water supply for rainfed and irrigated agriculture. It should also lead to an acceleration of erosion, likely degradation and salinization of the soil, a fall in agricultural yields in the plains and a reduction of the forage potential in mountainous and steppe areas. Faced with this situation and in the context of its Global Policy, on the one hand, and its Agricultural and Rural Renewal Policy (PREAR), on the other hand, Algeria is engaged in a process of risk mitigation and adaptation of its development programs. It has also put in place a National Climate Plan (PNC) and submitted it to National Determined Intended Contribution (INDC) at the time of ratification of the Agreement on Climate Change (CC). For the issues of risk mitigation on natural resources and adaptation of its agriculture, Algeria has undertaken the following: - developed a strategy for the management and sustainable development of forest resources (mountain areas) and steppe resources; - developed a strategy against desertification; -developed a water policy; - developed projects of proximity of integrated rural development (PPDRI); -developed a policy of agricultural development and food security. The purpose of this paper is to present the current conditions of Algerian agriculture to the risks of CC as well as the major policies and strategies for dealing with these risks. It will also determine the level of involvement of Algeria in the mitigation process and especially the adaptation and resilience of its agricultural and rural development policies and programs to the risks associated with CC. In the end, it will propose a series of recommendations in relation to the country's structural, economic and institutional conditions.

Key words: *Climate change, policies, Algeria.*

FAMILY FARMS IN AUSTRIA, ITALY AND POLAND

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Abstract

Recently there has been a surge of interest in family farms – in particular because 2014 was declared by the United Nations as the International Year of Family Farming. This focus on family farms is mainly a reaction to several trends, such as economic pressures, large-scale land grabbing or the restructuring of agrifood chains, etc. Yet it has to be recognised that the changes taking place in agriculture and agrifood systems put into question the role of family farms. This paper responds to the need for a review of family farms by examining the situation in Austria, Italy and Poland. It uses the 'sole holder criteria' based on the legal form of the farmer to identify family farms. It analyses the status of family farms in terms of (I) numbers, area cultivated, livestock and labour force, (II) their contribution to nutrition and food security, and (III) their consideration within the agricultural policies. The situations in Austria, Italy and Poland are outlined using official agricultural census data, 2013. The results show, family farms are by far the prevailing form of agriculture in these three countries. Furthermore, we explore the country specific characteristics within the policy environment given in which family farms operate and how this policy supports them. Finally, this form of farm poses significant challenges for food production and systematic policy design. We conclude by giving some suggestions on future perspectives and the areas for further research.

Keywords: *Austria, family farms, Italy, Poland, policy aspects.*

POTENTIAL AND CHALLENGES OF ICT INTEGRATION IN AGRICULTURAL EXTENSION: EVIDENCE FROM MALAWI

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Abstract

Information and communication technology (ICT) has been believed as one of the breakthroughs to addressing multiple global challenges in communication. ICT has demonstrated its potential in improving access to financial, health services and markets in Africa through such platforms as mobile money and other interactive mobile services, especially in east and west African countries. Despite this progress, the spread of ICT in most Sub-Saharan African countries, including Malawi, has been low. Analyzing the potential of integration of ICT in agricultural extension in Malawi, this review highlights the opportunities and challenges for rolling out ICT based agricultural extension service delivery. The review showed that a large population having low or no computer literacy, and residing in rural areas, with poor infrastructure such as electricity and roads, limited the exploitation of ICT potentials. Furthermore, the capacity of local institutions to generate adequate content for ICT is constrained by small number of ICT professionals and huge dependence on imports of both ICT content and equipment. On the positive note, the growth and spread of 3G internet coverage across Malawi, inability of extension staff to meet farmers' demands for information, and improvements in flexibility to use and portability of ICT gadgets in remote areas makes ICT more appealing. Moreover, a favorable policy environment, which recognizes the potential of ICT to address the current challenges in the country, offers more opportunities for ICT integration in agricultural extension. A holistic approach is, therefore, recommended as an option for enhancing ICT integration in developing countries.

Keywords: *ICT, Information and communication technology, Malawi, agricultural extension.*

EFFECT OF MICROCLIMATIC FACTORS ON THE THICKNESS OF THE WOOL FIBRES IN DUBSKA AND PIVSKA PRAMENKA AND ITS USE IN THE TEXTILE INDUSTRY

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Abstract

Thickness of wool fibres in various breeds of Pramenka sheep (Dubska and Pivska) varied; it was examined during different periods, spring and autumn, and it came from different locations – mountain Vlašić in Bosnia and Herzegovina (BH) and Pivska mountain in Montenegro. Air temperature and the degree of insolation have a major significance on the quality of wool fibres in both Pramenka breeds. Seasonal changes, average temperature and insolation together with the age of animals and the region of the body from which samples were taken, affect the quality and the use value of wool fibres. Wool as a raw material is exposed to the activity of various insults – mechanical, thermal and chemical. The quality of wool products depends on physical and technological characteristics of the wool. The textile industry requires high-evenness of the wool primarily to reduce the sorting costs, which also increases the value of wool, Mioč B. et al. (2006). Respectively, the data represents a contribution to the study of the fineness of wool fibres and their use in industry, the use for technical purposes and especially to the importance of the wool as a strategic ecological raw material.

Key words: *Dubska, Pivska Pramenka, wool fibres, micro-climate.*

FINANCIAL MANAGEMENT AND CONTROL, RISK MANAGEMENT AND DISCHARGING IRREGULARITIES IN THE AGRICULTURAL SECTOR IN BIH

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Abstract

Financial management and control are a comprehensive system of internal controls that are established and for which the managers of institutions are responsible, and by which, by managing risks, ensure that the budgetary and other resources will be used correctly, ethically, economically and efficiently in achieving the goals. Within the overall economy and after more than two decades after the war, BiH agriculture is still burdened with numerous problems and does not show the vision of its own social development. By adopting several laws and establishing institutions, it gradually builds an agricultural framework, but it still remains with numerous problems due to undefined measures of support to domestic production. The aim of this study is to protect the means of loss, abuse and damage in accordance with laws and other regulations. This system includes all business transactions, and in particular those related to revenues, expenditures, asset and liability protection. The internal control system is carried out by the responsible persons of the institution and the employees of the institution. Experiences from the practice show that the key to establishing financial management and control is a timely and permanent incorporation of all knowledge and solutions, the activation of all employees in raising awareness for financial management and control. These findings were achieved through the method of direct implementation of projects on the market (local self-government, budget and extra budgetary users, state-owned trading companies and local self-government units) through financial management and control projects, strategic plan, asset register and risk management. Today, it is clear that 80% of the problems arise from 20% of the causes – that is why employees should be educated so that they can recognize them and act effectively on them.

Keywords: *mission, vision, goals, processes.*

HOME GARDENS – GEOGRAPHY OF BIOCULTURE AND QUALITY

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Abstract

The current study focuses on plant diversity used in production of traditional food from the Balkans. The selected products are part of Ark of Taste e-catalogue of Slow Food and their recognition and promotion is a result of the collaborative network of 8 Balkan countries (including Turkey). All entries involve small-scale farmers and processors engaged in preservation of food biodiversity and traditions through sustainable use of biological resources. From over 250 products (primary and processed), 174 were found to include plant ingredients or to be local varieties/landraces. Most of the latter are cultivated in gardens and/or as small-scale crops being part of the disappearing traditional practices handed down from generation to generation. About half of the products are manufactured by small businesses that offer food at local or regional markets and/or restaurants. Analyzing the threats for food diversity in the Balkans we have detected a high level of similarity that presumes common approaches to safeguarding it. To illustrate the overall conclusions, we have investigated Bulgarian traditional products with geographical reference. Challenges and transformations related to plant heritage conservation at home gardens are discussed.

Keywords: *rural areas, plant varieties, agrobiodiversity, local communities.*

Acknowledgements

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APPLICATION OF AGRICULTURAL RISK MANAGEMENT POLICY IN BULGARIA

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Abstract

Up-to-date challenges to agriculture and sustainability have led to a practical need to minimize the risks of their activity. Emerging uncertainties, risks, and crises related to the natural environment, technology, economic and political environment as well as globalization are new challenges addressed to risk management in the agrarian sector. Important for effective risk management is its understanding by all actors in the chain of the types of risks. Some of the risks faced by agriculture are critical and require a constant search for solutions for its management. The main aim of the publication is to analyze the application of risk management policy in Bulgaria. The hypothesis is that policies related to agrarian risk management will reduce the negative consequences of its occurrence and impact. The paper is divided into several parts. The first part includes a theoretical background of sources and types of risk in agriculture. The second part relates to review and assessment of the legislative framework and the existing instruments for risk management in agriculture. The analytical part is based on an application of risk management policy in Bulgaria. Based on that, general conclusions and policy recommendations are made.

Keywords: *agricultural risk, risk policy management.*

IMPACT OF AGRICULTURE ON WATER POLLUTION

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Abstract

The impact of agriculture on surface and groundwater is determined as negative. On the other hand, the agriculture is negatively influenced by wastewater and polluted groundwater. The aim of the paper is to identify, analyze and assess the impacts of agriculture on water pollution and agriculture as a pollutant. The object of the survey is agriculture, and the subject of research is 1) the impact of water pollution on the agrarian sector and 2) the effects of agrarian activities on water pollution. The methodological framework of the paper includes: 1) literature review of impact of the water resources on agriculture and agriculture as a contributor to the water pollution; 2) analysis of impact of agriculture on water pollution based on statistical information and own survey; 3)conclusions and recommendations for mitigation of water pollution. The used method in the paper is survey method among agrarian, environmental and agroecological experts.

Keywords: *agriculture, water pollution, recommendations.*

PROBLEMATIC DEVELOPMENT OF THE AGRICULTURAL SECTOR IN SOUTH KIVU (EASTERN DRC)

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Abstract

Like its numerous water and land resources, the issue of reviving the agricultural sector in the DRC in general and in South Kivu in particular, highlights three major challenges related to the coverage of food needs, the increase in income, and improving the attractiveness of agricultural activity and the rural environment. These challenges should attract the attention of researchers, politicians and practitioners very well. With a population of over 80% agricultural, the province of South Kivu still holds indicators that are red. This is the case of the 60.2% poverty rate, the 61% food insecurity rate, and the 44.8% chronic malnutrition rate; more than 50% of food dependency rate. Several structural and cyclical problems are blocking the revival of South Kivu's agricultural sector. The objective of this work is to be able to not only describe the main factors that hinder the revival of the agricultural sector in the province of South Kivu but also to give the possible solutions to remedy this problem in this province. The results of this study show that several problems block the development of South Kivu's agricultural sector such as, the near-absence of agricultural policies, insecurity, heavy and inappropriate taxation, the inadequacy of technical agricultural schools, the low budget allocated to agricultural services and the research center, the difficulty of access to land and capital by young people and women, overpopulation and its consequences, competition between the agricultural sector and the mining sector, the yield of weak agricultural products, the virtual absence agri-food businesses, high marketing costs, poor condition of agricultural desert roads, inaccessibility to markets and the presence of multiple harassment, poor business environment and poor governance, weak power of farmers' organizations. The promotion of formal land rights to solve the land issue, the elimination of unequal access to resources between men and women, the dynamics of agricultural services, state research centers and farmers organizations would make it possible to significantly increase agricultural production. It is at this price that the agricultural sector of the province of South Kivu can be revitalized.

Key words: *agricultural development, agricultural revival, agricultural sector, South Kivu.*

FACILITATORS' PERFORMANCE OF COMMUNICATION AND EDUCATIONAL INTERVENTIONS OF FARMERS' FIELD SCHOOLS (FFSS) IN RURAL EGYPT

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Abstract

FFSs have been used as an effective group learning approach in rural Egypt. In each FFS a number of farmers (20-25 males, females or mixed) meet regularly (on the weekly basis) with their facilitators, who perform the needed activities to make group learning easier by organizing the FFSs' communication and educational activities through organized and interactive discussions, participatory learning among farmers. The level of facilitators' performance, of these activities, is one of the most important determinants of the success of FFSs. This study investigated the levels of facilitators' performance of these activities, and the challenges facing them in this concern. The study was conducted in Fayoum Governorate (around 100 Kilometers from Cairo). All the Ministry of Agriculture extension workers (47), who work, in 3 Districts of Fayoum, and function as facilitators in the investigated 20 FFSs, were personally interviewed by using a questionnaire designed and pretested for data collection. Frequencies, percentages, average mean, standard deviation and correlation coefficient were used for data presentation and analysis. The study results revealed that: a) The majority of FFSs' facilitators (around 72 %) demonstrated high and medium levels of performance, and, b) Statistically significant and positive correlations were found among the level of performance and the following independent variables: number of the facilitators' years of experience in FFSs, number of training courses, attended by the facilitators. Several challenges facing the FFSs' facilitators were revealed, including: lack of transportations facilities (as reported by36.2%), lack of appropriate incentives for facilitators (34%) and lack of funds allocated by the Government for FFSs (32%). Facilitators' recommendations to face these challenges included: providing them with convenient transportation facilities and financial incentives.

Keywords: *Performance, Facilitators, Farmer field school, Egypt.*

CONCILIATING FOOD PRODUCTION AND ENVIRONMENTAL QUALITY: NEW INSIGHTS WHEN MITIGATING EU AGRICULTURAL GREENHOUSE GAS EMISSIONS

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Abstract

This paper focuses on the arbitrage between and within productions and greenhouse gas emissions at the European Union level. By using the European agro-economic AROPAj model, we assess the effects that can occur in the crop and livestock production in the EU, when introducing the pricing of greenhouse gas (GHG) emissions. The study highlights counter-intuitive elements such as increasing the supply of agricultural products – especially cereals and oilseeds – for a rise of the carbon price, for a price level below 50 or 100 € according to the products and the Member States. The increase in the simulations concerns both the areas and the quantities of products, whether these products are marketed or reused at the farm (for animal feed). On the other hand, livestock production, milk and meat, decreases significantly when the CO_2 price increases, whatever the level of this price. The reduction of emissions in CH_4 and N_2O (measured in CO_2eq), of the order of 25 to 35 % according to the calibration "year" of the model (2007 to 2012) for a price of 200 €/t CO_2eq, is definitely stronger for methane than for nitrous oxide. This result is consistent with the fact that livestock productions are more "sensitive" to the CO_2 price because they are associated with the emission of methane that is easier to reduce via animal feed, according to the model. These effects are due to complex substitutions regarding crops, grasslands and fodders, being related to the problem of animal feeding (on-farm recycled grain cereals, concentrates and grasslands and fodders).

Keywords: *Environmental policies, greenhouse gas emissions, Agriculture, Climate change, Carbon price.*

ECONOMIC TOOLS AIMING AT NITROGEN USE REDUCTION BY THE EUROPEAN AGRO-SYSTEM

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Abstract

Mineral fertilizers are often used by agriculture, all around Europe. Crops require nitrogen for their metabolism and these fertilizers may strongly increase the yields. However, mineral fertilizers, when they are used excessively, may be the cause of several environmental problems. For instance, nitrates, that are seeping into the ground, until groundwaters or steams, can worsen the quality of water. Nitrous oxide, a powerful greenhouse gas may significantly contribute to global warming. For these reasons, public authorities need to have tools to better control the quantity of fertilizers that is spread. Through AROPAj, a technico-economic model of the supply side of the European Agriculture, an increase in the price of mineral fertilizers (until 200 % of the initial price) was implemented for 6 years, from 2007 to 2012. The purpose of this study is to analyze farmers' behavior, concerning mineral fertilizing demand, land use or greenhouse gas emissions when they face the introduction of a tax on fertilizers price, other things being equal. Results show that an increase in fertilizers price may reduce their consumption but also reduce the greenhouse gas emission from the agricultural sector in the European Union. More precise simulations for France, in 2009, show that some regions are more affected by a tax on nitrogen fertilizers price than others. These simulations also show that the part of land allocated for cereal crops may decrease in favor of permanent pasture and wasteland.

Keywords: *AROPAj, mathematical programming, agri-environmental policy, taxes, mineral fertilizers, land use.*

CURRENT STATE OF EXTENSIVE FARMING IN THE MUNICIPALITY OF KALAMPAKA AND PERSPECTIVES FOR DEVELOPMENT

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Abstract

Livestock farming is usually practiced in mountainous and semi-mountainous areas of Greece. The current state of extensive livestock farming in the Municipality of Kalampaka is reflected by the data collected in the framework of this study, aiming at assessing the development potential of the area. The production criteria used in the work are: the number of livestock [sheep and goats (young/less than 1-year-old and over 1-year-old), cattle of different ages, equidae, pigs and sows], grasslands area, % of annual land-use. General statistics show differences between the 20 mountainous communities for the years 2014 and 2015. Three communities show the most intense livestock activity, with pastoral/extensive sheep and goat farming systems corresponding to over 80% of livestock farming in the Municipality of Kalampaka. Indigenous genotypes of small ruminants are predominant among the livestock. Hierarchical Cluster Analysis was applied in order to group the different communities with common features. From the cluster analysis it appears that communities are grouped into two major clusters based on their production criteria, one of which is formed by a single community, while the other is formed by three different sub-groups. With regard to the perspectives of livestock farming in these areas, we found that there is a reduction in livestock numbers from 2014 to 2015 due to the extensive type of livestock farming. However, in some communities, the grazing density is below the average, therefore livestock numbers could be increased. Such an effort has already begun in some areas, utilizing indigenous small ruminant genotypes, in order to contribute to the conservation of local genotypes.

Keywords: *extensive farming, semi-mountainous areas, indigenous genotypes.*

EXPLANATION OF THE FOOD PATTERNS AMONG VILLAGERS HOUSEHOLDS

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Abstract

Despite the pivotal role in the production of food, villagers today are considered one of the most important factors in terms of food security due to climate, economic and social changes. Rural households in Iran are faced with a decrease in quantity, quality and diversity of food products by rural households. On the other hand, because of socio - cultural and cultural changes, people face the spread of fast food and canned food in these areas. This study aimed to answer the question of what kind of food patterns were done among rural households in Jiroft County and what factors affected it. The findings of the study showed: - in the week, sample households use:rice: with an average of 4.99, consume artificial sugars, such as sugar, sugar and sweets with an average of 4.71 and dairy with an average of 4.7 times. - the consumption of rice among the villagers was significantly related to the consumption of other foods, including milk and their products, vegetables and fruits, legumes, legumes. - access to the water required to produce agricultural and animal products was the most important factor in how to consume milk and its products among rural households (R = 0.47, F = 5.628, sig=0.028). - annual income was the most important factor in how to interest solid oil consumption, sugar, sausage and sausage among rural households (R = 0.52, F = 7.44, sig = 0.013).

Keywords: *Food patterns, Rural Household, Planning, Jiroft.*

INVESTIGATING FARMERS' KNOWLEDGE ABOUT CLIMATE CHANGE IN IRAN

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Abstract

Climate change poses severe threats to agriculture sector, rural livelihoods and food security particularly in developing country. Mounting evidence has revealed that farmers can effectively manage this negative impact by adapting their farming practices to climate change. However, it is a common belief that more information and knowledge about climate change will lead to a better understanding of the phenomenon and adaptation options. Therefore, farmers as common victims of climate change need to refresh and continually update their knowledge about climate change to raise their potential capacity and output in the facing of climate change impacts. As such, an in-depth understanding of the various layers of factors that shape farmers' knowledge and their adaptive responses is a prerequisite for well-targeted agricultural adaptation planning. Therefore, the aim of this study was to investigate factors affecting knowledge of wheat growers about climate change and the associated impacts in Kermanshah county in western Iran. To achieve study goal a quantitative study (survey methodology) was used. A multi-stage random sampling technique was used to select 350 farmers to data gathering. Data were collected through a questionnaire which internal reliability and the validity was confirmed. Structural equation modeling revealed that the environmental attitude ($\beta= 0.31$, $p< 0.0001$), risk attitude ($\beta= 0.18$, $p < 0.002$) and trust ($\beta= 0.14$, $p < 0.013$) had significant predictors of farmers' knowledge about climate change. The present study provides a justification for agriculture extension program that intend to encourage farmers' adaptation behaviour against climate change impacts.

Keywords: *Climate Change, Knowledge, Agriculture Sector, SEM.*

PROBLEMS OF TOMATO GROWERS IN USING DRIP IRRIGATION SYSTEMS IN IRAN

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Abstract

Despite of more than a decade of applying drip irrigation system in Dayyer County, Iran and its adoption by tomato growers of the region, observations show that efficiency of this system is lower than desired level. Therefore, the aim of current study was to analyze problems of tomato growers in using drip irrigation in Dayyer County. Survey method was used. Statistical population of the study consisted of all tomato growers in Dayyer County (N=3500). By using the table of Morgan the sample size was determined (n=346). The sample was chosen through Proportional stratified sampling technique. Data were collected using a questionnaire. The questionnaire's validity was confirmed by a panel of Jahad-e-Agriculture experts. Reliability of the questionnaire was conducted and confirmed using Cronbach`s alpha (α: 0.74 - 0.84). The data were analyzed by using Spss20 and Excel. Based on obtained results of Borich and Quadrant need assessment models, nine themes as educational needs were identified: ability to use and to perform maintenance desalination systems, ability to overcome blockage of dropper and ability to perform service and maintenance of drip irrigation systems. The results also showed that the greatest dissatisfactions of tomato growers were: difficulty in getting credits, purchasing and maintenance of desalination systems and poor content of training and extension programs.

Keywords: *Drip irrigation systems, Need assessment, problems, Iran.*

FARMERS' PERCEPTIONS OF DROUGHT IMPACTS BASED ON THEIR LIVELIHOOD ASSETS

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Abstract

Drought management Planning requires accurate information about drought impacts and consequences on micro level (Farmers). The purpose of this study was to explain farmer's perceptions of drought impacts based on Sustainable Livelihoods Approach. This study used a descriptive – survey method. Statistical population of the study consisted of all rice producers of Sosan County in Izeh (N=300). By using the table of Morgan the sample size was determined (n=170). The sample was chosen through Proportional stratified sampling technique. Data were collected using a questionnaire. The questionnaire's appearance and content validity was confirmed by a panel of agricultural extension and education experts. Reliability of the questionnaire was conducted and confirmed using Cronbach`s alpha (α: 0.60- 0.89). The data were analyzed by using SPSS program. To construct livelihood assets indices, at the first stage the variables were converted to standardized scores by using Division by Mean procedure. Then principal components analysis was used for determining the weights for indicators in composite indices. The results showed that farmers experienced more social consequences of drought than other consequences. The results revealed that livelihood assets, except natural capital, had negative relationship with farmer's perception on the impacts of drought. K-means cluster analysis clustered farmers into three groups based on their livelihood assets. Regression analysis showed that livelihood assets explained 37 percent of the variance in farmers' perception on the economic impact of drought.

Keywords: *Farmers, perceptions, Drought, Impacts, Livelihood assets.*

THE EARTHQUAKE RISK ADAPTATION IN LIVESTOCK FARMING: CASE STUDY OF AMATRICE RURAL AREA (ITALY)

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Abstract

The problem of the phenomen on of earthquakes provokes, for the productive activities in the rural space, such as livestock farming, several discomforts concerning the technical, organizational and social point of view. One of the fundamental questions, which has not yet been answered by the research community, is the correct attention regarding the adaptation to seismic risk and the related strengthening of the resilience of local community affected. These aspects are strongly contained within the Goals 2,8,11,13,15 and related targets within the 2030 Agenda for the Sustainable Development Strategy and they are topics and pillar actions in the earthquake affected areas. In Italy, in general and the Central Area in particular, people coexist with earthquakes that have devastating effects on the structures and infrastructures of both as civil and productive sectors for the centuries. The earthquake on 24 August 2016 resulted in a large area called "crater" with estimated damages of around 12 billion euros and over 300 deaths in Central Italy. In particular, the reality of the Municipality of Amatriceunderwent a shock that virtually razed the entire historic center of the small town and in many cases eliminated the productive capacity of many companies especially livestock farms. The paper focuses with a detailed investigation and punctual analysis of the risk management choices used for the resumption of the flourishing livestock activities present historically in the area itself.

Key words: *Risk Management, Resilience, Earthquake Adaptation, Sustainable Development, Innovation.*

ASSESSMENT OF THE SUSTAINABILITY OF THE MEDITERRANEAN DIET: IMPLEMENTING THE MED DIET 4.0 MODEL IN SOUTHERN ITALY

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Abstract

The Mediterranean Diet is characterized by a nutritional model that remained constant over time and space, consisting mainly of olive oil, cereals, fresh or dried fruit and vegetables, a moderate amount of fish, dairy and meat, and many condiments and spices. However, the Mediterranean Diet is more than just food, because its adoption brings about multidimensional benefits regarding the four dimensions of sustainability (environment, economy, society and culture, nutrition-health). Hence, IFMeD and CIHEAM Bari, in collaboration with FAO and Forum on Mediterranean Food Cultures, developed a new framework called "Med Diet 4.0", in which the four dimensions are incorporated to assess the sustainability of the Mediterranean Diet. Currently, there are several challenges for the further development of the "Med Diet 4.0" model, such as understanding the interdependences and importance of the four sustainability dimensions, selecting and prioritizing a set of sustainability indicators, calculating a sustainability score using the data gathered for each indicator, and choosing the scale for testing the model. Taking into consideration the above-mentioned challenges, this research aims to assess the sustainability of the Mediterranean Diet by implementing the "Med Diet 4.0" model through a participatory Multiple Criteria Decision Aiding (MCDA) framework. This framework has been tested using a set of 56 sustainability indicators in a pilot project entitled "The Apulian Lifestyle for a happy long life", which took into consideration also the sustainability of the Mediterranean Diet in other 9 regions of Southern Italy. The MCDA framework enabled to assess the overall sustainability score of the Mediterranean Diet and the score related to each dimension in all the regions of Southern Italy. Furthermore, this framework made it possible to delineate the sustainability profile of Apulia region according to the different indicators and to each dimension. By analyzing this profile, brief recommendations of intervention were formulated to support the government of Apulia region in improving the sustainability of the Mediterranean Diet at the regional level.

Keywords: *Mediterranean Diet, Sustainability assessment, Med Diet 4.0, Sustainability indicators, Multiple Criteria Decision Aiding.*

GOVERNANCE ASSESSMENT FOR SOFT WHEAT FOOD SECURITY IN MOROCCO

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Abstract

In Morocco, despite the efforts made by the State in order to achieve food security under the framework of the Green Morocco Plan (GMP) , the government has not been able to solve the structural problem of production. In fact, the country remains highly dependent on the international markets and the economic situation of the exporting countries as well as on the commercial relations it has with them. According studies made by international institutions (IFAD, WB, FAO), other underlying factors such as population growth, demand for biofuels, and climate change could lead to an international supply deficit on the horizon 2030, particularly in regions with high production and export of wheat. However, results in a narrowness of markets and, consequently, new international price shocks. In this context, the present work purpose was to assess the country's vulnerability to soft wheat supply in the face of threats from import markets by 2030. Using the simple linear regression model, we estimate the evolution of the three economic aggregates: production, consumption and import of soft wheat. The aim was to analyze the prospects of the political choice in terms of increasing the Rate of Consumption Cover (RCC) by the national production of soft wheat in the year 2030. According to our results, it turned out that the national supply could follow an upward trend in the year 2030, but would record a slow growth marked by a strong fluctuation. In addition to low productivity, there was also low quality of the local product, which probably leads to an acceleration of the import dependency ratio. However, in the face of expected threats in import markets, the prospects for political choice could cripple the situation by 2030 and place the country in a chronic state.

Key words: *vulnerability, Rate of Consumption Cover (RCC), Soft wheat, political choice, Green Morocco Plan (GMP)*

INDIGENOUS AGRICULTURAL PRODUCTS AND BIODIVERSITY FOR THE DEVELOPMENT OF REGIONAL AREAS. ITALY CALLS BOSNIA AND HERZEGOVINA

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Abstract

In 1992, the Earth Summit in Rio de Janeiro considered biological diversity by introducing the term 'agricultural biodiversity' or 'agro-biodiversity', conceived as the set of varieties that each farmer recognizes and considers as part of the collective heritage of his land of origin. Italy holds a record of biodiversity for almost all the most important crops used for food, only partly due to physical and geographical factors. Apulia, in Southern Italy, is witnessed by numerous small details such as the countless units of land surface and quantity of agricultural products, the thousand dialects, habits and customs of the small towns. Apulia seems to be a happy island for biodiversity and needs to be protected with about 500 agricultural varieties between horticulture products and vegetables (Polignano carrots, onions from Acquaviva, and so on). The Southern part of Bosnia and Hercegovina, region of Herzegovina, is administratively divided to Western and Eastern Hercegovina having Neretva river as natural border between two. Due to difficult post-conflict transitional period, disputable approaches undertaken in revitalisation of the agriculture and ongoing political disagreements, the rich agro-biodiversity of the area has been partially lost. But regardless all difficulties, Herzegovina farmers, holding a strong cultural identity with food, helped saving from disappearance some of the oldest and most traditional products such as cheese in sack, kajmak (creamy cheese) in sack, roga green bean or poljak bean, all of them recognized by Slow Food movement to be 'arc of taste' products. The contribution, in addition to verifying the state of the art, intends to evaluate the different approaches regarding the subject outlined with regard to management and practices in Italy and in Bosnia and Herzegovina.

Key words: *Agriculture, Biodiversity, Development, Italy, Bosnia and Herzegovina.*

AGRICULTURAL AND PISCICULTURAL ACTIVITIES IN THE BAHOUAKAHA LOWLAND PREPARED FOR THE FAILURE OF THE TINE HYDRO-AGRICULTURAL LACUSTRINE SYSTEM (CÔTE D'IVOIRE)

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Abstract

Lakes of hydro-agricultural dams are technical innovations developed by the Ivorian State in the countryside of the north of the country in the 1970s. The presence of these water reservoirs has helped to boost agricultural production and to begin an extension of aquaculture activities through the construction of various fish farms. Today, however, the dam of Tiné in the sub-prefecture of Bahouakaha, like many of these works, is in a poor state of operation due to a lack of regular maintenance of its facilities. This reality negatively impacts the agricultural activities practiced in this lowlands of an area of more than 200 hectares. The objective of this study is to examine the consequences of the failure of this lake development on the cultural and halio-aquaculture activities that depend on it. The methodological approach is based on an exploitation of the documentation relating to tributary activities of fluvio-lacustrine environments. Semi-structured interviews and direct observation of the facts were also used during the field surveys. It appears that the dysfunction of the lake supply system has led to the closure of a state-built fish farm in the lowlands. Currently, a water leak due to the damage of the stop valve, at the monk tower of the dam, affects rice and vegetable productions. This situation undermines the livelihoods of user communities and threatens the food security of local populations.

Keywords: *Côte d'Ivoire, lacustrine system, agricultural activities, fish farming, failure.*

WILLINGNESS TO PAY FOR GEOGRAPHICAL INDICATION PRODUCT ON THE INTERNAL MARKET: CASE OF ATTIÉKÉ IN CÔTE D'IVOIRE

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Abstract

This paper analyses the issues of Geographical Indication on the internal market in case of Côte D'Ivoire. In Côte d'Ivoire, attiéké is a local food elected to Geographical Indication process. The production of the attiéké, semolina of cassava cooked to the steam, is traditionally done by the Lagoon's population called: Ebrié, Avikam, Alladian Adjoukrou…. They used to cooking it for their own consumption. Nowadays, the production of the Attiéké is also practiced by several other national ethnic groups and foreign communities. This production is important and is based in rural areas. The culmination of the procedures for the Geographical Indications would be a powerful factor for rural development for the Côte d'Ivoire. The country aims to implement a specific product in each region. This strategy of development is sustainable because it is based on culture and social habits of the local populations. To study consumers' behaviour, five regions (Abidjan, Dabou, Jacqueville, Grand-Lahou and Yamoussoukro) were investigated and 238 consumers from these regions were investigated. Conjoint analysis has been used to know the willingness to pay (WTP) of the local population. As results, consumers were focused on hygienic conditions and the size of grain. The price were not so important because 41% of consumers did not look at the level of price. This information can be used to set a price based on characteristics improvement.

Key words: *Geographical Indication, internal market, attiéké, willingness to pay, conjoint analysis.*

DIVISION OF LABOUR AMONG INNOVATION INTERMEDIARIES IN AGRICULTURAL INNOVATION SYSTEMS: A CASE OF INDONESIA

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Abstract

Innovation intermediaries are individuals and organisations that help others improve productivity through enhancing connectivity among economic actors in national, sectoral, and regional systems of innovation. Taking an example of Indonesia, this paper sheds light on different roles that public and private innovation intermediaries play in the agricultural sector, thereby illustrating division of labour among them. Overall, the case of Indonesia illustrates that structure and outcome of agricultural technology transfer heavily depend on regulatory environments and social recognition where economic agents engage in knowledge creation and dissemination. The public sector accounts for more than half of the actors involved in agricultural research and extension. Economic incentives for researchers in the public sector are provided through promotion and royalty. However, information regarding economic consequences of such technology transfer activities remains unclear, which chiefly stems from the delegation of authority to local governments after the regime change in 1998. Private agricultural R&D and extension have been organised and managed in a more direct manner where it involves fewer internal actors working in an environment with a lot less bureaucracy. However, vague regulatory environment makes it difficult for the private sector, multinational enterprises in particular, to have a positive view against technology transfer from the public sector. Quite similar to that of the private sector, the activities of Village Unit Cooperative are mostly driven by opportunities to generate more profits. This is done by taking collective actions and coming as a group to gain more access to the market, which reached a peak from 1980s to 1990s under the top-down regime. However, many cooperatives are currently teetering on the brink of bankruptcy and closing down as many had been so accustomed to a centralised decision-making.

Key words: *Agricultural innovation systems, agricultural extension, Indonesia, innovation intermediaries, division of labour.*

MODELING FOR IMPROVED WATER HARVESTING AND INVESTMENT IN RANGELANDS AREA IN JORDAN

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Abstract

A national environmental socio-economic project was conducted In October 2017 in a rural village named Era in the north western part of Jordan . Era is considered as an agricultural and rage land area. It has good soil fertility, suitable environmental conditions in addition to relatively high rain water precipitation, which encouraged local community to work in different farming activities either planting or grazing. Last years, due to climate change and biodiversity retardation; rain fall in the area became low which reduce the amount that can be available for plant growing. Local farmers adopted traditional agricultural practices gain low income retain. This leads to shifting the farming work to wives and youth while men are usually go to their formal work in the city. It was of great important to target women and youth in training project deals with new agricultural techniques overcome the effect of climate change. A pilot cooperative project was established by the effort of local community, charity association, university consultant and funded by UNDP-Jordan. The project dealing with training 200 individuals of local communities' beneficiaries from which 70% of them are women. The project set ups for rangelands and drought management system with several practices; rainwater harvesting, soil quality analysis, area productivity improvements, adopting nil tillage or zero tillage, introduction of new planting technology; as hydroponic and aquaponics. The training of the concerned participants tailored to ensure that those trainees will be able to transfer the knowledge and skills gained to others in the community or even other interested in the near areas. The projects ensure providing the area with demonstrative pilot project which is considered as a field school for others.

Keywords: *Rage land, Biodiversity, Pilot project, Hydroponic, Water harvesting, Local communities, Rio convention*

SAMS – INTERNATIONAL PARTNERSHIP ON INNOVATION IN SMART APICULTURE MANAGEMENT SERVICES

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Abstract

SAMS is a project funded by the European Union within the H2020-ICT-39-2016-2017 call. SAMS enhances international cooperation of ICT (Information and Communication Technologies) and sustainable agriculture between EU and developing countries in pursuit of the EU commitment to the UN Sustainable Development Goal "End hunger, achieve food security and improved nutrition and promote sustainable agriculture". The project consortium comprises of four partners from Europe (two from Germany, Austria and Latvia) and two partners each from Ethiopia and Indonesia. Beekeeping with small-scale operations provides perfect innovation labs for demonstration and dissemination of cheap and easy-to-use open source ICT applications in developing countries. SAMS proposes implementation of Precision Beekeeping by allowing active monitoring and remote sensing of bee colonies and beekeeping by developing appropriate ICT solutions supporting management of bee health and bee productivity and a role model for effective international cooperation. SAMS addresses requirements of end-user communities on beekeeping in developing countries. It includes technological improvements and adaptation as well as innovative services creation in apiculture based on advanced ICT and remote sensing technologies. SAMS increases production of bee products, creates jobs (particularly youths/women), triggers investments, and establishes knowledge exchange through networks. The final outcome of the project will be a technologically enhanced beehive system and service including the following main components: a) a physical low-cost beehive model; b) a decision support system; c) an automatic advisory support tool; d) a bee management business concept. To find out more visit our project website https://sams-project.eu/.

Keywords: *Precision beekeeping, Bee colony monitoring, Decision support system, Beehive management.*

INVOLVEMENT OF FARMS IN DEMONSTRATION ACTIVITIES FOR ECONOMIC AND SOCIAL PURPOSES: LITHUANIAN CASE STUDY

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Abstract

This study aimed to analyze the farms' demonstration activities, focusing of the main purposes of on-farm demonstrations in Lithuania. The survey of 30 Lithuanian farms, providing demonstration activities was performed in October and November 2017, as the part of European Commission project "Peer-to-peer learning: Accessing Innovation through Demonstration, Tender "National Inventories of Demonstration Farms in Lithuania". Results showed that in Lithuania, the majority of on-farm demonstrations were implemented in farms focused on experimental activities. Usually younger farmers and participants of different EU projects actively chose to host the demonstrations. The purposes of the demonstrations were diverse, but often focused on increasing farmer profit. Some demonstrations were undertaken to educate the society about agricultural activities, or highlight the issues in creation of environmental goods, preservation of environment, livestock welfare, etc. or to present the new technologies used in agricultural activities. Some demonstrators showed ongoing research innovations developed under the framework of joint projects with universities. Commercially available new products or management systems were also shown during the on-farm demonstration. In conclusion, interest in the demonstrations taking place on farms in Lithuania was increasing. Farmers' willingness to host their own demonstrations would be stronger with availability of funding. Farmers need more information about the benefits of demonstration activities to attract more interest and willingness to participate. Innovative use of new technology may help communities become involved into the demonstration events. Farmers' participation in European partnership projects, demonstration projects and information activities increases their competences, competitiveness, viability and generates additional income.

Keywords: *on-farm demonstration, research innovations, willingness to demonstrate, Lithuania.*

ENVIRONMENTAL TAXES EFFECT ON ENVIRONMENTAL PROTECTION

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Abstract

One of the main measures against global warming and rapidly increasing pollution are the environmental taxes. The research covers all countries of the European Union and world's major economies: the U.S, Japan and China, as well as Norway and Turkey. The research involved application of the parallel methods for assessment of the regression tendencies of endogenous indicators, while the "weighted" index was used for summarization of the results. The following characteristics of the environmental condition were taken as the endogenous variables: greenhouse gas emissions, carbon dioxide emissions, and ecological footprint. The indicators of maintenance of the environmental condition were the following: physical consumption of renewable energy and its share in the total energy consumption. Research period: 1994-2015. Intensification of natural resource consumption, greenhouse gas emissions and renewable energy consumption were found to be reversely related to the growth of revenues from the environmental taxes. Comparison of the tax effect on the rate of economic growth and growth in energy consumption showed that the fiscal effect competed with the economic effect and did not compete at all with the energy effect, which was considerably stronger. The effect of environmental taxes was the strongest in the economically stronger countries with the highest ecological deficit. The role of these taxes was stronger in terms of maintenance of the level of natural energy resources at the expense of consumption of renewable energy. On the other hand, ecological taxation promotes development and introduction of pollution mitigation technologies and, consequently, creation of new jobs. This means that environmental taxes are directly related to ecological quality of people's life. Finally, differences in public awareness, civic consciousness and fair treatment of nature determine, to a certain degree, individual responsibility of each country to nature under the "you have to pay for everything" approach.

Keywords: *Environmental Taxes, Environmental protection, effect, European Union.*

CONSUMPTION OF ORGANIC FOOD AND CONSUMMERS` ATTITUDES TOWARDS ORGANIC FOOD IN THE REPUBLIC OF MACEDONIA

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Abstract

The sale of organic products in EU countries has considerably increased. The consumption of organic food in the Republic of Macedonia is still low, and the attitude of consumers towards organic food is rather unexplored. The aim of this research was to investigate the consumption of organic food in the Republic of Macedonia as well as the attitude of consumers towards it. Literature, studies, documents and official statistics data were used to achieve the set goal. The analysis of a surveyed sample of 151 consumers of organic food in the Republic of Macedonia was of particular importance. The sample was analyzed in terms of gender, economic status of the respondents, age and some other aspects. In addition to enriching scientific thought in the field of agri-economic science, the results of this research can also be used by the agribusiness sector as well as by the state institutions of the Republic of Macedonia. The results obtained by this research indicate that consumers in the Republic of Macedonia rather rarely buy organic food, although they often know what the term organic food means, and relevant useful information is mainly received by television and the Internet. In retailers, consumers find it rather hard to recognize organic food. A kind of a problem also is a certain level of skepticism that consumers have regarding the appropriate control of organic food producers and relevant consumer protection.

Keywords: *consumption, marketing, market, organic food, survey.*

CONSUMPTION OF POULTRY MEAT AND CONSUMMERS` ATTITUDES TOWARDS POULTRY MEAT IN THE REPUBLIC OF MACEDONIA

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Abstract

The structure of the overall consumption depends on the level of development of the country's producing forces. Consumption of poultry depends on several factors, such as: structure of the population, incomes, i.e. the earnings of the population, prices, substitutes, the organization, equipment and high-range market (better availability near the residences increases consumption), the culture of nutrition, habits, customs and tradition as well as religious affiliation. The aim of this research was to investigate the consumption as well as the attitude of consumers towards poultry meat in the Republic of Macedonia, considering that its consumption was also an indicator for the level of development of the economic conditions or welfare of the country, and vice versa. Literature, studies, documents and official statistics were used to accomplish the set goal. Of particular importance was the analysis of an appropriate sample of 151 consumers of poultry meat in the Republic of Macedonia. Obtained results indicate that consumers in the Republic of Macedonia of all types of meat prefer poultry and their favorite poultry is chicken. It is usually served as meals several times a week. Usually it is purchased at large trade centers, and customers pay particular attention to the shelf life of the produce, originating from a verified producer. Macedonian consumers trust domestic producers more than those of imported poultry meat.

Keywords: *Consumption, market, distribution, poultry meat, survey.*

IMPACT OF FERTILIZER MICRODOSING TECHNIQUE ON AGRICULTURAL FARMS IN MALI

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Abstract

The fertilizer micro dosing technique consists to put at the sowing or after plants emergence, small quantities of appropriate mineral fertilizers in crop planting holes. This study examines the impact of fertilizer micro dosing technique on agricultural farms based on millet and sorghum in Mali. The techniques of micro-dosing used were manual and mechanical fertilizers distribution. Data were collected during two successive campaigns, 2014 and 2015. A sample of 108 farms was selected randomly from a total of 360 farms having served as diagnostics on cropping systems. The Semi-Structured Interviews (SSI) was used as tools. Descriptive statistics and analytical methods were used to analyze data's with STATA software. The results showed that the use of fertilizer micro dosing technique has a significant impact on millet and sorghum productivity and ensures the self-supply of cereals for adopting farms.

Keywords: *fertilizer micro dosing technique, productivity, food security, agricultural farms based on millet and sorghum, Mali.*

CHAPINGO - AGROPEC STAR® EXTENSIONISM MODEL

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Abstract

Extensionism is one of the most effective mechanisms to facilitate the access to knowledge and high-value technologies and the interaction with research-teaching institutions for producers. The objective of the study was to determine the impact of the extension model Chapingo - Agropec Star on dual purpose, regarding calf, milk, swine, cocoa, coffee, pepper, vanilla and pineapple value networks. The information was obtained from the database of each value network registered in the Agropec Star software from 2014 to 2017. There were 151 extension agents, 1,895 direct producers and 10,227 indirect producers in the value networks, which included 13,246 cows, 12,596 heifers, as well as 1,879.92 hectares. The digital registry of the events that occur in the 1,895 enterprises was achieved, skills were developed for advising in the 151 extension agents and capacities of the producers to improve the productivity of their enterprises were developed. The technologies implemented were: ensiling in 24% of enterprises, rotate pastures in 50%, discard unproductive animals in 61%, milk production weigh and weaning weight in 40%,health management in 45%, as well as fertilize, prune, graft, pests and diseases control, and harvest register in 100% of agricultural agribusinesses. The model allows the registration, control, monitoring, evaluation and analysis of the events occurring in agribusiness of the different value networks, the online monitoring of the performance of the extension agents, the indicators of the agribusinesses and all scheduled activities.

Keywords: *Agribusiness, advice, technicians, extension, productivity.*

MODEL OF INTANGIBLE ASSETS AND CAPITALS IN ORGANIZATIONS

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Abstract

The psychological studies of organizations, with regard to human capital, have shown that this factor increases to the extent that the environmental demands are intensified, but it is the intellectual trait that acquires the greatest value when considered as the main intangible asset. of an organization. In this way, the objective of this paper was to expose the theoretical, conceptual and empirical frameworks related to human capital in order to establish discussion scenarios related to the value chain of an organization based on its intangible assets. A documentary study was carried out with a non-probabilistic selection of sources indexed to repositories such as Dialnet , Latindex and Redalyc , considering the year of publication and relationship between the concepts of organization and human capital. There are lines of research around empathy, trust, commitment, satisfaction and happiness as inherent factors of human capital as an intellectual asset of an organization.

Keywords: *Organization, human capital, intangible asset, model, specification.*

GOVERNANCE REGARDING THE SERVICE OF POTABLE WATER

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Abstract

Social representations are visions of the everyday world that is historically constructed alongside the dissemination of media intensifies their audiences. In this sense, the printed media availability and water policy has not only been systematically reduced to opinions by the press, but also two logics have been grown on the credibility of the information and the verifiability of it. In this sense, this study exposes the lines of discussion for the analysis of tandem policies and agenda setting in the availability and supply of water. The results show frames from newspaper audiences are considered promoters of a relative deprivation that is the conformism of the service quality of public water supplies.

Keywords: *compliance, performance, availability, supply rate.*

GOVERNANCE IN A COFFEE INDUSTRY THOROUGH A EMPIRICAL FRAMEWORK PROPOSAL

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Abstract

Community health in contexts affected by floods, fires or frost, coffee marketing proves to be an example to follow to observe the local entrepreneurship. In this sense, the objective of this study was to perform a non-experimental, transversal and exploratory study with a nonrandom selection of 300 trader's coffee. From a structural model ⌈χ2 = 1.335 (5GL) p = 0.935; GFI = 0.982; AGFI = 0.947; RMSEA = 0,000⌋ se established reliability (perception scale enterprise with alpha 0.724) and valid for five allusive to perceptions of economic opportunity (32% of the total variance explained), financial (22% of the variance), sales dimensions (16% of the variance), social (10% of the variance) and environmental (3% of the variance). the fourth factor reflected the construct (β = 0.47), followed by the first (β = 0.30) and the fifth factor (β = 0.16). Based on theoretical and conceptual frameworks the study of entrepreneurial perception vulnerable groups dedicated to the sale of coffee as a way of subsistence is proposed.

Keywords: *Entrepreneurship, economy, finance, sales, social, environmental.*

MACROECONOMICAL ASPECTS OF AGRICULTURAL ECONOMIES IN THE DURMITOR AREA AS INDICATORS OF RURAL DEVELOPMENT

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Abstract

Agriculture, together with tourism, is a social commitment and represents the basis of Montenegro's further development, and being the first ecological state in the world further strengthens such commitment. The available agricultural potentials of the Durmitor region, in spite of certain limitations, are inevitable in the creation of Montenegrin arable land in general. To be frank, the tendencies in agriculture of the region are somewhat negative compared to the general situation in the country. The same occurrences have been seen in other countries with highland areas in Europe, but such "highland complexes" in agriculture in developed countries were eliminated with proper economic policies. Foreign but also domestic experiences tell us that it is possible, through contemporal techno-economic means, to organize production in highland areas. This implies adequate choice of measures, methods, and conducts, through which the achievement of better production structures and comparative advantages can be achieved. Based on that, the main goal of this study is to show the main development tendencies, through analysis and comparison of natural, agricultural and climate data, relying on previous researches and production practices of the region.

Keywords: *agricultural resources, potentials, healthy food, Durmitor region development program.*

MOROCCAN OLIVE OIL SECTOR SMALL PRODUCERS IN THE LIGHT OF PORTER'S MODEL

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Abstract

This work presents the results of a development project between Morocco and the USA (US $ 350 million) on the modernization of olive oil, almond and fig tree sectors in Morocco. This paper focuses on olive oil. One of the objectives was to set up a marketing strategy for the integration of small mountains producers (<5 ha) to the modern distribution. As a methodology, we built our marketing strategy on 4 pillars over more than 50 000 ha: - The organization of farmers in cooperatives; - The organization of several cooperatives belonging to the same geographical area in Economic Interest Group; - As a differentiation strategy, we created an agricultural label to differentiate their olive oil in the market; - National association of Economic Interest Group. In total we were able to form 147 cooperatives and 20 Economic Interest Groups. The project was built on a public-private partnership. Small farmers contributed by 20% of the project cost. The agricultural label was recognized by the Moroccan authorities in 2015, more than 40 tons were certified. The paper depicts Market competitiveness in the light of Porter's model (Porter, 2008). In the space of 4 years, despite the barriers to market entry raised by private industry, small farmers were able to penetrate the local market and even carry out export operations. In 2018, one of the economic interest groups obtained the 4th best prize among 12 in the World of MARIO SOLINAS.

Key words: *Olive oil, small producers, Morocco.*

VERTICAL INTEGRATION AND THE ECONOMICS OF CONTRACT FARMING IN MOROCCO: CASE OF CEREAL SECTOR

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Abstract

Contractual farming (CF) arrangements have the capacity to address market failures and improve technology adoption, productivity and welfare. In Morocco, Government and donors use CF as a strategy to increase the adoption of new agricultural technologies and developing value chains. In this context, the models of agro-food aggregation forms the basic concept recommended for the first pillar of the PMV. The aggregation models aim to link the farms to progress and comfort formally on the mechanism of double contracting between the State and the aggregator (AG), on the one hand, and between the aggregator AG and the farmers being aggregated (Ag) on the other. This study aims to identify attitudes, perceptions, behavior and analyze the determinants of adhesion to the cereal collection project and determine the current state of the cereal collection project at the national level. These investigations sensed the existence of 55 Agricultural Aggregation Project (AAP) for an investment of 16,012.96 M.Dh and involving 96,695 Ag recipients. The number of the AAP for cereals having received the certificate of aggregation amounts to 10. The checked projects concern the centralized model. The results of this study showed that there has not yet been a rigorous evaluation of these plans. In addition to structural problems that have arisen in the grain collection project which constitute obstacles to the competitiveness and modernization of this sector, the other problems have been mainly related to the land structure, legal system, lack of sustainable financing and limited opportunities for professional development. Contracts are faced with many shortcomings, where the principal ones concern the heterogeneous contents which do not include quality advantages and the non-implication of farmers within the negotiation process. The entire risk relating to the production is borne by the farmers aggregated.

Key words: *Agricultural Aggregation Project, centralized model, cereal, Contract farming, supply chains, Vertical Coordination.*

GENDER EQUALITY AND SUSTAINABLE RURAL DEVELOPMENT IN MOROCCO

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Abstract

Rural territories constitute a political concern in Morocco because of their demographic, social and economic importance. They extend over 90% of the area of the Kingdom and represent 40% of the national population. The efforts made by the public authorities in the areas of development and social promotion in recent years have certainly registered perceptible progress, evidenced by a slight positive evolution of certain indicators, in particular access to education, infrastructure and access to social services. A recent FAO study (2017) has reported that three-quarters of people enduring a chronic undernourishment and poverty live in rural areas. In these situations of food insecurity and economic vulnerability, women are the first to suffer. In fact, the rate of eviction of girls from the entire education system is much higher than that of boys, and women's working hours are often much higher than those of men. In addition, the lack of property rights for women and girls, coupled with the huge unpaid workload or precarious rural employment conditions, are adding to the obstacles to human but also economic and social development. Rural women rely heavily on natural resources for their livelihoods and are particularly vulnerable and exposed to multiple risks. Yet, these women play a vital role in strengthening long-term global food security and sustainable management of natural resources in the most fragile ecosystems. The promotion of gender equality is therefore an important prerequisite for achieving a viable and sustainable development in rural areas, especially in the agricultural sector. Securing women's access to productive resources is not only an economic and social imperative but also an essential condition for their participation as partners in development and economic growth.

Keywords: *Gender, Equality, Rural development, Sustainability, Morocco.*

INTEGRATED ADAPTATION STRATEGIES FOR CLIMATE CHANGE: SMALL FARMERS' OPTIONS FOR FUTURE FOOD SECURITY IN SOUTH WEST NIGERIA

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Abstract

This study analyzed the extent of utilization of integrated climate change adaptation strategies (ICCAS) employed by arable crop farmers in South west Nigeria. Specifically, it identified various integrated climate change adaptation strategies utilized by arable crop farmers in the study area, determined the level of awareness of the use of climate proof crops, and identified factors associated with the use of integrated climate change adaptation strategies with the view to providing sustainable adaptation strategies to climatic change. Multistage sampling procedure was used to select 500 respondents from the two major ecological zones (Forest and Derived Savana) in the study area. The research was carried out with the use of well-structured interview schedule to obtain necessary data. Both descriptive and analytical tools were employed. Pearson Product Moment Correlation (PPMC) and Multiple Regression Analyses were used to test the formulated hypotheses. Findings from the study showed that socio-economics characteristics of arable crop farmers varied. The results clearly demonstrated planting of climate proof crops as a significant option used by the farmers to adapt to the climate change. Other adaptation options included provision of irrigation, engaging in off-farm works and the use of different market channels. Positive and significant correlation existed between extent of ICCAS and ecology related factors. This present work documented integrated climate change adaptation strategies utilized by arable crop farmers in south west Nigeria. Also, it would enhance increase in food production, thereby, facilitating wellness and increase in life expectancy of Nigeria population.

Keywords: *integrated, adaptation strategies, climate proof crops, climate change, food security.*

EFFECTS OF GOAT THEFT ON WOMEN FARMERS IN RURAL COMMUNITIES OF KWARA STATE, NIGERIA

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Abstract

The study was carried out in Kwara State to describe the socioeconomic characteristics of women farmers, identify the sources of information on goat production, examine the management practices used in goat rearing, enumerate the reasons for involvement in goat rearing, investigate the pattern of goat theft in the study area, examine the perceived effects of goat theft on the farmers, and identify the coping strategies used by farmers against goat theft. A three-stage sampling technique was employed in the selection of 160 respondents from 4 Local Government Areas (LGAs) in Kwara State. Data was collected with interview schedules and analyzed using descriptive, Spearman Rank Order Correlation and Kendall Tau's Statistics. Results show that a typical respondent in the study area was aged 69 year,. 66.3% were married while the average household size was 9 persons. Less than half (42.5%) of the respondents had primary education and an average herd size of 12 goats. Respondents had average of 12 years of goat farming experience with an average annual income of N45,000. Furthermore, household size (0.185, $p<0.05$) and average annual income (0.153, $p<0.05$) are significant and positively related to severity of goat theft. Also, Herd size (0.234, $p<0.05$) and years of experience (0.228, $p<0.05$) have significant and positively related to the coping strategies adopted by farmers. Incidence and pattern of goat theft has a linkage with the goat production system used by the women. Goat theft is severe at nights and during dry seasons as the animals stay longer scavenging. The effects of goat theft as indicated by respondents are decimation of stock population, food insecurity and low productivity. It is recommended that NGOs and other Government agencies should as a way of empowering rural women, support in building goat sheds for women farmers as a way of reducing scavenging of goats and theft.

Key words: *Effects, Goat Theft, Women Farmers, Rural Communities.*

RISK MANAGEMENT STRATEGIES IN SMALL RUMINANT PRODUCTION IN NIGERIA

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Abstract

The study examined the risk management strategies among small ruminant keepers in Kano State, Nigeria. Multistage sampling technique was used for data collection. Structured questionnaire was administered to 60 respondents in the study area. Data were analysed using descriptive statistics, likert attitudinal scale and multinomial logit regression. The result revealed that the average age of respondents was 36 years, 95.1% were female, 81.7% were married with average household size of 7 persons and majority (71.6%) had no formal education with more than 12 years of production experience. Also 75% of the respondents had no extension contact and all the respondents relied mainly on family labour. The respondents identified diseases and parasites, improper health practices, inappropriate breeding practice, poor feeding and poor housing as well as production risk, low price of output, inadequate market, and high cost of input as marketing risk, such as lack of credit facilities and government policy as financial and institutional risk, respectively and labour and technical knowhow as human risk. Most of the perceived risks to goat keepers were rated high. The risk attitude showed that majority (60%) of the respondents were risk averse while 23.3% and 16.7% were risk takers and risk neutral, respectively. The multinomial logit regression result showed that age, production experience and household size were significant at 10%, 5% and 1%, respectively. The study recommended that stakeholders should focus on creating a cost effective livestock insurance coverage against risks associated with goat production.

Keywords: *Management, Strategies, Small Ruminants, Keepers, Nigeria.*

RISK MANAGEMENT IN MAIZE PRODUCTION

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Abstract

This study evaluates the risk management strategies among maize and other forest farmers/users in Bauchi LGA of Bauchi State, Nigeria. Questionnaires were administered to ninety five respondents randomly sampled. Descriptive statistics and multinomial logistic regression model were used for data analysis. The study revealed that 55, 5% of the respondents were females with mean age of 42 years, 57.87% were married with an average household sized of 8 persons and atleast primary education level. Production risk, marketing risk, financial risk, institutional, human and personal risk were identified as major sources of risk in maize farming under which 79.9%, 69.1%, 50.6%, were credit facilities, government/personal policies and inadequate family labour respectively as risks occurring all year around within the last five years. The results further showed that 90% of the identified risks were rated as high risks mostly occurring all year round where 52.63% of the respondents had risk averse attitude. The multinomial regression model revealed that the coefficient of age and farming experience were positive across the risk categories. The result of the marginal effect and quasi – elasticity estimates revealed that variables were both positively and negatively elastic in the risk attitude of respondents. The study further showed that 78.8%, 73.0% and 89.6% of the respondents employed intercropping, gathering market information and use improved seeds as their preventive, mitigating, and coping strategy respectively. Therefore, the study revealed that risk perception was based on the nature of risk experienced by the farmers and it varied according to farmer's risk attitude and the risk management strategy used by the farmer. It was therefore recommended that maize farmers should be encouraged to form agricultural co – operatives in order to pool resources together and negotiate jointly with input suppliers to manage the inherent risks in maize farming.

Key words: *Maize production, Nigeria.*

SOCIO-ECONOMIC ANALYSIS OF CATTLE RUSTLING FOR PASTORALISTS IN NIGER STATE, NIGERIA

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Abstract

Given the prevailing circumstance on pastoralism in the country, this study was conducted in Niger State, Nigeria to uncover the threats posed to the pastoralists through cattle rustling. It examined the likely identities of the rustlers and their adduced reasons for rustling, as well as the coping strategies adopted by the pastoralists after their cattle are being rustled. Qualitative and quantitative methods of survey have been adopted. Hence a questionnaire and an interview schedule have been administered to the pastoralists to elicit information. The findings revealed that, 65% of the pastoralists had been rustled, impunity for crime and police support ranked highest among the reasons for cattle rustling and 80% of the rustlers were Fulani. The findings also revealed that majority (75.8%) of the respondents was not aware of agricultural extension service, whilst only 27% of the group heard about extension services on Radio and 100% had never been visited by extension officers. The study recommended Government intervention in curbing the threat, establishment of cattle ranch, empowerment for jobless youths whilst extension agents extend delivery of their services to the pastoralists.

Key words: *cattle, pastoralists, Nigeria.*

EFFECTIVENESS OF INFORMATION AND COMMUNICATION TECHNOLOGY IN DISSEMINATION OF AGRICULTURAL INFORMATION ON INPUT DELIVERY AMONG ARABLE CROP FARMERS IN EKITI STATE, NIGERIA

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Abstract

The study attempts to investigate the level of awareness, access and effectiveness of information and communication technology (ICT) tools among arable crop farmers in Ekiti State, Nigeria. Data were gathered through a questionnaire scheduled on a total of 90 arable crop farmers. The data were analyzed using frequency, mean, standard deviation, correlation coefficient and independent sampled t-test. The results revealed that, the mean age of the respondents was 50.5 years and mean years of farming experience was of 37.3 years. Radios, television, telephone, were mostly used. These ICT tools were moderately effective among arable crop farmers in the study area. Based on the results of independent sampled t-test, there were significant differences in the mean scores in access and usage of ICTs. Sequel to the findings of the study, it was recommended that the extension institutions in Nigeria should concentrate their effort in farmers'training on usage of ICT facilities on agricultural information delivery in order to improved arable production in the study area.

Key words: ICT, information disemination, Nigeria.

POST HARVEST MANAGEMENT IN CITRUS IN PAKISTAN

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Abstract

Post-harvest losses damage the national economy of the developing countries. These losses are so high and have to be minimized to improve the socio economic condition of producer. Citrus is major fruit produced mainly in the Sargodha, Layyah, Vehari, Mandibahudin and Toba the Singh district of Punjab Pakistan. In Punjab, total area under citrus cultivation is 183.2 thousand hectares, Sindh 6.9 thousand hectares, Khyber Pakhtunkhwa 5.1 thousand hectares and Baluchistan 1.1 thousand hectares. Sargodha district covers about 51 % of total cropped area. Citrus crop is affected by the pre and post-harvest losses. These losses are up to 38% while developing countries have only up to 10%. Among the factors of post-harvest losses in citrus there are physiological, pathological, mechanical and environmental ones. Climate change also contributes to post-harvest losses in citrus. In Pakistan, lack of adoption of modern technologies in harvesting, transportation, processes and packaging contributes to these losses. On farm and off farm facilities should be improved to decrease the magnitude of post-harvest losses. Post-harvest nonconventional preservation technologies are in need to be opted to minimize these losses. One of the emerging green technologies is application of edible coating (Polysaccharides). Edible coating will not only improve the quality of fruit produced but also ensure the preservation. Storage facilities should also need to be focused to minimize losses.

Key words: *Citrus, Pakistan scenario, edible coating, storage.*

SOYBEAN WAR IN PARAGUAY: THE SOYBEAN BOOM'S FLOW FROM BRAZIL TO PARAGUAY, ITS SPILLOVER EFFECTS AND STATE RESPONSES

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Abstract

This paper identifies the causes and effects of the soybean boom in Paraguay that took place through the brazilian producers that massively migrated since the 1960s until the 1990 but also represent remaining challenges to governability and environmental sustainability. The causes of this expansion are diverse and complex, and only the main ones will be addressed. The brazilian producers and their descendants have access to financial aid, technical assistance and technology. Institutional weakness, lack of transparency and public participation in building policies and corruption is evident in several ways. Paraguayan state not only doesn't provided for meny years the necessary technical and financial support to the traditional producers, but through its little control facilitated the big actors' predation of natural resources. The Zero Deforestation Law was examined briefly, showing its impressive results. Enacting of the Zero Deforestation Law and the rigorous control that followed in order to make sure the law was enforced helped reduce the deforestation in 80 % (reaching in some years even more than 90 %). This is a clear example showing that when the State acts effectively in cooperation with civil society, regardless its limitations, improvements can be experienced, benefiting thousands of citizens. The soybean production expansion, although representing an important proportion of the Paraguayan GDP growth, must be regulated carefully considering its side effects and the violent conflicts that it may install between the actors within the society. Environmental issues must be subject of strict regulation and control to make sure the valuable resources are cared for and sustainably used.

Keywords: *Atlantic Forest, deforestation, migration, Paraguay Western Region, soybean production.*

TRADITIONAL FARMING PRACTICES AND CLIMATE CHANGE ADAPTATION AMONGTHE DUMAGATS OF TANAY, RIZAL AND THEIR IMPLICATIONS TO THE DELIVERY OF EXTENSION AND ADVISORY SERVICES

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Abstract

Climate change is one of the most damaging and serious environmental threats faced today worldwide. While almost everyone highly depends and puts their trust on what technology, innovations and initiatives from hard-core science can do to cope with the changing climate, there are still people who find hope on indigenous knowledge systems. The study aimed to analyze the traditional farming practices of the Dumagats in Tanay, Rizal and how these relate to their adaptation and mitigation of climate change. The analysis was based on interviews with 17 members of the Dumagat tribe specifically residing in Barangay Cuyambay, San Andres and Mamuyao, and supported by KII and FGD as well as document reviews. Results of the study showed that the Dumagats adopt indigenous knowledge systems and their high sensitivity and resilience to climate change aided them on their farming system and activities. These traditional farming practices were exemplified from land preparation to planting, fertilizer application, weed and pest management, harvesting and post-harvest activities. Owing to their dependence upon, and close relationship with, the environment and its resources, the Dumagats learned to interpret and react to the impacts of climate change in creative ways, drawing on their traditional knowledge to cope with the impending changes. With the increasing trend at all levels of government to service the needs of rural communities there is the need for the extension to contextualize advisory service delivery for indigenous communities.

Keywords: *Climate Change, Dumagat Tribe, Indigenous Knowledge Systems, Traditional Farming Practices.*

ORGANIZATIONAL CONFLICT AND CONFLICT MANAGEMENT STRATEGIES OF MANAOL NAGCARLAN IRRIGATORS ASSOCIATION, INC., PHILIPPINES

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Abstract

Organizational conflict involves Philippine farmers' associations, as an interesting field of research remained as a 'gray area' as far as the current generation is concerned. In order to establish knowledge base and understand some fundamental aspects of conflict in this context, a case study utilizing the Manaol Nagcarlan Irrigators Association, Inc. as the subject explored a comparable organizational conflict landscape underlying the institution, factors causing conflicts within, and possible conflict management strategies used by their organization's leader. Conflict was viewed as a normative phenomenon and they recognized that it became a problem to a certain extent. Using the convergent research design as method for examining the degrees of power conflict, intra-organizational conflict and dominating conflict management strategies, insights of farmers triangulated with the information provided by the key informant--the president of the associationwere themed and synthesized. Members exhibited unity and trust among each other, empowered by their leaders who encouraged collective conflict resolution when the need arose. But they had some claims that they still were experiencing misunderstandings, resource bereavement, low attendance turnout, and inability to pay fees, among others that could be significant triggers to conflict.

Keywords: *Organizational conflict, conflict management strategies, social psychology, rural development.*

MECHANISMS AND ECONOMIC CONSEQUENCES OF PUBLIC INTERVENTION IN AGRICULTURAL HOLDINGS IN POLAND DURING THE PERIOD OF EU MEMBERSHIP

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Abstract

The concept of public intervention in agriculture can be understood very broadly, as any act or omission of the operation of public state institutions. In the article discusses the economic reasons for the public intervention, then presents the types and effects of intervention implemented by the CAP and presents the impact of intervention policy on economic decisions of agricultural producers. In the further part of the article, based on the statistic data from 2004-2016, were presented the changes in agriculture sector. A characteristic feature of this process is the deagrarisation the national economy and the development of rural areas. Throughout this process, it is extremely important for the ongoing structural changes to result in the improvement of the competitive position of farms and long-term and sustainable rural development. Poland's accession to the EU has generated new economic and organisational conditions to support structural changes in the broadly defined food economy and rural areas. Policy instruments implemented within the CAP create chances for the stabilisation of structural policy conditions over the period of several production cycles, thus stimulating the desired changes in the area structure of farms, the improvements in the competitiveness of production, environmental protection and multi-functional development of rural areas. Thus they are a fundamental instrument supporting the process of modernisation of Polish rural areas and agriculture. The article conclusions are referred to structural changes and to competitiveness of agri-food sector.

Keywords: *public support policy, competitiveness, intervention in agriculture.*

NATURAL CONSTRAINS VS. FARM'S ECONOMIC EFFICIENCY, EXAMPLE OF FARMS IN POLAND

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Abstract

Natural conditions constitute the foundation for various forms of farming and they determine the production capabilities. They are one of numerous determinants of productivity and profitability. Various natural difficulties may have a significant impact on the economic efficiency of farming. As a consequence, it may lead to abandoning the use of land, reducing the vitality of the rural community, or changing the management system for less environmentally friendly. *The aim of the study is to identify and assess the economic diversification of farming efficiency in areas with natural constraints (ANCs).* The study was based on the Polish FADN data. The analysis included FADN farms with an economic size of 2+ ESU and the data for 2010 and 2015. The analysis covered farms located in lowland zone (I and II), mountain zone and in zone with specific difficulties. Results show significant differences in the efficiency of farming located in individual zones of natural constraints. However, there are no significant differences in the efficiency of farming between farms in the lowland zone and outside the ANCs. The production and financial results of these farms were at a similar level. In turn, the economic efficiency of farms in the mountain zone and in zone with specific difficulties was significantly different from the one of farms outside ANCs. It means that the CAP's ANC subsidies do not compensate for differences in production and financial results of farms in ANCs. To maintain agricultural activity in these areas, we should aim at increasing payments for farms from mountainous areas and from specific areas. This is an important recommendation for the CAP 2020+ that should be taken into account when considering the distribution of CAP funds. This means that the ANC subsidies introduced under the CAP do not compensate for differences in production and financial results of farms operating there, in particular in mountainous areas and the ones with specific handicaps.

Keywords: *farming efficiency, farm incomes, areas with natural constraints, ANC subsidies.*

REACHING TERRITORIAL COHESION? PRINCIPLES AND PRACTICES OF THE NEW REGIONAL POLICY: THE CASE OF INTEGRATED TERRITORIAL INVESTMENTS AND COMMUNITY LED LOCAL DEVELOPMENT IN POLAND

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Abstract

The emerging concepts and regional policy instruments are focused on balancing a socio-economic development in the spatial aspect. They differ from each other not only in the approach to a scale and scope of support of individual territorial units, but also in the way and conditions of assistance. New regional policy tools can be considered through the prism of links with the rural development process and policy, and in particular the potential effects that they may have on these areas. The paper analyses new instruments of the EU Cohesion Policy and Common Agricultural Policy in a form of Integrated Territorial Investment (ITI) and Community-led Local Development (CLLD). The aim of the research was to determine a potential impact of these initiatives on the socio-economic situation of the countryside in Poland. The study showed that both the ITI and CLLD could play a positive role in creating conditions conducive to improving the situation of rural population in Poland. However, their implementation involves a number of barriers and risks. The progress in implementing projects under analysed instruments is limited and does not allow for their comprehensive assessment. The conducted research has been based on literature review, available quantitative data and qualitative information published by the public bodies implementing the ITI and CLLD in Poland.

Key words: *Regional Policy, Rural Areas, EU, ITI, CLLD.*

ADOPTION AND DIFFUSION OF FOOD PRODUCT INNOVATIONS AMONG YOUNG POLISH CONSUMERS

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Abstract

Product innovations belong to key drivers of consumers markets. In many cases they are essential factors determining performance of companies exposed to monopolistic competition. But, product innovations are not instantly adopted by all consumers. The most popular explanation of the innovation diffusion process is a model developed by Rogers (1962). According to this model consumers can be grouped as follows: innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%), and laggards (16%). In the paper it was hypothesized that that age of the consumers was an important determinant of their behavior regarding adoption of food product innovations. Based on a survey carried out in a group of 211 university students, an empirical evidence was provided that adoption and diffusion of food product innovations among young consumers differed considerably from the distribution described in the Rogers' model. It was found out that they had paid much greater attention to the new food products than it could be expected with regard to other consumers. They often searched for new attributes of the food products and wanted to be first buyers and opinion leaders. Own market observations were for them the most important source of information about food product innovations. These findings have some practical marketing implications for the food companies. In general, since young consumers are more often leading innovators and tend to be more frequently opinion leaders than the rest of population, food companies introducing product innovations should focus their marketing efforts on them as a key target group.

Keywords: *Innovations, food products, consumer behavior, Poland.*

ARBUTUS UNEDO L. AS AN ALTERNATIVE SOURCE OF ANTHOCYANIN COMPOUNDS FOR APPLICATION AS FOOD COLOURING AGENT

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Abstract

Arbutus unedo L., commonly known as strawberry-tree, is a shrub used as ornamental plant in the gloomy Mediterranean areas which fruits are popularly eaten and used to produce beverages . Beyond these common applications, these fruits could also be explored for their phenolic composition, once they are a source of anthocyanin compounds with great colouring capacity to be potentially used in food industry, in detriment of artificial colorants. In this context, the present study aimed to optimize the extraction of these compounds from *A. unedo* fruits through different techniques, namely heat and ultrasound assisted extraction and, for that purpose, a response surface methodology was applied using the circumscribed central composite design of three variables with five levels. For the model application, the anthocyanin concentration and the extraction yield were used as responses, being the identification of these compounds performed by HPLC-DAD-ESI/MS. The anthocyanin profile of *A. unedo* fruits consisted of delphinidin-3-glucoside, cyanidin-3-glucoside, and cyanidin-3-pentoside, with cyanidin-3-glucoside as the most abundant one. Heat assisted extraction proved to be the most effective technique at 5 min, 90°C, and 80% of ethanol, yielding 51.2% of fruit dry weight, with a total anthocyanin concentration of 382.4 µg/g of dried fruit, and 744.6 µg/g of extract. Moreover, these response values were slightly improved by studying the solid/liquid ratio effect at the optimal conditions indose-response format, showing steady extraction values from 5 to 40 g/L. The obtained results showed the possibility of using *A. unedo* fruits as a source of anthocyanin compounds for industrial applications.

Keywords: *Arbutus unedo* L., *cyanidin-3-glucoside, food colorant, heat and ultrasound assisted extraction, response surface methodology.*

Acknowledgments

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OPTIMIZATION AND COMPARISON OF MACERATION AND ULTRASOUND ASSITED EXTRACTION SYTEMS FOR THE PRODUCTION OF A COLORANT EXTRACT FROM *HIBISCUS SABDARIFFA* L. FLOWERS

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Abstract

Hibiscus sabdariffa L. is an herbaceous medicinal plantused as infusion for the treatment of several disorders, namely, fever and high blood pressure, gastrointestinal and hepatic diseases. In addition to those health benefits, the calyces area potential source of natural pigments, due to its high content in anthocyanins. This work aimed to optimize the experimental conditions of anthocyanins'extraction from dried calyces of *H. sabdariffa,* comparing two methodologies, maceration and ultrasound assisted extraction, in order to develop a natural colorant. To obtain the conditions that maximize anthocyanins' extraction, a response surface methodology (RSM) was applied using the circumscribed central composite design of three variables with five levels. Time, temperature and ethanol - water proportion - in the case of maceration, were the relevant independent variables, while for ultrasound assisted extraction, the ultrasonic power was used instead of temperature which was kept constant. Two anthocyanin compounds were identified by HPLC-DAD-ESI/MS: delphinidin-3-sambubioside and cyanidin-3-sambubioside. The responses used as criteria were the quantification of the identified anthocyanins and the extraction yield of the final residue. Ultrasound assisted extraction proved to be the most effective method: 43 min, 390 W and 46 % of ethanol. At these optimal conditions, the extraction yield was 61.2%, with a total anthocyanins' content of 23.1 mg/g dried plant, and 47.5 mg/g extract. Additionally, the response values were slightly improved by studying the solid/liquid ratio effect using the optimal conditions in dose-response format (5 to 200 g/L), showing continuously decreasing values as the solid/liquid ratio increases. Overall, the obtained results showed the possibility of using *H. sabdariffa* flowers as a source of anthocyanin compounds for industrial applications.

Keywords: *Hibiscus sabdariffa L. flowers, Anthocyanins, Heat and Ultrasound assisted extractions, Response Surface Methodology.*

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NATURAL COLOURING AGENTS OBTAINED FROM DIFFERENT PLANT SOURCES APPLIED TO THE PASTRY SECTOR

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Abstract

Given that some intolerance and allergic reactions have been associated with the consumption of artificial additives, in recent decades consumers have been choosing to ingest food containing natural alternatives [1,2]. The present work presents some preliminary results regarding the incorporation of natural colorants in products of the pastry industry. The juices of different natural matrices namely beet, blackberry and cherry were incorporated into a pastry product (at TecPan Lda.). The samples were divided into small sets, to evaluate the nutritional value, the microbial load and the parameters of color and pH over time. Here, we present the results of the first three months of storage of the pastry products. The values obtained were compared with control samples (without any natural/artificial colorant) and with products incorporated with an artificial colorant used by the company. Moreover, the products were stored, exposed and protected from light, in order to verify the stability of the additives, and the results were compared. The nutritional value of the samples remained practically unchanged over time, and no changes were observed regarding the microbial load of the samples. However, some variations were observed in the pH and color values. The products prepared with berry juices tended to present the highest pH values. Regarding the color parameter, products prepared without any coloring agent showed the highest L^* values, whilst those prepared with the artificial colorant were less bright. In what regards a^*, as expected, control products presented the lowest value. Concerning b^*, the minimum values were registered in products prepared with the artificial colorant, and the maximum ones observed in control samples. Overall, the storage time did not induce any significant change in any case, and the results obtained from stored samples protected from light and exposed to light were very similar.

Keywords: *Natural food additives, pastry industry, incorporation of natural ingredients.*

Acknowledgments

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THE TENDENCY CONCERNING THE EVOLUTION OF OILSEED MARKET IN ROMANIA

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Abstract

Agriculture is an important economic sector assuring food for population, raw materials for processing industry and agro-food products for export. The analysis of the foreign trade activity is of a major importance for establishing efficiency, identifying trades and the justification of specific decisions in this activity. Main oilseed crops cultivated in the EU are rapeseed, sunflower and soybean. Romania's agricultural production in 2016 compared to members states of the EU, places Romania as follows, for both cultivated area and output for the sunflower crops, on the first place. The increased sunflower production was imposed by the demand of oil industry able to process 70% of domestic seeds. Also, rapeseed production has recorded a continuous increasing trend in the analyzed period. Oilseeds price reflected a large variation from a year to another, but mainly a continuous increasing starting from the year 2007. The increased price is justified by demand/offer ratio and by the increased demand of oilseeds in the internal and external markets. In the coming years, Romania will continue to become a more and more important oilseeds producer and exporter in the EU-28. The main purpose of the paper is to study the mode in which the foreign trade activity of Romania with oilseeds has evolved in the period 2007-2016. Were used statistical data referring to land surfaces sown with oilseeds, productions, the average yield per hectare, prices, import and export of oilseeds and also, the imports coverage degree by exports

Keywords: *oilseeds, production, export, import, price.*

CONSIDERATIONS REGARDING THE PRODUCTION AND MARKETING OF SORGHUM IN ROMANIA

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Abstract

The paper captures trends regarding the production and marketing of sorghum in Romania during 2007-2016. For this purpose, a series of specific indicators were analyzed, among which: the area cultivated with sorghum for consumption and sorghum for brooms, in Romania, on Macroregions and Development Regions; the production of sorghum for consumption and sorghum for brooms, in Romania, on Macroregions and Development Regions and the commercial balance of sorghum for consumption. Worldwide, in 2016, the area cultivated with sorghum was 43,186.79 thousand ha, and the production of 70,212.22 thousand tons. For the year 2025 an increase is foreseen of the cultivated areas to 44,113.98 thousand ha and the production to 79,123.45 thousand tons. The surface cultivated with sorghum for consumption in the year 2016 in the EU was 123.18 thousand ha and the production of 676.4 thousand tons. The main sorghum cultivars for consumption in the EU in 2016 were: France (47.92 thousand hectares), Italy (43.84 thousand hectares) and Romania (9.16 thousand ha), and in the top producing countries for the year 2016 were: Italy (313.79 thousand tons), France (244.89 thousand tons), Spain (36.36 thousand tons) and Romania (24.41 thousand tons). The data used in this paper was taken up primarily from the National Institute of Statistics of Romania (INS), but also from other international specialized websites. It is necessary to specify that the results of the research are presented in tables and are graphically illustrated.

Keywords: *area cultivated, production, Romania, sorghum.*

RISK MANAGEMENT IN OCCUPATIONAL EXPOSURE TO PESTICIDES: THE ROMANIAN PERSPECTIVE

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Abstract

This study aimed to establish the importance of controlling exposure and health effects of toxic chemicals used in agriculture, and to raise awareness in rural communities. Data regarding main categories of pesticides, number of exposed workers, number of occupational diseases caused by these chemicals, and the value of biomarkers in certain exposures were collected from plant protection offices and from official public health reports. Specific health effects in agricultural workers were analyzed following a 14-year retrospective study between 1993 and 2006. On the basis of national data and scientific literature review, educational materials were written, respectively a dedicated chapter in the work health promotion guide and a dedicated module for the training course for practitioners of occupational medicine in the agriculture sector. Currently, there are about 9300 Romanian workers applying pesticides in agriculture, while 3523 are involved in mixing, loading, and storage. Occupational intoxications have decreased significantly until 2006 and occur only accidentally nowadays. Activity of serum cholinesterase - significantly decreased at $p < 0.01$ - is a reliable biomarker to be used in occupational exposure to organophosphates and carbamates. In 2017 the training course was accredited as Continuous Medical Education course at European level and is expected to engage more than 10000 participants. Research and official statistics subjected an informational system created to support agricultural communities to better manage the risk posed by plant protection products.

Keywords: *Pesticide, Agriculture, Intoxication, Risk management.*

THE EVOLUTION OF THE RECORDING OF MAIZE HYBRIDS IN ROMANIA

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Abstract

The registration of a variety means decades of community work, studying all plant varieties created by Romanian or foreign research, without which no hectare of land can be cultivated in Romania. The system of registering new creations in the Official Catalog is based on a precise description of the variety, on the establishment of uniformity and stability following field examination of the characteristics required by the conditions required for registration. This system makes possible to evaluate all varieties under common ambient conditions. This facilitates control of the interaction between varieties and environmental conditions and it is possible to describe the candidate varieties and reference varieties under the same climatic conditions. The purpose of the test is to establish an optimal expression of the phenotype of the variety as a technical basis of assessment to establish its originality with the aim of determining the status of the variety for the new plant creation and the introduction into cultivation of varieties with valuable biological potential. The state food security is reached, among other things, by a proper system of testing, recording and multiplication of varieties, as well as certification of seed produced in accordance with the domestic and international regulations in force. By rigorous testing of maize hybrids and the recording of the performance of hybrids with resistance to unfavorable climatic conditions to diseases and pests in the Official Catalog of Romanian varieties of plants, farmers are given the advantage of obtaining large data, to cover production costs in crop production and to provide a benefit.

Keywords: *registration, testing, hybrid, corn.*

ASSESSING THE VULNERABILITY OF RURAL COOPERATIVESTO CLIMATE CHANGE IN RWANDA

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Abstract

Rural cooperatives in Rwandaface a range of vulnerabilities regarding climate change. These are due to rainfall induced risks such as flooding, landslides, soil erosion or climate variability such as drought. Rwanda being a country of thousand hills is likely to be exposed to landslides, flooding and erosion. These hazards make rural agricultural cooperatives unable to cope with the adverse effects of these changes. In the country where the majority of the population relies on agriculture for their survival or as a source of income, appropriate strategies are necessary needed in order to allow rural agricultural cooperative to adapt and to mitigate the adverse effects of climate change. Researches on this issue in Rwanda are very few or inexistent, so this study is filling the gap and analyze the vulnerability or rural cooperative to climate change and inform policy makers on how to build the capacity of rural cooperatives for reducing their vulnerability to climate change and making them to be the real catalyst of socio-economic development. Using interviews and focus group discussions, cooperative members reported having experienced a huge lose due to climate change adverse effect, where their varieties of crops were damaged by either the intense rain or by the prolonged drought. Furthermore, the fertile land is taken away by the erosion or flooding. Therefore, rural cooperative need increased capacity to adapt and build resilience to climate change.

Keyword: *Vulnerability, climate change, rural cooperative, Rwanda.*

IMPACT ANALYSIS OF «TUBURA» AND SOCIO-ECONOMIC WELFARE OF FARMERS IN MBAZI SECTOR, HUYE DISTRICT, RWANDA

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Abstract

The most Rwandan population is dependent on agriculture. Approximately 80% of farms have a surface area of less than 1 ha each. More farmers have faced main challenges such as: lack of availability of organic fertilizers, lack of enough agronomists to guide farmers at lower levels and lack of trainings related to agriculture production before arrival of Tubura in Rwanda. Tubura supplies stakeholder farmer with four part solution (farm input, finance, training and market facilitation) to empower farm income per acre. The main research question was: To what extent did Tubura contributed in improving socio-economic welfare of farmers in Mbazi sector? The study used both quantitative and qualitative approaches, descriptive and historical comparative methods in order to examine what changes in society could be attributed to the Tubura farmers before and after adhesion. The direct observation, the questionnaire and the interview were used on the total population of 192 stakeholder farmers of Tuburain Mbazi sector with 48 farmers selected by non probabilistic and purposivesampling techniques. Data were analyzed through Microsoft office Excel 2010 via tables, frequencies. The findings indicated that the farmers' harvest recorded per season after joining Tubura increased by 56%. Furthermore, Tuburamainly contributed in improving socio-economic welfare of farmers in Mbazi sector on the rate of 76%, after being trained in every agricultural activity and using organic fertilizers, selected seeds, solar lamp and cook stove. However, Tubura farmers faced some challenges related to lack ofsome products like sheeting and watering can, which were not provided by Tubura. The present study seeks to analyze the impact of Tubura on the socio-economic welfare of farmers in Mbazi sector, Huye District, Southern Province, Rwanda.

Keywords: *Tubura, Socio-Economic Welfare, Impact, Farmers, Mbazi.*

EVALUATION OF AGRICULTURAL EXTENSION CONVOYS IN THE KINGDOM OF SAUDI ARABIA

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Abstract

The Ministry of Environment, Water and Agriculture (MEWA) paid attention to conducting Agricultural Extension Convoys (AECs) to increasing the effectiveness and efficiency of agricultural extension programs in the Kingdom of Saudi Arabia (KSA), throw reaching farmers in their farms, or accessible sites and help them to identify and solve their actual problems by a team of experts, specialists and technicians, in addition to the mobile laboratory. The main aim of this paper was to evaluate the AECs in the KSA, which was held during the years 2016 and 2017, through identifying the opinion of respondents about the methods and organizational procedures of AECs, measuring the respondents' utilization of services and extension activities provided through AECs and determining the most important strengths and weaknesses of the AECs. Data were collected during February and March 2018 by an electronic questionnaire form a sample of 70 participants. Frequencies, percentages, mean, maximum, minimum, and range were used for data presentation and analysis. The results showed that the averages of respondents' opinion scores about analytical services provided, extension recommendations relationship with main agricultural activities in the target area, contribution of extension recommendations in respondents' agricultural information rising and Utility of extension services provided by AECs were: 3.36; 3.81; 3.71; 3.84 of 5 respectively. The averages of respondents' opinion scores about appropriateness of duration, timing, organizing, and locations of AECs were 3.03; 3.31; 3.56; 3.56 of 5 respectively. The most important strengths of AECs were clearness of extension messages, rising of participants' agricultural knowledge and skills, and face to face communication while the most important weaknesses of AECs were shortage of duration, only one campaign per year and poor media coverage.

Keywords: *Evaluation, Agricultural extension. Convoys, KSA.*

THE IMPORTANCE OF TV SHOWS FOR FARMERS AND THEIR PRESENCE IN THE MEDIA SPACE OF SERBIA AND REGION

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Abstract

Starting from the importance of television, due to its close relationship with viewers, as a convenient means of informing and education, its offer of special contents that can have an impact on the acquisition of specific knowledge and motivation of agricultural producers in Serbia has been analyzed. The researchfor this paper was to determine the importance of special programs intended for countryside and agriculture to inform producers as well as to establish the confidence of agricultural producers regardinginformation provided by such content. A sample that covered 314 inhabitants of rural areas in Serbia was created. A questionnaire was used as a test instrument, which consisted of a group of questions relating to the respondents' views of special programs intended for agricultural producers, as well as assessing the usefulness of the information received and trust in the subjects in the programs. The programs that were analyzed were broadcast on four television channels that have a national frequency, two of which are public and two are commercial. Compared withother ways of informing about news in agricultural production, among agricultural producers, TV shows about agriculture are in second place immediately behind Agricultural Advisory Services. Almost half therespondents (47.8%) singled out interviews with government officials and attachments that recommend different products as the least useful information. When it comes to trust in the subjects that speak in programs about agriculture, the surveyed viewers give priority to experts (almost every secondviewer), while in second place are agricultural producers.

Key words: *television, information, knowledge, agricultural producers.*

THE ANALYSIS OF FRUIT EXPORT FROM REPUBLIC OF SERBIA WITH REGARD TO THE TRADE WITH BOSNIA AND HERZEGOVINA

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Abstract

The basic goal of the research was to review manifested trends and structure of fresh fruit and processed fruit products export from Republic of Serbia. Moreover, we specially analyzed the trade with Bosnia and Herzegovina representing a significant foreign trade partner, as from the point of fresh fruit and processed fruit products trade, as well as from the point of overall trade of agricultural-food products. The research results pointed out that fresh fruit and processed fruit products represented the important export products for Republic of Serbia. In observed period, positive foreign trade balance was realized. The authors specify that the export of fruit was important capacity of the country, and in order to be utilized, more investments in production were necessary, as well as the implementation of business marketing concept. In this paper, the authors pointed to the importance of the EU Stabilization and Association Agreement for the intensification of fruit and exports, as well as the importance of higher share of high processing phase products in the exports, which would provide favorable exports structure and a higher level of competitiveness. In addition, the authors stressed the importance of implementation of CEFTA in the further development of Republic of Serbia exports of these products, with emphasis on the development of trade with Bosnia and Herzegovina, one of the signatories of the mentioned agreement.

Key words*: fruit, export, Serbia, Bosnia and Herzegovina.*

INFLUENCE OF THE APPLICATION OF INFORMATION TECHNOLOGIES ON THE RURAL DEVELOPMENT OF SERBIA

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Abstract

Modern global changes affecting rural areas have influenced on physical changes to the spatial plan, the way of functioning of the rural areas, and have been changing social relations. Also, globalization of the market, new technologies, dynamics of flows of people, goods, capital and information have influenced the traditional structure of the rural areas, changing the relations and functions in these areas. This research points to the perspectives of rural areas of Serbia in the digital age, so this paper analyzesthe current state of implementation of information technologies (IT) in rural areas of Serbia and the importance of information technologies for rural development. Research units are the areas in Serbia, divided into the northern and southern regions. Also, in order to indicate the disparity in the urban-rural area, the analysis includes division by type of settlement. The aim of the paper is to point out to the importance of information technologies as one of the key factors for the development of rural areas, but also to explore the prerequisites for applying these technologies in the rural areas of Serbia. Within the framework of the analysis, socio-economic indicators have been defined, which point to the problems of the development of rural areas of Serbia. Information technologies are one of the possible solutions for the development of rural areas in terms of improving efficiency, increasing competitiveness, work and education, and establishing sustainable forms of rural tourism. Also, information technologies are the basis for the development of the model of multifunctional agriculture and the promotion of local products and cultural heritage.

Keywords: *Rural development, Information technologies, Serbia.*

TYPE OF WASTE AS A FACTOR OF ECONOMIC DEVELOPMENT OF HOUSEHOLDS AND ENVIRONMENTAL PROTECTION IN RURAL ENVIRONMENTS

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Abstract

The survey was conducted in the villages of Jablanica in district Orašac, Jarsenovo and Stupnica, a rural area in the City of Leskovac (Serbia). The work aimed to determine guidelines, role and importance of small farmers in rural areas and the impact of sustainable agriculture in the economic development of local communities and the protection of the environment they live in. For that purpose we used the method of interviewing farmers to identify and describe the factors influencing the amount of waste generated on farms and the impact on the environment. Also, we tried to find out appropriate methods of the waste separation on organic and inorganic waste, which is later used as a mineral supplement in the fields (organic waste) or safely disposed of (inorganic waste). Total of 60 agricultural holdings were surveyed. The results showed that factors influencing the amount and type of waste hadan impact on the farmers'perception. The questionnaire proved to be medium-sized, the Kronbach alpha coefficient was 0.539 (Cronbach's Alpha, 539). At the same time, the way we collected, stored, classified and used waste was significant because of the economic upgrades per units of production and reduction of the harmful effects on the environment.

Key words: *farmers, economic development, waste, environmental protection.*

PERFORMANCES OF SOYBEAN PRODUCTION IN THE WESTERN BALKAN COUNTRIES

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Abstract

Soya is very important in human, as well as in animal nutrition, because of its high quality nutritional properties (about 40% protein and 20% of oil). Global soya production has recorded incredible growth in the previous period, so the total global soybean production in 1961 was 26 million tons, while in 2015 it was 315 million tons. In the European Union (EU), there is a growing demand for high-protein crops, such as soya, primarily for the production of animal feed, as European agriculture is in deficit with high-protein crops. All the Western Balkan countries have Stabilization and Association Agreements (SAAs) with the EU and have a clear EU perspective. Small areas under the strain in the European Union increased demand for high-protein as well as non-GMO crops with significant trends indicating the need to increase soybean production in the countries of the Western Balkans. These countries have the potential to provide adequate, sufficient and reliable reserves of soybean (or protein) to all users in Europe. The aim of this paper is to compare performances of soybean production of Western Balkan countries and to reveal their potential for EU markets.

Keywords: *Soybean, production, Western Balkan, European Union.*

LAND CONSOLIDATION AND PROFITABILITY RATIOS IN AGRICULTURAL PRODUCTION

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Abstract

Agriculture production nowadays is considered as a commercial activity. Consequently, it must be treated through the market tools of analysis. One among many strategic activities in development of agricultural production is land consolidation. Relations between land consolidation and profitability of agricultural production are complex and not clearly visible. Method for research those relations could be based on researching relations structure between land consolidation and profitability of agricultural production. The connection between those two phenomena in economics is analysed through the profitability ratios. Profitability ratios in final form are simple equations between two measurable values and they are obtained *a posteriori* after realization of agricultural products on the market. When planning land consolidation numerous unknown parameters exists and it is almost impossible to predict all of them and consequently the prediction of profitability is very uncertain. Bearing in mind the importance of agricultural production and accepting the assumption that in next decades the demands for food will increase or, at least will keep the actual level, it is possible to develop models for prediction of profitability in agricultural industry depending on land consolidation. The analysis is based on micro economic level which encompasses the structure of costs and gains in agricultural production as well as certain intervals in which the parameters of profitability could belong in the future period of time. According to those intervals, the different scenarios were investigated. The profitability ratios were analysed depending on fixed and variable costs where fixed and variable costs were decomposed on the part which depended on land consolidation and part which was independent of land consolidations. The research and results are predominantly in the theoretical context including efforts to be done on the base of available data from practice in Republic of Serbia.

Key words: *Land consolidation, Profitability ratios, Parcel size, Economics.*

A DOUBLE HURDLE MODEL OF AWARENESS AND PARTICIPATION IN TRADITIONAL HANDICRAFTS AMONG RURAL WOMEN IN SOUTH AFRICA

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Abstract

Rural women have depended on localised traditional technologies and skills for ages. These techniques have been applied in a wide range of livelihood activities both on-farm and off-farm. While extensive work has been done in the adoption of technologies in rural areas, howbeit studies focused on adoption of retro technologies and off-farm livelihood activities are very few. Thus, given the significance of both traditional technologies and handicrafts in the rural development nexus, studying determinants of awareness and participation in such technologies among rural women assumes importance. A cross-sectional survey of 170 rural women (88 adopters and 82 non-adopters) was carried out in Amathole District Municipality of South Africa. Participation in traditional handicrafts was specified as a two-step decision process with awareness as a precondition for participation. Therefore, the Heckman two-stage model was used to analyse factors affecting awareness and participation in traditional handicrafts among rural women. Results indicated that age, employment status, social networks, access to material, access to tourism market and workshop attendance influenced awareness. Employment status, number of employed household members, workshops attendance and crafter experience influenced participation. The study urges for a comprehensive policy framework to promote awareness and participation in traditional handicrafts as a rural poverty alleviation and employment creation strategy.

Keywords: *Traditional handicrafts, Heckman model, poverty, rural women, off-farm.*

SUCCESS FACTORS IN THE VALUE CHAIN OF MILK IN SWITZERLAND

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Abstract

The Swiss milk market has been in a difficult period since the abolition of milk quotas in 2009. Despite border protection, Swiss milk prices remain heavily connected to (lower) European and global prices. Thus, it is difficult for dairy farmers to generate sufficient income and forces many of them to abandon milk production. In this study successful examples of creating added value to achieve a better milk price were analysed. By means of an online questionnaire, dairies, producer and milk processing organizations (n=59) were asked about success stories and success factors in adding value. In order to gain in-depth insight, case studies with milk processing companies (n=7) were conducted and the results evaluated in a workshop with the stakeholders. Results show that even in today's difficult situation it is possible to pay dairy farmers an above-average milk price and to operate successfully. Identified success factors are on different levels of the value chain: the production of high-quality milk, strict volume regulation and transparency between producers and processors, a clear strategy, a distinctive product, a suitable communication and marketing strategy, different sales channels, good customer relationships and a customer willing to pay for the added value of the corresponding product. All stakeholders in the value chain of milk need a pinch of courage to try something new, passion, dedication and persistence. A good and direct cooperation between producer and processor is key for success and a higher milk price. Thus, a sincere joint commitment along the entire value chain is important.

Keywords: *Milk production, success factors, value chain, milk price, added value, Switzerland.*

AN EXPLORATION ON FACTORS INFLUENCING GOVERNMENT SUPPORTED CERTIFIED SEED USE: A CASE STUDY IN TURKISH WHEAT FARMING

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Abstract

Wheat is one of the most important crops for human nutrition in Turkey and World. Seed is an important input in wheat growing as in all crop production. Seed costs are the most important item in production inputs in wheat farming. Seed is the main input for crop production and high-quality and certified seed is the first condition of productivity. For this reason, certified wheat seed use is encouraged by the government in Turkey since 2003. Certified seed use has increased in wheat production of Turkey in recent years. The main objective of this study was to determine the factors affecting the government supported certified seed use of wheat farmers in the Burdur and Isparta provinces located in the Lakes Region of Turkey. Main data were obtained in the face-to-face survey, which was carried out with the wheat farmers. The data were analyzed with the chi-square test which was used to test the relationship between variables. The result of the analyses showed that there was a significant relationship between the farms using certified seed, considering farmers experience, the purpose of wheat growing, the status of farmer registration system, agricultural credit use, size of total farmland and size of wheat cultivation area. *As a result, it can be said* that the produce high-quality wheat is associated with the use of certified seeds. In this context, maintaining the certified seed support with respect to wheat seed is also important for the certified seed use of the wheat farmers. Farmers should be informed and be aware of the studies about government supported certified seed use for to increase the use of certified seed in wheat production.

Keywords: *Wheat Farming, Certified Seed Use, Supported policy, Turkey.*

GOVERNMENT SUPPORTED BIOLOGICAL CONTROL IMPLEMENTATION AND ITS DETERMINANTS IN GREENHOUSE PRODUCTION IN TURKEY

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Abstract

Usage of biological control methods are increasing in crop production because of concern and awareness of consumers about food safety and pesticide residue problems. Also, biological control is a key component of pest management for minimizing the usage of pesticides, environmental and health problems. Biological and biotech fighting practices have been supported in Turkey since 2010 in order to ensure crop production activities economically and increase the biologic and biotechnical fighting practices, to decrease the consumption of pesticides, to provide sustainable agricultural production, to contribute to the solution of the residues problem in fresh fruit and vegetable exports and domestic consumption. The main objective of this study was to analyze factors affecting on government supported biological control implementation and its determinants in pest management of greenhouse pepper growing for sustainable food production in the Mediterranean coastal region of Turkey. The data used in this study were collected from 84 greenhouse growers by using a face to face survey in Kas District of Antalya province, Turkey. Purposive sampling technique was used for the sample selection. Both description and inferential statistics were used for data analysis. Also, the chi-square test was used to test relationship between variables. The result of the analyses showed that there was a significant relationship between the biological control implemented and non-implemented farms. Age, educational level, retirement status of farmer, number of employees worker, agricultural credit use, greenhouse growing experience, pepper yield, type of greenhouse covering, type of greenhouse ventilation, crop production systems, internet use, farm association membership, soil analyses case, and participation in agricultural extension activities of farmers showed significant relationship with their government supported biological control implementation. Farmers believed that biological control farming practices improves crop quality and yield, environment and human health in the long period. Farmers in the study area reported that they were not getting any assistance from the agricultural extension agencies. There is a role of governments in motivating farmers on expansion of biological control practices. For this reason, extension agencies in the study area should conduct intensive farmer *training programs on* biological control and pest management in greenhouse production.

Keywords: *biological control, greenhouse production, pest management, government policy, sustainability, Turkey.*

ECONOMIC ANALYSIS OF THE BLACK CUMIN (NIGELLA SATIVA L.) GROWING: AN EXPLORATORY SURVEY

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Abstract

Black cumin (Nigella sativa L.) is the economically important plant growing in many parts of Turkey. Black cumin has the significant place among medicinal and aromatic plants. It has been used for thousands of years as a spice and food preservative, as well as a protective and curative remedy for numerous disorders. The aim of this research is to investigate an economic analysis in determining the production cost and profitability of black cumin grown in Bucak district of Burdur province, Turkey. The data used in the study were obtained from 72 local black cumin growers using a questionnaire. The farms were chosen by random sampling method. The results revealed that the proportion of fixed and variable costs in total production cost were 36% and 64%, respectively. Average production costs were 868.3 \$ ha^{-1}. It was found that the share of labor, machine, fertilizer and seed cost in the total variable costs were 24.2%, 20.8%, 10% and 5.8%, respectively. Gross profit, net profit, and relative return were found to be 840, 527.6 \$ ha^{-1}, 1.6, respectively. This study showed that black cumin production is profitable in the study area. As a conclusion it can be said that growers should continue to pay more attention on black cumin growing. It is advised that the continuation of the black cumin growing in the research area is suitable from the standpoint of farm management principles. Also, the growers should be organized into cooperative and, they should be strengthened with especially in decision and policy making on issues affecting their input use in black cumin growing.

Keywords: *Black cumin, Production Cost ,Profitability, Economic Analysis, Turkey.*

CONSEQUENCE OF WHEAT COST AND PRICES AND RELATIONSHIP PRICES WITH YIELD AND SOME QUALITY PARAMETERS IN BREAD WHEAT CULTIVARS IN TRAKYA REGION

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Abstract

Trakya region is located in the Northwestern part of Turkey. Bread wheat is mainly field crops widely grown in Trakya region (Turkey). Bread wheat production area is almost 550.000 ha and yield is 5 t ha^{-1} depend on genotypes, environment and agronomic practices. In Trakya region in some year, adverse weather, disease or insects may lead to a crop loss and revenue returns that do not cover production expenses. Due to biotic and abiotic stress factors rise in farm input costs and wheat prices has had economic effects on wheat sector in Trakya region. The mean yields from 2008 to 2017 seasons used in this analysis of 4 cultivars (Pehlivan, Gelibolu, Selimiye and Aldane) growing in the region. In the study of four cultivars from regional bread wheat experiment yield and quality parameters used from 2008 to 2017 growing seasons. Grain yield, 1000-kernel weight, test weight, protein ratio, gluten, gluten index, hardness, sedimentation were compared with price and yield. This comparison allows for a sectorial overview of the proportion of Trakya region wheat producers covering their production costs. Across 10 years environments, average yield varied from 450.4 kg da^{-1} in 2016 and 863.6 kg da^{-1} in 2008 seasons. In Trakya region the year of 2008 was more profitable due to higher yield and price and followed by 2014 thanks to higher grain yield. The highest wheat yields, mean prices and mean profit were in 2008 year. Wheat prices and profit continuously have fallen from 2008 up to 2017, but in 2009 and 2015 dramatically dropped. Mean prices of wheat rose to record highs during 2008 so the highest wheat yields, and mean profit were in 2008 year. In 2016 both wheat yields and mean prices including mean profit were down significantly from their 10 year highs. In Trakya region in order to get high profit the yield and some quality parameters were in the mainly factors.

Keywords: *Bread wheat, cultivars, price, inputs, costs of production.*

ENERGY FLOW ANALYSIS FOR RICE PRODUCTION: A CASE STUDY FROM ÇANAKKALE PROVINCE, TURKEY

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Abstract

Rice (*Oryza sativa* L.) is grown under mechanized system in Turkey. In this study, the energy consumption for rice is analysed in Çanakkale, Western province of Turkey. The indicators are: net energy, energy use efficiency, specific energy, energy productivity, direct energy, indirect energy, and total energy input. The cultivars of rice commonly grown in province are listed in two groups: native and high yield cultivars, especially hybrid. Primary data were obtained through field survey with farmer's interviews face to face with a questionnaire from 75 farms in Biga, Ezine and center districts in the province. Secondary data and energy equivalents were obtained from available literature using collected data of the production period of 2017–2018, TUIK and FAO. Analysis of data showed that averagely diesel had the highest share within the total energy inputs around 55%, followed by chemical fertilizer with 30%, especially nitrogen, followed by machinery inputs because of combine and drying unit. Another important input is the pesticides share with around 4% because herbicides using is very high. Labour is the optimum level because of all cultivation activities are performed by mechanical power.

Key words: *Fuel, chemical fertilizer, input, output, Çanakkale.*

A RESEARCH ON THE TENDENCY OF RE-MIGRATION TO RURAL AREA: A CASE STUDY OF KARATAY DISTRICT IN KONYA PROVINCE (TURKEY)

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Abstract

Migration from villages to cities is an extremely important factor in terms of social, cultural and economic development of the countries, which significantly affects the agricultural sector. On the other hand, the migration and population growth have begun to restrict the living areas in the cities, and it is seen that people tend to re-migrate to the villages because of noise pollution, environmental pollution and financial difficulties. Within this scope, it was aimed to determine the factors affecting people to migrate, the tendency to re-migrate to village, the loyalty of villagers lived in cities on their villages and not loosing the features of the villages. In the study, people who had spent their previous life in the villages and had a tie (house, land etc.) with their village were taken into consideration. The population interval was enlarged in order to reach the example according to the desired interval, assuming that all the people living in the city did not have villages, and Karatay district of Konya province was determined as the research area. In the study, the criterion of "having been migrated from village to city" was taken into consideration and total sample was 60 households. According to the results of the research, these households earned from farming before coming to city.The most important factors of coming to the city were financial difficulties, childrens' education and unemployment. Even they moved to urban centers they still keep their connection with village and they continue dealing with agricultural activities in their village of origins. Raising the welfare and providing the livability of the rural areas which are the source of agricultural sector indispensable for county's economy,return to rural areas from urban areas will make possible.

Key words: *Rural Migration, Sustainability, Development, Agriculture.*

NEW ROLE OF AGRICULTURAL EXTENSION AND ADVISORY SERVICES BASED ON CURRENT FINDINGS AND FURTHER COLLABORATION FOR IMPROVED NUTRITION

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Abstract

Nowadays, there are a number of projects tackling with challenges around which this study is based. For instance, the ultimate goal of the current project SKIN is to create a permanent stakeholders' association on short food supply chain (SFSC) that works on the joint economic growth of the agricultural sector through the exchange of local food practices and through coaching sessions stimulating innovation. It creates a European network of best practices in SFSC that addresses the fragmentation of knowledge in the agricultural sector and supports bottom-up innovation initiatives. No doubts, boosting innovation through that project in local areas will lead to economic growth in the regions. But, for its sustainable development, it is crucial to create agricultural extension and advisory services (AEAS), particularly in EU countries and also to modify their role using bottom-up approaches. Despite the fact that the role of AEAS in EU countries is transforming in the last few years, from a technology transfer paradigm to a demand-driven model, there are still two challenges that should be tackling in the global agenda: 1) facilitate linking of local agricultural sector and nutrition; 2) build sustainable network of advisors in the EU for improving knowledge flows in national and regional agricultural knowledge and innovation systems (AKIS). According also to the findings of the SKIN project and to another recently submitted (FENIX, H2020 call DT-SFS-14-2018) the launch of new projects will contribute to tackle those challenges and make possible for AEAS to gather large amount of information and knowledge from local areas and population, helping all types of stakeholders to improve health, environmental and economic sectors in targeted region.

Keywords: *agricultural sector, innovation, extension, food security, personalized nutrition, rural advisory services.*

7. FORESTRY AND AGRO-FORESTRY

STUDY OF THE VISUAL QUALITY PARAMETERS OF THE CORK OF SOME CORKFORESTS IN THE EXTREME NORTH-WEST ALGERIA

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Abstract

The cork forests in northwestern Algeria are confronted with a series of environmental constraints that accentuate their degradation, especially fires, drought, conifer afforestation and the health of trees. Initial cork quality analysis (with Coveless device CQ05 n°0017) revealed that the cork is well distributed between the southern and northern zones of the geographical area of production.Cork for producing natural and colmated stoppers (Q-A and Q-B) growmainly in Hafir (69.33%) and M'Sila (49.33%). On the other hand, the cork bark with low thickness (Q-C) and corkwood refuse (Q-D) are individualized respectively on the samples of Nesmoth (40%) and Beni Ouarssous (30.67%). The superimposition of its cork quality values to environmental factors by means of MCA has shown that the effect of biotic and abiotic factors is decisive. In the mountains of Hafir, there are healthy trees (trunk and crown), in full production (circumference and height), which grow on stony ground that give the best quality of cork (Q-A) between the four provenances. On the other hand, in the Beni Ouarssous coastline, trees are declining (trunk and top), invaded by the conifer afforestation and the aftereffects of fires that produce poor quality of corkwood refuse (Q-D). Between its two boundaries, the M'Sila (littoral) and Nesmoth (mountain) stands are well adapted to their natural environment by simultaneously providing Q-B and Q-C cork.

Keywords: *Oak cork, cork, quality, environmental factors, MCA.*

CORK OAK RESISTANCE TO FOREST FIRES IN THE REGION OF TLEMCEN (NORTHWESTERN ALGERIA)

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Abstract

The fire resistance of cork oak has long been known. Through to the protection provided by its suberous bark and the many dormant buds located under it, can keep its trunk and restore a forest atmosphere in a few years. To confirm or deny this hypothesis, four stands of cork oak trees surviving two different fires were studied in 2018. In Hafir, two stands (H1 and H2) survived the 2005 fire and Zarieffet two others (Z1 and Z2) survived the 2007 fire. The measurements performed on the sample trees concerned dendrometric parameters and health status. On cork, we conducted an analysis of its growth and quality. The results revealed a major change in the structure of the four stands due to the dominance of the small wood species (Hafir: 14%, Zarieffet: 53%) and woodland (Hafir: 90.9%, Zarieffet: 42%). These traumatized subjects support verdant crowns with a sanitary state leading to a start of attrition (1.60 <IS <2.0). The percentage of "mother of cork" low damaged and very damaged is high in Hafir than Zarieffet, 57% against 40% of the total. The visual quality of cork produced by these trees carries the clues of a healthy cork since only the bark is soaring. Due to a high presence of waste cork, the quality indices is better in Hafir stands (H1: 10.20; H2: 6.69) than in Zarieffet (Z1: 5.92; Z2: 6.92). 66% of cork trees can produce stoppers cork in Hafir versus only 48% in Zarieffet.

Keywords: *Cork forest, fire, caliber, growth, quality.*

ESTIMATION OF BIOMASS AND CARBON STOCKS: ADAPTIVE MEASURES TOWARDS CLIMATE CHANGE AND FOREST MANAGEMENT IN RUSSIA

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Abstract

Current land use in Russia has an impact on the pools of carbon and biodiversity conservation in forest areas. Total forest area in Russia has exceeded 885 million hectares, that is around almost a half of the total area of the country. These areas play a major role in climate change, due to the carbon concentration. However, it is problematic to measure of total carbon stocks and biomass. The carbon storage estimation can be represented by three methods: an individual-based gap model of forest dynamics (FAREAST), mapping of distribution of living forest biomass (MODIS) and individual tree-based forest gap model University of Virginia Forest Model Enhanced (UVAFME). Due to the results of the Model estimations multiply scenarios could be implemented; for example, improvement of the stakeholder's network and land use control on the governmental level. At the same time, a complex of factors has an influence on future scenarios. For instance, permafrost affected soil and led to the stronger dependence on climatic conditions over the last 15 years in Russia, as well as on fire disturbance. To follow changes in soil and air temperature, in this paper was analyzed collected data from weather stations in Russia. Climate change influenced on agricultural land use. Traditional Siberian crops would be changed to new crop varieties with an extra irrigation. These adaptation measures would promote sustainability and food security in Siberia within the context of global warming. Meanwhile the new land use legislation does not rely on natural ecosystems and biodiversity conservation. Alternative policies will be reflected on through the framework of *Green economy*.

Key words: *Biomass, Biodiversity, Carbon stocks, Policy implementation.*

COMPARISON OF CHEMICAL COMPOSITION AND ANTIOXIDANT ACTIVITY BETWEEN INDIAN STRAWBERRY (*DUCHESNEA INDICA* (JACKS.) FOCKE) AND OTHER SPECIES OF STRAWBERRIES

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Abstract

Indian strawberry (*Duchesnea indica* (Jacks.) Focke) comes from subcontinent of India and south China. It is unknown when exactly this species has arrived on our soil. The analyzed population of Indian strawberry from a forest garden in Banja Luka is relatively old. It was brought from Syria in the middle of the last century. Despite the fact that this species is considered invasive, its micro-population in this forest garden has not expands. Indian strawberry is classified into strawberries, although in terms of the systematic it does not belong to the genus *Fragaria*, but to the genera *Duchesnea* or *Potentilla*. From the common forest strawberry (*Fragaria vesca L.*) it is distinguished by yellow flowers, top-fruits, which are almost tasteless and odourless, while the flowers of the forest strawberry are white, the fruits slightly hanging, sweet and fragrant. Regarding the chemical composition, the content of dry matter (14.35 g/100g), total content of sugar (4.26 g/100g), vitamin C (5.96 mg/100g), total acidity (expressed as the content of citric acid) (0.25 g/100g) have been analyzed. Also, the content of some mineral elements in Indian strawberry have been determined, with following results: sodium (5.3 mg/100g), potassium (152.4 mg/100g), magnesium (17.7 mg/100g), calcium (26.6 mg/100g), iron (0.72 mg/100g), phosphorus (27.6 mg/100g), zinc (0.22 mg/100g), manganese (0.32 mg/100g), copper (0.06 mg/100g), selenium (0.16 µg/100g) and chrome (2.1 µg/100g). Content of total phenolic (4.985±0.204 mg GEA/g_{FW}), flavonoids (2.124±0.183 mg Qc/g_{FW}), flavonols (0.518±0.03 mg Qc/g_{FW}), total anthocyanins (1.274±0.001 mg/g_{FW}) and monomeric anthocyanins (1.05±0.08 mg/g_{FW}) have been determined as well. The results obtained for Indian strawberry are compared with the content of these components in other strawberries.

Key words: *Indian strawberry, chemical composition, mineral composition, antioxidant activity.*

CHEMICAL COMPOSITION, NUTRITIONAL VALUE AND ANTIOXIDANT PROPERTIES OF CRABAPPLES

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Abstract

The aim of this study was to determine the chemical composition, nutritional value and antioxidant properties of three crabapples: *Malus* `Pink Perfection` *Malus* `Royalti` and *Malus* x *zumi* `Golden Hornet`, with distinctive appearance characteristics. Subjects of the analysis were fresh fruits and juice obtained from the last one by steam extractor. Crabapples were taken from an urban garden. Chemical analysis includes the following parameters: macro- and microelements (As, Ca, Cu, Fe, K, Mg, Mn, N, Na, P, Se, Zn), water, dry matter, ash, proteins, sugars, total acidity, pectin, minerals, pH, vitamin C, anthocyanins, phenolic compounds, nonflavonoids, flavonols and free radical scavenging capacity (applying DPPH and ABTS tests). Basic phenotypic and morphometric characteristics of the fruits were observed as well. Results obtained from the research have shown that *M.* 'Pink Prefection' and *M.* x *zumi* 'Golden Hornet' have a fairly similar chemical composition. *M.* `Royalti contains significantly more vitamin C and a little more sugar, but is also poorer in pectin and has much greater acidity. Compared to commercial apples, crabapples do not lag behind in sugar content, but they have significantly higher acidity and half the amount of vitamins C. The elemental composition of crabapples is also fairly uniform. When it comes to phytochemicals, *M.* 'Royalti is particularly prominent by the high content of anthocyanins, flavonols and phenols. The ABTS test showed that *M.* x *zumi* 'Golden Hornet' has the strongest antioxidant capacity. We have reached the same result by applying the DPPH method.

Key words: *crabapples, chemical composition, nutritional value, antioxidant properties.*

FOREST CONTRIBUTION IN VEGETATION AND FLORA IN A SPECIAL PROTECTED AREA OF MOUNT TAYGETOS (SOUTHERN GREECE)

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Abstract

Greece has various climatic and biological conditions which favors the development and spread of forests with rich biodiversity (flora and fauna species). The present study was conducted at the Special Protected Area of Mount Taygetos, Southern Greece (*Site of Community Importance: GR2550006*), during 2016 and 2017. This study presents the species richness, relative abundance (%) and alpha diversity of flora and vegetative species in burned and unburned areas in forest ecosystems of *Fraxinus ornus* L. The sampling of flora was carried out in randomly selected plots of 0.25 m^2 and vegetation was recorded in randomly selected sampling plots of 100 m^2. The highest relative abundances of flora and vegetative species were *Bromus rubens* L. (21%) and *Fraxinus ornus* L. (27%), respectively, in forest burned areas. Also, *Prunella vulgaris* L. (32%) and *Fraxinus ornus* L. (61%) have the highest relative abundances in unburned areas. It is noteworthy that two important endemic species (*Abies cephalonica* Loudon and *Origanum scabrum* Boiss. & Heldr.) were recorded in the study area. These species have high ecological value and may attract researchers and nature enthusiasts. Moreover, the data revealed significantly higher vegetation diversity in the forest burned areas whereas the forest unburned areas had the lowest vegetation diversity. It is important that the study areas are appearing to have evidence supporting the fact that Mount Taygetos is a self-healing ecosystem with very high rates of regeneration. This contribution will be utilized as a valuable tool to the scientific community and providing baseline information for further research.

Keywords: *Native flora, regeneration, monitoring, utilization, Natura 2000.*

AGROFORESTRY PRACTICES CONTRIBUTION TOWARDS SOCIOECONOMICS: A CASE STUDY OF TAWAU COMMUNITIES IN MALAYSIA

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Abstract

Agroforestry is a key indicator in terms of socioeconomic level towards developing countries especially to rural communities for sustainable development. Generally, agroforestry practices are valued environmentally, economically and socially. However, a key problem within recent literatures in relation to agroforestry practices is lack of awareness and knowledge among local community in rural areas. The aim of this study was to identify the contribution of agroforestry practices towards socioeconomics of communities in Merotai Besar, Tawau, Sabah, Malaysia. The data collection was conducted by questionnaire, which was randomly distributed to 250 respondents from five (5) villages namely Merotai Besar, Simpang Tiga, Kijang, Langsat and Iban. Majority of respondents strongly agreed that agroforestry practices could provide food resources for the wellbeing of rural communities. More than half of the communities in Merotai Besar area practiced agrisilvicultural system. A small number of residences in the study area also practiced agrosilvopastoral and silvopastoral systems. In spite of the fact that 93.2% of respondents were practicing agroforestry, they lack awareness that they were practicing agroforestry. This was due to poor dissemination of agroforestry information. This paper suggests that policy makers should encourage stakeholders to provide training and skills development centre to enhance the community's knowledge. Furthermore, it is necessary to encourage active community-based management practices within respective villages for sustainable economic development and to ensure prosperity for all. In conclusion, agroforestry practices can expand the socioeconomics level to reduce poverty of rural communities in Tawau area.

Keywords: *Socioeconomic, agroforestry practices, rural communities, Borneo.*

FOREST MANAGEMENT IN THE FIRST PROTECTION REGIME OF SPECIAL NATURE RESERVE "KOVILJ-PETROVARADIN MARSHES" – ANALYSIS AND IMPROVEMENT OPTIONS

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Abstract

Forest management in a protected area, such as the Special Nature Reserve "Kovilj-Petrovaradin marshes" is determined by the rules and regulations that require nature protection, as well as forestry. All actions to be taken must strive to achieve the objectives of both professions. But, most importantly, it is necessary to manage the forest, this complex and very valuable natural resource, in the way that is most appropriate to the natural conditions on the ground. This paper presents an analysis of the natural conditions, bioecological characteristics of the forest habitats in the first protection regime. Pedological analyses are given, data about the plant cover on the studied area are given and finally, the characteristics of the forests are shown. Forest stands are also analysed from the aspect of classification into high conservation value forests, together with the classification and management process of these forest types, all in terms of the protection provided in this regime. The aim of this paper is to examine and analyse the natural characteristics of forests and forest habitats in the first protection regime, as well as the management of this natural resource in the past. Eventually, the most important goal is to provide potential improvement options based on the greatest challenges during the past period.

Keywords: *Special nature reserve, Forest management, I protection regime, HCV forests.*

COMPARATIVE EFFECTIVENESS OF SOME INSECTICIDES IN CONTROLLING *IPS TYPOGRAPHUS*

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Abstract

In the field (Golija Mountain, spruce forest approximately 80 years old, outbreak of *Ips typographus*) and semi-controlled laboratory conditions (Institute of Forestry in Belgrade), studies of the biological efficacy in the control of *I. typographus* adults, two concentrations (2% and 3%) of selected chemical (Fastac®Forst – active ingredient Alpha-cypermethrin) and biological insecticides (Naturalis Biogard® – active ingredient spore of *Beauveria bassiana*), were conducted. On June 13th, 2017, five TRIPODs in three repetitions, were installed along the edge of a forest stand, alternating in a single line with 10 m spacing. TRIPODs comprised of three spruce logs, 1.5 m in length and minimum 19 cm in diameter. Logs were taken from freshly cut healthy spruces. Trap logs were treated with insecticides diluted in water. The TRIPODs were baited with aggregation pheromone dispenser IT Ecolure that was attached to the top. After two months, bark beetles were sampled together with bark. Three samples approximately 34 x 13 cm in size, were taken from the upper, central and lower part of each log. The samples were placed in plastic boxes, stored in the laboratory and controlled at seven-day intervals. Experiments was established in the complete random block pattern in three repetitions, where the blocks for each variant present 3 samples. Fastac®Forst, in accordance with its functioning, caused 100% mortality of the adult *I. typographus* before their boring in the logs. No evidence of *B. bassiana* infection was reported in the collected individuals. The percentage of *I. typographus* individuals infected with *B. bassiana* on logs treated with Naturalis Biogard® 2% was 45.9%, and for Naturalis Biogard® 3% - 39.3%.

Key words: *Fastac®Forst, Naturalis Biogard® biological efficacy, Ips typographus.*

CHARACTERISTICS OF ALKALIZED SOILS IN THE BAČKA REGION (SERBIA) AND THE POSSIBILITY OF THEIR AFFORESTATION

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Abstract

Alkalized soils occupy 80,333 ha or 3.75% of the total area of Vojvodina and represent the areas fragmentally covered with scarce halophytic shrubby vegetation. Besides alkalization processes endanger about 34,000 ha, or 1.60% of primary agricultural land, which represents in total 5.35% areas endangered with alkalization in Vojvodina. Bearing in mind the surfaces that are endangered by alkalization, in the Bačka region, the study of alkalized soils was carried out on relief forms in the form of depressions representing river basins from the geological past. In these relief areas of Bačka, where alkalisation is present, alkalized soil is formed at the soil type designated as solonetz, class solonci. The paper presents the properties of solonetz soils, ie their physical and chemical properties. The study of these soils is significant for the purpose of finding a suitable method for the melioration of such areas. On the basis of the soil studies, the tree species that can be planted on these habitats will be determined. The soil quality of these areas will be improved through forest establishment.

Keywords: *Alkalized soils, Afforestation, Forest melioration.*

THE INFLUENCE OF DROUGHT ON GROWTH AND DEVELOPMENT OF WHITE POPLAR SHOOTS *IN VITRO*

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Abstract

The study tested the effect of drought on growth and development of the shoots of five white poplar (*Populus alba* L.) genotypes (L-12, L-80, LBM, LCM and *Villafranca*) cultured *in vitro*. The effect of four different concentrations of polyethylene glycol (PEG 6000) (1 g/l, 10 g/l, 20 g/l and 50 g/l) in the rooting medium and the rooting medium without PEG (used as Control) were studied. After 35 days of cultivation, following characters were measured: height of shoot, number of roots, length of the longest root, the percentage of survival and rooting. According to the analysis of variance, effects of the media, genotypes and interaction genotype × medium were statistically significant for the most of examined characters. The best differentiation of genotypes was achieved on medium in which the PEG concentration was 50 g/l, so this medium was then used in drought tolerance evaluation. The best drought tolerance was achieved by the *Villafranca* genotype, which had the highest values of the height of shoot, the number of roots and percentage of rooting. Presented results suggest that testing of drought tolerance *in vitro* is a useful method for evaluation of white poplar genotypes. However, the research should be expended on other parameters and related to the tests in field conditions.

Keywords: *Populus alba, in vitro culture, drought tolerance.*

PERCEPTIONS ON CONSTRAINTS TO AGROFORESTRY COMPETITIVENESS: A CASE STUDY OF SMALL HOLDER FARMERS IN LIMPOPO PROVINCE, SOUTH AFRICA

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Abstract

Agroforestry is a land use system that includes the use of woody perennial, agricultural crops and animals in combination to achieve beneficial ecological and economical interactions for food, fiber and livestock production. However limited understanding, incorrect information and a negative mindset could hinder the competitiveness of this practice. This case study of smallholder farmers in Limpopo Province attempted to explain the farmers' constraints to agroforestry competiveness by analysing their perception on agroforestry. The survey was conducted in Limpopo Province by the Agricultural Research Council, University of Venda and Water Research Commission. The research is fully funded by the Water Research Commission. The aims of the survey were to document smallholder farmer's perception on constraints to agroforestry competiveness in Limpopo Province and to review the current knowledge on Agroforestry in the province. A total of 65 smallholder farmers participated in the study and were spread in districts as follows: Vhembe (40), Capricorn (21) and Mopani (4). Quantitative and qualitative designs were used as a questionnaire, stakeholder's discussion and field observations were part of the data collection. A purposive sampling technique was used to select 65 potential agroforestry farmers from the list provided by the Department of Agriculture, Forestry and Fisheries and Forestry South Africa Limpopo. Data was coded, captured, and analysed using SPSS. The results indicated the following as the most important constraints identified by farmers: cost of production (13.92%); labour (13.92%); distance to the market (10.7%); cost to the market (11.36%); financial institutions (12.81%); suppliers (11.8%); indirect support (12.04%), fiscal policy (9.8%) and labour policy (12.6%).The identified farmer's perceptions were in line with some of the researcher field observations. It is thus recommended that stakeholders should take note of the constraints identified by farmers in an attempt to increase agroforestry competitiveness.

Keywords: *Smallholder Farmers, Agroforestry, Perceptions, Limpopo Province and South Africa.*

SINOP AREAS DESIGN AND PLANNING OF POTENTIAL OF ECOTOURISM, TURKEY

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Abstract

Naturally, plans and programs should be made in the light of ecotourism principles in order to make this center more efficient use and development for tourism purposes. For this reason, ecotourism has been defined in this study and ecotourism possibilities in Sinop have been examined and solution proposals have been presented. Sinop as an important historical value and great potential because of its outstanding natural and cultural heritage. Sinop and its environs are both an important center of destination for Turkish tourism with its natural beauties and cultural values. This study deals with the ecotourism resources of Sinop that include its historical, cultural, and natural landscape to determine its potential classification in terms of values that can be a source of tourism activity and are intended to be mapped. For this purpose, the value of the tourism resources that constitute Sinop's values such as maps, photos, and surveys were evaluated in light of data collected because of work done in the area and of existing and potential ecotourism activities. Then the appropriate fields for the specified activities creating a digital base were determined. During the evaluation and processing of data, they were used to map the ArcGIS program. In conclusion, Sinop's ecotourism resources including its historical, cultural, and ecological values were identified and mapped.

Keywords: *design potential, forest, Sinop, planning potential, ecotourism, geographic information systems.*

DEGRADATION OF THE CHEMICAL PROPERTIES OF SEMI-ARID FOREST SOILS UNDER THE INFLUENCE OF CROPPING PRACTICES

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Abstract

In recent years, forest soils in the semi-arid zone have undergone significant degradation due to mainly cereal-controlled anarchic crops. Several trees are destroyed annually to liberate space that will be replaced by agriculture on a soil already very fragile by overgrazing and climatic hazards. The control of "soil quality" is an important issue in any restoration. This concept covers the physical, chemical and biological properties which own effects and interactions result in more or less efficient operation in terms of production, environmental impact and sustainability of systems Forest. The objective of this work is to study the changes generated by deep tillage on the chemical properties of soil in forest environments. Some chemical analyses have been carried out on forest soils impacted by deep tillage and compared to soil results not affected by crops that will serve as a witness for our work. For this we have chosen two forest areas in the Wilaya of Saida present in the semi-arid bioclimatic stage. The first station has been very degraded by the ploughs and the second one has not been affected by the crops. For better homogenization of our results the same geological, topographic and exposure conditions have been chosen. The results show a significant difference in some chemical parameters such as pH, pH Kcl, and organic matter between the ploughed area and its control. For the rest of the parameters statistical analysis shows that there is not a significant difference between the two zones. This shows that forest cropping practices can alter certain chemical traits of soils that will then have repercussions on other soil parameters such as the microflora that will need to be explored in other work.

Key words*: tillage, soil, forest, Aleppo pine, chemical analyses.*

INFLUENCE OF TEMPERATURE AND PRECIPITATION ON ANNUAL CORK-RING WIDTH OF QUERCUS SUBER L. (ZARIEFFET IN ALGERIA)

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Abstract

In Mediterranean regions, the cork oak (Quercus suber L.) receives limited attention for dendrochronological studies because tree ringsare faint and cork rings with a clear annual banding are rather neglected. We analyzed the climatic signal of cork-ring chronologies for 1996–2010 from Algeria oak forest called Zarieffet. The goal was to evaluate the strength and consistency of climate signal and to assess cork growth sensitivity to climate variables (precipitation and temperature). Cork sampling took place in July during the cork harvesting season of 2010. For each selected tree, one or two cork samples (100 cm^2) were collected (at 1.30m height). The cork samples were then prepared for image acquisition by boiling and drying,while optical quality surface finishing was done by cutting and sanding the transverse sections until annual cork rings were clearly visible. The cork-ring width series were dated from Snapshot images of the transverse sections scanned and stored in TIF graphic format. Images were then analyzed using ImageProPlus®. Selected dendrochronological statistics were calculated based on indexed cork-ring chronologies. Pearson's correlation coefficients were calculated between the chronology of index-cork and climate variables. In general, our results provided valuable information about the regional climate forcing trends constraining and enhancing cork growth. Trends of cork growth, via correlation analysis, including climate variables and Lang's index were successfully assessed. The climatic water balance influences cork growth. Drought-driven cork growth reduction is a threshold function of a P-T ratio, with expected increasein the drought occurrence under changing climate.

Keywords: *Quercus suber L., cork oak, Mediterranean climate, dendroclimatology, corkrings.*

STUDY OF ALEPPO PINE LITTER SUBJECT TO THE EFFECT OF COASTAL SPRAYS

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Abstract

Soils are considered non-renewable in the short and medium term, and are particularly threatened by human activities and climate change.Soil organic matter is degraded by bacteria and fungi. Coastal environments may have significant constraints on the decomposition of forest litter related to water potential and winds that lead to sea salinity on the soil.The objective of this research was to see the effects of the coastal context on certain physico-chemical properties and microbiology of Aleppo pine litter. For this study we used litter bags comprising the litter of *Pinus halepensis* harvested in the coastal and inland zone in Algeria. The control litters were left in their sampling site and a transfer of litter from the inland to the coastal area was also carried out to check if there was a coastal zone effect on the litter.Our results showed that there was an effect of the coastal context on the physico-chemical and microbiological characteristics of litters. Indeed, a different pH between the two zones was noticed. The data of the humidity showed that the Coniferous litters were strongly dependent on exposure to coastal effects and the stress of plants resulting from these litters. Microbial communities were less important in the coastal zone. It was also shown that genetic diversity was higher in inland bedding and that catabolic profiles and cellulose activities varied according to context.

Key words: *coastal, continental, litter, Aleppo pine, embrun.*

THE EDGE EFFECT ON THE RADIAL GROWTH OF ALEPPO PINE IN THE DAIA-SAIDA MAUNNTAIN (ALGERIA)

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Abstract

The fragmentation of the forest area results in the multiplication of edges and when a new resource is made available or its intensity increases by the creation of new edges, the trees exploit it intensively and develop very quickly. Dealing with this problem is the main objective of this work, which will examine the effect of openings on the radial growth of trees in the pine forest of the Daïa-Saïda Mountains (Algeria) where two natural and representative sites were selected, the first being an adult forest and the second being a natural regeneration. We sampled from the straight opening three parallel lines of trees spaced by 10 meters apart. In each line, 10 individuals meeting the criteria for dendrochronology sampling were cored. The first line consisted of feet close to the opening (taking advantage of the edge), then every 10 meters of penetration inside the stand.two other lines parallel to the opening were selected. In this dendroecological study, 50 trees with two carrots per tree were selected with the thickness estimatation of 4659 treerings.The results obtained confirmedan considerable excess of radial growth despite the narrowness of the openings (4 and 8 m) so, the removal of one or more trees due to a local disturbance frees up space and resources, leading to increased growth rate of adjacent trees.

Keywords : *Edge effect, Radial growth, Forest cover, Aleppo pine, Daïa-Saïda Mountains.*

IMPACT OF AGE AND RAINFALL VARIATIONS ON THE RADIAL GROWTH OF *PINUS HALPENSIS* MILL

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Abstract

The comparison of the results of both dendroclimatic and dendrochonological analysis of the Aleppo pine (*Pinus halpensis MILL*) in the state forest of Tlemcen (north of Algeria) has been achieved in particular site conditions. The analysis of the growth of the annual rings and the reports of the relative gaps of the successive rings shows a clear regressive trend at the young trees. The average sensitivity (AM) and the respective coefficients of the inter-dating (SR) to the young trees and to the most aged confirm an enough strong dependence of the first especially to the climatic factors, especially the precipitations. The results of this work permitted to establish a relation between radial growth and precipitations according to the age of the rings formation. Thus, it is established that from these results, particularly from the mean sensibilities (SM) values, that the climatic variations influence appreciably on the young trees. So to avoid the biological and physiological changes linked to the ageing of the trees, it is preferable to compare the rings on a 40 to 50 years period as it is the case of the six selected samples in the survey zone.Key-words: Aleppo pine, annual ring, radial growth, relative deviation, mean sensibility, inter dating profile, synchronization

Key words: *Pinus halepensis, radial growth, synchronization.*

DYNAMIC OF CORK OAK ECOSYSTEMS IN THE NATURAL PARK OF EL KALA (ALGERIA)

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Abstract

In this study, ecosystems of *Quercus suber* were investigated in order to understand the dynamic of changes occurring in the National Park of El-Kala (Algeria) between 2002 and 2013. Landsat images, remote sensing techniques and GIS tools were the key elements to undertake this work. The 2013 NDVI image was subtracted from 2002 one, and the resulting NDVI differencing image was classified into three categories: positive, negative and no change. Assessment was satisfactory with an overall accuracy of 98.14% and Kappa coefficient of 0.97. Areas affected by vegetation loss were mainly found in the east and south part of the park, whereas areas with vegetation gain were located around water bodies. Regarding land cover change, two unsupervised classifications were applied and seven land cover classes were defined in both images. Based on field knowledge and statistics' comparison, land cover classes affected by areas' decrease were Dense forest (-0.96 %), Uncultivated land (-3.99 %) and Barren land (-6.56 %). In contrast, land cover classes with positive change were: Water body (+2.01 %); Open forest (+4.93 %), Cultivated land (+4.45 %) and Urban (+3.66 %). The main causes for these changes were: expansion of urban areaand newinfrastructures, degradation of dense forests due to human pressures mainly grazing and clearing, intensification of agriculture activities with uncontrolled irrigation and last but not the least, forest fires in summers due to long droughts periods and holiday rush.

Key words: *Quercus suber's ecosystems, Change Detection, NDVI Differencing, Land Cover, National Park of El Kala.*

COMPARATIVE STUDY OF SOME PHYSICO-CHEMICAL PARAMETERS OF THE NEEDLES OF "*PINUSHALEPENSIS. MILL*" BETWEEN TWO SEMI-ARID AND ARID FOREST AREAS

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Abstract

In Algeria, pinewoods are concentrated mainly in arid and semi-arid areas where climatic conditions severely limit the production potential. There are almost 881 000 ha of Aleppo Pine in Algeria in 2007 (DGF), from a reforestation (usually since colonial times). The little grouping of Aleppo pine, which still exists in the natural state, continues to regress as a result of repeated fires or uncontrolled grazing, and as a result of the climatic changes accentuate by strong heats. It represents a very important natural richness that we are obliged to protect by developing techniques of adaptation with the current climatic stresses especially in arid regions.The tolerance mechanism proves to be the most effective strategy in critical situations. In the context of climate change we have been interested in the determination of adaptive strategies of Aleppo pine in arid and semi-arid areas, set up to cope with more intense and longer drought episodes and a decrease in precipitation. For this, we studied the characteristics of some physicochemical parameters of the needles of Aleppo pine collected in two different bioclimatic zones; an area in the semi-arid (Saida) and an area in the arid (Naàma). Our results have shown that Aleppo pine needles in each bioclimatic floor had these own characteristics namely morphology, water content, organic matter and mineral matter, chlorophyll rate and yield were higher in the semi-arid zone than in the arid zone. Analysis of variance (ANOVA) and Analysis (ACP) showed a significant difference between the different parameters measured at the two study areas and confirmed the imprint of the bioclimatic stage on the *Pinus halepensis* Mill species in each zone .

Keywords: *Pinushalepensis Mill., needles, semi-arid and arid, physico-chemical parameters.*

CONSERVATION AND MANAGEMENT OF GENETIC POTENTIAL OF SESSILE OAK (*QUERCUS PETRAEA* /MATT./LIBL.) IN SERBIA

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Abstract

In Serbia, there are 10 native species of oaks out of which three species in the sessile oak aggregate and hold a significant position: Central European sessile oak (*Quercus petraea* /Matt./Libl.), Balkan sessile oak (*Quercus dalechampii* Ten.) and cluster-fruited oak (*Quercus polycarpa* Schur.) The species of the sessile oak aggregate have a wide distribution in Serbia. They range in the lowlands (outside the flooded areas) in the submauntain areas and they extend from altitude of 200*m* on the north border of range, to the altitude of 1200 *m* on the south and east borders of the range in Serbia. The aggregate of sessile oak in Serbia makes 13 different associations and numerous sub-associations on different bedrocks manifested by the great phyto-coeno-diversity of this species. This paper deals with sessile oak variability and breeding in Serbia. Thanks to a great heterogeneity of site conditions of this polymorphic oak species, there is a significant intra- and inert-provenance variation of morphological and physiological properties. The comparative analyses of diversity among populations of sessile oak in different parts in Serbia point to a rich gene pool of this species, resulting from the action of complex genetic factors, ecological factors and different management procedures performed in sessile oak natural forests. The research of sessile oak genetic variation by molecular markers, cp DNA, mt DNA and micro-satellite methods point to the need for further analyses of sessile oak genetics diversity. These results will be practically applicable in the identification and selection of seed stands with the best-quality autochthonous populations with the suitable desirable quantitative and qualitative characteristics. Further efforts on breeding of this polymorphic and polyvalent species, taking into account the current state of its forests and the need for increasing the areas under this species, require the application of the methods of mass and individual selection, by which the already registered seed forests will be revised, the new ones will be selected and test trees will be selected in all regions of sessile oak native range. In this way, a wide sessile oak genetic potential will be archived in the established seed orchards and progeny tests.

Key words: *Sessile oak, Conservation, Management, Serbia.*

SOME OF LAND TYPES IN COASTLINE OF RIVER SAVA IN AREA OF "MOROVIĆ" SERBIA

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Abstract

During the study, the basin of the river Sava was selected because a large part of the vegetation and land formations in the territory of FO "Morović", due to the low altitude and proximity to the river, has been affected with flooding and underground water. We analyzed the land by the river Sava and confirmed various land combinationsaffected by different external influences. The pedological research with a review of the humidification regime of underground and flooding water should serve us as a good starting point for defining the types of soil. In the area of Ravni Srem, a specific microrelief was formed in the form of beams, plateaus and a series that conditioned a different soil humidification regime, as well as a topographic and hydrological regime, which led to the study of different land types. According to in the forests of Ravni Srem there are four defined types of soil in the hydromorphic array and three types in the automorphic array. The floods that affected this area during 2014 caused large amounts of waterto remain in the defended part of the area for a long time after the Sava river was with drawn into its riverbed. As a consequence of long water retention and possible changes in the properties of the soil, certainly there are changes in the physical and chemical properties of the land.

Keywords: *types of land, the river Sava, the area of Ravni Srem, ground water, the flooding areas.*

INVESTIGATING THE EFFECT OF SUBSTRATE, MYCORRHIZAL APPLICATION AND BULB SEPARATION ON THE GROWTH OF THE WILD ORCHID *ANACAMPTIS PYRAMIDALIS*

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Abstract

Pyramidal orchid (*Anacamptis pyramidalis*) is a wild terrestrial orchid widely found in Lebanon and the Mediterranean zone. Random collection and trade of the orchid for medicinal and edible use (salep) subjected it to a risk of extinction. Consequently, the current work aimed to propagate this orchid in vivo. Orchid bulbs were transplanted from the wild into four different soil substrates (Pinebark, Pinebark-Peat (1/1), Peat-Sand (1/1) and control: soil from the collection site) under controlled conditions of temperature and humidity. The effect of mycorrhizal application (MY: Yes) was tested in the different substrates except in control and orchid bulbs (son bulb and mother bulb) were planted combined (SB+MB) or after separation of the mother bulb (SB). Same treatments were repeated over two consecutive years. Results showed an earlier emergence of son bulbs (SB) grown in control substrate. Moreover, there was a significant difference in plant growth with superiority for (SB) compared to (SB+MB) regarding plant length and elongation of first leaf except bulb dimensions (length and width) that were higher in (SB+MB). Mycorrhizal application enhanced the overall growth of plants and its effect was the most obvious in the substrate Peat-Sand (1/1). In general, the best growth of the orchid was observed at the level (SB)/(MY:Yes)/Peat-Sand (1/1). Results of the second experimental year confirmed those of the first year with an improvement of the rate of emergence by 13%. The in vivo propagation method was beneficial on improving the growth of A. *pyramidalis* ex situ and it could be adopted as an initiative for wild orchid conservation.

Keywords: *Anacamptis pyramidalis, conservation, substrate, mycorrhiza, bulbs.*

NUTRITIONAL SECURITY AND FACTORS INFLUENCING HOUSEHOLDS ACCESS MECHANISM TO A VARIETY OF FRUITS IN FOREST AREAS OF CAMEROON

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Abstract

The consumption of fruits and vegetables is generally low in developing countries making food insecurity (FIS) and under nourishment a daily reality for many households. Assessing fruit tree abundance and fruit access mechanisms could help boost nutritional security in forest areas with increasing deforestation. Through a household survey, this paper investigated fruit tree species abundance and diversity and fruit access mechanisms and tested the impact of different levels of deforestation. Data was analysed descriptively and statistically with the use of the Pearson coefficient, ANOVA, X^2-test and Cramer V test on SPSS. Likert scale summaries and means were equally done using SPSS. Upto 95% of households experienced general food scarcity, with no significant difference between the means of food expenditure and the strategies to cope with food scarcity. Fruits were obtained from wild and domesticated tree sources across all three levels of deforestation. In all, 25 fruit tree species were recorded comprising 15 wild and 10 domesticated species. Households had access to fruit trees (FTs) at a ratio of one household to 10 trees, comprised of four wild and six domesticated trees. The mean occurrence of FTs was higher in the most deforested zone than in the least deforested zone while there was no difference between the least, moderately and the most deforested zones. Fruits and fruit juice were hardly purchase by the majority of households and the amount of money spent on fruits did not show a significant difference with mean household income. Thus fruits were obtained mainly through gathering and harvesting, not through buying. Therefore, increase in fruit tree planting is necessary to boost local fruit consumption in the study area.

Key words*: Fruit access, Perceptions, Purchase, undernourishment, Wild and domesticated fruittrees.*

VARIABILITY OF SURVIVAL AND HEIGHT GROWTH IN PEDUNCULATE OAK PROVENANCE TRIALS – "JASTREBARSKI LUGOVI" AND "KOŠKA", CROATIA

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Abstract

Pedunculate oak (*Quercus robur* L.), which accounts for one tenth of all the forest in Croatia, is one of the most valuable forest tree species. Provenance trials, where populations of different geographical origin are tested in a common environment (common garden test), are a tool suited to allow the study of intraspecific adaptive genetic variation. The aim of the research in provenance trials is to identify provenances that are characterized by good growth and adaptability, to be used as a source of seed for future afforestation. In Croatia, two trials (Jastrebarski lugovi and Koška) were established in 2008 and 2010 for research within-species genetic variability of pedunculated oak populations originating from Austria and Croatia. Genetic field trials involved 22 provenances (17 Croatian and 5 Austrian) planted over a total area of 3.75 ha in 2.5 by 2.0 m spacing. Trials were established according to a randomized complete block experimental design with three replications (blocks). In total, 6 600 saplings were planted. Research of adaptive genetic variability of oak populations was conducted by analysis of height growth and survival. Survival for first analyzed year at trial Jastrebarski lugovi was extremely good (98.73%), but after it visibly decreased. The total mean height of all plants in the trial in 2016 was 441.51 cm. The mean survival of studied plants at trial Koška in first analyzed year was 84.61%. In 2016, survival was 68.3% and average height of plants was 255.79 cm.

Keywords: *Quercus robur* L., *genetic test, adaptive genetic variability, quantitative genetic parameters.*

Acknowledgements

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TREE CLIMBING METHODS AND THEIR IMPLEMENTATION IN FOREST RESEARCH

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Abstract

The forest canopy has been described as one of the last remaining frontiers for field biologists. In the last decade forest canopy studies have been recognized as an emerging field of science. A key part of these studies are canopy access methods. Engineered solutions such as walkways, booms, cranes and rafts are difficult to implement for researchers because of prohibitive financial costs. On the other hand, tree climbing techniques permit relatively inexpensive vertical and horizontal movement that allows collection of multiple samples within canopy, even at branch tips. Based on our research experience we describe and compare the two most common rope climbing techniques: Single Rope Technique (SRT) and Double Rope Technique (DRT). SRT provides a quick and efficient method for rope ascending. Its short comings are the inability of climbing beyond entry pitch and different ascent and descent equipment sets, but most of all the limited capacity of horizontal movement within the canopy. DRT offers a simple and safe way to access tree canopies. Although it is energy intensive and slow, it will resolve every one of the mentioned disadvantages of SRT, but compared to SRT it does have its own short comings. DRT requires a clear and isolated route up the tree and the exclusive use of arborist rope. Therefore we recommend the use of SRT when accessing conifer canopies or when the subject of research is within grasp from the entry pitch (e.g. cone collecting, increment bore coring, etc.) while DRT should be used when it is necessary to achieve horizontal movement within the canopy or advance beyond the initial entry pitch (e.g. leaf sampling, collecting scions, monitoring biotic damage factors).

Keywords: *Canopy access, DRT, SRT, leaf sampling, collecting scions.*

INFLUENCE OF ENVIRONMENTAL FACTORS ON HERBACEOUS PLANT DENSITY IN A "*LEMON VERBENA*" AND ABANDONED AGROECOSYSTEMS OF GREECE

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Abstract

Lemon verbena is one of more than 30 species of aromatic shrubs in the genus Aloysia (Family: Verbenaceae) with various environmental and economic benefits. Biodiversity and especially herbaceous plants can be used as indicators of habitat quality and can provide habitat and food for faunal communities, and act as a driver of nutrient cycling. Thus, herbaceous plant composition and density are focal objectives for sustainable management, effective biodiversity conservation, and successful ecosystem restoration. The aim of the present study is to investigate the effects of environmental factors on herbaceous plant density in an organic cultivation "*Lemon verbena*" and abandoned (11 years) ecosystems. The study was conducted in April-May 2016, 2017 and 2018 of Central Greece. In total, 29 species of herbaceous plants (20 plant species in the *Lemon verbena* ecosystem and 14 plant species in an abandoned ecosystem) were recorded in the study area. The most frequently occurring plant was *Avena sterilis* (Family: Poaceae) in both types of ecosystems. Furthermore, Generalized Linear Models (GLM) highlighted the importance of ecological interactions between of the environmental factors and herbaceous plant density in an organic cultivation "*Lemon verbena*" ecosystem. The model showed that soil organic matter, P and K had significant effects on herbaceous plant density and interprets 81% of the total variation of herbaceous plant density in an organic cultivation of "*Lemon verbena*" ecosystem. This study could be utilized as a valuable tool to the scientific and agricultural community for the sustainable management in "*Lemon verbena*" ecosystem.

Keywords: *Aromatic plant, density, utilization, Environment, Greece.*

THE EFFECT OF TITANIUM DIOXIDE NANOPARTICLES ON GERMINATION AND GROWTH INDICES OF OAK ACORNS UNDER DROUGHT STRESS

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Abstract

Crisis oak decline in recent years destroyed broad sections of Zagros forestry and its existence was endangered changing the structure of forest stands in Iran. In this research, titanium dioxide nanoparticles as a potential agent to prevent the devastating effects of drought stress on oak acorns were used. The treatments included four levels of titanium dioxide nanoparticles concentrations (0, 10, 50 and 100 mg. l^{-1}) and four drought stress levels (0, -3, -6 and -9 bar). A factorial experiment based on a completely randomized design with two factors and three replications was conducted at the Institute of Biotechnologyof Karaj, Iran. Results showed that the treatment of seeds with titanium dioxide nanoparticles had a significant effect on the emergence rate of plants. The morphological traits of aerial part in treatment with titanium dioxide nanoparticles showed a significant increase compared to control. The application of 10 mg/l titanium dioxide nanoparticles at drought stress level increased the root fresh weight to 26.1% relative to the fresh weight of the control root. In drought stress treatments, with increasing tensile level, the level of all plant characteristics compared to the control treatment increased to -3 bar level and then decreased significantly. The application of 50 mg/l concentration of nanoparticles at drought stress level increased the root length by 10.33 mm in comparison with the control treatment. In general, 10 mg and 50 mg/l concentrations are the best recommendations for improving root characteristics and reducing the effect of drought stress on oak plants.

Key words: *Drought stress, Oak decline, Ilam, Physiology.*

POTENTIAL ENERGY WOOD RESOURCES IN UNDERSTOREY OF *MYRTILLOSA MEL.* FOREST SITE TYPE STANDS IN LATVIA

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Abstract

Forest resources are the most significant natural resources of the state of Latvia. According to the second stage data of Forest Resource Monitoring, in 2014, Latvia has 3575 thousand hectares of forest land, which accounts for approximately 55.3 percent of the total territory of Latvia, while the total wood stock is estimated at 668 million cubic meters. A considerable part of it can be used for energy production, thus practically providing most of the necessary heat energy, a large part of the amount of electricity, as well as the amount of energy needed to provide transport movement. In recent years, the consumption of certain woody biomass products, such as chips and pellets, has a tendency to grow, due to a number of factors: the opportunity to use its own resources, export them, the increase in international financing for renewable energy projects etc.. The fossil fuel price increases and the development of strategic and regulatory decisions contribute to this. The forest undergrowth and understorey which according of the Rules for cutting trees in forest lands are suggested partially to be preserved, contain a considerable amount of potential energy wood. In the forthcoming study on the assessment of energy wood resources, a sufficient number of plots to be established in drained forests are foreseen, in order to ascertain the exact potential of their energy extraction in the drained forest site types in the country, as they reach or are close to the cutting age. The results obtained in Myrtillosa mel. forest site type suggest that the biomass of naturally humid wood of shrubs of understorey comprises of 22 665 kg per hectare but calculated the dry mass - 12 590 kg per hectare. The results suggest that this biomass is considerable and it is reasonable to use it for energy wood extraction simultaneously with final felling.

Keywords: *Energy wood, Understorey, Myrtillosa mel. forest site type.*

THE DENDROMETRICAL INDICES OF OVERGROWN DRAINED SCOTS PINE *PINUS SYLVESTRIS* L. STANDS IN LATVIA

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Abstract

The work analyses an impact of a drainage system, established in 1939 on overgrown pine tree stand in longer period of time. For the purposes of study 14 sample plots, established by scientists K. Buss and P. Zalitis during the 50's and the beginning of 60's, were remeasured. Distance between the draining ditches was 432 m. Sample plots Nr. 1.-5. were organized in the *Myrtillosa turf. mel.*, Nr. 6., 7., 13., 14. – in *Vacciniosa turf. mel.*, and Nr. 8.-12. – in *Callunosa turf. mel*. forest site types. The number of trees in sample plots decreased due to stand ageing and natural "thinning" process. The number of trees decreased by 51%. However, current 893 trees per ha were good index to show the stability of the stand. Stands basal area increased in all compared forest site types, maximal being 41.7 m^2 ha^{-1} in *Myrtillosa turf. mel.* forest site type, according to measurements made in 2016. Average diameter and average height of a tree in the stand was also bigger in *Myrtillosa turf.mel.* forest site type plots. The stand volume in *Myrtillosa turf. mel.* in 2016 was 384.8 m^3 ha^{-1}, in *Vacciniosa turf. mel.* and it comprised 326 m^3 ha^{-1}, but in *Callunosa turf. mel.* it was 259.7 m^3 ha^{-1}. In total, the average stand volume in 2016 was 323.5 m^3 ha^{-1}. Analysis of statistical parameters showed the substantial impact by the forest site type on diameter and height of the tree. For the inventory of ground cover vegetation, the point-square method was used by using of 1 mm thin and 1 m long metallic needle. 200 points were made in each sample plot for ground cover inventory. All plants touching the needle were listed. 37 plant species from 32 ecological groups were detected at *Myrtillosa turf. mel.* forest site type plots, 26 species from 23 ecological groups – at *Vacciniosa turf. mel.*, and 23 species from 17 ecological groups – at *Callunosa turf. mel.* forest site type plots. Ellenberg indicator values, Chekanovsky similarity index and Shannon index for ground cover plants showed the changes of ground cover plant coverage caused by forest drainage. Nevertheless biological diversity of plants in the stand was preserved. Study results confirm the hypothesis: forest drainage has positive impact on overgrown Scots pine stands dendrometrical parameters and stands growing stock increase. The beneficial effect of hydrotechnical melioration continues even 50 years after reaching the cutting age. This confirms the usefulness of the use of economic age in the management of drained stands.

Keywords: *Drained forests, Scots pine, Dendrometrical indices, Tree increment.*

THE ABUNDANCE OF MICROSCOPIC FUNGI IN SOIL OF DIFFERENT TREE STANDS

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Abstract

Microscopic saprophytic fungi are dominant in forest soil, where fungal community compositions differed within tree species and soil quality. *Trichoderma* Pers. Ex Fr. are often predominant components of the soil mycobiota, where they are involved in a number of processes, like humic acid synthesis and degradation of xenobiotics and has the ability to attack or inhibit other fungi also. The abundance of microscopic fungi in the top layer of mineral soil, of 15 native and alien tree species stands of dendropark, was investigated in spring and autumn season in 2017–2018. The most abundant microscopic fungi were in *Thuja occidentalis* L., *Betula pendula* and *Larix sibirica* Lebed. stands soil and the least one in *Tilia cardata* Mill., *Fraxinus americana* L. and *Sorbus intermedia* (Ehrh.) Pers. stands soil. *Penicillum* Link and *Trichoderma* genera were found in the soil of all the considered stands. The highest number of fungal genera was identified in the soil of *Alnus glutinosa* L., *Larix sibirica* Lebed., *Thuja occidentalis* L. and the lowest in *Aesculus hippocastanum* L.) and *Quercus robur* L. The most frequent *Trichoderma* genus fungi was identified in the soil of native broad-leaf tree species stands – *Quercus robur* L., *Acer platanoides* L. and *Tilia cardata* Mill. The least number – in the soil of birch (*Betulaceae*) family and coniferous tree stands. The research results revealed that the *Trichoderma* genus fungi had a negative effect on biodiversity and general abundance of microscopic fungi in the soil of the considered tree stands.

Key words: *stands, mineral soil, microscopic fungi, Trichoderma.*

SOIL/PLANT RELATIONSHIPS IN ARCTIC AND ALPINE AREAS. A LITERATURE SURVEY.

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Abstract

A literature survey on the issue of soil/plant relationships at low temperatures showed that plant growth at low temperatures are controlled by incomplete seed maturation because of too low summer temperatures (1), winter damage on needles and bark tissue above snow cover, as a result of freezing and drying stress, due to temporarily frozen soil in spring, leading to photochemical damage on chloroplasts (2), and growth limitation at low soil temperatures because of slow uptake rates of nutrients and decomposition rates of organic nitrogen (3). This last process is particularly important because it is directly linked to growth and uptake of nutrients through the dark respiration process. In most plants the uptake of nitrate and phosphate from soil takes place against a concentration gradient and is dependent on energy from respiration, and the growth limitation is probably through the active uptake of nutrients (mostly nitrogen) in roots. The process is further dependent on nutrient content in soil and decomposition rates of organic matter. In accordance with this, a strong response in root nitrogen uptake rates have been found in birch seedlings on soil nitrogen level and temperature, and the effect of soil temperature is further amplified by its effect on microbial activity and decomposition rates. The mycorrhiza in soil is in this respect functioning as an extended root system, supplying the plants with nitrogen, in exchange with carbohydrates.

Keywords: *nutrient uptake, temperature, respiration, soil, decomposition, mycorrhiza.*

THE INFLUENCE OF THE TIME OF ORGANIC MATTER DRYING ON THE DYNAMICS OF WATER RETENTION BY FOREST SOIL ECTOHUMUS

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Abstract

The aim of the research was to determine the dynamics of water retention by spruce ectohumus (*Picea abies* (L.) H. Karst) under simulated rainfall conditions (12 mm/h), depending on the method of drying and the time of organic matter reaching the minimum values of the initial water content. Rainfall simulation was performed on soil monoliths brought to the minimum value of the initial content by 4 different methods. In variants I and II, the monoliths were dried at 35°C, while in variants III and IV they were subjected to free drying under laboratory conditions. In variants I and III, the monoliths were dried under cover, while in II and IV without cover. Comparisons of the dynamics of water retention between individual variants of experiments were conducted by dividing the course of this dynamics into two phases: I - lasting from the beginning of the experiments until a given monolith reached the maximum increase of water content, and II - lasting from the moment of reaching the maximum increase until the end of simulated rainfall. The impact of the drying time on water content increments after single rainfall was the most visible in phase I of the experiments, in which the average increments were: 0.80 mm in variant I, 0.38 mm in variants II and III, and 0.22 mm in variant IV. In phase II of the experiments, there was no influence of the time of organic matter dryingon the dynamics of water retention. The largest differences in the amount of water drained after the end of single rainfall and during drainage were found between variants I and IV of the experiments. Variant I was characterised by the lowest amount of water drained and the shortest drainage time. Variant IV was characterised by the highest amount of water drained and the longest drainage time, reaching even 360 minutes in phase II of the experiments.

Keywords: *Forest hydrology, Forest soils, Organic matter, Water retention, Picea abies (L.) H. Karst.*

THE GRADATIONAL POTENTIAL OF PINE SHOOT BEETLES *TOMICUS* SSP. (COLEOPTERA: CURCULIONIDAE: SCOLYTINAE) IN FORESTS DAMAGED BY HURRICANE-STRENGTH WINDS

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Abstract

The lesser pine shoot beetle *Tomicus minor* (HARTIG, 1834) and the common pine shoot beetle *Tomicus piniperda* (LINNAEUS, 1758) are among major pests representing the group of bark beetles in European forests. Both species are the most frequent cause of tree decay in tree stands with anadmixture of the Scots pine. The paper presents an analysis of the population potential of pine shoot beetles in tree stands disturbed by hurricane-force winds. The basis for the analysis was provided by the data from the secondary pest monitoring in the Pisz Forest Division ("Szast Referential Forest") and in the Złotoryja Forest Division in Poland affected by cyclone Kyrill. The pine tree stands located in the Maskulińskie and Pisz Forest Divisions were referred to for comparison. The collected data and analyses referred to the pine stands whichwere over 20 years old. The research methodology consisted in systematically looking for dying trees and debarking them in order to estimate the concentration and distribution of feeding areas on the tree trunk. The number of grub holes and the number of exit holes of adult insects were determined in each discovered feeding area. According to the obtained results, the areas of tree stands damaged by hurricane-strength winds are places of intensive breeding of pine shoot beetles and therefore they put in danger the adjacent tree stands. It was proved that the age of the tree stand influenced the reproductive potential of the both analysed beetle species and that the type and degree of tree stand damage were factors differentiating the threat for the adjacent tree stands.

Key words: *Hurricane, Tomicus, pine shoot beetles, population potential, reproductive potential.*

THE PROBLEM OF DEVELOPMENT OF LANDSLIDE IN THE FOREST AREA IN POLAND: AN EXEMPLE OF BLIZNE (COMMUNITY JASIENICA ROSIELNA, VOIVODESHIP PODKARPACKIE)

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Abstract

Landslides are one of the biggest natural hazard in the world. In Poland the majority of landslides are located in the southern part of country called the Carpathia Mountains. Although Jasienica Rosielna is a small community, an important national Route No 19 passes through its center. It is a part of Pan-European route called Via Carpathia. In Jasielnica Rosielne forestry is an important branch of the economy. This case study focuses on the village of Blizne, famous for its unique UNESCO monument – a wooden church from XV century. Blizne is one of the most forested areas in the community, with the area of forestation covering 39% of the village. Landslides, one of the most significant hazards for forest, cover 6% of the area (counting the valley of the Stobnica river). Thanks to the use of the modern GIS tools (ArcGis), geomorphological mapping, and orthophoto interpretation it is possible to estimate hazard for forestry production in the area. In general, trees protect the slopes from erosion, but any large and deep structural landslide can cause large losses. For this reason, it is important to evaluate the potential hazard in this area, which is especially susceptible to landslide due to intense long-term rainfall and/or the spring thaw. The area of Blizne is interesting from the geological point of view because it has rich geological structure, represented in flysch, and three nappes – Skolenappe (unit), Subsilesiannappe and Silesian nappe. The occurence of faults also raises the area's susceptibility to the landslide.

Key words: *Landslide, susceptibility, forestation, Jasienica Rosielna, Blizne.*

GROWTH VARIABILITY OF DIFFERENT SCOTS PINE PROVENANCES PLANTED IN THE CENTRAL POLAND

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Abstract

The aim of this study was to determine the growth variability of nine provenances of Pinus sylvestris experimental plots in the Central Poland (Rogów Forest Experimental Station). We selected 15 trees from each provenance, samples were taken as discs at breast height (1,3 m). The analyses were conducted using classical dendrochronological techniques. Tree-ring chronologies, basic statistics and relations climate-growth relations were developed for each provenance. The similarity between the provenances was determined (the Hierarchical Cluster Analysis, convergence GLK and correlation coefficients, t-value). The analysis was carried out for the period 1970-2015. Clustering revealed that the growth patterns were similar for all provenances, differences were small and insignificant. The highly values of the synchronicity and correlation coefficients and the normalized Euclidean distances between the provenances showed that the interannual variability of tree-ring width for all the provenances reflected the prevailing influence of the local weather conditions. Factors influencing formation of tree-ring widths hardly differed between the provenances. The main factor limiting tree-ring width was law temperature of early spring (March-April). Temperature in April determined the starting day of cambium initiation for all provenances. High summer temperatures in current year had a negative impact on tree-ring width. The role of precipitations was much smaller. However, summer drought (July-August) was a clear climatic signal. The impact of extreme summer droughts on Scots Pine of all provenances was observed in 1992, 2003 and 2013.

Keywords: *Pinus sylvestris, tree-ring, climate-growth relationships, provenances, Poland.*

VARIABILITY OF RADIAL GROWTH AND CLIMATIC SIGNALS ON DIFFERENT HEIGHTS OF THE TRUNKS OF EUROPEAN ASH IN THE POLAND

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Abstract

The research presented in this study concerns the variability of radial growth and its reactions to climate at different heights along the trunks of European ash affected by ash dieback. Samples were collected from 12 trees growing in the Southern Poland (Gidle Forest District) in the moist broadleaved forest habitat. Samples were taken as discs from the base of the trunk (at about 0,1 m), at breast height (1,3 m), at 2 m height and from 2 m up to the top. The radial growth and effect of climatic factors on wood anatomy were assessed by classical dendrochronological techniques Tree-ring chronologies, basic statistics and climate-growth relations were developed for each height. The residual chronologies correlated by response function analysis with the thermal and pluvial conditions in a 16-month period: from June of the previous year to September of the next year, when the annual ring was formed. We found an only slight variability of radial growth reactions at different heights along the trunk. Only within the crown, the growth pattern was different than the rest of the trunk. The factors determining the radial growth of ash were precipitation during the activation of the cambium in spring (April) and thermo-pluvial conditions during the most intensive cellular divisions (June). These relations were similar at each height of trunk below the crown. The response to climatic factors within the crown was weaker and different. From 1990-2013, the sensitive of ash radial growth to climatic factors was higher than from 1965-1990, what indicated a decrease of resistance of stands caused by climatic changes.

Keywords: *Fraxinus excelsior, trunk, climate-growth relationships,-ash dieback, Poland.*

INFLUENCE OF WEATHER CONDITIONS ON THE ANNUAL RADIAL GROWTH OF THE SCOTS PINE IN 2017 (CASE STUDY: PERMSKII KRAI, RUSSIA)

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Abstract

Tree-ring analysis provides an opportunity to determine climatic effects on the wood formation of tree species. This research shows influences of different geomorphological processes and forestry practices on wood formation. It allows the creation of forestry policy in different natural territories. Dendrochronology studies are widely used for tree investigations in forest and urban economies. They provide an opportunity to determine the cause of tree mortality and whether a tree was living or dead when cut by wood characteristics of the stump. This article contains research results of Scots pine (*Pinus sylvestris* L.) wood formation during the vegetation period. This research is needed for the time determination for illegal logging investigation. The wood formation studies were completed in 2017. The study areas were in the South taiga (a boreal forest) near the city of Perm and the mixed coniferous-broad-leaved forest zone (near the city of Kungur) in the western part of Ural. The studied plantations included mature and young trees. The mature stands were in different forest sites (the fresh subor (B_2) and moist subor (B_3) according to the Pogrebniak classification). The young pine trees vegetated on karstic lands of the agricultural designation. The soil of this plot was the loam grey forest soil (the forest site C_2). The weather conditions of 2017 encompassed cold temperatures and an ample quantity of precipitation in the first half of the vegetation period as well as warm temperatures and a precipitation deficit in August. The early wood cells growth in the mature trees started in the first week of June. The early wood cells growth in the young trees started on 3rd June. The cells of the mature trees started to form late wood at the end of July. The late wood of the young trees started to form at the first half of September 2017.

Key words: *dendrochronology, illegal logging, early wood, late wood, Scots pine, southern taiga, boreal coniferous forest.*

DETERMINATION OF VARIOUS SPECIES OF THE GENUS *POPULUS* TRUNK DIAMETER BASED ON THE STUMP DIAMETER: CASE STUDY PERM, RUSSIA

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Abstract

The poplar is widely used in protective and recreational plantings due to the ease of reproduction, the rate of increase and decorativeness. Often poplar trees become the object of unauthorized destruction, due to its negative qualities: brittle wood, insect and fungus infestation, annual and abundant fuzz. The destruction investigator must determine the damage cost based on the tree species and trunk diameter. On the locale, the trunk diameter will be determined by the stump diameter. This calculation is made by using a specific table. Nevertheless, there are not poplar species in that table, except the aspen. The article presents the results of a study on the poplar trunk diameter dependence on the stembase diameter. The research was done in a specially protected natural area called the «Chernyayevsky forest» in Perm. The purpose of the study was to improve the methodology for determining damage caused by illegal logging of trees (poplar) in forest and urban areas. The study on the poplar stembase formation was carried out in September 2017 in artificial plantations of the «Chernyayevsky forest». The plantation age was 60 years. The forest type of the research plantation was a pine pleurocarpous moss forest. The forest site was fresh subor (B_2) according to the Pogrebniak classification. The research data showed the trunk diameter calculation error attained one calliper scale.

Key words*: species, genus, poplar, illegal logging, poplar diameter at breast height and stump.*

RARE MACROMYCETES OF THE REPUBLIC OF ABKHAZIA (RUSSIA)

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Abstract

A great relevance of the problem of studying and conservation of biological diversity of the Earth is reflected in International Convention on Biological Diversity signed at the United Nations (UN) conference in Rio de Janeiro in 1992 by representatives of 180 countries. An important direction of solving this problem is monographic study of taxa of living organisms, the identification of globally and regionally endangered and vulnerable species and their inclusion in the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species, national and regional Red Books. Fungi as a heterotrophic component of ecosystems present an important component of global biota. In nature, the fungi decompose plant debris and are included into the humification processes. The purpose of the present paper is a survey of macromycetes in forest ecosystems of specially protected natural areas of Abkhazia. The research was carried out in broad-leaved forests, pine forests, fir-beech forests and sub-alpine birch forest, the height interval was 5 to 1980 m above sea level. In the examined forests, 237 species of fungi belonging to 139 genera, 53 families, 21 orders and 6 classes were identified. The task of the present work includes an identification of rare species of fungi, with the aim to organize further protection in conjunction with their habitat. In our studies, 62 species fall under Rare category. The list of rare species recommended for inclusion in the Red Book of the Republic of Abkhazia when preparing its publication is given in this paper. The list includes such species as *Amanita caesarea*, *Clathrus ruber*, *Pseudocolus fusiformis*, *Geastrum triplex*, *Geastrum fimbriatum*, *Cortinarius violaceus*.

Keywords: *Rare macromycetes, Republic of Abkhazia, Forest ecosystems, Red Book.*

STRUCTURE AND TREE AND BUSH SPECIES COMPOSITION OF GREEN AREA IN MICRODISTRICTS OF THE CITY PERM (RUSSIA)

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Abstract

The natural component in human life is a necessary element of its existence. It plays a particularly prominent role in the life of a city dweller. The natural components in the city are green areas. For their effectiveness, the green area should have a rational structure. Each category of green spaces fulfills its functions. For high-quality functioning, green areas should have the optimal range and stand density. Complex urban conditions lead to the death of trees and shrubs, thereby changing both the range and stand density in the plantation. Regular observing is necessary for timely monitoring of green area. The article contains information on the structure of green area and the diversity of species composition of plantations in the public area in the "Staroplotsky" and "Daniliha" Microdistricts, Perm (Russia). The percentage of landscaping of the territory is 24.2% of the total area in the Microdistricts (692583 m^2). In the greening of the Microdistricts there are green areas of three categories: public (9%), restricted use areas (86%), and special purpose areas (5%). In green area of public use, 89% is occupied by the area of street greening. In the greening of public areas, 11 species of trees and 4 species of bushs are used. Among the trees of street greening, poplars (24%) and ash-leaved maple trees (32%) prevail.

Keyword: *Categories of green area, Green public area, Assortment, Urbanized environment, Structure of green area.*

ECOLOGICAL-COENOLOGICAL VITALITY OF BLACK PINE ON ABITATS OF DIFFERENT TYPES OF FORESTS IN THE PARK-FOREST "KOŠUTNJAK" IN BELGRADE, SERBIA

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Abstract

Park forest "Košutnjak" is located in the urban area of Belgrade and marks the transition between Pannonian and submountain-mountain region in terms of orographic-edaphicmeaning which makes it specific in structured content of floral-geographical and ecological-typological elements. As a result, vegetation and soil typological structure is very pronounced. Primary typological composition makes up a large number of primary defined types of forest. Artificially established stands represent a significant share of the total area of this park forestoccurring in the habitat of various types of forests. Black pine in the park-forest "Košutnjak"occupies the largest area on habitats of the following typological affiliation: - Turkey oak, Sessile oak and hornbeam forests (*Carpino-Quercetum petraeae-cerridis typicum*) on cambisol; -Turkey oak and oak of Virgil with black ash (*Orno-Quercetum cerris-virgilianae typicum*) on shallow to deep pararendzina on loess (drycambisol). Research of ecological and coenological vitality of black pine at the age of 50years on the forest habitat types listed above showed that black pine on habitat of forest types of Turkey oak, Sessile oak and hornbeam (*Carpino-Quercetum petraeae-cerridis typicum*) on cambisol achieved faster growth but with significantly reduced ecological-coenological vitality, respectively. The progressive succession lead to moredynamic replacement with species of primary type of forest in relation to habitat of Turkey oak and oak of Virgil with black ash (*Orno-Quercetum cerris-virgilianae typicum*) on pararendzina (dry cambisol).

Key words: *black pine, forest type, ecological vitality, coenological vitality.*

ECOLOGICAL AND COENOLOGICAL VITALITY OF COMMON OAK IN HABITATS OF DIFFERENT TYPES OF FORESTS IN THE PARK-FOREST "KOŠUTNJAK" IN BELGRADE, SERBIA

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Abstract

The largest areas of artificially established stands of Common oak on secondary habitats in the Park-forest "Košutnjak" are located on two types of primary forests: - Turkey oak, Sessile oak and hornbeam forests (*Carpino-Quercetum petraeae-cerridis typicum*) on cambisol; -Turkey oak and oak of Virgil with black ash (*Orno-Quercetum cerris-virgilianae typicum*) on shallow to deep pararendzina on loess (drycambisol). On habitats of Turkey oak, Sessile oak and hornbeam forests (*Carpino-Quercetum petraeae-cerridis typicum*) on cambisol, at the age of 50, artificially established stands of Commonoak have a complete canopy. Average stand height in this age is 18.5 m, and average stand diameter is 35 cm. On habitats of forest of Turkey oak and oak of Virgil with black ash (*Orno-Quercetum cerris-virgilianae typicum*) on shallow to deep pararendzina on loess (dry cambisol), at the age of 50, artificially established stands of Common oak have thinned canopy, with noticeable and dynamic progressive succession. Average stand height at this age is 12.3 m and average stand diameter is 20 cm. Common oak in these forest types have a significantly different ecological andecological-coenologic alvitality and adaptability. Common oak on forests habitat of xeromezophilic character, (*Carpino-Quercetum petraeae-cerridis typicum*) on cambisol, achieved significantly higher production effects and ecological-coenological vitality and more optimal functional durability in relation to the type of forest of xerothermic character-Turkey oak and oak of Virgil with black ash (*Orno-Quercetum cerris-virgilianae typicum*) on shallow to deep pararendzina on loess (dry cambisol).

Key words: *common oak, forest type, ecological vitality, coenological vitality.*

VARIABILITY OF MORPHOMETRIC TRAITS OF SEED AND SEEDLINGS OF DIFFERENT GENOTYPES OF PEDUNCULATE OAK (*QUERCUS ROBUR* L.)

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Abstract

This paper presents the results of the morphometric analysis of seed and one-year-old seedlings of different genotypes of Pedunculate oak (*Quercus robur* L.). The seed was collected in the pure stand of Pedunculate oak with 10 mother trees which are minimum 50 meters away from each other. The length, width and weight of the acorn have been measured on the sample of 50 acorns per tree and based on the measured values of the length and the width the volume and the shape index of the acorn have been calculated. The collected seed was planted in the seedling nursery of the Institute of Forestry in Belgrade (Serbia) and the seedlings were produced in equable environmental conditions. At the end of the first vegetation season the root collar diameter and the height of the seedlings were measured on the random sample of 50 seedlings per mother tree, and on the basis of the measured values the ratio height : root collar diameter was calculated. The detailed data on morphometry and variability of several traits of seed and seedlings have been presented using the comparative analysis of 10 mother trees. On the basis of the obtained statistical parameters it can be concluded that the genetic variability exists both within and between analyzed mother trees. The analysis of variance for a single factor (One-Way ANOVA) was performed for the purpose of determination of existence of the statistically significant differences for all observed traits. The results of the analysis of variance showed that there are statistically significant differences between studied mother trees for the observed morphometric traits. The obtained results contribute to acquiring knowledge on analyzed traits, give preliminary assessment of the genetic variability of the studied mother trees and represent a good start point for future researches of the species breeding; the results can also be used for the improvement of the production of good quality raw material of Pedunculate oak.

Keywords: *Pedunculate oak, seed, seedlings, morphometry, variability*.

MACROELEMENT CHANGES IN *DIOSPYROS KAKI* L. ALONG AN ALTITUDINAL GRADIENT

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Abstract

Leaves are the best organs reflecting nutritional status of plants and leaf analysis is an important method used to determine the nutritional levels of plants. Leaf N and P concentrations are two of the key leaf traits which play crucial roles in ecosystem function and dynamics. In addition to these elements, carbon is also necessary for plant growth and development. The objectives of this study were a) to examine whether there was or there was not difference in use of macronutrient elements in deciduous species *Diospyros kaki* L., b) to show annual change of N, C and P dynamics according to altitudinal gradient and growing period, c) to determine the reasons of this change. For this purpose, Maçka district in Trabzon province was selected as a study area and the leaves collected along an elevation gradient (170, 344, 485 and 796 m). From these chosen localities, leaves were monthly collected from May to December 2015. The leaf samples were dried at 60°C until the constant weight. N and C concentrations by Dumas method and P concentration by the stannous chloride method were determined. Leaf N, C and P (g dm^{-2}) contents were calculated with the formulas. There were only significant differences ($P < 0.01$) for leaf N (%) and N (g dm^{-2}) values of *Diospyros kaki* along with the altitudinal gradient. Leaf N, C and P (%), N and P (g dm^{-2}) values of *Diospyros kaki* showed statistically significant differences ($P < 0.01$) among all months. The highest N and P (g dm^{-2}) contents were at 344 m in September and the lowest N and P (g dm^{-2}) contents were at 485 m in May, respectively. The highest P, N and C (%) concentrations were at 344 and 796 m, the lowest N, C and P (%) were 485, 344 and 170 m, respectively. The highest and lowest N and P (%) were in May and December, respectively. The highest C (%) was in December, the lowest C (%) was in July. Based on the obtained data, leaf macroelement values significantly changed along with the altitudinal gradient during the growing season.

Keywords: *Altitude, Macroelement, Diospyros kaki, Trabzon, Turkey.*

DETERMINING EFFECT OF ROAD, SLOPE AND WATER SOURCE FACTOR ON VEGETATION DENSITY USING GEOGRAPHIC INFORMATION SYSTEM IN AHIR MOUNTAIN RANGELANDS OF KAHRAMANMARAS CITY (TURKEY)

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Abstract

Uncontrolled and over-grazing on rangelands lead to decrease in value of plant-covered area and change in botanical composition. Overgrazing results from grazing more livestock than grazing capacity of rangelands. In this study, effects of factors such as roads, slope and water sources considered to cause overgrazing on vegetation were determined by using remote sensing techniques and geographic information systems in rangeland of Ahır mountain located in Kahramanmaras city (Turkey). Vegetation density was determined with the help of NDVI (Normalized Difference Vegetation Index) derived from landsat satellite image in this study. Road, slope and water source maps were generated by using geographic information systems. According to results, it was found that vegetation density changed based on roads, slope and water sources.

Key words: *Rangeland, Remote sensing, Overgrazing, NDVI.*

TEMPORAL CHANGE IN WATER QUALITY IN KAHRAMANMARAS (TURKEY) DELI CAY STREAM WATERSHED

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Abstract

Water is a vital source of various activities such as sustainable agriculture, industry, energy supply, transportation and tourism meeting basic needs of human beings as well. Available water supplies in nature vary from time to time and spatially. Water amount is constant, whereas water distribution is nonuniform in the world. Water sources have become even more important in especially poor regions due to increase in water demand, pollution and climate change. Therefore, monitoring and analyzing water quality is essential for an effective water resource management. In this study, monthly changes in water quality were examined. For this purpose, some water quality parameters (pH, electrical conductivity, dissolved oxygen, total dissolved solid, temperature, turbidity, Fe, Ca, Si, Zn, Mn, Mg, Al, Na and K) were monitored in February, March, April and May. Four () repetitive measurements were performed twice a month. Temporal changes in the water quality parameters were revealed according to results. For example, it was determined that dissolved oxygen value was 9.56 mg/l in February, while it was 7.25 mg/l, 2.75 mg/l and 3.27 mg/l in March, April and May respectively.

Key words: *Water quality, Temporal change, Deli Cay stream watershed.*

OPTIMIZATION OF THE BIOCHEMICAL AND OPTICAL METHODS FOR THE DETERMINATION OF CHLOROPHYLL CONTENTS IN SESSILE OAK TREES

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Abstract

It has been reported by many scientists that there is a strong positive correlation between chlorophyll content, SPAD values and chlorophyll fluorescence (CFR: F735/F700) values. There are many methods and devices developed for the determination of leaf chlorophyll content. The main purpose of this study was to reveal the relationship between the results of conventional biochemical chlorophyll content measurements and portable optical chlorophyll content meters values. This study was carried out on a subspecies of the sessile oak (*Quercus petraea* (Mattuschka) Liebl. subsp. *iberica* (Steven ex Bieb.) Krassiln.). It was aimed to determine the relationship between chlorophyll content values obtained by chlorophyll extraction method using 80% acetone and the data obtained from optical chlorophyll content measuring devices SPAD-502Plus and CCM-300. In order to determine this relationship, measurements were made on a total of 44 leaves. It was determined that the results of all three measurement types showed a strong correlation. As a result of the regression analysis, various equations were formed in order to convert the obtained SPAD and CFR values to the data obtained from the acetone extraction method. When the equations with the highest r^2 values were examined, it was seen that all the calculations made per unit area (mg/cm^2) gave better results than the calculations made per fresh weight (mg/g). As a result of the studies, the highest r^2 value was obtained when the total chlorophyll content per unit area was related to SPAD ($r^2 = 0,9367$).

Keywords: *Acetone, CCM-300, Chlorophyll Content, Sessile Oak, SPAD-502Plus.*

MODELING SOIL THERMAL PROPERTIES IN A ULUDAĞ FIR AND SCOTS PINE MIXED STANT

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Abstract

Modeling soil thermal properties in plant canopies is difficults as plant cover affects the amount of solar radition on soil surface as well as heat flow and storage in the soil profile. Thermal diffusivity of soils (κ) is a function of soil specific heat capacity (C_m) and soil heat conductivity (λ) and it shows a non-linear change from the surface towards the lower layers depending on soil heat conductivity and volumetric heat capacity (C_v). In this study, the performance of layer, point1, and point2 methods were compared to predict thermal diffusivity (κ) in a Uludağ fir (Abies bornmulleriana) –Scots pine (Pinus sylvestris) mixed stand in Ilgaz reservation area located in North Cental Anatolia of Turkey. Soil temperature was measured with water-proof portable thermal sensors (Thermochro the iButton DS1921G) placed at 5, 10, 15, 20, 30, 40, and 50 cm soil depths. Surface parameters τ_0 (average temperature at soil surface), τ_a (wave amplitude), and ε (phase angle) are found as τ_0: 15.43, τ_a: 3.38, and ε: 2.01. The mean values of κ for Layer, Point1, and Point2 methods were $2.464.10^{-7}$, $3.37.10^{-7}$, and $2.01.10^{-7}$ m^2 s^{-1}, respectively. The performance of methods to predcit κ was compared by criteria of correlation coefficients and relative mean squared error between measured and predicted temperature values. Point1 and Point2 methods outperformed the Layer method, suggesting that the Point methods can be preferred over the Layer method in modeling thermal properties in similar forest canopies.

Keywords: *Soil thermal properties, soil thermal diffusivity, heat conductivity, layer method, points methods.*

EFFECTS OF CLIMATE CHANGES ON INSECTS

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Abstract

Insects are more affected by climatic factors than warm-blooded animals. Climatic parameters are defined as the dominant abiotic factor directly and indirectly affecting insects; they have great importance on insect population dynamics through viability, development rates, fertility, geographic distribution and modulation of insect metabolism. Quantitative changes in a number of parameters such as moisture, rainfall, periodic repetition, solar radiation, increased CO_2, O_3, and ultraviolet light levels causes an increase in temperature, and because of being ectothermic organisms; the insects are very sensitive to these high temperatures. Many scientists foresee that world's temperature will increase from 1.0 °C to 3.5 °C by the year 2100. Invertebrates will react very rapidly to this increase in world warming. Temperature thresholds usually limit the distribution of species. As well as facilitating the establishment and dissemination of introduced alien species; climate warming is seen to play an increasingly significant role in triggering population-driven increases in indigenous species. In addition to causing some complex effects on insect populations, global warming also influences everything related to the organisms such as host plants, natural enemies, competitors.The effects of climate changes are complicated response to the average increase in temperature. Although insects' responses may differ depending on climate season and bioclimatic regions, the major responses are earlier flight periods, acceleration of development rates and improved winter survival. Slow response of insects and their hosts to global warming may also cause impaired phenological synchronicity, but adaptive genetic processes will probably renew this synchronization rapidly. In some cases, warming results in the removal of boundaries that limit the range of existing species or the replacement of their locations; and this situation is likely to make possible the establishment and spreading of invasive alien species.

Keywords: *Climate change, Insect pests, Insect populations, Alien species.*

INVASIVE INSECT SPECIES INTRODUCED IN TURKEY IN RECENT YEARS

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Abstract

An invasive species is a plant, fungus, or animal species that is not native to a specific location but come from outside the region in different ways, and that has a tendency to spread to a degree believed to cause damage to the environment, human economy or human health. Invasive species adversely economically, environmentally, or ecologically affect the habitats and bioregions. If many exotic plants and animals succeed to settle in a new ecosystem that they are not naturally found, they become invasive species. Many organisms pass from one ecosystem to another due to the development of trade and transportation routes. The increase in importing of the plants and wood material in the recent years has been causing the presence of these invasive species in Turkey. The ways where these pests are introduced vary broadly, but they are often the consequence of accidental or deliberate human activities. Whatever their means of arrival, invasive species can have an adverse and often very damaging impact on agriculture, forestry, the natural environment and human lifestyle. Although some impacts such as the loss of economic values can be clearly quantified, the others including environmental impacts (e.g. loss or change of biodiversity), impingements on human lifestyle, and amenity losses are not easy to quantify. Turkey is like a bridge between Europe and Asia in international trade, so the risk of transmission of invasive species is very high. In recent years, many invasive insect species had entered into Turkey in various ways and these pests have caused great damage on many forest trees and ornamental plants. If we order these entries chronologically; it will be as follows: In 1960s *Dendroctonus micans* (Great spruce bark beetle) on Picea (spruce) trees, in 2005 *Rhynchophorus ferrugineus* (Red palm weevil) on Phoneix and palm (palm) trees, in 2009 *Corythucha ciliata* (Sycamore lace bug) on Platanus (oriental plane) trees, in 2009 *Leptoglossus occidentalis* (Western conifer seed bug) on Pinus (pine) trees and mainly on *Pinus pinea* (stone pine), in 2012 *Cydalima perspectalis* (Box tree moth) on Buxus (boxwood) trees, in 2014 *Anoplophora chinensis* (Citrus longhorned bettle) on Acer (maple) trees and in 2014 *Dryocosmus kuriphilus* (Chestnut gall wasp) on Castanea (chestnut) trees.

Keywords: *Invasive species, damage, Turkey.*

PREDICTING THE FUTURE DISTRIBUTION OF *PITYOGENES BISTRIDENTATUS* EICHOFF, 1878 (COL.: CURCULIONIDAE, SCOLYTINAE) IN THE MEDITERRANEAN BIOGEOGRAPHICAL REGION OF TURKEY IN RESPONSE TO CLIMATE CHANGE

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Abstract

Climate change is the most important global environmental issue today. Effects of climatic changes are already evidentfrom rising temperature and also changes on the distributions of a lot of species. *Pityogenes bistridentatus* Eichoff, 1878 is an important bark beetle species for black pine (*Pinus nigra* Arnold) forests of Mediterranean and Aegean Regions of Turkey. This species is bivoltine in these black pine stands and sometimes become problematic for forestry. This study aimedat development of modelof the future (2070) distribution of the species according to two different global climate change scenarios. GPS data of collected specimens of *P. bistridentatus* were recorded during field studies that were conducted between 2008 and 2017. Current and future potential distribution areas of the species were determined usingmaximum entropy modeling. RCP 4.5 and RCP 8.5 emission scenarios reported in IPCC5 were used to model the future potential distribution of the species. As a result of the study, it was determined that the species distributed on the Black pine (*Pinus nigra*) forests throughout the Mediterranean and the inner part of the Aegean region of Turkey at the present time. It was estimated for 2070, that the distribution areas would become narrow and main distribution would be in the middle and eastern parts of the Mediterranean region of country according to both emission scenarios: RCP 4.5 and RCP 8.5. Despite the estimated shrinkage of the species' distribution,it may still be a potential pest that causes economic damage to black pine fields in the coming period.

Keywords: *Pityogenes bistridentatus, Maxent, Pinus nigra, climate change, future prediction, modeling.*

EFFECT OF SOIL COMPACTION ON SOME SOIL PROPERTIES IN AHIR MOUNTAIN RANGELAND OF KAHRAMANMARAS CITY (TURKEY)

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Abstract

Rangelands play an important role in soil and water protection, natural beauty, biodiversity, wildlife, organic and inorganic matter change apart from meeting roughage need. So, these areas have been one of human being occupations since time immemorial. This situation has caused some problems such as uncontrolled and over-grazing, degradation of vegetation structure and decrease in productivity. Besides, overgrazing leads to decrease in vegetation density and change in soil physical properties. Soil compaction causes both degradation of soil physical quality and decrease in infiltration rate. In this study, effects of soil compaction on some soil properties were investigated. For this purpose, 3 different areas namely pathway, closure (reclamation area) and grazing area were selected in rangelands of Ahır mountain. Total of 360 penetration measurements, 120 for each area, were performed. Penetration measurements were performed at depth of 5, 10, 15 and 20 cm. In order to determine soil properties such as bulk density and water holding capacity, 12 undisturbed soil samples were alsotaken from each area. According to results, it was determined that pathway had the highest compaction value in the study area.

Key words: *Soil compaction, rangeland, soil properties.*

AN INVESTIGATION ON SOME HYDROLOGICAL, PHYSICAL AND CHEMICAL PROPERTIES OF SOIL UNDER DIFFERENT STAND TYPES

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Abstract

In this study carried out in Kahramanmaras-Baskonus Research Forest (Turkey), changes in some hydrological, physical and chemical properties of soil under different stand types were investigated. For this purpose, we selected five different stand types (oak+beech, beech+black pine, black pine, cedar and cedar+black pine) to take soil samples. Total of 40 soil profiles, 4 soil profiles for each stand type, were determined in the study area. Soil samples were taken from depth at0-20 cm and 20-50 cm in each soil profiles.Thirteen soil properties namely, texture, dispersion ratio, moisture equivalent, wilting point, available water, permeability, porosity, water holding capacity, bulk density, particle density, pH, loss on ignition and electrical conductivity were analyzed. According to results, it was determined that the highest maximum water holding value (41.73%) was found in oak+ beech stand, while the organıc matter value (8,96%) and the highest dispersion ratio value (76.87%) were found in cedar and cedar+blackpine stands respectively.

Key words: *Soil properties, stand type, baskonus forest.*

MONITORING OF TREE SPECIES IN THE FOREST BY USING REMOTE SENSING

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Abstract

Nowadays, the use of remote sensing and its terrestrial components in forestry has become very popular. Detecting tree species in the forest, damaged trees, and damaged trees in a forest fire includes remote sensing study issues in forestry. In this study, remote sensing was used in order to detect tree species in the forest. The study was carried out in Çorum region in Turkey. Leaf samples were taken from 13 tree species in this scope. Spectroradiometer measurements were performed of the samples in order to obtain reference spectra for each tree species. Statistical analysis of each measurement was made and the reference end members required for classification were obtained. Landsat 8 was used as satellite image. The atmospheric and radiometric corrections of the image were made to eliminate errors in the image. Spectroradiometer measurements were then resampled to the Landsat 8 satellite image band intervals and made ready for classification. After all these processes, a spectral classification was made and the tree species in the forest were detected on the satellite image.

Keywords: *Remote sensing, Spectral classification, Forestry, Tree species.*

INCENTIVES FOR INDEGENOUS CONSERVATION OF FORESTS: A CASE OF SHAMVA, ZIMBABWE

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Abstract

Zimbabwe underwent a resettlement programme to address the imbalance in land access. It is hypothesized that the resettlement programme exacerbated deforestation in Zimbabwe. Existing research on resettlement has focused mainly on gender, land tenure, productivity and livelihoods. Less attention has been paid on issues concerning farmer perception on incentives offered by management organizations and the factors influencing the farmer perceptions of the incentives offered in resettlement areas. A survey was conducted in Shamva, Zimbabwe. A sample of 247 respondents were randomly selected and stratified as 98 A1 farmers, 50 A2 farmers and 99 Old resettled farmers. The data was collected using structured questionnaires, interviews and observations. The study identified, described and quantified various management organizations and activities in Shamva district. The study analyzed farmer perceptions of the management organizations by generating management satisfaction rankings. Binary regression analysis was used to analyze factors influencing the overall satisfaction rankings. The results indicated that socio economic factors were not significant in explaining the level of satisfaction ranking in A2 farmers but they were significant in A1 and Old resettlement areas. Policy recommendations were made in respect to the result of satisfaction ranking of management organizations and activities and the factors influencing these perceptions on incentives offered by the organizations.

Keywords: *deforestation, resettlement, organization, incentives, Zimbabwe.*

PHYTOCHEMICAL ANALYSIS OF *GYRINOPS WALLA* AND COMPARISON WITH *AQUILARIA MALACCENSIS*

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Abstract

Agarwood is a fragrant dark resinous wood formed in the heartwood of *Aquilaria* sp. (Thymelaeaceae), especially in *A. malaccensis*. The aromatic resin, agarwood, is used for the world's most expensive perfumes. *Gyrinops walla* (Thymelaeaceae) is an evergreen tree which grows in wet zone regions in Sri Lanka. Recently, it has been identified that *G. walla* possesses agarwood producing ability, which is similar to other species in family Thymelaeaceae. The objective of the present study was to preliminary identification of phytochemicals present in *G. walla* and to compare them with *A. malaccensis* which was the true agarwood resin forming species. Air dried coarse powders of different stem samples and leaf sample of *G. walla* and a stem sample of *A. malaccensis* were used and phytochemicals were extracted with each sample using soxhlet extractor with dichloromethane at 70 °C. After extraction, solvent was evaporated under reduced pressure and crude was re-dissolved in ethyl acetate for the phytochemical screening, using GC-MS. An external standard method was used to identify peaks and analyte concentrations in the chromatogram. From the stems, sixteen phytochemicals were identified in *A. malaccensis* and thirteen were found in *G. walla* all presented in agarwood resin. Out of those, nine compounds were found to be common in both species. Also, few important phytochemicals were identified from *G. walla* leaves. Therefore, *G. walla* could be confirmed as a species with significant influence on social, economic and natural environment in Sri Lanka and globally as an alternative of expensive agarwood resin for perfumery industry.

Key words: *Agarwood, GC-MS, Phytochemicals, Thymelaeaceae.*

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