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## ALFALFA QUALITY UNDER THE INFLUENCE OF FERTILIZATION UNDER CONDITIONS OF MOLDAVIAN FOREST STEPPE

### CALITATEA LUCERNEI SUB INFLUENȚA FERTILIZĂRII ÎN CONDIȚIILE DIN SILVOSTEPA MOLDOVEI

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**Abstract:** The research conducted during 2011-2012, on the Ezăreni farm, has sought influence of fertilization on the leaves/stems ratio, crude protein content (CP), neutral detergent fiber content (NDF), acid detergent fiber content (ADF) and relative feed value (RFV), of alfalfa (*Medicago sativa* L.) in the second and third year of vegetation, at the first cut. The studied experimental plots were v<sub>1</sub>- unfertilized (control plot), v<sub>2</sub>-N<sub>50</sub>P<sub>50</sub>, v<sub>3</sub>-N<sub>75</sub>P<sub>50</sub> and v<sub>4</sub>-30 t/ha manure). The results showed that the fertilization negatively affected crude protein content of plants. Although the protein content of leaves was higher and that of stems was less affected, the leaves/stems ratio decided this indicator for plant production. Organic fertilization showed a highly significant positive effect on the content of plant leaves and stems in NDF and ADF.

**Key words:** fertilization, CP, NDF, ADF, RFV

**Rezumat:** Cercetările efectuate în perioada 2011-2012, în cadrul Fermei Ezăreni, Iași, au urmărit influența fertilizării asupra raportului frunze/tulpini, a conținutului în proteină brută (PB), a conținutului în fibre detergent neutru (NDF), a conținutului în fibre detergent acid (ADF) și a valorii furajare relative (RFV), la lucernă (*Medicago sativa* L.), în anii II și III de vegetație, la coasa I. Variantele de fertilizare studiate au fost v<sub>1</sub>-nefertilizat (variantea martor), v<sub>2</sub>-N<sub>50</sub>P<sub>50</sub>, v<sub>3</sub>-N<sub>75</sub>P<sub>50</sub> și v<sub>4</sub>-30 t/ha gunoi de grajd). Din analiza rezultatelor obținute s-a observat că fertilizarea minerală a influențat negativ conținutul în proteină brută din plante. Chiar dacă conținutul frunzelor în P.B. a fost mai mare, iar cel al tulpinilor a fost puțin influențat, raportul frunze/tulpini a decis valoarea acestui indicator în cazul producției de plante. Fertilizarea organică a manifestat un efect pozitiv foarte semnificativ asupra conținutului plantelor, frunzelor și tulpinilor în NDF și ADF.

**Cuvinte cheie:** fertilizare, PB, NDF, ADF, RFV

Alfalfa (*Medicago sativa* L.) is one of the species with a high quality potential.

Evaluating the amount of crude protein produced per unit area, alfalfa can not be surpassed by any other forage crop in specific climatic conditions of our country.

Productivity and quality of alfalfa is directly dependent on soil conditions, climatic conditions and cropping technology.

Like any other crop, the ability to control the impact factors on the quality of alfalfa, will be found in harvested product quality.

The leaves/stems ratio is an important quality indicator because quality alfalfa depends on it. Percentage of leaves is desirable to be as high, the reason being that the leaf protein content is at least double the stems, as shown by many authors

(Orloff S.B. and Putnam D.H., 2007; Petkova D. and Panayotova G., 2007). For this reason, breeders aim to breed varieties with a higher number of internodes and a smaller height. Thus, for this purpose were created multifoliate varieties (Schitea Maria and Varga P., 2007; Tyrolová Y. and Vybourná A., 2008).

#### MATERIAL AND METHODS

The research was conducted in 2011 and 2012 (March-October), on the Ezăreni farm (47°05'-47°10' North latitude and 27°28'-27°33' East longitude), farm belonging to the University of Agricultural Sciences and Veterinary Medicine Iași. The soil from the region is a cambic chernozem characterized by the indicators presented in *tab.1*.

Research has sought influence of fertilization on some quality indicators (leaves/stems ratio; CP -



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crude protein content; NDF - neutral detergent fiber content; ADF - acid detergent fiber content; RFV - relative feed value), of alfalfa (*Medicago sativa* L.), during the second and third growing season at the first cut.

The research was conducted in a randomized

plots experiment, in three replications, which have a 10 m<sup>2</sup> harvesting area (2m x 5m).

The studied factor was fertilization with four variants as follows: v<sub>1</sub>-unfertilized, v<sub>2</sub>-N<sub>50</sub>P<sub>50</sub>, v<sub>3</sub>-N<sub>75</sub>P<sub>50</sub> and v<sub>4</sub>-30 t·ha<sup>-1</sup> manure.

Table 1

Physico-chemical characteristics of soil that was placed experience

Horizon	Clay (<0.002)	pH	Humus (%)	N total (%)	P-Al (ppm)	K mobile (ppm)	Ca exch. (me)
Ap 0-20 cm	41.8	6.68	2.24	0.178	26.00	242	15.21
Atp 20-28 cm	38.8	6.78	2.40	0.149	10.43	178	15.38

The leaves/stems ratio was determined by separating the stem, leaflets, buds and flowers by the stem, weighing them separately and report their amount to the amount of strain (leaves/stems ratio).

Nitrogen content was determined by Kjeldahl method, and NDF and ADF content were determined by Van Soest method.

RFV was calculated using the formula (Sheaffer C.C. et al., 1995; Boman R. L., 2010):

$$RFV = \frac{88.9 - (0.779 \cdot ADF) \cdot \frac{120}{NDF}}{1.29}$$

Depending on the content CP, NDF, ADF and RFV, alfalfa hay can be classified into six quality classes (tab.2), used by many authors (Kiraz A.B., 2011; Redfearn D. and Zhang H., 2011).

Table 2

Quality standards of grasses, legumes and grasses-legumes mixtures

Quality standard	CP	NDF	ADF	RFV
	(% from DM)			
0-Prime	>19	<40	<31	>151
1	17-19	40-46	31-40	125-151
2	14-16	47-53	36-40	103-124
3	11-13	54-60	41-42	87-102
4	8-10	61-65	43-45	75-86
5	<8	>65	>55	<75

The biological material used was represented by Sandra alfalfa variety (F 660-94) registered in 2003 to I.N.C.D.A. Fundulea. (Schitea Maria and Martura T., 2004).

Manure used had the following chemical composition: N-0.445%, P<sub>2</sub>O<sub>5</sub>-0.212% and K<sub>2</sub>O-0.695%.

Fertilizers were applied, and incorporated into the soil before seeding. Harvesting was performed with Bertolini 411 harvester, at a height of 7 cm from the ground.

The results were interpreted statistically by analysis of variance and calculation of least square difference (LSD).

## RESULTS AND DISCUSSION

Alfalfa crop fertilization is an important factor, which production is dependent on, especially production quality. In this case mineral and organic fertilization showed a different impact on quality indicators. The leaves/stems ratio (indicator which depends on the quality of alfalfa) was not significantly affected by organic fertilization. In contrast, mineral fertilization resulted in a higher proportion of strains. In the field it is easy to see, alfalfa plants in mineral fertilized variants were higher with longer internodes and a larger diameter but with the same number of floors of leaves.

Crude protein content of plants was negatively influenced by mineral fertilization. Although the CP content of leaves was higher and that of strains was less affected, leaves/stems ratio decided the value of this indicator for plant production (tab.3, tab.4).

Organic fertilization showed a highly significant positive effect on the content of plant leaves and stems in NDF and ADF. The same trend was manifested in mineral fertilization except in NDF and ADF strains content, where the values obtained had the same meaning, but were negative.

Relative feed value of alfalfa plants and leaves was influenced distinct and very significant to all variants of fertilization. Mineral fertilization significantly improved the relative feed value stems.

The forage obtained in the 2-year study, was classified as class three which means medium quality (tab.3, tab.4).



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Table 3

## Influence of fertilization on the quality of alfalfa in 2011, the first cut

Analyzed indicator		Fertilization variant				LSD 5 %
		v <sub>1</sub> - unfertilized (control)	v <sub>2</sub> - N <sub>50</sub> P <sub>50</sub>	v <sub>3</sub> - N <sub>75</sub> P <sub>50</sub>	v <sub>4</sub> - 30 t·ha <sup>-1</sup> manure	
Leaves/stems ratio		0.50	0.44 <sup>o</sup>	0.41 <sup>o</sup>	0.50	0.03
CP content (% from DM)	leaves	31.0	31.2*	31.3*	31.2*	0.1
	stems	14.3	14.2 <sup>o</sup>	14.4*	14.2 <sup>o</sup>	0.1
	whole plant	20.5	20.0 <sup>o</sup>	19.7 <sup>o</sup>	20.6*	0.1
NDF content (% from DM)	leaves	26.9	27.8*	28.7*	27.6*	0.1
	stems	67.2	66.3 <sup>o</sup>	66.4 <sup>o</sup>	67.9*	0.2
	whole plant	53.9	55.7*	57.3*	55.5*	0.1
ADF content (% from DM)	leaves	21.1	21.9*	22.7*	21.7*	0.2
	stems	57.1	56.1 <sup>o</sup>	56.1 <sup>o</sup>	57.7*	0.2
	whole plant	45.8	47.6*	49.1*	47.4*	0.2
RFV	leaves	252	241 <sup>o</sup>	231 <sup>o</sup>	243 <sup>o</sup>	2
	stems	62	64*	64*	61	2
	whole plant	93	88 <sup>o</sup>	83 <sup>o</sup>	88 <sup>o</sup>	2
Quality standard	leaves	0	0	0	0	
	stems	5	5	5	5	
	whole plant	3	3	3	3	

Table 4

## Influence of fertilization on the quality of alfalfa in 2011, the second cut

Analyzed indicator		Fertilization variant				LSD 5 %
		v <sub>1</sub> - unfertilized (control)	v <sub>2</sub> - N <sub>50</sub> P <sub>50</sub>	v <sub>3</sub> - N <sub>75</sub> P <sub>50</sub>	v <sub>4</sub> - 30 t·ha <sup>-1</sup> manure	
Leaves/stems ratio		0.58	0.50 <sup>o</sup>	0.47 <sup>o</sup>	0.58	0.02
CP content (% from DM)	leaves	30.6	31.2*	31.5*	31.1*	0.3
	stems	12.5	12.1 <sup>o</sup>	11.8 <sup>o</sup>	11.5 <sup>o</sup>	0.2
	whole plant	19.1	18.5 <sup>o</sup>	18.1 <sup>o</sup>	18.6 <sup>o</sup>	0.2
NDF content (% from DM)	leaves	29.1	30.1*	31.0*	29.8*	0.2
	stems	69.3	68.3 <sup>o</sup>	68.5 <sup>o</sup>	68.9 <sup>o</sup>	0.2
	whole plant	54.7	55.7*	56.5*	54.8	0.2
ADF content (% from DM)	leaves	22.8	23.6*	24.4*	23.4*	0.2
	stems	58.8	58.0 <sup>o</sup>	58.1 <sup>o</sup>	58.5	0.4
	whole plant	45.7	46.6*	47.2*	45.7	0.2
RFV	leaves	228	218 <sup>o</sup>	210 <sup>o</sup>	221 <sup>o</sup>	3
	stems	58	60*	60*	59	1
	whole plant	92	89 <sup>o</sup>	87 <sup>o</sup>	92	2
Quality standard	leaves	0	0	0	0	
	stems	5	5	5	5	
	whole plant	3	3	3	3	



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## CONCLUSIONS

Mineral and organic fertilization showed a different impact on quality indicators; the leaves/stems ratio (indicator which depends on the quality of alfalfa) was not significantly affected by organic fertilization; mineral fertilization resulted in a higher proportion of stems.

Crude protein content of plants was negatively influenced by mineral fertilization, even if crude protein content in leaves was higher and that of stems was less affected, leaves/stems ratio decided this indicator.

Organic fertilization showed a significant positive effect on the content of plant leaves and stems in NDF and ADF, the same trend was manifested when mineral fertilization except in NDF and ADF contents stems, where the values obtained were negative.

Relative feed value of alfalfa plants and leaves was influenced significant in all variants of fertilization.

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