BLACK LOCUST (*ROBINIA PSEUDOACACIA*): THE MOST VALUABLE SOURCE FOR MONOFLORAL HONEY IN ROMANIA

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Abstract. Black locust (*Robinia pseudoacacia*) is a tree that blooms in early spring, its flowers being used both as medicinal plants and by the bees to gather the precious nectar to produce honey. Locations of black locust forests in Romania are presented as well as their blooming period. Monofloral locust honey is presented with their physical-chemical properties, on some important collaborative studies, made by International Honey Commission in collaboration with different specialists from all over Europe.

Keywords. Black locust, bee family, production, monofloral honey.

INTRODUCTION

Romanian flora is rich and varied, comprising over 300 species of meliferous plants. Largest share of cultivated plants is represented by canola (especially in recent years, when the area under cultivation increased significantly because of biodiesel fuel production, which made canola as a main harvest), than locust, linden, sunflower, pastures and hayfields.

80% of the production of honey in our country is made from different sunflower hybrids' nectar, black locust and linden forests. Meliferous flora of Romania have a potential of 20 thousand tons of honey, may sustain over 1.7 milions of bee families from which can be obtained an amount of 35 thousand tons/year (http://apiardeal.ro/romikele/Apicultura_pentru_toti).

Black locust (*Robinia pseudacacia*) is a thorny tree that blooms in late spring and early summer. In Romania was raised since the eighteenth century. Acacia is one of the most important trees, although this meaning is crossed often overlooked. Among other uses (land setting, wood turning, creating protection cords, etc.) it has beekeeping and biotherapeutic value also.

MATERIAL AND METHOD

BLACK LOCUST (*ROBINIA PSEUDOACACIA*)

Nowadays this tree is cultivated or raised wildly on 120 000 ha, located mainly in the plains or hilly regions of Romania. This tree is drought-resistant, flourishes abundantly with a high quantity of nectar. The blooming period if the weather conditions are favorable, is about 12-14 days, this period giving a production of about 1000 – 1200 kg honey/ha forest, a strong bee family being capable of producing about 25 kg honey/bee family (Mărghitaş 2002).

In our country, black locust blooms in two distinct periods of the year. The first blooming period includes parts of counties:

- BIHOR: Valea lui Mihai, Săcuieni, Simian.
- BRĂILA: Tătaru, Râmnicelul, Însurăţei, Cioara.
- BUZĂU: Ruşeţu, Largu.
- CONSTANŢA: Cernavodă, Viişoara, Cobadin, Cumpăna, Dumbrăveni, Ciocârlia, Vadu.
- DÂMBOVIŢA: Mătăsaru.
- DOLJ: Cerbu, Ciuperceni, Maglavit, Cioace, Dervaica, Tunari, Apele Vii, Mârşani, Rudari.
- GALAŢI: Hanul Conachi; Lieşti, Buceşti, Bălăbăneşti, Târgu Bujor.
- IALOMIŢA: Groasa, Ileana, Tămădău, Pasărea, Moldoveni, Dridu.
- ILFOV: Râioasa, Săbăreni, Valea Mocanului.
- MEHEDINŢI: Balta Verde; Jianu Mare; Crivina, Cureaua Lungă; Pătule, Gârla Mare; Vraţa.
- SATU MARE: Careii Mari, Sanislau.
- TELEORMAN: Cervenia, Bârseşti, Brânceni, N.Bălcescu.
- TIMIŞ: Alioş, Remetea Mică.

The second blooming period for black locust (10 days later than the first one) is situated in:

- ALBA: Vânţ, Măhăceni, Meteşti.
- ARGEŞ:Vedea, Samara, Albota, Cerbu, Moşoaia, Băiculeşti, Drăganu.
- MEHEDINŢI:Ilovăţ, Siseşti, Vodiţă, Colibaşi, Balata
- OLT: Leleasca, Sâmbureşti, Dobroteasa, Spieni, Aluniş.
- PRAHOVA: Izvoarele, Vălenii de Munte, Predealu-Sărari, Cărbuneşti, Teişani, Homorociu.
- VÂLCEA: Sirineasa, Brânceşti, Mihăieşti, Bălceşti, Livezeni, Zetreni, Stroieşti, Muereasca, Călimaneşti, Olăneşti, Cheia, Brezoiu, Voineasa, Horezu.

Acacia flowers have therapeutic effects on the nervous system, digestive and lung. It is recommended infusion of the flowers, which are consumed two or three cups a day after meals. Tea eases digestion, boosts ball effectively decrease gastric acidity and biliary dyskinesia and hypotonia. Furthermore, infusion promotes and facilitates coughing. Last but not least, is soothing, sedative on the nervous system, relieves stress and promotes sleep. Acacia flowers have a complex chemical composition, with tannins, sugars, organic and phenolic acids (caffeic or chlorogenioc acid) and volatile oils. Also delicious acacia honey is soothing and healing effects (in gastritis and ulcer) is tonic for the nervous system (neurosis) and increases the overall immunity of the body.

High quantities of nectar are secreted by locust flowers, which represent raw material for honeybees *Apis mellifera* to produce black locust honey.

BLACK LOCUST (*ROBINIA PSEUDOACACIA*) HONEY

In Romania, there are two main types of honey, namely: floral honey (nectar honey) which may be monofloral or multifloral and honeydew honey (forest honey).

The most common types of monofloral honeys are: locust (*Robinia pseudoacacia*), lime (*Tilia platiphyla*), sunflower (*Helianthus anuus*), mint (*Mentha* sp.), raspberry (*Rubus*

ideaus L.), canola (*Brassica napus oleifera* L.), coriander (*Coriandrum sativum* L.), fireweed (*Epilobium augustifolium* L.) and others.

In a normal year without weather problems about 20000 tons of honey can be produced, the largest share is held by multifloral honey in 50%, followed by black locust honey - 35% and lime honey, with a share of 15%.

Due to specific temperate climatic conditions of our country and diversity of flora, the quality of bee products is considered to be superior. For example black locust honey is receiving every year many appreciations at international fairs (Apimondia Congress and Food Trade Exhibitions).

Even if high productions of honey are obtained in Romania, the consumption of this type of food is very low, among the lowest from Europe. If Germany have a consumption of 2.2 kg/capita, Netherlands and Belgium 1.5 kg, in Romania only approximately 0.5 kg/capita is consumed.

Black locust honey is produced by the bees *Apis mellifera* from the nectar of locust (*Robinia pseudoacacia*). It can be harvested in June, because the first blooming period in our country is in the second half on May. This type of honey is the most appreciated by the consumers due to its bright yellow color, fluid appearance, sweet and flowery taste. Its finesse and discretion are the main characteristics appreciated by the consumers, and the reason for which this type of honey can be used in food industry as sweetener, without denaturing the original taste of the food.

Water content is generally low (<18%), pH around 4 and also low acidity (~14 meq/kg). Electrical conductivity is insignificant, being in accordance with inorganic matter (ash), lower than 0.1%. Sugar spectrum has a characteristic fingerprint, fructose being more than 40%, low content of glucose (<35%) and rather high content of di- and trisaccharides (sucrose, maltose, isomaltose and erlose), around 10%. Robinia pollen in the sediment of this type of honey is rather low, knowing the fact that is underrepresented in the flower. Accompanying pollen is represented by the specific flora from the harvest location, comprising of spring trees pollen, dandelion, willow, canola, sainfoin or clover.

Over the past decades there were many studies trying to classify different monofloral honeys, special attention being given to black locust honey.

Persanno Oddo and Piro (2004) described the main unifloral honeys from Europe by joining the work of 20 different laboratories from 11 countries. The study was focused on the physico-chemical analysis of honey (more than 30 parameters) from 15 monofloral honey types. Our interest was focused on the analysis of black locust (*Robinia pseudoacacia*) honey, and the mean characteristics and values are presented below.

Table 1.

Sensory analysis of *Robinia pseudoacacia* honey (Persano Oddo and Piro, 2004)

Sensory description		
Visual assessment	*Colour intensity*: very light	
	Colour tone: normal honey colour	
Olfactory assessment	*Intensity of odour*: weak	
	Description: floral – fresh fruit and warm	
Tasting assessment	*Sweetness*: medium to strong	*Acidity*: weak
	Bitterness: absent	*Intensity of aroma*: weak
	Description of aroma: floral – fresh fruit and warm	
	Persistence/aftertaste: short	
	Other mouth perceptions: -	
Physical characteristics	*Crystallisation rate*: slow	

Table 2.

Physical-chemical analysis of *Robinia pseudoacacia* honey (Persano Oddo and Piro, 2004)

Colour (mm Pfund)	**Electr. cond.** (mS/cm)	**Specific rotation**	**Free Acidity** (meq/kg)	**Diastase** (DN)	**Fructose** (g/100 g)	**Glucose** (g/100 g)	**Fruct.+Gluc.** (g/100 g)	**Fruct./Gluc.** ratio	**Gluc./Water** ratio
12.9 ±5.6	0.16 ±0.04	-16.6 ±3.1	11.2 ±3.4	10.5 ±5.0	42.7 ±2.3	26.5 ±1.7	69.2 ±3.3	1.61 ±0.11	1.57 ±0.13

To compare the results of IHC work (Persano Oddo and Piro, 2004) with other European studies made in different countries, an extensive bibliographic review was performed (Piazza and Persano Oddo, 2004), collecting the analytical data available in the literature related to the same honey types and analytical parameters reported in the descriptive sheets.

Table 3.

Bibliographic study on physical-chemical analysis of *Robinia pseudoacacia* honey (Piazza and Persano Oddo, 2004)

Analysis	Reference
Pollen Grains/10 g honey 10^3	**<20** (Persano Oddo et al. 2000)
% Specific pollen	low, very low (Institut Technique de l'Apiculture, 1975; Bogdanov, 1990); **17** (Pourtallier, 1992); **20**±5 (Bogdanov, 1997); **>15** (Persano Oddo et al. 2000)
Colour (mm Pfund)	**<30** (Institut Technique de l'Apiculture, 1975); **11**±0 (Brunneau, 1992); **15**±6 (Persano Oddo et al. 1995A); **14.5**±5.9 (Persano Oddo et al. 2000)
Electrical conductivity (mS/cm)	**0.19**±0.02 (Institut Technique de l'Apiculture, 1975; Bogdanov, 1990); **0.15** (Krauze and Zalewski, 1991); **0.15**±0.06 (Bruneau, 1992); **0.16**±0.04 (Pourtallier, 1992); **0.15**± 0.03 (Persano Oddo et al. 1995A); **0.19** (Foldhazi et al. 1996); **0.19**±0.04 (Bogdanov, 1997, 1999); **0.23**±0.04 (Golob and Plestenjak, 1999); **0.15**±0.04 (Persano Oddo et al. 2000); **0.14** (Ivanov, 2002); **0.1**±0.1 (Dinkov, 2003)
Specific rotation (□)$^{20}_{D}$	**–14.2** (Ivanov, 1978); **–17.0**±2.7 (Persano Oddo et al. 1995A); **–16.9**±2.67 (Persano Oddo et al. 2000); **–15.1** (Ivanov, 2002); **–17.0**±1.2 (Dinkov, 2003)
pH	**3.9** (Institut Technique de l'Apiculture, 1975); **3.9** (Krauze and Zalewski, 1991); **4.0**±0.2 (Brunneau, 1992); **3.9**±0.1 (Pourtallier, 1992); **4.0**±0.1 (Persano Oddo et al. 1995A); **3.8**±0.25 (Bogdanov, 1997); **3.7**±0.13 (Golob and Plestenjak, 1999); **3.9**±0.17 (Persano Oddo et al. 2000)
Free acidity	**8.0** (Institut Technique de l'Apiculture, 1975);

(meq/kg)	**13.8**±0.7 (Ivanov, 1978); **15.2** (Krauze and Zalewski, 1991); **10.0**(Brunneau, 1992); **5.0** (Foldhazi et al. 1996); **24.4**±2.71 (Golob and Plestenjak, 1999); **10.9**±2.57 (Persano Oddo et al. 2000); **13.0**±0.07 (Ivanov, 2002)
Lactones (meq/kg)	**5.5** (Institut Technique de l'Apiculture, 1975); **4.9** (Krauze and Zalewski, 1991); **3.4** (Foldhazi et al. 1996); **2.4**±1.77(Persano Oddo et al. 2000)
Total acidity (meq/kg)	**13.7** (Institut Technique de l'Apiculture, 1975); **20.0** (Krauze and Zalewski, 1991); **14.3**±4.5 (Pourtallier, 1992); **12.4**± 2.6 (Persano Oddo et al. 1995A); **8.4** (Foldhazi et al. 1996); **13.3**±3.4 (Persano Oddo et al. 2000)
Water (g/100 g)	**<18** (Institut Technique de l'Apiculture, 1975); **18.2**±0.2 (Ivanov, 1978, Bogdanov, 1990); **17.0** (Krauze and Zalewski, 1991); **18.0**±0.3 (Brunneau, 1992); **17.6**±0.8 (Pourtallier, 1992); **16.4**±0.9(<18) (Persano Oddo et al. 1995A); **16.5**±1 (Golob and Plestenjak, 1999); **16.6**±0.9 (Persano Oddo et al. 2000); **17.5** (Ivanov, 2002); **16.7**± 0.9 (Dinkov, 2003)
Diastase (DN)	**>10** (Institut Technique de l'Apiculture, 1975); **8.7**±0.4 (Ivanov, 1978); **11.5** (Krauze and Zalewski, 1991); **8.6**±2.9 (Persano Oddo et al. 1995A); **9.3**±1.94 (Golob and Plestenjak, 1999); **8.7**±2.7 (Persano Oddo et al. 2000); **13.6**±0.8 (Ivanov, 2002)
Invertase (U/kg)	**51.4** (Krauze and Zalewski, 1991); **26.4**±16.2 (Persano Oddo et al., 1999); **27.2**±17.6 (Persano Oddo et al. 2000); **29.4**±4.4 (Serra Bonvehi et al., 2000); **27.9**±17.6 (Dinkov, 2003)
Proline (mg/kg)	**229** (Krauze and Zalewski, 1991); **199** (Foldhazi et al. 1996); **210**±50 (Persano Oddo et al. 2000); **213.4**±172.3(Dinkov, 2003)
Fructose (g/100 g)	**49.2** (Institut Technique de l'Apiculture, 1975); **44.1** (Krauze and Zalewski, 1991); **42.1**±2.2 (Brunneau, 1992); **41.4**±1.3 (Pourtallier, 1992); **43.1**±2.9 (Persano Oddo et al. 1995A); **49.6** (Foldhazi et al. 1996); **41.6**±0.9 (Bogdanov, 1997, Ivanov, 1997); **43.7**±1.64 (Golob and Plestenjak, 1999); **43.5**±2.37 (Persano Oddo et al. 2000)
Glucose (g/100 g)	**34.3** (Institut Technique de l'Apiculture, 1975, Bogdanov, 1990); **28.4** (Krauze and Zalewski, 1991); **29.2**±0.5 (Brunneau, 1992); **26.6**±1.3 (Pourtallier, 1992); **25.9**±1.5 (Persano Oddo et al. 1995A); **30.4** (Foldhazi et al. 1996); **24.7**±0.6 (Bogdanov, 1997, Ivanov, 1997); **29.2**±1.1 (Golob and Plestenjak, 1999);

	26.1±1.27 (Persano Oddo et al. 2000)
Sucrose (g/100 g)	**2.5** (Institut Technique de l'Apiculture, 1975, Bogdanov, 1990); **2.3** (Krauze and Zalewski, 1991); **0.4**±0.5 (Brunneau, 1992); **1.8**±1.7 (Pourtallier, 1992); **2.5**±2.1 (Persano Oddo et al. 1995A); **1.1** (Foldhazi et al. 1996); **3.2**±0.9 (Bogdanov, 1997, 1999, Ivanov, 1997); **2.3**±1.63 (Golob and Plestenjak, 1999); **2.3**±1.9 (Persano Oddo et al. 2000)
F+G (g/100 g)	**72.6** (Krauze and Zalewski, 1991); **69.0**±3.7 (Persano Oddo et al. 1995A); **79.9** (Foldhazi et al. 1996, Ivanov, 1997, Bogdanov, 1999); **72.9**±2.2 (Golob and Plestenjak, 1999); **69.6**±3.0(Persano Oddo et al. 2000)
F/G ratio	**1.43** (Institut Technique de l'Apiculture, 1975); **1.45**±0.10 (Brunneau, 1992); **1.55**±0.09 (Pourtallier, 1992); **1.67**±0.11 (Persano Oddo et al. 1995A); **1.63** (Foldhazi et al. 1996); **1.70**±0.05 (Bogdanov, 1997, Ivanov, 1997); **1.50**±0.07 (Golob and Plestenjak, 1999); **1.67**±0.10 (Persano Oddo et al. 2000)
G/W ratio	**1.63** (Institut Technique de l'Apiculture, 1975); **1.55**±0.11 (Persano Oddo et al. 1995A); **1.57**±0.10 (Persano Oddo et al. 2000)

CONCLUSIONS

Romania has a great potential to produce honey and other bee products at the highest quality requirements in Europe. Due to specific temperate climatic conditions of our country and diversity of flora, the quality of our bee products is considered to be superior. Black locust (*Robinia pseudoacacia*) honey is one of the most demanded honey type because of its characteristics.

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