

## THE BIODIVERSITY OF THE MELLIFEROUS PLANTS IN THE SURROUNDINGS OF THE TOWN SEBES (ALBA COUNTY) AND THEIR ECONOMICAL IMPORTANCE

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### Abstract

*The goal of our research is to analyze the biodiversity of the melliferous plants in Alba County, mainly in the surroundings of Sebes by identifying the melliferous plants from the spontaneous flora and of the tree species without inflorescence. In the same time there were analyzed other aspects such as: the thermic index of the blooming (T), the average data of starting of the blooming, the honey production (kg/ha) and the apiarian weight. The methods and the techniques that were used in the study were as follows: the use of the bibliographical resources, the observation, the use of the method of direct collecting, getting photos, and the determination of the botanic materials in the lab. There were identified 48 melliferous species from the spontaneous flora and 5 tree species without inflorescence (manna honey). In Alba County does regularly average productions on bee families, superior to those done in the country due to a valuable melliferous potential.*

**Key words:** biodiversity, melliferous flora

### INTRODUCTION

The rupestrian paintings, having a magic potential on the walls of the caves in Paleolithic establish the fact that the man of those eras knew the bees and we can imagine how, in its activity as a collector was competing with the animals in finding the honey from the honey combs of the little flying bees in order to provide the daily necessary food.

During the ancient times the man's interest for bees could be seen in the writings coming from the mythology of the people. Aristotle had a scientific interest in analyzing the bees, who in his work *The History of the Animals* dedicated a great part to these invertebrates. Plinius the Old in an encyclopedic spirit describes and put into a relationship with the man the bees species found on the entire surface of the world known at that time. *Naturalis Historia* contains data regarding the relation man-bees and bees-plants. The relation man-bees continued to go on, knowing in the same time the hard work of a poor apiarist as well as the glory of the symbolic exhibiting of the bees on the imperial mantle.

The interest in bees for their lives and behavior reached a summit in the thorough researches of Karl von Frisch (1886-1982), which had an echo in the entire savant society and for which he received the Nobel Prize in 1973, being considered afterwards one of the *founders fathers* of the new biological science, Ethnology. His researches were shared and developed regarding the bees as well as other species of animals by Konrad Lorenz and Nikolaas Tinbergen, awarded with the Nobel Prize alongside Karl von Frisch.

Till nowadays the bees are in the centre of the fundamental scientific research giving data to the molecular biology in elucidating the mystery surrounding the role of genes in the configuration of the bee's behavior. K. Dawkins, researcher and an adept of the synthetic theory in the actual Darwinism, exposed in his book *The Selfish Gene* an experiment on families and species of bees, the role of genes in forming and transmitting the behavior at these [4].

The second component of the binomial is formed by plants. The researches done during the time demonstrated that the raising of bee

families can't be profitable if in the area were the bee garden is situated there aren't resources of nectar and pollen for bees. The apiarists emphasized the importance of knowing the melliferous base in the activity area of the bees, the period of blooming of the flowers, the quantity nectar and pollen that can be collected by these. The melliferous plants are the totality of plants with nectar or pollen but there are also mixed plants giving both pollen and nectar. All these are forming what is called the melliferous base. The secret of a profitable apiculture from an economic point of view requires the apiarist's capacity of settling the bee garden taking into consideration the melliferous plants in the area.

The present study stresses the analysis of the biodiversity of the melliferous plants in the Alba County, mainly in the surroundings of the town Sebes, by identifying the melliferous plants in the spontaneous flora and the arboreal species without inflorescence.

## MATERIALS AND METHODS

The researched area refers to the administrative territory of Alba County (Fig. 1), but the researches have been done mainly in the surroundings of the town Sebes.

The investigations took place during 2010-2013 with the participation of the students from the department Of Agricultural Sciences and the Protection of the Environment within the "Lucian Blaga" University in Sibiu.

In the researches that took place regarding the fulfillment of the proposed goals there were taken into consideration specific methods:

- the use of the bibliographic resources requested by the goal and objectives of the study;
- the observation regarding the floristic inventory in Alba County, mainly in Sebes and its surroundings, taking down the identified species during the trips;
- the use of direct gathering, a quantitative method for the plants that couldn't be identified in the researched area, these were going to be studied in the lab. For the sampling there were used some simple tools and materials: little shovel and a special box for plants;

- there have been taken a lot of pictures coming to complete the data obtained in the field;
- the processing of the information from the field, the determination of the botanic material in the lab in order to establish the floristic list [1], [2], [3], [5], [6], [7], [8], [11].
- the study centered round the species *Apis mellifera* L.

## RESULTS AND DISCUSSIONS

The Alba County is situated in the central part of Romania, occupying a surface of 624,200 ha. being dominated by the mountainous area, the town Sebes is situated in the area of influence of the mountain and at the limit of separation of The Secaselor Plateau with the river Mures passage. Due to its geographic position the town Sebes is characterized by a medium continental climate having an average yearly temperature of 9.3C.

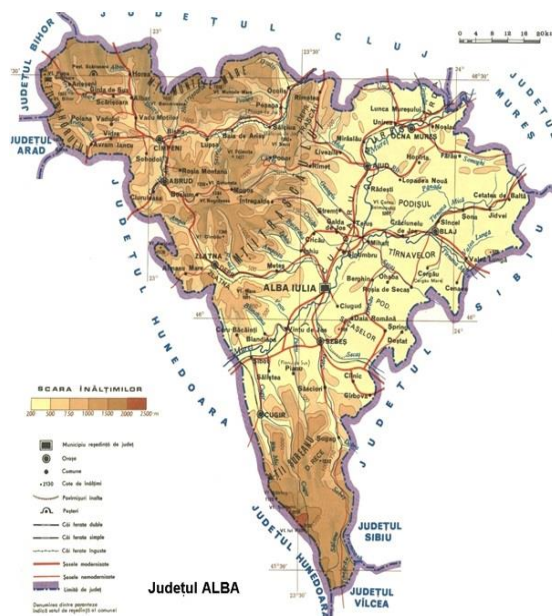


Fig. 1 The map of the Alba county  
source: <http://pe-harta.ro/alba/>

The flora in the Sebes area is influenced by the particularities of the climate, altitude, relief, hydrographic basin but also by the changes done by man. The vegetation is framed at the floor of the oak and forest steppe. The forests are dominated by the oak alongside with the horse beam, sycamore maple, maple tree, elm

tree, ash tree, birch, lime tree, wild cherry tree and crab apple tree. Due to the biologic and climate conditions the shrubs occupy an important role (the blackthorn, the hip rose tree, cornel tree or the common elder). The hills are dominated by the pastures and hayfields, which alongside the pastures and hayfields in the fields are an important melliferous source [13].

The melliferous plants in the researched area offer to the bees nectar and pollen. Their production is not a big one. There are, anyhow some very melliferous species and due to the succession of blossoming during all the active season can assure together with the melliferous trees and shrubs a very important maintaining harvesting for the development of the bee families. The statistics of honey shows that there are done approximately 180 tones, and the average for a bee family is estimated at 16.07kg. honey per family, this being above the average apiarian production in Romania.

Table 1. Melliferous plants identified in the spontaneous flora in the surroundings of the town Sebes

Nr	The species	The thermic index of blooming (T°C)	The average data of blooming	Honey production (kg/ha)	The apiarian weight
1	2	3	4	5	6
1	Salcâmul alb ( <i>Robinia pseudacacia</i> L.) (Fabaceae)	600-765	10-20.05	800-1200	Very big
2	Teuil argintiu ( <i>Tilia tomentosa</i> Moench) (Tiliaceae)	1400- 1450	17-27.06	1200	Very big
3	Floarea-soarelui ( <i>Helianthus annuus</i> L.) (Asteraceae)	1000-1100	24.06-30.07	34-122	Very big
4	Zmeurul ( <i>Rubus idaeus</i> L.) (Rosaceae)	1038-1235	05-15.06	50-200	Very big
5	Izma broastei ( <i>Mentha aquatica</i> L.) (Lamiaceae)	1400-1575	22-30.06	220	Big
6	Rapita mare ( <i>Brassica napus oleifera</i> L.) (Brassicaceae)	220-330	10-20.04	40-100	Big
7	Rapita mică ( <i>Brassica rapa oleifera</i> L.) (Brassicaceae)	220-330	10-20.04	30-100	Big
8	Salcia albă ( <i>Salix alba</i> L.) (Salicaceae)	100-135	20-30.03	100-150	Big
9	Sparceta ( <i>Onobrychis viciaefolia</i> Scop) (Fabaceae)	1038-1235	05.05-06.06	120-300	Big
10	Tei pucios ( <i>Tilia cordata</i> Mill) (Tiliaceae)	1050-1100	02-12.06	600-1000	Big
11	Trifoiul alb ( <i>Trifolium repens</i> L.) (Fabaceae)	765-940	20-30.05	100-250	Big
12	Afinul	525-680	05-15.05	15-30	Middle

	( <i>Vaccinium myrtillus</i> L.) (Ericaceae)				
13	Cais ( <i>Prunus armeniaca</i> L.) (Rosaceae)	200-300	11-23.03	25-40	Middle
14	Castanul sălbatic ( <i>Aesculus hippocastanum</i> L.) (Hippocastanaceae)	475-525	27.04-07.05	30-100	Middle
15	Ceapa seminceră ( <i>Allium cepa</i> L.) (Liliaceae)	1330-1540	20-30.06	70-150	Middle
16	Cimbrisorul ( <i>Thymus serpyllum</i> L.) (Lamiaceae)	1230-1430	15-25.06	150-220	Middle
17	Cireșul ( <i>Cerasus avium</i> L. Moench) (Rosaceae)	220-330	10-20.04	30-40	Middle
18	Coacăzul negru ( <i>Ribes nigrum</i> L.) (Grossulariaceae)	275-395	14-24.04	20-50	Middle
19	Corobătică ( <i>Salvia verticillata</i> L.) (Lamiaceae)	1330-1540	20-30.06	400-600	Middle
20	Dovleacul ( <i>Cucurbita pepo</i> L.) (Cucurbitaceae)	765-940	20-30.05	40-50	Middle
21	Izmă bună ( <i>Mentha piperita</i> L.) (Lamiaceae)	1620-1870	05-15.07	100-200	Middle
22	Izmă creată ( <i>Mentha spicata</i> L.) (Lamiaceae)	1620-1870	05-15.07	100-200	Middle
23	Jaleșul sălbatic ( <i>Stachys recta</i> L.) (Lamiaceae)	1130-1335	10-20.06	150-250	Middle
24	Lucerna ( <i>Medicago sativa</i> L.) (Fabaceae)	680-850	15-25.05	25-200	Middle
25	Mărul ( <i>Malus domestica</i> Borkh) (Rosaceae)	350-450	20-30.04	30-42	Middle
26	Măzarichea ( <i>Vicia pannonica</i> Cr.) (Fabaceae)	765-940	20-30.05	30-50	Middle
27	Mazarichea de primăvară ( <i>Vicia sativa</i> L.) (Fabaceae)	850-960	25-31.05	10-30	Middle
28	Măzarichea păroasă ( <i>Vicia villosa</i> L.) (Fabaceae)	765-940	20-30.05	30-100	Middle
29	Murul de miriște ( <i>Rubus caesius</i> L.) (Rosaceae)	798-960	22-31.05	30-50	Middle
30	Muștar sălbatic ( <i>Sinapis arvensis</i> L.) (Brassicaceae)	765-940	20-30.05	40	Middle
31	Păducelul ( <i>Crataegus monogyna</i> Jacq.) (Asteraceae)	550-645	01-14.05	35-100	Middle
32	Păpădia ( <i>Taraxacum officinale</i> L.) (Asteraceae)	176-275	05-15.04	200	Middle
33	Porumbarul ( <i>Prunus spinosa</i> L.) (Rosaceae)	350-450	20-30.04	25-40	Middle
34	Prunul ( <i>Prunus domestica</i> L.) (Rosaceae)	300-350	15-25.04	20-30	Middle
35	Roișița ( <i>Melissa officinalis</i> L.) (Lamiaceae)	475-502	28.05-20.06	100-150	Middle
36	Salvia de câmp ( <i>Salvia pratensis</i> L.) (Lamiaceae)	798-960	22-31.05	280	Middle

37	Salvia ( <i>Salvia officinalis</i> L.) (Lamiaceae)	1750-1980	10-20.07	200-400	Middle
38	Scaul dracului ( <i>Eryngium campestre</i> L.) (Apiaceae)	1750-1980	10-30.07	100-300	Middle
39	Sovărvul ( <i>Origanum vulgare</i> L.) (Lamiaceae)	1130-1335	10-20.06	70-80	Middle
40	Trifoiul roșu ( <i>Trifolium pretense</i> L.) (Fabaceae)	1230-1430	15-25.06	25-50	Middle
41	Trifoiul mărunț ( <i>Medicago lupulina</i> L.) (Fabaceae)	1230-1450	07-27.06	30-40	Middle
42	Urzică moartă alba ( <i>Lamium album</i> L.) (Lamiaceae)	680-850	15-25.05	100-180	Middle
43	Urzică moartă ( <i>Lamium purpureum</i> L.) (Lamiaceae)	80-135	20-31.03	50-90	Middle
44	Albăstriță ( <i>Centaurea cyanus</i> L.) (Asteraceae)	1320-1463	02-22.07	50-60	Small
45	Brusturul ( <i>Arctium lappa</i> L.) (Asteraceae)	1275-1450	15-27.07	30-50	Small
46	Castravetele ( <i>Cucumis sativus</i> L.) (Cucurbitaceae)	600-730	20.06-16.08	20-100	Small
47	Căpșunul ( <i>Fragaria moschata</i> Duch) (Rosaceae)	200-320	20.04-29.05	30-40	Small
48	Lucerna galbenă ( <i>Medicago falcata</i> L.) (Fabaceae)	680-850	15-25.06	30	Small

In the literature of specialty there are known 1,000 species of melliferous plants, from which 200 are important for the apiculture [5], [6], [7], [8]. From these, in the researched area there were found 48 species of melliferous trees, which belong to a number of 13 botanic families [9], [10]. The list of the botanic families in the order of the numeric number is presented in table 2 and figure 2.

Table 2. The list of the botanic families with melliferous species, their numeric and relative abundance of these in the surroundings of the town Sebes (Alba County)

Nr.	Family	Numeric abundance	Relative abundance (%)
1	Lamiaceae	12	25,00
2	Fabaceae	10	20,84
3	Rosaceae	8	16,67
4	Asteraceae	5	10,42
5	Brassicaceae	3	6,25
6	Tiliaceae	2	4,17
7	Cucurbitaceae	2	4,17
8	Salicaceae	1	2,08
9	Grossulariaceae	1	2,08
10	Apiaceae	1	2,08
11	Ericaceae	1	2,08
12	Hipocastanaceae	1	2,08
13	Liliaceae	1	2,08
	Total	48	100,00

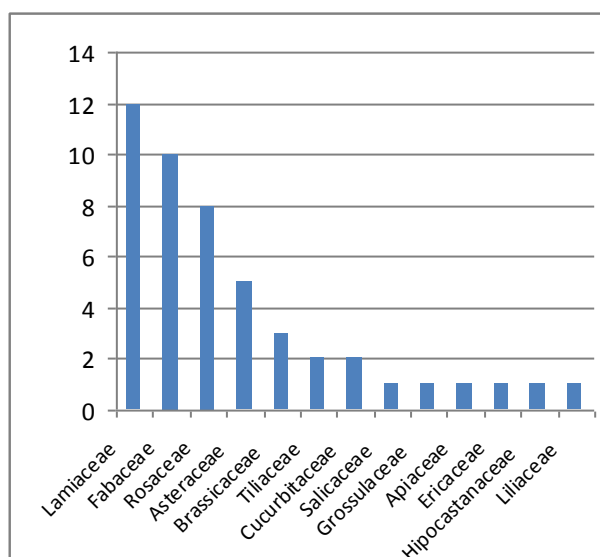


Fig. 2 The graphic representation of the melliferous plants on families

Analyzing the data of the graphic1 results that 35 melliferous plants (72.93%) belong to 4 botanic families. Firstly comes the *Lamiaceae* family with 12 species (25%), followed by the *Fabaceae* family with 10 species (20.84%). On the third place is the species belonging to the *Rosaceae* family with 8 species (16.67%) and on the fourth place is the *Asteraceae* family with 5 species (10.42%). A number of six botanic families registred only a species of melliferous plants (2.08% each).

Almost half of the 48 analyzed melliferous species (45.48%) belong to the botanic families *Lamiaceae* and *Fabaceae*.

The period of blooming of the melliferous species is during March (11<sup>th</sup>-23<sup>rd</sup> March 2013) *Prunus armeniaca* L. (apricot) and its ends in August *Cucumis sativus* L. (16<sup>th</sup>-20<sup>th</sup>) (cucumber).

From the point of view of the apiarian weight the analyzed melliferous base is high. From the total of 48 melliferous species, 4 species (8.33%) have a very big apiarian weight; 7 species (14.58%) have a big apiarian weight; 32 species (66.66%) have middle apiarian weight and 5 species (10.41%) represent a small weight.

The biggest production of honey (kg/ha) was obtained from the species; *Rabinia pseudocata* L., *Tilia tomentosa* Moench (1200 kg/ha) and *Tilia cordata* Mill (600-1000kg/ha).

In the Alba County the beech forest and the evergreen ones still cover large areas in The Metaliferi, Trascau Mountains and Sebes. From the total surface of 624,200 ha of the county, 79,022 ha (12.66%) is covered by woods. The resin trees occupies an area of 34,044ha (435), the beech 28,494 (36%), the oak 8.036 ha (10%) and different other hard species 7,851 ha (10%) and different soft species 533ha (1%).

The trees from these woods, besides their forestry importance constitute an important source of nectar and pollen. In the same time the production of honey is completed by the production of manna. The manna honey is the kind of honey that doesn't come from the nectar of the flowers. Manna comes from two places: the sweet secretions of the trees (vegetal origin) or the sweet secretions of the aphids (animals origin). The bees remade the sweet drops in case the surrounding flora doesn't cover their necessity. The arboreal species that assure the manna production in the researched area belong to the following plants families: *Pinaceae*: *Abies alba* Mill, (fir tree), *Picea abies* L., H. Karst (spruce fir) having a big apiarian weight; *Fagaceae*: *Fagus sylvatica* L. (beech), *Quercus petraea* L, having a middle apiarian weight and *Corilaceae* with the species *Corylus avellana* L (hazel nut tree).

## CONCLUSIONS

In the Alba County there were identified 48 species of melliferous plants belonging to a number of 13 botanic families. The biggest number of melliferous species belongs to the families: *Lamiaceae* (12 species), *Fabaceae* (10 species), *Rosaceae* (8 species), *Asteraceae* (5 species). On the opposite side are the families: *Salicaceae*, *Grossulariaceae*, *Apiaceae*, *Ericaceae*, *Hipocastanaceae*, and *Liliaceae* with one representative.

The methods and the techniques used for the study were: the use of the bibliographic resources, the observation regarding the floristic inventory; the use of direct sampling, the quantitative methods, taking photos and the

determination of the botanic material in the lab.

The period of blooming of the melliferous plants in the researched area is during the period March-August, the most favorable period being during the harvesting from May to June.

Although the production of honey is not big with the exception of three species (*Robinia pseudacacia* L. *Tilia tomentosa* Moench and *Tilia cordata* Mill.) due to the succession of blooming during the active period, the melliferous plants assures together with the melliferous trees and shrubs an important maintaining harvesting for the development of the bee families.

There were identified 5 arboreal species without inflorescence (manna honey): *Abies alba* Mill. (fir tree) *Picea abies* L., H. Harst (spruce fir), *Fagus sylvatica* L. (beech), *Quercus petraea* L. and *Corylus avellana* L. (hazel nut tree). The species of resinous trees in the woods in the Alba County have the biggest weight producing in the same time manna honey in the hot years and few rains. The resinous trees are followed by the beech, the following species occupying a more restrained area and the soft species are almost of no importance.

Bees present an importance in the agricultural economy by the production of apiarian products as well as for their contribution to the pollination of the majority of the known plants.

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## REFERENCES

- [1]Cârnu, I.V., 1980, Flora meliferă. Editura Ceres, București.
- [2]Cârnu, I.V., Hocioată, E., 1973, Baza meliferă și polenizarea culturilor entomofile. Editura Ceres, București.
- [3]Ciocârlan V., 2000, Flora ilustrată a României, Editura Ceres, București.

[4] Dawkins, R., Gena egoistă, 2013, Editura Publica, București.

[5] Pârnu C-tin, 2002, Enciclopedia plantelor. Plante din flora României, vol.I, Ed. Tehnică, București.

[6] Pârnu C-tin, 2003, Enciclopedia plantelor. Plante din flora României, vol.II, Ed. Tehnică, București.

[7] Pârnu C-tin, 2004, Enciclopedia plantelor. Plante din flora României, vol.III, Ed. Tehnică, București.

[8] Pârnu C-tin, 2005, Enciclopedia plantelor. Plante din flora României, vol.IV, Ed. Tehnică, București

[9] Sârbu, I., Ștefan, N., Oprea, A., 2013, Plante vasculare din România: determinant ilustrat de teren, Editura Victor B Victor, Bucuresti.

[10] Speta Elise, László R., 2010, Wildpflanzen Siebenbürgens, Plöchi Druck GmbH, Freistadt, Austria

[11] Ștefan, N., Oprea, A., 2007, Botanică sistematică, Editura Universității "Alexandru Ioan Cuza", Iași.

[12] <http://pe-harta.ro/alba/>

[13] [http://www.sebesonline.ro/coordonate\\_generale](http://www.sebesonline.ro/coordonate_generale)