Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 17, Issue 4, 2017
PRINT ISSN 2284-7995, E-ISSN 2285-3952

A MELIFER BASE FROM MĂRGINIMEA SIBIULUI. CASE STUDY-SĂLIȘTE

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Abstract

The study aimed to idemtify and evaluate the honey species in Sibiu surrounding area, especially in the surroundings of Sălişte. Thus, it is desirable to complete and exploit as efficiently the honey resources in Sibiu County. Among the research methods applied in this study are: the use of bibliographic resources, direct field observations, the collection of plant material in the studied ecosystem, the determination of the botanical material in the laboratory. 23 plant families of 44 species have been identified in the area. Of these, only 28 have a melliferous potential. According to the nature of the feed they provide to the bees, the honey plants have been divided into: nectaropolinifers, nectarifers, polinifers. The honeycomb base includes species belonging to mountain forests, hills and plateaus, grasslands and meadows. From the apiculture point of view of we have identified five groups. The floral potential of the area has encouraged other than sheeping another concern of the inhabitants of this area, namely beekeeping.

Key words**:** *melifer base, faunistics, Sălişte (Sibiu county)*

INTRODUCTION

Bee's mythology started from man's fascination for this creature. Admiration reaches such a high degree that the dilemma is justified: it is creation or evolution.
Bees always existed, from the Palaeolithic cave paintings to Bonaparte's Imperial, which had a bee as a heraldic sign. As far as we are concerned, the metropolis on the column of Trajan in Rome testifies to the bee's worship in the Geto-Dacian space. In the age of genetics, bee has been involved as a revealing research material on gene involvement in animal behaviour.
Bee Dance, a ritual and mysterious air balloon, has been deciphered by the removal of any supernatural element by Karl von Frisch, who has clarified that bees, through this dance, communicate to their community, information about nectareous locations in the area. Karl von Frisch received the Nobel Prize [1].
Bees, through their internal organization, have formed a model in human aspirations to prefigure social relations. The Bishop of Canterbury in a conversation with King Henry about the organization of the kingdom gives the following answer:
"So also - the bees, by the law of nature, meant to give the example of the ordinance and the most flourishing kingdom "[18].
Lewisohn, "an adept of anthropomorphic animal psychology," a theory of great vogue in the 18th-19th centuries, describes in his book "A History of Animals" among other things a story about how to accept man-bee relations. Fable, through its structure and the message it carries, best illustrates the theory of anthropomorphism. Allegory and fable reproduce what a man wants from the animal as a model. In Lewisohn's story, a Dutch doctor, Bernard Mandeville, believes in the straightening of society through the fable. He also believes in the original that moral and ethical excesses prevent society from performing. In his poem "Bees Story" he imagines a state of these who is leading according to the most drastic norms of morality and ethics. The result is total state fall, until bankruptcy, and the remaining bees return to tree trunks, as it was in *illo tempore*. The indignation of the English community in this fable was so great that a complete judge condemned the author, and his literary production was outlawed [9].

Entire encyclopaedias, treatises, textbooks, popularization books, a whole literature illustrating the importance of bee breeding and the interaction of the human- bee binomial have been written. We cannot talk about the bees and the products [12,13] they offer without underlining that they depend exclusively on the vegetable world [10].

MATERIALS AND METHODS

The research took place in the surroundings of Sălişte, Sibiu County;
The survey period took place during the years 2014-2015;
For the proper conduct of the study, the following specific methods were considered:
- Use of information from the literature [7,10,11];
- Observation for the identification and inventory of honey species in the studied area, area belonging to the fourth grading category, the Transylvanian bio-aquatic zone [23];
- Direct, qualitative gatherings in the studied ecosystem;
- Laboratory identification of botanical material collected from the field by using more bibliographic resources [4, 5, 9, 14, 15, 16, 17];
- Drawing up the floral list.

RESULTS AND DISCUSSIONS

Our study complements research on the honey base in the Center Region [1, 2, 3]. The researches focused on Marginimea Sibiului area, which is located in the southwestern part of Sibiu County, and comprises 18 localities located at the foot of the Cindrel Mountains. The basic occupation of the population of this area was the transhumant sheepfold. The area is of a rare beauty, and the mother nature was extremely lucky with its inhabitants: mountains, hills, waters, forests, meadows and orchards where they grow over 1,400 plant species from which the locals use 450: medicinal, food, fodder and honey. The latter representing 23% of the plants in the whole area [6, 25]. The floral potential of the area has stimulated another concern for the inhabitants, namely beekeeping. Botanical research has been differentiated in the localities belonging to Mărginimea Sibiului. For the towns of Galeş, Rod, Vale floral information is reduced. The flora of Poiana Sibiului is known only for 10%, the one in Fântânele (Cacova), Sălişte, Sibiel, Tilişca does not exceed the proportion of 25% and the flora of Poplaca is known for 50%. Localities such as Gura-Râului, Răşinari, Râu-Sadului, Sadu, Tălmăcel are very well botanically researched [5]. From this vast area, we focused our attention on Sălişte locality to identify the honeycomb base and to emphasize its economic importance.
The town of Sălişte, also known as the "capital of Mărginimea Sibiului " by some [24] or "the place of full beauty" by others [25], is located 20 km from Sibiu, towards Sebes Alba, at the foot of the Cindrel Mountains, Aciliu, Amnas, Crint, Gales, Fantanele, Mag, Săcel, Sibiel and Vale.

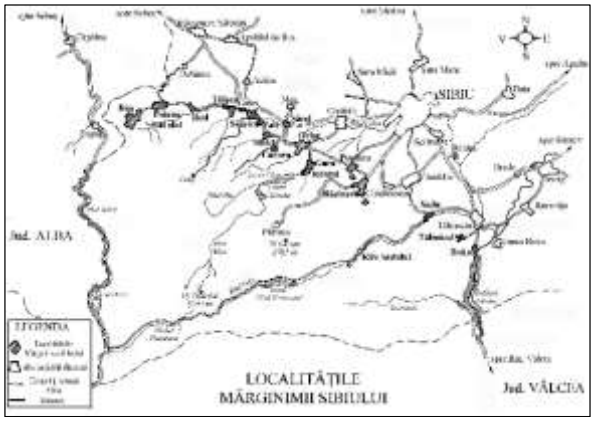

Fig. 1. The settlements of Mărginimea Sibiului
Source: https://limbaromana.org/wp-content/uploads/harta.jpg

The climate is moderate with lower annual averages (6^0C), and average annual precipitation ranges from 600-700mm. Grains are grown in the area, but there are also orchards, pastures and grazes, being a beehive in terms of apiculture.
In his book "Cormoflora of Sibiu County" Professor Constantin Drăgulescu, following the analysis of the flora of the localities in the county, states that the town of Sălişte is part of the localities with summary information on the floral potential, specifying in his book 34 species [5]. Our study highlighted a total of 23 families of 44 species

Table 1. The main plants useful for bees in Săliştei flora, Sibiu County (2014-2015)

Nr Crt	Species name	Average data of blossoming	Honey production (Kg/ha)	Share of apiculture	Observations
1	2	3	4	5	6
1	*Quercus petraea* (Matt.) Liebl. (Fagaceae)	20-30 April	20	Medium	Forest honeybee plant that offers abundant pollen and sometimes mana. It shelters Lachnus roboris, a very important mana producer.
2	*Fagus sylvatica* L. (Fagaceae)	15-25 May	20	Medium	Forest honeybee plant. Visited by bees especially for pollen-rich plants. He also offers mana.
3	*Pinus sylvestris* L. (Pinaceae)	May-June	10	Medium	Provides large amounts of inferior quality pollen, sometimes even honey.
4	*Picea abies* (L.) H. Karst. (Pinaceae)	20-30 June	50	Big	Tree that provides pollen and honey.
5	*Betula pendula* Roth (*Betulaceae)*	April-May	10	Small	Visited by bees especially for the abundant and early pollen, extremely necessary for the colonies.
6	*Acer pseudoplatanus* L. (Sapindaceae)	April-May	200	Medium	It is a source of nectar and especially pollen. Nectar is secret and in bad weather.
7	*Fraxinus excelsior* L. (Oleaceae)	Aapril	20	Small	Provides pollen bees, propolis and sweet bark juices.
8	*Corylus avellana* L. (Betulaceae)	1-10 March	20	Medium	Male inflorescences, avenues, open up early. It is a great polenifer and offers honey
9	*Robinia pseudacacia* L. (Fabaceae)	10-20 May	800-1200	Very big	The plant hung from the forest. It provides the main production pick.
10	*Trifolium pratense* L. (Fabaceae)	15-25 June	25-50	Medium	Honey production is lower than all other species of this genus due to the depth of the corolla [11]. Bees do not always collect nectar.
11	*Trifolium repens* L. (Fabaceae)	20-30 May	100-250	Big	One of the most important honey plants. The plant has the following qualities: produces nectar and pollen in abundance, and offers monoflorous honey.
12	*Lotus corniculatus* L. (Fabaceae)	May- September	15-30	Small	Plants are rarely visited by himenopters.
13	*Onobrychis viciifolia* Scop. (Fabaceae)	5-15 June	120-300	Big	It is an early source in nectar and pollen for Apis mellifera carpathian Foti.
14	*Medicago sativa* L. (Fabaceae)	15-25 May	25-200	Medium	The bee does not visit the lantern too often because the pistil hits the hymenopter at the base of the trumpet [11].
15	*Campanula abietina* Griseb. & Schenk (Campanulaceae)	July-August	-	Without sharing	Bell bells produce nectar, but are of no economic importance to beekeeping.
16	*Crocus heuffelianus* Herb. (Iridaceae)	March-April	20	Small	Provides, early spring, pollen and nectar to bees.
17	*Vaccinium myrtillus* L. (Ericaceae)	05-15 May	15-30	Medium	Produces nectar and pollen.
18	*Vaccinium vitis-idaea* L. (Ericaceae)	May-July	-	Without sharing	Good source of bee nectar
19	*Bruckenthalia spiculifolia* (Salisb.) Rchb (Ericaceae)	July-August	-	Without sharing	Offers nectar to insects, without economic importance.
20	*Rubus idaeus* L. (Rosaceae)	05-15 June	50-200	Very big	It is a major bush with concentrated nectar (abundant).
21	*Rubus caesius* L. (Rosaceae)	22-31 May	30-50	Medium	Offers nectar and pollen
22	*Sorbus aucuparia* L. (Rosaceae)	April-May	30-40	Medium	Visited by bees for nectar, often pollen.
23	*Crataegus monogyna Jacq. (Rosaceae)*	20 -30 May	35-100	Medium	Offers nectar and pollen
24	*Fragaria vesca* L. (Rosaceae)	May-Juny	-	Without sharing	Appreciated due to nectar but not of economic importance.
25	*Malus domestica* Borkh. (Rosaceae)	20-30 April	30-42	Medium	It is appreciated for both its nectar and pollen. The species is particularly important in the development of colonies.
26	*Prunus domestica* L. (Rosaceae)	15-25 April	20-30	Medium	Provides quality pollen and nectar and plays an essential role in colonial development.
27	*Sambucus nigra* L. (Adoxaceae)	June-July	80	Small	Provides a small amount of nectar and pollen to the bees.
28	*Thymus serpyllum* L. (Lamiaceae)	June-July	150	Medium	Plant rich in nectar.

Families with only one representative: *Sapindaceae* (*Acer pseudoplatanus* L.); *Oleaceae* (*Fraxinus excelsior* L.); *Rubiaceae* (*Galium odoratum* (L.) Scop); *Geraniaceae* (*Geranium robertianum* L.); *Gentianaceae* (*Gentiana asclepiadea* L.); *Juncaceae* (*Luzula luzuloides* (Lam.) Dandy &Wilmott); *Ranunculaceae* (*Trollius europaeus* L.); *Primulaceae* (*Soldanella*

pusilla L.); *Oxalidaceae* (*Oxalis acetosella* L.); *Lamiaceae* (*Thymus serpyllum* L.); *Adoxaceae* (*Sambucus nigra* L.); *Hypericaceae* (*Hypericum perforatum* L.); *Campanulaceae* (*Campanula abietina* Griseb. & Schenk); *Brassicaceae* (*Cardamine bulbifera* Crantz.); *Iridaceae* (*Crocus heuffelianus* Herb);

Families with two representatives: *Fagaceae* (*Quercus petraea* (Matt.) Liebl., *Fagus sylvatica* L.); *Betulaceae* (*Betula pendula* Roth, *Corylus avellana* L.); *Pinaceae* (*Pinus sylvestris* L., *Picea abies* (L.) H. Karst.);

Families with three representatives: *Ericaceae* (*Vaccinium myrtillus* L., *V. vitis-idaea* L., *Bruckenthalia spiculifolia* (Salisb.) Rchb.); *Poaceae* (*Festuca rubra* L., *Agrostis capillaries* L., *Poa pratensis* L.);

Families with four representatives: *Asteraceae* (*Pilosella aurantiaca* (L.) F.W. Schultz & Sch.Bip, *Carlina acaulis* L., *Homogyne alpina* (L.) Cass., *Matricaria chamomilla* L.);

Families with six representatives: *Fabaceae* (*Trifolium pretense* L., *T. repens* L., *Lotus corniculatus* L., *Onobrychis viciifolia* Scop., *Medicago sativa* L., *Robinia pseudacacia* L.);

Families with seven representatives: *Rosaceae* (*Sorbus aucuparia* L., *Crataegus monogyna* Jacq., *Rubus idaeus* L., *R. hirtus* Waldst. & Kit., *Fragaria vesca* L., *Malus domestica* Borkh., *Prunus domestica* L.);

Of the total of 44 species, only 28 have a melliferous potential (Table 1)

Table 2. Numerical and relative abundance of honey species in the surroundings of Sălişte, Sibiu county

Nr. crt.	Family	Numeric Abundance	Relative Abundance (%)
1	Rosaceae	7	25
2	Fabaceae	6	21.44
3	Ericaceae	3	10.72
4	Pinaceae	2	7.14
5	Fagaceae	2	7.14
6	Betulaceae	2	7.14
7	Sapindaceae	1	3.57
8	Oleaceae	1	3.57
9	Campanulaceae	1	3.57
10	Iridaceae	1	3.57
11	Adoxaceae	1	3.57
12	Lamiaceae	1	3.57
	Total	28	100

The 28 species in the researched region belong to 12 families. We make the list of botanical families in order of numerical importance (Table 2)

Analyzing the data in Table 2, the family with the largest number of honey species, 7 in number, is the Rosaceae family (25%) followed closely by Fabaceae with 6 species (21.44%). The Ericaceae family with 3 species (10.72%) is ranked third. The families *Pinaceae, Fagaceae* and *Betulaceae* are represented by 2 species each (7.14%), and the families *Sapindaceae, Oleaceae, Campanulaceae, Iridaceae, Adoxaceae* and *Lamiaceae* have a melliferous plant species (3.57% each).

The landscape of Mărginimea Sibiului include several areas: alpine with numerous meadows dominated by grasses and creeping shrubs; Subalpine area with bushes, meadows; the mountain forest area with spruce, mountain maple, poplar, blueberries and secondary meadows installed on the site of forests; the area of hills and plateaus with deciduous forests (beech, oak, hornbeam, sycamore, acacia), fruit trees [19, 26].

The hazy resources of Sălişte and surrounding areas belong to the following categories:

Trees and shrubs: *Robinia pseudacacia* L., *Acer pseudoplatanus* L., *Quercus petraea* (Matt.) Liebl., *Fagus sylvatica* L., *Picea abies* (L.) H. Karst., *Betula pendula* Roth, *Fraxinus excelsior* L., *Corylus avellana* L., *Rubus idaeus* L., *R. caesius* L., *Sorbus aucuparia* L., *Crataegus monogyna* Jacq., *Fragaria vesca* L., *Vaccinium myrtillus* L., *V. vitis-idaea* L., *Sambucus nigra* L.;

Fruit trees and berries: *Malus domestica* Borkh (Fig 2), *Prunus domest*ica L.;

Fig. 2 Stall in Sălişte in the apple orchard (original)

Hayfields and pastures, forest races: *Trifolium pratense* L., *T. repens* L., *Onobrychis viciifolia* Scop., *Campanula abietina* Griseb. & Schenk, *Crocus heuffelianus* Herb, *Thymus serpyllum* L., *Bruckenthalia spiculifolia* (Salisb.);

Some species include fodder crops: *Onobrychis viciifolia* Scop, *Trifolium pratense* L., *T. repens* L., *Medicago sativa* L., *Lotus corniculatus* L.

Depending on the products offered to the bees (Table 1), the 28 species from the Sălişte flora, Sibiu County belong to the following categories:

- **Nectaropoliniferous plants**. They offer both the pollen and the nectar to the himenopteres. From the economic point of view, they are the most valuable apiculture and are the most widespread. Among these are: *Acer pseudoplatanus* L., *Robinia pseudacacia* L., *Trifolium pratense* L., *T. repens* L., *Lotus corniculatus* L., *Onobrychis viciifolia* Scop., *Medicago sativa* L., *Crocus heuffelianus* Herb, *Vaccinium myrtillus* L., *Rubus idaeus* L., *R. caesius* L., *Sorbus aucuparia* L., *Crataegus monogyna* Jacq., *Malus domestica* Borkh., *Prunus domestica* L. [21].
- **Nectar plants**. They offer bees only nectar. In the studied area only, the Thymus serpyllum L. is of economic value. Other species produce nectar but are not apicultural *Campanula abietina* Griseb. & Schenk, *Vaccinium vitis-idaea* L., *Bruckenthalia spiculifolia* (Salisb.) Rchb, *Fragaria vesca* L.
- **Poleniferous plants**. The latter offer pollen bees such as *Quercus petraea* (Matt.) Liebl., *Fagus sylvatica* L., *Pinus sylvestris* L., *Picea abies* (L.) H. Karst., *Betula pendula* Roth, *Fraxinus excelsior* L., *Corylus avellana* L., *Pinus sylvestris* L. [20].

The honey resources of our country have been grouped into 5 categories according to their apical importance [7,8]. The five categories include plants with a very large, large, medium, small, and no weight bee. The plants in Săliştei area are found in all these groups (Table 1).

1. Species with very high weight (7.16%). Only two species are included in this category: *Robinia pseudacacia* L., *Rubus idaeus* L. They provide yearly significant crop production;

2. Large apicot species (10.71%): *Picea abies* (L.) H. Karst., *Trifolium repens* L., *Onobrychis viciifolia* Scop. with high melliferous potential, supplying periodically the production harvest;

3. Species with medium beekeeping (50%). In this category, most of the identified taxa are fourteen: *Quercus petraea* (Matt.) Liebl, *Fagus sylvatica* L., *Pinus sylvestris* L., *Acer pseudoplatanus* L., *Corylus avellana* L., *Trifolium pratense* L., *Medicago sativa* L., *Vaccinium Myrtillus* L., *Rubus caesius* L., *Sorbus aucuparia* L., *Crataegus monogyna* Jacq., *Malus domestica* Borkh., *Prunus domestica* L., *Thymus serpyllum* L. [20, 21]. All these species provide annual maintenance and developmental selections, of production;

4. Species with low apiculture (17.85%). In this category we find five species: *Betula pendula* Roth, *Fraxinus excelsior* L., *Lotus corniculatus* L., *Crocus heuffelianus* Herb., *Sambucus nigra* L. These provide bee families with nectar and pollen needed for maintenance and development.

5. Species without beekeeping (14.28%). There are plants that occasionally offer nectar and pollen short time. They are not economically important. Among these species we find four taxa: *Campanula abietina* Griseb. & Schenk, *Vaccinium vitis-idaea* L., *Bruckenthalia spiculifolia* (Salisb.) Rchb, *Fragaria vesca* L.

Out of the total of the 28 species studied, five (17.85%) are producing extrafloral honey, sometimes called honey, and normal honey. This type of honey is of animal origin and comes from sweet bees collected from leaves, petioles and branches. Mana is the excretion product of *Homoptera* (*Aphididae, Lachnidae, Lecanidae*), with a system adapted for sucking and iching, which feed on sap of elaborate plants [22]. Mana can have a sugar concentration of 20-40% [11]. Among the host plants in the surroundings of Sălişte, which are of economic importance to the manufactures, are: *Quercus petraea* (Matt.) Liebl., *Fagus sylvatica* L., *Pinus sylvestris* L., *Picea abies* (L.) H. Karst, *Corylus avellana* L.

Analyzing the data of Table 2 stands out that the period of flowering of the honey plants is in the period of March to September, with the

maximum favorability of harvesting in May-June.

CONCLUSIONS

In the area of Mărginimea Sibiului, especially in the surroundings of Sălişte, 44 plant taxa were identified, of which 28 were with melliferous potentials. They belong to a number of 12 botanical families: *Rosaceae* (7 taxons), *Fabaceae* (6 taxa), *Ericaceae* (3 taxa), *Pinaceae, Fagaceae* and *Betulaceae* with 2 taxa each. Families of Sapindaceae, *Oleaceae, Campanulaceae, Iridaceae, Adoxaceae, Lamiaceae* have one representative for each.

The natural landscape of Mărginimea Sibiului is differentiated on several areas: alpine, subalpine, hill and plateau. Honey plants are found in areas with trees and shrubs, orchards with trees and fruit trees, meadows, pastures, rarities of the forest.

Due to the nature of the food that it offers *Apis mellifera carpatica* Foti, the 28 species of plants of the melliferous base studied are divided into three categories: 15 nectaropoliniferous species, i.e. 53.57%; 4 nectariferous species, i.e. 14.28% and 8 polyniferous species, i.e. 28.57%. The fact that half of the honey plants offer bees both nectar and pollen makes this category the most important of the area in beekeeping and economic terms.

We find all five categories of honey resources: species with high apiculture (7,16%), species with high apiculture (10,71%), medium bee species (50%), small species (17, 85%), bee-free species (14.28%). Because the floristic potential of the area is 67.87% in the first three important economic categories, it encouraged another concern for the inhabitants of this area, namely beekeeping.

The maximum harvesting allowance in the area is estimated between May and June.

There have been identified five host plants of economic importance for manmade producers: *Quercus petraea* (Matt.) Liebl., *Fagus sylvatica* L., *Pinus sylvestris* L., *Picea abies* (L.) H. Karst, *Corylus avellana* L.

It is necessary to capitalize much more effectively on the flora and, implicitly, on all the honey resources in the area, because the productive performances, measurable in quantities of honey and other hive products, are primarily influenced by the honeycomb base.

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