

THE IMPORTANCE OF THE MELLIFEROUS FLORA FOR THE BEEKEEPING IN GURA RÂULUI COUNTRYSIDE AREA (SIBIU COUNTY), ROMANIA

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Abstract

The melliferous potential consists in the capacity of a certain areal to provide food (nectar, pollen, manna) for the bee's families to obtain the beekeeping products. The knowledge of this resource is important in the beekeeping practice, being the success key to obtain a rich production of quality. The purpose of the study is the identification of the flora with a melliferous potential in Gura Râului countryside (Sibiu county). To achieve the purpose, it was important to analyze the specialized literature, the direct field research, the examination, taking photos, collecting botanical material and its identification in the laboratory. The study is finalized by drawing up a list with 47 species with a melliferous potential that belong to 22 botanical families.

Key words: plants with melliferous potential, Gura Râului countryside (Sibiu county)

INTRODUCTION

The honeybee is the creation of the Gods, offered to the mortal mankind in a moment of divine inspiration and maximum generosity.

Diodor of Sicily and Calimax in the “Hymn to Zeus” said that the bees fed Zeus, when he was a baby in Crete, where he was hidden by his mother Rhea to protect him against the cannibalous appetite of the Cronos.

Glaucos Minos'son, was lost as a baby, in the catacombs of the labyrinth. He was found by Poliidor, dead in a large pot full of honey [9].

On the Goddess Artemis's skirt, that is a statue found in the archaeological exactions in Pritaneu, Efes, between other symbols are present bees disposed by fours in two lateral rows.

Honey was used also as material to embalm. In the Palace of Cnossos, pots full of honey were found that contained the dead bodies of the Cretan children. The people believed that over these pots, the souls of the embalmed children were flying in form of the bees.

The Olympian Divinities always protected the honeybees. Arister, Apollo's son learned about the beekeeping from the Centaur

Chiron. Therefore, beekeeping spread within Elada and beyond its borders.

Herodotus gave us an information in “Histories” that the lands beyond the Ister (Danube) cannot be easily crossed because of the swarm of the bees.

Through here penetrated Darius of Istaspe and then Alexander the Great as well, in his expedition to pacify the turbulent tribes in North, before going into the great Asian adventure. After ten years he returned home in a coffin full of honey [10].

Testimonies about the fact that in the regions beyond the Istru, the beekeeping culture was an economical preoccupation and that honey was a part of the daily menu of the inhabitants, one could also find the information on the metopes of the “Column” in Rome.

In whole Europe, the bee was used as a heraldic symbol, being found on the imperial mantles [2].

Biological science dedicated multiple studies to the bee, crowned even by Nobel Prize.

For centuries people were interested in beekeeping, following to obtain of more and more productions in honey and beeswax.

Nowadays this interest is exceeded by the importance of the bees concerning the pollinating of the plants.

It is a known fact that the pollinating of entomophilous plants could grow the production with 75-80%. The bees evolved with flowers in a symbiosis that assure the reciprocal success of the two groups [1].

Scientific researchers appreciated that a single bee could visit in a minute, several other 24 flowers; that made it to be labeled as “the creature of the world who could not be replaced”. This fact stimulated research about the melliferous base in the beekeeping areal. The assurance of a rich habitat in wildflowers comes as a help for this important pollinator, the bee.

Many researches state out the fact that the autochthon plants adapted to soils and local climate, which are the preferable sources for bees [11].

This fact was spotlighted by our researches that took place in different habitats in Sibiu county in the period of 2013- 2020.

The purpose of the present study consists in the identification of the flora with a melliferous potential in the basin of the countryside Gura Râului (Sibiu county).

The magic of beekeeping is deep embedded in the human mental being an explanation for the pensioners’ dream to spend their time with this bucolic activity, meaning the return to nature.

MATERIALS AND METHODS

In the South of Transylvania, in an area between the Olt river, Frumoasa valley and the Northern crests of the South Carpathians Mountains, live so called “The marginals” (Mărgineni) a community that stand out by an authentic spiritual and economic feature.

The localities disposed on two rows along the areal, converging their majority towards are called “Mărginimea Sibiului” (Marginal of Sibiu).

One of the villages of “Mărginime”, is Gura Râului, a countryside on the Cibin river, where the thrifty man is in connection with the mountain, with a rich vegetation, with a

diversified fauna where beekeeping is in a meaningful attention.

The border of the village is from top of the mountains- at the Iezerele Cindrelului – to the valley at the limit of the village Orlat, that was formerly a center of the frontier guard (Fig.1).

Lucian Blaga has a true poetical inspiration in his verses of the poem “Boca del Rio” (Gura Râului): “Do you remember the green, the beehives and the cooing doves on the roofs?”

Indeed, three quarter of the border of the village is covered by deciduous forest (oak tree, hornbeam, beech tree), coniferous forest (fir tree, spruce fir) that cover a surface of 6,217 ha. as well as shrubs, bushes, pasture lands and hay field with a surface of 2,958 ha.

It is important to mention that on the territory of Gura Râului village there are four protected areas: one site of communitarian importance - Frumoasa, an area of avifaunistical protection - Frumoasa and two other natural areas are protected by the national interest - National Park Cindrel, beside the Iezerele Cindrelului. There are also arable cultivated plots of land with: wheat,rye, two -row barley, oats, maize, potato, vegetables, fodder. The surface of the arable plot is assessed to 924 ha [29].

Beekeeping is at home! The number of bee families increases every year, therefore in 2019 they were more than 700, with a honey production more than 15 tons [30].

To achieve the purpose of this study, the following methods have been applied:

-The analysis of specialized literature about the flora in the studied areal.

-The direct field research, collecting the plants and taking photographs.

-The application in the field was in the period of 2018- 2019.

- In the laboratory it was identified the collected material in the studied area, using numerous bibliographic sources [4, 8, 16-19, 25, 26, 27].

The final of the study consists in drawing up the list of the plants with the melliferous potential in this area [3, 5, 7, 12-15, 20, 28].



Fig.1. The localization of Gura Râului locality in the Sibiu county
 Source: <http://pe-harta.ro/Sibiu/>, Accessed on 07.10, 2020.

RESULTS AND DISCUSSIONS

The honeybee in her way of life is close connected with her natural medium, being implied in the conservation, restoration and supporting the biodiversity both by pollinating

the spontaneous flora and also of the cultivated one, being such a strong link in the trophic chain of all species [21]. The key of success in beekeeping consists of mastership by the farmer of the technology for beekeeping and also its insurance by turning to account as efficient as possible of the melliferous resources from spontaneous, forestry and cultivated flora of every habitat. The village Gura Râului is, together with other 29 localities, in the category of areals with good botanical investigations and a floristic inventory almost complete [6]. On the basis of the speciality literature [6, 22-27] and our own researches, 177 taxons in the studied areal were identified. Among them, 47 taxons are in the category of plants with a melliferous potential (22.55%) (Table 1).

Table 1. Flora with melliferous potential in the basin of the village Gura Râului (Sibiu county)

Nr. crt	Species	The economical beekeeping weight	Biological data	Observations
1	2	3	4	5
Pinaceae				
1	<i>Abies alba</i> Mill.	high	Coniferous tree, resinous, pollen, manna	Host plant for the manna producers
2	<i>Picea abies</i> (L.) H.Karst.	high	Coniferous tree, resinous, nectar, manna, propolis	The spruce fir is the host plant which is the most important for the manna producers
3	<i>Pinus cembra</i> L.	medium	Coniferous tree, resinous, pollen, manna	On the branches and offshoots live species of <i>Lachnidae</i> , manna producers
Cupressaceae				
4	<i>Juniperus communis</i> L.	low	Coniferous tree, resinous, manna	The juniper tree supplies considerable harvest of manna for the maintenance and development of the bee family
Ranunculaceae				
5	<i>Aconitum firmum</i> Rchb.	medium	herbaceous, nectar	Can be found in meadows, rocky places in the mountain zone
6	<i>Aconitum tauricum</i> Wulf.	medium	herbaceous, nectar	Can be found in grassy places around the sheepfolds
7	<i>Aquilegia vulgaris</i> L.	low	herbaceous, propolis, nectar, pollen	The flowers are intensely visited by bees
Fagaceae				
8	<i>Fagus sylvatica</i> L.	medium	deciduous tree, nectar, pollen, manna	The tree supplies the harvest of bees in the period May-June
9	<i>Quercus petraea</i> (Matt.) Liebl.	medium	deciduous tree, pollen, manna	-
Betulaceae				
10	<i>Alnus glutinosa</i> (L.) Gaertn.	medium	tree, pollen, propolis	Offers high quantities of pollen as early as March
11	<i>Alnus incana</i> (L.) Mnch.	medium	deciduous tree, pollen, manna	It offers harvests in springtime months, March, April
Corylaceae				
12	<i>Corylus avellana</i> L.	medium	deciduous tree, pollen, manna	The most early bush that offers pollen to bees. manna is produced by the Homopter <i>Myzocallis coryli</i> (Goeze)
Caryophyllaceae				
13	<i>Silene vulgaris</i> (Mnch.) Garke	high	herbaceous, nectar, pollen	-
Rosaceae				
14	<i>Cerasus avium</i> L.	medium	tree, nectar, pollen	Fruit tree, very often visited by bees
15	<i>Malus domestica</i> Borkh.	medium	fruit tree, nectar, pollen	Species very appreciated for the nectar, but mostly for its highly polleniferous value
16	<i>Prunus spinosa</i> L.	medium	thorny bush, nectar, pollen	Honey has a yellow-golden colour, intense flavour and a pleasant taste
17	<i>Prunus domestica</i> L.	medium	fruit tree, nectar, pollen, manna	a fruit tree with a large spreading
18	<i>Pyrus communis</i> L.	medium	fruit tree, nectar, pollen	The flower secretes smaller quantities of nectar
19	<i>Rosa canina</i> L.	medium	thorny bush, nectar, pollen	The flowers are intensely visited by bees
20	<i>Rubus caesius</i> L.	medium	bush, nectar, pollen	The harvest of nectar and pollen are very important for maintenance and development of the bee families
21	<i>Rubus idaeus</i> L.	very high	bush, nectar, pollen	It can be found in the zone of the spruce fir and the beech tree. It blossoms at the end of May. In the best conditions it produces large quantities of nectar
22	<i>Sorbus aucuparia</i> L.	medium	tree, nectar, pollen	the limit of the coniferous and mixt forests
Fabaceae				
23	<i>Lotus corniculatus</i> L.	medium	herbaceous, nectar, pollen	-
24	<i>Trifolium campestre</i> Schreb.	medium	herbaceous, nectar, pollen	-
25	<i>Trifolium dubium</i> Sibth.	medium	herbaceous, nectar, pollen	-
Celastraceae				
26	<i>Euonymus europaea</i> L.	medium	bush, nectar	It grows in forets, groves, bushes. It blossoms in spring and sommertime
Rhamnaceae				
27	<i>Frangula alnus</i> Mill.	medium	bush, nectar, pollen	The monoflower honey has important therapeutical qualities
Aceraceae				
28	<i>Acer pseudoplatanus</i> L.	medium	tree, nectar, pollen, manna	It is widely spread in the mountain zones. It produces nectar also during unfavourable time. It offers a large quantity of pollen. Honey is extremely flavoured

Source: [6].

Table 1. Flora with melliferous potential in the basin of the village Gura Râului (Sibiu county) (continued)

Apiaceae				
29	<i>Astrantia major</i> L.	low	herbaceous, pollen, nectar	-
30	<i>Angelica archangelica</i> L.	medium	herbaceous, pollen, nectar	-
31	<i>Pimpinella saxifraga</i> L.	low	herbaceous	-
32	<i>Sium latifolium</i> L.	medium	herbaceous, pollen, nectar	-
Salicaceae				
33	<i>Populus tremula</i> L.	medium	deciduous tree, pollen, manna, propolis	-
34	<i>Salix caprea</i> L.	high	bush, pollen, nectar	the honey has a silvery colour, pleasant taste, in autumn produces manna
Ericaceae				
35	<i>Vaccinium myrtillus</i> L.	medium	bush, nectar, pollen	the flowers are intensely visited by bees
36	<i>Vaccinium vitis-idaea</i> L.	medium	bush, nectar, pollen	the bees visit intensely the flowers all period of blossoming, from May to July
Primulaceae				
37	<i>Primula veris</i> L. em. Hudus	medium	herbaceous, nectar, pollen	It can be found in grassland; the blossoming is in April- May
Oleaceae				
38	<i>Fraxinus excelsior</i> L.	medium	deciduous tree, pollen, manna	-
Lamiaceae				
39	<i>Mentha arvensis</i> L.	high	herbaceous, pollen, nectar	The peppermint honey has a yellow colour with a tint of green. The taste is sweet, with a specific flavour
40	<i>Teucrium chamaedrys</i> L.	medium	herbaceous, nectar, pollen	-
Dipsacaceae				
41	<i>Scabiosa ochroleuca</i> L.	medium	herbaceous, pollen, nectar	-
Asteraceae				
42	<i>Taraxacum officinale</i> (L.) Weber ex F.H. Wigg.	medium	herbaceous, nectar, pollen	the flowers offer to bees an intense harvest of nectar and pollen in the hours before lunch
43	<i>Telekia speciosa</i> (Schreb.) Baumg.	medium	herbaceous, nectar, pollen	-
44	<i>Arnica montana</i> L.	low	herbaceous, pollen, nectar	The harvest takes place only during the period of blossom, on an average of 14 days
Orchidaceae				
45	<i>Orchis morio</i> L.	medium	herbaceous, pollen, nectar	-
46	<i>Neotinea ustulata</i> (L.) R.M.Bateman, Pridgeon & M.W.Chase	medium	herbaceous, pollen, nectar	-
Poaceae				
47	<i>Zea mays</i> L.	medium	herbaceous, under crop, pollen	-

Source: [6].

The flora with honey potential in the basin of Gura Râului locality (Table 1) includes 47 species belonging to a number of 22 botanical families. We note the existence of the following families:

- **with one representative:** *Cupressaceae* (*Juniperus communis* L.), *Corylaceae* (*Corylus avellana* L.), *Caryophyllaceae* (*Silene vulgaris* (Mnch.) Garke), *Celastraceae* (*Euonymus europaea* L.), *Rhamnaceae* (*Frangula alnus* Mill.), *Aceraceae* (*Acer pseudoplatanus* L.), *Primulaceae* (*Primula veris* L. em. Hudus), *Oleaceae* (*Fraxinus excelsior* L.), *Dipsacaceae* (*Scabiosa ochroleuca* L.), *Poaceae* (*Zea mays* L.);
- **with two representatives:** *Fagaceae* (*Fagus sylvatica* L., *Quercus petraea* (Matt.) Liebl), *Betulaceae* (*Alnus glutinosa* (L.) Gaertn, *A. incana* (L.) Mnch.), *Salicaceae* (*Populus tremula* L., *Salix caprea* L.), *Ericaceae* (*Vaccinium myrtillus* L., *V. vitis-idaea* L.), *Lamiaceae* (*Mentha arvensis* L., *Teucrium chamaedrys* L.), *Orchidaceae* (*Orchis morio* L., *Neotinea ustulata* (L.) R.M.Bateman, Pridgeon & M.W.Chase);
- **with three representatives:** *Pinaceae* (*Abies alba* Mill., *Picea abies* (L.) H.Karst., *Pinus cembra* L.), *Ranunculaceae* (*Aconitum firmum* Rchb., *A. tauricum* Wulf, *Aquilegia*

- vulgaris* L.), *Fabaceae* (*Lotus corniculatus* L., *Trifolium campestre* Schreb, *T. dubium* Sibth.), *Asteraceae* (*Taraxacum officinale* (L.) Weber ex F.H. Wigg, *Telekia speciosa* (Schreb) Baumg., *Arnica montana* L.);
 - **with four representatives:** *Apiaceae* (*Astrantia major* L., *Angelica archangelica* L., *Pimpinella saxifraga* L., *Sium latifolium* L.);
 - **with nine representatives:** *Rosaceae* (*Cerasus avium* L., *Malus domestica* Borkh., *Prunus spinosa* L., *P. domestica* L., *Pyrus communis* L., *Rosa canina* L., *Rubus caesius* L., *R. idaeus* L., *Sorbus aucuparia* L.).
- Most species with honey potential in the area are part of the category of forest honey plants and includes 14 tree species and 13 shrub species. Trees and shrubs by their diversity and by occupying most of the studied area represent the most important honey source of the studied area. These categories come with the highest intake of nectar and pollen. The remaining 20 species belong to the category of herbaceous plants.
- The 47 species that form the honey resources of Gura Râului basin are divided in terms of importance for beekeeping in the following categories:

Species with a very high beekeeping weight, with one representative (2.12%), which occupies important areas and annually ensures significant production harvests. In this category the species *Rubus idaeus* L. was identified with the average date of onset of flowering between 05.-15.05 [7] and which on days with temperatures above 20°C produces large amounts of nectar.

Species with a high beekeeping weight cover large areas and ensure periodic or annual harvesting. The five species (10.63%) included in this category are: *Abies alba* Mill., *Picea abies* (L.) H. Karst., *Silene vulgaris* (Mnch.) Garke, *Salix caprea* L., *Mentha arvensis* L.

Species with medium bee weight. Most plants (76.62%) included in this group provide sustained harvests of nectar and pollen annually for the maintenance, development of bee families. Sometimes, in extremely favorable conditions, they can also support production harvests. The category includes 36 species: *Pinus cembra* L., *Aconitum firmum* Rchb., *A. tauricum* Wulf., *Fagus sylvatica* L., *Quercus petraea* (Matt.) Liebl., *Alnus glutinosa* (L.) Gaertn., *A. incana* (L.) Mnch., *Corylus avellana* L., *Cerasus avium* L., *Malus domestica* Borkh., *Prunus spinosa* L., *P. domestica* L., *Pyrus communis* L., *Rosa canina* L., *Rubus caesius* L., *Sorbus aucuparia* L., *Lotus corniculatus* L., *Trifolium campestre* Schreb., *T. dubium* Sibth., *Euonymus europaea* L., *Frangula alnus* Mill., *Acer pseudoplatanus* L., *Angelica archangelica* L., *Sium latifolium* L., *Populus tremula* L., *Vaccinium myrtillus* L., *V. vitis-idaea* L., *Primula veris* L. em. Hudus, *Fraxinus excelsior* L., *Teucrium chamaedrys* L., *Scabiosa ochroleuca* L., *Taraxacum officinale* (L.) Weber ex F.H. Wigg., *Telekia speciosa* (Schreb.) Baumg., *Orchis morio* L., *Neotinea ustulata* (L.), *Zea mays* L.

Species with low bee weight. The five species in the group (10.63%) provide nectar or pollen harvests for the maintenance of bee families, but do not support production harvesting. In this category we find the species: *Juniperus communis* L., *Aquilegia vulgaris* L., *Astrantia major* L., *Pimpinella saxifraga* L., *Arnica montana* L.

We emphasize that out of a total of 47 species with honey potential, 32 species (68.08%) are important sources of both nectar and pollen. The pollen collected by bees is transformed into pasture so indispensable to bees for their food and larvae, especially those of the queen. But what bees look for in plants is nectar, produced by the nectar glands of entomophilous plants, and transformed into floral honey. We mention that if the honey plants are in suitable environmental conditions, the secretion can be continuous.

Also, the honey base of the Gura Râului basin includes 13 species (27.65%) producing manna. Extremely important is the manna of animal origin produced by *Lecanidae* and *Lachnidae* (*Insecta: Homoptera*) that are found on conifers. Manna-producing insects on deciduous species are of little interest.

CONCLUSIONS

The analysis of the flora in the basin Gura Râului certified the fact that the locality and its surroundings are well studied, having the floristic inventory almost complete, with 177 species. Among them, the identified flora with melliferous potential is represented by 47 species (26.55%).

The inventory of the melliferous flora contains 22 botanical families, among them the family Rosaceae is the best represented (9 taxons), followed by *Apiaceae* (4 taxons), *Pinaceae*, *Ranunculaceae*, *Fabaceae*, *Asteraceae* (3 taxons each of them), *Fagaceae*, *Betulaceae*, *Salicaceae*, *Ericaceae*, *Lamiaceae*, *Orchidaceae* (2 taxons each of them).

Several 10 families have each of them a single representative: *Cupreeaeae*, *Corylaceae*, *Caryophyllaceae*, *Rhamnaceae*, *Aceraceae*, *Primulaceae*, *Oleaceae*, *Dipsacaceae*, *Poaceae*.

From the point of view importance for beekeeping there were 4 categories identified: species with a very high beekeeping weight (2.12%), species with high beekeeping weight (10.63%), species with a medium beekeeping weight (76.62%) and species with a low beekeeping weight (10.63%).

The majority of melliferous species are nectaro-poleniferous. Due to the fact that the first three groups with importance for beekeeping, that assure harvesting of honey yearly or periodically, totalized 89.37% from the total plants with a melliferous potential, demonstrates that the melliferous resources of this zone are satisfying for the beekeeping demands.

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