Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 3, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE MELLIFEROUS POTENTIAL OF THE FLORA IN THE GUȘTERIȚA LOCALITY, SIBIU COUNTY, ROMANIA

Iuliana ANTONIE

"Lucian Blaga" University, The Faculty of Agricultural Sciences, Food Industry and the Protection of the Environment, Sibiu, 7-9 Dr. Ion Rațiu, 550012, Sibiu, Romania, Phone: +40 269 211338, Fax: + 40 269 213381, E-mail: iuliana_antonie@yahoo.com

Corresponding author: iuliana_antonie@yahoo.com

Abstract

The locality Gușterița, today a neighborhood of Sibiu city, belongs to the well studied place concerning the botanical point of view, with almost complete floristical inventories. Our study has a purpose to identify the main melliferous plants in the Gușterița locality and its surroundings. We want to complete my researches about the melliferous base of the Sibiu county, in order to turn to the best account of the melliferous resources in this area.The following methods have been applied to achieve the purpose: the study the data from the specialized literature of the botanists who have done researches in this area, direct observations in the field, the collecting of the botanical material and its identification in the laboratory. The result of the researches consists in the compiling list of the melliferous species in this area. They were identified 43 plants families and 181 melliferous species from the spontaneous and subspontaneous Flora with obvious implications in the the beekeeping.The melliferos resources of this area were grouped into four groups after the point of view of the melliferous weight.The knowledge of the floristic potential in Gușterița represents the key to the success for the beekeeping in Sibiu county.

Key words**:** *Gușterița, beekeeping weight, melliferous plants*

INTRODUCTION

The Gods, in a moment of divine grace, created the honey bees „for the sake of the man"[18]. Darwin sensed the honey bees, path in their 100 milion years of existence.

The human fascination about honey bees was also supported by the fact that the product of bees, honey, was the only one sweetener in human nutrition. This fascination diminished its attractiveness because of the imports of sugar cane from the New World into Europe.

Honey, this complete basic element was a part of the food of the Gods. Zeus himself was fed, as a baby, with honey and goat-s milk.

Greek mythology records the family Melisus, the honey man, with his daughters, the nymphs Melissa (the Bee Queen) and Amaltea (the Goddess Capra) that have fed Zeus immediately after his birth by Rheea [9].

An ancient Greek mith said that the first temple, of the five built, ab initio, at Delfi, was made of beewax and it was worshiped to the Earth Goddess in the hypostasis of a Bee [8].

The Paleolithic cave paintings also highlight the close relationship between man and bee. There are endless researches, works, studies dedicated to the bees, from the ancient times until the present day. Aristotel left us the extensive studies in his books, such as „Animal History". Plinius the Elder gathered in his encyclopedic work „Naturalis Historia" all the knowledges existing at that time about bees.

Herodotus gave us an interesting and somewhat surprising information: „ The land beyond water (Ister, Danube) can not be easily broken because of the crowd of bees ". Xenophon confirms: „ The food of Getas consists primarily of honey, vegetables, simple or cooked milk and vey little meat, because the faith in Zamolxis stopped them [10].

The bee has never lost its fascination for man. The Ethology, a science that deals with the study of the animal manifestations, has been keenly concerned with the enigmatic manifestations and states of the bees world. The so called „ the bees dance" considered a fantastic ritual, full of mystery has been

unravelled by the researcher Karl von Frisch. He drawed out of its spfere of magic, concluding that „the dancing bee" is nothing else but an informational attempt in the bees effort for guidance to the melliferous locations. Karl von Frisch received the Nobel Prize for his discoveries [1].

The researches has shown that the flowering plants, appeared 245- 200 million years ago. About around 100 million years they were spread over almost the entire globe. The bees have evolved simultaneously with the flowering plants. The key to success of this symbiosis was the necessary pollen both for the bees and also for the plants reproduction. [11]. The importance of pollinating insects in plant wool has been debated over time by different naturalists, among them bees and butterflies playing an important role. Studies and research related to the importance and evolution of lepidopteran populations in the hills of Gușterița [24] and in the surroundings of Sibiu have been carried out over time by the Sibiu saxons, but there are also more recent studies in recent years [25].

Over time there have been studies on the importance and beneficial qualities of honey. Physico-chemical analyzes revealed the composition and content of honey, which is strictly dependent on pollen and nectar of flowers [12,13].

The purpose of our research consists in identification of the melliferous flora from Gușterița and its surroundings, Sibiu county. The data obtained were corroborated with th data from the specialized literature about the studied flora of the area.

MATERIALS AND METHODS

The investigations were carried out in Gușterița, a Saxon settlement that is currently included in the area of the Sibiu city, which is in full expansion. The area of Gușterița comprises meadows, forests of acacia, alder, bushes, schrubs and orchards.The study of the melliferous flora was carried out between the years 2012-2018, from point of view theoretical and practical, on the following levels:

- the use of information from the specialized literature,
- the direct observation in the field,
- the collecting of the melliferous plants in the area and the identification of the plants in laboratory.

RESULTS AND DISCUSSIONS

An important condition for the growth and the profitable maintenance of the bees families is the knowledge of the melliferous plants in the area. Gușterița is a part of the localities in Sibiu county, that have been well investigated under the botanical aspect, with an almost complete inventory of the flora [1, 4, 5, 20, 21, 22]. The research of the potential of the flora in this area led to a number of 927 species of plants, of which we have identified 181 species of melliferous plants.

In order to identify the species of this flora, we have been used a number of resources from the speciality literature [2, 7, 14, 15, 16, 17, 23].

The result of our study is the elaboration of the floristic list of the melliferous plants and the determination of the beekeeping weight for each species [3, 6, 19]. (Table 1).

Table 1. The melliferous potential of the flora from the locality Gușterița and its surroundings.

Nr.crt	Family	Species	Beekeeping weight
1	*Berberidaceae*	*Berberis vulgaris* L.	Medium
2	*Aristolochinaceae*	*Aristolochia clematitis* L	Medium
3	*Ranunculaceae*	*Adonis vernalis* L.	Medium
4		*Anemone nemorosa* L.	Medium
5		*Anemone ranunculoides* L.	Medium
6		*Anemone sylvestris* L.	Medium
7		*Clematis vitalba* L.	Medium
8		*Helleborus purpurascens* W.etK.	Medium
9	*Papaveraceae*	*Chelidonium majus* L.	Little
10		*Corydalis solida* (L.) Sw.	Medium
11		*Papaver dubium* L.	Medium
12		*Papaver rhoeas* L.	Medium
13	*Fagaceae*	*Quercus petraea* (Matt.) Liebl.	Medium
14		*Quercus robur* L.	Medium
15	*Corylaceae*	*Corylus avellana* L.	Medium
16	*Caryophyllaceae*	*Silene vulgaris* (Mnch.) Garke	Large
17	*Polygonaceae*	*Polygonum aviculare* L.	little
18		*Polygonum hydropiper* L.	Medium
19	*Rosaceae*	*Crataegus monogyna* Jacq.	Medium
20		*Malus pumila* Mill.	Medium
21		*Pyrus communis* L.	Medium
22		*Prunus domestica* L.	Medium
23		*Prunus avium* L.	Medium
24		*Prunus cerasus* L.	Medium
25		*Filipendula vulgaris* Mnch.	Little
26		*Fragaria vesca* L.	Little
27		*Fragaria viridis* Duch.	Medium
28		*Malus sylvestris* (L.) Mill.	Medium
29		*Potentilla alba* L.	Little
30		*Potentilla anserina* L.	Little

31		*Prunus spinosa* L.	Medium
33		*Prunus tenella* Batsch.	Medium
32		*Rosa canina* L.	Medium
33		*Rubus caesius* L.	Medium
34		*Sorbus torminalis* (L.) Crantz	Medium
35	*Fabaceae*	*Amorpha fruticosa* L.	Medium
36		*Robinia pseudoacacia* L.	Very large
37		*Galega officinalis* L.	Little
38		*Lathyrus tuberosus* L.	Medium
39		*Lotus corniculatus* L.	Medium
40		*Medicago falcata* L.	Medium
41		*Medicago lupulina* L.	Medium
42		*Medicago sativa* L.	Medium
43		*Melilotus officinalis* (L.) Pall.	Medium
44		*Onobrychis arenaria* (Kit.) Ser.	Medium
45		*Onobrychis viciifolia* Scop.	Large
46		*Trifolium campestre* Schreb.	Medium
47		*Trifolium hybridum* L.	Medium
48		*Trifolium medium* L.	Medium
49		*Trifolium montanum* L.	Medium
50		*Trifolium ochroleucon* Huds.	Medium
51		*Trifolium pannonicum* Jacq.	Medium
52		*Trifolium pratense* L.	Medium
53		*Trifolium repens* L.	Large
54		*Vicia cracca* L.	Little
55		*Vicia grandiflora* Scop.	Medium
56		*Vicia hirsuta* (L.) S.F.Gray	Little
57		*Vicia pannonica* Cr.	Medium
58		*Vicia sativa* L.	Medium
59		*Vicia villosa* Roth.	Medium
60	*Lythraceae*	*Lythrum salicaria* L.	Medium
61	*Onagraceae*	*Chamaenerion angustifolium* (L.) Scop.	Large
62		*Epilobium hirsutum* L.	Medium
63		*Oenothera biennis* L.	Little
64	*Thymelaeaceae*	*Daphne mezereum* L.	Medium
65	*Cornaceae*	*Cornus sanguinea* L.	Medium
66	*Celastraceae*	*Euonymus europaea* L.	Medium
67	*Rhamnaceae*	*Frangula alnus* Mill.	Medium
68		*Rhamnus cathartica* L.	Medium
69	*Aceraceae*	*Acer campestre* L.	Medium
70		*Acer pseudoplatanus* L.	Medium
71	*Rutaceae*	*Dictamnus albus* L.	Little
72	*Geraniceae*	*Geranium pretense* L.	Medium
73	*Linaceae*	*Linum austriacum* L.	Medium
74		*Linum flavum* L.	Medium
75		*Linum hirsutum* L.	Medium
76	*Apiaceae*	*Carum carvi* L.	Medium
77		*Chaerophyllum aromaticum* L.	Little
78		*Daucus carota* L.	Medium
79		*Eryngium campestre* L.	Medium
80		*Eryngium planum* L.	Medium
81		*Heracleum sphondylium* L	Little
82		*Pastinaca sativa* L.	Medium
83		*Pimpinella saxifraga* L.	Little
84	*Tiliaceae*	*Tilia cordata* Mill.	Very large
85		*Tilia platyphyllos* Scop.	Very large
86	*Malvaceae*	*Althaea cannabina* L.	Little
87		*Althaea officinalis* L.	Little
88		*Althaea pallida* W. et K.	Little
89		*Lavatera thuringiaca* L.	Medium
90		*Malva pusilla* Sm.	Little
91		*Malva sylvestris* L.	Little
92	*Violaceae*	*Viola ambigua* W. et K.	Medium
93		*Viola canina* L.	Medium
94		*Viola odorata* L.	Medium
95	*Brassicaceae*	*Barbaraea vulgaris* R. Br.	Medium
96		*Brassica elongata* Ehrh.	Medium
97		*Brassica nigra* (L.) Koch	Large
98		*Brassica rapa* L. ssp campestris (L.) Clapham	Large
99		*Cardamine pratensis* L.	Little
100		*Crambe tataria* Sebeok.	Little
101		*Hesperis matronalis* L.	Little
102		*Lunaria annua* L. ssp. annua	Medium
103		*Raphanus raphanistrum* L.	Medium
104		*Sinapis alba* L.	Large
105		*Sinapis arvensis* L.	Medium
106	*Resedaceae*	*Reseda lutea* L.	Medium
107	*Salicaceae*	*Salix alba* L.	Large
108		*Salix caprea* L.	Large
109		*Salix cinerea* L.	Large
110		*Salix fragilis* L.	Medium
111		*Salix purpurea* L.	Medium
112	*Cucurbitaceae*	*Bryonia alba* L.	Medium
113	*Primulaceae*	*Primula veris* L.	Medium
114	*Gentianaceae*	*Centaurium erythraea* Rafn.	Medium
115	*Apocynaceae*	*Vinca herbacea* W. et. K.	Little
116		*Vinca minor* L.	Little
117	*Solanaceae*	*Datura stramonium*	Little
118		*Hyoscyamus niger* L.	Little
119	*Convolvulaceae*	*Calystegia sepium* (L.) R.Br.	Medium
120		*Convolvulus arvensis* L.	Medium
121	*Boraginaceae*	*Anchusa officinalis* L.	Medium
122		*Cerinthe minor* L.	Medium
123		*Cynoglossum officinale* L.	Medium
124		*Echium vulgare* L.	Little
125		*Pulmonaria officinalis* L.	Medium
126		*Pulmonaria mollis* Wulf.	Medium
127		*Symphytum officinale* L.	Medium
128	*Verbenaceae*	*Verbena officinalis* L.	Medium
129	*Lamiaceae*	*Ballota nigra* L.	Medium
130		*Calamintha clinopodium* Spenn.	Little
131		*Chaiturus marrubiastrum* (L.) Rchb.	Medium
132		*Glecoma hederacea* L.	Medium
133		*Glecoma hirsuta* W. Et K.	Medium
134		*Lamium album* L.	Medium
135		*Leonurus cardiaca* L.	Medium
136		*Marrubium vulgare* L.	Medium
137		*Melittis melissophyllum* L.	Medium
138		*Mentha longifolia* (L.) Nathh.	Medium
139		*Mentha piperita* L.	Medium
140		*Nepeta nuda* L.	Medium
141		*Origanum vulgare* L.	Medium
142		*Phlomis tuberosa* L.	Medium
143		*Prunella grandiflora* (L.) Jacq.	Medium
144		*Prunella vulgaris* L.	Medium
145		*Salvia nemorosa* L.	Medium
146		*Salvia nutans* L.	Medium
147		*Salvia pratensis* L.	Medium
148		*Salvia verticillata* L.	Medium
149		*Stachys annua* L.	Large
150		*Stachys germanica* L.	Medium
151		*Stachys recta* L.	Medium
152		*Stachys sylvatica* L.	Medium
153		*Teucrium chamaedrys* L.	Medium
154		*Thymus glabrescens* Willd.	Medium
155	*Plantaginaceae*	*Linaria vulgaris* Mill.	Medium
156	*Orobanchaceae*	*Pedicularis comosa* L.	Little
157	*Scrophulariaceae*	*Scrophularia nodosa* L.	Medium
158		*Verbascum blattaria* L.	Medium
159		*Verbascum chaixii* Vill.	Medium
160		*Verbascum lychnitis* L.	Medium
161		*Verbascum nigrum* L.	Medium
162		*Verbascum phlomoides* L.	Medium
163		*Verbascum phoeniceum* L.	Medium
164	*Rubiaceae*	*Galium verum* L.	Little
165		*Viburnum opulus* L.	Medium
166	*Valerianaceae*	*Valeriana officinalis* L.	Medium
167	*Dipsacaceae*	*Cephalaria radiata* Griseb. et Schenk	Little
168		*Cephalaria uralensis* (Murr.) Roem. et Schult.	Medium
169		*Dipsacus laciniatus* L.	Medium
170		*Scabiosa ochroleuca* L.	Medium
171	*Asteraceae*	*Arctium lappa* L.	Medium
172		*Arctium tomentosum* Mill.	Medium
173		*Aster amellus* L.	Medium
174		*Bellis perennis* L.	Medium
175		*Carduus acanthoides* L.	Medium
176		*Centaurea scabiosa* L.	Medium
177		*Cichorium intybus* L.	Medium
178		*Cirsium arvense* (L.) Scop.	Medium
179		*Cirsium canum* (L.) All.	Medium
180		*Inula britanica* L.	Little
181		*Taraxacum officinale* (L.) Weber ex F.H. Wigg	Medium

It is known that the life of bees, both in the larval and adult stages is closely related to the plant world. In our country they have been identified 398 species of melliferous plants. [17]

In Gușterița, the melliferous resources belong mainly to the spontaneous flora. We identified 181 species of melliferous plants that belong to 43 botanical families.

The best represented families are: *Lamiaceae* with 26 species, *Fabaceae* with 25 species, *Rosaceae* with 17 species, *Asteraceae* and *Brassicaceae* with 11 species, each of them, *Apiaceae* with 8 species, *Boraginaceae*, *Scrophulariaceae* with 7 species each of them, *Ranunculaceae* with 6 species, *Malvaceae* with 6 species and *Salicaceae* with 5 species.

The families represented by a small number of species are: *Papaveraceae* and *Dipsacaceae* with 4 species each of them, *Onagraceae*, *Linaceae* with 3 species each; *Fagaceae*, *Polygonaceae*, *Rhamnaceae*, *Aceraceae*, *Tiliaceae*, *Apocynaceae*, *Solanaceae*, *Convolvulaceae* and *Rubiaceae* with 2 species per family.

Many families are represented only by a single species: *Berberidaceae*, *Cornaceae*, *Corylaceae*, *Primulaceae*, *Lythraceae*, *Celastraceae*, *Rutaceae*, *Resedaceae*, *Cucurbitaceae*, *Gentianaceae*,*Verbenaceae*, *Plantaginaceae*, *Orobanchaceae* and *Valerianaceae* (Fig.1, Fig.2).

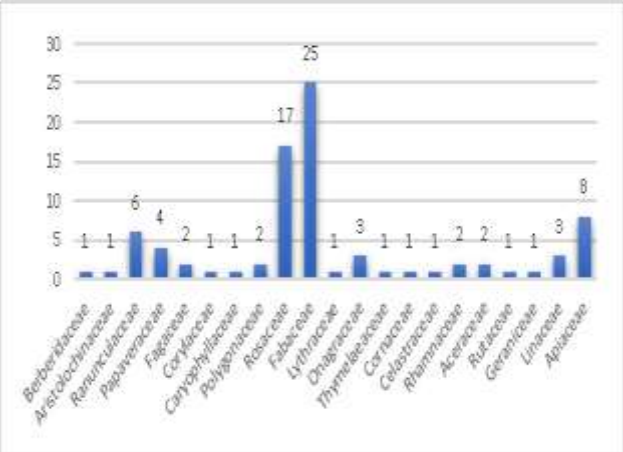

Fig. 1. The numerical abundance of the species included in the melliferous plants base in Gușterița.
Source: Own design.

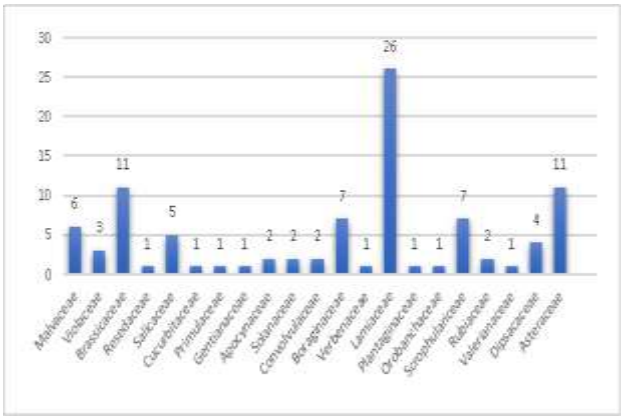

Fig.2. The numerical abundance of the species included in the melliferous plants base in Gușterița (continuation).
Source: Own design.

The ensuring a habitat rich in wild flowers comes to support the main pollinator in the area, *Apis mellifera carpatica* L. (the Carpathian bee) which has been formed under the specific conditions of climate, relief and melliferous plants base in our country. To place the bees families in Gușterița on the beekeeping hearths, located in an area with a high biodiversity of the melliferous plants, has a result the obtaining of a good honey harvest and the maintaining a favourable biological balance for the living bees.

The natural harvesting resources are extremely important because they are directly related to the beekeeping production.The 181 melliferous plants species of the investigated area could be distributed in the following four groups, after their beekeeping weight:

- Three species have been identified with a very large economical beekeeping weight: *Robinia pseudoacacia* L., *Tilia cordata* Hill., and *Tillia platyphyllos* Scop. They represent 3% of the total of the melliferous species.
- 11 species have a large economical beekeeping weight: *Silene vulgaris* (Mnch) Garke, *Onobrychis viciifolia* Scop., *Trifolium repens* L., *Chamaenerion angustifolium* (L.) Scop., *Brassica nigra* (L.) Koch, *Brassica rapa* L. ssp. *campestris* (L.) Clapham, *Sinapis alba* L., *S. caprea* L., *S. cinerea* L., *Stachys annua* L. These 11 species represent 6% of the melliferous species total.
- With a medium economical beekeeping weight is the best represented category. These

totalized 135 species which represent 74% of the total analized species (Table 1).

- The category with a low economical beekeeping weight includes 32 species which represent 18% of the honey resources of the area (Fig. 3).

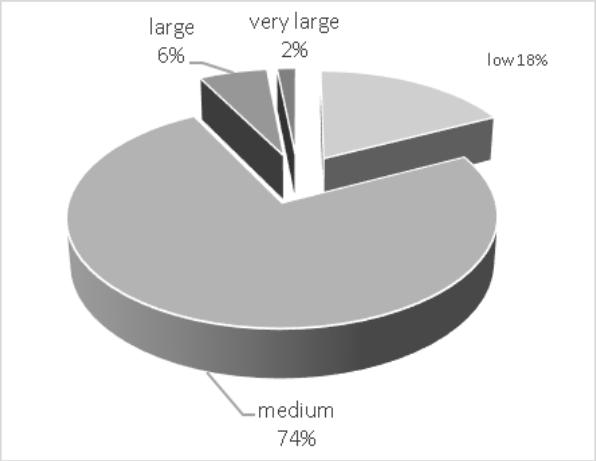

Fig. 3. The economical beekeeping weight of the melliferous plants species in the area of Gușterița
Source: Own design.

The melliferous species in the studied area have an economical- beekeeping weight that is divided into four categories: very large (2%), large (6 %), medium (74%) and little (18%).

On observe that the most important categories (very large, large and medium) represent 80% of the melliferous flora of the area, that demonstrate that the studied zone has a high beekeeping potential that can support the development of the beekeeping. (Photo 1)

Photo 1. Beekeeping located in Gușterița area
Source: Original.

CONCLUSIONS

After the botanical classification, in the flora of Gușterița, there are 927 cormophyte species, of which 181 species (19,52%) have a melliferous potential. They were grouped into 43 botanical families. The best represented from this point of view are Lamiaceae (26 sp.), Fabaceae (25 sp.) and Rosaceae (17 sp.)

Due to the large number of the valuable melliferous species, the plants in the area represent an important economical beekeeping factor that means production yields. Species with very large (2%), large (6%), medium (74%) and little (18%) beekeeping weight have been identified.

Because the melliferous potential of the flora in this zone is found in 80% in the first three categories with economical-beekeeping value, demonstrate that Gusterita is an area favourable for the beekeeping, ensuring the quality of honey produced in this area and its diversity.

REFERENCES

[1]Antonie, I., 2016, Grădina ecologică Gușterița, in: Antofie Maria-Mihaele, Sava Camelia (Eds.), Construim împreună - valori în gasronomie, 139-154.
[2] Ciocârlan, V., 2000, Flora ilustrată a României, Ed. Ceres, București, 116-882.
[3]Cîrnu, I., 1989, Plante melifere, Ed. Ceres, București, 31-81.
[4]Doltu, M.I., Schneider-Binder, E.,1970, Plante colectate și prelucrate de Ferdinand Schur aflate în colecția de herbarii a Muzeului Brukenthal, St. și com. Muz. Brukenthal Sibiu, șt.nat, 15:215-262.
[5]Drăgulescu, C., 2003, Cormoflora județului Sibiu, Ed. Pelecanus, Brașov, 51-478.
[6]Eftimescu, M., Berbecel, O., Cîrnu, I., Roman, A. M., 1982, Influența vremii asupra producției de miere, Ed. Ceres, București, 56-68.
[7]Grau, M., 2009, Plante cu flori în decursul anotimpurilor. Ghid al plantelor din Transilvania, Ed. Hora, Sibiu, 34-152.
[8]Graves, R., 2018, Miturile Greciei Antice, Ed. Polirom, București, 36-37.
[9]Grimal, P., 2003, Dicționar de mitologie greacă și romană, Ed. Saeculum I. O., București, 324-325.
[10]Guariti, D., 2013, Mierea, Ed. Casa Oradea, 7- 8.
[11]Lee-Mäder, E., Fowler, J., Vento, J., Hopwood, J., 2017, 100 de plante pe placul albinelor, Ed. M.A.S.T., 10-11.
[12] Moise, G., 2015, Research on quality analysis of an assortment of five types of honey in Romania. Scientific papers series Management, Economic

Engineering in Agriculture and Rural Development, 15(3): 195-199.
[13]Moise, G., 2016, Research methods and analysis used to determine fakes in food (honey). Scientific papers series Management, Economic Engineering in Agriculture and Rural Development. 16(4): 229-233.
[14]Pârvu, C., 2002, Enciclopedia plantelor. Plante din flora României, vol.I, Ed. Tehnică, București, 14-889.
[15]Pârvu, C., 2003, Enciclopedia plantelor. Plante din flora României, vol.II, Ed. Tehnică, București, 1-660
[16]Pârvu, C., 2004, Enciclopedia plantelor. Plante din flora României, vol.III, Ed. Tehnică, București, 254-777.
[17]Pârvu, C., 2005, Enciclopedia plantelor. Plante din flora României, vol.IV, Ed. Tehnică, București, 151-715.
[18]Plinius, 2001, Naturalia Historia. Enciclopedia cunoștințelor din Antichitate, vol.II, Ed. Polirom, București, 180-228.
[19]Pop, I., 1982, Plante spontane și subspontane cu valoare economică din flora R.S.România, Contribuții Botanice, Grădina Botanică, Cluj-Napoca, 131-141.
[20]Schneider-Binder, E., 1971, Pajiștile xeromezofile din depresiunea Sibiului și colinele ei marginale, St. și com. Muz. Brukenthal Sibiu, șt.nat, 16:113-122.
[21]Schneider-Binder, E., 1972, Tufișurile alianței Prunion fruticosae Tx. 1952 și Prunion spinosae Soo (1930 n.n.) 1040 din zona colinelor marginale ale depresiunii Sibiului, St. și com. Muz. Brukenthal Sibiu, șt.nat, 17:183-208.
[22]Schneider-Binder, E., 1975, Pajiștile xeroterme din Ord. Festucetalia valesiacae Br.-Bl. Et Tx. 1043 în zona colinelor marginale ale depresiunii Sibiului, St. și com. Muz. Brukenthal Sibiu, șt.nat, 19:95-120.
[23]Speta, E., Rákosy, L., 2010, Wildpflanzen Siebenbürgens, Plöchl Druck GmbH, Freistadt.
[24]Stancă-Moise, C., 2018, The species of Macrolepidoptera collected from the Gușterița hill, Sibiu, existing within the Collection of dr. Viktor Weindel, Oltenia Studii și Comunicări Stiințele Naturii, 34(2): 131-136.
[25]Stancă-Moise, C., 2017, Data about the Macrolepidoptera fauna of Sibiu county (Romania), Studia Universitatis Vasile Goldis Arad Seria Stiintele Vietii, 27(1):19-26.