RESEARCH ON CULTURES OF HONEY PLANTS AT THE LEVEL OF CORNETU COMMUNE, IN ILFOV COUNTY - MINIREVIEW

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Abstract. *The productivity and health of bee colonies depend on the presence of the honey zone, collecting nectar and pollen throughout the beekeeping season. Honeybees cannot exist in the absence of honey plants. The nectar and pollen of flowers on the territory of Romania constitute a valuable natural resource that would be wasted in the absence of bees, as until now the processing methods are insufficiently used. The proposed research theme aims at the superior exploitation of technologies for obtaining bee products by applying biotechnological methods and by the contribution of special technologies for increasing honey production by cultivating honey plants that bloom in the autumn period (September - October), when the main plant's honeysuckle has ended their flowering period, at the level of Cornetu, in Ilfov county.*

Keywords: honey plants, beekeeping, ecological agricultural crops, Ilfov county

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1. Introduction

Ecological beekeeping offers food security, contributing to the quality of life in rural areas and especially in api-phytotherapy offices.[7].

Martinello et al., 2021 [5], highlighted that bees could be considered active sentinels of environmental pollution and possibly human health whistleblowers through their importance to human well-being through pollination and the production of honey and other bee products.

Most contaminants accumulate in wax [9], but also in other bee [11].

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The need for organic bee farms and organic agricultural crops is of vital importance for biodiversity conservation and human health, this argument has not been fully researched in the scientific community, according to the literature.

Rahimi et al., 2020 [7], in the scientific paper *"Organic Beekeeping Practices in Romania: Status and Perspectives towards a Sustainable Development"*, drew attention to the importance of using certain conceptual evaluation models in the case of sustainability for the ecological beekeeping sector.

This concept is also supported by Kouchner et al., 2018 [4], underlining the lack of tools necessary for an evaluation of sustainability in this field and suggesting an evaluation system dedicated exclusively to the cultivation of ecological plants, in order to obtain bee products with a perfect antioxidant potential.

This research work is intended to be a map at the level of Ilfov County of the honeydew areas and areas with honeydew potential by encouraging the establishment of ecological agricultural crops through the monoculture cultivation system.

2. Materials and Methods

The proposed article aims at the superior valorization of technologies for obtaining bee products by applying biotechnological methods and through the contribution of special technologies to increase honey production by cultivating honey plants that bloom in the autumn period (September - October) when the main honey plants were already harvested, for example sunflowers and bees cannot find other flowers.

The most famous fodder and medicinal plants are grown in Ilfov county, which has a special honey value, are clover *(Trifolium), spring pea (Vicia sativa L.),* white mustard *(Sinapis alba),* phacelia *(Phacelia tanacetifolia),* good isma *(Mentha x piperita),* lavander or lavender *(Lavandula angustifolia),* field sage *(Salvia pratensis),* yellow sulfine *(Melilotus officinalis),* rapeseed *(Brassica napus oleifera),* buckwheat *(Fagopyrum esculentum).*

Beekeeping in Romania has entered a new era of evolution, taking into account the fact that this occupation is a component of agriculture and at the same time has countless tangents with the food industry, with medicine through apitherapy and with environmental protection which obviously signals the danger environmental pollution.

2.1. Ecological beekeeping in Ilfov county

The biological material will be represented by the local bee from Ilfov, which has the advantage of being excellently adapted to the natural conditions of the area.

The present research is carried out in the apiary with a stationary hearth in the commune of Cornetu, Ilfov county, with a population of about 30 families of bees, shown in Figure 1.

Fig. 1. Beehives located next to the buckwheat and mustard plant lots are used as cover crops
(Cornetu Commune, Romania, October 28, 2021)

The purpose of the research paper is to carry out own studies on the following elements: the floristic composition of the south-eastern area of Ilfov county, the geographical location of the commune where the experimental apiary is located, the relief and the structure of the vegetation, below will be presented the development of beekeeping in the area, the population of families and the technology used in the harvesting of bee products, the plant species that make up the honey base of the beehive in the order of their flowering, particularities of the plants, of the production of beehive products in the conditions of the area and the beekeeping share of each plant or group of plants.

The objective of this scientific work is to obtain improved biomaterials in different forms of conditioning containing beehive products.

At the current state of knowledge, with all the amazingly developed technology, I believe that beekeeping has not exhausted the range of possibilities for using the products of the hive.

For beekeeping, in our opinion, it is the time to initiate, organize and develop new directions of orientation such as: by pollinating cultivated and spontaneous plant species, the honeybee contributes to increasing the productivity of agricultural crops, but also to the conservation, restoration and protection of biodiversity by pollinating spontaneous flora, being a basic link in the trophic chain of all species.

The contribution of bees to the quantitative and qualitative increase in the production of entomophiles crops through their pollination. Research in this sense, carried out directly on real crops established for this purpose, can bring valuable information to both the plant sector and beekeepers or for scientific research related to the environment.

Increasing the input of diversified bee production in the biosynthesis industry, by developing and applying production technologies for harvesting tools and biologically active preparations. For the implementation of the pursued objectives, during the first year (2021), of the implementation of the AGROAPIS project (PNDR Agreement, Measure 6.1 – Financing Agreement having registration no. C16100000011884200019/24.12.2020), experimental crops were established in areas of 0.5 ha, with each of the crops with melliferous potential: mustard, phacelia, peas, buckwheat and camelina.

As shown in Figure 2, to track bee behavior and productivity in using nectar taken from staggered flowering flowers, several hives were placed near the plots of cover crop plants.

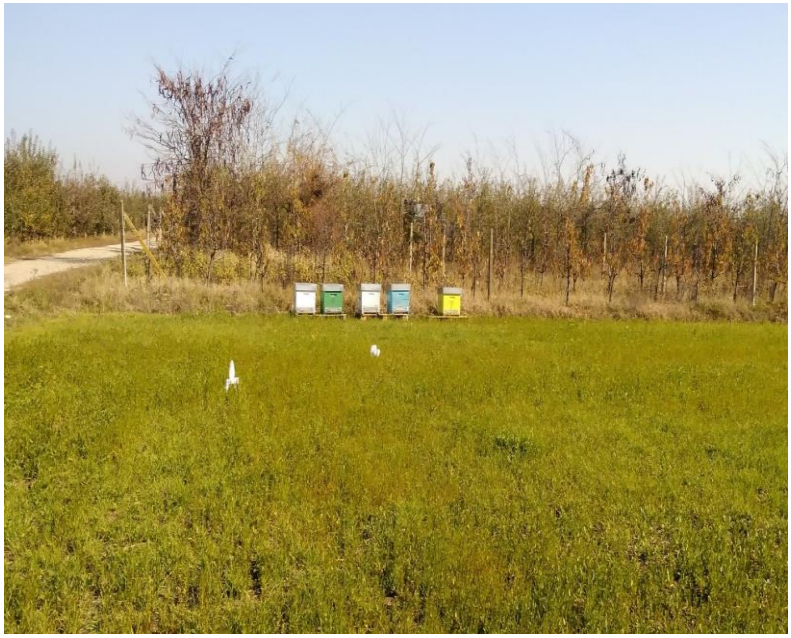

Fig. 2. Beehives located next to lots with camelina plant (*Camelina sativa.)*, that are used for cover crops (Moara Domnească Educational Center, Romania, October 28, 2021)

2.2. Honey resources of Ilfov county

This research work is intended to be a map at the level of Ilfov county of the honeydew areas and areas with honeydew potential by encouraging monocultures. The most famous medicinal and technical plants grown in Ilfov County, with honey value, are:

- *clover* *(Trifolium)* name given to several plants from the legume family, with leaves composed of three leaflets and flowers gathered in globular inflorescences, variously colored, some species being cultivated as forage plants.

- ***spring pea*** *(Vicia sativa* L.) known as common pea, garden pea, is a nitrogen-fixing leguminous plant from the *Fabaceae* family.

- ***white mustard*** *(Sinapis alba*) is an annual plant of the *Cruciferae* family, it is cultivated for its seeds, either as animal feed or for crop rotation.

- ***phacelia*** *(Phacelia tanacetifolia)* is a melliferous plant from the *Hydrophylaceae* family, native to tropical countries. The plant is in the form of a bush, with 15-20 branches, which, in turn, ramify.

- ***mentha x piperita*** (Mentha x piperita) is an herbaceous, perennial aromatic medicinal plant from the *Lamiaceae* family, known by several popular names: *garden mint, mint.*

- ***lavender*** (*Lavandula angustifolia*) is a species of plant in the genus Lavandula, family Lamiaceae, it is an aromatic and medicinal plant with bushy branched stems, 30–50 cm tall, small, narrow leaves and fragrant purple flowers.

- ***field sage*** (*Salvia pratensis*) synonym (*Salvia virgata*) is a perennial plant from the *Lamiaceae* family.

- ***the yellow sulphina*** (*Melilotus officinalis*) is of great honey importance, has a long flowering period, from June to September, and is well visited by bees. It is characterized as being very rich in nectar and rich in pollen, both of the best quality. The geographical diversity and richness of the honey base provides a quality nectar and pollen harvest.

- ***rapeseed*** (*Brassica napus oleifera*) is a plant from the *Brassicaceae* family.

- ***buckwheat*** (*Fagopyrum esculentum*), is an annual plant cultivated all over the world, which is part of the *Fagopyrum* genus, *Polygonaceae* family.

Studies will be carried out in order to determine the melliferous potential of the buckwheat, mustard, phacelia, peas and camelina crops in the two locations by the capillary method.

The capillary method consists in determining the nectariferous capacity with the help of a glass pipette (capillary), which is achieved by:

- Determination of the sugar concentration (%) of nectar collected from flowers/inflorescence with the help of the refractometer;

- The calculation of the Carbohydrate Index (mg/flower) will be done by the following formula:

Carbohydrate index (mg/flower) = [Nectar secretion (mg/flower) x sugar concentration (%)]/100

- Statistical calculation of the honey production that can be obtained from each flower species (from the collected nectar determinations)
- Microscopic identification of the pollen from the 5 honeydew plants compared in the two locations
- The influence of weather conditions on the development of plants and the variation of the amount of nectar and honey in the two locations.

2.3. Melliferous plain vegetation

The melliferous vegetation of the plain is characterized by the predominance of massifs of entomophilous crops (pollination carried out with the help of bees) and acacia and linden forests concentrated on certain areas and periods of time.

The identification of these crops and forests in the area of Ilfov County helps the beekeeper by means of a GPS device to safely analyze a harvest of honey and beehive products.

Sustainability in the beekeeping sector as a result of agriculture based on hybrids and less nectariferous varieties, the intensive use of chemicals in agriculture and agricultural activity, environmental toxins as well as the increase in associated multifactorial health problems of bee colonies underlines question the economic value of pollination.

Currently, beekeeping is an important sector that is developing a special concern for ecological crops. In general, this ecological agriculture is practiced separately from the rest of mass agriculture. The clear principles applied to ecological agriculture are strictly applied in the practice of ecological beekeeping, being regulated by legislation in the field [12] and certificates from certification bodies recognized at European level (e.g., Ecocert, etc.).

The clear principles of ecological beekeeping consist in supporting with great care and attention the health and vitality of bee colonies and minimizing the negative influences brought to the environment and especially to the consumers of bee products.

First of all, the beekeeper must have extensive specialist knowledge regarding the natural behavior of bees and ecological methods of working in the apiary [6].

For long-term sustainability in the development of ecological beekeeping, an important measure is training to increase the level of socio-cultural development of the parties involved in this process: farmer - beekeeper.

Education for the growth and expansion of ecological services with new technologies aimed at farmers and beekeepers. Beside these support measures, there is a need to develop support programs for the parties involved in organic agriculture and beekeeping and the ability to understand the legislation; in addition, according to some authors [2] organic agriculture as a "sustainable" agricultural system offers a potential solution for sustaining biodiversity by helping to protect the environment.

Modern farming systems use both bees and wild pollinators to provide pollination, which have the ability to pollinate indoors or at low temperatures. The decline of bee species due to the increased use of pesticides raises concerns about pollination in agriculture.

The number of farmers is quite low in terms of adopting more environmentally friendly practices for pollination. Through this report, we want to identify an ecological - economic model at the level of bee farms, to explore the impact of pollination on the production of biological crops.

This study evaluates farmers' decisions to adopt and optimize organic crops with a well-defined role in ensuring pollination and the good development of the rhythm of life of bees and other pollinators.

3. Results and Discussions

The results show that, through various sustainability schemes of organic agriculture and beekeeping, effectively to encourage and implement new agricultural practices, to ensure pollination and maintain organic beehives and viable pollinators, farmers are willing to cultivate organic honey plants for the maintenance of pollen collection [3].

According to the study entitled *Organic Bee Pollen: Botanical Origin, Nutritional Value, Bioactive Compounds, Antioxidant Activity and Microbiological Quality* published in 2012 by researchers Xesús et al., [10], results that the antioxidant

activity of pollen is increased as a result of the fact that it comes from organic plant cultures.

The medicinal properties of these products were recognized thousands of years ago by ancient civilizations, although in the modern era, they have limited use.

Table 1. The total phenolic, flavonoid, phenolic acid, anthocyanin, and carotenoid content in multiflower honey and honeys enriched with bee pollen.

Addition of Bee Pollen (%)	**Total Phenolic Content (mg GAE/100 g)**	**Total Flavonoid Content (mg QE/100 g)**	**Total Phenolic Acid Content (mg CAE/100 g)**	**Total Anthocyanin Content (mg/100 g)**	**Total Carotenoid Content (mg/100 g)**
0	30.75 ± 0.25	2.77 ± 0.29	11.02 ± 0.68	2.01 ± 0.05	0.138 ± 0.001
5	63.33 ± 0.27	5.94 ± 0.25	16.65 ± 0.19	4.02 ± 0.05	0.311 ± 0.004
10	89.42 ± 0.61	8.38 ± 0.19	17.08 ± 0.23	5.57 ± 0.38	0.934 ± 0.001
15	136.63 ± 0.44	12.11 ± 0.48	20.32 ± 0.52	7.60 ± 0.19	1.404 ± 0.002
20	156.13 ± 0.92	14.25 ± 0.27	21.26 ± 0.39	9.16 ± 0.09	1.726 ± 0.001
25	178.26 ± 1.13	16.39 ± 0.16	24.44 ± 0.17	11.32 ± 0.10	2.333 ± 0.001
$LSD_{0.05}$	0.83	0.36	0.51	0.22	0.003

Table source: [1].

Bee products represent an inexhaustible source of natural antioxidants, including phenolic acids, flavonoids and terpenoids, as well as numerous other phytochemicals, which are capable of ameliorating the effects of oxidative stress that underlie the cause of many ailments [5]. Table 1 shows values obtained from the determinations made at the level of some organic compounds from samples of multiflora honey enriched with pollen [1].

Moreover, the analysis carried out did not reveal differences in texture, and the increasing addition of raw pollen collected by bees in honey reduced its brightness. Already, an addition of 5% raw bee pollen decreased the brightness of the honey to an average value of 3.07, and with the addition of 25% raw bee pollen, the brightness of the honey decreased to a level of 1.21 [8].

Conclusions

(1) The objective of the research within the doctoral thesis is to carry out a comparative study between the honey crops of buckwheat, mustard, phacelia, peas and camelina sown in the basic beehive in the **Cornetu commune** located in the

south-west of Ilfov county, on the left bank of the Argeș river (where it forms the Mihăilești reservoir, Giurgiu county) on the banks of Sabar River and the **Experimental Didactic Field in Moara Domnească** located in Găneasa commune - Ilfov county, it stretches in the eastern part of the county, on the border with Călărași and Ialomița counties.

(2) These 5 crops (mustard, phacelia, peas, buckwheat and camelina) with high honeydew potential are seeded in July 2021 to ensure maintenance honeydew after the sunflower harvest. This study has the role of supporting the beekeeping sector by raising the values of beehive products, by using agricultural crops beneficial to bees and pollinators in accordance with agro-environmental conditions.

(3) This study will contribute directly and indirectly to increasing the productivity and sustainability of modern agriculture. Directly, because it contributes to improving and maintaining the health of bee colonies. Healthy bees are generally large and have a better chance of surviving the winter. This should ultimately lead to reduced losses of bee colonies over winter, again contributing to better sustainability of their numbers and efficient use of resources.

(4) The indirect contribution is ensured through a more resistant and healthy bee colonies and a more sustainable beekeeping sector, there will be a sufficient number of colonies per square km of agricultural land and, therefore, the productivity of agricultural farms will increase. Romania has a special beekeeping and honeybee potential, and, by encouraging and specializing young farmers with financial and informational support, this type of preparation with the addition of raw pollen collected by bees can be made for the apitherapeutic natural food industry.

(5) Through this study, we want to encourage farmers to optimize ecological crops with a well-defined role in ensuring pollination and the good development of the life rhythm of bees and other pollinators, and, at the same time, increasing beekeeping production by cultivating honey plants even by beekeepers in periods time poor in honey crops.

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