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Research Article

Relation Between Honey Bees (*Apis mellifera* L.), Population of Plant Species, Collected pollen and Its Protein Content

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Abstract

In this work, the relation between honey bees, population of plant species, collected pollen and its protein content was studied. There have been established two negative and two positive correlations of the analyzed plant species which have been most visited and naturally populated. It can be said that the bees collect the same amount pollen from these plant species regardless of its high or low protein content. The analysis not found difference and there is no relation between amount of collected pollen and its protein content. The quantity collected pollen by the bees depends on the population of the certain plants that bees visit. We have to consider the differences in the discoveries of bees-scouts, when searching for new crops, flower type, the number of flowers, bees' direct access pass, the distance to the hives, ecological factors and etc. When flowering *Centaurea cyanus*, bees collect most of it pollen and less from *Ranunculus* sp. The results of the study show that the wide variety of pollen provided the taxons with population "2" and less with population "+". It is necessary to keep and protect the native flora, which provide to the bee's food.

Keywords: Pollen; Protein content; Honey bee; *Apis mellifera* L.

Introduction

Pollen is extremely important for bees and has a significant role in their diet. Pollen is the source of protein necessary for vital processes of the honey bees (*Apis mellifera*) [1]. There is a relationship between the nutritional value of pollen and the development, reproduction, and productivity of the bee colonies [2]. Without the presence of flowering plants and supply of pollen in the local environment, the bee colonies reduce the rearing brood [3-4]. The protein content in the pollen of different plants has different quantity [5-7]. Pollen dispersed by insects is commonly heavier, somewhat moist and sticky and coloured in various shades of yellow, brown, orange or red [8]. The pollen loads of honey bees come in various colours, which may vary with weather conditions [9]. Honey bees prefer to collect pollen from 5 to 6 plants species during every single month. It is not proven difference and there is no relation between amount of pollens collection and their protein content. When flowering introduced agricultural plants, bees collect most of them pollen, depends on the climate condition. The results of the study show that the wide variety of pollen provided the taxons of naturally occurring flora, over 75%-80% [10]. The aim of this research is to identify whether there is a relation between honey bees (*Apis mellifera L.*), population of plant species, collected pollen and its protein content.

Materials and Methods

Pollen traps were placed in five bee hives and the pollen pellets were harvested every 2 days from April till September 2012-2014 in area of Belozem (Bulgaria) (42,2°.25,033333°). The pollen loads from each hive, were analyzed carefully. One thousand three hundred samples of bee-collected pollen pellets are separated over white sheets, according to colour, shape and texture. The plant species of each pollen pellet is identified through microscopic examination of grains and the amount of collected pollen was weighted by an analytical scale. Melissopalynological analysis was carried out using similar methodology [11]. Each identified pollen sample was placed on a slide with a drop of isoglucose and added fuchsin. The slides were then dried in not above 40^0C and fixed with EntelanTM (Entelan Microscopy, Karlsruhe, Germany). To identify the pollen is used the database of the laboratory of Apiculture-Sericulture of the Agricultural school of Aristotle University and self-made database of the plants in the study area.

The data on the protein content of pollen from different plant species were available from a previous study [7]. The analysis of the plant population has been conducted [12] and the plants have been grouped according to the scale [13] where:

„5"- plant population is > 75%.

„4"- plant population is between 50-75%.

„3"- plant population is between 25-50%.

„2"- plant population is between 5-25%.

„1"- plant population is between 1-5%.

„+"- plant population is < 1%.

„r"- plant population is represented by 1-2 representatives.

Results and Discussion

The data on the amount of collected pollen and its protein content over the three years of some plant species populating is represented in Table 1. Statistical analysis (Excel) has been conducted so as to build a connection between the collected amount of pollen and its protein content among the various plant species with the same breeding value. There has been a negative but not significant correlation (r=-0.05, p≤ 0.05) between the species *Eryngium campestre*, *Chenopodium sp.* and *Chondrilla juncea* with coefficient of population "3". There has been a positive but not significant correlation (r=0.12, p≤ 0.05) between the species *Centaurea calcitrapa*, *Cntaurea cyanus, Vicia sp., Convolvulus arvensis, Centaurea solstitialis, Centaurea sp., Salix sp., Plantago sp.* and *Morus nigra* with coefficient of population „2". There has been a highly significant negative correlation (r=-0.85, p≤ 0.05) between the species *Robinia pseudoacacia, Brassica nigra, Carduus sp. and Cirsium sp.* with coefficient of population „1". There has been a highly significant positive correlation (r=0.56, p≤ 0.05) between the species *Rosa canina, Amorfa fruticosa, Dipsacus sp.* and *Ranunculus sp.* with coefficient of population „+" (Table 1).

Table 1: List of the some plant species according to their protein content (%), amount collected pollen (g) and population.

Plant species	Protein content (%)	Amount collected pollen (g)	Population according to Braun-Blanquet
Eryngium campestre	23.5	454.00	3
Chenopodium sp.	13.2	760.90	3
Chondrilla juncea	11.5	294.90	3
Centaurea calcitrapa	23.7	194.70	2
Centaurea cyanus	23.2	1613.20	2
Vicia sp.	22.8	231.07	2
Convolvulus arvensis	21.5	530.30	2
Centaurea solstitialis	21.4	1088.60	2
Centaurea sp.	20.6	213.60	2
Salix sp.	19.9	720.19	2
Plantago sp.	13.7	1006.60	2
Morus nigra	13.3	81.92	2
Robinia pseudoacacia	25.2	78.36	1
Brassica nigra	24.9	186.30	1
Carduus sp.	17.8	217.80	1
Cirsium sp.	15.4	467.90	1
Rosa canina	24.9	75.90	+
Amorfa fruticosa	24.8	724.00	+
Dipsacus sp.	19	70.50	+
Ranunculus sp.	15.3	41.15	+

There have been established 2 negative and 2 positive correlations of the analyzed plant species which have been most visited and naturally populated. It can be said that the bees collect the same amount pollen from these plant species regardless of its high or low protein content. We have to consider the flower type, the number of flowers, bees' direct access pass, the distance to the hives, ecological factors and etc.

Conclusion

In this, experimental studies it is discover the preferences of honey bees for different types of pollen. The knowledge of the flora in the area of beekeeping is very important and giving information about the productivity of the bee colonies. The honey bees have them floro-specialization and floro migration. It is found no relation between amount of collected pollen and its protein content. Such a studies will lead to the understanding of the importance of the flora for good beekeeping practice. It is necessary to keep and protect the native flora, which provide to the bee's food. From ecological point of view, it is necessary to conserve the natural flora in order to ensure the normal feeding of the bees and the maintenance of the biodiversity.

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