



BEE SCIENCE
NUTRITION

By



Testing the effectiveness of a nutritional supplement based on carbohydrate-protein substitutes during the replacement period of wintering honeybees

Author: Dr. Popovici Daniel Cristian

ABSTRACT:

Background and problem description: The period of replacement of wintering honey bee generations represents a critical period, when depopulation and mortality can occur. The quality and quantity of food reserves, when the consumption of energetic and protein substances from the honeycombs increases, is very important. To support the nutritional needs of the progressive increase in the number of larvae and to avoid depletion of the adult population, the administration of protein patties at the end of winter becomes a necessity, therefore their quality must be known and scientifically validated for the safety of administrations.

Methodology: Thus, a comparative experiment was set up, to test the effectiveness of carbohydrate-protein patties as supplementary feed on groups of standardized honeybee colonies consisting of 10 colonies/group. The experimental group was administered protein patties based on pollen substitutes (SPP) and one control group was administered protein patties based on 56% frozen pollen with 12.5% crude protein, collected in spring, containing pollen from the species: willow (*Salix* spp.), rapeseed (*Brassica* spp.), hawthorn (*Crataegus* spp.) and fruit trees (*Prunus* spp., *Pyrus* spp., *Malus* spp.). The measurements targeted the amount of brood at the beginning and end of the testing period (February 15 - March 21), using the Netz frame. **Results and conclusion:** Statistical analysis of the obtained data (SPSS, T-student test for independent samples) shows that no significant differences were found between the two groups ($t = -0.968$, two tailed $p = 0.35$), although in the control group it was found that the mean brood area was larger than in the experimental group (Mean exp = 22.45, Mean ctrl. = 25.58) and significant difference compared to one unfed group ($t = 5.388$, two tailed $p < 0.000$; Mean = 11.23). **Practical implications:** Based on the data, the administration of tested carbohydrate-protein substitutes patties during certain periods when their administration is allowed contributes to supporting brood rearing and the development of honeybee colonies.

Materials & Methodology:

A total of 26 honey bee colonies were used, each forming a winter cluster on 5-6 well-populated Dadant frames, in Timiș County, Romania. All colonies were kept under similar conditions, including genetics and queen origin. As of February 15, no brood was present in the colonies, with only a few queens having laid their first eggs.

The stages of the study were:

- Evaluation of the bee colonies, assessment of food reserves, and brood nest reduction. Carbohydrate feed reserves were supplemented by adding frames from storage. (February 10-15, 2023).
- Protein feeding (February 15). It is worth mentioning that the feeding was carried out in several successive stages, with supplements added to the colonies that had consumed the previously provided feed.
- Data collection (brood measurement was performed in the apiary using a wire frame on March 20, 2023). The measured brood area included larval brood surrounded by capped brood but did not include marginal larval brood—very little of which was present due to the cold weather during the period of March 10-20.
- Data entry and interpretation (March 21 - April 1). The data were entered into SPSS.

The first group (10 colonies) was fed with Super Protein Patties, while the second group (6 colonies) received patties containing 12.5% crude protein from pollen and the same carbohydrate base as the Super Protein Patties. The third group (10 colonies) was not fed.

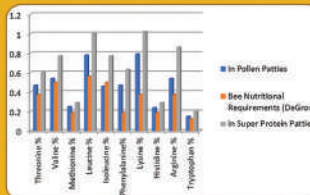
The pollen mixture used (frozen for preservation and of high biological quality) came from willow (*Salix* spp.), rapeseed (*Brassica* spp.) and hawthorn (*Crataegus* spp.).

Nutritional profile of the pollen: Moisture: 19.2%, Crude protein: 22.5%, Fat: 7.2%, Minerals: 2.4%, Starch: 1.9%, Total sugars: 29.2% (Wesling laboratories).

Essential amino acids in pollen patties (%): Arginine 0.54, Histidine 0.24, Isoleucine 0.46, Leucine 0.78, Lysine 0.79, Methionine 0.25, Phenylalanine 0.47, Threonine 0.47, Tryptophan 0.15, Valine 0.54 (Wesling laboratories).

Nutritional profile of Api Pollen Substitute (protein source in Super Protein Patties, based on ingredient specs): Crude protein: 51%, Fat: 7.7%, Minerals: 2.3%, Fiber: 3.4%, Carbohydrates: 4.4% (Wesling laboratories).

Essential amino acids in Super Protein Patties (%): Arginine 0.86, Histidine 0.29, Isoleucine 0.77, Leucine 1.0, Lysine 1.02, Methionine 0.29, Phenylalanine 0.63, Threonine 0.6, Tryptophan 0.19, Valine 0.77



Conclusions:

Although the average amount of brood was higher in the colonies fed with pollen ($M = 25.58$, $SD = 6.81$) compared to those fed with Super Protein Patties ($M = 22.45$, $SD = 5.94$), the differences were not statistically significant ($t = -0.968$, two-tailed $p = 0.350$). The reliability of obtaining the same results if the experiment were repeated is very low.



Statistically significant differences ($t = 5.388$, $df = 17$, two-tailed $p = 0.000$) were found between the Super Protein PATTIE group ($M = 22.45$, $SD = 5.94$) and the unfed group ($M = 11.23$, $SD = 1.95$). We can conclude that Super Protein PATTIE supports approximately twice the amount of brood compared to colonies that were not given protein supplements.

A similar test of brood quantity was carried out between August 1, 2019 - March 3, 2020, in the same apiary, where nuclei were fed both in autumn and during February-March. The products used were prototype commercial protein feeds available at that time:

- Group 1 - Super Protein Candy 10% Crude protein (based on Api Pollen Substitute, the same protein source as in Super Protein PATTIE)
- Group 3 - unfed
- Group 5 - Pollen-based feed, approx. 10% Crude protein

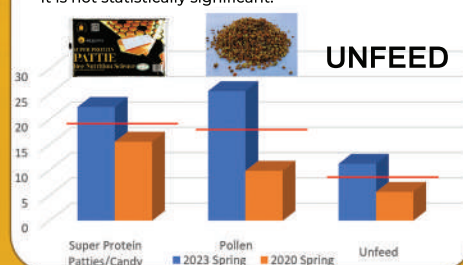
The pollen used was collected in spring 2019 from Rosaceae species (*Prunus* spp., *Pyrus* spp., *Malus* spp.), willow (*Salix* spp.), and a small percentage of rapeseed (*Brassica* spp.), and was preserved by freezing. No amino acid composition analysis was performed on the pollen.

The average measured brood areas were:

- Group 1 - 15.58 dm² brood mean
- Group 3 - 5.67 dm² brood mean
- Group 5 - 9.83 dm² brood mean

Medium Brood Surface (dm²)

*It is not statistically significant.



Popovici Daniel Cristian

Research and Development Department, SC Cirast SRL (Dulcofruct Bee Nutrition Science), Golești de Sus, Cotești, Vrancea County, Romania

Background and problem description: The period of replacement of wintering honey bee generations represents a critical period, when depopulation and mortality can occur. The quality and quantity of food reserves, when the consumption of energetic and protein substances from the honeycombs increases, is very important. To support the nutritional needs of the progressive increase in the number of larvae and to avoid depletion of the adult population, the administration of protein patties at the end of winter becomes a necessity, therefore their quality must be known and scientifically validated for the safety of administrations. PURPOSE: We tested the efficiency of a commercial energy-protein product (Super Protein Pattie®-SPP), with a content of 12.5% crude protein from inactivated yeast (*Saccharomyces*) and soybean (*Glycine max*) rich in essential amino acids, embedded in a mass of carbohydrate substances with added vitamins and minerals, probiotics, oils and phytonutrients from 14 medicinal plants. METHODOLOGY: Thus, a comparative experiment was set up, to test the effectiveness of carbohydrate-protein patties as supplementary feed on groups of standardized honeybee colonies consisting of 10 colonies/group. The experimental group was administered protein patties based on pollen substitutes (SPP) and one control group was administered protein patties based on 56% frozen pollen with 12.5% CP, collected in spring, containing pollen from the species: willow (*Salix* spp.), rapeseed (*Brasica* spp.), hawthorn (*Crataegus* spp.) and fruit trees (*Prunus* spp., *Pyrus* spp., *Malus* spp.). The measurements targeted the amount of brood at the beginning and end of the testing period (15.02-21.03), using the Netz frame. Results and CONCLUSION: Statistical analysis of the obtained data (SPSS, T-student test for independent samples) shows that no significant differences were found between the two groups ($t=-0.968$, two tailed $p=0.35$), although in the control group it was found that the mean brood area was larger than in the experimental group (Mean exp.=22.45; Mean ctrl. =25.58) and significant difference compared to one unfed group ($t=5.388$, two tailed $p=0.000$; Mean=11,23). Practical implications: Based on the datas, the administration of tested carbohydrate-protein substitutes patties during certain periods when their administration is allowed contributes to supporting brood rearing and the development of honeybee colonies.