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# RESEARCHES CONCERNING THE EFFECTS OF SUPPLEMENTARY FEEDING OF BEES FAMILIES DURING AUTUMN, WINTER, SPRING

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***Abstract***

*The purpose of the paper is to track the production of honey, its chemical analysis and determination of the economic efficiency of supplementary feeding of bee families during the fall, winter and spring. Chemical analysis of honey indicated in most cases according to its characteristics, supplementary trace evidence of industrial products and is noticeable only at the four experimental batches, where they found traces of industrial glucose. Although experimental batches recorded higher output compared to the control batch, however, due to expenses related to supplementation, only 3 groups, namely those who received Apiinvert, Melisol and glucose-fructose syrup recorded higher profits of 9%, respectively 31.6% compared to the control batch, retrieving other lower profits, the lowest value being noticeable in the experimental batch that was used as a semisolid food supplement, which had a deficit of 11.52% compared to the control batch.*

***Keywords****:* bees, chemical analysis, honey, profit, supplementary feeding.

## INTRODUCTION

The most important problem that beekeeper must solve for the bee family is to provide all the time food and its health. During an apian year there are periods during which bee pollen and nectar are missing from nature, the beekeeper being forced to interfere by feeding stimulation or supplementation (Warring et al., 2012). An early feeding stimulation can prepare the beehive to harvest the nectar or to allow proper preparation of the queen bee for laying (Czirjak et al., 2012). Sugar syrup or syrups made from fructose-glucose administered in small doses and frequencies will act as supplements to the family (Marghitas, 2008; Bura et al., 2005).

## MATERIALS AND METHODS

The experiments were performed in its own apiary on a number of 35 bee families (6 frames per family) divided into 7 batches of 5 families, including a control batch and 6 experimental batches (Table 1).
The 6 experimental batches were given different energy supplements, as well as carbohydrate composition (Table 2) additional periods being, August 15 to September 15, respectively March 15-April 15 for the batches E2-E6 and September 1 - November 30, January 7 to April for the batch E1.

Table 1. Experimental scheme

| Batch | Treatment | Number of frames average intervals | Season treatment | Following objectives |
|---|---|---|---|---|
| Control | 15 kg honey | 6 | - | Evolution of honey production<br>The economic efficiency of feed supplementation<br>Determination of humidity and honey diastase index<br>Dosage of hidroximetilfurfurol (HMF)<br>Identification of industrial glucose |
| E1 | 15 kg honey + 13 kg semisolid food | 6 | 01 Sept – 30 Nov<br>07 Jan – 15 Apr | |
| E2 | 15 kg honey + 13 kg Apiinvert | 6 | 15 Aug – 15 Sept<br>15 Mar – 15 Apr | |
| E3 | 15 kg honey + 13 kg Dulcofruct | 6 | 15 Aug – 15 Sept<br>15 Mar – 15 Apr | |
| E4 | 15 kg honey + 13 kg Melisol | 6 | 15 Aug – 15 Sept<br>15 Mar – 15 Apr | |
| E5 | 15 kg honey + 13 kg Apimera | 6 | 15 Aug – 15 Sept<br>15 Mar – 15 Apr | |
| E6 | 15 kg honey + 13 kg glucose-fructose syrup | 6 | 15 Aug – 15 Sept<br>15 Mar – 15 Apr | |

Table 2. The chemical composition of supplements used for experimental batches (% of dry matter)

| Product | Glucose | Fructose | Sucrose | Maltose |
|---|---|---|---|---|
| Semisolid food* | 8 | 12 | 80 | - |
| Apiinvert | 31 | 39 | 30 | - |
| Dulcofruct | 35 | 55 | - | 10 |
| Melisol | 50 | 45 | - | 5 |
| Apimera | 40 | 50 | - | 10 |
| Glucose-fructose syrup | 55 | 35 | - | 10 |

* The semisolid food was made by mixing 840 g sugar Farin (powder) and 160 g of polyfloral honey.

Taking the supplement consisted in the introduction of 1 kg from each product in very thin bags, they being introduced inside the beehive, over the bee family frames, the quantities being of 7 kg supplement in the first period and 6 kg in the second period.
The supplement doses were administered after previous dose consumption.

## RESULTS AND DISCUSSIONS

The entire experimental period was followed both the degree of consumption of administered supplements, some features of honey (Table 3), the main harvest recorded productions, as well as the profit differences between the control and the experimental batches.
In terms of dry matter content, we find that the highest value (83.2%) was met at the control batch, while the lowest one at the experimental batch E4 (78.8), which denotes a difference of 5.6%. The other batches recorded intermediate values.
This HMF presence is within the limits shown in the specialized literature (up to maximum 4%), except for the experimental batch 6.

Table 3. Features characteristics of honey

| Batch | Dry matter (%) | HMF (mg%) | Diastase index | Industrial glucose |
|---|---|---|---|---|
| M | 83.2± 0.33 | 0.38± 0.04 | 13.9± 0.51 | None |
| E1 | 81.5± 0.41 | 1.23± 0.09 | 11.2± 0.29 | None |
| E2 | 79.2± 0.27 | 1.25± 0.08 | 10.9± 0.60 | None |
| E3 | 80.3± 0.34 | 2.53± 0.12 | 6.5± 0.44 | Present |
| E4 | 78.8± 0.50 | 3.81± 0.32 | 6.5± 0.41 | Present |
| E5 | 81.2± 0.27 | 3.99± 0.36 | 6,5± 0.38 | Present |
| E6 | 82.9± 0.39 | 5.13± 0.69 | 10.9± 0.52 | Present |

Diastase index values confirm the natural characteristic of honey, all the recorded values being above 6.5, being considered as minimum by specialized literature.
Industrial glucose is present under the form of traces only at batches E3-E6, lacking at the control batch and experimental batches E1 and E2.
By analyzing the obtained average honey production per family (Table 4), we find that the highest efficiency was at the experimental batch 6, which had a higher production with 18.1 kg compared to the control batch, 14.6 kg compared to the experimental batch 1, 8.2 kg compared to the experimental batch 2, 13.4 kg compared to the experimental batch 3, 9.6 kg compared to the experimental batch 4, 13.8 kg compared to the experimental batch 5.
Moreover, it can be noticed that all experimental batches recorded higher productions compared to the control batch.

Table 4. The honey production

| Harvest | Control batch | | E1 batch | | E2 batch | | E3 batch | | E4 batch | | E5 batch | | E6 batch | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total/ batch | Average/ family | Total /batch | Average/ family | Total/ batch | Average/ family | Total/ batch | Average/ family | Total/ batch | Average/ family | Total/ batch | Average/ family | Total/ batch | Average/ family |
| Acacia 1 | 49.0 | 9.8± 0.34 | 60.5 | 12.1± 0.41 | 71.0 | 14.2± 0.39 | 58.4 | 11.7± 0.27 | 72.5 | 14.5± 0.34 | 61.6 | 12.3± 0.21 | 76.8 | 15.4± 0.72 |
| Acacia 2 | 52.0 | 10.4± 0.54 | 57.0 | 11.4± 0.36 | 70.0 | 14.0± 0.22 | 57.1 | 10.4± 0.51 | 70.6 | 14.1± 0.22 | 61.5 | 12.3± 0.24 | 81.7 | 16.3± 0.85 |
| Lime | 42.0 | 8.4± 0.51 | 43.5 | 8.7± 0.20 | 47.5 | 9.5± 0.31 | 51.7 | 11.3± 0.58 | 49.0 | 9.8± 0.29 | 47.5 | 9.5± 0.20 | 58.6 | 11.7± 0.25 |
| Sunflower | 74.0 | 14.8± 0.66 | 73.5 | 14.7± 0.25 | 78.0 | 15.6± 0.33 | 73.6 | 14.7± 0.47 | 77.5 | 15.5± 0.31 | 68.1 | 13.6± 0.31 | 90.6 | 18.1± 0.25 |
| Total | 217.0 | 43.4± 1.89 | 234.5 | 46.9± 0.62 | 266.5 | 53.3± 1.08 | 240.8 | 48.1± 1.11 | 269.6 | 53.9± 1.35 | 238.7 | 47.7± 1.06 | 307.7 | 61.5± 1.05 |

Table 5. Income and expenses quantification

| Batch | Honey production (kg) | Average price (lei/kg honey) | Income (lei) | Supplement administrated (kg) | Supplement price (lei/kg) | Expenses with supplementation (lei) | Profit (lei) % compared to the control |
|---|---|---|---|---|---|---|---|
| M | 43.4 | 13 | 564.2± 24.62 | - | - | - | 564.2 100% |
| E1 | 46.9 | 13 | 609.7± 8.07 | 13 | 8.5 | 110.5 | 499.2 88.48% |
| E2 | 53.3 | 13 | 692.9± 14.03 | 13 | 6.0 | 78.0 | 614.9 109% |
| E3 | 48.2 | 13 | 626.6± 14.45 | 13 | 5.0 | 65.0 | 561.6 99.5% |
| E4 | 51.9 | 13 | 674.7± 17.59 | 13 | 4.5 | 58.5 | 516.2 109.2% |
| E5 | 47.7 | 13 | 620.1± 13.83 | 13 | 4.6 | 59.8 | 560.3 99.3% |
| E6 | 61.5 | 13 | 799.5± 13.68 | 13 | 4.4 | 57.2 | 742.3 131.6% |

Table 6. The testing of the differences significance of followed characters

| Specification | Honey production/family | | | | | | Profit/family | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Batch | Control | E1 | E2 | E3 | E4 | E5 | Control | E1 | E2 | E3 | E4 | E5 |
| Control | - | IS | DS | S | DS | S | - | S | S | IS | S | IS |
| E1 | IS | - | S | IS | S | IS | S | - | DS | S | DS | S |
| E2 | DS | S | - | S | IS | S | S | DS | - | S | IS | S |
| E3 | S | IS | S | - | S | IS | IS | S | S | - | S | IS |
| E4 | DS | S | IS | S | - | S | S | DS | IS | S | - | S |
| E5 | S | IS | S | IS | S | - | IS | S | S | IS | S | - |
| E6 | VS | VS | S | DS | S | DS | VS | VS | DS | VS | DS | VS |

IS –insignificant; S – significant; DS – distinct significant; VS – very significant

Although the experimental batches recorded higher productions compared to the control batch, however, due to expenses from the supplementation (Table 5), only 3 batches, namely E2, E4 and E6, recorded higher profits of 9%, respectively 31.6% than the control batch, the others bringing lower profits, the lowest value being noticeable at the experimental batch E1 (Table 6), which had a deficit of 11.52% compared to the control batch.

## CONCLUSIONS

Following further feeding with different carbohydrate preparations of bee families the following facts have been observed:

1. Honey production for the batches which received energy supplements registered increases compared to the control batch, although different depending on the preparation used, as follows:

- Syrup made up of glucose and fructose determined an increase in the production of 41.7% compared to the control batch, being the closest (15.4%) for this indicator to the batch that received as supplement product Apiinvert;

- The weakest experimental results were recorded at the experimental batch E1, followed by the experimental batch E5, at which the differences from the control batch were of 8.1% and 9.9%

2. In terms of profits obtained from the sale of production it can be found that it was registered only for half of the experimental batches, the others recording lower values that the control batch.

3. The chemical analysis of honey indicated in most cases its characteristics of conformity, evident traces of supplementary with industrial products, this being noticeable only at the four experimental batches, where industrial glucose traces were found.

## REFERENCES


Bura M., Patruica S., Bura V.A., 2005. Apiarian tehnology.Ed. Solness.

Czirjak T.Z., Dodu M., Popovici D., 2013. Study of the effects of honey substitutes on wintering and development of bee families.Annals of University from Oradea, Fascicle Ecotoxicology, Animal Science and Tehnology of Food Industry, p.102-107.

Marghitas L.A., 2008. Bees and their products. Ed. Ceres, Bucuresti.

Waring C., Waring A., 2012. Manual beekeeping. Complete guide, stepe be stepe, beekeeping. Ed. MAST.