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FEEDING BEES IN THE SPRING PERIOD

Nicolae EREMIA[1*], ORCID: 0000-0003-4917-7440,
Olga COȘELEVA[1], ORCID: 0000-0002-1261-4953
Ivan CATARAGA[1], ORCID: 0000-0003-0244-6578,
Fliur MACAEV[2], ORCID: 0000-0002-3094-1990

[1]*Technical University of Moldova, Republic of Moldova*
[2]*Institute of Chemistry, State University of Moldova, Republic of Moldova*
[*]*Corresponding author: Nicolae EREMIA – e-mail: eremia.nicolae@gmail.com*

Abstract. For the intensive development of beekeeping, the creation of new preparations is of particular importance, as they stimulate the growth of bee colonies and contribute to increased productivity. The research aims to assess the impact of the CobalRibo biostimulator (aqueous solution of hexamine cobalt (III) chloride and Rebaudioside A glycoside) on the growth of bee colonies, early developmental stages, and overall productivity. It has been determined that the optimal dose of the CobalRibo biostimulator for early spring bee feeding, in the absence of a maintenance nectar-pollen crop, is 3 ml/L of sugar syrup. Early spring bee feeding with a mixture of 50% sugar syrup and 3.0 ml/L of CobalRibo biostimulator, in a quantity of 1.0 L per bee colony, administered once every 6 days starting from April until the beginning of white acacia flowering, enhances queen prolificacy, promotes the growth of the number of capped brood, and increases honey yield.

Keywords: *Apis mellifera; Bee colonies; Biostimulator; Sugar syrup; Morphoproductive indices.*

Rezumat. Pentru dezvoltarea intensivă a apiculturii, o deosebită importanță are elaborarea noilor preparate, care stimulează creșterea și contribuie la sporirea productivității albinelor. Scopul cercetărilor constă în evaluarea impactului biostimulatorului CobalRibo (soluție apoasă de clorură de hexamină de cobalt (III) și glicozida Rebaudioside A) asupra creșterii familiilor de albine, dezvoltării timpurii și productivității. S-a stabilit că doza optimă a biostimulatorului CobalRibo, administrat albinelor primăvară devreme în absența unei recolte nectaro-polenifere de întreținere, este de 3 ml/L sirop de zahăr. Alimentația albinelor cu un amestec de sirop de zahăr de 50% și cu 3,0 ml/L de biostimulator CobalRibo, în cantitate de 1,0 L per familie de albine, odată la 6 zile începând cu luna aprilie până la începutul înfloririi salcâmului alb, sporește prolificitatea mătcilor, favorizează creșterea numărului de puiet căpăcit și a producției de miere.

Cuvinte-cheie: *Apis mellifera; Familii de albine; Biostimulator; Sirop de zahăr; Indici morfoproductivi.*

INTRODUCTION

All essential substances required for the metabolic processes of bees are sourced from their consumed food, which includes nectar, honey, pollen, bee bread, and water. If the food reserves of bees are limited, especially in the absence of maintenance har-

vests, additional feeding becomes essential, particularly towards the end of summer and in spring to stimulate colony growth (Dezmirean & Mărghitaș, 2007; Красочко & Еремия, 2022).

The method of feeding bees is a well-established practice, commonly using sugar as a substitute for honey. In the effort to stimulate the growth of bee colonies in spring, a 50% sugar syrup is often used (Кривцов et al., 2000). The disadvantage of this method lies in the wear and reduction in the longevity of the bees.

Stimulative feeding of bees in spring represents an indispensable condition for increasing honey production in bee colonies. In this case, the food should contain all the necessary components in a proportion suitable for the physiological needs of the bee's body (Лойко, 2018).

Stimulative feedings play an important role in the spring development of bees and are widely used in the beekeeping practice. These mainly consist of sugar syrup, enriched with preparations containing amino acids, vitamins, and trace elements (Cataraga, 2022; Морева & Давыдова, 2013; Щепеткова et al., 2021).

For the intensive development of beekeeping, special importance is given to the development of new preparations that stimulate the growth of bee colonies and contribute to increased productivity.

In the examination of stimulants for the growth of bee colonies and increased productivity, significant emphasis is placed on natural biostimulators of the new generation, which reflects a current and pertinent issue in beekeeping research.

Previous studies have shown that the use of nutritional additives in the diet of bees increases the productivity and efficiency of the maintenance of bee colonies (Cataraga, 2022; Chiriac, 2020).

The problem lies in expanding the range of biologically active, natural, environmentally harmless substances that have a stimulating effect, thereby increasing the efficiency of nutrients, contributing to enhanced immunity, queen prolificacy, development, and overall productivity of bee colonies.

The research aims to evaluate the effects of the CobalRibo biostimulator used in early spring bee feeding, in the absence of a maintenance nectar-pollen crop, on the growth of bee colonies, early developmental stage, and overall productivity.

MATERIALS AND METHODS

The research was conducted using the bee colonies from the apiary in the village of Peticeni, Calarasi district. Four groups of bee colonies were established for experimentation, each comprising three colonies. Group assignment was based on the principles of analogous methods, considering factors such as the number of combs, strength, capped brood, and honey reserves in the hive. During the spring period, in the absence of a maintenance nectar-pollen harvest, the bees were fed with one liter of 50% sugar syrup containing a biostimulator. The feeding concentrations for each group were as follows: Group I received 2.0 ml/L of syrup, Group II received 3.0 ml/L, Group III received 4.0 ml/L, and Group IV (control) received pure sugar syrup.

The biostimulator used in the research consists of an aqueous solution of hexamine cobalt (III) chloride and Rebaudioside A glycoside.

Bee feeding was carried out starting on April 22, 2022, followed by subsequent feedings on April 28, 2022; May 4, 2022, and May 10, 2022, by administering one liter of syrup once every 6 days (Figure 1).

Figure 1. *Syrup administration through the feeder*

The bee colonies within the experimental groups underwent a comprehensive examination of morpho-productive indices, encompassing parameters like the number of combs in the hive, colony strength, the number of capped broods, queen prolificacy, and honey reserves.

Data analysis was conducted using statistical variation methods and computer programs, with Microsoft Excel being one of the tools employed.

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RESULTS AND DISCUSSIONS

In April, in the absence of nectar-pollen harvesting, the control of bee colonies was carried out, and the experimental groups were selected. Prior to the first feeding on April 22, 2022, observations indicated an average of 8.0-8.3 combs in the hive, a colony strength of 7.0 spaces between combs populated with bees, a capped brood count ranging from 104.3-117.7 hundred cells, and a honey reserve of 2.7-3.0 kg (Table 1). The queen prolificacy during this period ranged from 859 to 981 eggs in 24 hours.

Table 1. *Morphoproductive indices of bee colonies before stimulative feeding on April 22, 2022*

Group	Indices	Number of honeycombs, pcs.	Bee family strength, spaces between combs populated with bees	Number of capped brood, hundreds of cells	Honey reserves, kg
I - CobalRibo, 2,0 ml/ L sugar syrup	±	8,3±0,667	7,0±0,577	117,7±13,860	2,7±0,333
	V, %	13,85	14,28	20,43	21,65
II - CobalRibo, 3,0 ml/ L sugar syrup	±	8,0±0,577	7,0±0,577	117,7±18,877	2,7±0,333
	V, %	12,50	14,28	34,96	21,65
III - CobalRibo, 4,0 ml/ L sugar syrup	±	8,0±1,00	7,0±1,00	113,3±9,762	3,0±0,577
	V, %	21,65	24,74	14,15	33,33
IV – Control, pure sugar syrup	±	8,0±0,577	7,0±0,577	104,3±9,684	2,7±0,333
	V, %	12,50	14,28	16,07	21,65

Conducting the control of bee colonies on May 18, 2022, before the flowering of white acacia, revealed an average of 9.3-11.0 combs in the hive, with a strength of 8.3-10.0 spaces between combs populated with bees (Table 2).

Table 2. *Morphoproductive indices of bee colonies before the flowering of white acacia on May 18, 2022*

Group	Indices	Number of honeycombs, pcs.	Bee family strength, spaces between combs populated with bees	Number of capped brood, hundreds of cells	Honey reserves, kg
I - CobalRibo, 2,0 ml/ L sugar syrup	±	9,3±0,333	8,3±0,333	96,7±12,468	0,5±0,00
	V, %	6,18	6,93	22,34	-
II - CobalRibo, 3,0 ml/ L sugar syrup	±	11,0±1,528	10,0±1,528	100,7±6,766	0,5±0,00
	V, %	24,05	26,46	11,64	-
III - CobalRibo, 4,0 ml/ L sugar syrup	±	9,7±1,202	8,7±1,202	87,7±9,597	0,5±0,00
	V, %	21,53	24,02	18,96	-
IV – Control, pure sugar syrup	±	9,7±0,882	8,7±0,882	97,3±12,387	0,5±0,00
	V, %	15,80	17,62	22,04	-

The bee colonies in experimental Group II increased on average by 100.7 hundred cells, representing a 3.49% growth compared to the control Group IV. Notably, honey reserves in the bee colonies significantly decreased from 2.7-3.0 kg to 0.5 kg, confirming the lack of maintenance nectar collection and adverse weather conditions (high temperatures, drought).

During the inspection conducted on June 5, 2022, at the end of the white acacia nectar flow, it was observed that the bee colonies in the experimental groups had, on average, 15.6-17.0 combs, with a strength of 14.7-16.0 spaces between combs populated with bees (Table 3).

Table 3. *Morphoproductive indices of bee colonies at the end of the flowering of white acacia on June 5, 2022*

Group	Indices	Number of honeycombs, pcs.	Bee family strength, spaces between combs populated with bees	Number of capped brood, hundreds of cells	Honey reserves, kg
I - CobalRibo, 2,0 ml/ L sugar syrup	±	16,0±2,082	15,0±2,082	156,7±5,488	33,1±6,818
	V, %	22,53	24,04	6,07	35,64
II - CobalRibo, 3,0 ml/ L sugar syrup	±	17,0±1,528	16,0±1,528	161,7±0,333	34,1±3,958
	V, %	15,56	16,54	0,36	20,10
III - CobalRibo, 4,0 ml/ L sugar syrup	±	15,6±2,333	14,7±2,333	140,7±9,871	31,6±4,452
	V, %	25,80	27,58	12,15	24,42
IV – Control, pure sugar syrup	±	16,3±0,667	15,3±0,667	130,3±11,236	31,9±2,050
	V, %	7,07	7,53	25,57	11,13

Comparatively, the bee colonies in the experimental groups (1-III) showed an average increase of 140.7-161.7 hundred cells, representing 10.4-41.4 hundred cells more than the control group. Queen prolificacy ranged between 1172 and 1347 eggs in 24 hours, while in the control group, it was 1086 eggs.

The results indicate that spring stimulative feeding increased queen prolificacy and the growth of capped brood by 10.79-24.09%, surpassing the effects observed in the control group (Figure 2).

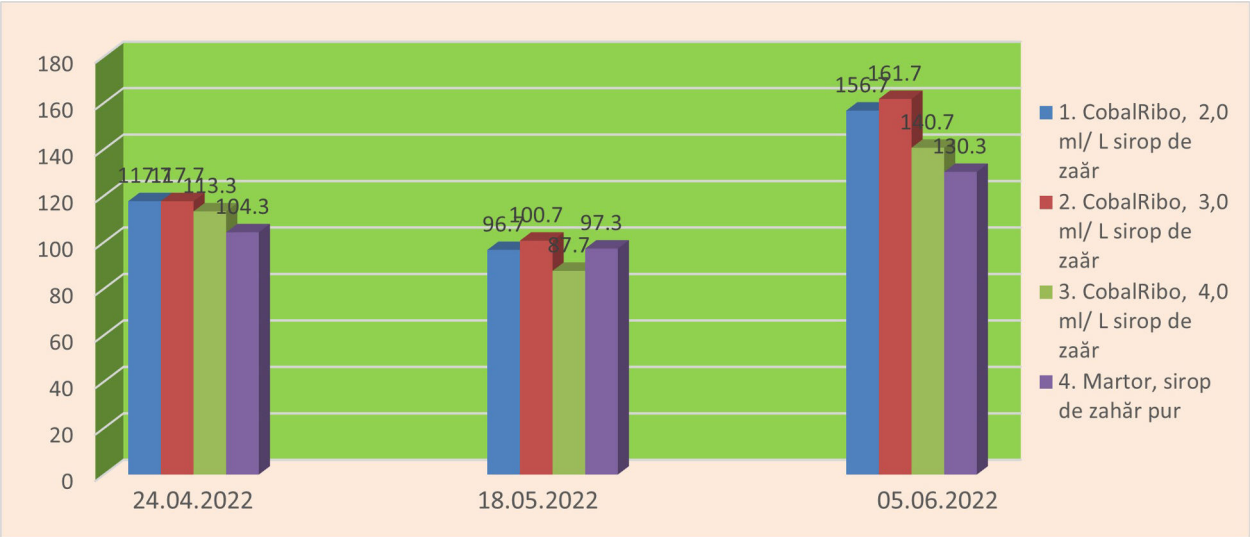

Figure 2. *Dynamics of capped brood in bee colonies, hundreds of cells (sugar syrop/sugar syrop/sugar syrop/Control group, pure sugar syrop)*

Despite challenging weather conditions, the bee colonies in experimental Group II managed to store an average of 34.1 kg of honey, indicating a 6.9% increase compared to the control Group IV. (Figure 3).

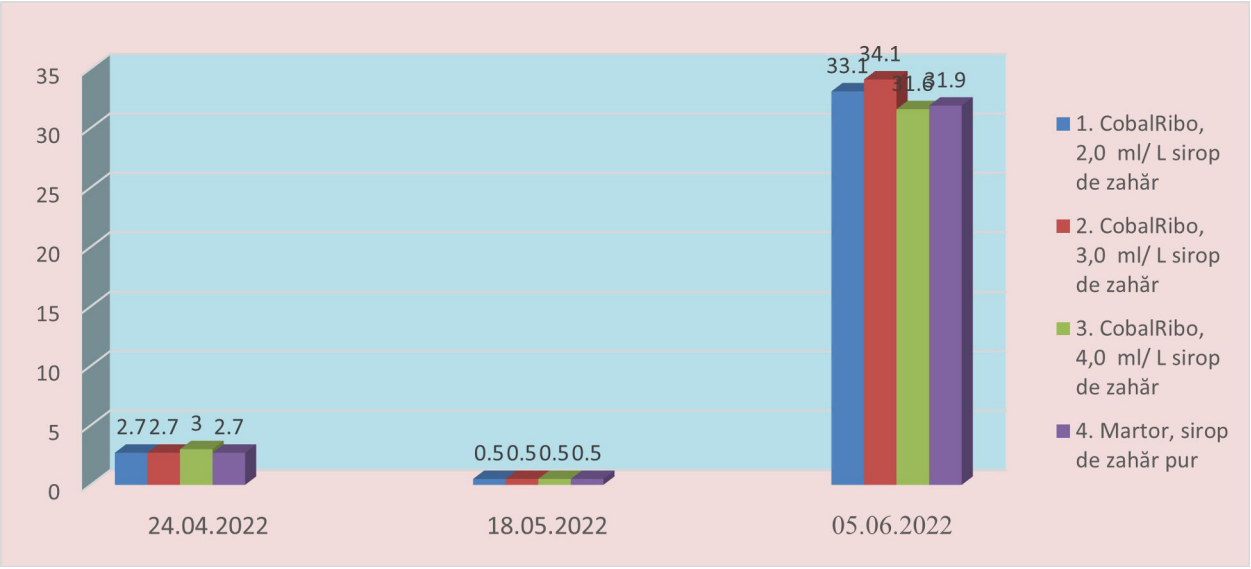

Figure 3. *Dynamics of honey reserves in bee colonies, kg (sugar syrop/sugar syrop/sugar syrop/Control group, pure sugar syrop)*

Spring stimulative feeding of bees with a mixture comprising 50% sugar syrup and the CobalRibo biostimulator, administered at a volume of 1.0 L per bee colony every 6 days, results in a notable increase of 24.10% in queen prolificacy and a 6.9% enhancement in honey production.

CONCLUSIONS

Based on the evaluation, it has been determined that the most effective dosage of CobalRibo bio stimulator for early spring bee feeding, especially in the absence of a maintenance nectar-pollen harvest, is 3 ml/L sugar syrup.

Implementing the method of spring bee feeding with a mixture of 50% sugar syrup and 3.0 ml/L of CobalRibo biostimulator, administered at a rate of 1.0 L every 6 days from April until the onset of white acacia flowering, has resulted in enhanced queen prolificacy, increased development of capped brood, and augmented honey production.

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Conflict of interests
The authors declare that they have no conflict of interests.

Authors' contributions
This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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