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PARTICULARITIES OF THE SELECTION OF SPECIALIZED LINES OF THE CARPATHIAN BEES

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CONTENT

Conceptual milestones of the research

The actuality of the subject. Bees provide the population with valuable food and therapeutic products such as: honey, wax, propolis, royal jelly, pollen, grass and venom, and also contribute to the pollination of agricultural crops that ensure the increase in the quantity and quality of seeds and fruits.

Selection of valuable bee families and queen breeding play an important role in increasing honey production.

In the Republic of Moldova, there are 7 certified beekeeping farms that produce queen bees. However, they ensure only 7.9% of the required quantity, and the beekeepers need to import them from different countries, which leads to the mythologizing of the local livestock. Queens that are obtained from production apiaries do not have the necessary set of useful characters and are used solely as urgent replacement material (Government Decision No. 768 of 21.10.2020) [14].

At the same time, the insufficiency of the pure genetic material of the Carpathian breed is noted, and some measures are taken to solve this problem, including the certification of the valuable breeding material [15].

As a result of the implementation of the approved measures, significant performances were achieved, for example, the number of bee families in the Republic of Moldova increased 1.9 fold, from 96.0 thousand, in 2006, to 182.1 thousand families, in 2019. At the same time, honey production increased to 5.7 thousand tons [14].

The process of improving beekeeping depends on several factors, including the organization and realization of the hive work, the breeding technology and the quality of the queens, the exploitation of the bees, etc.

The living conditions of bees change under the influence of natural factors. The large difference in day/night temperatures, the flowering of plants in unfavorable conditions for bees, the types of honey collections other than those with which the bees were used to, altogether influence the vital activity and honey production of the bees. The success of beekeeping depends on the organization of the hive base, the selection, reproduction, implementation of valuable material and the improvement of bee breeding methods [19, 18].

The main purpose of artificial selection consists in discovering, consolidating and growing the best genotypes of bees, which can provide high productivity and are more comfortable to work with, for example – gentle, non-robbery, etc., a fact that contributes to increasing the productivity of the beekeeper's work [5].

For the intensive development of beekeeping, of particular importance is the development of new preparations, which stimulate the growth of bee families, activate winter resistance and contribute to increasing productivity.

In the search for stimulants, increasing importance is given to natural biostimulants of the new generation, which is a current problem.

Based on the aforementioned, the study of morphometic, morphoproductive indices, the selection and reproduction of valuable bee families, the efficiency of the use of natural biostimulators in bee food is of interest.

The purpose of the paper: consists in the scientific argumentation of the improvement of the genetic background, the assessment of the specialized lines of Carpathian bees, the elaboration of new technological procedures for the stimulation of bee families.

Research objectives

1. Evaluation of the peculiarities of selection of specialized lines of Carpathian bees.
2. Comparative assessment of the morphometric characters of Carpathian bees and specialized import lines.
3. Elucidation of the morphoproductive characters of bee families of specialized lines.
4. Establishing the use of new generation biostimulants in bee nutrition.
5. Revealing the effectiveness of using some biostimulators in bee nutrition.

The research hypothesis consists in the analysis of the morphoproductive characters of the specialized lines of Carpathian bees, the evaluation of the F_1 (import ♀ + local ♂) and F_2 (F_1♀ + local ♂) progeny and their reproduction resulting in increased productive performance; the effectiveness of the use of natural biostimulants of the new generation in the supplementary nutrition of honey bees.

Synthesis of research methodology and justification of chosen research methods. The research methodology is based on the classical principles and methods described and used in beekeeping [5, 11, 21, 12, 20, 29], which have been applied for the assessment and analysis of the morphometric and morphoproductive characters of the bee families and to improve the genetic background of the Carpathian bees.

The analysis and interpretation of research results was carried out according to variational biometric statistics, according to the methods of [30, 32] and with the use of Microsoft Office and Excel software.

The research was carried out during the years 2017-2021, at the apiaries in the districts of Nisporeni, Călărași, Hâncești, Ialoveni and Orhei and in the beekeeping laboratory, Department of

Animal production management and agri-food safety of the State Agrarian University of Moldova.

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THESIS CONTENT

The **Introduction** section presents the topicality of the research theme, the current situation in the field, the purpose and objectives of the research, the research hypothesis, the synthesis of the methodology and the justification of the chosen research methods and the summary of the sections of the thesis.

1. THE PARTICULARITIES OF SELECTION IN BEEKEEPING

Chapter 1 contains a synthesis of the scientific materials presented in the specialized literature on the topic of the thesis on selection in beekeeping, morphometric, morphoproductive indices and resistance to varroosis of bee families, supplemental feeding of bees with the use of biostimulators. Information and analysis of the situation in the field, synthesis of knowledge regarding selection in beekeeping and the use of bioregulators and nutritional additives in bee stimulant food are presented.

2. MATERIAL, METHODS AND RESEARCH CONDITIONS

2.1. Study material and research conditions

For the execution of the proposed objectives, a series of experiments were carried out during 4 years (2017-2021), at the apiaries from: Seliștevillage, Nisporeni district (figure 2.1), Onișcani village, Călărași district, SRL Albinărie, Ialoveni district, Fundul Galbenei village, Hâncești district and Zorile village, Orhei district.

The peculiarities of the selection of specialized lines of Carpathian bees, the morphometric, morphoproductive characters, the resistance to the Varroa mite and the use of new generation biostimulators in the additional food of the bees were studied.

The 1st experience. In 2017, at the apiary in Seliștevillage, Nisporeni district, Carpathian queens of different genotypes, lines: M1, M2, M3, M4 and M5, were imported from the reproduction nursery in the Transcarpathian region of Mukacev (Ukraine). Imported queens were introduced into the bee colonies by changing the old ones. In 2018, 7 batches of one-year-old queen bee families were formed, of which: batch I – line M1, batch II – line M2, batch III – line M3, batch IV – line M4, batch V – line M5, batch VI – local queens from 2017 and batch VII – local queens from 2018.

The 2nd experience. Following the selection, the most valuable bee families were identified and selected and 3 batches were formed. Carpathian bee families with queens from the local population were included in the first batch, in batch II – bees with import Carpathian queens (Mukacev, Ukraine), in batch III – bees with queens from the first generation F_1 (imported ♀ + ♂local). morphoproductive characters, including strength and honey production, were studied in selected bee families.

The 3rd experience. For the selection of bees resistant to varroosis, at the apiary in Selişte village, Nisporeni district, highly productive bee families were identified and selected and 3 batches were formed, 25 families in each. Bee families with queens from the local population were included in the first batch, in batch II – bees with queens imported from Mukacev (Ukraine), in batch III – bees with queens from the first generation F_1 (imported ♀ + ♂local). The resistance of Carpathian bees to varroosis was determined by the number of mites that fell after the treatments.

The 4th experience was carried out at the apiary in Selişte village, Nisporeni district, in 2017, where two batches were formed. The families of bees from batch I were fed one liter of sugar syrup with 60 mg of the "Verbascozid" biostimulator, and those from batch II (the Control) were fed pure sugar syrup. Supplemental feeding was carried out every 6 days during spring.

The approval into production with the use of the natural biostimulator "Verbascozid" in bee feed was carried out at the apiaries in: Onişcani village, Călăraşi district; SRL "Albinarie" and Fundul Galbenei village, Hâncești district (**the 5th, 6th and 7th experiences**) [10].

The 8th experience. In 2019, 5 batches of bee families were formed at the apiary in Selişte village. The families of bees from batch I were additionally fed once every 6 days with one liter of sugar syrup with the preparation "Immunostimulator" 2 ml/L, batch II - 4 ml/L, batch III - 6 ml/L, batch IV (standard) – "Stimulcom" 10 g/3 L of syrup and batch V – Control (pure sugar syrup) [6, pp. 112-116].

As the "Immunostimulator" was used the preparation obtained from peat, produced in Ukraine, which presents a liquid emulsion with biologically active components. The bees were fed on 24.04.2019; 30.04.2019 and 6.05.2019, one liter of sugar syrup each.

The 9th experience was carried out at the apiary of SRL "Albinarie" where 4 batches were formed. The families of bees from batch I were additionally fed one liter of sugar syrup with the preparation "Immunostimulator" 4 ml/L, batch II - with "Algae suspension", 250 ml/per family, batch III (standard) - Stimulcom, 10 g/3 L and batch IV – Control (pure sugar syrup). The administration of sugar syrup with bee biostimulators was carried out on 16.09.2019 and 29.09.2019.

The 10th experience was carried out at the apiary in the village of Selișteе, where five batches were formed. The bees were fed additionally on 29.08.2020 and 13.09.2020.

Bee families from batch I were given 1.5 liters of sugar syrup with 2.0 ml of 3%/L solution of "Polydisperse Chitosan", batch II – with 3.0 ml of 3%/L solution, batch III – with 4.0 ml solution 3%/L, batch IV (standard) – with "Stimulcom" 10 g/3 L, batch V – Control (pure sugar syrup). During the spring period, the bees were additionally fed once every 7 days with one liter of sugar syrup with "Polydisperse Chitosan": batch I – with 2.0 ml of 3%/L solution, batch II – with 3.0 ml of 3%/L solution, batch III – with 4.0 ml of 3%/L solution, batch IV – with "Stimulcom" 10 g/3 L (standard), batch V – Control (pure sugar syrup) [9, pp. 82-86],

The 11th experience was carried out at the apiary in the village of Zorile, Orhei district, where 5 batches were formed. The bee families in batch I were administered, on 12.09.2020, 2.0 liters of inverted corn syrup in a concentration of 1.5:1 + 1.5 ml of 3%/L solution of biostimulator "Steviozide", batch II – with 3.0 ml of 3%/L solution, batch III – 4.0 ml of 3%/L solution, batch IV (standard) – with "Stimulcom" 10 g/3 L of inverted corn syrup, batch V – Control (pure inverted corn syrup).

In the spring period, the bees were additionally fed once every 7 days with one liter of inverted corn syrup in a concentration of 1:1 with the biostimulator "Steviozide", respectively: batch I - with 1.5 ml of 3%/L solution, batch II – with 3.0 ml of 3%/L solution, batch III – with 4.0 ml of 3%/L solution, batch IV (standard) – with "Stimulcom" 10 g/3 L of inverted corn syrup (standard) and batch V – control (inverted corn syrup).

The 12th experience was carried out at the apiary in the village of Selișteе, where 4 batches were formed according to the principle of the analogue method. Five times, the bees were fed a liter of sugar syrup with a natural biostimulator, on the dates: 04.08.2022; 18.04.2022; 28.04.2022; 8.05.2022 and 15.05.2022. The bee families in batch I were given one liter of sugar syrup mixture and 0.75 ml/L of biostimulator "Citropot" at each feeding, batch II - 1.5 ml/L, batch III - 2.5, batch IV – Control (pure syrup).

2.2. Research methods of morphoproductive characters in bees

In order to study the values of the morphoproductive characters of the bee families, the total control was performed, and the following were recorded: the number of combs, the power, the brood of the queens, the number of hatched broods, the amount of honey in the nest [4, 5].

The strength of the families was determined in the spaces between the honeycombs populated with nest bees; the capped brood – with the help of the grid with 5x5 cm^2 squares; resistance to

wintering – by assessing dead bees during the winter, food consumption during the wintering period and the general condition of the nest; honey reserve – by weighing the honeycombs with the electronic scale [4, 5].

For the research and appreciation of external characters, samples of worker bees were collected in the spring period, 20-30 individuals from each family, according to recommended methods. In the beekeeping laboratory of the Faculty of Agronomy of the UASM, worker bees were prepared and examined for morphometric characters using the MBS-9 microscope. The study of the morphometric and morphoproductive characters of bee families was carried out according to methodical indications [20, 29, 4, 5, 11, 12, 21].

The biometric processing of the obtained data was carried out by the method of statistical variations and the certainty threshold of differences was established according to PLOHINSCHII AND MERCUREVA [30, 32], using Microsoft Office.

3. THE PARTICULARITIES OF CARPATHIAN BEES SELECTION

3.1. Body mass and morphometry of Carpathian bees

Lean body mass. The results of research carried out in 2020 demonstrated that the integral body mass of local Carpathian bees is on average 112.9 mg, of imported bees – 122.0 mg and of the first generation – 117.6 mg, and without the intestine – 75.6 mg, 90.0 mg and 74.7 mg (figure 3.1), respectively. Imported worker bees had a body mass 9.1 mg higher than local ones (*B ≥ 0.95) [8, pp. 123-128].

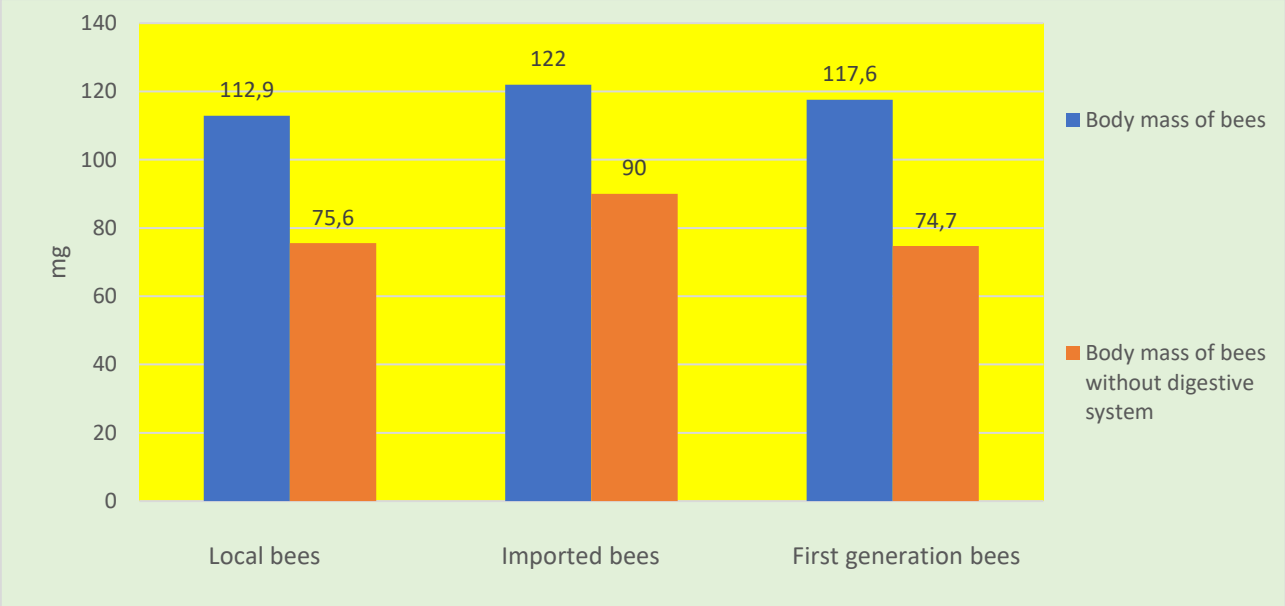

Figure 3.1. The average values of the body mass of the bees, whole and without the digestive system, 2020, mg

The research carried out in 2021 found that on average for the bee families, the body mass of the worker bees varied between 98.0 mg (bee family no. 179) and 130.0 g (bee families no. 26 and #8). The gutless body mass of worker bees ranged, on average, between 69.0 mg (bee family no. 179) and 93.0 mg (bee family no. 26). The values of the integral body mass of worker bees, on average per hive, was 116.7 mg, and without intestine – 85.4 mg.

The analysis of the body mass values of worker bees from various genotypes showed that bees from the local genotype had an average integral mass of 119.4 mg, bees from the first generation – 118.2 mg, which falls between the imported and local ones, while in the second generation the body mass was reduced by 1.7 mg. The highest body mass without the digestive system, of 89.0 mg on average, was found in bees of the first generation, and in the second generation it was reduced by 2.8 mg.

Morphometry. The morphometry research carried out in 2021 on various genotypes demonstrated that the values of the external morphological characters of the worker bees are: the length of the trunk – 6.06-6.10 mm, the length of the large right wing – 8.52-8.64 mm, the width of the large right wing – 2.91-2.93 mm, length of tergite-3 – 1.92-1.99 mm, size between projections of tergite-3 – 4.41-4.55 mm, length of sternite-3 – 2.63-2.66 mm, width of sternum-3 – 3.65-3.70 mm, length of wax glands – 2.10-2.23 mm, width of wax glands – 1.48-1.52 mm, length of tarsus-3 – 1.92-1.95 mm, width of tarsus-3 – 1.04-1.06 mm.

Result show that imported worker bees have a proboscis length of 6.10 mm, a cubital index of 47.0% and a discoid dislocation of 81.17%. These values are higher than for the other genotypes by 0.02-0.04 mm, 1.0-2.8% and 13.67-18.47%, respectively.

In worker bees of the second generation, the width of the large right wing is 0.02 mm higher than for the other genotypes, the length of tergite-3 – 0.06-0.07 mm higher and the length of the wax glands – 0.07-0.13 mm higher than for the other genotypes.

The most valuable bee families identified of pure Carpathian breed and with a quiet behavior during control were used in breeding for raising queens.

3.2. Morphoproductive characters and selection of Carpathian bees

Experience I. The results of the research carried out in 2018 demonstrated that from the first honey collection - white acacia, local bees worked best (queen age 1 year) with a honey production of 31.77 kg. From the five genotypes, the bees from the M5 line presented a higher productivity, with a total 31.02 kg of honey collected (table 3.1).

From imported bee families, line M2 (queen age 1 year), from white acacia, on average, 3.15 kg less honey was extracted compared to local ones (significance of differences between means is genuine ♀ML- ♀ M2 **B ≥ 0.99), line M3 – by 4.19 kg less (♀ML-♀ M3 **B ≥ 0.99), line M4 – by 2.85 kg less (♀ML-♀ M4 ** B ≥ 0.99).

Table 3.1

Honey production extracted from different genotypes during the active season, 2018, kg

Genotype of queens in bee families	Honey extracted from:			Total amount of extracted honey
	white acacia	linden	sunflower	
♀ line M 1 - changed in 2017	29,75 ± 0,917	21,77 ± 0,357*	22,19 ± 0,534	73,72 ± 1,525
♀ line M 2 - changed in 2017	28,62 ± 0,689**	21,2 ± 0,517	22,4 ± 0,461	72,26 ± 1,292
♀ line M 3 - changed in 2017	27,58 ± 1,635**	21,58 ± 0,641	23,23 ± 0,495*	72,4 ± 1,669
♀ line M 4 - changed in 2017	28,92 ± 0,421**	21,52 ± 0,390*	23,9 ± 1,107	74,35 ± 1,537
♀ line M 5 - changed in 2017	31,02 ± 0,791	22,11 ± 0,560*	24,0 ± 0,419***	77,21 ± 1,269*
♀ local, year 2017	31,77 ± 0,685	20,46 ± 0,306	21,58 ± 0,351	73,82 ± 1,159
♀ local, year 2018	22,93 ± 2,364	18,05 ± 0,654	22,36 ± 0,398	63,34 ± 2,831

Note: The significance of the differences between the means is authentic: - honey extracted from white acacia ♀ML-♀ M2 **B ≥ 0.99; ♀ML-♀ M3 **B ≥ 0.99; ♀ML-♀ M4 **B ≥ 0.99;
- honey extracted from linden trees ♀ML-♀ M1 *B ≥0.95; ♀ML-♀ M4 *B ≥0.95; ♀ML-♀ M5 *B ≥0.95;
- honey extracted from sunflower ♀ML-♀ M3 *B ≥ 0.95; ♀ML-♀ M5 ****B ≥ 0.999;
- total amount of extracted honey ♀ M2-♀ M5 *B ≥ 0.95; ♀ M3-♀ M5 *B ≥ 0.95.

It was revealed that from the second honey collection, from linden trees, genotypes with imported queens had better results, with bee families producing by 0.74-1.65 kg more honey, on average, compared to the local ones of the same age.

Bee families with imported queens' line M1 stored 1.31 kg more honey from linden than local ones of the same age (♀ML-♀ M1 *B ≥ 0.95), line M4 – 1.06 kg more (♀ML-♀ M4 *B ≥ 0.95), M5 line –1.65 kg more (♀ML-♀ M5 *B ≥ 0.95). A lower honey production (18.05 kg) was shown by local bee families whose queens were changed in 2018, or 2.41 kg less than those with one-year-old queens.

It was revealed that the amount of honey extracted from the sunflowers of the imported genotypes with one year of age was higher by 0.61-2.42 kg of honey compared to the local ones of the same age, and compared to those of the current year (2018) – 0.04 kg (M2 line) – 1.64 kg (M5 line).

The amount of honey extracted from the sunflower crop of the imported bee families, line M3 (queen age 1 year), exceeded the local families production by 1.65 kg of honey (♀ML-♀ M3 *B ≥ 0, 95), line M4 – by 2.32 kg and line M5 – by 2.42 kg of honey (♀ML-♀ M5 ****B ≥ 0.999).

Thus, it was noted that the production of honey from three honey collections of Carpathian bee families with imported queens constituted, on average, 72.26-77.21 kg of honey, while for the local ones – 73.82 kg, and for those with queens of the current year (2018) – 63.34 kg.

Analyzing the honey production of the imported genotypes, we can mention that the M5 line performed best, which stored 77.21 kg of honey or by 3.39 kg (4.59%) more than the local ones. The honey production of the M5 line was higher by 4.95 kg (6.85%) compared to the M2 line (♀ M2-♀ M5 *B ≥ 0.95), and compared to the M3 line – 4.81 kg higher (6.64%) (♀ M3-♀ M5 *B ≥ 0.95) [22, pp. 47-54].

The amount of honey extracted from one-year-old queen bee families of the local genotype was 14.2% higher than from the current ones.

Experience II. Analyzing the research results, indicated in table 3.2, we can mention that the production of honey obtained from one of the local bee families selected from batch I was, on average, 101.36 kg, and the total amount – 1520.4 kg; from batch II, respectively –103.20 kg and 2683.5 kg and from batch III F_1 (import ♀+♂local) – 104.5 kg and 2612.5 kg.

Table 3.2

Honey production obtained from the experimental lots and apiary, kg

Lot	No. f/a in lot	Honey extracted from:			Honey extracted per season	
		white acacia	linden	sunflower	on average from a family of bees	total
I – bee families with local queens	15	523,3	500,3	496,8	101,36±0,729	1520,4
II - families of bees with imported queens	26	907,1	886,1	890,0	103,20±1,018	2683,2
III - bee families with first generation F_1 queens (imported ♀+local ♂)	25	876,4	874,4	861,7	104,50±0,737*	2612,5
Total amount of honey on the apiary	**350**	**7354**	**7563**	**7709**	**64,64**	**22626**

Note: The significance of the differences between the means is genuine: after the extracted honey, on average, from a family of bees I-III *B ≥ 0.95.

Due to heterosis, the production of honey from bee families in batch III F_1 was, on average, 3.14 kg more than in batch I and 1.3 kg more compared to those in batch II, which constituted a 3.10% and 1.26% increase, respectively.

The obtained results confirm the opinion of some researchers [1, 17] that "crossing female queens from one line with drones from another line leads to obtaining offspring with valuable characteristics, superior to the two initial lines". Likewise, it has been demonstrated that, according to honey productivity, Carpathian bee hybrids are superior to the parental forms [28, pp. 14-15]. Due to the hybridization of geographically distant subspecies, the offspring of the first year showed a higher honey production [26, pp. 855-858; 31, pp. 458-462].

In total, 22,626 kg of honey were obtained from the apiary with a population of 350 bee families, giving an average value of 64.64 kg per family [13, pp. 272-278; 24, pp. 23-25].

Therefore, it was revealed that the honey production of local bee families constituted, on average, 101.36 kg of honey, of Carpathian bees imported from abroad – 103.20 kg and of families with first generation F_1 queens – 104.5 kg.

Due to the heterosis effect, in the first generation of F_1 families the viability of bees increased and more honey was produced - 1.26% more compared to the maternal forms and 3.1% more compared to the paternal forms [13, pp. 272-278; 2, pp. 178-182].

3.3. Selection of bees resistant to varroosis

The third experience. The number of mites, fallen after three treatments was, on average, 256.8 pcs. (lot I), 359.46 pcs. (batch II) and 308.0 mites (batch III). Comparing the experimental groups, we can mention that the local bee families in group I were less attacked by the Varroa mite with 102.66 pcs. compared to the imported batch II ***B ≥ 0.999, and compared to batch III first generation F_1 – with 51.2 mites less I-III**B ≥ 0.99 (table 3.3) [23, pp. 57- 61].

Table 3.3

The total number of Varroa mites that fell after the treatments, n=25.

Loads	$\overline{X} \pm S_{\bar{x}}$	V, %	Limits (min.-max.)
I. Bee families with local queens	256,80+14,168	21,368	170 - 354
II. Bee families with imported queens	359,46±13,252***	18,80	212 – 457
III – bee families with F_1 queens (import ♀+local ♂)	308,0±13,677**	22,20	175 – 443

Note: Significance of differences between means is genuine: I-II ***B ≥ 0.999; I-III * B ≥ 0.95; II-III ** B ≥ 0.99.

Therefore, we can mention that local bees are better adapted and resistant to the Varroa mite compared to Carpathian bees raised from queens imported from abroad [23, pp. 57-61; 27, pp. 29-31; 3, pp. 183-187].

3.4. Economic indices in the apiary from Selişte village between 2017-2021

During the years of the study (2017-2021), the number of bee families at the apiary in the village of Selişte was 350-360 pcs., the production of honey varied between 5,354 kg (year 2020) and 22,626 kg (year 2019), and between 14.87 and 64.64 kg for one hive, respectively, which was influenced by climatic conditions (table 3.4).

Table 3.4

Honey production and income per apiary

Year	Effective of bee families, pcs.	Total honey extracted per beehive, kg	Average production of honey obtained from one beehive, kg	Average purchase price, lei	Accumulated income per beehive, lei	Gross income per beehive, lei
2017	360	17 378,2	48,27	54,96	2 653,07	955 203,27
2018	360	18 086,3	50,23	53,74	2 691,34	971 997,19
2019	350	22 626	64,64	51,48	3 235,51	1 164 984,76
2020	360	5 354	14,87	51,57	766,96	276 105,78
2021	360	13 919,7	38,66	83,55	3 230,53	1 163 018,05

The purchase price varied from 51.48 lei (year 2019) to 83.55 lei (year 2021), and the accumulated income per hive – from 766.96 lei (year 2020) to 3,235.51 lei (year 2019). The gross income per apiary, was of 1,164,984.76 lei in 2019, and 1,163,018.05 lei in 2021.

4. STIMULATION OF BEE FAMILIES USING SOME NEW GENERATION BIOSTIMULATORS

4.1. Stimulation of growth and productivity by the adition of the biostimulator "Verbascozid" in the supplementary feeding of bees

The 4th experience. As a biostimulator we used the preparation "Verbascoside" as a biostimulator, developed by the "Natural Bioregulators" laboratory of the Institute of Genetics, Physiology and Plant Protection of AŞM. The natural biostimulant includes: polyethylene glycol, calcium nitrate, boric acid, dehydroconiferyl alcohol-9'-O-ß-D-glucopyranoside and dehydroconiferyl

alcohol-9-O-ß-D-glucopyranoside glycoside extract. The glycoside extract was obtained from Verbascum densiflorum Bertol plants [16].

As a result, the research showed that the additional feeding of worker bees with sugar syrup and the biostimulator "Verbascoside" (60 mg/L) increases honey production by 4.92 kg (15.29%) compared to the control group. From the sunflower honey harvest, the bee families in batch I stored, on average, 33.3 kg of honey each, or 3.6 kg (12.1%) more than the control batch, which translated into 70.4 kg or by 8.5 kg (13.73%) more per season, respectively.

4.2. Approval of production investigations

The 5th experience. According to the research results, before the start of the additional feeding of the bees, at the control carried out on 03.05.2017, there were, on average, 5.67-6.3 combs in the nest, the strength – 4.67-5.0 spaces among the honeycombs populated with bees, the number of capped broods – 72.0-73.67 hundred cells and the honey reserve – 1.0 kg.

During the control carried out on 06.05.2017, it was certified that after collecting honey from the white acacia in the nest of bee families, there were from 15.3 combs (batch IV, control) to 18.7 pcs. (lot III, "Verbascoside", 90 mg/L). The best developed were bee families from group II ("Verbascoside", 60 mg/L), which had the power, on average, of 15.0 spaces between the honeycombs populated with bees or 40.19% higher compared to the control group (table 4.1).

Table 4.1

Morphoproductive characteristics of bee families at the end of honey collection, (06.05.2017), n=3

Lot	Clues	No. honeycombs, pcs.	The power of the bee family	The number of capped brood and larvae	Honey reserve in the nest, kg
I – „ Verbascoside”, 30 mg/L	$\overline{X} \pm S\overline{x}$	16,7±3,335	12,7 ± 1,856	150,7 ± 2,900	29,7± 7,272
	V, %	34,64	25,38	18,23	42,36
II – „ Verbascoside”, 60 mg/L	$\overline{X} \pm S\overline{x}$	18,0±2,00	15,0 ± 2,646	151,0 ± 21,127	44,67±12,504
	V, %	19,24	30,55	24,23	48,48
III – „ Verbascoside” 90 mg/L	$\overline{X} \pm S\overline{x}$	18,7±1,333	12,3 ± 1,202	138,7 ± 19,599	29,77 ± 7,914
	V, %	12,37	16,87	24,48	46,05
IV – Control (pure sugar syrup)	$\overline{X} \pm S\overline{x}$	15,3±2,906	10,7± 1,764	144,0±18,56	30,5±7,37
	V, %	32,82	28,64	22,32	41,86

The families of bees from the experimental groups I and II, which were given the supplementary food sugar syrup with the biostimulator "Verbascoside" in amounts of 30 mg/L and 60 mg/L, respectively, increased, on average, by 150.7 and 151.0 hundred cells or 4.65% and 4.86%

more than the control group. The fertility of the queens was 1256 and 1258 eggs in 24 hours, and in the control group – 1200 eggs. With the increase of the amount of biostimulator per liter of sugar syrup, the number of broods of the queens and the number of capped broods, respectively, decreased.

It was revealed that the amount of honey extracted from white acacia of the bee families in the experimental groups I and III, was on average, 29.7-29.77 kg each, and those from the control group IV – 30.5 kg. The highest honey production was obtained from the bee families of the experimental group II ("Verbascoside", 60 mg/L) – 44.67 kg, or 14.17 kg (46.46%) more than in the control group.

The amount of sunflower extracted honey, from the bee families in batch I ("Verbascoside", 30 mg/L) constituted, on average, 49.3 kg or by 8.0 kg (19.37%) more than in the control group. Increasing the amount of "Verbascoside" biostimulator, 90 mg/L, did not influence the productivity of bee families. The amount of honey extracted from white acacia and sunflower by bee families in batch II ("Verbascoside", 60 mg/L) was, on average, 90.5 kg or 25.99% more than in the control lot.

From the bee families in batch I, which were administered "Verbascoside", 30 mg/L,were obtained 79.07 kg of honey or 10.08% more compared to the control batch. The bee families from batch III stored the same amount as the control batch (figure 4.1). Increasing the dose resulted in reduced honey production.

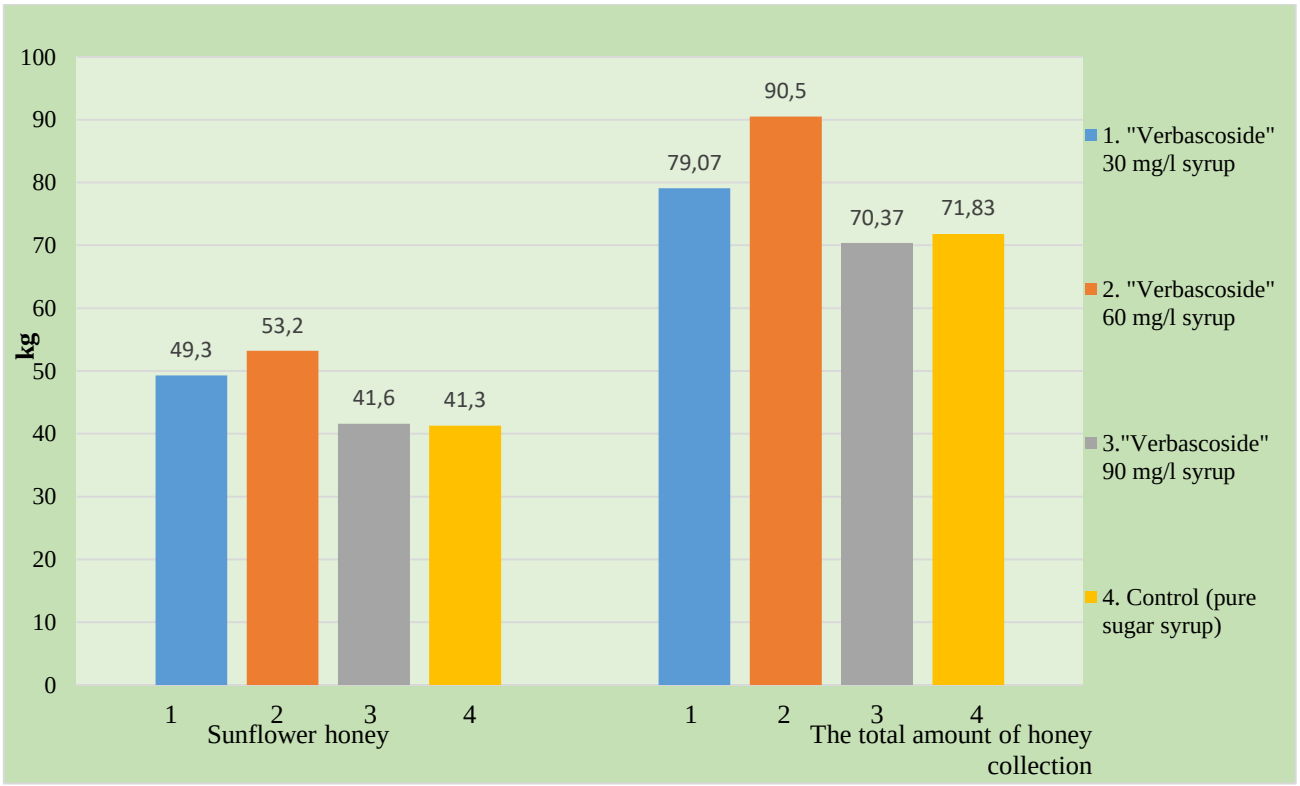

Figure 4.1. Dynamics of honey production obtained from sunflower and (acacia + sunflower), kg

Therefore, we can mention that the optimal amount of the natural biostimulator is 60 mg/L, and its administration in the stimulating food of bees ensures the increase in power by 8.29-40.19%, the brood of queens and the number of capped brood – by 4.65- 4.86% and the increase in honey production – by 25.99-46.46% [10, 7, pp. 48-53].

The 6th experiment was carried out in parallel at the apiary SRL "Albinarie" to determine the optimal amount of the biostimulator in the supplemental food of the bees.

During the control carried out on 02.05.2017 before the additional feeding, it was revealed that, in the nest of the bee families, there were, on average, 11.7-14.6 honeycombs, the strength – 10.7-12.6 spaces between the populated honeycombs with bees, the number of capped broods – 100.0-100.6 hundred cells and the honey reserve – 4.33-5.0 kg.

The supplemental food of the bees with the use of the biostimulator "Verbascoside" had a positive influence on the growth of the capped brood, which in the experimental groups constituted, on average, 140.0-161.7 hundred cells or 28.5-50.2 hundred cells (25.56-45.02%) more than in the control group.

It was revealed that the highest honey production was obtained from the bee families of batch I ("Verbascoside", 30 mg/L), which is 36.9 kg or 2.8 kg (8.2%) more than in the control group, in group II ("Verbascoside", 60 mg/L) – 36.7 kg or 2.6 kg (7.62%) more and in group III ("Verbascoside", 90 mg/L) – 35.0 kg or 0.9 kg (3.64%) more than in the control group (table 4.2).

Table 4.2

Morphoproductive characteristics of the bees' families (05.06.2017), n=3

Lot	Clues	No. honeycombs in the nest, pcs.	The power of the bee family	The number of capped brood and larvae	Honey reserve in the nest, kg
I – "Verbascoside", 30 mg/L	$\overline{X} \pm S\overline{x}$	18,7±0,882	17,7 ± 0,882	140,0 ± 16,563	36,9± 2,900
	V, %	8,18	8,64	20,49	9,06
II – "Verbascoside", 60 mg/L	$\overline{X} \pm S\overline{x}$	18,3±0,882	17,3 ± 0,882	144,3± 12,347	36,7± 2,751
	V, %	8,33	8,81	14,82	12,99
III – "Verbascoside", 90 mg/L	$\overline{X} \pm S\overline{x}$	17,3±1,764	16,3 ± 1,764	161,7 ± 18,889	35,0 ± 4,821
	V, %	17,62	18,70	20,23	23,83
IV – Control (pure sugar syrup)	$\overline{X} \pm S\overline{x}$	17,7±0,882	16,7±0,882	111,5 ±3,50	34,1±4,258
	V, %	8,64	9,16	4,44	21,63

Therefore, the use of the biostimulator "Verbascoside" in the supplemental food of bees, one litre of the mixture once every 6 days, ensures the increase of the brood of queens and capped brood by 25.56-45.02% and the production of honey by 3.64-8.2% compared to the control group.

The 7th experiment was carried out at the apiary in the village of Fundul Galbenei, where bee families are kept in multi-storey hives on pallets.

During the control carried out on 2.05.2017 before the additional feeding of the bees, it was found that in the nest of the families there were, on average, 9.6 honeycombs, the strength – 8.6 spaces between the honeycombs populated with bees, the number of capped brood – 74.4-74.8 hundred cells and the honey reserve in the nest – 1.0-1.4 kg.

Supplemental feeding of bees from experimental group I ("Verbascoside", 60 mg/L) increased brood brood growth by 5.74%, compared to group II (standard) and by 34.86%, compared to group III (control). The brood of queens from the experimental group I during this period was, on average, 1396 eggs in 24 hours or 5.76% more compared to group II (standard) and 34.88% more, compared to group III (control).

It was certified that during honey collection, the bee families that were additionally fed with the biostimulator "Verbascozid" 60 mg/L stored on average 36.02 kg or 2.50% more, compared to batch II (standard) and by 5.69% more, compared to batch III (control).

Therefore, we can mention that the optimal amount of the biostimulator "Verbascoside" is 60 mg/L sugar syrup, and the feeding is carried out one litre every 6 days, during the spring period.

The use of this method ensures an increase in the strength by 2.38-40.19%, the brood of queens and capped brood – by 4.86-45.02% and increases honey production by 5.69-46.46% compared to the control group [10].

4.3. Stimulation of growth and productivity through the use of the immunomodulator

The 8th experiment was carried out at the apiary in Seliștevillage, Nisporeni district. The preparation obtained from peat, produced in Ukraine, was used as an immunomodulator. The results of the research showed that, at the control carried out on 24.04.2019, at the time of the formation of the experimental batches, before feeding, the bee families had, on average, 8.0-8.6 combs in the nest, the strength – 7.0 -7.6 spaces between the honeycombs populated with bees, the number of capped brood was 110.3-111.3 hundred cells and the amount of honey – 3.0-3.6 kg.

Analyzing the morphoproductive characters of the bee families before the white acacia bloom (18.05.2019) we can mention that the number of honeycombs in the nest was, on average, 17.0-18.2 pcs., the strength – 16.0-17.2 spaces between honeycombs populated with bees and the amount of honey – 6.3-8.3 kg.

The amount of the capped brood oscillated between 115.1 hundred cells (group V, control) and 135.8 (group III, immunomodulator, 6 ml/L). The brood of the queens from the bee families of

the experimental groups constituted, on average, 1006-1132 eggs in 24 hours or 4.90-18.04% more than the control group.

After picking from the white acacia, during the control of the bee families carried out on 11.06.19, it was revealed that the number of honeycombs in the nest varied between 20.0-23.3 pcs., the strength – 18.7-22.6 spaces among honeycombs populated with bees or 0.5-21.51% more than the control group. The bee families in the experimental groups that were stimulated by feeding a mixture of sugar syrup and a 6 mg/L solution of the immunomodulator grew 118.0-154.3 hundred brood cells or 0.42-30.76% more much compared to the standard batch and by 2.16-33.02% more, compared to the control batch.

The maximum amount of honey production from white acacia was obtained from bee families of group I (immunomodulator, 2 ml/L) – 37.8 kg or 7.5 kg (24.7%) more than from the standard batch IV and with 8.7 kg (29.9%) more than from the control batch V (figure 4.2).

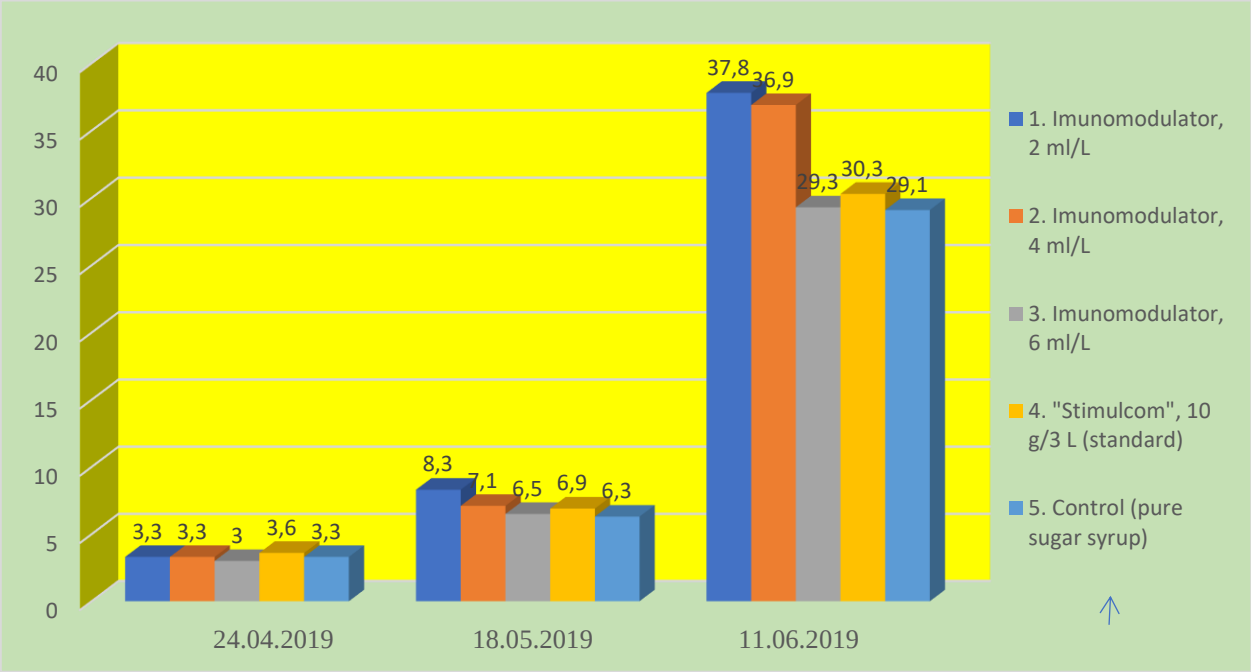

Figure 4.2. The amount of honey production, kg

An additional increase of the added immunomodulator led to a reduction in honey production in bee families.

So, we mention that the use of the immunomodulator 2 ml/L in the bee feed contributes to the increase of the capped brood and the prolificacy of the queens by 10.86% and of the honey production by 29.9%, while the use of the nutritional additive "Stimulcom" (standard) – by 1.73% [6, pp. 112-116].

4.4. Stimulation of the resistance of bee families during wintering

The 11th experiments. The results of the research carried out on 16.09.2019 at the apiary SRL "Albinarie" before feeding, at the time of the formation of the experimental batches, demonstrated that in the nest of the bee families there were, on average, 9.0-9.3 honeycombs, the strength being 7.3-8.0 spaces between the honeycombs populated with bees and the honey reserve – 11.7-12.0 kg.

Analyzing the dynamics of resistance and the consumption of honey during the winter, we can mention that the bee families from batch I wintered best. These bees were fed in the autumn with sugar syrup and immunomodulator - 4 ml/L, and their survival rate was 77 .4% or 9.9% higher than in batch III (standard) and 25.0% higher than in batch IV control. The winter resistance of bee families, which were administered sugar syrup and Algal suspension (batch II) 250 ml per family, was 73.2% or 5.7% % higher than in group III (standard) and 20.8% higher compared to the control group [25, pp. 205-208].

4.5. Stimulation of the resistance and productivity by using the natural bioregulators Polydisperse Chitosan, "Steviozide" and "Citropot" in the bee feed composition

The 10th experiment was carried out at the apiary in Seliștevillage. The natural bioregulator (2% solution of polydisperse chitosan) entered the feed. It was found that before feeding, during the control of the bee families carried out on August 29, 2020, there were, on average, 9.7-10.0 honeycombs in the nest, the strength – 8.7-9.0 spaces between honeycombs populated with bees, the number of hatched brood – 30.3-35.0 hundred cells and the honey reserve – 19.5-20.8 kg. The bee families in the experimental batches were fed twice on 29.08.2020 and on 13.09.2020, 1.5 L each time, with a total of 3 L sugar syrup with polydisperse chitosan.

During the spring check-up (30.03.2021) it was found that bee families from experimental groups I and II (polydisperse chitosan in the amount of 1.5-3.0 ml of 3%/L solution) survived at the level of group IV (standard) – 95.24%, or 15.09% better than batch V (control). The families of bees from group III that were administered sugar syrup with 4 ml of 3%/L solution in the autumn period had a lower resistance – 85.71% [9, pp. 82-86].

The families of bees from the experimental groups I and II during the winter had a honey consumption of 4.17-4.5 kg, or 1.90-2.26 kg less than group IV (standard) and 1.50-1.86 kg less, compared to batch V (control). The honey consumption at a space between the honeycombs populated with bees was 0.287-0.403 kg and 0.350-0.466 kg, respectively.

It was revealed that from the families of bees from batch I, which were stimulated (polydisperse chitosan, 2.0 ml of 3%/L solution) were obtained, on average, 25.92 kg of acacia honey,

or by 97.85% more compared to the control group V [9, pp. 82-86], which confirms the opinion of some scholars [33]. The honey production obtained from the bee families in batch III was 26.3 kg, and in batch II two families swarmed, which influenced the final amount.

The 11th experience. The composition of the food included a natural bioregulator, which is an extract of "Stevioside" glycosides.

During the control carried out on April 1, 2021, during the spring inspection, it was found that the bee families from batch II ("Steviozide", 3.0 ml 3%/L solution) wintered best, having a winter resistance of 65.0%, or 8.33% higher than batch V (control) and 6.67% higher than batch IV (standard). At the same time, we report that with the increase in the amount of the biostimulator, the resistance to wintering remained at the same level in batch III – 65.0%.

After the honey collection from the white acacia (8.06.2021), it was found that the highest number of capped brood was, on average, 155.3 hundred cells, in the bee families of batch II ("Steviozide", 3.0 ml of 3%/L solution), or 32.73% more than in batch V (control) and 12.29% more than in batch IV (standard), respectively. The use of the natural biostimulator "Steviozide", in an amount of 3.0 ml/L of inverted corn syrup (batch II), ensures the increase of honey production – by 33.57% more compared to batch V (control) and, respectively, by 12.85% compared to batch IV (standard). Increasing the amount of the natural biostimulator to 4.0 ml/L of inverted corn syrup did not influence the productivity of bee families (figure 4.3).

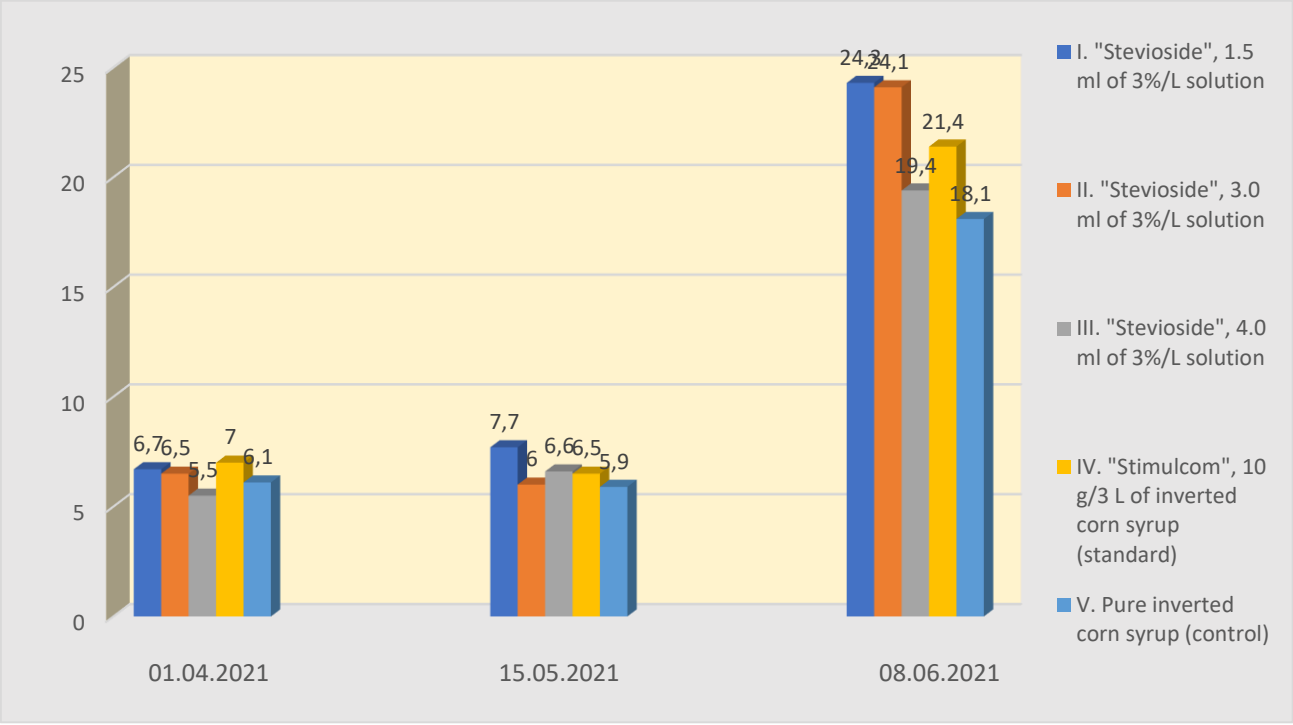

Figure 4.2. The amount of honey production, kg

The 12th experiment was carried out at the apiary in the village of Selișteа, where 4 batches of bee families were formed according to the principle of the analogue method. In the absence of maintenance honey, the bee families in the experimental batches were additionally fed 4 times, using each time a liter of sugar syrup with the natural biostimulator "Citropot" on: 8.04.22; 18.04.2022; 8.05.2022 and 18.05.2022.

After the honey collection from the white acacia on 13.06.2022, it was revealed that the families of bees from the experimental groups I, II and III had, on average, 117.7-123.0 hundred brood cells or 15.96-21.18% more than the control group (table 4.3).

Table 4.3

Morphoproductive characters of bee families (13.06.2022), n=3

Lot	Clues	No. honeycombs, pcs.	The power of the bee family	The number of capped brood and larvae	Extracted honey, kg
I. ”Citropot”, 0,75 ml/L	$\overline{X} \pm S\bar{x}$	20,0	17,3±1,667	121,0±25,325	29,5±1,704
	V, %	-	16,65	36,25	10,0
II. ”Citropot”, 1,5 ml/L	$\overline{X} \pm S\bar{x}$	20,0	18,3±0,667	117,7±5,364	30,0±3,381
	V, %	-	6,29	7,897	19,52
III. ”Citropot”, 2,5 ml/L	$\overline{X} \pm S\bar{x}$	20,0	17,7±1,333	123,0±18,358	26,7±2,114
	V, %	-	13,07	25,85	13,73
IV. Pure sugar syrup (control)	$\overline{X} \pm S\bar{x}$	20,0	18,5±0,500	101,5±5,500	27,4±3,00
	V, %	-	3,82	7,663	15,48

The highest production of honey was obtained from bee families in batches I and II, which constituted an average of 29.5-30.0 kg from a bee family, or 7.66-9.49% more than in the control group.

The optimal amount of biostimulator administered per liter of sugar syrup is 0.75-1.5 ml/L, and the optimal feeding schedule of the bee families is once every 6 days in the absence of a honey collection.

4.6. The economic effectiveness of the use of natural biostimulants

The use of biostimulators in the food of bees in the spring period increases honey production and, respectively, the efficiency of the maintenance of bee families. On average, "Verbascozid" showed an increase by 53.9%, "Immunomodulator" – by 35.4%, "Steviozide" – by 45.7% and "Citropot" – by 11.21%.

GENERAL CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

1. Research into the specifics of the selection of specialized lines of Carpathian bees, morphometric, morphoproductive indices and the highlighting of valuable bee families allowed the creation of a population of Carpathian bees, which is distinguished by: quiet behavior during control, resistance during wintering, to the Varroa mite and with increased productivity.

2. It was found that using pastoral beekeeping, during the active season the local Carpathian bees stored, on average, 101.36 kg of honey, those imported from abroad – 103.20 kg and the first F_1 generation – 104.5 kg. Due to heterosis, in the bees of the first generation F_1, the viability increased and more honey was collected, by 1.26% compared to the maternal forms and 3.1% more compared to the paternal forms. In total, 22,626 kg of honey were obtained per apiary, on average, and 64.64 kg from each family [13, pp. 272-278; 2, pp. 178-182].

3. It was revealed that the local bees of the Carpathian race are more resistant to varroosis and are less attacked by mites compared to the imported ones. , Judging by the number of mites that fell after performing three treatments, the bees of the first generation F_1 occupy an intermediate position between the local and imported ones [3, pp. 183-187; 23, pp. 255-258; 27, pp. 29-31].

4. The method of using the biostimulator "Verbascoside" (MD,1326) was developed and patented, which includes feeding bees with sugar syrup and extract of glucosides dehydroconiferyl alcohol-9'-O-β-D-glucopyranoside and dehydroconiferyl alcohol- 9-O-β-D-glucopyranoside, which increases the strength of families by 2.38-40.19%, the prolificacy of queens – by 4.86-34.86% and the amount of honey obtained – by 5.69-46.46% [10].

5. The main result obtained contributes to solving the important scientific problem of improving the genetic background of Carpathian bees, *determining* and *establishing* the optimal amount of biostimulators used in bee feed. This led to the *development* of a new process that *ensures* the increase of survival and productive performance of bee families.

Recommendations:

In order to increase the effectiveness of bee breeding, it is recommended to carry out breeding work in local Carpathian bee populations in pure breed by selecting and reproducing the most valuable families and using interlineal hybrids of the first generation in various honey collections during the active season.

For the growth of strong families with many worker bees necessary for honey picking, increased immunity and productive performance, it is recommended to administer natural biostimulators "Verbascoside" 60 mg/L, Immunomodulator 2 ml/L, polydisperse chitosan 2.0 ml 3%/L solution and "Steviozide" 3.0 ml 3%/L solution, one liter of syrup each, once every 6-9 days in spring and when food reserves are replenished in autumn [10].

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- **Patents of invention**

15. EREMIA, N., CHIRIAC, A., CAISÎN, L., **CATARAGA, I**. et al. Bee feeding procedure. Short-term invention patent no. 1326. No. deposit: s 2018 0021. Date of deposit: 2018.03.21. In: BIOPI, 2019, no. 3.

ADNOTARE

CATARAGA Ivan, „Particularitățile selecției liniilor specializate ale albinelor carpatice". Teza de doctor în științe agricole, Chișinău, 2022.

Structura tezei: introducere, patru capitole, concluzii generale şi recomandări, bibliografie din 192 de titluri, 3 anexe, 99 pagini de text de bază, 41 de figuri şi 38 de tabele. Rezultatele cercetărilor au fost publicate în 15 lucrări științifice.

Cuvinte-cheie: familii de albine, selecție, linii, mătci, caractere morfometrice și morfoproductive, hrană suplimentară, biostimulatori.

Scopul lucrării: constă în argumentarea științifică a perfecționării fondului genetic, evaluării liniilor specializate a albinelor carpatice, elaborării noilor procedee tehnologice de hrănire a albinelor.

Obiectivele cercetării: evaluarea particularităților selecției liniilor specializate ale albinelor carpatice; aprecierea comparativă a caracterelor morfometrice ai albinelor carpatice și a liniilor specializate de import; determinarea caracterelor morfoproductive ai familiilor de albine a liniilor specializate; stabilirea utilizării unor biostimulatori din generația nouă în nutriția albinelor; relevarea eficienței utilizării unor biostimulatori în nutriția albinelor.

Noutatea şi originalitatea științifică constă în argumentarea științifică a utilizării liniilor specializate pentru perfecționarea fondului genetic a albinelor carpatice și aprecierea comparativă a caracterelor morfoproductive, evaluarea utilizării biostimulatorilor naturali, stabilirea normelor optime în hrana suplimentară a albinelor pentru valorificarea culesurilor melifere și elaborării noilor procedee tehnologice (Brevet, MD 1336).

Rezultatul obținut contribuie la soluționarea unei probleme științifice importante rezidă în ameliorarea fondului genetic albinelor carpatice, *determinarea și stabilirea* cantității optime de biostimulatori utilizați în hrana albinelor ce a *condus* la *elaborarea* noilor procedee care *asigură* la sporirea supraviețuirii și performanțelor productive a familiilor de albine.

Semnificația teoretică: în temeiul cercetărilor efectuate a fost perfecționat fondul genetic al albinelor carpatice cu folosirea liniilor specializate de import, argumentată utilizarea biostimulatorilor naturali în hrana suplimentară a albinelor, ce asigură sporirea productivității familiilor de albine.

Valoarea aplicativă a lucrării rezidă în utilizarea liniilor specializate în perfecționarea fondului genetic a albinelor carpatice, folosirea biostimulatorilor naturali în hrana suplimentară a albinelor ce contribuie la dezvoltarea familiilor și sporirea producției de miere.

Implementarea rezultatelor științifice a fost realizată la diverse stupine din raioanele Nisporeni, Ialoveni, Hâncești, Călărași, Orhei şi în procesul didactic – la Universitatea Agrară de Stat din Moldova.

АННОТАЦИЯ

КАТАРАГА Иван, "Особенности селекции специализированных линий карпатских пчел". Докторская диссертация сельскохозяйственных наук, Кишинев, 2022.

Структура диссертации: введение, четыре главы, общие выводы и рекомендации, библиография из 192 наименований, 3 приложения, 99 страниц основного текста, 41 рисунков и 38 таблиц. Результаты исследования были опубликованы в 15 научных статьях.

Ключевые слова: пчелиные семьи, селекция, линии, матки, морфометрические и морфопродуктивные показатели, подкормки, биостимуляторы.

Цель работы: состоит в научном обосновании улучшения генетического фонда, оценке специализированных линий карпатских пчёл, разработке новых технологических приемов подкормки пчёл.

Задачи исследования: оценка особенностей селекции специализированных линий карпатских пчёл; сравнительная оценка морфометрических показателей карпатских пчёл и специализированных импортных линий; определение морфопродуктивных показателей пчелиных семей специализированных линий; установление использования биостимуляторов нового поколения в кормах пчел; выявление эффективности использования биостимуляторов в кормлении пчёл.

Научная новизна и оригинальность заключается в научной аргументации применения специализированных линий для улучшения генетического фонда карпатских пчел и сравнительной оценке морфопродуктивных признаков, а также использования природных биостимуляторов, установлении оптимальных норм при подкормке пчел для реализации медосборов и разработке новых технологических процессов (Патент 1336).

Полученный результат, способствующий решению важной научной задачи, заключается в *улучшении* генетического фонда карпатских пчёл, определении и установлении оптимального количества биостимуляторов, используемых в подкормах пчёл, что *привело к разработке* новых процессов, обеспечивающего повышение выживаемости и продуктивности пчелиных семей.

Теоретическая значимость: на основании проведённых исследований улучшен генетический фонд карпатских пчёл с использованием специализированных импортных линий, обосновано использование природных биостимуляторов в подкормках пчёл, что обеспечивает повышение продуктивности пчелиных семей.

Практическая значимость работы заключается в использовании специализированных линий в совершенствовании генетического фонда карпатских пчёл, применении природных биостимуляторов в подкормках пчёл, способствующих развитию семей и увеличению производства мёда.

Внедрение научных результатов осуществлялось на различных пасеках в районах Ниспорены, Яловены, Хынчешть, Кэлэраш, Орхей и в учебном процессе – в Государственном аграрном университете Молдовы.

ANNOTATION

CATARAGA Ivan, "Particularities of the selection of specialized lines of Carpathian bees". Doctoral thesis in agricultural sciences, Chisinau, 2022.

Thesis structure: introduction, four chapters, general conclusions and recommendations, bibliography of 192 titles, 3 annexes, 99 pages of basic text, 41 figures and 38 tables. The research results have been published in 15 scientific papers.

Keywords: bee families, selection, lines, queens, morphometric and morphoproducts indices, stimulating food, bioregulators.

The purpose of the study: consists in the scientific argumentation for improving the genetic fund, the evaluation of the specialized lines of Carpathian bees, the elaboration of new technological procedures for feeding bees.

The objectives of the work: evaluation of the peculiarities of the selection of specialized lines of Carpathian bees; comparative assessment of the morphometric characteristics of Carpathian bees and specialized import lines; determining the morphoproductive characteristics of bee families of specialized lines; establishing the use of new generation biostimulators in bee feed; revealing the effectiveness of the use of biostimulators in bee nutrition.

The scientific novelty and originality: consist in the scientific argumentation of the use of specialized lines for improving the genetic background of Carpathian bees and the comparative assessment of morphoproductive characters, evaluation of the use of natural biostimulators, the establishment of the optimal norms in the supplementary feeding of the bees for the capitalization of the honey collections and the elaboration of the new technological processes (Patent MD 1336).

The result obtained that contributes to solving an important scientific problem lies in improving the genetic background of Carpathian bees, determining and establishing the optimal amount of biostimulators used in bee feed that led to the development of new processes that ensure increased survival and productive performance of bee families.

The theoretical value: based on research, the genetic background of Carpathian bees has been improved with the use of specialized import lines, arguing the use of natural biostimulators in supplementary bee feed, which ensures increased productivity of bee families.

The applicative value of the work: lies in the use of specialized lines in improving the genetic background of Carpathian bees, the use of natural biostimulators in the supplementary feeding of bees that contribute to the development of families and increased honey production.

The implementation of scientific results: was carried out at various apiaries in Nisporeni, Ialoveni, Hâncești, Călărași, Orhei districts and in the teaching process – at the State Agrarian University of Moldova.

CATARAGA IVAN

PARTICULARITIES OF THE SELECTION OF SPECIALIZED LINES OF CARPATIAN BEES

SPECIALTY: 421.03 – ANIMAL BREEDING TECHNOLOGY AND OBTAINING ANIMAL PRODUCTS

Abstract of PhD Thesis in Agricultural Sciences

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