

STUDIES ON THE STIMULATING EFFECT OF SOME PRODUCTS ON THE BEE COLONY PRODUCTIVITY PARAMETERS IN BULGARIA

Ivanka Zhelyazkova *, Kalinka Gurgulova** Ivan Panchev***, Vera Popova***

* Agricultural Faculty , Trakia University, Stara Zagora, izhel@uni-sz.bg

** National Diagnostic Veterinary Medical Research Institute, Sofia

*** "Primavet-Sofia" Ltd.

Introduction

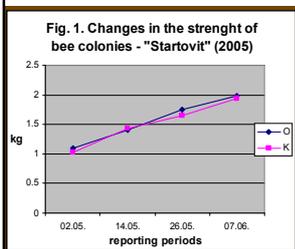
On the basis of the review of available literature it is known that supplemental feeding of bee colonies with suitable supplements at the end of winter and in early spring stimulates the egg-laying activity of queens and the secretion activity of hypo-pharyngeal glands of breeder bees. In bee nests more brood is reared and the number of worker bees increases.

In beekeepers practice products high in protein (respectively essential amino acids), mineral salts, vitamins and certain natural products – essential oils, vegetal extracts, organic acids, etc., with proven positive effect on the bee organism and the bee colony are used as stimulators in supplemental feeding of bees (Zhelyazkova, 1999; Ivanova, Ivanov, 2000; Ivanova, 2002; Adl Rashdy Hassan, 2003; Papachristoforou, Theodoropoulos, 2005).

Until now, research within Bulgarian apiculture in this sphere has not been sufficient. Separate experiments were made to prove the efficacy of acaricides and stimulating effect of some of the essential oils (Gurgulova et al., 1995; Nenechev, Kirilov, 1995; Nenechev, 2003; Gurgulova et al., 2004; Gurgulova et al., 2006 a, b; Nenechev et al., 2006). The results, achieved until now are encouraging, and this is the reason for searching and testing new products with vegetal nature (essential oils, extracts), which may be used in apicultural practice.

Since long time no products have been manufactured and imported in Bulgaria for stimulation of spring and autumn development of bee colonies. It is necessary to offer for use in the beekeeper's practice complex stimulating products.

The objective of the research is to study the effect of the stimulant products "Startovit", "Aptonus", "Apsaniran" and "Green TM" on the productive parameters of bee colonies (strength, quantity of sealed worker brood, honey production capacity, etc.).



Material and methods

The products "Startovit", "Aptonus" and "Apsaniran", included in the research, are manufactured by „Primavet – Sofia“ Ltd. The veterinary medical product "Startovit" contains sodium and chlorine ions, cobalt and phosphorus and can be used as stimulating agent during the spring period for optimizing and enhancing the development of weak and medium-strong bee colonies until the first main pasture.

"Aptonus" is a carbohydrate bee food containing the amino acid methionine and vitamin E, and is for stimulating early spring supplemental feeding.

"Apsaniran" is a mixture of pine and wormwood extract.

"VitaFeed GreenTM" is a stimulating nutritional supplement (Vita Feed), which is used only for bees - contains essential oils from walnut-tree, thyme and cultivated marjoram and wild marjoram. The producer is VITA (Europe) Limited – England, and the Distributor of the Product for Bulgaria is the Company "Primavet – Sofia" OOD (Ltd).

All products have been tested on an apiary in the region of Stara Zagora, Bulgaria. In all experiments the changes in the features characterizing the development of bee colonies have been traced. Measurements have been done by a measure frame (square size 5 x 5 cm) at an interval of 12 days.

Results and discussion

I. Veterinary medical product "Startovit"

The results shown on fig. 1 reveal gradual increase of the strength of colonies in both groups, respectively 46,8% more for the control group and 46,7% more for the experimental group. The reported differences before supplemental feeding and after the last supplemental feeding are highly reliable ($P \leq 0,001$). Concerning the number of brood reared by the bee colonies a tendency of gradual increase has been noticed and is larger for the experimental group (fig. 2). Calculations reveal that in the control group for the period 2 May – 7 June brood quantity has increased by 71,2% and in the experimental one – by 76,0%. The difference is reliable. The total quantity of honey obtained from colonies given supplemental feeding with "Startovit" at the beginning of the season is by 21,63% more compared to the control group – reliability of differences $P \leq 0,05$ (fig. 3). From the 19 colonies of the experimental group reliable bigger quantity ($P < 0,01$) of extracted honey has been obtained (average per bee family 19,354 ± 1,779 kg), which is by 36,89% more than the extracted honey of the control group (12,215 ± 2,170 kg).

II. "Aptonus" carbohydrate food

The data analysis of the parameter strength and quantity of brood reared by bee colonies in all three groups shows gradual increase of values (fig. 4 and 5). The comparative analysis of the results of the three groups about the quantity of reared brood at the first and last measuring shows highly reliable difference ($P \leq 0,001$). The greatest quantity of extracted honey per bee colony has been obtained from the experimental group (32,0 ± 1,801 kg) – fig. 6. The comparison of the groups regarding the values of the analysed feature shows that in the experimental group (fed with "Aptonus") about 9 kg more extracted honey has been obtained per colony (27,34% and 28,12% more). The results from the study reveal that in the experimental group the total quantity of honey is greater (49,122 ± 3,911 kg/bee colony) compared to the control groups – 38,693 ± 4,251 kg for C1 and 39,139 ± 3,737 kg for C2 respectively.

III. "Apsaniran"

Comparative data in the development of bee colonies from experimental and control groups at the end of the autumn (Stage I) and beginning of the spring (Stage II) period are given in table 1. The data from the autumn check-up (2006) reveal reliability of differences in various groups within the limits from $P \leq 0,05$ to $P \leq 0,001$. On the basis of the data analysis in the spring period the following conclusions can be made: changes in bee quantity (strength) and sealed brood are equal in the different groups regardless of the type of additive in supplemental feeding and the reported differences in the values of controlled parameters among groups in different measurements are small and unreliable; after 6 times of supplemental feeding the greatest amount of brood was reported in the group that had received „Apsaniran“.

IV. Vita feed "Green TM"

The data, stated in Table 2, shows gradual decrease of the quantity of bees (strength) and of the sealed working brood cells in the bee colonies from both of the groups, which is a normal process during the autumn development of the honey bees. On the grounds of the comparative analysis of the data on 01.08. and 06.09. it was found out that the quantity of the sealed worker brood cells decreased respectively with 55,13% in case of the Control group and with 44,65% in case of the Experimental group, fed with "VitaFeed Green TM". The comparison of the data, received on 06.09 (preparation for the winter period) and on 15.10 (closing for the winter period) shows the decrease of the value of the index "quantity of sealed worker brood cells" for the two bee groups of the bee colonies - 100% for the Control group and 95,03% for the Experimental group, treated with "VitaFeed Green TM".

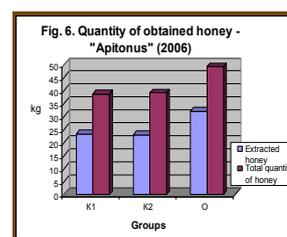
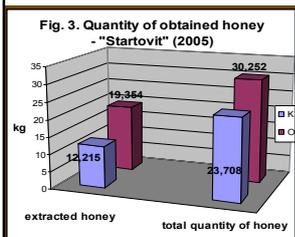
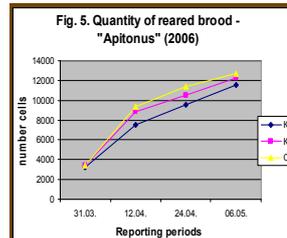
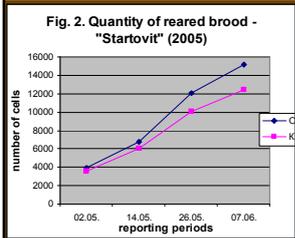
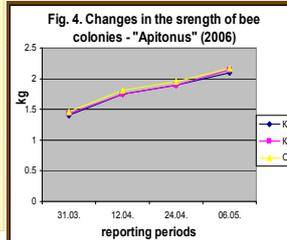


Table 1. Development of bee colonies during the winter-spring period "Apsaniran" (2006, 2007).

| Report periods | Groups | Parameters - S.E.S. | |
|---|----------------------------------|---------------------|-------------------------|
| | | Bee (kg) | Brood (number of cells) |
| Autumn check-up for wintering (15 Apr 2006) | O ₁ | 1,425 ± 0,072 | 128 ± 47,371 |
| | O ₂ | 1,425 ± 0,079 | 248 ± 112,259 |
| | K ₁ | 1,579 ± 0,086 | 269 ± 110,171 |
| | K ₂ | 1,425 ± 0,072 | 0 ± 0 |
| Reliability of differences (α) | O ₁ vs O ₂ | 0,152 | 0,000 |
| | O ₁ vs K ₁ | 0,152 | 0,000 |
| | O ₁ vs K ₂ | 0,152 | 0,000 |
| | O ₂ vs K ₁ | 0,152 | 0,000 |
| Main spring check-up (15 Apr 2007) | O ₁ | 1,599 ± 0,086 | 1150 ± 526,709 |
| | O ₂ | 1,759 ± 0,086 | 1649 ± 556,757 |
| | K ₁ | 1,599 ± 0,085 | 1389 ± 566,755 |
| | K ₂ | 1,477 ± 0,086 | 1057 ± 463,750 |
| Reliability of differences (α) | O ₁ vs O ₂ | 0,162 | 0,000 |
| | O ₁ vs K ₁ | 0,162 | 0,000 |
| | O ₁ vs K ₂ | 0,162 | 0,000 |
| | O ₂ vs K ₁ | 0,162 | 0,000 |

On the basis of the results obtained from the studies we recommend for the beekeeping practice: the application of "Aptonus" and "Startovit" at early spring and spring supplementary feeding; using "Apsaniran" for autumn stimulating supplemental feeding of bee colonies, in spring treatment "Apsaniran" can be used as a stimulant with poorer pasture and insufficient pollen in nature; adding "Vita Feed Green TM" (dose 10 ml/l) to the sugar syrup during the autumn feeding of the bees. The tested vegetal product "Vita Feed Green TM" is suitable for application for the purposes of biological apiculture.

References

- Adel Rashdy Hassan, 2003, XXXVIII-th Apimondia Inter. Apicultural congress, Ljubljana, Slovenia (24-29. VIII. 2003), Final programme and Book of abstracts, 534
- Gurgulova K., I. Vasileva, 1995, Medley of Reports from the International Ecological Conference, Vratsa, 23-24. XI.
- Gurgulova K., I. Zhelyazkova, V. Popova, 2004, Apicult, 38, 307 – 316
- Gurgulova K., P. Nenechev, I. Zhelyazkova, D. Pavlov, 2006 (a), Ecology and the Future, V, 2, 32-36
- Gurgulova K., P. Nenechev, I. Zhelyazkova, D. Pavlov, 2006 (b), Animal breeding sciences, XLIII, 5, 42 – 45
- Ivanova T., Z. Ivanov, 2000, Acta entomologica Bulgarica, Suppl. 1, vol. 6, 3–4, 24–28
- Ivanova T., 2002, Acta entomologica Bulgarica, Suppl. 2, vol. 8, 3–4, 3–11
- Nenechev P., N. Kirilov, 1995, Apimondia Publishing House, Bucharest, Romania, 202-203
- Nenechev P., 2003, Arsicilic, vol. 3, 2, 43-44.
- Nenechev P., I. Jeljaszkova, K. Gurgulova, D. Pavlov, 2006, Ecology and the Future, var. V, 2, 27-31
- Papachristoforou A., K. Theodoropoulos, 2005, XXXIX-th Apimondia International Apicultural congress, Dublin, Ireland, 21-26. VIII. Abstracts, 175
- Zhelyazkova I., 1999, Dissertation, Trakia University, Stara Zagora

Table 2. Development of the bee colonies in the end of the beekeeping season (01.08. – 15.10. 2008 +)

| Groups | Parameters | Report periods - 2008 + | | | | |
|----------------------------------|--------------------------|-------------------------|----------------|---------------|---------------|---------------|
| | | 01.08. | 13.08. | 25.08. | 06.09. | 15.10. |
| Control | -Bee (kg) | 1,285 ± 0,06 | 1,295 ± 0,05 | 1,290 ± 0,09 | 1,049 ± 0,10 | 1,255 ± 0,05 |
| | -Honey (kg) | 1,091 ± 0,09 | 0,671 ± 0,43 | 0,709 ± 0,72 | 11,264 ± 0,25 | 10,911 ± 0,47 |
| | -Pollen (mg) | 245 ± 64,42 | 185 ± 15,08 | 185 ± 24,49 | 129 ± 22,98 | 55 ± 18,17 |
| | -Brood (number of cells) | 4249 ± 235,54 | 5508 ± 1541,12 | 4948 ± 762,26 | 2888 ± 164,22 | 0 ± 0 |
| Experimental (fed with Green TM) | -Bee (kg) | 1,75 ± 0,11 | 1,80 ± 0,09 | 1,89 ± 0,09 | 1,79 ± 0,05 | 1,65 ± 0,05 |
| | -Honey (kg) | 1,122 ± 1,18 | 0,855 ± 1,12 | 0,115 ± 1,09 | 10,908 ± 1,11 | 14,272 ± 1,92 |
| | -Pollen (mg) | 289 ± 52,98 | 149 ± 16,76 | 196 ± 32,21 | 95 ± 12,25 | 68 ± 15,98 |
| | -Brood (number of cells) | 6540 ± 506,24 | 5888 ± 683,22 | 3749 ± 868,18 | 3428 ± 611,88 | 188 ± 190,89 |