EFFECTIVENESS OF USING "KANDY" IN PREPARING BEES FOR WINTERING

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Honey, as a valuable food product and an effective treatment, is widely used in the food, pharmaceutical, and perfumery industries. However, many countries cannot meet domestic honey demand due to limited honey collection potential. There is a noticeable shortage of artificial sweeteners, such as sugar and corn syrup, in the world, even though their production amounts to millions of tonnes per year. Therefore, the demand for natural honey and other beekeeping products in developed countries exceeds their supply [1].

In a bee colony, there is a strong interrelationship between the functionality of its members. The productivity of beekeeping depends on the breed, the quality of worker bees, and the intensity of egg-laying by the queen. Raising strong bee colonies and producing high-quality queens depends on the care and nutrition provided by the coordinated efforts of the worker bees [2].

Age is a crucial factor in bees, affecting various indicators such as development, colony productivity, and survival. Therefore, regulating the age composition of the colony is essential to ensure an increase in nurse bees during spring and a sufficient number of foraging bees during the main honey flow, as well as a healthy population of young bees for winter [3-5].

A healthy and strong bee colony guarantees its efficiency during both active and passive life phases, including successful wintering. At all times, colonies require quality and sufficient protein and carbohydrate feed. Proper nutrition determines the profitability of beekeeping and honey yield.

When choosing feed, it is important to avoid stimulating bees to leave the hive in search of nectar. It is recommended to avoid using syrup, as it may cause such behaviour and lead to bee mortality. Typically, winter feeding is done using "Kandi." Our research outlines the effectiveness of this homemade feed in slightly varying formulations.

The aim of the study was to determine the feasibility of using "Kandy" with the addition of pollen when preparing Ukrainian Steppe bee colonies for wintering, which are planned to be used for producing queen bees in the spring.

Methods. The study was conducted in spring 2023 at the apiary of the "Dnipro Beekeeper" agricultural cooperative in Solonyanskyi District, Dnipropetrovsk Oblast. The research followed established beekeeping methods. The colonies met the standards for the Ukrainian Steppe breed of bees based on external evaluation. The research com-

plied with the European Convention for the Protection of Animals used for Experimental and Other Scientific Purposes (1986).

The bee feed paste "Kandy" was homemade ("Dnipro Beekeeper"), meeting microbiological, organoleptic, and physicochemical requirements in line with DSTU 7005:2009. It has been certified as safe by the State Scientific Research Institute for Laboratory Diagnostics and Veterinary and Sanitary Examination (No. 001053 p/21).

Three categories, each with two groups of analogue colonies (5 colonies in each group), were formed from those intended for use as mother, father, and nurse colonies. At the time of forming the control and experimental groups, each colony had 2.5 kg of bees, 8.0 kg of feed honey, sufficient pollen reserves, 18-month-old queens, two frames of sealed brood (160 cells), and two frames of open brood.

The feed honey was removed during the study, but pollen reserves were retained.

The 1st group (mother, father, and nurse colonies) served as the control group. They were fed regular "Kandy" consisting of 70% powdered sugar and 30% fructose-glucose syrup. Feeding was done by placing a paste block on the frames under the ceiling.

The 2nd group, the experimental group, received the same feeding schedule but with "Kandi" containing an additional 2.5% pollen. Honey was excluded from the paste to prevent the inclusion of inferior honey, which could lead to wintering issues.

Queen egg-laying was measured using a 5x5 cm grid. Colony strength was assessed by counting the bees in the frame spaces and converting this to mass, where bees covering both sides of a standard 435x300 mm frame weigh 300 g.

The data were statistically processed using variation statistics, with results verified using Student’s t-test. Mean values were considered statistically significant at $p < 0.05$ - *, $p < 0.01$ - **, and $p < 0.001$ - ***.

Results. Autumn stimulation of colony growth and development through feeding positively impacted the queens' egg-laying rates. Peak egg-laying was influenced by the presence of protein in the feed, even though the colonies had ample pollen reserves. In all three groups, colonies fed with regular "Kandi" showed increased egg-laying rates by 21 September, ranging from 1541.7 to 1550.0 eggs per day. Compared to the initial level, the daily laying rate of queens increased by 1.56 times in the mother group, 1.63 times in the father group, and 1.64 times in the nurse colonies. Afterward, the queens’ laying rates declined.

A sharp decline in daily egg-laying was observed in all groups on 15 and 27 October. The rate dropped 3.59 times in the mother group, 3.57 times in the father group, and 3.42 times in the nurse colonies compared to 3 October.

In the group fed "Kandy" with pollen, the queens’ daily laying rates were consistently higher. Their laying peaked on 3 October at 1799.2 eggs/day, compared to 1575.0 eggs/day on 21 September in the control group. The laying rate increased by 1.83 times with "Kandy" + 2.5% pollen and by 1.64 times with regular "Kandy". In subsequent observations, laying rates naturally declined, but the pollen-enriched feed group main-

tained higher rates. On 15 and 27 October, egg-laying in this group was 1.44 and 1.07 times higher than in the control.

A similar trend was observed in the father and nurse colonies when fed "Kandy" with pollen, with peak laying rates recorded on 21 October (1691.7 and 1958.3 eggs/day, respectively). By the end of the observations, egg-laying in the father colonies dropped sharply to 458.3 eggs/day. In the nurse colonies, peak laying occurred on 3 October at 1799.2 eggs/day, followed by a steep decline to 466.7 eggs/day by the end of the experiment. The rate dropped 3.85 times compared to its peak, whereas the control group (fed regular "Kandy") saw a 3.63-fold decrease, despite lower overall laying rates.

Conclusion. The study found that the highest daily egg-laying rates were observed in colonies fed with "Kandy" + 2.5% pollen. These colonies were best prepared for successful wintering and can be used more effectively in the next season for early queen production. Positive results were obtained from feed containing a protein component, despite the colonies having adequate pollen reserves.

References:

1. Landaverde R., Rodriguez M.T., Parrella J.A. Honey Production and Climate Change: Beekeepers' Perceptions, Farm Adaptation Strategies, and Information Needs. *Insects*. 2023. Vol. 14, no. 6. P. 493.

2. Rangel, J., Böröczky, K., Schal, C., & Tarpy, D. R. Honey Bee (Apis mellifera) Queen Reproductive Potential Affects Queen Mandibular Gland Pheromone Composition and Worker Retinue Response. *PLOS ONE*. 2016. Vol. 11, no. 6. P. 0156027.

3. Кучер С.О., Пастушок Р.С., Милостивий Р.В. Ріст і розвиток бджолиних сімей користувальної групи у разі стимулюючої підгодівлі. *Науково-виробничий журнал "Бджільництво України"*. 2024. Вип. 12. С. 38-42.

4. Kucher, S., Pastushok, R., & Mylostyvyi, R. Effectiveness of using different types of nuclei and methods of replanting queen bees in bags. *Scientific Messenger of LNU of Veterinary Medicine and Biotechnologies. Series: Agricultural Sciences*. 2024. Vol. 26, No. 100. P. 195-198.

5. Pastushok R., Kucher S., Mylostyvyi R., Sanzhara R., Gutyj B. The feasibility of using protein components in the composition of "Kandy" in preparation of bees for wintering. *Scientific Messenger of LNU of Veterinary Medicine and Biotechnologies. Series: Agricultural Sciences*. 2024. Vol. 26, no. 101. P. 13-17.