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Classification of Preparations Affecting Varroa in Bees

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Annotation: This article provides information about the medicinal preparations and active substances that affect Varroa jacobsoni mites, the causative agents of varroatosis in honey bees. It describes the methods and dosages used to apply these substances to bee colonies. The information is based on both Uzbek and international scientific literature.

Keywords: Araxnoz, immunitet, varaotoz, chemical, acaratsids, cell,melittofoz, physical methods, heat treatment, amitsid, amitraz, barkes, apifit.

Introduction: On February 8, 2022, the President of the Republic of Uzbekistan set forth priority tasks for the development of the beekeeping sector in Clause 6 of Decree No. PQ-120. In particular, the decree identifies the fundamental improvement of the beekeeping management system and the implementation of advanced practices in beekeeping across all regions of the country as priority objectives. It emphasizes the importance of organizing breeding activities in the beekeeping sector on a scientific basis, increasing the efficiency of beekeeping farms, expanding the volume and variety of honey production, introducing modern technologies for honey processing, enhancing the export potential of the sector, and applying advanced practices throughout the country.[1-2]

One of the major factors causing significant economic damage to beekeeping is the diseases of bee colonies. These diseases not only weaken the bees’ organisms but often also lead to their

death. What complicates the situation further is the anthropogenic impact related to human activities, which causes a decrease in the bees' immunity. If necessary measures are not taken to prevent and treat arachnosis (colony) diseases, mass mortality of bee colonies will occur. [4-7] We have observed this several times in recent years in Russia, including in Altai in 1997 and 2002 with regard to varroatosis (Grobov O.F., Sotnikov A.N., 2003). The death of many bee colonies during those years indicates that although the problem of combating this disease has somewhat eased, it has not yet been fully resolved. To this day, not a single apiary has been completely restored to full health. Furthermore, the uncontrolled use of strong chemical agents against mites has led to the intensification of other diseases. According to research, the use of acaricides has contributed to the emergence and spread of ascospherosis, decay (gall disease), and some viral infections (Belonogov A.P., 2003). Additionally, residues of medicinal substances can accumulate in the wax cells of bee hives and in bee products (Solovyova L.F., 1999, 2004).

Prevention. Prevention is aimed at reducing the number of parasites inside the bee hive and is carried out using the biological control methods described below. Since varroatosis causes protein deficiency in the bees' bodies, it is necessary to feed them with protein-rich nutrition and increase their resistance levels with other stimulants (as described below). [3-5]

Control, Measures

The study of the biology of Varroa mites has made it possible to develop various methods for combating bee diseases. These methods can be conditionally divided into three groups: physical, chemical, and biological (zootechnical and others).[3-4]

Physical methods include the following: heat treatment, dusting the bees, ionizing radiation, ultraviolet and infrared rays, ultrasound, polarized fields, vacuum, electric current, and others.[1-4]

It has been found that ultrasound causes Varroa jacobsoni mites to fall out of the hive. Ultraviolet radiation (using a Q-400 lamp, irradiating from a distance of 16–34 cm from the bees for 10 minutes) led to a sharp increase in bee activity and resulted in 100% mortality of the mites within 17 hours (Gaponova V.S., Grobov O.F., 1978).

Vacuum (at −0.98 atm pressure for 30 minutes) or exposure to microwave radiation (up to 5 seconds) caused 80–100% of the mites to fall off (Rukavitsin I.I., Rib R.D., 1990).

The heat treatment method is primarily based on creating temperature conditions that are unfavorable for the mites' survival. It has been found that mites and bees have different tolerances to high temperatures: bees can survive longer at elevated temperatures, which is related to the difference in body mass between bees and mites.

The essence of this method is that the bees are shaken off the frames and placed into a special mesh cassette, which is then put into a thermal chamber maintained at 42–46°C for 15–20 minutes. Under such conditions, the mites fall off the bees, and the bees are then returned to their hive.[2-7]

Experiments with heat treatment have shown that several important factors need to be considered when applying this method.

The main requirements for acaricide preparations made from existing pesticides are their high effectiveness (83–99%), safety for bees, and ease of application. However, these preparations only eliminate mites in open colonies and do not affect parasites in closed (capped) brood. Therefore, selecting the correct time for treatment is very important. [4] When using chemical methods, it is essential to strictly follow the recommended dosages and the guidelines on how to apply the preparations to the hive. [1-5]

Currently, the most widely used preparations are those based on amitraz. Amitraz has moderate toxicity for warm-blooded animals and humans (hazard class 3), rapidly breaks down into

metabolites in the environment, and has high acaricidal activity, which allows its extensive use in beekeeping. [2-4] Very low therapeutic doses are used for treatment, which, when strictly following the instructions and application rules, prevents bee mortality and does not cause resistance to activating substances. However, some authors believe that resistance to amitraz is observed among bees.

The mechanism of amitraz's effect on Varroa mites is not well studied. It is assumed that amitraz acts as a multifunctional respiratory inhibitor, killing the mites not instantly but within 2–3 days.

Among local beekeepers, the most popular preparations based on this are Bipin, Bipin-T, Apitak, Varropol, while abroad, Apivarol, Avartin, Antivar, Varamit, and others are widely used. [2] Preparations based on the active ingredient flumethrin, which have high effectiveness in beekeeping, are also widely applied. Currently, several main methods are used to introduce preparations into the bee colony: in aerosol form (based on gas or water) and through the vaporization of acids (such as formic acid and others). [3-6]

In the first method, heat-treated paper strips soaked with the active substance (Barkas, Apistal-S, Polisan, Tanis, TEDA, and others) are used. The strip is ignited and placed at the entrance of the beehive. After lighting the strip, the entrance is closed. [1] The resulting smoke particles fill the entire hive with the active substance and affect the mites. Such a chemical agent acts for a short period — from 6 up to 24 hours.

Additionally, the vaporization of acids (such as formic acid and others) is also used to eliminate mites. Formic acid is widely used among Western beekeepers. In Russia, it was widely applied in the 1980s. Currently, formic acid is produced in very convenient packaging by "Apisfera 2000" LLC. [3-7] Now, let us focus on the use of some chemical preparations that have been effective in current and recent bee treatments:

Bipin, Bipin-T (a mixture of amitraz and thymol), Vetfor (an analogue of Bipin produced by Apisfera 2000 LLC) — these are concentrated amitraz emulsions with a 12.5% concentration. Amitraz water emulsion at 0.00625% concentration shows high effectiveness (98–99.3%) and is effective at low temperatures during summer and cold autumn nights.

The working solution of these two preparations is prepared by diluting 1 ml of the substance in 2 liters of warm water at 28–30°C. This solution is used to spray the bees or pour into the hive aisles without damaging the hive, at a rate of 8–10 ml per aisle. [4-7] The treatment course consists of 2 applications, with a 6–7 day interval between each application.

Varropol is a polyvinyl chloride strip containing 1% active amitraz. It remains active throughout its time inside the hive, allowing effective treatment of colonies even when eggs are present, that is, throughout the entire season. The treatment effect occurs when the preparation strip comes into direct contact with the mites. The strips are hung vertically between the frames in the hive's aisles and are evenly distributed throughout the hive, at a rate of one strip per every five frames. It is recommended to keep the strips in the hive for 30–35 days. After working with Varropol, it is necessary to wash hands thoroughly.

Amitsid is thermal paper strips impregnated with amitraz. It is recommended to use it at temperatures not lower than 10°C. The strips are ignited and placed in the lower hive in a smoked condition. After treatment, the hive entrance holes are closed for 30–45 minutes. If there are eggs, it is recommended to conduct treatment 2–3 times every 7 days; if there are no eggs, 2 treatments with 1–2 day intervals are required. After working with the designated preparation, hands should be thoroughly washed and the mouth rinsed.

Tanis, Barkas — thermal paper strips impregnated with amitraz, measuring 20 × 50 mm. It is recommended to use them at temperatures not lower than 10°C. The application technique for this product is similar to that of Amitsid.

Apifit — wooden strips containing flumethrin and thymol. The preparation is placed in the hive at a rate of one strip per 3–5 aisles. Using these treatment strips improves the overall health of the entire poultry area and increases the resistance of bees and eggs to diseases (Mannapov A.G. et al., 2005). The preparation has been in use since 1990. No side effects were detected even at 3–5 times the recommended dose of Apifit in studies conducted at the Krasnopolyanskoe OPPPH base (Melnik V.N., Muravskaya A.I., 2005).

Amipol – T — wooden strips impregnated with a solution of acaricide and thymol. Bee colonies are treated in spring and summer-autumn periods using strips placed inside the hive. According to calculations, 2 strips are placed for every 10–12 bee-occupied frames. The preparation remains in the bee hive for 3 to 30 days, depending on the amount of sealed brood. Colonies are treated in spring before the honey flow and in the summer-autumn period after honey harvesting.

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