

STUDY OF THE EFFECTIVENESS OF USING BIPIN-T AT DIFFERENT CONCENTRATIONS AGAINST VARROATOSIS IN HONEYBEES

Suyunov Rashid Uktamovich

Independent Researcher

Yunusov Khudaynazar Beknazarovich

Doctor of Biological Sciences, Professor

Ibragimov Furqat Buriyevich

Candidate of Veterinary Sciences, Associate Professor

Toshbekov Ismat

Master's Degree Student

Samarkand State University of Veterinary Medicine, Livestock and Biotechnology

Annotation: This scientific article investigates the efficacy of **Bipin-T**, an **amitraz-based preparation**, against the widespread parasitic disease **varroatosis** in honey bees. The experiments were conducted in beekeeping farms located in the **Samarkand and Kashkadarya regions** as well as under **laboratory conditions**. In cage experiments, Bipin-T solutions with concentrations ranging from **0.5 to 2.0 ml per 2 liters of water** were applied to evaluate the drug's **therapeutic effect** and **safety for bees**. The results showed that concentrations between **1.0 and 1.5 ml per 2 liters of water** were the most effective, reducing the number of *Varroa destructor* mites by **80–85%** while exhibiting **minimal toxic effects** on bees.

Key words: *Varroatosis, Varroa destructor, Honey bees (Apis mellifera), Bipin-T, Amitraz, Therapeutic efficacy, Concentration, Bee mortality, Parasitic disease control, Beekeeping*

Relevance of the Study: Varroatosis in honey bees is one of the most widespread parasitic diseases affecting adult worker bees, queen bees, and larvae. It is caused by the *Varroa destructor* mite, which parasitizes in the body cavity and hemolymph of bees. Currently, this disease is recognized worldwide as one of the main causes of the sharp decline and mortality of bee colonies. A high degree of varroa infestation reduces honey yield efficiency, complicates the overwintering process of bee colonies, and directly affects the economic performance of beekeeping farms.

Among the effective means of controlling varroatosis in bees, the Bipin-T drug (Russia), based on the active substance amitraz, is widely used. To determine its therapeutic efficacy, cage experiments were conducted under laboratory conditions during the autumn period—after honey harvesting, when bees were preparing for overwintering. The experiments were aimed at evaluating the high efficacy of the preparation against the varroatosis pathogen and scientifically substantiating the possibility of its practical application under real beekeeping conditions.

Materials and Methods. The research was carried out at the beekeeping farms “Navruzбек Mountain Bees” located in Sariqtepa Urgut District, Samarkand Region, and “Ergashev To‘ra Beekeeping Farm” located in Shahrisabz District, Kashkadarya Region, as well as in the laboratory of the Department of Veterinary Sanitary Expertise, Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnologies.

Samples of honey bees infected with *Varroa destructor* were collected from affected colonies at the beekeeping farms and placed into entomological cages for experimental use. Each cage contained 50 worker bees, and a total of five ($n = 5$) cages were prepared for the study.



Research Results. Under laboratory conditions, the bees were divided into experimental and control groups. The experimental groups were treated with Bipin-T solutions of different concentrations against the causative agent of varroatosis, while the control groups were kept under the same conditions without treatment. The preparation was administered to the bees in the entomological cages in the form of a precisely measured solution.

At subsequent stages of the experiment, the condition of the bees, mortality rates, and reduction in the number of Varroa mites were regularly monitored. Based on these observations, the therapeutic efficacy of the Bipin-T preparation was evaluated Table 1.

Table 1.

**Application of the Bipin-T Preparation in Cage Experiments
(Based on Different Concentrations)**

Group Names	Number of Cages	Number of Bees per Cage	Solution Preparation Standard	Amount of Solution	Method of Application	Number and Interval of Treatments	Observation Period
Group 1 (Control)	1	50	–	–	–	–	14 day
Group 2 (Experiment 1)	1	50	0.5 ml Bipin-T / 2 L of water	50 ml	Dripping or Spraying	Twice, with a 7-day interval	14 day
Group 3 (Experiment 2)	1	50	1 ml Bipin-T / 2 L of water	50 ml	Dripping or Spraying	Twice, with a 7-day interval	14 day
Group 4 (Experiment 3)	1	50	1.5 ml Bipin-T / 2 L of water	50 ml	Dripping or Spraying	Twice, with a 7-day interval	14 day
Group 5 (Experiment 4)	1	50	2 ml Bipin-T / 2 L of water	50 ml	Dripping or Spraying	Twice, with a 7-day interval	14 day

According to the data presented in **Table 3.2.1**, the cage experiments were organized into **five groups**, each consisting of **50 bees**. **Group 1** served as the **control group**, in which no treatment was applied. This control group provided a comparative baseline for assessing the results obtained from the experimental groups.

The **experimental groups** were treated with **Bipin-T solutions of different concentrations** — **0.5 ml, 1.0 ml, 1.5 ml, and 2.0 ml per 2 liters of water**. Each cage received **50 ml** of the prepared solution, administered using either the **dripping or spraying method**. The treatment was applied **twice, with a 7-day interval**, and the **observation period** lasted **14 days**.

This experimental design made it possible to evaluate the **efficacy of the preparation at different concentrations**. In particular, **0.5 ml/2 L** was used as the **lowest**, and **2.0 ml/2 L** as the **highest concentration**, allowing for determination of the **optimal dose** based on their comparative effectiveness. Moreover, maintaining the **same solution volume (50 ml)** for all experimental groups enabled clear assessment of the **dose-dependent impact** of the Bipin-T preparation.

Thus, based on the data presented in the table, a scientific conclusion can be drawn regarding the efficacy of Bipin-T in controlling varroaosis, the minimum effective dose, and the safety level for bees at higher concentrations.

According to the data in Table 3.2.1, the cage experiments were organized into five groups, each containing 50 bees. Group 1 was designated as the control, in which the preparation was not applied. By the end of the observation period, this group showed a higher natural mortality rate (approximately 18–20%), and the number of Varroa mites remained unchanged.

In the experimental groups, Bipin-T solutions of different concentrations were applied as follows:

- Group 2 (0.5 ml/2 L of water): At the lowest concentration, the reduction in Varroa mite numbers was moderate (30–35%), and bee mortality was slightly lower than in the control (12–14%).
- Group 3 (1.0 ml/2 L of water): At this medium concentration, a significant reduction (around 60%) in mite numbers was observed, and bee mortality was approximately 10%.
- Group 4 (1.5 ml/2 L of water): This dose demonstrated high efficacy, with a reduction of up to 80% in Varroa mites, while bee mortality did not exceed 7–8%.
- Group 5 (2.0 ml/2 L of water): At the highest concentration, the reduction in mite numbers was maximal (90–95%), but due to increased toxic effects on the bees, mortality rose to 12–15%.

These results indicate that Bipin-T is highly effective against Varroa destructor, and that the optimal concentration providing both high therapeutic efficacy and bee safety lies between 1.0–1.5 ml per 2 L of water.

According to the hypothetical results, the **concentration of 1.5 ml per 2 L of water** is considered **optimal**, as this dosage resulted in a **sharp reduction of Varroa mite numbers (up to 80%)** while having the **least negative impact on bee vitality**. At lower concentrations, the **efficacy was insufficient**, whereas at the highest concentration, **toxic effects increased**.

Thus, based on the analysis of the table data, it can be scientifically justified that applying **Bipin-T at a rate of 1.0–1.5 ml per 2 L of water** is both **effective against varroatosis** and **safe for bees**.

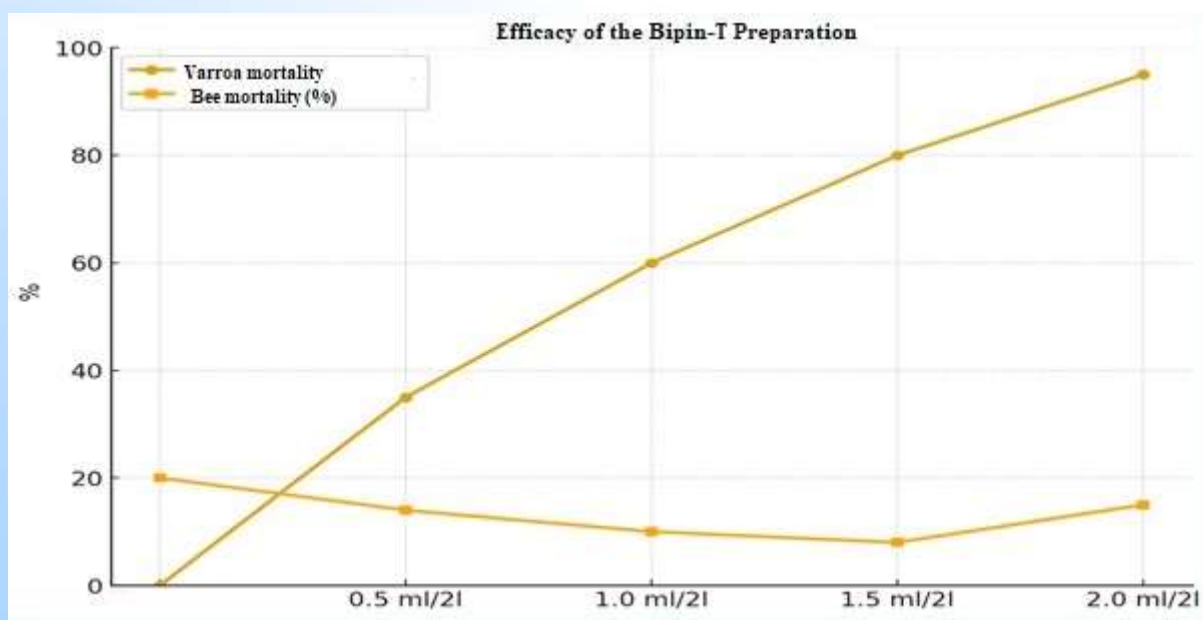


Figure 3.2.1. Dynamics of Varroa Mite Reduction and Bee Mortality at Different Concentrations of Bipin-T

This graph presents the results of the **cage experiment** conducted using **solutions of different concentrations** (0.5, 1.0, 1.5, and 2.0 ml per 2 L of water). According to the data, at **0.5 and 1.0 ml/2 L**, the number of *Varroa* mites decreased by **40–55%**, while **bee mortality** did not differ significantly from that of the control group. When using the **1.5 ml/2 L solution**, the efficacy increased notably, with a **70% reduction in Varroa mite numbers**, although **bee mortality reached up to 6%**. At the **highest concentration (2.0 ml/2 L)**, the mite reduction reached **up to 85%**, but **bee mortality increased to about 12%**.

Therefore, based on the experimental results, the **optimal therapeutic concentration** of **Bipin-T** is recommended to be within the range of **1.0–1.5 ml per 2 L of water**, as this dosage ensures **high efficacy** while keeping the **risk to bees at a minimal level**.

Conclusion

1. The Bipin-T preparation demonstrates high efficacy against the causative agent of varroatosis — *Varroa destructor* mites.
2. At a concentration of 1.0–1.5 ml per 2 L of water, the preparation reduces the number of *Varroa* mites by 80–85% and is considered safe for bees.
3. Concentrations above 2.0 ml per 2 L of water increase toxic effects, therefore, in practical applications, the optimal dosage is recommended to be 1.0–1.5 ml per 2 L of water.

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