EFFICACY OF THE FLUVALINATE-BASED PREPARATION FLYUTSIN AGAINST VARROA DESTRUCTOR IN HONEY BEES

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ABSTRACT

This scientific article examines the efficacy of a fluvalinate-based preparation, Flyutsin, against the parasitic mite Varroa destructor in honey bees. Field and laboratory experiments carried out during 2023-2025 in Samarkand and Kashkadarya regions assessed various concentrations of the drug in cage and field trials. Results indicated that doses of 1.0–1.5 ml per 5 L of water achieved optimal mite control while maintaining bee vitality. Higher concentrations (2.0 ml/5 L) increased toxicity. These findings support the recommendation of the 1.0–1.5 ml/5 L dose as effective and safe for practical use.

Introduction: One of the most widespread and economically significant diseases in honey bees is *varroatosis*, caused by the mite *Varroa destructor*. This parasite feeds on the hemolymph of bees, weakening their overall physiological condition, reducing immunity, and creating favorable conditions for the development of various secondary infections. As a result, colonies become weakened, honey production decreases, and in severe cases, entire colonies may perish. Therefore, the development and practical implementation of effective, affordable, and environmentally safe treatments against varroatosis remain an urgent and important task.

Relevance of the Study: In recent years, the Flyutsin preparation produced in Uzbekistan has been widely used in practice. The active ingredient of the preparation is *fluvalinate*, which belongs to the group of synthetic pyrethroids. It acts by disrupting the membrane potential of the varroa mite's nervous system, leading to rapid paralysis and death. Importantly, fluvalinate is considered relatively safe for bees, as it does not negatively affect the queen's egg-laying activity, the development of young bees, or the quality of honey and wax. Additionally, it is highly effective through contact exposure.

Materials and Methods: The scientific research was carried out between 2023 and 2025 at the Department of Veterinary Sanitary Expertise, Samarkand State University of Veterinary Medicine, Animal Husbandry, and Biotechnologies. Field experiments were

conducted within the framework of the Mega Project implemented at the university vivarium, specifically in the Apidomic. Studies were performed on Carpathian breed bee colonies from three beekeeping farms: “Orzu,” “Olim,” and “Dilmurod Bees” located in the Toyloq District of the Samarkand Region, and “Ergashev To‘ra Beekeeping Farm” located in the Shahrisabz District of the Kashkadarya Region. In each farm, research was conducted on 15 bee colonies. The study employed organoleptic, physicochemical, microbiological, and toxicological methods.

Research Results: The study aimed to evaluate the efficacy of Flyutsin under cage experiment conditions at different concentrations, assess its effects on bee vitality and varroa mites, and determine optimal dosage levels through statistical analysis. To determine the therapeutic effectiveness of the preparation, laboratory experiments were conducted during the autumn period—after honey harvesting, when bees were preparing for overwintering. The experiments were designed to assess the high efficacy of the Flyutsin preparation against the varroatosis pathogen (*Varroa destructor*) and to provide a scientific basis for its practical application under real beekeeping conditions.

1-table

Efficacy of Flyutsin Application in Cage Experiments (Based on Different Concentrations)

Names of the Groups	Number of Bees per Cage	Solution Preparation Standard	Amount of Solution Administered per Cage	Method of Application	Number of Treatments and Interval	Observation Period
Group 1 (Control)	50	–	–	–	–	21 day
Group 2 (Experiment 1)	50	0.5 ml Flyutsin / 5 L of water	50 ml	Spraying	3 times, at 7-day intervals	21 day
Group 3 (Experiment 2)	50	1 ml Flyutsin / 5 L of water	50 ml	Spraying	3 times, at 7-day intervals	21 day
Group 4 (Experiment 3)	50	1.5 ml Flyutsin / 5 L of water	50 ml	Spraying	3 times, at 7-day intervals	21 day
Group 5 (Experiment 4)	50	2 ml Flyutsin / 5 L of water	50 ml	Spraying	3 times, at 7-day intervals	21 day

The study was conducted to evaluate the efficacy of the Flyutsin preparation against the varroatosis pathogen, *Varroa destructor*, using cage experiments. A total of five cages were used in the experiment, one serving as the control group and the remaining four as experimental groups treated with different concentrations of the preparation. Each cage

contained 50 bees, totaling 250 bees for the experiment. The observation period lasted 21 days.

In the control group (Group 1), no preparation was applied, and the bees were kept under natural conditions. The results from this group served as a baseline for comparing the efficacy observed in the experimental groups.

In Group 2 (Experiment 1), 0.5 ml of Flyutsin per 5 liters of water was prepared and applied to each cage at 50 ml per cage via spraying. This concentration represented the minimum dose, allowing assessment of the initial efficacy of the preparation. The data obtained from this group provided evidence that Flyutsin shows a certain level of effectiveness even at low concentrations.

In Group 3 (Experiment 2), 1.0 ml of Flyutsin per 5 liters of water was applied via spraying. This concentration approximates the practically recommended dose, and its efficacy was compared with that of Group 2 to determine the dose–effect relationship.

Group 4 (Experiment 3) received 1.5 ml of Flyutsin per 5 liters of water. This group was designed to observe the effect of the preparation at a higher concentration and to evaluate its efficacy approaching the maximum level.

In Group 5 (Experiment 4), 2.0 ml of Flyutsin per 5 liters of water was applied via spraying. This represented the highest concentration, allowing assessment of the optimal balance between toxicity and efficacy.

The experiments demonstrated that the efficacy of Flyutsin against Varroa mites increased progressively with higher concentrations. Even at the minimum concentration (0.5 ml/5 L), some effect was observed; however, the highest efficacy was expected within the 1.0–1.5 ml/5 L range. At the 2.0 ml/5 L concentration, although efficacy was high, a negative impact on bee vitality was observed.

2-table

Efficacy of Flyutsin Application in Field Experiments (Based on Different Concentrations)

Group Name	Solution Preparation (Flyutsin / 5 L water)	Solution per Comb Interval (ml)	Total Solution for 12-Frame Hive (ml)	Method of Application	Number and Interval of Treatments
Group 1 (Control)	–	–	–	–	–
Group 2 (Experiment 1)	0.5 ml / 5 L	7–8 ml	≈ 82.5 ml	Spraying	3 times, 7-day intervals
Group 3 (Experiment 2)	1.0 ml / 5 L	7–8 ml	≈ 82.5 ml	Spraying	3 times, 7-day intervals
Group 4 (Experiment 3)	1.5 ml / 5 L	7–8 ml	≈ 82.5 ml	Spraying	3 times, 7-day intervals
Group 5 (Experiment 4)	2.0 ml / 5 L	7–8 ml	≈ 82.5 ml	Spraying	3 times, 7-day intervals

To assess the efficacy of Flyutsin under field conditions, five groups were established. Group 1 was designated as the control, receiving no treatment. This group served to determine the natural background, monitor natural bee mortality, and observe the dynamics of Varroa mite development.

In Group 2 (Experiment 1), the solution was prepared at a concentration of 0.5 ml Flyutsin per 5 L of water. Each comb interval received 7–8 ml of the solution, totaling approximately 82.5 ml per 12-frame hive. Treatment was applied three times at 7-day intervals. This low concentration was used to determine the minimum efficacy of Flyutsin and to evaluate any potential negative effects on bee vitality.

Group 3 (Experiment 2) received a solution concentration of 1.0 ml/5 L, with the same application method and volume as the previous group; only the concentration differed. This experiment was considered a practically recommended intermediate dose, aimed at balancing Varroa mortality and bee safety.

In Group 4 (Experiment 3), the solution was prepared at 1.5 ml/5 L. Each comb interval received 7–8 ml, totaling 82.5 ml per hive. Treatments were applied three times at 7-day intervals. This concentration was intended to achieve a higher level of Varroa mortality while ensuring that bee vitality was not negatively affected.

Group 5 (Experiment 4) received the maximum dose of 2.0 ml/5 L. All other conditions were identical to the previous groups. This group allowed assessment of Flyutsin's efficacy at high concentrations and identification of potential risks to bee health.

The experiments demonstrated that Flyutsin's efficacy is directly dependent on the concentration applied. The lowest concentration (0.5 ml/5 L) did not achieve sufficiently high Varroa control, while higher concentrations (1.5–2.0 ml/5 L) showed a potential for negative effects on bees. Based on empirical observations and theoretical analysis, the most optimal result was observed at 1.0 ml Flyutsin/5 L. At this dose, Varroa mortality was high, and no negative effects on bee vitality were detected. Therefore, this concentration is recommended as the optimal dose for applying Flyutsin under field conditions.

Conclusions

1.The Flyutsin preparation demonstrates significant efficacy against Varroa destructor mites when applied at appropriate concentrations.

2.The optimal therapeutic concentration lies at 1.0–1.5 ml per 5 L water, as this range achieves high mite mortality while preserving bee colony health.

3.Concentrations above 2.0 ml per 5 L water, although more effective against mites, pose increased risk of negative effects on bee vitality; thus, practical application should favour the lower effective range.

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