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## USE OF DRONES IN THE CONTROL OF HAZARDOUS PESTS OF WHEAT

Q. Bababekov<sup>1</sup>,  
R. A. Alamuratov<sup>1,2</sup>,  
J. K. Rakhmonov<sup>1,3</sup>,  
U. M. Ibragimov<sup>2</sup>,  
A. P. Egamnazarov<sup>2,1</sup>

<sup>1</sup>Plant Protection and Quarantine Scientific  
Research Institute, Tashkent, Uzbekistan

<sup>2</sup>Cereal and Legume Crops Research Institute,  
Tashkent Experimental Station, Uzbekistan

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### Abstract

This paper presents the results of experiments conducted in 2025 at the Tashkent Experimental Station of the Cereal and Legume Crops Research Institute to evaluate the effectiveness of using drones for the application of chemical and biological preparations against the dangerous wheat pest *Olema melanopus* (cereal leaf beetle). The studies assessed the efficacy of chemical insecticides containing lambda-cyhalothrin and imidacloprid, as well as the microbiological preparation “Bioturin,” based on the entomopathogenic bacterium *Bacillus thuringiensis*. The results showed that the chemical preparations provided 85.9–95.0% efficacy, while the biological preparation achieved 75.6–83.3% biological efficiency.

**Keywords:** Wheat, cereals, pest, drone, *Olema melanopus*, larva, insecticide, biopreparation, dosage, activity, efficacy.

### Introduction

Food security remains one of the most pressing challenges faced by countries worldwide. In recent years, Uzbekistan has implemented measures to develop the



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food industry, attract investment, and promote export-oriented production, resulting in increased volumes of food output. Increasing wheat productivity is one of the key objectives of agriculture, as it plays an essential role in ensuring the country's food security [3,7].

To achieve high yields, it is necessary not only to follow advanced agrotechnical practices but also to protect the crop from pests that cause damage from the seedling stage to full maturity. This requires in-depth studies of pest bioecology, distribution, and damage levels, as well as the development of scientifically based, effective control measures [2].

Under the conditions of Uzbekistan, the cereal leaf beetle (*Olema melanopus*) has become a serious pest of wheat. In the absence of timely control, yield losses can reach 15–20%. Organophosphorus and synthetic pyrethroid insecticides have been used effectively against this pest. However, while these chemical agents are efficient, they may also have adverse effects on the environment and beneficial entomofauna. Moreover, the ability to apply protective measures even during irrigation periods is critical to maintaining control effectiveness.

In recent years, attention has turned to the use of biological control methods against wheat pests. For instance, Bondarenko [6] reported positive results from using entomophages to manage pest populations. Likewise, researchers at the Plant Quarantine and Protection Research Institute found that biological preparations based on *Bacillus thuringiensis* were effective against *O. melanopus* [1].

Traditional pest control in wheat fields is generally conducted using ground-based sprayers. However, these sprayers are ineffective in flooded areas, which allows pests to damage a significant portion of the crop within a short period. The use of drone technology enables pesticide application under a wider range of field conditions, including irrigated fields, thus ensuring timely and effective pest management.

Therefore, the aim of this study was to investigate the potential of drones in protecting wheat crops from pests and to identify effective methods for applying modern chemical and biological preparations using drone technology.



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## Materials and Methods

The timing of pest occurrence and population density was determined according to the standard methods described by G.E.Osmolovskiy and N.V.Bondarenko (1978) [4].

Experiments against the cereal leaf beetle (*Olema melanopus*) were conducted during the wheat heading stage. The trials were established when the pest population density reached 18–23 individuals per 50 leaves in the wheat field.

The experiment included treatment, standard (reference), and control variants, each consisting of three replications. Pest numbers were recorded before treatment and at 3, 7, and 14 days after treatment. The efficacy of the tested preparations was determined in comparison with the untreated control.

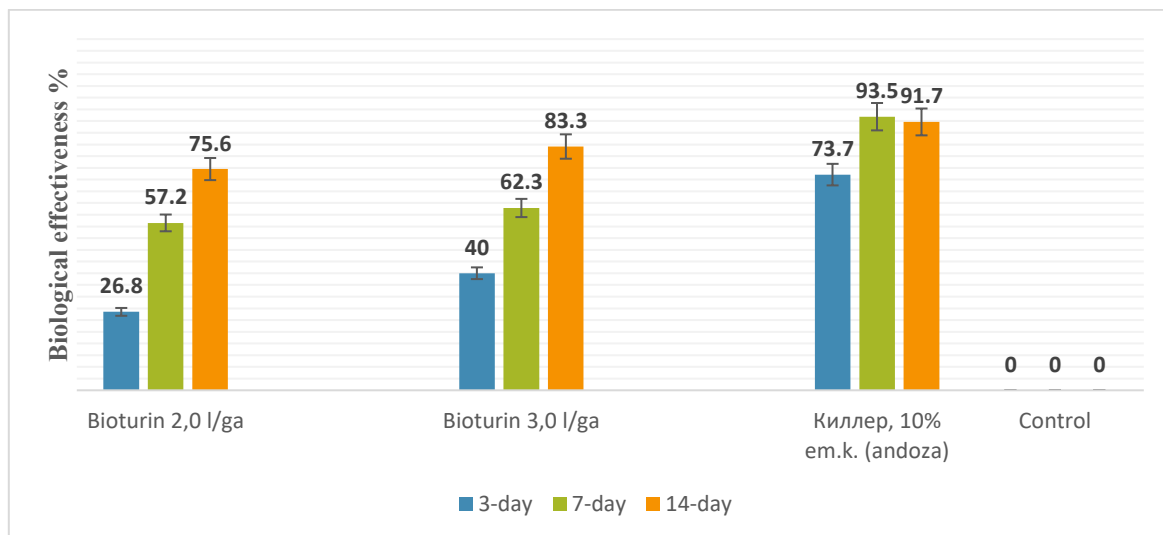
Field trials were conducted following the methodological guidelines of Khodjayev Sh.T. (2004) [8], and biological efficacy was calculated according to the formula proposed by Pontenier (1981) [5].

## Research Results

Experiments against wheat pests were conducted during the first ten days of April at the Tashkent Experimental Station of the Research Institute of Grain and Leguminous Crops on a 10-hectare wheat field. The biological preparation Biturin was tested at application rates of 2.0 and 3.0 L/ha. For comparison, control and standard variants were included in the experiment. As a standard treatment, the chemical insecticide Killer, 10% EC, was used. No treatments were applied in the control variant. Each experimental variant consisted of three replications.

The preparations were applied to the wheat field using a drone sprayer, with a working solution consumption rate of 10 liters per hectare. The experimental wheat field was irrigated, and the biopreparation was applied by drone over the moist area.

In the variants treated with the microbiological preparation Biturin at 2.0–3.0 L/ha, the number of pests before treatment averaged 18.3–19.0 individuals per 50 wheat leaves. Fourteen days after treatment, the pest population decreased to 3.4–4.8 individuals, respectively.



**Figure 1. Biological efficacy of the biopreparation Biturin applied by drone against *Olema melanopus* in wheat**

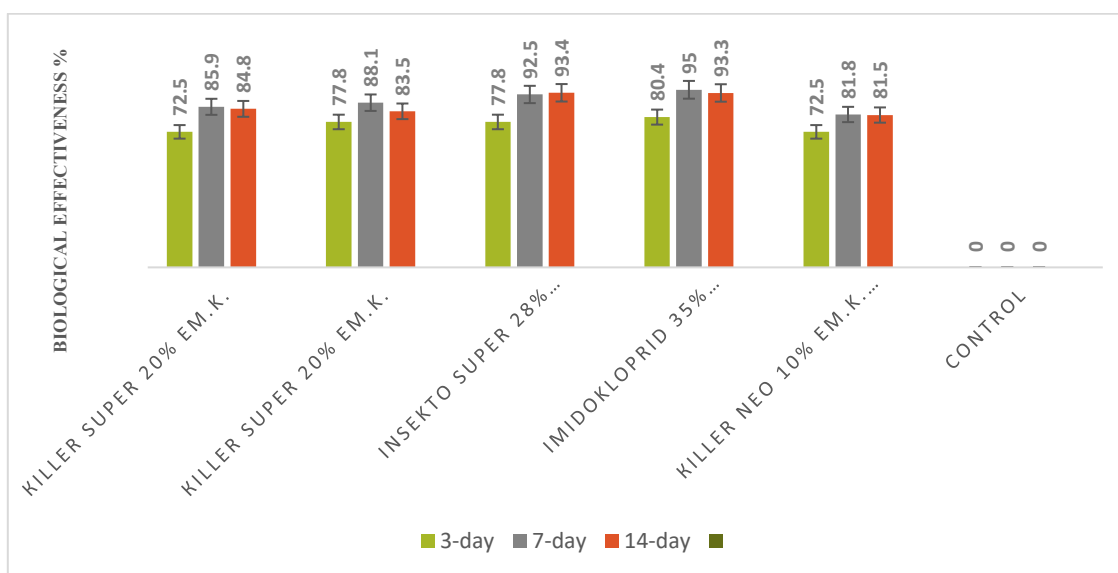
The biological efficacy of the biopreparation Biturin at a rate of 2.0 L/ha reached 75.6% on the 14th day after treatment, while at 3.0 L/ha it was 83.3%. In the standard variant, where the chemical insecticide Killer 10% EC was applied at a rate of 0.1 L/ha, 91.7% mortality of *Olema melanopus* was recorded on the 14th day. In the untreated control variant, the pest population increased from 18.6 to 20.0 individuals per 50 leaves during the same period (Figure 1).

Field experiments on the application of chemical insecticides by drone against the cereal leaf beetle were conducted on a 70-hectare wheat field at the Tashkent Experimental Station of the Research Institute of Grain and Leguminous Crops. The fields were irrigated, and treatments were carried out over moist soil using drone sprayers. The experimental results are presented in Figure 2.

As shown in the figure, preparations containing the active ingredients lambda-cyhalothrin and imidacloprid were tested for their efficacy against *O. melanopus*. After drone application, Killer 20% EC at rates of 0.05 L/ha and 0.07 L/ha achieved biological efficacy levels of 85.9% and 88.1%,



respectively, seven days after treatment. Among the newer insecticides tested, Insectosuper 28% EC and Imidacloprid 35% EC applied at 0.1 L/ha by drone demonstrated the highest efficacy, with 92.5–95% biological control achieved seven days after treatment. In the control variant, the pest population increased from 17.8 to 23.7 individuals per 50 leaves over 14 days.



**Figure 2. Biological efficacy of chemical insecticides against *Olema melanopus*.**

## Conclusions

According to the results of the conducted research, the biopreparation Biturin, when applied by drone at rates of 2.0–3.0 L/ha, demonstrated a biological efficacy of 75.6–83.3% against the wheat pest *Olema melanopus*.

Among the chemical insecticides tested, those containing the active substances imidacloprid 35% EC (0.1 L/ha), imidacloprid + lambda-cyhalothrin (Insectosuper 28% EC, 0.1 L/ha), and lambda-cyhalothrin (Killer 20% EC, 0.05–0.07 L/ha) achieved 85.9–95.0% pest mortality when applied by drone. Compared to the standard treatment (Killer Neo 10% EC), the efficacy of the tested preparations was 2–15% higher.



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The use of drone technology for pesticide and biopesticide applications enables effective treatment even in irrigated (watered) fields and provides rapid and efficient protection of wheat crops against pests.

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