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**BIOLOGICAL AND ECONOMIC EFFICACY OF THE
ENTOMOPATHOGENIC NEMATODE *STEINERNEMA*
CARPOCAPSAE AGAINST THE COTTON BOLLWORM
HELICOVERPA ARMIGERA UNDER FIELD CONDITIONS IN
UZBEKISTAN**

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Abstract. *The cotton bollworm, *Helicoverpa armigera* (Hübner), is an economically important pest of cotton. This study summarizes field evaluations of a local isolate of the entomopathogenic nematode *Steinernema carpocapsae* against *H. armigera* in the Tashkent and Surkhandarya regions of Uzbekistan during 2023-2025. Nematode suspensions were tested at 80 and 100 million infective juveniles (IJs) ha and compared with a reference treatment and an untreated control. Reported biological efficacy in selected observations reached 72.6% and 86.4% at the respective application rates in Tashkent, and 76.0% and 82.0% in Surkhandarya. Cotton yield increased by 4.5-5.0 centners ha relative to untreated control. These results suggest that locally sourced *S. carpocapsae* has potential as a biological control agent within integrated cotton pest management.*

Keywords: *Steinernema carpocapsae; Helicoverpa armigera; biological control; infective juveniles; field efficacy; cotton yield; Uzbekistan.*

Introduction

Helicoverpa armigera is a major polyphagous pest whose larvae damage reproductive organs of cotton and can substantially reduce marketable yield.

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Dependence on chemical insecticides presents challenges related to resistance management, non-target exposure and environmental protection. Entomopathogenic nematodes (EPNs) are among the biological control agents investigated as alternatives to conventional insecticides. Infective juveniles of *Steinernema* spp. seek susceptible insect hosts and introduce their symbiotic bacteria, leading to host mortality under favorable conditions.

The performance of EPNs in the field may differ from laboratory results because the nematodes are living organisms sensitive to desiccation, ultraviolet radiation, temperature and contact with their hosts. Local isolates may therefore be valuable candidates for regionally adapted pest management. The objective of this contribution was to synthesize the dissertation's field evidence on the biological, agronomic and economic performance of a local *S. carpocapsae* isolate against *H. armigera* in two cotton-growing regions of Uzbekistan.

Materials and methods

Field experiments were conducted during 2023-2025 at the Murad Agro Biznes farm (4 ha), Yukori Chirchik district, Tashkent region, and the Musurmonqulov Bolta Yormatovich farm (12 ha), Sherabad district, Surkhandarya region. The reported design included four treatments, each replicated three times. The treatments comprised *S. carpocapsae* suspensions at 80 and 100 million IJs ha, a reference Helitec treatment at 0.33 L ha, and an untreated control. Agronomic management was kept comparable among treatments.

Applications were made during the period of abundant bollworm larval occurrence. At the Tashkent site, the nematode suspension was applied using an OVX-600 sprayer with 600 L ha spray volume. Pest abundance was recorded before treatment and at 48, 96 and 144 hours after application. The assessments of biological efficacy and yield response and presents economic calculations based on production costs and the value of harvested cotton. Because the source

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provides results from several observation sets, those values are reported separately rather than pooled into an unsupported combined estimate.

Results and discussion

In both regions, nematode-treated plots showed reduced bollworm abundance compared with untreated plots. In one set of Tashkent field observations, biological efficacy was 72.6% at 80 million IJs ha and 86.4% at 100 million IJs ha. The corresponding figures reported for Surkhandarya were 72.0% and 86.0%. A separate Surkhandarya observation at 144 hours after treatment recorded 70% and 86%, respectively.

The higher application rate generally produced stronger pest suppression. This dose-related pattern is biologically plausible because a larger number of infective juveniles may increase the probability of encountering susceptible larvae. Nevertheless, field performance may also be influenced by humidity, temperature, soil characteristics, irrigation and initial pest density.

Yield and economic outcomes

In Tashkent, cotton yield was 3.6 centners per ha in the untreated control, 43.0 centners per ha at 80 million IJs per ha, and 43.5 centners per ha at 100 million IJs per ha. The respective yield preserved relative to the control was 4.5 and 5.0 centners per ha, equivalent to 450 and 500 kg per ha. The dissertation reports a conditional net income of 12,749.9 thousand UZS per ha for the 80-million-IJ treatment.

In Surkhandarya, untreated plots yielded 40.5 centners per ha, whereas the 80- and 100-million-IJ treatments yielded 45.0 and 45.5 centners per ha, respectively. Thus, the yield advantage over the control was again 4.5-5.0 centners per ha. At 100 million IJs per ha, reported conditional net income was 14,449.6 thousand UZS ha, with additional net profit of 1,664.9 thousand UZS ha compared with the untreated control.

Conclusions

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Field trials conducted in the Tashkent and Surkhandarya regions of Uzbekistan during 2023-2025 indicate that the local *S. carpocapsae* isolate is a promising candidate for biological suppression of *H. armigera* in cotton production. Both evaluated doses reduced pest abundance, while the 100-million-IJ per ha treatment generally showed greater biological efficacy. Compared with untreated controls, nematode applications were associated with preservation of up to 5.0 centners per ha (500 kg ha) of cotton yield. The findings support further development of locally adapted EPN-based interventions as part of integrated pest management.

REFERENCES

1. Эшчанов. Б.Р, Курбонова Н.С . Файзуллаева. Оценка биологической эффективности энтомопатогенных нематод против хлопковой совки (*Heliothis armigera* Hübner) в лабораторных условиях. Актуальные проблемы современной науки. -Москва. 2025.-№ 2.-С.195-199.
2. Fayzullayeva A.A, Eshchanov B.R, Qurbonova N.S., // **Assessment of the biological efficacy of entomopathogenic nematodes against cotton bollworm (*Heliothis armigera* Hb.) in the conditions of Surxondaryo region.**// “New Innovations in National Education” Journal. - Tashkent, 2024. Special Issue No. 11, Part 1, p. 128-133.
3. Веремчук Г.В. Данилов Л.Г. Методические указания по определению инвазионной активности нематодных культур рода Неоаплестана (Стеинернематидеae). Л., -Москва. 1978, - 7 с.
4. Доспехов Б.А. Методика полевого опыта.-М.: Агропромиздат, 1985.- 432 с.
5. Хо‘jaev Sh.T. Qishloq xo‘jaligida pestitsidlarni ishlatish hamda tadqiqot o‘tkazish usul va shartlari. - Toshkent: “Zilol buloq”, 2020. - 152 b.