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ASSESSMENT OF THE BIOLOGICAL EFFICACY OF ENTOMOPATHOGENIC NEMATODES AGAINST COTTON BOLLWORM (*HELIOTHIS ARMIGERA* HB.) IN THE CONDITIONS OF SURXONDARYO REGION

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Abstract: *This article studies the biological efficacy of two types of entomopathogenic nematodes (Steinernema carpocapsae and Heterorhabditis bacteriophora) against the larvae of cotton bollworm using different concentrations (200 YL/ml and 500 YL/ml). The results indicated that both nematode species caused larval mortality, with H. bacteriophora demonstrating the highest efficacy when applied at a concentration of 500 YBL/ml.*

Keywords: *cotton bollworm, entomopathogenic nematodes, larvae, biological efficacy, Heterorhabditidae, Steinernematidae, bacteria.*

Introduction: The concept of “biological control” is applied across various fields of biology, particularly in entomology, plant pathology, and nematology. In entomology, biological control involves using live predatory insects, entomopathogenic nematodes (EPN), or microbial pathogens to stabilize pest insect populations, yielding high scientific results that are safe for human health. EPNs are recognized as highly effective biological control agents for economically significant insect pests. Researchers worldwide are currently engaged in experiments and research to isolate new EPN strains.

The cotton bollworm (*Heliothis armigera* Hb.) is one of the most dangerous pests of cotton, damaging all parts of the plant, especially bolls and buds, which results in a drastic reduction in yield and fiber quality. Although chemical insecticides are effective against the cotton bollworm, their use has several drawbacks, including environmental pollution, the development of resistant pest strains, and adverse effects on human health.

Consequently, there is a growing interest in environmentally safe and effective biological control methods. One such approach involves isolating entomopathogenic nematodes from nature, culturing them in the laboratory, and applying them to pests.

Several studies have demonstrated the high efficacy of two specific nematode species: *Steinernema carpocapsae* and *Heterorhabditis bacteriophora*. For instance, *S. carpocapsae* has shown significant results against cotton bollworm larvae. Similarly, according to Ahmad (2012), *H. bacteriophora* has proven to be an effective biological agent against various plant pests.

Advantages of Biological Control over Chemical Pesticides:

1. Biological control agents are non-toxic and do not leave harmful residues in food, unlike chemical pesticides.
2. Biological control works harmoniously with the environment, serving as nature's way of fighting pests.
3. Chemical pesticides can disrupt ecosystems and harm beneficial organisms.
4. Pests can quickly develop resistance to chemical agents, while biological control methods work collectively to keep pest populations under control.
5. Biological control agents actively target pests, even those in hidden locations, whereas chemical pesticides must directly hit their target to be effective.

Various EPN species, including *Steinernema carpocapsae* and *Heterorhabditis bacteriophora*, have demonstrated high efficacy in experimental trials against cotton bollworms conducted by over fifty scientists.

Our objective is to scientifically study, for the first time in Uzbekistan, the biological efficacy of the two EPN species, *Steinernema carpocapsae* and *Heterorhabditis bacteriophora*, against cotton bollworm.

Materials and Methods: Field trials were conducted at a cotton field in Sherabad District, Surxondaryo Region, owned by Bolta Yormatovich Musurmonkulov. On June 2024, observations identified eighteen ***Heliothis armigera*** Hb specimens. The goal was to culture the larvae in laboratory conditions and assess the efficacy of locally isolated entomopathogenic nematodes against the pupal stage. Laboratory tests were conducted

on EPN suspensions of ***Steinernema*** and ***Heterorhabditis*** to determine their effectiveness in pest control.

Results: Both ***S. carpocapsae*** and ***H. bacteriophora*** demonstrated high pathogenicity towards cotton bollworm larvae. At a concentration of 200 YL/ml, ***S. carpocapsae*** achieved larval mortality within 16 hours, while ***H. bacteriophora*** took 62 hours. At a concentration of 500 YL/ml, ***S. carpocapsae*** caused mortality within 7 hours, and ***H. bacteriophora*** within 48 hours. In the control group, the larvae pupated and emerged as adult moths after 16 days.

Conclusion: The study confirms that ***S. carpocapsae*** and ***H. bacteriophora*** are highly effective in controlling cotton bollworm larvae. ***H. bacteriophora***, in particular, showed maximum efficacy at higher concentrations. These findings suggest that these nematodes could potentially be applied in open fields as a biological control method against cotton bollworm.

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