AMERICAN JOURNAL OF EDUCATION AND LEARNING
ISSN: 2996-5128 (online) | ResearchBib (IF) = 9.918 IMPACT FACTOR
Volume-3| Issue-6| 2025 Published: |30-06-2025|

INFORMATION ABOUT ENTOMOPATHOGENIC NEMATODES

https://doi.org/10.5281/zenodo.15686272

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Abstract

The article provides information about entomopathogenic nematodes used in pest control of agricultural crops. The cycle of their development and use in some foreign countries and in the Republic of Uzbekistan is indicated.

Keywords

Entomopathogenic nematodes, harmful insects, development cycle, effectiveness

More than 24,000 free-living and parasitic species of nematodes, or roundworms, are currently known, but considering the ongoing discovery of new species, especially those parasitic on insects, it is estimated that there are at least 1 million species. Free-living nematodes are found at the bottom of various water bodies and in the soil, while parasitic nematodes are found on plants, animals, and humans. In this article, we will focus on entomopathogenic nematodes—parasites of insects.

In recent decades, the method of biological pest control in agriculture has become widespread. To expand the range of agents (entomophages) used in this method, research is being conducted to discover new, more effective types. Producing agricultural products free of pesticide residues has become an urgent problem. In this context, the use of entomopathogenic nematodes, particularly against soil-related pest species, is being actively studied and implemented worldwide.

Nematodes that are pathogenic to insects are known as entomopathogenic nematodes.

Entomopathogenic nematodes possess ideal qualities for biological control against quarantine and other dangerous pest insects. Globally, beneficial nematodes rank as the third most widely used bioagent for biological control, following Trichogramma and Bacillus thuringiensis. Due to the risks associated with insecticides, they are increasingly being used as alternatives in organic farming.

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Beneficial nematodes can be effectively used against more than 200 harmful insect species from over 100 groups. These include cotton bollworms, fruit flies (e.g., cherry flies), moths (e.g., Oriental fruit moths), rootworms (e.g., wireworms), and others.

1. Nematodes can kill pest insects within 48 hours.

2. Beneficial nematodes are quite resilient and can remain viable for several months if stored at suitable temperatures (around 4°C).

3. Pest insects do not develop natural or acquired resistance to beneficial nematodes.

4. They are environmentally safe and have no adverse effects on soil, air, natural entomophages, warm-blooded animals, or humans.

5. Beneficial nematodes have high reproductive potential, with one nematode potentially producing hundreds of thousands of offspring within 10 days.

6. They can be reproduced and applied year-round.

Currently, entomopathogenic nematodes and their formulations are widely used in foreign countries. For example, in California, their application against codling moths and the American white butterfly has achieved effectiveness rates of 72.0–86.0%.

According to research in Ukraine, entomopathogenic nematodes are widespread in the country's protected and semi-arid lands, as well as in crop agrocenoses. Samples taken from various regions showed an occurrence rate ranging from 22.6% to 40.0%.

The first information about entomopathogenic nematodes in Russia was provided by I.N. Filipiev in 1934. At the “Biodan” LLC under the All-Russian Research Institute of Plant Protection, two biopreparations based on entomopathogenic nematodes were created: EntonemF and Nemabact. These showed effectiveness rates of 93.6% against wireworms, 80.0% against Colorado beetles, and 86.0–98.0% against tobacco thrips.

Entomopathogenic nematodes are mostly used in the form of aqueous suspensions. However, these suspensions cannot preserve the viability of the nematodes for long. To ensure longer shelf life and stability, nematode-based formulations using gelatin, silicone, and mineral oils have been developed. These can retain pathogenicity for up to five days.

In Uzbekistan, initial studies on the use of entomopathogenic nematodes against agricultural pests have been conducted since 2020 by staff of the "Biological Control against Pests and Diseases" laboratory of the Scientific Research Institute of Plant Quarantine and Protection. Currently, several types of entomopathogenic

nematodes isolated from local soils are being studied, reproduced in laboratory and biolaboratory conditions, and applied against cotton bollworms and other pests.

Technique for Reproducing Beneficial Nematodes in Biolaboratory Conditions

Reproduction process in biolaboratory conditions:

Required materials:

1. Parent stock of beneficial nematodes
2. Wax moth larvae
3. Plastic containers

For a 1-hectare area, place 1,000 wax moth larvae into a plastic container and add 30–40 ml of nematode suspension (parent material). Keep the container in a dark room or cover it with black fabric at a temperature of 15–28°C for 10 days. After this period, yellowish, slimy spots will appear on the container walls.

Application in the field:

Early in the morning or late in the evening, when it is cool and not directly sunny, place 1,000 infected wax moth larvae into a bucket with 5 liters of water and leave them for 20 minutes. Then, mix the liquid from the bucket with 300–600 liters of water for every 1 hectare of field. Apply it using any available water-spraying equipment.

Currently, several types of entomopathogenic nematodes isolated from local soils are being studied, reproduced in lab and biolab conditions, and applied against cotton bollworms and other pests.

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