



# Beneficial Nematodes- our soldiers against crop pests

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## ABSTRACT

We often go for insecticide application as soon as we find a pest-attack in our crops. But these poisons not only kill the notorious pest, but also kills many beneficial insects and other non-target once too. Additionally, they trigger development of resistance and resurgence of the target pest. When washed by rains, these insecticides are carried to our water resources, enters our soil and thereby pollute our environment. Residues of these toxicants present in the plant produce and in environment when enters living system of an organism results into many chronic effects like biomagnifications, development of cancer and many also cause deleterious effect in normal growth and development of the affected organism. But in the present time, with the growing awareness, people are now showing more inclination towards organic produce and thereby promoting organic farming. When we talk about crop protection in organic farming from devastating pest then our natural warriors come into the scene. These are various bioagents like parasitoid wasp (example *Trichogramma*, *Bracon*); various insect attacking microbes like Entomopathogenic bacteria (example *Bacillus thuringiensis*), entomopathogenic fungi (example *Beauveria bassiana*, *Metarhizium anisopliae*,

*Verticillium lecanii*) and entomopathogenic viruses (Nucleopolyhedrovirus and Granulovirus). In this article we'll discuss about one such bioagent which has all qualities of a potential biopesticide i.e., Entomopathogenic nematodes (EPNs).

### What are Entomopathogenic nematodes (EPNs)?

Nematodes! When we here about nematodes our mind goes straight to round worms, *Ascaris lumbricoides*- human intestinal parasite. Oh! Don't worry EPNs are different, they don't target humans. Entomopathogenic nematodes like their name, they only target insects. These are thread worms which cause disease in insect and the insect die within 48-72 hrs. They don't kill the insect alone rather do it with the help of their true friend i.e. their symbiotic bacteria which they carry within their body. *Heterorhabditis* and *Steinernema* are the two genera of EPNs who have symbiotic association with bacteria of genus *Photorhabdus* and *Xenorhabdus*, respectively. As these nematodes comes in contact with target insect-pest they enter within the insect's body through natural opening like mouth, anus and spiracles. When it reaches insect's blood i.e., haemolymph, it releases the bacteria into haemolymph. Bacteria then multiply, release various toxins and enzymes, which kill the insect and digest its internal organs. Now both EPNs and bacteria enjoy the soupy treat and multiply within the insect cadaver. As the resources within the cadaver starts to deplete the EPNs engulf the bacteria and comes out by rupturing insect's body and search for new target insect and so the cycle continues.

### What is the importance of using EPNs?

EPNs possess several attributes like they kill the target pest very fast within 48-72 hrs, they are ecofriendly and are completely safe for non-target organisms and humans and therefore are exempted from US EPA registration. EPNs can be effectively used against subterranean pest like root grubs and white grubs. Natural parasitization of root grubs and even of pupal stages of many lepidopteran pest (which pupates within soil)



by the EPNs has been reported by various researchers. EPNs can also be effectively used against above ground pest inhabiting in concealed environment.

**EPNs against Fall army worm (FAW), an exotic pest of maize: -**

FAW, *Spodoptera frugiperda* is an exotic pest of maize which is native to America, entered India in 2018 and now is one of the most destructive pests of maize crop. The pest infests the crop both in vegetative as well as reproductive stage. If not managed, the pest has potential to cause 21%-53% loss of the annual maize production. Larval stage of this pest feed on the maize crop. EPNs like *Heterorhabditis indica* and *Steinernema carpocapsae* has been found to be very effective in management of FAW. Third instar FAW larvae bore into the whorl of maize plant and feed there. Target application of EPNs to the whorl region of plant kills the hidden larva. The fifth instar larvae of FAW goes underground within soil to pupate, thus applying EPNs to the soil kills the later instar larvae as well as pupae. EPNs can be one of the important means for biological management of this destructive pest. EPNs also show compatibility with many insecticides like Imidacloprid, Chlorpyrifos, Chlorantriliprole etc. thus can be used along with the compatible insecticide which can result into additive or synergistic effect.

**Major consideration while purchasing EPNs formulation: -**

The most important consideration while selecting a bio-pesticide is its quality parameters. The formulation of any bio-pesticide should be procured from authentic source. Formulation should not be too old and should contain robust and effective bioagents with high survival percentage. Wettable Powder (WP) formulation of EPNs have been found very effective and are made available by various private bio-pesticide companies under trade name Grubcide, SOLDIER-WP etc. formulation are also made available by government institute like ICAR-NBAIR.

**Considerations during field application of EPNs:-**

Naturally EPNs inhabit in soil therefore, they are little sensitive to UV rays and desiccation. Thus, spray should be scheduled in evening hours for better result, as this will avoid their exposure to sun. If the weather condition is very dry then irrigation before EPNs application should be provided.

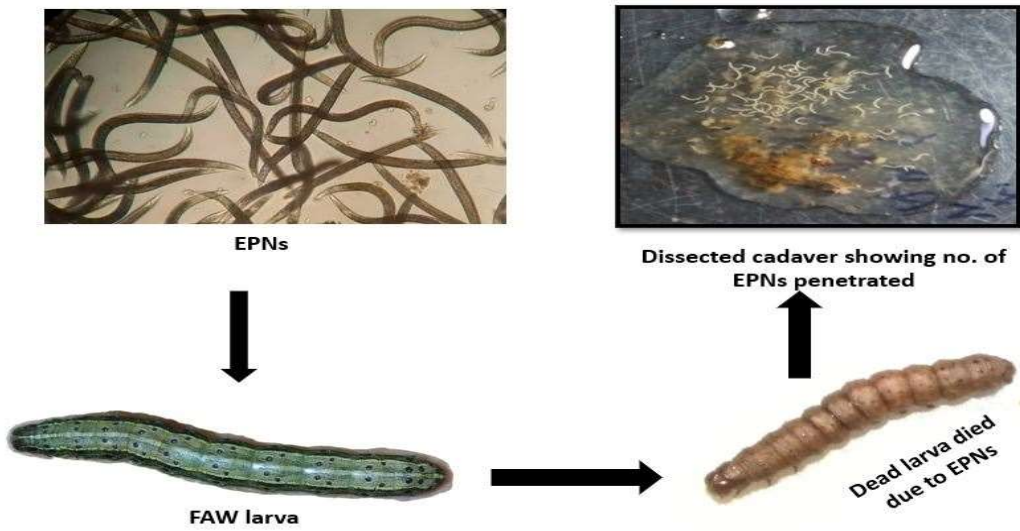
**Conclusion: -**

It's high time for the humans to move towards sustainable approach in all their activities. And agriculture is one of the human activity whose stability lies only in sustainability. Thus, EPNs can be a good option in our move towards sustainable approach of pest management.

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FAW larva feeding on maize plant



Dead larva died due to EPNs