



BIOLOGICAL CONTROL - DEFINITION - HISTORY - CLASSICAL EXAMPLES - FACTORS GOVERNING BIOLOGICAL CONTROL



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IV. Entomopathogenic nematodes (EPNs)

- Nematodes which are capable of killing, sterilizing or seriously hampering the development of insect and completing at least one stage of their life cycle in the host.

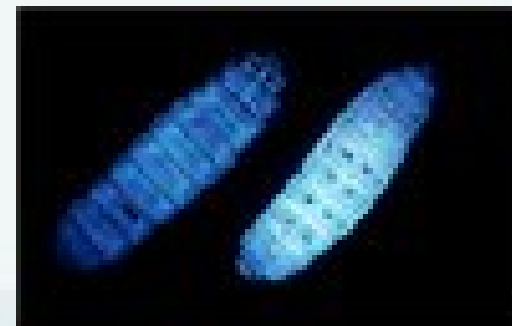
Other Names: Entomogenous, Entomophilic, Insect parasitic nematodes etc.

Important groups of EPNs

1. Family: Mermithidae (Order: Enoplida)
2. Family: Steinernematidae (Order; Rhabditida)
3. Family: Heterorhabditidae (---- ,,-----)



Steinernema



Heterorhabditis

Special qualities of Steinernematidae and Heterorhabditidae

- Quick mortality of the host (24 ó 48 hr)
- Wide host range (> 200 insect species of 10 Orders)
- Wide distribution ó found all parts of the world except Antarctica
- Symbiotic association with bacteria (*Xenorhabdus*; Steinernematidae and *Photorhabdus*; Heterorhabditidae)
- Infective stage (3rd stage) is non feeding, free living, durable and capable of withstanding adverse climatic changes
- Can be mass produced both on natural host and artificial diet
- Good shelf life
- Easy to apply
- Safer to non target organisms

J3 infective juveniles enter the blood system of the host through body openings

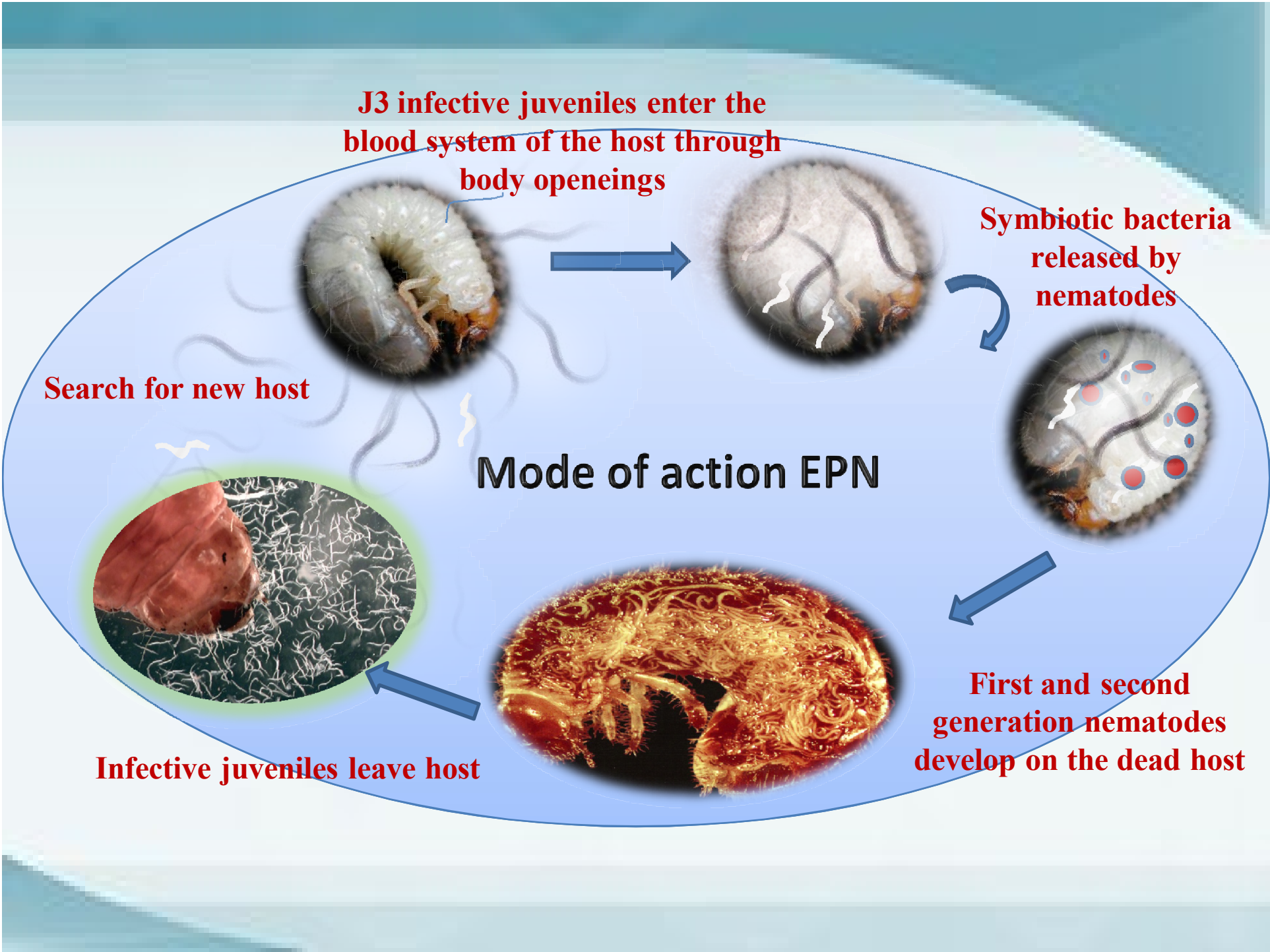
Symbiotic bacteria released by nematodes

Mode of action EPN

First and second generation nematodes develop on the dead host

Infective juveniles leave host

Search for new host



Advantages of microbial agents as component in IPM

- Exploitation for pest control is environmentally safe due to host specificity
- Microorganisms have natural capability of causing epizootic levels due to their persistence in soil and efficient transmission
- Compatible with chemical insecticides
- The cost of development and registration of microbial insecticide is much less than that of chemical insecticides
- Large scale culture and application is relatively easy and inexpensive
- No resistant development

Factors affecting biological control

1. Tolerance limit of crop to insect injury - Successful in crops with high tolerance limit
2. Crop value - Successful in crops with high economic value
3. Crop duration - Long duration crops highly suitable
4. Indigenous or Exotic pest - Imported NE more effective against introduced pest
5. If alternate host available for NE, control of target pest is less
6. If unfavourable season occurs, reintroduction of NE required
7. Presence of hyperparasites reduces effectiveness of biocontrol
8. Tritrophic interaction of Plant-Pest-Natural enemy affects success of biocontrol, e.g. *Helicoverpa* parasitization by *Trichogramma* more in tomato than corn
9. Use of pesticides affect natural enemies
10. Selective insecticides (less toxic to NE required)
11. Identical situation for successful control does not occur
12. Depends on life cycle of NE

General Limitations of Biological Control include:

- The host (pest) population will continue to exist at a level determined by the properties of the host, its natural enemies and of the habitat they occupy
- The effectiveness of natural enemies must be considered relative to man's economic thresholds
- The attainment of biological control of one major pest on a crop necessitates the elaboration of a system of integrated control for other pests of the crop, if any exist; and
- The research necessary in seeking a biological control solution to a problem is often demanding in terms of scientific and technical staff, funds, and time, and a solution cannot be guaranteed in advance.

THANK YOU