

## Plant Parasitic Nematodes in Soil and their Management

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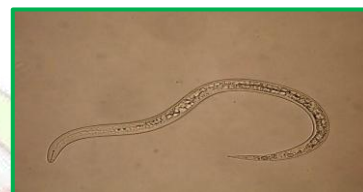
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**What are Plant Parasitic Nematodes?** PPNs or Plant Parasitic Nematodes are **triploblastic**, **bilaterally symmetrical**, **unsegmented**, **pseudocoelomatic invertebrates** with a **triradial oesophagus**, **hexaradial mouth operature** and lacking specialized organs for respiration and circulation.



### Important plant parasitic nematodes

- Seed gall/ ear cockle nematode of wheat: *Anguina tritici*
- Cereal cyst nematode: *Heterodera avenae*
- Root knot nematode: *Meloidogyne spp.*
- Citrus nematode: *Tylenchulus semipenetrans*
- Reniform nematode: *Rotylenchulus reniformis*
- Stem & bulb nematode: *Ditylenchus dipaci*
- Stem nematode of rice: *Ditylenchus angustus*
- Potato root nematode: *Ditylenchus destructor*
- Mushroom nematode: *Ditylenchus mycelophagus*
- Bud and leaf nematode: *Aphelenchoides sp.*
- Rice leaf or white tip nematode: *Aphelenchoides besseyi*
- Potato cyst nematode: *Globodera rostochiensis*
- Root lesion nematode: *Pratylenchus sp.*
- Rice root nematode: *Hirschynniella sp.*
- Burrowing nematode: *Rodopholus sp.*
- False root knot nematode: *Nacobus sp.*
- Stunt or stylet nematode: *Tylenchorhynchus sp.*
- Pin nematode: *Paratylenchus sp.*
- Needle nematode: *Longidorus sp.*
- Dagger nematode: *Xiphinema index*
- Lance nematode: *Haplolaimus sp.*

### Damage symptoms

Nematodes that feed above ground produce symptoms include **necrosis**, **lesion**, **discoloration**, **dead or devitalized buds**, **seed galls**, **twisting**, **deformed stem and foliage**,

and leaf discoloration. Stunting, discoloration of foliage, wilting, root lesion, diminished root system, root proliferation, root rot, root surface necrosis, curled tip, root galls, coarse roots, stubby roots, and clusters of sprouts on tubers are among the symptoms of below-ground feeding nematodes.



### Management of Plant Parasitic Nematodes

- **Solar heat:** Most nematodes are sensitive to desiccation and heat. Exposure of soil to sun and wind kills a large number of nematodes. Two ploughings at fortnight's interval during summer months, after harvest of rabi crops, can reduce nematode population substantially.
- **Soil solarization:** Involving the mulching of moist soil with clear polythene sheet for a few weeks in summer, the soil solarization is effective in reducing nematode populations, and controlling other soil borne pathogens and weeds. This practice conserves soil moisture and prevents wind erosion.
- **Organic amendments:** Certain organic amendments like deoiled seed cakes of plants like neem, karanj, mahua, etc. when applied to soil are known to be highly effective in suppressing plant parasitic nematodes.
- **Botanical nematicide:** Certain substances of plant origin are known to be toxic to nematodes. A few commercial products based on neem seed kernel, Oil, leaves, etc., have become available. These can be applied to seed and nursery-beds for reducing nematode damage to plants at the early growth stage. Species of *Calotropis*, *Ipomea*, etc., have been found to contain nematode suppressive moieties in their leaves.
- **Biological control of nematodes:** A large number of antagonistic microfauna and microflora have been discovered. A few of these have shown potential as biological control agents. Several egg parasitic (*Paecilomyces*, *Verticillium*), toxin producing fungi (*Catenaria*, *Harposporium*, etc.) have been identified and exploited for the management of nematodes on a small scale. Similarly, different kinds of bacteria have been found useful in suppressing nematodes and reducing crop damage. The parasitic bacteria, *Pasteuria penetrans*; and toxin producing bacteria such as *Pseudomonas fluorescens*, etc., have been found to be highly effective biological control agents of nematodes. These organisms can be introduced into the nematode infested area and ecological conditions can be created to enable their establishment in the problem area.
- **Chemical control:**
  - A. **Fumigants:** e.g. DD- a mixture of 1, 3-dichloropropene, 1, 2-dichloropropane, EDB-ethylene dibromide, MBr-methyl bromide, Nemacone (DBCP dibromochloropropane).
  - B. **Non-fumigants:** (i) Carbamates: Aldicarb, Carbofuran, Oxymyl, Metham Sodium. (ii) Organophosphate:-Thionazin (Nemaphos), Phorate (Thimet), Phenamiphos (Nemacur).
- **Physical control:** Hot water treatment (54 °C for 10 – 15 min.) Irradiation, Osmatic pressure and Ultrasonic.

- **Regulatory methods:** such as adoption of legislative quarantine regulations e.g. potato tubers used as seed materials restricted use from Nilgiri hills (TN) to other part of country.
- **Crop rotation:** It is most effective for Molya disease control by growing of mustard and gram.
- **Trap/Antagonistic crop:** Use of trap crops can be effective. For eg.-
  - I. Mustard: contains Allyl isothiocyanate toxic for cyst nematode.
  - II. Marigold: contains  $\alpha$  - terthienyl, reduce population of *Meloidogyne spp.*, *Paratylenchus* and *Rotylenchulus*.
  - III. Garlic, onion and beans growing as intercropping useful for suppressing *Meloidogyne spp.*
- **Flooding:** it kills nematode by asphyxiation.
- **Use of healthy propagative parts:** Propagation through healthy planting material.
- **Soil sterilization:** nursery beds are treated with formalin @ 2 lit / m<sup>2</sup> before 15 days of crop sowing is very effective for control of soil borne pathogen and nematodes.
- **Use of resistant varieties.**