



Disease Complex of Root-Knot Nematode (*Meloidogyne* spp.) with Fungus in Cotton and Its Management

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Being an important cash crop with wide importance in agriculture economy cotton is grown entirely in tropical, subtropical, and warm-temperature countries throughout the world including India. In India, Maharashtra, Punjab, Haryana, Gujarat, Madhya Pradesh, Karnataka and Andhra Pradesh are the major producing states of Cotton and commonly grown in northern part of country, Gujarat and Tamil Nadu. The cultivation of cotton is adversely affected by various constraints like biotic (insect-pests and diseases including plant parasitic nematodes) and abiotic factors (rainfall, temperature, humidity, soil-type, soil chemicals and pH etc.) Among biotic factors, plant parasitic nematodes (PPNs) are responsible for causing accountable loss (~15-25%) to cotton crop. The major nematodes species of cotton i.e. root-knot nematode, reniform nematode, lesion nematode, lance nematode and sting nematode etc are well adapted to warm environments.

In Northern cotton-growing areas, the root-knot nematode (*Meloidogyne incognita*) is an important pest of cotton crop. *M. incognita* is widespread in cotton growing regions of Punjab and Haryana on *G. hirsutum* (American) and *G. arboreum* (Desi) cottons, with a distinctive appearance of like galls on the roots. Cotton fields showing characteristic patchy growth and poorly growing plants can be seen in areas around Sirsa, Fatehabad and Hisar district of Haryana. *M. incognita* is responsible for 20.5 per cent total yield losses, estimated as Rs. 4717.05 million losses proving to be the economically most important pest in cotton (Kumar *et al.*, 2020). In India, only race 3 and race 4 of *M. incognita* parasitize the cotton crop causing yield losses, with galling being most extensive on *G. hirsutum*. Besides this, it also causes complete crop loss by forming disease complexes with other Phyto-organisms as like fungi, bacteria, viruses etc.

Symptoms

The above-ground parts symptoms of root-knot nematode attack on cotton are not very diagnostic. Infestation results in uneven, pale, stunted and sick crop. The general symptoms of damage include dwarfing, chlorosis and temporary wilting and a general unthrifty appearance giving the look of nutritional deficiency symptoms due to the slow debility of affected roots to function properly for nutrient, water uptake and translocation even when adequate fertilizers and moisture are present in the fields. The other symptoms may include dieback, yellowing, wilting and premature shedding of the foliage with severe stunting. High population density of the nematode at sowing can kill the plants at seedling stage.

- Poorly developed tap root system and shallow lateral roots of infected plants are due to the parasitisation of root-knot nematode.
- The below-ground symptoms include galls or knots on the roots. Galls on cotton roots not as numerous and enlarge as much in succulent roots being woodier.

- Less number of bolls set and small in size is the common above ground symptom manifested due to malfunctioning of water and nutrient uptake and translocation.
- The early season crop may suffer more, wilting of infected plants and slow rate of stress recovering.
- Wilting and even death of plant is more common in presence of disease complexes.



During cropping season, the nematode population grows rapidly and poor growth of infected plants in patches reflects the common symptom of nematode infection

Disease complexes of nematode and fungal pathogens

Besides, inflicting direct damage to the plants, *M. incognita* interact with other micro-organisms (fungi, bacteria, viruses etc.) and thus form disease complexes as phytophagous nematodes are part of soil micro fauna like other organisms. In all these synergism interactions, there is greater



incidence of wilt or seedling disease with greater yield suppression when cotton is exposed to multiple pathogens than when only a single pathogen is present. PPNs interact with these microorganisms in one or another way. Atkinson (1892) observed the increased severity of Fusarium wilt of cotton in soils harbouring root-knot nematodes was the first report of an interaction between a fungal pathogen and a PPN. Interactions involving PPNs and fungal pathogens in cotton fall into two general categories;

- i) Interactions between nematodes and seedling disease pathogens.
- ii) Interactions between nematodes and vascular wilt pathogens.

Management

Nematode management of cotton based on to prevent the yield losses and quality of the crop. to keep the nematode population below ETL continuous monitoring of the crop and necessary measures can be taken these measures include:

- Hot summer months in northern India can be utilized profitably for deep summer ploughing as it is known to be a very effective farm operation in reducing nematode population.
- Grow non-host crops; Guar, Onion, Garlic, Cereal etc. which reduced root knot populations.
- Crops as Mustard, Sesamum, Sunnhemp, Asparagus and African marigold have antagonistic effect which suppresses root-knot nematodes.
- Use of resistant/ tolerant varieties (Bikaneri nerma, Sharda, Paymaster) is most economical method.

- Seed treatment of cotton with *Gluconacetobacter diazotrophicus* strain 35-47 (biotica) @50ml/5kg seed against *M. incognita*.
- Seed treatment @ 20g/kg of seed + soil application @ 2.5kg/ha of *Pseudomonas fluorescens* reduced nematode population.

References

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