

**Nishi Keshari**

Assistant Professor  
Department of Nematology  
RPCAU, Pusa, Samastipur  
Bihar, India - 848 125

**Corresponding Author**

Nishi Keshari  
[nishi@rpcau.ac.in](mailto:nishi@rpcau.ac.in)

# Management of Nematodes in Horticultural Crops

The plant parasitic nematodes are the hidden enemies of many crops causing huge losses by infecting individually or causing complex disease by interacting with other plant pathogens. The horticultural crops are the cash crop of growers and because of their high nutrient value, the production cost is also high. For getting off-season products, protected cultivation is getting beneficial for handsome earning of cultivators but due to plant parasitic nematodes, the quality and quantity of these produce are hampered and proper return could not be achieved in market. Since these organisms are microscopic and most of them are found in soil so, they could not get noticed. Their population could not be eradicated because of their high population and very well developed survival strategy. So, managing them below economic damaging level, certainly helps in enhancing the quality of produce and good return to the farmers.

## INTRODUCTION

The horticultural crops are gaining popularity since a few years because people are now becoming more aware of hygiene and health. So, they are growing fruits, vegetables, flowers, medicinal and aromatic plants, spices, condiments in their small gardens, fields, even in small plots or earthen pots or in their balconies whatever the area they have. The plant parasitic nematodes are causing many losses in these crops that most of the people do not assess because very few people are aware of these microscopic organisms. Since these are hidden in soil and because of their small size (0.5-2 mm), they could not get noticed. The symptoms they produce, are confused with nutrient deficiency as they feed on roots and so roots become unable to take water and nutrients from soil and so, photosynthesis of plants get disturbed showing stunting, yellowing and wilting. These symptoms are also produced when the soil becomes deficient in

proper nutrition. The nematodes have short life cycle and high reproduction rate, they build up their population very high within a short span of time. Even though the farmers and growers use many control methods but some nematodes are difficult to manage because of their polyphagous nature like root knot nematodes, reniform nematodes, lesion nematodes etc. have a wide host range and a small number of crops are available for crop rotation on which they do not multiply. They do not only affect the plant health but they deteriorate the quality of produce which do not fetch a good return in market. If the soil is already infested with sufficient number of nematodes, the seedlings and planting materials like corms, bulbs etc. get infested and do not develop properly. The damage caused by nematodes, are also get infected easily by other plant pathogens because the root cells and plant cells get exposed to the environment inviting the spores of fungi and bacteria who develop fast and multiply to cause rotting and complex disease symptoms to the plants. These nematodes mostly spread through transport of soil from infected part to healthy part. It may be due to movement of human feet, animal feet, farm implements or due to irrigation water flowing from infected fields to healthy fields.

### LOSSES DUE TO NEMATODES

Some nematodes also feed on aerial parts of plants like flower buds, leaves, stems, flowers etc. causing a high yield loss. The average loss estimated, is about 12.3 % in all the crops infected by plant parasitic nematodes. The fruits and vegetables are more prone to these nematodes compared to other crops. In potatoes, the cyst nematode, *Globodera rostochiensis* are causing diseases and because of this, a quarantine rule is there at Nilgiri hills. Now, this is spreading to nearby areas and plains also. The citrus nematodes, *Tylenchulus semipenetrans* causing huge losses in all type of citrus plants whether it is young or old. The burrowing nematode, *Radopholus similis* which is a major disease causing nematode in plantation crops like black pepper, banana, areacanut, coconut etc. The root knot nematodes are the number one notorious nematode in all the nematodes. It can infect most of the crops. It produces small to large root knots on the roots as a result of feeding on roots. It produces root knots or galls on almost all fruit crops like, banana, papaya, guava, pineapple, jackfruit etc., in vegetables like all cucurbits, okra, tomato, chilli, brinjal etc. The root vegetables like carrot, beet etc. can get enough losses (Nagesh *et al.*, 2005). It can

infect more than 3000 plant species (Abad *et al.*, 2003). They need tropical and sub tropical climate for their development. The size of galls depend on the size of roots. If roots are small and delicate, small root knots are formed and if roots are fleshy and thick, large sized galls are formed. The carrot experiences forking and small galls on its roots yielding in worse quality which gets no return or less return during selling.

The nematodes also play a major role in breaking the disease resistance because of weakening of plants due to its feeding. So, they incite the other pathogens to attack for which the plants are earlier found resistant. They are the most advanced nematodes as they have developed high adaptation with the plants life cycle and feeding on the root cells and modifying their physiology. They have high fecundity. A female root knot nematode can lay 200-500 eggs in its whole period of life. Recently a new species, *Meloidogyne enterolobii* became a threat of guava causing root knots and the plants undergo wilting and finally become dry (Poornima *et al.*, 2017).

Now a days, off-season vegetables and flowers are grown in protected cultivation where the nematodes multiply very rapidly because of optimum climatic conditions and proper moisture. So, this protected cultivation, now, is becoming an endemic for this disease spread.

Since nematicides are not much available and we have to rely on insecticides and fungicides or bactericides for their management. These are expensive as well as have adverse effect on the soil and air environment. So, the eco-friendly management practices should be exploited and protect our environment through natural control methods.

### MANAGEMENT

The management of nematodes, although is very difficult but their population can be lowered to below economic damage level so that the plants do not suffer much and it can compensate the losses or it can tolerate the disease symptoms. The following methods can be done to lower the population of these plant parasitic nematodes

1. Healthy and certified seeds should be used. It should not be taken from the field where the crops have a history of any disease or pests

2. Seed treatment and seedling treatment should be done before sowing and planting to protect the crops from the nematodes
3. Field sanitation is important. Between two crops, the fallow field should not develop weeds or off plants because polyphagous nematodes can complete their life cycle on these crops and build up their population enough to infect the next season crops
4. Use of biocontrol agents which are available and also use the botanicals from easily available antagonistic plants
5. Crop rotation could be done with green manuring crops like sunn hemp, cowpea, Vetch (*Vicia sativa*) etc. or with non-host crops or antagonistic crops like marigold, mustard, asparagus etc.
6. Soil solarization is the foremost effective method of nematode management. The main field could be deeply ploughed in summer season twice or thrice at an interval of 15 days or the nursery soil can be solarized by covering with transparent polythene for 2-3 weeks because it enhances the temperature inside the soils and kills the nematodes and other plant pathogens as well as insect larvae and eggs. The soil should be wet for effectiveness of this method.
7. Use of FYM, leaves of neem and vegetables, crop residues inside the soil can enhance the soil quality like soil texture, soil structure and soil fertility which increases the resistance power of plants to tolerate or resist the nematode development. FYM or vermicompost @ 18-20 kg/ha can also help in reducing or killing the nematodes, their juveniles and eggs inside the soil. Also precaution should be taken in applying compost that these should be incorporated at least 15-20 days prior to sowing or transplanting of the crops. The non-edible oilseed cakes of neem, karanj, mustard, castor etc. can be added in soil @ 3-4 q/ha before sowing.
8. For potato cyst nematodes, growing of non-host crops like, cauliflower, cabbage, turnip, carrots, garlic, beet root, radish etc. is beneficial.
9. Seed treatment could be done with *Pseudomonas fluorescens* @ 20 g/kg seeds and its soil application it could be used @ 2-5 kg/ha
10. For the management of burrowing nematodes, the planting materials of plantation crops should be treated with hot water at 50-55°C for 20-25 minutes. For this the boiling water should be mixed with normal water to get the temperature of 50-55 °C as water boils at 100 °C
11. The citrus planting material should be raised in nematode free soil. If it is purchased then the roots should be treated before planting with neem based chemicals or any pesticides like carbofuran or carbosulfan. The soil should be tested in a nematological laboratory.
12. The cleanliness should be maintained in cultivation of any crop that no implements should be used without proper cleaning.
13. In citrus trees, the oil cakes should be applied @ 1 kg/plant
14. Alternate drying and wetting of soil is important for managing reniform nematodes as these keep their 2/3<sup>rd</sup> part of body outside the root, so dryness kills these nematodes

### CONCLUSION

The plant parasitic nematodes are one of the major causes of yield loss and quality reduction in fruits, vegetables, flowers, ornamentals, medicinal and aromatic plants, spices and condiments. As the nematicides have residual problem on soil and plant, so natural and organic methods should be used to manage them. The farmer's awareness about the nematode damages and the losses as well as the management practices should be done through trainings, workshops, field days, kisan goshti or through print media.

### REFERENCES

- Abad, P., Favery, B., Rosso, M.N. (2003). Root-knot nematode parasitism and host response: Molecular basis of a sophisticated interaction. *Molecular Plant Pathology*, 4, 217-224.
- Nagesh, M., Hussaini, S. S., Chidanandaswam, B. S. (2005) Incidence of root-knot nematode, *Meloidogyne incognita* on gherkin, *Cucumis sativus* and yield losses. *Indian Journal of Plant Protection*, 33, 309-311.
- Poornima, K., Suresh, P., Kalaiarasan, P. (2017). Root knot nematode, *Meloidogyne enterolobii* in guava (*Psidium guajava* L.) a new record from India. *Madras Agricultural Journal* 2017; 103(10/12): 359-365.