

NEMATODE BIOCONTROL

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Nematodes, the unseen enemies of plants are ubiquitous in nature. Only recently they have been recognised as crop pests. They are slow pathogens causing debility in plants and the damage done by them often goes unnoticed or is overlooked. This has caused the delay in labelling them as pests of crops. These tiny creatures are now considered as very serious enemies of farmers because of the destruction they cause directly or indirectly to the agricultural and horticultural crops and also to several other important crops including cash crops like cardamom, coffee, tea, etc. There is hardly any plant which does not host one nematode or the other. The crop losses due to nematode pests are not only in the form of reduced plant growth and yield but are also due to the poor marketable quality of the produce.

In India, a total of 300 different species of nematodes have so far been identified as parasites causing damage to different economic crops. Some workers have attempted to assess the damage caused by these nematodes in terms of monetary losses. There are some reports which indicated heavy crop losses due to the attack of nematodes.

Van Berkum and Sheshadri (1970) gave for the first time such

an account. According to them the seed gall nematode in wheat *Anguina tritici* caused \$ 10 million loss to wheat crop. The root lesion nematode *Pratylenchus coffeae* inflicted a loss of 3 million to coffee and the cereal cyst nematode *Heterodera avenae* caused Rs.8 million loss to wheat and barley (in Rajasthan province alone) annually.

The burrowing nematodes (*Radopholus similis*) causes damage to the roots of coconut, arecanut, black pepper and banana. This endoparasitic nematode is vermiform and microscopic, the length of the body - ranging from 0.05 mm to 1 mm. Due to the infestation by this nematode a large number of lesions are formed on the root system resulting in rotting of the infected roots at a later stage. The crop loss due to the burrowing nematode has not been studied properly due to the complex nature of damage it causes. But it has been estimated that there is a 30 per cent increase in yield in the noninfested coconut palms when compared to the infested ones (Sosamma *et al.*, 1989).

The losses caused by nematodes are enormous and warrant efficient control measures. Since nematode is a soil borne organism before adoption of control measures a complete understanding of the

behaviour of the nematode species involved on the host plant and ecological constraints is very much essential.

Eventhough physical, cultural and chemical methods are used for controlling nematodes, biological control methods are getting prominence. They are cheap and have no side effects. Sewell (1965) defined biological control as the induced or natural, direct or indirect limitation of a harmful organism or its effects by another organism or group of organisms. Biological control measures against nematodes include the use of predaceous or parasitic organisms such as certain fungi, bacteria, protozoan, viruses, nematodes, etc. This method of control can be considered as a skillful manipulation of the biosphere against nematode pests for achieving maximum benefits. Eventhough the concept of biocontrol is still in its infancy, its tremendous potentials have been demonstrated by research results obtained in recent times.

The organisms used for biocontrol of nematodes could be categorized as predators and parasites. Cobb (1920) postulated use of predaceous nematodes for biocontrol of plant parasitic nematodes. Since then lot of work has been carried out in this field. Though many nematodes have

shown predacity *in vitro*, positive evidence at field level is still awaited. Most predacious nematodes belong to the group *mononchide*. Fungi are also used as biocontrol agents against nematodes. *Paecilomyces lilacinus* is one such antagonistic fungus. This biocontrol agent was successfully used for controlling burrowing nematode of banana during 1966. Again the success story was repeated when another endoparasitic nematode *Pratylenchus* affecting maize was controlled. But the experiment conducted by Jatala (1985) by using *Paecilomyces lilacinus* for controlling *Tylenchulus semi penetrans* in citrus was found to be very successful. Reddy and Khan during 1988 controlled *Rotylenchulus* in tomato roots using the same fungus.

Sosamma and Koshy in 1989 could control the burrowing nematode population in arecanut and pepper by using *Paecilomyces lilacinus* under green house conditions.

Mankau and Prasad in 1975 reported that the bacterium *Pasteuria penetrans* is very effective in controlling nematode population. In fact in India the use of the bacterium *Pasteuria penetrans* as a biological control agent had been initiated only from 1977 onwards. Sosamma *et al* (1991) reported that the burrowing nematode *R. similis* in arecanut seedlings could be controlled by *Pasteuria penetrans* under green house conditions.

The use of vesicular arbuscular (VA) mycorrhizae as a component in biocontrol measures is bringing down the nematode population in coconut, arecanut, pepper,

subabul, ginger, cardamom etc. in Central Plantation Crops Research Institute. It was observed that when introduced into the root zones of these crops the inoculated plants suffer less in comparison to the uninoculated ones.

Organic amendments have been used for crop improvement by farmers since the advent of agriculture. Ancient Greek and Roman writings mention benefits to crops due to manuring. The beneficial effects of organic amendments against nematode diseases have been discovered only very recently. Singh and Sitaramaiah (1970), Sayre (1971), Muller and Gorch (1982), Siddique (1986) and Linform (1937) got significant reduction in root knot nematode population by organic additives. It is now well established that organic soil amendments effectively suppress noxious nematodes to varying extent depending upon the type of organic matter, species of nematode involved, host plant species and the prevailing ecological conditions. Addition of organic matter to soil stimulates microbial activity (Rodriguez-Kabana *et al*, 1987) and this leads to the control of nematode population. In Central Plantation Crops Research Institute experiments using neem

cake were conducted in arecanut based cropping system and the results showed that the application of neem cake twice a year @ 1 kg/plant can control plant parasitic nematode population in the field level.

Though the desired level of control of nematodes has not yet been obtained by using biocontrol agent, a large number of organisms have recorded their potential to name a few, fungi like *Verticillium chlamydosperum*, *Paecilomyces lilacinus*, *Nematophthora gynophila* and *Catenaria auxiliaris* and bacteria like *Pasteuria penetrans* and *Bacillus penetrans* all proved their worth under certain conditions. Some of the crops like marigold, mustard, rocket salad, etc. have also shown fairly good qualities in reducing nematode population.

Now that some organisms are available as potential biocontrol agents, research has to be directed for evolving techniques by which their effectiveness is maximised. Also development of technology to incorporate them as a component in integrated nematode management needs emphasis. Then this environment friendly economical method of controlling nematode pests would come to stay.

Biodiesel is most important oil, says study

According to *Oils and Fats International* No.4 of 1994, vegetable oils as biodiesel will have the most important industrial application in the future. A study says that if both the EU and the USA were to replace a much as 5 per cent of traditional diesel fuel with biodiesel, the impact on many industries allied to the world food chain would be immense. Among the consequences would be the need to increase oilseed production by 60 per cent in the United States and by 400 per cent in the European Union, as well as a large capital investment for the crushing volume of oilseeds."

-The Cocomunity