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## Sustainable development for the management of nematodes in the banana root of Muzaffarpur

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**Abstract-** Banana is a major agricultural crop in North Bihar. It is an affordable and high nutritional value and a rich source of various vitamins and minerals. It reduces blood pressure and the risk of heart and kidney disease. Banana is a perennial crop, which is why it is a suitable condition for the abundance of the parasitic nematodes and their population increase in its root along with rhizosphere soil. Plant-parasitic nematodes can be controlled by different methods. Most of the workers developed and identified several sustainable developments for the management of banana nematodes. In which different cropping systems and integrated pest management are incorporated. In recent times, different strategies for host management and cultural practices like sanitation, and complete removal of infected plants along with rhizomes. Plantation of healthy crops, Rotation of crops with nonhosts. Use of nematicides, prevent the infestation and spread of nematodes, Irrigation with fresh water and not with drainage water. Farmers were suggested to the plantation of Tagetes. The nematode control is important for growth, quality, and yield by keeping the nematode population below the economical threshold level. It is a part of the Green revolution in Banana crop production for sustainable development with women empowerment

**Key words:** Sustainable development, women empowerment, Integrated pest management, parasitic nematodes, Rhizosphere, green revolution

### INTRODUCTION

Nematodes are found in different forms, root-knot nematodes cause disease in banana crops in north Bihar. The banana plant is severely damaged by nematode paste and farmers are unaware of this. A survey was conducted in the different localities at Muzaffarpur to identify the infected plants. Infected plants were identified by above-ground and underground symptoms such as curling of leaves, reduced flower sheath, and fall of immature fruit bunch, and in underground symptoms, the primary and secondary roots had galls of different sizes.

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Numerous workers do research on the management of plant-parasitic nematodes through sustainable agriculture and integrated pest management implementation. They focus on developing different strategies for sustainable nematode management by different agriculture systems. A sustainable agriculture system maintains the reproduction capacity of the soil. Besides other environmental factors, the temperature is very important for the spread of root-knot nematode in banana plants worldwide. It was observed in banana and other vegetable crops, that the increase in temperature beyond 20°C may promote nematode infestation in banana crops. Plant-parasitic nematode decreases the growth of

plants and also decreases the yield of the banana crop. Plant-parasitic nematodes limit the productivity of bananas as yearly losses are estimated to be 5% to 12% annually.

Meloidogyne, Heterodera, and Rodophylus are the most common devastating losses in banana crops. Nematode control aims to improve growth, quality, and yield by keeping the nematode population under control. It is a type of green revolution in Banana crop production for sustainable development with women empowerment.

## LITERATURE REVIEW

Due to the polyphagous nature of the nematodes in general and *Meloidogyne incognita* in particular, this nematode has been from different parts of the country on the different economically important crops. Nematology laboratory was established in 1961 at Agricultural College and Research Institute Coimbatore, with the assistance of the Rockefeller Foundation and the Indian Council of Agricultural Research. In 1966, a division of Nematology was established at IARI, New Delhi.

In 1982, the Department of Nematology was established at Rajendra Agricultural University, Pusa, Bihar. In the present study work done on the root-knot disease of bananas has been discussed. Rajagopalan and Chinnrajan (1976)<sup>1</sup> reported plant-parasitic nematodes, associated with bananas they reported the loss in the yield due to this pathogen. Nair (1979)<sup>2</sup> studied the root-knot disease of bananas and suggested its control through chemicals. Rajendran *et al.* (1979)<sup>3</sup> studied the infection of bananas by nematodes. They suggested different sources of inoculums.

Mukherjee and Dasgupta (1983)<sup>4</sup> studied the infected banana in the Hooghly district of West Bengal and reported the community of nematodes present there. Bhattacharya and Rao (1984)<sup>5</sup> reported the effect of soil covers and soil moisture on the Nematode population in soil and in studied the efficacy of some plant extracts on Nematodal disease in the field.

Chaudhary and Phukan (1992)<sup>6</sup> studied the plant-parasitic Nematodes associated with bananas in Assam. They correlated the nematode population and the damage caused by them.

Mani and Prakash (1992)<sup>7</sup>, reported the distribution of nematodes associated with certain principal crops in Andhra Pradesh and predicted the expected loss due to this parasite. Araya and Cheve (1994)<sup>8</sup> reported the host

status of *Crotalaria*, *Sesamum*, and *Dolichos* to *Meloidogyne javanica*. Prasad *et al.* (2000)<sup>9</sup> observed the antinomic activity of Marigold (*Tagetes exacta* L.) flowers. They also examined the chemicals extracted from it.

Prasad and Reddy (2000)<sup>10</sup> studied the pest problem and after a survey prepared the reports. Devarajan and Rajendran (2001)<sup>11</sup> studied there action of some Banana clones to the burrowing nematodes *Rodopholus cialis* in bananas. Vyas *et al.* (2001)<sup>12</sup> suggested the management of root-knot nematodes in bananas.

Sundararaju and Cannayane (2002)<sup>13</sup> studied the fungus *Paecilomyces lilacinus* that parasites on the eggs of Nematode on the banana waste and certain plants' leaves. They suggested its use to control the pathogen, and reported the best treatment for the nematode population on bananas using the artificial network.

## MATERIAL & METHODS

### Nematode Management

For the management of plant-parasitic nematodes, nematologists developed integrated pest management systems. IPM strategies were found to be very effective in the sustainable management of most of the nematodes in banana crops. IPM is found very effective in the control and spread of root-knot nematodes.

Roberts indicated that different management practices may be applied for the successful management of nematodes in bananas. There are some strategies for the sustainable management of root-knot nematode:

1. Use of nematode-free antagonistic crops,
2. Use of chemical-free practices like crop rotation and soil cultivation,
3. Use of different organic soil management,
4. Use of alternative cropping systems to increase tolerance to nematodes.

## RESULTS & DISCUSSION

After the implementation of the above methods for sustainable nematode control, the following results have been obtained.

### Integrated pest management:

To avoid the use of nematicides in the control of nematodes, IPM is being used to integrate available resources and cropping systems. Most IPM practices have focused on nematode biology, host and damage, etc.

### Nematode management and soil life:

Study of soil biology, nematode type, host-pathogen relationship, cropping systems, and growth-promoting bacteria have the potential for the development of new ideas for the sustainable management of nematodes as well as increased banana crop yields.

### Biocontrol of nematode:

Nematodes are a very good bioindicator of soil ecology as plenty of nematodes in the soil indicate a positive correlation with banana crop productivity but a negative impact on plant growth due to excessive root-knot galling. Several weeds of crops are directly or indirectly associated as hosts to certain plant-parasitic nematodes like *Meloidogyne*. In banana fields, crop rotations have been used frequently to control plant-parasitic nematodes. Different antagonistic plants like mustard, rapeseed, marigold, etc. are very effective for sustainable management of nematodes. Uses of nematode-resistant varieties are one of the most economical for sustainable nematode management.

### Nematode management and Modern Technology:

For the sustainable management of nematodes in bananas have been developed for more practical and effective control, and the modern techniques will be found to be more effective results in the sustainable management of nematodes.

### Nematode control through Genetic engineering:

Genetic engineering is a very useful tool in the management of nematodes and increasing disease resistance in banana plants.

## CONCLUSION

Sustainable development for the management of nematodes in banana root involves traditional and genetically engineering practices that should reduce the population of root-knot nematodes and decrease the dependency on synthetic pesticides and nematicides and significantly increases the yield of crops. The development of a sustainable nematode management system is required to develop very convenient and effective control measures of various nematodes to reduce every possible loss to banana crops to fulfill the increasing demand of rapid increase in population world over to improve banana plant growth and productivity with women empowerment.

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