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Short Communication

ROOT-KNOT DISEASE AND ITS MANAGEMENT IN BRINJAL

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ABSTRACT
Plant parasitic nematode population was controlled by using Bio-agents and Botanicals These methods were applied to control *Meloidogyne Incognita* (root-knot nematode) on Brinjal (*Solanum Melongena)* to reduce the number of root galls, egg masses there by increased the yield and plant growth. The best control of root-knot disease was accomplished when bio-agents such as *Paecilomyces lilacinus*, *Trichoderma harzianum* and Botanicals such as Neem cake extract, mustard oil cake, neem leaf, castor cake extract were used.

KEYWORDS: Bio-agents, root-galls, *Meloidogyne Incognita*, Botanicals.

INTRODUCTION

Plant parasitic nematodes are microscopic round worms that feed on and damage plants. The most common serious nematode is the root-knot nematode found throughout the country (Fourgani and Edongali, 1989) with a very wide host range among all the cultivated crops in the country. All plant parasitic nematodes have a stylet at the anterior end which can be protruded and used like a hypodermic needle to penetrate the plant cells. The most striking feature of nematode distribution and damage within a field is the irregularities of infested areas, damaged crops will appear as irregular patches or streaks that may vary in size, shape and number. These variations usually reflect the compounding of nematode stress (as a function of population density, feeding behavior, damage potential, host response etc.) on a plant by such other factors as physical soil differences, irrigation and drainage patterns. The root-knot nematodes are most important pest of Brinjal crop. It's been reported that *Meloidogyne Incognita* form root-galls which can be controlled effectively by using the Bio-agents and Botanicals which in turn increases the yield and plant growth.

MATERIALS & METHODS

The root-knot nematode was controlled by using integrated methods such as bio agents *Paecilomyces lilacinus*, *Trichoderma harzianum* and botanicals such as Neem cake extract, mustard oil cake, neem leaf, castor cake extract. Nursery beds of Brinjal were prepared by using above bio agents and botanicals. Brinjal seedlings raised in these treatments were transplanted in pots and observed for plant growth and reduction in root galls. Five pots were taken for each treatment where each pot was having 7 kg of sandy loam soil. The inoculation of *Paecilomyces lilacinus* at 4 g./kg of soil in combination with mustard oil cake at 0.5 and 1.0 t/ha increased plant growth with corresponding decrease in number of galls, egg masses of *Meloidogyne Incognita* on Brinjal. Application of 10% neem cake extract (at 20 ml/pot) mixed with spores of *Paecilomyces lilacinus* (at $1x10^6$ spores/ml.) was effective in increasing plant growth and reducing root galling final nematode population both in soil and roots. The above treatment also gave maximum parasitization of egg masses *Meloidogyne Incognita* and spore density of *Paecilomyces lilacinus* in soil (Rao and Parvatha Reddy, 1994). Reduction in root galling and final nematode population of *Meloidogyne Incognita* were observed in brinjal seedlings which were given bare root dip treatment in 10% neem leaf suspension mixed with spores of *Paecilomyces lilacinus* (at $4x10^5$ spores/ml) for 30 minutes. Significant increases were also observed in root colonization, parasitization of eggs and spore density of *Paecilomyces lilacinus* in soil (Rao *et al*., 1997b). Root dip treatment of Brinjal seedlings in neem cake extract base formulation of *Paecilomyces lilacinus* (at $5x10^6$ spores/ml) for 20 minutes and planted in pots gave significant increase in plant growth, root colonization and parasitization of eggs of *Meloidogyne Incognita*. Application of castor cake extract based formulation of *Trichoderma harzianum* (at 500 ml/$m^{2)}$ containing $9.9x10^3$ spores/ml) to nursery beds of Brinjal was effective in producing vigorous seedlings (with maximum seedling weight) with least root galling. Above treatment also increased root colonization and parasitization of *Meloidogyne Incognita* females by *Trichoderma harzianum* (Rao *et al*., 1998d).

Below were the treatments of root-knot disease for Brinjal:

Paecilomyces lilacinus + mustard oil cake
Neem cake extract + spores of *Paecilomyces lilacinus*
Bare root-dip treatment of neem leaf suspension + spores of *Paecilomyces lilacinus*
Root-dip treatment of Brinjal seedlings in neem cake extract + of *Paecilomyces lilacinus*
Castor cake extract + *Trichoderma harzianum*

Proper irrigation was done to the pots throughout the study of nematodes and daily temperature maintained between 26-33^{o}C. Treatments were replicated 4 times. Plant growth was observed periodically and symptoms were recorded if any. After 8 weeks, plants with soil were carefully removed from the pots and their roots were washed gently

under water. 1g of root sample was taken from each plant and was examined for number of galls and egg masses after staining by lactic acid-fuchsin and data recorded (Byrd *et al*., 1983).A stereomicroscope was used for counting root galls and egg masses on the root system of the plant from each pot.

RESULTS & DISCUSSION

Below data in Table (1) indicates that all applied treatments caused considerable reduction in numbers of root galls and egg masses of *Meloidogyne incognita.*

Best control of *Meloidogyne incognita* was achieved when 10% neem cake extract (at 20 ml/pot) was used with spores of *Paecilomyces lilacinus* (at $1x10^6$ spores/ml). This gave maximum reduction in root galling (87.53%) and egg masses (71.20%) there by increased yield (64.36%). Root-dip treatment of Brinjal seedlings in neem cake extract with *Paecilomyces lilacinus* (at $5x10^6$ spores/ml) for 20 min resulted 84.23% reduction in root galls and 70.90% reduction in egg masses which was ranked second. Application of caster cake extract with *Trichoderma harzianum* (at 500ml/m^2containing $9.9x10^3$ spores/ml) was proved the least effective treatment where reduction in root galls was 70.30% and reduction in egg masses was 59.26%

TABLE 1. Integrated management of root-knot nematode in Brinjal with Bio-agents and Botanicals

Treatment / Dose	% Reduction in root galling	% Reduction in egg masses	% Increase in yield
Inoculation of *Paecilomyces lilacinus*at 4g/kg of soil + Mustard oil cake at 0.5 and 1.0 t/ha	73.36	68.20	52.50
Application of 10% neem cake extract (at 20 ml/pot) + spores of *Paecilomyces lilacinus* (at $1x10^6$ spores/ml)	87.53	71.20	64.36
Bare root-dip treatment in 10% neem leaf suspension + spores of *Paecilomyces Lilacinus* (at $4x10^5$ spores/ml) for 30 min	81.00	68.40	49.50
Root-dip treatment of Brinjal seedlings in neem cake extract + formulation of *Paecilomyces Lilacinus* (at $5x10^6$ spores/ml) for 20 min	84.23	70.90	58.20
Application of caster cake extract + *Trichoderma harzianum* (at 500ml/m^2containing $9.9x10^3$ spores/ml)	70.30	59.26	48.20

The infected plants are stunted with dried peripheral branches bearing smaller chlorotic leaves almost turning to white in later stages (Rajendran et al., 1976). The root-knot nematodes, causing root galls are the most well known nematode parasites of plants. These are prevalent in all parts of the world, mainly in sub-temperate, sub tropical and tropical regions affecting almost all agricultural crops including Brinjal. Root-knot nematode (*Meloidogyne* species) is a sedentary endoparasite. Neem derivatives such as azadirachtin, nimbin, cake extract, leaf extract have been effectively employed for seed treatment of Brinjal against *Meloidogyne incognita*. The effect of various neem products and formulations might be due to the direct nematode toxicity of the seed coatings and making the environment unfavorable for nematode activity. Plants grown from coated seeds possibly acquire resistance or tolerance to the nematodes (Siddiqi and Alam, 1989b). Nursery bed treatment was found effective against Brinjal (Khan *et al*., 1976). *Paecilomyces Lilacinus* is by far the most promising and practicable bio control agent for the management of root-knot nematodes. *Paecilomyces Lilacinus* increased growth of Brinjal and reduced root galling, egg masses and number of eggs per egg mass of *Meloidogyne incognita* (Sharma and Trivedi, 1989). In this context developing 'Integrated Nematode Management' (INM) strategy is the challenge before the nematologists. INM is a systems approach that in the context of the associated environment and the population dynamics of the nematode species, utilizes all suitable techniques and methods in as compatible manner as possible and maintains the nematode populations below those causing economically unacceptable damage or loss

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