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Biocontrol potential of the parasitic fungus *Paecilomyces lilacinus* against the root-knot nematode *Meloidogyne incognita* in banana

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ABSTRACT: **Greenhouse studies were conducted to evaluate the biocontrol potential of the parasitic fungus *Paecilomyces lilacinus* (Thom.) Samson, against the root-knot nematode *Meloidogyne incognita* (Kofoid and White 1919) Chitwood 1949 in banana. Application of *P. lilacinus* (multiplied in neem cake) @ 15 or 20 g/plant significantly reduced the root gall index, egg masses, eggs, females and soil population of the nematode. The fungus penetrated the egg masses and egg masses contained only empty eggshells. Significant increase in plant growth was observed by application of *P. lilacinus*. The biological control treatment was comparable with carbofuran @ 40 g/plant.**

KEY WORDS: Banana, *Meloidogyne incognita*, *Paecilomyces lilacinus*

Banana, *Musa* spp. is an important commercial fruit crop grown world wide, both in the tropical and sub-tropical conditions. The root-knot nematode, *Meloidogyne incognita* is commonly associated with the crop and causes 29 per cent yield loss (Jonathan, 1994). Recent survey conducted in major banana growing areas of Tamil Nadu indicated severe incidence of the nematode throughout the state (Jonathan *et al.*, 1996). Management of nematode using biological antagonist have emerged as an alternate strategy, since the nematicides available are very few, expensive and lead to health hazards to human beings and animals. The bio-control potential of the parasitic fungus, *Paecilomyces lilacinus* (Thom.) Samson was reported against the *Meloidogyne* spp. (Jatala *et al.*, 1980). A study was, therefore, conducted to assess the efficacy of *P. lilacinus* against *M. incognita* in banana under pot culture condition.

MATERIALS AND METHODS

Pot culture experiments were conducted at Sugarcane Research Station, Sirugamani Tamil Nadu during 1997 to evaluate the efficacy of the parasitic fungus, *Paecilomyces lilacinus* against root-knot nematode, *Meloidogyne incognita* in banana. A pure culture of *P. lilacinus* was obtained from Indian Agricultural Research Institute, New Delhi. Conical flasks of 1000 ml capacity were filled with 750g neem cake powder and steam sterilized. *P. lilacinus* was inoculated to the neem cake and allowed to multiply for 15 days. The flasks were shaken at 48h interval to accelerate growth of the fungus.

Suckers of banana cv. Poovan of uniform size and weight (about 750g) were collected from healthy garden, pared to a depth of one cm, treated in hot water (50-55°C) for 10 minutes and planted

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Table 1. Effect of *P. lilacinus* on plant growth of banana

Treatment	Plant height (cm)	Pseudostem girth (cm)	No. of leaves /plant	Total leaf area (m^2)	Root length (cm)	Root weight (g)	Shoot weight (g)
*P. lilacinus** 5g/plant	50.9	16.3	6.3	0.43	56.9	510.9	883.5
*P. lilacinus** 10g/plant	54.3	17.6	6.6	0.49	59.3	520.3	898.3
*P. lilacinus** 15g/plant	68.6	18.3	7.1	0.53	68.3	541.9	953.9
*P. lilacinus** 20g/plant	69.9	18.6	7.0	0.54	68.6	545.3	975.6
Carbofuran(3G) 40g/plant	71.3	18.3	7.3	0.56	69.3	550.6	981.3
Control	46.6	12.9	5.9	0.36	40.6	396.3	641.3
SEM ±	1.7	0.8	0.4	0.02	1.6	13.1	14.5
CD (P=0.05)	4.8	1.6	0.9	0.05	4.2	36.3	39.9

* *P. lilacinus* multiplied in neem cake

in sterilized pot mixture (red soil: sand: farm yard manure - 2:1:1 v/v) in 15 kg capacity cement pots. Thirty days after planting the suckers, the freshly hatched juveniles of *M. incognita* were inoculated @ 15000 juveniles/plant at the rhizosphere by making small holes. The parasitic fungus infected neem cake (one gram contained 10^5 conidia) were added to the rhizosphere of the plant in doses *viz.*, 5, 10, 15 and 20 g/plant, 7 days after inoculating the nematodes. The above treatments were compared with carbofuran 3G @ 40 g/plant and control. There were seven replicates in each treatment. Watering was done once in three days with tap water passed through 325mesh sieve. The plants were uprooted on 90th day after planting and recorded the plant height, pseudostem girth, number of leaves, leaf area, shoot weight, root length and weight. The observations on nematode infestation was made by recording the root gall index (Heald *et al.*, 1989), egg masses, eggs per egg mass and females. The soil population was assessed using Cobb's sieving gravity method and Baermann funnel technique (Cobb, 1918). The experiment repeated at 30 days interval were identical in all respects. The data from the two experiments were pooled and analysed statistically.

RESULTS AND DISCUSSION

The data on the effect of the parasitic fungus *P. lilacinus* on *M. incognita* in banana have been presented in Table 1 and 2. The parasitic fungus caused reduction in nematode infestation when compared to the control plants. Significant reduction was observed in root gall index, egg masses, eggs per egg mass, females and soil population of the nematode in plants treated with 15 or 20 g of *P. lilacinus* inoculated neem cake and also in carbofuran treatment. The treatments *viz.*, *P. lilacinus* at 20g, 15g and carbofuran 40g/plant accounted for 52, 48 and 46 per cent reduction in root gall index over control, respectively (Table 2). However, significant reduction in number of eggs per egg mass was recorded in *P. lilacinus* treatments at 15 and 20g per plant whereas carbofuran treatment recorded comparatively higher number of eggs than that of the fungus treatment in lower doses *viz.*, 5 and 10 g per plant. *P. lilacinus* treated root samples showed many empty eggshells and an abundance of hypae were present endogenously in the eggs. This may be due to the ovicidal action of the parasitic fungus, since they mostly act as egg parasites on root-knot nematodes. Similar observations were reported on potato and betelvine due to *P. lilacinus*

Table 2. Effect of *P. lilacinus* on the infestation of *M. incognita* in banana

Treatment	Gall index*	Per cent reduction over control	No. egg masses / 5g root	No. of eggs/ egg mass	No. of females / 5g root	Final soil nematod population (250ml soil)
*P. lilacinus** 5g/plant	4.0	20.0	10.5	141.3	20.3	179.3
*P. lilacinus** 10g/plant	3.6	28.0	9.6	127.9	18.5	139.6
*P. lilacinus** 15g/plant	2.6	48.0	5.0	115.3	13.3	103.3
*P. lilacinus** 20g/plant	2.4	52.0	4.8	110.6	13.6	92.5
Carbofuran (3G) 40g/plant	2.7	46.0	4.5	156.3	14.2	99.6
Control	5.0	—	18.6	210.5	46.3	426.3
SEM ±	0.3	—	0.5	3.2	0.6	4.2
CD (P=0.05)	0.9	—	1.4	8.3	1.7	12.3

*Gall index scale: 1= No galls, 2= 1-25%, 3= 26-50%, 4 =51-75%, 5 =76-100% of the root system galled

against *M. incognita* (Jatala *et al.*, 1980; Jonathan *et al.*, 1995).

Significant increase in plant growth parameters *viz.*, height, pseudostem girth, number of leaves, leaf area, shoot weight, root length and weight was recorded in the banana plants treated with *P. lilacinus* @ 15 and 20g/plant and also in carbofuran treatment (Table 1). Present study indicated that the parasitic fungus *P. lilacinus* can be effectively used for the management of *M. incognita* on banana.

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