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Biological control of *Pythium aphanidermatum - Meloidogyne incognita* disease complex in brinjal with organic amendments

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Abstract : Biological control of *Pythium aphanidermatum - Meloidogyne incognita* disease complex in brinjal with organic amendment *viz.* farm yard manure and neem cake was evaluated in the field. The antagonisitic organisms used were *Trichoderma viride, T.harzianum* against pathogen and *Paecilomyces lilacinus* against nematode. The damping off incidence of brinjal was reduced in all the treatments, when the seeds were treated with antagonistic organisms and the soil was amended with the organic amendments 15 days before sowing *viz.* farm yard manure and neem cake at the rate of 20 t ha^{-1}. The dry shoot and root weights were higher in *T.viride* + farm yard manure treatment followed by *T.Viride* + neem cake treatment and the nematode gall-index was very much reduced in *P.lilacinus* + farm yard manure and in *P.lilacinus* + neem cake treatment *(Key words: Biological control, Pythium-Meloidogyne disease complex, Organic amendments)*

Brinjal is an important vegetable crop grown in India. It is ususally affected by the damping-off pathogen, *Pythium* sp. and also by root-knot nematode, *Meloidogyne* sp. Sometimes both the organisms are involved and cause disease complex. The non-availability of cheap and effective fungicides and nematicides is a major constraint in the management of *Pythium* sp. *and Meloidogyne* sp. and the existing control measures are becoming inadequate. Hence, the present investigation on biological control of *Pythium - Meloidogyne* disease complex in brinjal with antagonists and organis amendments was undertaken.

Materials and Methods

The biocontrol agents used in this experiment were *T.viride* and *T. harzianum* (antagonists against

Pythium) and *P.lilacinus* (antagonist against *Meloidogyne*). *P. lilacinus* culture was subcultured on potato dextrose agar (PDA) slants. *T.Viride* and *T. harzianum* were mass multiplied by inoculating in 250 ml conical flasks containing 70ml of Molasses-Yeast medium (molasses, 30g and yeast extract, 5g in one litre of distilled water and sterilised). The flasks were incubated at room temperature for 10 days. After 10 days, the suspension was pooled and one litre of each *T.viride* and *T.harzianum* suspension was mixed with 2 kg of talc powder separately. To this mixture 10g of carboxy methyl cellulose (CMC) was added and shade dried for 1 to 2h and it was packed in polybags. These talc formulations were further used for the seed treatment.

Two field trials were laid out to manage the *Pythium - Meloidogyne* disease complex in brinjal. The experiement was carried out in a Factorial Randomized Blocks Design (FRBD) with three replications and the cultivar used was Co2. The treatments were,

T1 - *T.viride* + Farm yard manure
T2 - *T.viride* + Neem cake
T3 - *T.harzianum* + Farm yard manure
T4 - *T.harzianum* + Neem care
T5 - *P.lilacinus* + Farm yard manure
T6 - *P.lilacinus* + Neem cake
T7 - *T.viride* alone
T8 - *T.harzianum* alone
T9 - *P.lilacinus* alone
T10 - Farm yard manure alone
T11 - Neem cake alone
T12 - Control

The nursery beds of 30 x 45 cm and 60 cm apart were prepared. The farm yard manure and neem cake treatments were applied in respective beds 15 days before sowing at the rate of 20 t ha^{-1}. For *T.viride* and *T.harzianum* treatments, the seeds were treated 24 h before sowing with talc based formulation of the antagonists at the rate of 4g kg^{-1} of seeds. *P.lilacinus* was applied as seed treatment at the rate of 1g of culture per kg of seeds. The seeds were surface sterilized with 0.1 per cent mercuric chloride and after drying they were treated with the antagonists. One gram of seeds were sown in each bed by line sowing. The germination percentage of brinjal seeds cv. Co 2 was determined by roll towel method.

The weekly plant stand was taken by counting the normal seedlings. The nematode gall - index was determined by using 1 -5 scale, where,

1	- Less than 1 per cent	of total roots galled
2	- 1 to 25 per cent	
3	- 26 to 50 per cent	
4	- 51 to 75 per cent	
5	- 76 to 100 per cent	

The seedlings were dried in an oven at a temperature of 70° C for 24 h and the dry shoot weight and root weight were determined at 45 days after sowing.

Results and Discussion

The per cent incidence of pre and post-emergence damping-off of brinjal were 13.62 and 16.35 in *T.viride* + neem cake applied treatment and it was followed by *T.viride* + farm yard manure applied treament (16.51) in pre-emergence damping-off and *T.harzianum* + neem cake treatment (18.58) in post-emergence damping-off (Table 1). Krishnamurthy (1987) observed the higher germination percentages in tomato when the seeds were treated with *T.viride* with soil amendments *viz.* neem cake and farm yard manure (25 t ha^{-1}). The reduction in damping-off incidence might be due to the reduction in the population of *Pythium* in soil. The attributable reason for the population decrease of *Pythium* might be, the possible toxic effect of decomposition products of the organic amendments interfering with the growth of the pathogen directly or such decomposition products might have encouraged the antagonists population in the soil. Rajan and Singh (1973) and Papavizas and Lumsden (1980) also stated similarly.

The shoot weight was increased to 69.42 per cent over control in *T.viride* + farm yard manure treatment followed by *T.viride*+neem cake treatment (67.93) and *P.lilacinus* + farm yard manure treatment (56.57). The root weight also increased to 90.22 per cent over control in *T.viride*+farm yard manure treatment followed by *T.viride*+neem cake treatment (84.44) and *P.lilacinus* + farm yard manure treatment (83.11). The present investigation revealed that both the dry shoot and root weights were maximum in *T.viride* + farm yard manure treatment followed by *T.viride* + neem cake and *P.lilacinus* + farm yard manure treatment. The organic amendments might influence the growth of the plants by providing nutrients. Chindo and Khan (1986), and Ahmed *et al.* (1993) suggested that the organic amendments application enriched the soil organic matter and reduced the plant parasitic nematodes which supports the present investigation.

Table 1. Effect of organic amendments with antagonists on *Pythium* and *Meloidogyne* disease complex in brinjal

Treatment	Pre-emergence	Post-emergence	Shoot Weight/plant (g)	Root Weight/plant (g)	Nematode-gall index
T. viride + FYM	16.51^{e}	20.03^{gf}	1.402^{a} (69.42)	0.428^{a} (90.22)	2.25^{bcd} (-25.00)
T. viride + NC	13.62^{f}	16.35^{h}	1.392^{a} (67.93)	0.415^{a} (84.44)	2.25^{bcd} (-25.00)
T. harzianum + FYM	18.59^{e}	22.76^{f}	1.268^{bc} (52.96)	0.408^{a} (81.33)	2.75^{ab} (-08.33)
T. harzianum + NC	17.47^{e}	18.58^{g}	1.256^{bc} (51.51)	0.403^{a} (79.11)	2.75^{ab} (-08.33)
P. lilacinus + FYM	19.71^{e}	24.19^{ef}	1.298^{ab} (56.57)	0.412^{a} (83.11)	1.50^{f} (-50.00)
P. lilacinus + NC	18.11^{e}	19.55^{g}	1.256^{bc} (51.50)	0.405^{a} (80.00)	1.75^{de} (-41.67)
T. viride alone	23.00^{d}	25.96^{e}	1.302^{ab} (57.06)	0.402^{a} (78.67)	2.75^{ab} (-08.33)
T. harzianum alone	29.97^{c}	33.65^{d}	1.121^{e} (35.22)	0.338^{c} (50.22)	3.00^{a} (00.00)
P.lilacinus alone	32.27^{bc}	36.69^{e}	1.242^{bc}(49.82)	0.385^{ab}(71.11)	2.00^{cde}(-33.33)
FYM alone	35.74^{b}	39.26^{b}	1.268^{vc}(45.72)	0.342^{c}(52.00)	2.75^{ab}(-08.33)
NC alone	32.85^{bc}	35.58^{cd}	1.190^{bc}(43.55)	0.358^{bc}(58.22)	2.50^{abc}(-16.67)
Control	40.71^{a}	43.43^{a}	0.829d	0.225^{d}	3.00
CD (P=0.05)	(A)	1.054	4.421	0.066	0.019 0.278
	(B)	1.217	5.105	0.077	0.022 0.321
	(A x B)	2.108	8.841	0.133	0.038 0.551

FYM - farm yard manure ; NC - neem cake ;
Figures in parantheses are per cent increase / decrease over control.
In the columns each figure followed by the same letter do not differ significantly at 5 per cent level by DMRT

The nematode gall-index was highly reduced in seed treatment with *P.lilacinus*+ soil amendment with farm yard manure, followed by *P.lilacinus* + neem cake treatment. The findings of Sivakumar and Vidhyasekaran (1990) and Jonathan (1994) supported this findings.

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