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Research article

MANAGEMENT OF ROOT-KNOT NEMATODE, *MELOIDOGYNE INCOGNITA* ON GREEN GRAM THROUGH BIOAGENTS

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ABSTRACT: Investigation carried out to study on efficacy of different bio-agents (*Trichoderma viride, T. harzianum,* Biofor- pf and neem cake) against root-knot nematode, *Meloidogyne incognita* in green gram (*Vigna radiata*) revealed that soil application of neem cake @ 2 tones/ ha significantly increased the shoot length, fresh and dry weight of shoot of green gram, followed by soil application of *T. viride* @ 2.5 kg/ha as compared to untreated control. Among the different bio-agents, Biofor-pf @ 100 kg/ ha exhibited the best result in reducing the galls, egg masses and final soil nematode population followed by neem cake @ 2 tones/ ha. However, application of Carbofuran @ 1 kg a.i./ha was very effective in reducing the galls, egg masses as well as soil nematode population.
Key words: neem cake, *Trichoderma viridae, T. harzianum,* biofor-pf

INTRODUCTION

Green gram (*Vigna radiata* L. Wilczek), commonly known as Mung bean or *Moong*, belonging to the family Leguminoceae and subfamily Papilionceae, is a herbaceous, annual crop, mostly grown under semi-arid and sub-tropical climate. The crop is believed to be native of India and Central Asia (Vavilov, 1951) and now widely grown in Southeast Asia, Africa, South America and Australia. India produces 14.76 million tons of pulses from an area of 23.63 million hectare, of which green gram occupies 14.0 per cent in total pulses area and contributes 7.0 per cent in total pulses production of India (Directorate of Economics & Statistical, M/A, GOI, 2006). In Assam, it occupies an area of 8000 hectares with a total production of 4.4 thousand tones. The average yield of this pulse crop in Assam is considerably low, which is only 4.90 q/ha (Annon, 2008). The crop green gram suffers from a number of diseases caused by fungi, bacteria, virus and nematodes which reduces its growth; subsequently the production and productivity. The root-knot nematodes (*Meloidogyne* spp.) are considered as one of the most destructive pests of green gram limiting its production (Sikora and Greco, 1993). In India, the root-knot disease caused by *M. incognita* and *M. javanica* on green gram was first reported by Singh (1972). In Assam, yield loss in green gram due to *Meloidogyne incognita* is estimated as 17.50 to 57.83 per cent (Phukan, 2007).

Considering the economic importance of *M. incognita* as disease causing organism of green gram in Assam, the present investigation was carried out to find out an effective bioagent to manage this pest. Application of chemical nematicides is not advisable due to its negative impact of environment, ground water and on human health. Biological control agents were proved to be better option for management of plant parasitic nematodes. Therefore, attempts were made to study the comparative efficacy of different bio-agents i.e., *Trichoderma viride*, *T. harzianum*, Biofor-pf (a bio product from Assam Agricultural University which combines *T. harzianum* and *Psuedomonas fluorescens*) and neem cake for the management of root-knot nematode, *Meloidogyne incognita* on green gram. The work was undertaken with the following treatments, *viz.* T_1: *Trichoderma viride* @ 2.5 kg/ha, T_2: *T. harzianum* @ 2.5 kg/ha. T_3: Biofor-pf @ 100 kg/ha, T_4: Carbofuran @ 1 kg/ha, T_5: Neem cake @ 2 tonnes/ha, T_6: Control. Neem cake was applied in the soil fifteen days prior to sowing of green gram seeds, thoroughly mixed with soil and regular watering was done to enhance the process of decomposition. *Trichoderma viride*, *T. harzianum* and Biofor-pf were applied at the time of sowing.

MATERIALS AND METHODS

The study was carried out in micro-plots measuring 1m x 1m, in the Department of Nematology, A.A.U., Jorhat. Average initial population of root-knot juveniles (J_2s) recorded from the micro-plots was 337 J_2s per 200cc of soil. Green gram seeds var. Pratap was sown in the microplots with a spacing of 30 x 15cm. The experiment was laid down in RBD with four replications. The microplots were maintained following proper package of practices for the green gram crop.

After seventy-five days of sowing, the plants were harvested. Ten plants from each plot were uprooted randomly and the roots were washed carefully in tap water to remove adhering soil particles. Plant growth parameters (shoot and root lengths, fresh weight of shoot and root, dry weight of shoot and root), nematode infestation (number of galls per root system) and nematode reproductive characters (number of egg masses per root system) were determined and recorded.

RESULTS AND DISCUSSION

Results presented in Table 1 and Table 2 revealed that all the five treatments (4 treatments with bio-agents and 1 with chemical) significantly increased the plant growth parameters of green gram and decreased multiplication of *M. incognita*. The shoot length, fresh and dry weight of shoot was found to be maximum with the application of neem cake @ 2 t/ha (T_5) followed by *T. viride* @ 2.5 kg/ha (T_1). Minimum shoot length, fresh and dry weight of shoot was obtained in control (T_6). Bhattacharyya and Goswami (1987), and Mittal and Prasad (2003) observed similar result on soybean and tomato against *M. incognita*, respectively.

The fresh and dry weight of root were found to be more in control (T_6) which might be attributed to competition among the nematodes for food and space showing conformity with the result of Senthamarai *et al*. (2006) on *Coleus* infested by *M. incognita*.

Table 1. Effect of different bio-agents against *M. incognita* on plant growth characters of green gram (var. Pratap) (Mean of 4 replications)

Treatments	Shoot length (cm)	Fresh shoot wt. (gm)	Dry shoot wt. (gm)	Fresh root wt. (gm)	Dry root wt.(gm)
T1	55.51_{ae}	41.25_{a}	5.99_{ae}	11.12_{ab}	4.45_{a}
T2	47.25_{bd}	28.16_{bd}	$3.83_{bc,bd}$	9.98_{ab}	2.30_{b}
T3	$54.67_{ac,ae}$	33.67_{c}	4.30_{bc}	7.97_{cd}	1.31_{c}
T4	45.02_{bd}	26.52_{bd}	3.35_{bd}	7.67_{cd}	1.03_{d}
T5	$57.27_{ac,ae}$	45.95_{e}	6.40_{ae}	8.18_{cd}	1.45_{e}
T6	30.00_{f}	14.62_{f}	2.24_{f}	16.29_{f}	5.04_{f}
C.D= 0.05	3.98	3.11	0.58	1.78	0.073

Means followed by the same letter shown in subscript(s) are not significantly different

Table 2. Comparative efficacy of different bio-agents against *M. incognita* on green gram (var. Pratap) (Mean of 4 replications)

Treatments	No. of galls/ root system	No. of egg mass/ root system	Initial nematode population/200cc of soil	Final nematode population/200cc of soil
T1	28.54_{a}	17.62_{a}	337.25	218.52_{ce}
T2	23.38_{b}	15.16_{b}	342.75	216.20_{ce}
T3	15.10_{c}	10.22_{c}	329.55	199.77_{ce}
T4	5.05_{d}	3.44_{d}	343.00	40.15_{d}
T5	15.32_{e}	11.10_{e}	343.70	205.77_{ce}
T6	82.53_{f}	39.72_{f}	337.32	558.45_{f}
C.D=0.05	3.21	21.78	-	83.75

Means followed by the same letter shown in subscript(s) are not significantly different

The present study revealed that all bio-agents significantly reduced the number of galls per root system, number of egg masses per root system and final nematode population as compared to untreated control (Table 2), however, Carbofuran @ 1 kg a.i/ ha gave the best result among all the treatments. Among the bio-agents, maximum reduction in galls and egg masses per root system, and final nematode population was obtained in Biofor-pf @ 100 kg/ ha followed by neem cake @ 2 t/ha. Siddiqui and Shaukat (2004) reported that combined application of *Psudomonas fluorescens* and *Trichoderma harzianum* reduces galls and egg masses on tomato plant infested by *M. javanica.*

In the present investigation, application of neem cake @ 2 t/ha gave the best result in increasing plant growth parameters of green gram (var. Pratap) under nematode infested condition while, Biofor-pf @ 100 kg/ha (among the bio-agents) significantly reduced the nematode reproductive parameters.

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