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SCREENING OF *TRICHODERMA* ISOLATES AGAINST ROOT KNOT NEMATODE (*MELOIDOGYNE GRAMINICOLA*) OF RICE

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ABSTRACT

A pot experiment was conducted to know the effectiveness of *Trichoderma* spp. against *Meloidogyne graminicola*. In the pot experiment, 20 isolates of *Trichoderma* were tested against root knot nematode (*Meloidogyne graminicola*). It was observed that all isolates of *Trichoderma* were effective against root knot nematode as compare to control. Minimum 2.67 galls per plant were observed in S_{12} isolate of *Trichoderma* followed by S_{15} with 2.73 galls per plant. Maximum 8.60 galls were recorded in S_7 and S_9. The average 10.40 galls per plants were observed in control. Maximum 9.80 cm shoot length and 16.20 cm root length was observed in case of S_{12} and S_{11} isolates of *Trichoderma* respectively. Minimum 7.00 cm shoot length and 12.47 cm root length was recorded in S_7 and S_8 isolates of *Trichoderma* respectively. Average 5.67 cm shoot length and 10.93 cm root length was recorded in untreated control. The present study indicated that use of *Trichoderma* isolates may be better option in integrated nematode management programme (INM) and to reduce the environmental pollution.

INTRODUCTION

Rice (*Oryza sativa* L.) is the most important food crop of Asian origin. It is an indispensable source of calorie for almost half of the world population in Asia. In India, rice is grown in almost all the states. West Bengal is the highest rice producing state while Tamil Nadu has first place in productivity. Among the pest of rice crop, rice root-knot nematode, *Meloidogyne graminicola* (Golden and Birchfield, 1968) is the most widely distributed and a potential pest of upland, lowland and deepwater rice. Nematode attacks rice nursery as well as main crop and inflicts huge monetary loss to the growers. The yield loss of rice crop by root knot nematode has estimated worldwide.

Among the different bio-agents, *Trichoderma* has gained maximum attention as biocontrol agent due to the fact that it is effective against a large number of soil-borne plant pathogenic fungi and have the suppressive effects on some root nematodes without adversely affecting beneficial microbes like *Rhizobium* and capable of promoting growth of certain crops. Biological control of soil-borne plant pathogens and nematodes by antagonistic microorganisms is a potential non-chemical disease management practice (Stirling, 1991). A wide range of bacteria (Hallmann *et al*., 2001) and fungal agents (Meyer *et al*., 2001) have used to reduce of plant parasitic nematodes. Some species of *Trichoderma* have used widely as biocontrol agents against soil-borne plant diseases (Whipps, 2001). *Trichoderma* species isolated from different rice growing fields has potential suppressive effect on *M. graminicola* has been reported by Le *et al*. (2009). *Trichoderma* isolates have used successfully to control of the damage caused by soil-borne plant pathogens. *Trichoderma* have antagonistic activity towards root-knot nematode (Sharon *et al*., 2001; Meyer *et al*., 2001). *Trichoderma* spp. found in close association with roots contributes as plant growth stimulators (Ousley *et al*., 1994).

Biocontrol technologies have gained momentum in disease control of crop plants in recent times as these technologies not only minimize or replace the usage of harmful chemical pesticides but also found to be cheaper and efficient in certain disease control programmes. Hence, keeping all these points in view, the present investigation was undertaken with the evaluation the efficacy of different isolates of *Trichoderma* against rice root knot nematode.

MATERIALS AND METHODS

For evaluation the efficacy of *Trichoderma* spp. against rice root knot nematode a pot experiment was conducted from month of July 2015 to August 2015 at premises of main campus of S.V.P.U.A. & T., Meerut.

Preparation of sick pot

For the propagation of pure culture of *M. graminicola,* infected rice roots were collected from Crop Research Centre, Sardar Valabhbhai Patel University of Agriculture and Technology, Meerut. The infected rice roots were grinded by grinder. After the teasing/grinding, egg and juveniles came out from the roots which were collected and inoculated in earthen pots containing sterilized sandy soil for preparation of sick pot. The sick soil was removed from each pot and mixed properly and filled @ 1 kg per plastic pot. 100 gm. soil sample was taken for estimation of the population of second stage juvenile.

Preparation of mass culture of *Trichoderma*

Isolates of *Trichoderma* were isolated from different area of Uttar Pradesh and maintained in the laboratory. The pure culture of each isolates was maintained in slants at 5 ^{0}C temperature after growing for seven days at 25 $\pm$ 2 ^{0}C. For mass culture of *Trichoderma*, 50 g wheat grains were taken into 250 ml conical flasks along with 5% dextrose. Wheat grains in each conical flask were moistened with tap water, plugged with cotton and sterilized at 15 lbs/inch^2 for 20 minutes. After sterilization the different isolates of *Trichoderma* culture were inoculated in each flask and kept in incubator at 25 $\pm$ 2 ^{0}C temperatures for 7 days.

Mix of *Trichoderma* isolates in pot soil

Mass culture of 20 was separately amended in the soil @ 10 gm/kg of soil. Sick soil without bioagent served as control. Soils amended with bioagent and without bioagent were filled in pots at the rate of 1 kg/pot. Ten germinated PB-1121 rice varieties seeds were sown in each pot on the same day. For each treatment three replications were maintained. Observations on number of root galls, shoot and root length were recorded at 30 days after seed sowing. Data were analyzed using randomized block design (RBD).

RESULTS AND DISCUSSION

It was observed that all isolates of *Trichoderma* were effective against root knot nematode. Minimum average 2.67 and 2.73 galls/ plant were observed in S_{12} and S_{15} isolate of *Trichoderma* followed by (S_{11}, S_{19}, S_6, S_5, S_2, S_{17}, S_{10}, S_{16}, S_{13}, S_1, S_{14}, S_3, S_{16}, S_4, S_{20}) respectively. Maximum numbers of galls 8.60 were observed in S_7 and S_9 followed by S_8 (8.53). Reduction in number of galls per plant was also recorded by all isolates as compare to control. Average 10.40 galls per plants were observed in control. Improvement in root and shoot length was also recorded in all the isolates as compare to control. Maximum shoot length 9.80 cm/plant and root length 16.20 cm/plant was observed in case of S_{12} and S_{11} isolates of *Trichoderma*, respectively. Minimum shoot length 7.00 cm/ plant and root length 12.47 cm/plant were recorded in S_7 and S_8 isolates of *Trichoderma* as compare to control. In control 5.67 cm shoot length and 10.93 cm root length were recorded. Several authors have reported the efficacy of fungal bioagents used as soil application in reducing the *M*eloidogyne species populations. Similar result was found by Sharon *et al*. (2001) reported that *Trichoderma harzianum* reduced galling of root-knot nematode, *Meloidogyne javanica* on tomato plants. Pandey *et al*. (2003) using different treatments of *Trichoderma viride* against *Meloidogyne incognita* in chickpea and found that all *Trichoderma viride* treatments decreased galling and the final nematode population galling densities of *M. incognita* in both field and pots experiments as the level of the *T. viride* increased. Dababat and Sikora (2007) reported that inoculated soil with *Trichoderma* before one week of transplanting tomato seedlings resulted in reductions of up to 38.8% in nematode

Figure 1: Effect of different isolates of *Trichoderma* spp. against RKN of rice seedlings

Table 1: Effect of different isolates of *Trichoderma* spp. against root knot disease of rice

Treatments	Average root length	Average of root galls/plant	Average of shoot length
S_1	14.87	6.13	9.07
S_2	14.53	4.93	7.93
S_3	13.53	6.60	8.73
S_4	14.00	6.93	9.60
S_5	14.60	4.87	9.33
S_6	14.80	4.67	8.93
S_7	12.67	8.60	7.00
S_8	12.47	8.53	8.33
S_9	13.27	8.60	9.27
S_{10}	14.87	5.20	9.07
S_{11}	16.20	3.67	9.47
S_{12}	15.20	2.67	9.80
S_{13}	13.00	5.93	8.87
S_{14}	14.67	6.20	7.67
S_{15}	16.00	2.73	9.40
S_{16}	13.20	6.60	8.83
S_{17}	14.13	5.13	8.60
S_{18}	14.00	5.80	9.40
S_{19}	14.73	3.67	9.73
S_{20}	13.20	7.53	8.53
Control	10.93	10.40	5.67
CD	1.984	1.288	1.985
SE(d)	0.978	0.635	0.978
SE(m)	0.692	0.449	0.692
CV	8.533	13.027	13.391

galling. The biocontrol agents, *T. harzianum* and *T. virens* when applied in soil one week after nematode inoculation were significantly improving plant growth and reducing number of galls and juvenile penetration per root system reported by Pankaj *et al*. (2010). Le *et al*. (2009) reported that, isolated *Trichoderma* species from different rice soils are potential biocontrol agents of *M. graminicola***.** Similar finding also reported by Pavithra and Khatib (2014) who observed that mustard intercrop with *Trichoderma viride* reduce the number of galls and egg masses of *M. incognita* in brinjal.

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