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Research Article

Effect of chemicals and *Trichoderma viride* against in the management of root – knot nematode (*Meloidogyne incognita*.) of soybean (*Glycine max* L.)

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ABSTRACT

Root – knot nematode (*Meloidogyne incognita*.) of soybean is the most important disease and causes up to 50% yield loses in the susceptible cultivars. Effect of chemicals *viz.* carbendazim @ 2 g ai/kg Seed, carbendazim @ 2.5 kg ai/ha (soil treatment), carbofuran @ 2.5 kg/ha (soil treatment) and phorate @ 2.5kg/ha (soil treatment) and boiagent *viz. Trichoderma viride* @ 4 g/ kg seed and *Trichoderma viride* @ 2.5 kg/ha (soil treatment), were compare with *Trichoderma viride*. In the pot condition it was observed that *Trichoderma viride* @ 2.5 kg/ha (soil treatment) proved to be most effective against *Meloidogyne incognita* also increases in yield (number of pods/plant) productivity 40.50 and decreased the galls formation 53.81/ plot.

Keywords: Chemicals, *Trichoderma viride*, Meloidogyne incognita and soybean

INTRODUCTION

Soybean [(*Glycine max* L.) Merrill] belongs to the family Leguminosae. It is a well-recognized grain legume of the world. Now-a-days, soybean has become the most important oil seed crop all over the world. Soybean may be called the "Protein hope of future" because of its high nutritive value containing about 42-45% protein, 18-20% edible oil and 42-46% carbohydrate (Gowda & Kaul, 1982). On an average, about 8-10% of the protein intake in Uttar Pradesh diet originates from animal sources (Begum, 1989) and the rest can be met from plant sources by increasing the consumption of vegetables and pulses including soybean. Soybean plants, like many other legumes can fix atmospheric nitrogen symbiotically and about 80-90% nitrogen demand could be supplied by soybean through symbiosis (Bieranvand et al., 2003). In India the loss is predicted at about 14.6% and could as well go as high as 50-80% in some crops (Bhatti, 1992). In economic terms nematodes cause an estimated loss of about $ 157 billion annually to world agriculture (Abad et al., 2008). The loss of Indian agriculture is estimated at about Rs. 210 crore annually (Jain et al., 2007). The low yield of soybean is discouraging in compared to other soybean producing countries. This is mainly due to the infection of different diseases. Among the diseases, root-knot is one of the constraints for soybean production (Mian, 1986). Valient et al. (1990) stated that *Meloidogyne* spp. decreased soybean yield to a great extent. Ahmed & Srivastav (1996) observed significant reduction in all growth parameters of soybean due to the infection of *Meloidogyne incognita*. So, to increase the yield and quality of produce the effective, economic and eco-friendly disease management deserves priority. Thus, the present study was undertaken to see the effect chemical compare to *Trichoderma viride*.

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MATERIAL AND METHODS

The pot experiment was conducted at research field of Department of Plant Pathology, Sam Higginbottom Institute of Agriculture, Technology & Sciences Allahabad in *Kharif* season of 2010- 2011. The efficacy of seven treatments was tested against *Meloidogyne incognita* treatments *viz.* carbendazim @ 2 g ai/kg Seed, carbendazim @ 2.5 kg ai/ha (soil treatment), carbofuran @ 2.5 kg/ha (soil treatment) and phorate @ 2.5 kg/ha (soil treatment) and boiagent *viz. Trichoderma viride* @ 4 g/kg Seed and *Trichoderma viride* @ 2.5 kg/ha (soil treatment). Soybean variety P. S. 1042 were sown Complete Randomized Design (CRD) with three replication, pot size was 3 X 3 diameters, seed per pot 5 and observations are recorded.

Pot preparation and inoculation

Sandy – loam topsoil was steam – sterilized at 120°C for 150 minutes and pot sterilized with formaldehyde. The cooled soil was filled in to 25 cm diameter planting pots (five kg capacity). Five seed of root – knot nematode susceptible soybean variety were planted in each plot. Three weeks after planting, the soybean seedling was thinned to one plant per pot and inoculated with 500 eggs of *M. incognita* while the control pots were left uninoculated. Inoculation was done by dispensing the inoculums in to small holes made as close to the plant roots as possible using a gradated syringe. A week after inoculation carbifuran, phorat and *Trichoderma viride* was applied in the soil.

Inoculation of nematode

The soil around the seven day old seedling was loosened with needle and 10 ml nematode suspension containing 1000 larvae of *Meloidogyne incognita* was per inoculated pot. The loosened soil at the pots was covered with sterilized dry soil.

RESULTS AND DISCUSSION

All the treatment were significantly effective in reducing the disease incidence (no of gall) compared to control (Table 1 and Figure 1) *Trichoderma viride* @ 2.5 kg/ha (soil treatment) treatment no 2 (T_2) was found to be most effective in reducing the no of gall (53.81%) at 90 date after sowing (DAS), shoot length (60.76 cm), root length (12.70 cm), fresh root weight (3.86 g) and no of pods /pot (40.50) followed by Phorate 2.5 kg/ha (Soil treatment) T_6 no of gall (43.95) at 90 date after sowing (DAS), shoot length (57.40 cm), root length (11.60 cm), fresh root weight (63.46 g) and no of pods/pot (36.90)

Table 1: Effect of chemicals and *T. viride* on number of shoot length, root length, fresh shoot weight, fresh root weight, no of pods/plant and root knot or galls per pots of soybean at 90 DAS

Treatment		Shoot length (cm)	Root length (cm)	Fresh shoot weight (g)	Fresh root weight	No of pods/ plant	No of root knot or galls per pot (Reducing the no of gall %)
T_0	Control	32.06	6.96	44.93	1.56	15.66	74.333
T_1	*T. viride* (Seed treatment)	55.70	9.63	52.66	2.30	21.33	52.66 (19.15%)
T_2	*T. viride* (Soil treatment)	60.76	12.70	64.50	3.86	40.50	34.33 (53.81%)
T_3	Bavistin (Seed treatment)	43.63	9.53	61.66	2.76	36.30	60.00 (19.27%)
T_4	Bavistin (Soil treatment)	46.73	10.63	50.10	2.26	30.23	50.00 (32.73%)
T_5	Carbofuran (Soil treatment)	50.73	8.66	60.40	3.20	31.96	47.66 (35.88%)
T_6	Phorate (Soil treatment)	57.40	11.60	63.46	3.26	36.90	41.66 (43.95%)
	CD (P=0.05)	4.98	0.55	1.88	12.38	0.24	12.38

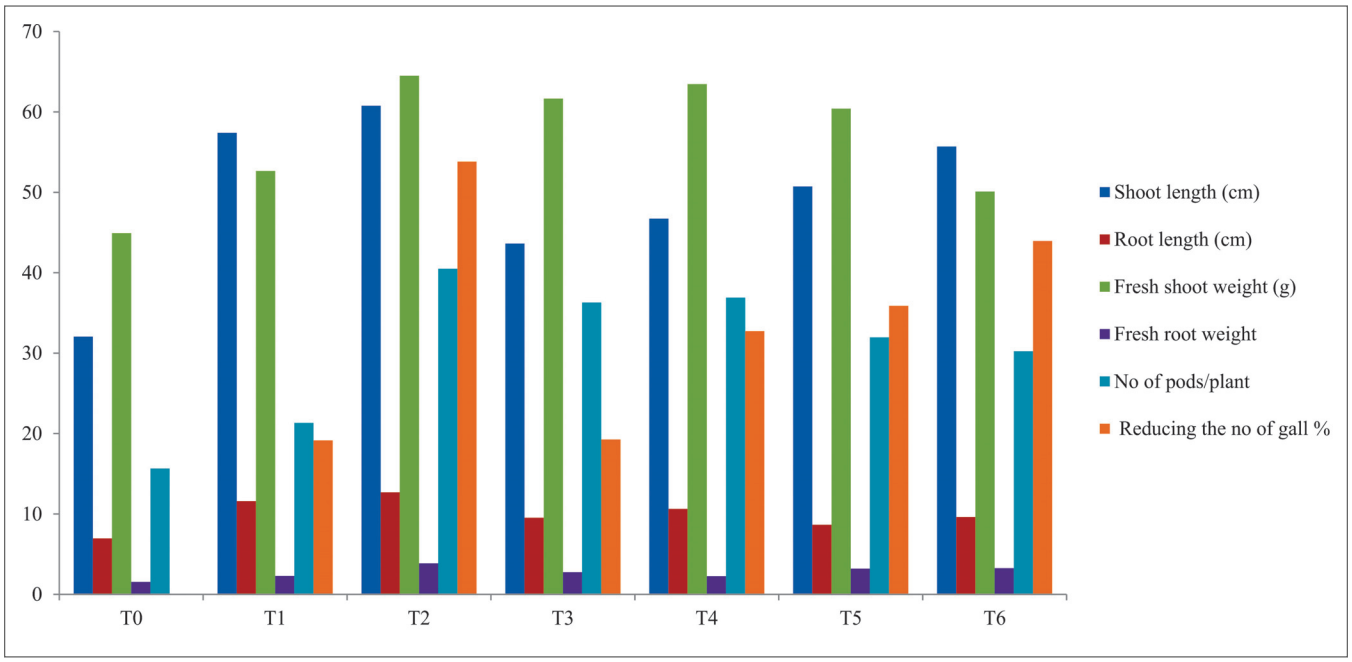

Figure 1: Effect of chemicals and *T. viride* on number of shoot length, root length, fresh shoot weight, fresh root weight, no of pods/plant and root knot or galls per pots of soybean at 90 DAS

compare to control, no of gall (74.33) at 90 date after sowing (DAS), shoot length (32.06 cm), root length (6.96 cm), fresh root weight (1.56 g) and no of pods/pot (15.66). Concluded that the) *Trichoderma viride* @ 2.5 kg/ha (soil treatment) treatment no 2 (T_2) was found to be most effective treatment against *Meloidogyne incognita* these results are accordance to Rekha Arya (2011), proved that all sources proved inhibitory, most effective were fructose and lysine in case of *T. viridae rhamnose* and *glycine* for *T. roseum*. It was observed that a direct correlation between the amount of phenols in the culture filtrate of fungi and its adverse effect on the hatching and mortality of juvenile of root-knot nematode. Nkechi Betsy Izuogu and Abiri (2015) found that in terms of plant height, the number of branches, yield and reduction of the soil nematode population and root galls, the plants on the *Trichoderma* treated plots performed significantly better (P=0.05) than those in the control unit did. Studies have shown that among a wide range of commercially important plant pathogens, *Trichoderma* species are highly efficient in biological control (Whipps & Lumsden, 2001).

CONCLUSION

The use of pesticides increases the health problems and decreases of soil fertility as well as increases the resistance the pathogens. The fungal antagonists and organic amendments lead. The positive role in increases the soil fertility and decrease the health problems. So we conclude the antagonists *Trichoderma viride*, and chemical can be successfully exploited as a biological control the management of soil borne disease particularly *Meloidogyne incognita* (root-knot). In the present studies the comparative efficacy of *Trichoderma viride* in managing the disease was satisfactory. It was found that soil treatment with *Trichoderma viride* @ 2.5 kg/ha soil treatment was most potent among all treatments.

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