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Research Note

Management of *Macrophomina* disease complex in jute (*Corchorus olitorius*) by *Trichoderma viride*

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ABSTRACT: An experiment was conducted in R.B.D. with seven treatments in four replications with olitorius jute variety JRO-524 for five consecutive years (2002-07) at the experimental farm of the Crop Research Station, Bahraich in a plot size of 3X5 m^2 with a row spacing of 30 cm. Recommended doses of N: P: K @ 60: 30: 30 kg ha^{-1} were applied. The treatment with soil application of *Trichoderma viride* thrice, i.e., 7, 15, 30 DAS was found best in controlling seedling blight, collor rot, stem rot and root rot diseases giving minimum per cent disease incidence (1.45, 3.07, 4.70 and 4.92, respectively) as compared to control (16.12, 9.47, 16.67 and 16.34, respectively). Soil application with *T. viride* twice (7 and 15 DAS) showed 2.05, 4.42, 6.14 and 6.15% incidence of the same diseases and ranked second. The treatment with carbendazim 50WP @ 2g kg^{-1}, seed showed 8.52% seedling blight 5.24% collor rot, 6.93% stem rot and 8.56% root rot incidence. Mean dry fibre yield was highest (25.70q ha^{-1}) in the plots when the soil was treated with *T. viride* at 7, 15 and 30 DAS, while it was lowest in control (17.76q ha^{-1}) and in carbendazim treatment it was 22.23q ha^{-1}. Variation in yield was due to the variations in plant height and basal diameter.

KEY WORDS: Biological management, *Macrophomina phaseolina,* jute, *Trichoderma viride*

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Jute (*Corchorus olitorius* and *C. capsularis*) is an important bast fibre crop next to cotton. It is mainly cultivated in Bangladesh, China, India, Nepal and Thailand over 9 lakh ha. Its fibre is used for making bags, decoratives, textiles and geotextiles, and its sticks are also used for fuel, door panels of automobiles, and for making false ceiling boards. Nearly 12-15% of the jute products are exported to about 20 countries of the world earning foreign exchange to the tune of Rs. 2000 crores per annum, and the trend is on the increase. Its production and productivity is hampered by a number of abiotic and biotic stresses. Among them *Macrophomina phaseolina* is devastating. It attacks any part of the plant at any stage of growth from seed germination to harvest, thus causing damping off, seedling blight, leaf blight, collor rot, stem rot and root rot (Roy *et al*., 2008). Average yield loss of 10% has been reported, but in case of severe infection it may increase to 35-40%. It becomes severe in hot (34 ± 1ºC) and humid weather (Mandal, 1990). Growing concern for health and environment, problems of resistance, resurgence, lethality to beneficial organisms and loss of bio diversity, especially vulnerable species, have restricted the widespread use of pesticides in plant disease control. Biological control provides long term management in a sustainable manner and the pathogens are killed by competition, mycoparasitism and antibiotics (Roy *et al*., 2008). It is also safe, cheap and eco-friendly. Therefore, an attempt has been made to manage the diseases caused by *M. phaseolina* using biological means. Its management through chemicals is not an easy task because of the climate, as the plant and pathogen both require warm and humid climate.

A field experiment in RBD was conducted with seven treatments in four replications with olitorius jute (Variety JRO-524) for five consecutive years (2002 to 2007), at experimental farm of Narendra Deva University of Agriculture & Technology, Crop Research Station, Bahraich, in a plot size of 3 x 5 m^2 with row spacing of 30 cm. The plant population at 8-10 cm was maintained by thinning at 20-25 days after sowing.

The recommended package of practices were followed as and when required. The treatments included: T_1 – seed treatment with *T. viride* @ 5g kg^{-1} seed, T_2 – soil application at 7 DAS with *T. viride* @ 2.5kg ha^{-1}, T_3-T_1+T_2, T_4 – soil application with *T. viride* at 7 and 15 DAS, T_5 – soil application with *T. viride* thrice at 7, 15 and 30 DAS, T_6 – seed treatment with carbendazim @ 2gm kg^{-1} seed and

Table 1. Per cent incidence of different diseases caused by *Macrophomina phaseolina* in jute and their impact on plant height, basal diameter and yield per hectare (2002-07)

Treatments	Stem blight	Collor rot	Stem rot	Root rot	Plant height (cm)	Basal Diameter (cm)	Yield (q ha^{-1})
T_1 – Seed treatment with *T. viride* @ 5g kg^{-1} seed	5.66 (6.48)	6.45 (31.8)	9.82 (41.09)	10.70 (34.5)	262	1.9	19.77
T_2 – Soil application at 7 DAS by *T. viride* @ 2.5 kg ha^{-1}	4.95 (69.2)	5.01 (47.09)	7.07 (57.5)	7.78 (52.3)	280	1.9	21.94
T_3 – $T_1 + T_2$	3.16 (80.19)	4.76 (49.7)	7.79 (53.2)	6.71 (58.9)	298	2.2	22.16
T_4 – Soil application of *T. viride* at 7 and 15 DAS	2.05 (87.2)	4.42 (53.3)	6.14 (63.16)	6.15 (62.3)	303	2.6	23.40
T_5 – Soil application of *T. viride* thrice at 7, 15 and 30 DAS	1.45 (91.0)	1.45 (67.5)	4.70 (71.80)	4.92 (69.8)	330	2.9	25.70
T_6 – Seed treatment with carbendazim @ 2gm kg^{-1} seed	8.52 (47.14)	5.24 (44.6)	6.93 (58.4)	8.56 (47.6)	300	2.9	22.23
T_7 – Untreated control	16.12 (0.0)	9.47 (0.0)	16.67 (0)	16.34 (0.0)	292	1.8	17.76
CD (P = 0.05)	2.86	1.32	2.40	2.28	014	0.22	1.75

Figures in parentheses are per cent disease reduction over control

T_7 – untreated control. For applying *Trichoderma viride* was well mixed in well decomposed farm yard manure and applied by broadcasting in plots and mixed in soil by hoeing. The data were recorded at fortnightly intervals after 15 days of germination till harvest. The incidence of diseases was recorded as percentage. Plant height (cm), basal diameter (cm) and fibre yield (q ha^{-1}) were also recorded and the data were subjected to statistical analysis for the test of significance.

Pooled results of five years (2002-07) indicated that soil application of *T. viride* at 7, 15 and 30 DAS was found significantly superior over all other treatments in controlling the diseases. Per cent incidence of seedling blight, collor rot, stem rot and root rot diseases was 1.45, 3.07,4.07 and 4.92, respectively when *T. viride* was applied thrice at 7, 15 and 30 DAS while in check it was 16.12, 9.47, 16.67 and 16.34%, respectively. The second best treatment, *i.e.,* soil application with *T. viride* twice (7 and 15 DAS) showed 2.05, 4.42, 6.14 and 6.15% incidence of seedling blight, collor rot, stem rot and root rot diseases. The treatment with carbendazim 50WP @ 2g kg^{-1} seed resulted in 8.52% seedling blight, 5.24% collor rot, 6.93% stem rot incidence. Mean dry fibre yield was highest (25.70q ha^{-1}) in the plots treated with *T. viride* at 7, 15 and 30 DAS while it was lowest in control (17.76q ha^{-1}) and in carbendazim treatment, it was 22-23q ha^{-1}. Variation in yield was due to variation in plant height and basal diameter.

Trichoderma spp. are common saprophytic fungi found in almost any soil and rhizosphere microflora and have been investigated as potential biocontrol agents because of their ability to reduce the incidence of diseases and common soil borne pathogens (Papavizas, 1985; Spiegal and Chet, 1998; Dubey *et al.,* 2007). Strains of *T. viride, Aspergillus niger* (Strain AN-27) and some species of fluorescent *Pseudomonas* have been established as very effective biocontrol agents for stem and root rot in jute (Srivastava and Singh, 2009; Roy *et al*., 2008). Siddique *et al*. (1998) reported effective control of *M. phaseolina, Rhizoctonia solani* and *Fusarium oxysporum* infection in sunflower and chickpea with *T. harzianum*. Plant growth was also enhanced (Siddique *et al.,* 1998, 1999). Seed treatment with *T. viride* and drenching with the same antagonist has controlled the root disease caused by *M. phsaeolina* in jute under different agro-ecological conditions (Anonymous, 1990-2006, 1999). It may be concluded that soil application of *T. viride* at 7, 15 and 30 DAS was most effective in controlling *Macrophomina* disease complex (*i.e*., seedling blight, collor rot, stem rot and root rot diseases) and also increased fibre yield in jute.

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