

Biological Management of Blackgram Root Rot (*Macrophomina phaseolina*) by Different Isolates of *Trichoderma* spp.

C. RETTINASSABABADY AND T. RAMANADANE

Pandit Jawaharlal Nehru College of Agriculture & Research Institute, Serumavilangai, Karaikal 609 603

Blackgram [*Vigna mungo* (L.) Hepper] is an important pulse crop gaining importance all over the world in recent years. It is rich in protein and contains amino acids in higher quantities than any other cereal and pulses. Among the various diseases affecting blackgram, root rot caused by *Macrophomina phaseolina* (Tassi.) Goid is becoming more serious because of its seed and soil borne nature [1]. Root rot can be controlled by using soil fungicides [2]. But the use of chemicals may pose danger to the environment by polluting the ecosystem. The high cost of chemicals required for soil application, development of fungicide resistance [3] and the hazardous effects of chemical fungicides on the eco-system have forced the scientist to develop alternate methods to control this disease. Hence, biological control method has been considered as a promising approach for the management of root rot of blackgram. The potential use of various species of *Trichoderma* as bio-control agent demonstrated the antagonistic activity against *M. phaseolina* was reported by many researchers [4, 5]. Hence, the use of different species of *Trichoderma* by two different methods of application (seed and soil) was studied against *M. phaseolina* under pot culture experiment.

The various *Trichoderma* isolates viz., *T. viride* (native isolate), *T. harzianum*, *T. hamatum*, *T. viride* (Coimbatore) were applied as seed inoculants (@ 5×10^9 conidia/ml. in 1 per cent CMC solution) and soil application (FYM inoculum containing 2.6×10^3 cfu/g of substrate).

Seed treatment with *Trichoderma* isolates

Sterilised pot culture soil mixed with the inoculum of *M. phaseolina* @ 50gm/kg of soil was filled in earthen pots (30 cm dia.). Blackgram seeds (cv. ADT 3) treated with spore suspensions of *Trichoderma* spp. using a spore concentration, of 5×10^9 conidia/ml. were sown @10 seeds/pot. Carbendazim seed treatment @ 2g/kg seed was also carried out along with an uninoculated control.

Soil application of *Trichoderma* isolates

The inocula of various *Trichoderma* isolates multiplied in FYM was used for soil application which were added to the pathogen inoculated soil @ 1 per cent by weight of the soil. The effectiveness of the antagonists was compared with carbendazim (0.1%) through soil drenching. Two days after antagonists application, healthy blackgram seeds @10/pot were sown in each pot. Root rot incidence was recorded at 15 days interval. The grain yield was also recorded at the end of the experiment. The pot culture experiment was conducted in a randomised block design with each treatment replicated three times.

Perusal of the data presented in Table 1 indicated that, seed treatment and soil application of *Trichoderma* species individually reduced the root rot incidence significantly when compared to control. At 15 DAS root rot incidence was minimum in carbendazim treatment in both seed and soil application of *Trichoderma* spp. The effect of *Trichoderma* isolates as seed treatment on the per cent root rot incidence under pot culture

condition are presented in Table 1. The per cent disease incidence was significantly more in pathogen inoculated control compared to all other treatments irrespective of days after sowing. The efficacy of native isolate of *T. viride* on decreased root rot incidence of blackgram might be due to high competitive saprophytic ability (CSA) and rhizosphere competence [6]. Seed pelleting method of delivering antagonists to the rhizosphere of the plants would have provided necessary protection to the emerging roots and shoots of the germinating seeds by creating a biological barrier around them. The effect of soil application of *Trichoderma* isolates on the incidence of root rot is presented in table 1. All the *Trichoderma* isolates caused significant reduction in disease incidence and their effect was comparable to that of Carbendazim. The effect of *T. viride* (native isolate) was on par with that of fungicide Carbendazim treatment. In the present study, seed and soil application of *Trichoderma* isolates significantly increased the grain yield. Maximum grain yield of 815 kg/ha (seed treatment) and 810 kg/ha (soil application)

was recorded by native isolates of *T. viride* compared to 290 kg and 320 kg/ha in control treatment, respectively. The increase in yield might be due to the fact that about 20 per cent of production potential of the plant was wasted to satisfy the unfavourable biological situations in soil [7]. When plants were treated with bioagents, its proliferation in rhizosphere altered the rhizosphere microflora and thereby facilitated the plants to utilise its entire energy for its own growth. Hence, the present study clearly indicates the superiority of native isolate of *T. viride* over other *Trichoderma* species and Carbendazim either through seed or soil application in providing biological protection against a seed/soil borne disease in blackgram.

REFERENCES

1. DHINGRA, O.D. & M.N. KHARE (1973). Biological control of *Rhizoctonia bataticola* urd bean. *Phytopath. Z.*, 76: 23-29.
2. BHIMSEN, S., KALPANA BHATNAGAR & K.S. SHEKHAWAT (1995). chemical control of stem blight of cowpea induced by *Macrophomina*

Table 1. Effect of seed and soil application with *Trichoderma* isolates on the incidence of root rot of blackgram

Treatments	Per cent disease incidence (DAS)									
	Seed treatment					Soil application				
	15	30	45	60	Grain yield (kg/ha)	15	30	45	60	Grain yield (kg/ha)
<i>T. viride</i>	7.66 ^e (16.07)	5.88 ^e (14.03)	5.14 ^e (13.10)	2.13 ^e (8.40)	760 ^b	9.09 ^d (17.55)	6.10 ^d (14.30)	5.34 ^d (13.36)	3.20 ^d (10.30)	790 ^b
<i>T. harzianum</i>	5.21 ^d (13.19)	4.50 ^d (12.25)	3.63 ^d (16.99)	1.94 ^d (8.01)	735 ^b	6.35 ^c (14.60)	4.66 ^c (12.46)	3.76 ^c (11.18)	2.87 ^c (9.75)	720 ^b
<i>T. hamatum</i>	4.22 ^c (11.85)	3.38 ^c (10.60)	2.59 ^c (9.26)	1.84 ^c (7.29)	696 ^c	5.18 ^a (13.16)	3.45 ^b (10.70)	1.88 ^b (7.89)	1.83 ^b (7.78)	686 ^c
<i>T. viride</i> native isolate	3.20 ^b (10.30)	2.44 ^b (8.98)	1.74 ^b (7.57)	0.00 ^b (6.06)	815 ^a	4.22 ^a (4.85)	2.47 ^a (9.05)	1.75 ^a (7.61)	0.00 ^a (6.13)	810 ^a
Carbendazim	2.32 ^a (8.76)	1.65 ^a (7.37)	0.00 ^a (5.92)	0.00 ^a (5.92)	825 ^a	3.20 ^a (10.30)	2.42 ^a (8.95)	1.72 ^a (7.54)	0.00 ^a (6.06)	805 ^a
Control	39.26 ^f (38.80)	28.90 ^f (35.52)	18.32 ^f (25.34)	22.46 ^f (28.29)	290 ^d	40.07 ^e (39.27)	29.82 ^d (33.10)	19.15 ^d (25.95)	23.71 ^c (29.14)	320 ^d

DAS-Days after sowing; Figures in parenthesis represent transformed values; In a column, means followed by similar letters are not different statistically by DMRT.

- phaseolina* (Tassi.) Goid. *Indian J. Mycol. Pl. Pathol.*, **25**(1): 110.
3. ANITHA, R., REDDY, M.S. & K.C. RAO (1989). Studies on acquired fungicide tolerance in *Macrophomina phaseolina* to Mancozeb and Captan and their cross tolerance to other fungicides. *Indian J. Pl. Prot.*, **17**: 155-158.
 4. INDIRA, N. & GAYATHRI SUBBIAH (2003). Management of blackgram root rot caused by *Macrophomina phaseolina* by antagonistic micro organism. *Madras Agril. J.*, **90**: (7-9): 490-494.
 5. SETHURAMAN, K., N. REVATHY & M. MANIVANNAN (2003). Efficacy of biocontrol micro-organisms on root rot of blackgram caused by *Macrophomina phaseolina* (T'assi.) Goid. *Legume Res.*, **26**(3): 218-220.
 6. KOUSALYA, G. & JEYARAJAN, R. (1991). Efficacy of antagonists on germination and root rot of blackgram. *J. Biol. Control.*, **5**(1): 42-44.
 7. ROVIRA, A.D. (1963). Microbial inoculation of plants. I. establishment of free living nitrogen fixing bacteria in the rhizosphere and their effects on maize, tomato and wheat. *Pl. Soil.*, **19**: 304-314.