J.Biol.Control, 5 (1), 42-44, 1991

Efficacy of Antagonists on Germination and Root Rot of Blackgram

KOUSALYA GANGADHARAN and R.JEYARAJAN
Department of Plant Pathology
Tamil Nadu Agricultural University
Coimbatore 641 003

ABSTRACT

Germination of blackgram seeds was significantly higher in *Trichoderma viride* + *T. harzianum* soil amendment 30 days before sowing and was on par with *T. viride* and *T. harzianum* applied individually. When added at the time of sowing, maximum germination was obtained in *T. viride* + *T. harzianum* soil amendment and was on par with *T.harzianum* soil amendment. There was significant reduction in the incidence of root rot when *T. viride* + *T. harzianum* was amended to soil either 30 days before sowing or at the time of sowing followed by *T. harzianum* soil amendment.

Key Words : Biological control, antagonists, *Trichoderma viride*, *T. harzianum*, *Macrophomina phaseolina*

The possibility of control of plant pathogenic fungi by antagonistic organisms added either alone or integrated with fungicide/s has been the subject of increasing interest. Biological control of soil-borne plant pathogens by addition of antagonistic organisms to soil/seed is gaining importance at present. This helps to minimise the hazards. In this laboratory, isolates of several antagonists have been assembled. In order to select a suitable isolate for the biological control, a pot culture experiment was conducted and the results are presented in this paper.

MATERIALS AND METHODS

T. viride and *T. harzianum* were multiplied on tapioca rind for 20 days. *M. phaseolina* was multiplied on sand maize medium for 10 days. In the first experiment, the pathogen and the antagonist/s were added to the soil 30 days before sowing (DBS) and in the second they were mixed with the soil at the time of sowing. The pathogen was added at 10% by weight of soil and the antagonist at 5% by weight of soil. The experiment was laid in a completely randomised block design.

The treatments were :

i. *M. phaseolina* (10%) + *T. viride* (5%)
ii. *M. phaseolina* (10%) + *T. harzianum* (5%)
iii. *M. phaseolina* (10%) + *T. viride* (5%) + *T. harzianum* (5%)
iv. *M. phaseolina* (10%) + TMTD seed treatment (4g/kg of seed)
v. and *M. phaseolina* (10%) alone (control)

Seeds of blackgram (var Co5) collected from apparently healthy plants were used for the studies. Ten replications were maintained for each treatment and 10 seeds were sown in each replication. Sowing was taken up simultaneously from the same seed lot both for 30 DBS and during sowing. The number of germinated seeds was counted without removing the seedlings. Root rot incidence was recorded 30, 45 and 60 days after sowing (DAS).

RESULTS AND DISCUSSION

The germination per cent was significantly higher when the soil was amended with *T. viride* + *T. harzianum*, 30 days before sowing and was on par with *T. viride* and *T. harzianum* soil amendment. When amended during sowing, maximum germination was obtained with *T. viride* + *T. harzianum* soil amendment and was on par with *T. harzianum* soil amendment (Table 1).

Table 1. Efficacy of antagonist/s on the germination of blackgram (%)

Treatments	Antagonists added to soil	
	30 DBS	During sowing
M. phaseolina + *T. viride*	90.0 (71.6)	82.0 (64.95)
M. phaseolina + *T. harzianum*	85.0 (67.3)	85.0 (67.3)
M. phaseolina + *T. viride* + *T. harzianum*	91.0 (72.6)	88.0 (69.8)
M. phaseolina + TMTD seed treatment	76.0 (60.67)	82.0 (64.95)
M. phaseolina(Control)	60.0 (50.8)	67.0 (54.95)
CD (P=0.05)	8.1	3.75

(Figures in parantheses are transformed values)

When amended 30 DBS, root rot incidence was significantly less in *T. viride* + *T. harzianum* soil amendment, and was on par with *T. harzianum* amendment. There was significant reduction in the incidence of root rot when *T. viride* + *T. harzianum* were added to soil at the time of sowing and was on par with *T. viride* and *T. harzianum* applied individually on soil amendments (Table 2). There was no significant difference in the incidence of root rot 30, 45 and 60 DAS, when the antagonist/s were added to soil 30 DBS. If they were added to soil at the time of sowing, incidence of root rot was significantly more on 45 DAS in comparison with 30 and 60 DAS (Table 2).

Gindrat *et al.* (1977) reported that *Gliocladium roseum* and *G. virens* successfully controlled black root rot of cucumber (*Phomopsis sclerotiodes*). Kommendahl and

Table 2. Efficacy of antagonists on the control root rot of blackgram

Treatments	% root rot incidence							
	Added 30 days before sowing (DBS)				Added at sowing			
	30 DAS	45 DAS	60 DAS	Mean	30 DAS	45 DAS	60 DAS	Mean
M. phaseolina + *T. viride*	6.3 (14.46)	10.2 (18.59)	8.1 (16.43)	8.2 (16.49)	5.8 (13.91)	25.5 (30.29)	7.4 (15.73)	12.9 (19.9)
M. phaseolina + *T. harzianum*	4.3 (11.96)	7.6 (16.09)	7.6 (16.08)	6.5 (14.71)	4.6 (12.39)	30.0 (33.29)	6.1 (14.30)	13.5 (20.0)
M. phaseolina + *T. viride* + *T. harzianum*	4.2 (11.81)	7.5 (15.83)	7.4 (15.77)	6.37 (11.47)	4.3 (11.95)	26.3 (31.84)	5.8 (13.91)	12.1 (19.20)
M. phaseolina + TMTD seed treatment	14.4 (22.24)	19.5 (26.12)	12.3 (20.51)	15.4 (22.96)	10.6 (19.0)	30.6 (35.58)	11.0 (19.37)	17.4 (24.65)
M. phaseolina + (Control)	20.9 (27.20)	29.6 (32.96)	15.2 (22.89)	21.23 (27.14)	20.3 (29.76)	49.5 (44.76)	20.3 (26.76)	26.7 (32.80)
Mean	10.02 (17.53)	14.88 (12.92)	9.72 (18.01)		10.9 (18.24)	31.2 (33.96)	9.5 (17.42)	
CD (P=0.05)	Period	Treatment	Periodx Treatment		Period	Treatment	Periodx Treatment	
	NS	3.99	6.9		2.67	3.45	5.97	

(Figures in parentheses are angles corresponding to percentages)

Windels (1978) evaluated and found 37 isolates of fungi and 22 isolates of bacteria effective in seed treatment for the biological control of root rot of pea by *R. solani*. Biological control of root rot of beans, cotton and tomato was obtained by using *T. harzianum* (Elad *et al.*, 1980). Akhtar *et al.* (1982) obtained satisfactory control of *Rhizoctonia* root rot of cotton by the addition of *T. harzianum* before sowing. Sunflower collar rot by *Sclerotium rolfsii* was effectively reduced by *T. viride* in Australia (Chakraborty and Bhowmik, 1985). There was maximum control (76.8%) of root rot of sugarbeet caused by *S. rolfsii* by integrated application of 30g *T. harzianum* + 100 mg PCNB/m (Upadhyay and Mukhopadhyay, 1986). Alagarsamy *et al.* (1987) reported that seed pelleting of cotton with the isolates of *T. harzianum*, significantly reduced pre-emergence and post emergence mortality of seedlings of cotton by *R. solani* and increased the survival of seedlings. Incorporation of *T. viride* in seed bed was effective in controlling root rot of sugarcane seedlings from ture seed (fluff) for 4 years (Padmanaban and Alexander, 1987). Mukhopadhyay (1987) controlled root rot of lentils and chickpea by the application of wheat-bran saw dust preparation of *T. harzianum* and *T. koningii* to field soil. Samiappan *et al.* (1987) reported that wheat bran based inoculum of *T. viride* I and *T. viride* III reduced root rot of greengram by 33 and 26 per cent over control respectively. Root rot of blackgram was reduced by 40 per cent over control by using *T. viride* isolates 1 and 4 for seed treatment (Samiappan, 1988).

It is evident from these results, that root rot of blackgram is significantly reduced by soil application of *T. viride* or *T. harzianum* or both multiplied on tapioca rind. Further, use of these antagonists seems to be or environmentally safer alternative to the use of fungicides for seed treatment.

REFERENCES

AKHTAR,C.M.,AMIN,C.M. and SALIM,C.M. 1982. Investigations on the biological control of *Rhizoctonia solani* and *Fusarium oxysporum* causing root rot and wilt diseases in cotton and linseed respectively. *Pakistan Ayub Agric. Res. Inst. Faisalabad.* 63 pp.

ALAGARSAMY,G., MOHAN,S. and JEYARAJAN, R. 1987. Effect of seed pelleting with antagonists against *Rhizoctonia solani*. Abs. Papers presented in *Workshop on Biological control of Plant Diseases* 10-12, March, 1987, TNAU, CBE. 3. p.21.

CHAKRABORTY,S. and BHOWMIK,T.P. 1985. Chemical and biological control of sunflower collar rot caused by *Sclerotium rolfsii* Sacc. *Pesticides*, **19**, 31-33

ELAD,Y., CHET,I. and KATAN,J. 1980. *Trichoderma harzianum* : A biological agent effective against *Sclerotium rolfsii* and *Rhizoctonia solani*. *Phytopathol.*, **70**, 119-121.

GINDART,D., VANDER HOEVEN,E. and MOODY,A.R. 1977. Control of *Phomopsis sclerotioides* with *Gliocladium* or *Trichoderma*. *Neth. J. Plant Pathol.*, **83**, 429-438.

KOMMENDAHL,T. and WINDELS,C.E. 1978. Evaluation of biological seed treatment for controlling root diseases of pea. *Phytopathol.*, **68**, 1067-1095.

MUKHOPADHYAY, 1987. Biochemical efficacy of *Trichoderma* spp. in controlling soil-borne diseases. Abs. Papers presented in *Workshop on Biological control of Plant Diseases*, 10-12 March, 1987, TNAU, CBE.3.

PADMANABAN,P. and ALEXANDER,K.C. 1987. Control of root rot of sugarcane seedlings by antagonistic organism, *Trichoderma viride*. Abs. Papers presented in *Workshop on Biological control of plant diseases*. 10-12, March, 1987, TNAU, CBE-3. p.10.

SAMIYAPPAN,R., ARJUNAN,G., UDAYAKUMAR,M., UDAYASURIYAN,V. and JEYARAJAN,R. 1987. Effect of *Trichoderma* spp. on *Macrophomina* root rot disease and *Rhizobium* nodulation in greengram. Abs. Papers presented in *Workshop on Biological control of Plant Diseases*. 10-12, March, 1987, TNAU, CBE-3. p.31-32.

SAMIYAPPAN,R. 1988. Biological control of blackgram root rot caused by *Macrophomina phaseolina* (Tausi) Goid. Ph.D. Thesis, TNAU, CBE-3, India. 169 pp.

UPADHYAY,J.P. and MUKHOPADHYAY,A.N. 1986. Biological control of *Sclerotium rolfsii* by *Trichoderma harzianum* in sugarbeet. *Trop. Pest Mgmt.*, **32**, 215-220.