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Short communication

Compatibility of biocontrol agent *Trichoderma viride* with various pesticides

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ABSTRACT

Compatibility of *Trichoderma viride* with 25 pesticides was evaluated *in vitro*. Among six seed-treatment chemicals tested, *T. viride* showed a high compatibility with the insecticide Imidacloprid (7.6cm mycelial growth), followed by Mancozeb (6.3cm) and Tebuconazole (3.7cm). Contact fungicides, viz., Pencycuron and Propineb were found to be fully compatible with *T. viride*. Among the 10 herbicides also tested, the fungus was highly compatible with Imazathafir (9.0cm) followed by 2,4-D Sodium salt (8.9cm) and Oxyfluoforen (6.5cm) while being totally incompatible with systemic fungicides like Carbendazim, Hexaconazole, Tebuconazole and Propiconazole.

Key words: *Trichoderma viride*, compatibility, pesticides

Soil and seed borne diseases constitute a major constraint in crop production. Seed-borne pathogens are carried externally and / or internally through seeds and it is essential to treat the seed with protectants for early control of pathogens and to raise healthy plant stand. This can be achieved through chemical and or biological means. *Trichoderma viride* is a potential biocontrol agent against several soil and seed borne pathogens (Papavizas, 1983). Owing to its antagonistic effect on inimical organism, it ranks as one of the most successful agents for biological control of pathogens (Gupta, 2004). As some fungicides are effectively used as seed-dressing, it is necessary to study compatibility of these with the commonly used bioagent, *T. viride*. Further, pesticides applied as foliar spray or soil drench ultimately reach the soil and affect beneficial non-target mycoflora, including fungi. Hence, knowledge of compatibility of *T. viride* with important pesticides may help opt for better plant-protection measures. Tolerance to commonly-used pesticides enhances the efficacy and expands the scope of application of biocontrol agents such as *T. viride*. Hence, a laboratory study was made to assess compatibility of some commonly-used, commercially available pesticides on growth and sporulation of *T. viride*.

Trichoderma viride was isolated from soil by dilution-plate technique and efficiency of the isolates was tested against *Fusarium solani* (isolated from chillies in dual cultures). The best isolate was maintained on Potato Dextrose Agar for further studies.

Six seed-treatment chemicals, viz., Carbendazim (0.1%), Mancozeb (0.25%), Captan (0.3%), Tebuconazole (0.15%), Captan+Hexaconazole and Imidacloprid (0.5%); five systemic-fungicides, viz., Hexaconazole (0.2%), Propiconazole (0.15%), Tebuconazole (0.15%), Difenconazole (0.05%), Benomyl (0.1%); three contact fungicides, viz., Pencycuron (0.2%), Copper oxy-chloride(0.3%), Propineb (0.2%); one combination product, viz., Carbendazim+Mancozeb (0.2%), and 10 weedicides, viz., Quizalopop ethyl 5% EC , Pyrithiobac sodium 10%EC, Oxyfluoforen 3.5%EC, Cyhalopop butyl 10%EC, Glyphosate+ammonium sulphate, Pendimethalin, 2,4-D Sodium salt 80%WP, Imazithaphir 10%EC, Atrazine 50%WP and Glyphosate 41%SL were evaluated for compatibility with *T.viride, in vitro,* by poisoned-food technique (Nene and Thapliyal, 1993).

Mycelial discs 0.5cm in diameter were cut out, using a sterile cork borer, from actively growing 7 day old culture of the fungus and placed in the centre of a Petri dish containing PDA supplemented with various pesticides. Inoculated Petri dishes were incubated at room temperature (28 ± 2^{o}C), and observations on radial growth of colony (mm) were recorded after 4 days when the growth of *T. viride* in the check plates was full. Three replications were made for each treatment, including, the check. Data was statistically analyzed.

Trichoderma viride showed a high compatibility with the insecticide Imidacloprid (7.6cm mycelial growth),

followed by Mancozeb (6.3cm) and Tebuconazole (3.7cm), respectively. Mycelial growth was inhibited in the presence of Captan and Captan+Heaxaconazole 2.1cm and 1.6cm, respectively (Table 1). *T. viride* isolate was totally incompatible with the systemic fungicide Carbendazim, which showed no mycelial growth.

On the other hand, *T. viride* was highly compatible with Pencycuron, showing a radial growth of 8.9cm, followed by Propineb (8.0cm). Lower compatibility was recorded in Copper oxy chloride and Carbendazim+Mancozeb (0.2%) amended medium (3.3cm and 2.9cm; Table 2). It was least incompatible with Hexaconazole, Tebuconazole, Propiconazole and Benomyl, respectively, by showing very scanty growth.

Among the ten herbicides tested, *T.viride* was highly compatible with Imazathafir (9.0cm), followed by 2,4-D Sodium salt (8.9cm) and Oxyflorofen (6.5cm) (Table-3). Moderate compatibility was observed with Glyphosate, Glyphosate+Ammonium Sulphate, Cyhalopop butyl 10%EC and Pyrithiobac sodium salt where it showed radial growth ranging from 2.8cm to 5.7cm. It was incompatible with Quizalopop ethyl 5%EC, followed by Atrazine and Pendimethalin, by exhibiting almost no growth.

Growth response of *T. viride*, ranging from inhibitory, stimulatory to neutral with the above chemicals observed in this study, is in agreement with earlier reports (Mondal *et al*, 1995; Sharma *et al*, 1999). Various seed-treatment chemicals positively affected growth of *T. viride*, while Carbendazim had an inhibitory effect. However, high compatibility of *T. viride* with Mancozeb and moderate compatibility with Captan and 2,4-D Sodium salt confirmed finding in the earlier reports (Gounder *et al*, 1999); Gupta, (2004). Earlier, Sharma *et al* (2001) suggested that COC fungicides were not compatible with *Trichoderma spp.*, while, compatibility of COC with *T. Viride* was reported by Karpagavalli (1997) and Bhattiprolu (2007).

In the present study, Fytolan showed 62.9% inhibition of growth of *T. viride*. Similar observations were reported by Shanmugam (1996). The slight difference observed may be due to geographical separation of *T. viride* isolates. Based on these studies, it is concluded that *T. viride* can be safely incorporated into IDM of seed and soil borne diseases.

Table 1. Compatibility of *Trichoderma viride* with seed-treatment chemicals

S.No.	Treatment	Dose of chemical	Diameter of fungus (cm)	Inhibition (%)
1	Carbendazim 50%WP	0.10%	0.50	94.4
2	Mancozeb 75%WP	0.25%	6.30	28.9
3	Captan 50%WP	0.30%	2.10	59.4
4	Tebuconazole 9.55%	0.105%	3.70	75.8
5	Captan 70% + Hexaconazole 5%WP,	0.20%	1.60	84.7
6	Imidacloprid 70%SD	0.05%	7.60	14.8
7	Check		8.90	
	SEM		0.088	
	SED		0.124	
	CD*(P=0.05)*		0.271	

Table 2. Compatibility of *Trichoderma viride* with fungicides

S. No.	Treatment	Dose of chemical	Diameter of fungus (cm)	Inhibition (%)
1	Hexaconazole 5%EC	0.20%	0.5	94.4
2	Propiconazole 250EC	0.10%	0.6	93.0
3	Tebuconazole 430SC	0.15%	0.5	94.4
4	Difenconazole 25%EC	0.05%	1.5	83.0
5	Pencycuron (contact)	0.20%	8.9	0.0
6	Copper oxychloride (contact) 50%WP	0.30%	3.3	62.9
7	Carbendazim12% +Mancozeb 64%WP	0.20%	2.9	67.4
8	Benomyl 50%WP	0.10%	0.7	92.0
9	Propineb (contact) 25%WP	0.25%	8.0	10.1
10	Check		8.9	
	SEM		0.048	
	CD*(P=0.05)*		0.141	
	CV		2.3%	

Table 3. Compatibility of *Trichoderma viride* with various herbicides

S.No.	Treatment	Dose of chemical	Diameter of fungus (cm)	Inhibition (%)
1	Quizalopop ethyl 5%EC	0.20%	0.5	94.4
2	Pyrithiobac sodium 10%EC	0.125%	2.8	68.8
3	Oxyfluoforen 3.5%EC	0.12%	6.5	27.7
4	Cyhalopop butyl 10%EC	0.22%	3.5	61.1
5	Glyphosate+ammonium sulphate71	0.62%	4.7	47.7
6	Pendimethalin 20%EC	0.62%	1.1	87.7
7	2,4-D Sodium salt 80%WP	0.22%	8.9	1.1
8	Imazithaphir 10%EC	0.152%	9.0	0.0
9	Atrazine 50%WP	0.62%	0.5	94.4
10	Glyphosate 41%SL	12%	5.7	36.6
11	Check		9.0	0.0
	SEM		0.088	
	CD*(P=0.05)*		0.259	
	CV		3.2%	

REFERENCES

Bhattiprolu, S.L. 2007. Compatibility of *Trichoderma viride* with fungicides. *Ind J. Pl. Prot.*, **35**:357-358

Gounder, S.B., Kulkarni, S. and Kulkarni, S. 1999. Compatibility effect of antagonists and seed dressers against *Fusarium udum* - the causal agent of pigeon pea wilt. *Karnataka J. of Agril. Sci.,* **12**:197-199

Gupta, V. 2004. Compatibility of biocontrol agent *Trichoderma harzianum* with pesticides. *J.Mycol. Pl. Pathol.,* **34:**504-505

Karpagavalli, S. 1997. Effect of different fungicides on the growth of *Trichoderma*. *Ind. J. Plant Prot.,* **25:** 82-83

Mondal, G., Srivastava, K.D. and Agrawal R. 1995. Antagonistic effect of *Trichoderma* spp. on *Ustilago segetum* var. *tritici* and their compatibility with fungicides and biocides. *Ind. Phytopath.*, **48**: 466-470

Nene, Y.L. and Thapliyal P.N. 1993. Fungicides in plant disease control. Oxford and IBH, New Delhi, pp 691

Papavizas, G.C. 1983. *Trichoderma* and *Gliocladium* - Their biology, ecology and potential of biocontrol. *Ann. Rev. Phytopath.,* **23:**23-54

Shanmugham, V. 1996. Biocontrol of rhizome rot of ginger (*Zingiber officinale*) by antagonistic microorganisams. M.Sc.(Ag.) thesis, Kerala Agricultural University, Vellanikkara, Thrissur, Kerala, p. 72

Sharma, D.D., Gupta V.P. and Chandrasekhar, D.S. 1999. Compatibility of certain biocontrol agents with chemical pesticides and fertilizers. *Ind. J. Sericulture,* **38**:79-82

Sharma, S.D., Mishra, A., Pandey, R.N. and Patel, S. J. 2001. Sensitivity of *Trichoderma harzianum* to fungicides. *J. Mycol. Pl. Pathol*., **31**:251-253

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