J.Biol.Control, 5 (1), 39-41, 1991

Control of Seed Borne Pathogens of Groundnut by Antagonistic Fungi

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ABSTRACT

Antagonistic fungi *viz., Trichoderma harzianum, T. viride, T. reesei, T. hamatum* and *T. pseudokoningii* were evaluated against seedborne pathogens of groundnut. The mycelial growth of *Aspergillus flavus* was heavily inhibited by *T. viride, T. hamatum, T. pseudokoningii* and *T. harzianum* whereas *A. niger* was retarded by *T. pseudokoningii* and *T. hamatum*. All the antagonistic organisms used were effective in inhibiting the mycelial growth of *Rhizoctonia bataticola* and *Fusarium semitectum*. The biocontrol agents were as effective as seed treatment with mancozeb and carbendazim in controlling the seed borne pathogens. Among the biocontrol agents *T. pseudokoningii* and *T. harzianum* were effective against *A. flavus* and *R. bataticola* while *T. reesei* was the most effective in controlling both pre-and post emergence death by *A. niger*. *F. semitectum* was controlled by *T. harzianum* and *T. viride*.

Key Words : Antagonistic organisms, *Trichoderma spp.* seed borne pathogens, Groundnut, mancozeb and carbendazim

Seed borne pathogens of groundnut are deterimental in crop production programme causing seed rot, seedling damage and diseases of various parts at later stages of crop growth (Khare, 1988). The fungi *Aspergillus niger* and *Rhizoctonia bataticola* infecting the seeds caused 30 per cent reduction in germination (Lalithakumari *et al.*, 1972). Use of *Trichoderma* spp. was reported to be effective in reducing the propagules of seed as well as soil borne pathogens (Papavizas, 1984). The present study was undertaken to evaluate the *Trichoderma* spp. against seed borne pathogens of groundnut in comparison with fungicides.

MATERIALS AND METHODS

The effect of antagonistic fungi on the growth of seed borne fungal pathogens of groundnut was studied under *in vitro* condition. Five *Trichoderma* spp. were used against four seed borne fungi *viz., Aspergillus flavus, A. niger, R. bataticola* and *Fusarium semitectum*. Agar plate method of Baker and Cook (1974) was followed in the assay as described below. Ten mm of seven days old culture disc of the test pathogen was placed in the centre of the Petri dish containing sterilized potato dextrose agar. Periphery of the Petri dish was inoculated with five antagonistic fungi separately. This was repeated for all the four pathogenic fungi. The Petri dishes were incubated at (28 ± 2°C) for seven days. Four replications were maintained for each pathogen. The colony diameter was recorded.

Four biocontrol agents *viz., T. harzianum, T. viride, T. reesei* and *T. pseudokoningii* and two fungicides *viz.*, mancozeb (Dithane M45 - 4 g/kg of seed) and carbendazim (2 g/kg of seed) were tested against seed borne pathogens. Seeds surface - sterilized with 0.1 per cent mercuric chloride were treated with the spore suspension of ten-day old cultures of four seed borne pathogens individually. After shade-drying, these seeds were treated with spore suspension of antagonistic fungi, using carboxymethyl cellulose 1 per cent as a sticker. Another set of seeds, already treated with pathogens were treated with mancozeb and carbendazim individually. Seeds inoculated with the pathogens alone served as control. Twenty five seeds were sown in each pot containing

Table 1. Bioassay of antagonistic organisms against seed borne pathogens of groundnut

Treatments	*A. flavus*		*A. niger*		*R. bataticola*		*F. semitectum*	
	Mean mycelial growth (cm^2)	Per cent inhibition	Mean mycelial growth (cm^2)	Per cent inhibition	Mean mycelial growth (cm^2)	Per cent inhibition	Mean mycelial growth (cm^2)	Per cent inhibition
T. harzianum	2.557	95.98	57.32	8.74	6.89	98.16	2.02	96.82
T. viride	1.736	97.27	26.58	57.68	5.48	91.38	5.82	90.85
T. reesei	41.972	34.03	49.03	21.94	5.81	90.54	6.74	89.41
T. pseudokoningii	1.879	97.04	3.72	94.07	1.51	97.63	6.29	90.11
T. hamatum	1.742	97.26	3.82	93.92	4.49	92.93	2.06	96.76
Control	63.62	-	62.81	-	63.58	-	63.62	-
CD (P=0.05)	0.782		1.843		0.729		0.103	

sterilized soil. Three replicates were maintained. Germination counts and post emergence death were recorded 7 and 15 days after the sowing respectively.

RESULTS AND DISCUSSION

Four spp. of *Trichoderma viz., T. viride, T. hamatum, T. pseudokoningii* and *T. harzianum* were highly inhibitory on the growth of *A. flavus* (Table 1). The growth of *A. niger* was drastically reduced by *T. pseudokoningii* and *T. hamatum* followed by *T. viride* than *T. reesei* and *T. harzianum*. Chohan (1970) reported that *T. viride* was highly antagonistic to *A. niger in vitro* showing a parasitic effect. Tirloksingh and Chohan (1974) also reported similar finding. Interestingly, all the five species of

Table 2. Efficacy of biocontrol agents and fungicides against seed borne pathogens

Treatments	*A. flavus*		*A. niger*		*R. bataticola*		*F. semitectum*	
	Germi-nation %	Post emergence death %	Germi - nation %	Post emergence death %	Germi nation %	Post emergence death %	Germi -nation %	Post emergence death %
T. harzianum	77.33 (61.59)	0.00 (6.52)	70.67 (57.21)	6.14 (13.93)	77.33 (61.59)	1.75 (8.81)	80.00 (63.43)	6.84 (14.32)
T. viride	70.66 (57.22)	7.51 (15.71)	64.00 (52.15)	12.53 (20.72)	66.52 (54.74)	5.79 (13.92)	70.67 (57.22)	0.00 (6.84)
T. reesei	65.33 (54.74)	8.21 (7.04)	80.00 (65.51)	6.68 (14.39)	68.00 (55.55)	5.88 (14.03)	66.67 (54.74)	12.00 (20.27)
T. pseudokoningii	66.67 (54.74)	0.00 (7.04)	65.33 (53.94)	0.00 (7.11)	74.67 (59.80)	0.00 (6.65)	68.00 (55.58)	5.89 (14.04)
Mancozeb	82.66 (65.61)	0.00 (6.32)	82.66 (65.42)	0.00 (6.36)	89.33 (71.01)	1.45 (8.09)	81.33 (64.4)	1.59 (8.47)
Carbendazim	77.33 (61.59)	5.71 (12.81)	89.33 (71.01)	0.00 (6.07)	81.33 (64.43)	1.59 (8.47)	78.66 (62.51)	0.00 (6.42)
Control	52.00 (40.14)	4.74 (40.22)	54.67 (47.68)	39.04 (38 67)	50.67 (45.38)	34.68 (36.23)	54.67 (47.68)	34.06 (35.69)
CD (P=0.05)	4.79	5.66	3.5	4.49	3.36	4.4	2.76	3.5

Figures in parentheses are arcsine values

Trichoderma used against *R. bataticola* and *F. semitectum* were highly effective in arresting the growth. The effectiveness of *T. viride* against *R. bataticola* was already reported (Norton, 1954; Murugesan,1990).

The effect of seed treatment with biocontrol agents and fungicides against each pathogen revealed that mancozeb was superior in increasing the seed germination and reducing the mortality of seedlings due to *A. flavus*. *T. harzianum* and carbendazim gave significant improvement in the germination of *A. flavus* - inoculated seeds (Table 2). The effect of mancozeb against *A. flavus* was reported by Bansal and Sobti (1988). *A. niger* was effectively controlled by both the fungicides followed by *T. reesei*. The fungicides and biocontrol agents *viz., T. pseudokoningii* and *T. harzianum* recorded increase in germination and decrease in mortality of seedlings caused by *R. bataticola*

All the *Trichoderma* spp. were effective in increasing the germination and reducing the post emergence death against *F. semitectum*. Among these, *T. viride* was compatible with carbendazim in controlling post emergence death and *T.harzianum* against pre emergence death. Osman *et al.* (1986) stated that *T. harzianum* followed by *T. viride* were the most antagonistic against *F. oxysporum* f. sp. *lupini*.

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