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EFFECT OF CHEMICALS AND *TRICHODERMA* ISOLATES AGAINST SOIL BORNE PATHOGENS IN GROUNDNUT UNDER *IN VITRO* CONDITION

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ABSTRACT

Seven different fungicides were tested against colony growth of *Rhizoctonia bataticola* and *Sclerotium rolfsii.* Among all the fungicides tested, hexaconazole 5% SC, tebuconazole 250 EC, vitavax power 75% WP at all concentrations recorded maximum inhibition (100%) against *Sclerotium rolfsii* and against *Rhizoctonia bataticola*. The per cent inhibition ranged from 97.7 to 100 per cent. Among different *Trichoderma* isolates tested, significant reduction of radial growth of *Rhizoctonia bataticola* and *Sclerotium rolfsii* was recorded by isolates CT7 and CT8.

KEYWORDS: Fungicides, *Trichoderma*, siol born pathogens

INTRODUCTION

Diseases caused by soil-borne fungi are a limiting factor in groundnut production in most of the groundnut growing areas in India. Among the soil-borne fungi, dry root rot (*Rhizoctonia bataticola*), stem rot (*Sclerotium rolfsii*) causes significant economic loss. Though the fungus is seed and soil borne (Dhingra and Sinclair, 1995), soil borne inoculum is more important in causing infection and disease development. Traditionally farmers rely on chemicals for the management of soil borne pathogen. In recent years, alternative ways of management of soil pathogens such as use of bio control agents, green chemicals *etc*., is gaining momentum due to deleterious effect of synthetic chemicals on environment along with various health and safety issues (Ramarethinum *et al.,* 2001).

MATERIALS AND METHODS

Isolation and identification of *Trichoderma* bio-control agents

Fungal bio-control agents (*Trichoderma* spp.) were isolated by using serial dilution technique from rhizophere soil of groundnut from different mandals of Chittoor district and identified based on morphological characters fungi (Rifai, 1969; Bhagat and Pan, 2010).

In vitro evaluation of different fungicides against stem rot and dry root rot pathogens of groundnut

Poisoned food technique was carried out using seven fungicides *viz.,* mancozeb 75% WP, tebuconazole 2 DS [Raxil], carbendazim 50% WP, SAFF 75% WP, hexaconazole 5% SC, tebuconazole 250 EC, Vitavax power 75% WP, to evaluate the colony growth of *Rhizoctonia bataticola* and *Sclerotium rolfsii* separately (Table 1 and 2). All the fungicides were tested at concentrations of 500,1000,2000,3000 and 4000 ppm in autoclaved potato dextrose agar media by poisoned food technique. All the treatments were randomized thrice in completely randomized design and incubated at 28ºC. Radial growth of fungus was recorded after 7-10 days of incubation when the fungal growth was covered completely in control plate. The per cent inhibition (PI) of the fungus over control was calculated using the following formula:

$$PI = \frac{A - B}{A} \times 100$$

where, A is colony growth of the fungus in control plate and B is the colony growth of the fungus in treated plate.

Antagonistic effect of *Trichoderma* spp. against collar rot and stem rot pathogens

Potentiality of ten native isolates of *Trichoderma* spp. were tested against *Sclerotium rolfsii* and *Rhizoctonia bataticola* by dual culture technique. Mycelial disc of five mm diameter of *Trichoderma* (seven days-old culture) isolates and the soil borne pathogens were placed on the opposite of the plate at equal distance from the periphery of the plate containing PDA media. Inoculated plates were incubated at 27 ºC. Fungicide (hexaconazole 5% SC @ 2

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ml/l) was used as chemical standard check. All the above treatments were replicated thrice in completely randomized design along with control plate of pathogen. Per cent inhibition was calculated as follows (Table 3).

$$\text{Per cent inhibition} = \frac{C - T}{C} \times 100$$

where, C = Mycelial growth in control and T = Mycelial growth in treatment

RESULTS AND DISCUSSION

In vitro evaluation of different fungicides against stem rot and dry root rot pathogens of groundnut

All the fungicides were very effective against *Rhizoctonia bataticola* at all concentrations and the per cent inhibition of mycelail growth ranged from 97.7 to 100. There was no significant difference observed between different concentrations used for each fungicide except SAFF (Table 1). Among different fungicides tested against colony growth of *Sclerotium rolfsii*, maximum inhibition (100.0%) was recorded by fungicides *viz.,* hexaconazole 5% SC, tebuconazole 250 EC, vitavax power 75% WP at all concentrations tested and there was no significant differences observed between different concentrations of fungicides. Next best fungicide was tebuconazole 2 DS (Raxil) where inhibition ranged from 96.1 to 99.2 per cent at all concentrations tested. In mancozeb fungicide treatment,the per cent inhibition ranged from 47.3 to 90.7 at different concentrations used. However, carbendazim was not much effective against *Sclerotium rolfsii* as per cent inhibition ranged from 0.0 to 48.8 only at different concentrations tested. Fungicide having combination product of mancozeb and carbendazim (SAFF) was also effective against *Sclerotium* as per cent inhibition ranged from 30.2 to 97.7 at different concentrations (Table 2).

Anitha Chowdary (1997) evaluated *in vitro* sensitivity of bell pepper isolate of *S. rolfsii* to captan, thiram @ 25, 50, 100, 250, 500 and 1000 ppm and propiconazole @ 10, 20, 25, 50, 100, 250 and 500 ppm and observed that propiconazole at a concentration of 250 ppm was effective in complete inhibition of *S. rolfsii*. Radhaiah (2012) also reported that mancozeb @ 0.2% completely suppressed the pathogen. Madhuri and Narayana Reddy (2013) reported the in vitro evaluation of nine fungicides by poison food technique and showed that tebuconazole and combination of carbendazim + mancozeb were effective in inhibiting the mycelial growth (94.1%) followed by difenconazole (93.3%). Das *et al.* (2014) reported that the effect of hexaconazole (systemic) has been highly effective in suppressing radial expansion as well as per cent inhibition of the *S.rolfsii* at all the concentrations used followed by Carboxin 37.5% + Thiram 37.5% (combo Fungicide) and tebuconazole.

Isolation and evaluation of *Trichoderma* spp. against collar rot and stem rot pathogens

Ten *Trichoderma* sps. were isolated from rhizophere soil of groundnut from different mandals of Chittoor district. All the ten isolates differed significantly in reduction of radial growth of *Rhizoctonia* when compared to growth of pathogen in control . Radial growth of *Rhizoctonia bataticola* ranged from 0.0 to 70.0 mm in all the treatments and was par with chemical check hexaconazole. Among different treatments, significant reduction of radial growth of *Rhizoctonia* was recorded in isolates CT7, CT8 and CT10. Next best treatment was *Trichoderma* spp. CT6 (Table 3). Per cent inhibition of *Rhizoctonia bataticola* ranged from 72.1 to 100.0 among all the isolates tested including chemical check (hexaconazole). Significantly higher inhibition was obtained using *Trichoderma* isolates CT7 and CT8 which were at par with the chemical standard check hexaconazole. Next best reduction was obtained by isolates of *Trichoderma* spp. CT5 and CT6 (Table 3).

Radial growth of *Sclerotium rolfsii* ranged from 0.0 to 70.0 mm in all the treatments including chemical control. Significantly less radial growth was obtained using isolates of *Trichoderma* spp. CT7 and CT8 which was at par with chemical check hexaconazole CT10 (Table 3). Among different bio-control agents, significantly higher per cent inhibition of *Sclerotium rolfsii* was recorded using isolates of *Trichoderma* isolates CT7 and CT8 which was at par with the chemical standard check hexaconazole (Table 3). The effectiveness local isolates of *Trichoderma* in inhibiting the growth of *S.rolfsii* up to 80 per cent under *invitro* conditions has been reported by Ganesan *et al.* (2007) and Bosah *et al.* (2010).

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Table 1. Mean per cent inhibition of colony growth of *Rhizoctonia bataticola* by using seven fungicides through poisoned food technique

Concentration of fungicides used (ppm)	Mancozeb 75% WP	Tebuconazole 2 DS (Raxil)	Carbendazim 50% WP	SAFF 75% WP	Hexaconazole 5% SC	Tebuconazole 250 EC (Folicur)	Vitavax power 75% WP
500	100.0 (85.9)	97.7 (81.1)	100.0 (85.9)	97.7 (81.1)	100.0 (85.9)	100.0 (85.9)	100.0 (85.9)
1000	100.0 (85.9)	100 (85.9)	100.0 (85.9)	98.4 (82.7)	100.0 (85.9)	100.0 (85.9)	100.0 (85.9)
2000	100.0 (85.9)	100 (85.9)	100.0 (85.9)	99.2 (84.3)	100.0 (85.9)	100.0 (85.9)	100.0 (85.9)
3000	100.0 (85.9)	100.0 (85.9)	100.0 (85.9)	99.2 (84.3)	100.0 (85.9)	100.0 (85.9)	100.0 (85.9)
4000	100.0 (85.9)	100.0 (85.9)	100.0 (85.9)	99.2 (84.3)	100.0 (85.9)	100.0 (85.9)	100.0 (85.9)
SEm±	-	-	-	2.0	-	-	-
CD at 5%	NS	NS	NS	4.6	NS	NS	NS
CV (%)	-	-	-	3.0	-	-	-

Figures in parenthesis are angular transformed values; NS=Non significant

Table 2. Mean per cent inhibition of colony growth of *Sclerotium rolfsii* (Stem rot) using seven fungicides through poisoned food techniques

Concentration of fungicides used (ppm)	Mancozeb 75% WP	Tebuconazole 2 DS (Raxil)	Carbendazim 50% WP	SAFF 75% WP	Hexaconazole 5% SC	Tebuconazole 250 EC (Folicur)	Vitavax power 75% WP
500	47.3 (43.4)	96.1 (78.7)	0.0 (4.0)	30.2 (33.3)	100.0 (85.9)	100.0 (85.9)	100.0 (85.9)
1000	74.4 (59.6)	96.9 (79.9)	17.8 (24.9)	65.1 (53.8)	100.0 (85.9)	100.0 (85.9)	100.0 (85.9)
2000	83.7 (66.3)	97.7 (81.1)	38.3 (38.5)	82.9 (65.6)	100.0 (85.9)	100.0 (85.9)	100.0 (85.9)
3000	92.2 (72.1)	98.4 (82.7)	44.2 (41.7)	86.8 (68.7)	100.0 (85.9)	100.0 (85.9)	100.0 (85.9)
4000	90.7 (72.1)	99.2 (84.3)	48.8 (44.3)	96.1 (78.9)	100.0 (85.9)	100.0 (85.9)	100.0 (85.9)
SEm±	1.8	1.8	0.9	1.9	-	-	-
CD at 5%	4.0	4.0	2.0	4.1	NS	NS	NS
CV (%)	3.5	2.7	3.7	3.8	-	-	-

Figures in parenthesis are angular transformed values; NS=Non significant

Table 3. *In vitro* evaluation of *Trichoderma* isolates against fungal pathogens stem rot and dry root rot of groundnut

Treatments	*Trichoderma* spp.	Radial growth (mm)		Per cent inhibition over control	
		Rhizoctonia bataticola	*Sclerotium rolfsii*	*Rhizoctonia bataticola*	*Sclerotium rolfsii*
T1	CT1	8.7 (16.9)	11.0 (18.9)	87.6 (69.6)	84.3 (67.1)
T2	CT2	9.7 (18.0)	18.7 (25.6)	86.2 (68.3)	73.3 (58.9)
T3	CT3	7.3 (15.7)	17.0 (24.3)	89.5 (71.1)	75.7 (60.5)
T4	CT4	10.0 (18.4)	15.0 (22.8)	85.7 (67.8)	78.6 (62.4)
T5	CT5	7.0 (15.3)	16.0 (23.3)	90.0 (71.6)	77.1 (61.7)
T6	CT6	6.7 (14.9)	17.0 (24.3)	90.5 (72.0)	75.3 (60.5)
T7	CT7	0.0 (4.0)	0.0 (4.0)	100.0 (85.9)	100.0 (85.9)
T8	CT8	0.0 (4.0)	0.0 (4.0)	100.0 (85.9)	100.0 (85.9)
T9	CT9	12.0 (20.2)	14.7 (22.5)	72.1 (65.5)	65.9 (62.7)
T10	CT10 (Hexaconazole)	0.0 (4.0)	0.0 (4.0)	100.0 (85.9)	100.0 (85.9)
T11	Control	70.0 (56.8)	70.0 (56.8)	--	--
	SEm ±	1.2	1.9	1.6	2.4
	CD at 5%	2.4	3.9	3.3	5.1
	CV (%)	6.5	8.0	2.6	4.3

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