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Effect of antagonists on *Pythium aphanidermatum* (Edson) Fitz and the growth of chilli seedlings

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ABSTRACT: *Trichoderma viride* Pers. Ex. Fries and *Pseudomonas fluorescens* Migula effectively inhibited the growth of *Pythium aphanidermatum*. Seed treatment with talc based formulation of *T. viride* (4g/kg) + *P. fluorescens* (5g/kg) recorded the maximum germination (92.3%), shoot length (4.45cm), root length (13.50cm), dry matter production (6.77 mg) and vigour index (1655.67) compared to the minimum in control.

KEY WORDS: Antagonists, chilli, damping-off, growth inhibition, *Pythium aphanidermatum*

Pythium aphanidermatum (Edson) Fitz. infects a number of crops and in chillies, it causes damping-off disease in the nursery. The pathogen being soil-borne in nature, is very difficult to control. Fungicides provide certain degree of control against seed, air and soil-borne pathogens, but at the same time pollute the air, soil and water affecting the beneficial microorganisms. Considering the above facts, biocontrol agents are being used for disease control in the present day crop husbandry in an increasing scale. The use of *Trichoderma* spp. (Xu *et al.*, 1993), *Pseudomonas fluorescens* (Vidhyasekaran and Muthamilan, 1995) and *Bacillus* spp. in plant disease management has been well documented. In the present study, attempts were made to assess the effect of antagonists such as *Trichoderma viride*, *Trichoderma harzianum*, *Bacillus subtilis*, and *Pseudomonas fluorescens* on the growth of *Pythium aphanidermatum* and chilli seedlings.

MATERIALS AND METHODS

Isolation of pathogen

Chilli seedlings affected by damping-off disease collected from the chilli nursery raised in the orchard at Tamil Nadu

Agricultural University (TNAU), Coimbatore, was used for the isolation of pathogen. The pathogen was isolated by tissue segment method on Potato Dextrose Agar (PDA) medium and purified in plain agar medium by single hyphal tip method (Rangaswami, 1958).

Effect of antagonists on the *in vitro* growth of *P. aphanidermatum*

The cultures of *T. viride, T. harzianum, B. subtilis, P. fluorescens* and talc-based formulations of *T. viride* and *P. fluorescens* were obtained from the Department of Plant Pathology, TNAU, Coimbatore and used in the study.

The efficacy of antagonists was tested by dual culture technique (Dennis and Webster, 1971) using PDA medium. Cork borer (five mm diam) was used to place the mycelial discs of pathogen and fungal antagonists. Bacterial antagonists were streaked at the periphery of the Petri-plate just opposite to the mycelial disc of pathogen using a flame sterilized inoculation needle. The plates were incubated at 28±2°C. The linear growth of antagonists and pathogen was measured at 24, 48 and 72h after incubation.

Effect of antagonists on the growth and vigour of chiili seedlings

Roll towel method (ISTA, 1976) was used to study the effect of antagonists on growth and vigour of chilli seedlings. Talc based formulation of *T. viride* and *P. fluorescens* were used to treat the seeds of Co.1 chilli (15 seeds/towel) either individually at the rate of *T. viride* (4g/Kg), *P. fluorescens* (10g/kg) or in combination *T. viride* (4g/kg) + *P. fluorescens* (5g/kg), *P. fluorescens* (10g/kg) + *T. viride* (4g/kg) and *T. viride* (2g/kg) + *P. fluorescens* (5g/kg). Captan at 4g/kg served as standard check. There were seven treatments including control with four replications per treatment. Roll towels with treated seeds were incubated at 25±2°C and 95±2 per cent relative humidity in the germination room. Germinated seeds were recorded after 14 days. Observations were recorded on shoot length, root length and dry matter production of seedlings after 14 days. Vigour indices were also calculated by following the procedure suggested by Abdul - Baki and Anderson (1973).

RESULTS AND DISCUSSION

Trichoderma viride and *Pseudomonas fluorescens* significantly inhibited the growth of *P. aphanidermatum* compared to *B. subtilis* and *T. harzianum* at 48h after incubation. *Trichoderma viride* and *P. fluorescens* recorded 33.0 and 28.87mm growth respectively, as against 26.25 and 24.5mm by *P. aphanidermatum*. At 72h after incubation the growth of pathogen exceeded the growth of antagonists except *T. viride* (Table 1). *Bacillus subtilis* was least effective in reducing the growth of the pathogen as it recorded lesser linear growth than the pathogen at all intervals of observation. The growth of the pathogen in *T. harzianum* inoculated plate was lesser than antagonist up to 48h after incubation and thereafter the growth of the pathogen

Table 1. Effect of antagonists on *in vitro* growth of *P. aphanidermatum* from chilli

Antagonist	Growth after 24 h		Growth after 48 h		Growth after 72 h	
	Pythium (mm)	Per cent reduction over control (mm)	*Pythium* (mm)	Per cent reduction over control (mm)	*Pythium* (mm)	Per cent reduction over control (mm)
T. viride	13.25	55.83	26.25	60.22	42.70	50.91
P. fluorescens	13.50	55.00	24.50	62.87	47.00	45.97
B. subtilis	15.50	48.33	25.25	61.74	75.75	12.93
T. harzianum	12.25	59.16	24.00	63.63	50.00	42.52
Control (Pathogen alone)	30.00		66.00		87.00	
CD (P = 0.05)	2.33		3.89		1.37	

Table 2. Effect of seed treatment of antagonists on growth and vigour of chilli seedlings

Treatment	Germination (per cent)	Shoot length (cm)	Root length (cm)	Dry matter production (mg)	Vigour index
T. viride (4g/kg)	89.8 (71.4)	4.00	12.65	6.38	1494.40
P. fluorescens (10g/kg)	84.8 (67.1)	3.75	11.77	6.25	1315.52
T. viride (4g/kg) + *P. fluorescens* (5g/kg)	92.3 (73.9)	4.45	13.50	6.77	1655.67
P. fluorescens (10g/kg) + *T. viride* (4g/kg)	88.3 (65.7)	4.15	11.95	6.44	1420.90
T. viride (2g/kg) + *P. fluorescens* (5g/kg)	83.0 (65.7)	2.85	10.77	6.05	1130.65
Captan (4g/kg)	92.5 (74.2)	3.55	11.67	5.94	1521.20
Control	82.3 (65.1)	1.15	10.52	4.33	960.62
CD (P = 0.05)	8.68	0.20	0.33	0.66	105.79

Figures in parentheses are arcsine transformed values.

excelled the growth of antagonists. This indicated that *T. viride* and *P. fluorescens* could be used to manage the damping-off of chillies caused by *P. aphanidermatum*. Effective inhibition of species of *Pythium* by *T. viride* (D' ercole *et al.*, 1984) and *P. fluorescens* (Weller and Cook, 1986) was also reported.

Seed treatment with *T. viride* (4g/kg) + *P. fluorescens* (5g/kg) registered the higher germination (92.3%) and was on par with Captan (4g/kg). *Trichoderma viride* (4g/kg), *P. fluorescens* (10g/kg) + *T. viride* (2g/kg) and *P. fluorescens* (10g/kg) (Table 2). The minimum germination (82.3%) was recorded in control. The minimum shoot length (4.45cm), root length (13.50cm) and dry matter production was recorded with *T. viride* (4g/kg) + *P. fluorescens* (5g/kg). Treating the seeds with antagonists either individually or in combination significantly increased the germination, shoot length, root length, dry matter production and vigour index compared to control. Krishnamoorthy (1987) also reported that seed treatment with *T. viride* increased seedling vigour of tomato. Wang *et al.* (1990) obtained increased growth rate of cucumber seedlings by treating with *P. fluorescens*. Similarly, Harris *et al.* (1994) also reported that treatment with *P. fluorescens* reduced damping - off of capsicum and increased shoot length. Present study revealed that talc based formulation of *T. viride* and *P. fluorescens* could be used for effective control of damping-off of chillies and also to obtain more vigorous seedlings.

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