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Biocontrol of damping off disease of chilli caused by *Pythium aphanidermatum*

SWAPAN KUMAR GHOSH

Department of Botany, Ramakrishna Mission Vivekananda Centenary College, Rahara, 24 Parganas (N)

An attempt was made to study the biocontrol efficacy of fungal antagonists in managing the damping off of chilli caused by *P. aphanidermatum*. *In vitro* assessment of mycoparasitism showed that out of nine isolates of antagonists, *Trichoderma viride*-2 inhibited the growth of the pathogen maximum followed by *T. harzianum*-3 and *G. virens* respectively. Similarly chilli seed dressing with fungal antagonists (conidial suspension : 5-6×10^{10}/ml) gave same nature of result against both pre-emergence and post-emergence damping off in both sterilized and unsterilised soil.

Key words : Biocontrol, damping off, chilli, antagonists, *Trichoderma viride, T. harzianum, G. virens, Phythium aphanidermatum*

INTRODUCTION

Chilli (*Capsicum frutescens* L) is one of the most useful spice crops. This crop is severely affected with damping off disease caused by *Pythium aphanidermatum* (Edson) Fitz (Ramanathan and Sivaprakasan, 1993). Application of antagonistic microorganism for the control of damping off disease caused by *Pythium* spp. in various crops has been reported by many workers (Singh and Srivastava, 1953 ; Sivan *et al.*, 1984 : Lifshitz *et al.*, 1986). In the present study, an attempt has been employed to find out the efficacy of antagonistic properties of some fungi and also seed treatment with these fungal antagonists in controlling the incidence of pre-emergence and post-emergence damping off disease of chilli.

MATERIALS AND METHODS

Five isolates of *Trichoderma viride*, three isolates of *T. harzianum* and one isolate of *Gliocladium virens* were rated for their antagonistic property following Bell's Test (Bell *et al.*, 1982) in dual culture plate against *P. aphanidermatum*, Mycelial discs (5 mm diam.) from the margin of actively growing colony of *P. aphanidermatum* and that of antagonists were inoculated simultaneously at opposite side of Petri dishes containing oat meal (5%) agar medium. The plates were incubated at 28 ± 1°C for 12 days in a B. O. D. incubator and subsequently assessed for their antagonistic activities.

Inoculum of *P. aphanidermatum* was prepared on sand maize (20 : 1, W/W) (Muthuswamy, 1972) and used for soil infection in pots. It was mixed at the rate of 1 part to 20 parts of the soil used.

Spores of isolates of *T. viride, T. harzianum* and *G. virens* were harvested from P. D. A medium after 12 days of incubation period. The spores were suspended in sterilized distilled water, and filtered through a muslin cloth. The filtrate containing conidia was centrifuged at 3000 rpm for 10 mints. The supernatent was discarded and the conidial pellet was resuspended in sterile distilled water. The spore suspension was adjusted to 5-6×10^{10} conidia/ml using a haemocytometer. Four ml of the conidial suspension was used to coat 10 g of chilli seeds (Sivan *et al.*, 1984), shade dried for 12 h and sown in pathogen inoculated sterilized and non-sterilized soil in pots.

Treated seeds were sown in pathogen inoculated soil at the rate of 100 seeds per pot. Each treatment was replicated thrice and pots were uniformely wa-

tered daily. Pre-emergence damping off was recorded. The post-emergence damping off was also noted after 12 and 22 days.

RESULTS AND DISCUSSION

The results (Table 1) indicated that *Trichoderma viride*-2 isolate exhibited maximum growth or mycoparasitism (6.25 cm) over *P. aphanidermatum* followed by *T. harzianum*-3 and *G. virens* respectively. Other isolates showed mycoparasitism but not so vigorous.

Table 1. Comparative mycoparasitic potentiality of some isolates of mycoparasite over *P. aphanidermatum.*

Indentity of mycoparasite	Growth of mycoparasite (cm) over *P. aphanidermatum*
Trichoderma viride-1	5.00*
T. viride-2	6.25
T. viride-3	5.05
T. viride-4	4.30
T. viride-5	4.20
T. harzianum-1	4.25
T. harzianum-2	3.20
T. harzianum-3	5.80
Gliocladium virens	5.30
SEm ±	0.1035
C.D.(P ≤ 0.05)	0.4010

*Mean of three replication.

Table 2. Effect of seed treatment with myco-parasites on damping off due to *P. aphanidermatum* (sterilized soil).

Seed treatment	Pre-emergence damping off (Percent)	Post-emergence damping off (Percent) 12 Days	22 Days
T. viride-2	*8.20(16.50)	10.20(18.61)	14.00(21.90)
T. viride-3	12.30(20.21)	16.06(25.18)	30.55(33.20)
T. harzianum-3	9.33(17.50)	11.39(17.00)	17.86(24.45)
G. virens	11.00(18.48)	14.00(21.90)	15.40(23.10)
Pathogen Uninoculated Control	2.00(7.96)	1.73(6.78)	3.73(10.21)
Pathogen inoculated Control	38.67(38.44)	43.43(42.01)	65.00(53.73)
C.D. (P ≤ 0.05)	0.3701	03.1250	3.3250

* Mean of three replication
Figures in parentheses are angular transformed values.

The date (Table 2) showed that minimum pre-emergence (9.20 %) and post-emergence damping off (10.20 % and 14.00 % after 12 and 22 days respectively) happened, when chilli seeds were dressed with *T. viride* -2. The treatment of *T. harzianum* -3 and *G. virens* were next to former. *T. viride* -2 gave best protection to chilli from damping off disease, when compared with pathogen inoculated control and other treatments.

The nature of results in unsterilized soil (Table 3) is similar to former (sterilized soil). Here pre-emergence (12.00 %) and post-emergence damping off (15.40 % and 18.00 % after 12 and 22 days respectively) were least in case of *T. viride* -2 treated seeds. Other treatments including pathogen inoculated control were inferior to *T. viride* -2 in managing damping off diseases in chilli.

Table 3. Effect of seed treatment with myco-parasites on damping off due to *P. aphanidermatum* (sterilized soil).

Seed treatment	Pre-emergence damping off (Percent)	Post-emergence damping off (Percent) 12 Days	22 Days
T. viride-2	*12.00(20.17)	15.40(23.10)	18.00(25.34)
T. viride-3	32.00(35.01)	40.57(39.56)	53.70(47.12)
T. harzianum-3	17.52(22.60)	25.44(30.26)	38.67(38.44)
G. virens	14.79(22.60)	23.34(28.88)	32.00(33.82)
Pathogen Uninoculated Control	5.00(12.91)	6.40(14.65)	10.00(18.32)
Pathogen inoculated Control	40.00(39.22)	65.90(54.54)	69.96(57.53)
C.D. (P ≤ 0.05)	0.725	0.815	0.252

* Mean of three replication.
Figures in parentheses are angular transformed values.

Higher mycoparasitic activity of *T. viride, T. harzianum* on other fungi has been previously establised (Ayers and Adams, 1981 ; Cook and Baker, 1983 ; Ghosh, 2000). However, information regarding mycoparasitism of these antagonists on *Pythium aphanidermatum* was very few (Ramanathan and Sivaprakasan, 1993). Ramanathan and Sivaprakasan (1993) also reported the efficacy of these mycoparasites in controlling damping off disease in chilli. The present findings corroborated former.

Seed dressing with *T. viride, T. harzianum* and *T. hamatum* in managing damping off csused by *Pythium* spp. in various crops has been previously reported (Sivan *et al.*, 1984 ; Lifshitz *et al.*, 1986).

The mycoparasitic potentiality of these antagonists used as seed treatment may be correlated with their ability to grow and colonize rapidly the seed coat of chilli. Dennis and Webster (1971) noted that *T. hamatum* secreted cellulase and with this enzyme it degraded the cell wall of *Pythium* spp. In this case, same mechanism might have operated in controlling *P. aphanidermatum.*

Therefore, these experiments present evidence of biocontrol activity of these antagonists which can be used as potential tools in managing the damping off disease of chilli.

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