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## Effect of Biocontrol agent on Chilli (*Capsicum annum* L.) using Seed treatment and Root dipping method

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### ABSTRACT

It has been confirmed that *Trichoderma* sp. has antagonistic and biological control activity in which *T. viride* maximum inhibited the pathogenic fungus by the dual culture technique. Seed treatment and application of the antagonist in root dipping are alternative methods for chemical control which could improve the establishment and colonization ability in the plant rhizosphere. This effectiveness of disease control with the added advantage of using small volumes of biocontrol preparations. In seed treatment and root dipping of chilli seedlings the transplanting to the pot after 30<sup>th</sup>, 60<sup>th</sup>, 90<sup>th</sup> and 120<sup>th</sup> days, the maximum percentage of seed germination and morphometric analysis such as shoot length, root length and yield of fruits were observed in the treatment of *T. viride* and *T. harzianum* when compared to control.

**Keywords:** *Trichoderma* sp, Chilli, Seed treatment, Root dipping

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## INTRODUCTION

It has been confirmed that *Trichoderma* sp. have antagonistic and biological control potential against the diversity of soil borne pathogens<sup>12,3</sup>.

The application of *Trichoderma* species can control a large number of foliar and soil borne fungi i.e., *Fusarium* sp., *Rhizoctonia solani*, *Pythium* sp., *Sclerotinia sclerotium*, *S. rolfsii* in vegetables, fruits and commercial crops. These results were similar to previous studies in other countries. *Trichoderma* sp. was used successfully to control fungal pathogens. *Trichoderma* products can be applied to the soil, used as seed treatment, seedling root dip or added to organic fertilizers<sup>4</sup>.

The use of *Trichoderma* product has both short term effects, immediate control of diseases and growth enhancement of crops as well as long-term effects which are demonstrated by the decrease in fungal pathogen inoculum in the field. Presently, *Trichoderma* based products are considered as relatively novel biological control agent which can help farmers to reduce plant diseases and increase plant growth.

## MATERIALS AND METHODES

### **Seed treatment:**

Three petriplates were taken and each plates contain 50 chilli seeds were surface sterilized with distilled water. Then surface sterilized chilli seeds mixed with 10 ml of *T. viride* (T1), *T. harzianum* (T2) and distilled water (C) poured in to each petriplates. Then the plates were incubated at 48 hrs at 35°C. After incubation of seeds were allowed to air dry over night under aseptic conditions and sown in the growth cabinet. The growth cabinet were watered with tap water when required. Then germinated seedlings were maintained in three growth cabinets. (Three replicates maintained) labelled as C, T1, T2 respectively. Initially percentage of seed germination was estimated and growth parameters like shoot length and root length were recorded.

### **Root dipping**

Root dipping method was adopted for the application of *Trichoderma* sp to manage the disease with biocontrol agent to the chilli plant. The diluted liquid culture was used to dip the roots of chili seedlings and allowed for 10 min. Then the seedlings were transplanted in to the pots. The morphometric analysis were observed with different intervals 30<sup>th</sup>, 60<sup>th</sup>, 90<sup>th</sup> and 120<sup>th</sup> days after planting of chilli crops. The following parameters of the pot culture in chilli crops were observed in the present investigation.

### **Shoot length**

The shoot length of all plants were measured from the soil level upto the 1<sup>st</sup> leaf of the plant and the result were m in centimeter.

### **Root length**

The root length of all plants was measured and the results were recorded in centimeter.

### **Fruit yield**

The total number of fruits were collected in each plant, weighed and results are tabulated.

## **RESULTS AND DISCUSSION**

### **Seed treatment**

After showing the seeds a maximum percentage of germination, shoot length and roots length was observed in *T. viride* treated after a period of 10 days was about 99%, 5.9 and 4.8 cm when compared to *T. harzianum* it showed about 97%, 5.2 and 4.5 cm. Then the minimum percentage of seed germination, shoot length and root length (cm) was observed in control plant was observed about 82%, 4.6 and 4.2 cm respectively.

### **Root dipping**

Chilli spice crops were selected for the introduction of *Trichoderma viride*, *T. harzianum* inoculants, to disease control, improvement of growth and yield traits. Among the 9 antagonistic organisms such as *Trichoderma viride*, *T. harzianum*, *T. koenigii*, *Aspergillus sulphureus*, *A. niger*, *A. sydowi*, *A. flavus*, *A. fumigatus* and *Penicillium* sp. two were selected for pot culture experiments based on their biocontrol capacity. The following parameters such as shoot length, root length, yield were observed and tabulated (Table -1).

### **Shoot length**

After transplantation the maximum shoot length was observed in *Trichoderma viride* at the intervals of 30<sup>th</sup>, 60<sup>th</sup>, 90<sup>th</sup> and 120<sup>th</sup> days was about 50.2, 67.0, 67.5 and 85 cm when compared to *T. harzianum* it showed about 48.4, 62.1, 71.6 and 78 cm. then the minimum shoot length was observed in inoculated plant is about 45.6, 56.7, 66.0 and 75.2 cm respectively.

### **Root length**

The maximum root length was observed in *T. viride* at the duration of 30<sup>th</sup>, 60<sup>th</sup>, 90<sup>th</sup> and 120<sup>th</sup> days was about 14.5, 20.7, 23.5 and 24.3 cm when compared to *T. harzianum* it showed about 13.9, 18.9, 21.6 and 24.2cm. Then the minimum root length was observed in control plant was about 12.6, 18.7, 22.5 and 23.9 cm respectively.

### **Weight of fruits**

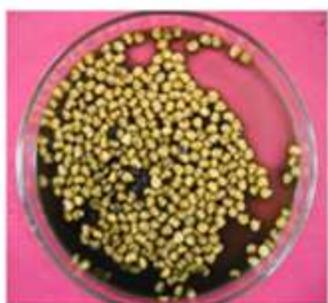
The maximum fruits were recorded in *T. viride* at the duration of 30<sup>th</sup>, 60<sup>th</sup>, 90<sup>th</sup> and 120<sup>th</sup> days was about 720, 960, 1040 and 1250 gm, when compared to *T. harzianum* it showed about 695, 780, 980 and 1140gm. Then the minimum fruits were recorded in control plant about 655, 780, 960 and 1060 gm respectively (Table I, Plate I and Plate II).

**PLATE - I****Effect of biocontrol agent on chilli seed treatments**

Control (C)



Control (C)

*Trichoderma harzianum* (T1)*Trichoderma harzianum* (T1)*Trichoderma viride* (T2)*Trichoderma viride* (T2)

**Table: 1 Effect of different antagonistic treatments on the growth of chilli plants**

S.No	No. of days	Control C				<i>T. viride</i> (T1)				<i>T. harzianum</i> (T2)			
		% of germination	Shoot length (cm)	Root length (cm)	Yield (gm)	% of germination	Shoot length (cm)	Root length (cm)	Yield (gm)	% of germination	Shoot length (cm)	Root length (cm)	Yield (gm)
1.	10	82	4.6	4.2	-	99	5.9	4.8	-	97	5.2	4.5	-
2.	30	-	45.6	12.6	655	-	50.2	14.5	720	-	48.4	13.9	695
3.	60	-	56.7	18.7	780	-	67.0	20.7	960	-	62.1	18.9	780
4.	90	-	66.0	22.5	960	-	67.5	23.5	1040	-	71.6	21.6	980
5.	120	-	75.2	23.9	1060	-	85	24.3	1250	-	78	24.2	1140

## PLATE – II

Effect of biocontrol agent on chilli seedlings  
treatment by root dipping method

Biological control of soil borne plant pathogens can be achieved by seed treatment with antagonists.<sup>5</sup> reported the biocontrol of *Rhizoctonia solani* and *Pythium* sp. by coating radish and pea seed with *T. harzianum* (Bain).<sup>6,7</sup> also investigated that the application of wheat bran colonized by *T. harzianum* to soils infested by *Rhizoctonia solani* and *Sclerotium rolfsii* reduced the incidence of disease caused by these pathogens in beans.

Jayalakshmi *et al.*, (2003) was also observed that the seed treatment with *Trichoderma viride* followed by *T. harzianum* was found to be effective in reducing the wilt disease incidence in

Coriander. Similarly, Nakkeeran and Devi (1997) observed that *Alternaria alternata* causing blight disease in Pigeon pea was most effectively reduced by seed treatment with *T. harzianum*.<sup>8</sup> also revealed that *Trichoderma viride*, *T. hamatum* and *A. awamori* inhibited the growth of *Alternaria alternata*. *Trichoderma* sp. are well documented as effective biological control agents of plant diseases caused by soil borne fungi.<sup>9</sup>

In previous report, *Trichoderma* species, either added to the soil or applied as seed treatments, grow readily along with the developing root system of the treated plants<sup>5,10,11,12</sup> Papavizas and Lumsden, (1980) also reported that seed treatment with *T. harzianum* reduced *Pythium* seed rot of pea and *Rhizoctonia*, damping off of cotton. The application of *Trichoderma harzianum* to bean roots resulted in a 25 to 100% reduction in the severity of the foliar disease, gray mould, caused by *Botrytis cinera*<sup>13</sup> reported that chilli seeds treated with biocontrol agent like *Trichoderma* sp (Negative isolate) at 4g/kg *P. fluorescens* – 1 (Negative isolates) at 10g/kg was found to reduce the population of *P. aphanidermatum* up to 30 days after sowing.

In the present study, the result of seed treatment the maximum percentage of seed germination, shoot length and root length were observed in *T. viride*. At the period of 10 days was about 99%, 5.9 and 4.8cm when compared to *T. harzianum*, it showed about 97%, 5.2 and 4.5cm. Then the minimum percentage of seed germination, shoot length and root length (cm) was observed in control plant is about 82%, 4.6 and 4.2 cm respectively.

Seed treatment with biocontrol agent was effective in controlling many fungal diseases. Mao *et al.*, (1997) showed that seed treatment with *Gliocladium virens*, *Trichoderma viride* isolates increased seedling stand, plant height, fresh weight and decreased root rot severity in corn, giving results comparable to those of treating with a fungicide (Captan). *Verticillium* wilt of cotton was effectively controlled by seed treatment with *Trichoderma virens* while *T. viride* and some bacterial species were effective against anthracnose of cowpea<sup>14,15</sup>. *T. harzianum* also effectively controlled *Sclerotium rolfsi* on blue lupines, of tomato and peanuts (Wells *et al.*, 1972).

In root dipping, after transplantation the maximum shoot length was observed in *T. viride* at the duration of 30, 60, 90 and 120 days and found to be about 50.2, 67.0 and 85cm when compared to *T. harzianum*, which showed about 48.4, 62.1, 71.6 and 78cm and the minimum shoot length observed in control plant is about 45.6, 56.7, 66.0 and 75.2 respectively. The maximum root length was observed in *T. viride* at the duration of 30, 60, 90 and 120 days and found to be about 14.5, 20.7, 23.5 and 24.3 cm when compared to *T. harzianum*, which showed about 13.9, 18.9, 21.6 and 24.2 cm and the minimum root length observed in control plant is about 12.6, 18.7, 22.5 and 23.9

cm respectively.

The maximum weight of fruits were recorded in *T. viride* at the duration of 30, 60, 90 and 120 days and found to be about 720, 960, 1040 and 1250 gm, when compared to *T. harzianum*, which showed about 695, 780, 980 and 1140 gm and the minimum fruits recorded in control plant is about 655, 780, 960 and 1060 gm respectively. The formulation of *Trichoderma* species was tested for their ability to control pre-emergence and post-emergence damping-off caused by *Pythium ultimum* in green house grown *Echinacea angustifolia* seedlings. A wettable powder formulation of *T. harzianum* isolate, significantly reduce the pre and post emergence damping-off caused by *P. utlimum*.

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## REFERENCES:

1. Grondona, I., Hermosa, R., Tejada, M., Gomis, M.D., Mateos, P.F., Bridge, P.D., Monte, E. and Garcia Acha, I., (1997). Physiological and biochemical characterization of *Trichoderma harzianum* a biological control agent against soilborne fungal plant pathogens. *Appl. Environ. Microbiol.*, **63**: 3189 – 3198.
2. Hanson, L.E. and Howell, C.R., (2004). Elicitors of plant defense responses from biological control strains of *Trichoderma virens*. *Phytopathology*, **94**: 171 – 176.
3. Bajwa, R., Mukhtar, I. and Anjum, T., (2004). *In vitro* biological control of *Fusarium solani* cause of wilt in *Dalbergia sissoo* Roxb. *Mycopath.*, **2(1)**: 11 – 14.
4. Ha, T.N., (2010). Using *Trichoderma* species for biological control of plant pathogens in Viet Nam. *J. ISSAS.*, **16(1)**: 17 – 21.
5. Harman, G.E., Chet, I. and Baker, R., (1980). *Trichoderma hamatum* effects on seed and seedling disease induced in radish and pea by *Pythium* spp. or *Rhizoctonia solani*. *J. Phytopathol.*, **70**: 1167 – 1172.
6. Elad, Y., Chet, I. and Kattan, (1980). *Trichoderma harzianum*. A biocontrol agent effective against *Sclerotium rolfsii* and *Rhizoctonia solani*. *J. Phytopathol.*, **70**: 119 – 121.
7. Hadar, Y., Chet, I. and Henis, Y., (1979). Biological control of *Rhizoctonia solani* damping-off with wheat bran culture of *Trichoderma harzianum*. *J. Phytopathol.*, **69**: 64 – 68.

8. Ghosh, C., Pawar, N.B., Kshirsagar, C.R. and Jadhav, A.C., (2002). Studies on management of leaf spot caused by *Alternaria alternata* on gerbera. *J. Maharashtra Ag. Uni.*, **27(2)**: 165 – 167.
9. Coley-Smith, J.R., Ridout, C.J., Mitchell, C.M. and Lynch, J.M., (1991). Control of botton rot disease of lettuce (*Rhizoctonia solani*) using preparations of *Trichoderma viride*, *T. harzianum* or tolclofos-methy. *Plant Pathol.*, **40**: 359 – 366.
10. Ahmad, J.S. and Baker, R., (1987). Competitive saprophytic ability and cellulolytic activity of rhizosphere-competent mutants of *Trichoderma harzianum*. *Phytopathol.*, **77**: 358 – 362.
11. Harman, G.E., (2000). The myths and dogmas of biocontrol. Changes in perceptions derived from research on *Trichoderma harzianum* strain T. 22. *Plant Disease*, **84**: 377 – 393.
12. Harman, G.E., (2001). *Trichoderma* spp. including *T. harzianum*, *T. viride*, *T. koeningii*, *T. hamatum* and other spp.
13. De Meyer, G., Bigirimana, J., Elad, Y. and Hofte, M., (1998). Induced systemic resistance in *Trichoderma harzianum* T39 biocontrol of *Botrytis cinera*. *European J. Plant Pathol.*, **104**: 279 – 286.
14. Hanson, L.E., (2000). Reduction of *Verticillium* wilt symptoms in cotton following seed treatment with *Trichoderma virens*. *The Journal of Cotton Science*, **4**: 224 – 231.
15. Adebajo, A. and Bankole, S.A., (2004). Evaluation of some fungi and bacteria for biocontrol of anthracnose disease of cowpea. *Journal of Basic Microbiology*, **44(1)**: 3 – 9.

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