



## Bio control effect of *Trichoderma viride* against *F. oxysporum* on Tomato vegetable crop under nursery study

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### ABSTRACT

In the present investigation the biocontrol effect of *Trichoderma viride* against *Fusarium oxysporum* on Tomato vegetable crop under nursery experiments. The collected soil sample used to isolate fungal pathogens and antagonistic fungi. Isolated colonies were identified cultural and morphological characters. In this study many type of fungal colonies were identified among the isolate the dominant fungal pathogen and antagonistic fungi were selected. The separated colonies were confirmed as *Fusarium sp* and *Trichoderma viride*. To analyse the antagonistic activity of *Trichoderma viride* against *Fusarium sp*. using various methods. In this study *Trichoderma viride* produced good antagonistic activity against *Fusarium sp*. The biocontrol agent resulted in increase in soil fertility, control of minor pathogens and increase in general health of plants, ultimately leading to an increase in plant metabolism. It enhanced the growth producing stimulating factors.

**KEYWORDS** : Biocontrol, *Trichoderma viride*, *Fusarium sp.*, Tomato.

### INTRODUCTION

Tomato (*Lycopersicon esculentum* L.) is largest vegetable crops in the world and healthy food for human, because it's special nutritive value and widespread production. It is one of the most important nursery-based vegetable crops cultivated for its fleshy fruits. Tomato plants are subjected to attack by several soil born fungal pathogens, which cause serious diseases as root rot and wilt [1, 2]. *Trichoderma sp.* has proved to be useful in the control of phytopathogens affecting different crops [3, 4]. Also, tomato plants treated by *Trichoderma sp.* have shown biocontrol activity against damping-off and root rot disease and gave high yield of tomato [5, 6]. Damping-off disease caused by *Fusarium oxysporum* is strongly affects tomato yield. Hence, the present manuscript deals with the investigation of bio control effect of *Trichoderma viride* against *Fusarium oxysporum* on Tomato vegetable crop under nursery experiments. Effects of biocontrol agent on the growth of plant were analyzed by pot culture experiment.

### MATERIALS AND METHODS

The present investigation has been designed to exploit *T. viride* as a potential biocontrol agent against *Fusarium sp.* which is being associated with the rhizosphere of economically significant *Musa sp.*

#### Collection of soil sample

The field soil samples were collected in and around the rural area of Tiruchirappalli district, Tamil nadu, India. The collected soil sample kept in sterile polythene bags and stored in refrigerator at 4°C for further studies.

#### Isolation and identification of Fungi

Standard dilution plate techniques were followed for the isolation of pathogens using Rose Bengal agar medium. Isolated fungi were identified based on cultural and morphological character.

#### Antagonistic activity

Antagonistic property of the fungal antagonist was studied by mycoparasitism. *F. oxysporum* was placed on one edge of petri dishes containing PDA and incubated at 25°C. Forty eight hours later, *Trichoderma viride* isolates were placed on the opposite side of *F. oxysporum* in previous Petri dishes and they were incubated in the same thermal condition. Interactions between *Trichoderma viride* isolates and *Fusarium* were evaluated based on radial growth of

pathogen, overgrowth speed of *Trichoderma viride* on pathogen colony, production of yellow pigment in overlapped area of two colonies and hyper parasitism (mycelial coiling).

#### Pot culture experiment

Effects of biocontrol agent on the growth of plant were analyzed by pot culture experiment. The following treatment was made for this study.

- T1 - Control
- T2 - Pathogen (*F. oxysporum*)
- T3 - Pathogen (*F. oxysporum*) + biocontrol agent (*Trichoderma viride*)
- T4 - Pathogen (*F. oxysporum*) + fungicide
- T5 - Pathogen (*F. oxysporum*) + biocontrol agent (*Trichoderma viride*) + fungicide

The sterile soil samples were mixed with biocontrol agent for above treatment methods respectively. This setup was incubated at room temperature for 5 days. After the incubation period the seeds were showed in the soil samples. The plant materials from the pot culture were collected after 30 days for the observation of following parameters.

#### Physico-chemical parameters and microbial status of soil

Soil was air-dried, ground and passed through a 2mm pore sieve and was stored in sealed containers at room temperature. Soil was characterized for physico-chemical [7] and microbial status was analyzed [8].

#### Analysis of Morphometric and Biochemical observation

The morphometric parameters such as shoot length (cm), No. of leaves, No. of branches, root length (cm) and fresh and dry weight of cultivated tomato plants (30 Days) were noted. The biochemical parameters such as chlorophyll a, chlorophyll b, total chlorophyll, protein, carbohydrate and phenol (mg/ml) were analysed from 30 days cultivated treatments unit Tomato leaves.

#### Statistical analysis

The results obtained in the present investigation were subject to statistical analysis like Mean ( $\bar{x}$ ) and Standard Deviation (SD).

#### Results and Discussion

In the present study isolated *T. viride* as a potential biocontrol

conformed by antagonistic method. Antagonist potential of *Trichoderma* species against different fungal phytopathogens has been reported by several researchers in the due course of time [9, 10]. *Trichoderma* spp. especially *T. viride* and *T. harzianum* exhibit substantial variability among strains with respect to their antagonistic activity and host range [12].

The effects of biocontrol agent on the growth of tomato plant were analyzed by pot culture experiment. The experiment field soil physicochemical properties were analysed (Table 1). The pH, P and Fe were increased in T2 treatment unit when compared to other treatment units. Biocontrol is considered a safer pest management strategy involving the use of natural enemies to maintain pest population levels under economic threshold. The Soil microbiological investigations are thus well suited to determine the physical and chemical influences on soil biology. The total microbial count was increased in pathogen inoculated soils compared to control. Remaining treatments slightly decreased microbial count compared to other treatment units (Table 2).

The biocontrol agent inoculated treatment (T3) the plant shoot lengths were increased (12.70±0.51). On the 30<sup>th</sup> day, the plant root length (Value expressed as Centimeters) measured the results follows in tomato plant T3 (5.70±0.80), T5 (4.0±0.62), and T4 (3.23±0.68). The no. of leaves and no. of branches also increased the biocontrol agent inoculated treatment (T3) compare than other treatments. The investigated results were presented in table 3. Similarly fresh and dry shoot, leaves, root weight were analysed (Table – 4). The biochemical parameter chlorophyll, protein and carbohydrate were increased biocontrol agent inoculated treatment (T3) and phenol level was decreased in T3 treatment (Table 5). However, it is clear from the present study that application of *Trichoderma* spp. culture directly on the seed surface before sowing resulted in increased biomass production thereby supporting the findings of Yousif and Sprent [13].

**Conclusion**

Biological control is a promising tool to maintain current level of agricultural production while reducing the release of polluting chemical pesticides to the environment. Antagonistic interactions of *Trichoderma viride* isolate showed excellent activity against various plant pathogens causing disease in tomato plant. Thus, the *Trichoderma viride* isolate could be further exploited for commercial scale up under localized climatic conditions.

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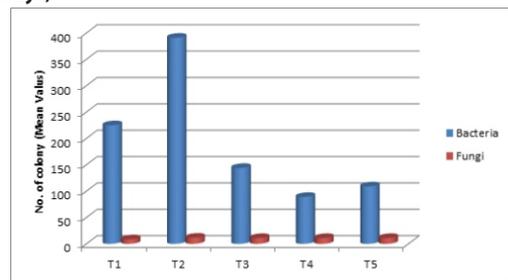
**Table – 1 Physicochemical analysis of Tomato Rhizosphere soil (30 Days)**

Nutrients	Before Planting	T1	T2	T3	T4	T5
pH	6.6	7.7	8.1	7.7	8.0	8.0
EC	0.41	0.45	0.37	0.67	0.50	0.41
N	98	63.0	73.4	71.4	85.4	68.6
P	23.0	14.5	17.5	14.5	17.0	16
K	127	85	241	237	276	284
Fe	3.36	3.53	3.57	3.53	3.53	3.48
Mn	2.17	2.98	2.92	2.99	3.24	3.00
Zn	0.87	0.84	0.86	0.87	0.84	0.84
Cu	1.54	0.87	0.85	0.86	0.83	0.86
Texture	Sand loamy soil					

T1-Control; T2-Pathogen; T3-Pathogen + Biocontrol agent; T4-Pathogen + fungicide; T5-Pathogen+ biocontrol agent+ fungicide.

**Fig. - 1 Enumeration of Microbes from Tomato Rhizosphere Soil**

**(30 Days)**



T1-Control; T2-Pathogen; T3-Pathogen + Biocontrol agent; T4-Pathogen + fungicide; T5-Pathogen+ biocontrol agent+ fungicide.

**Table – 2 Morphometric Observation of cultivated Tomato plants (30 Days)**

Treatments	Morphometric Observation (M±SD) n= 3			
	Shoot length (cm)	No. of leaves	No. of branches	Root length (cm)
T1	09.16±1.04	10.0±1.00	5.33±0.57	3.56±1.25
T2	08.83±0.35	04.6±0.10	3.30±0.10	2.23±0.90
T3	12.70±0.51	10.0±1.15	5.00±1.00	5.70±0.85
T4	09.16±1.04	9.30±0.57	5.30±0.57	3.23±0.68
T5	11.16±1.01	10.0±2.00	5.60±0.57	4.00±0.62

Values are expressed in Mean±Standard deviation; n=3.

T1-Control; T2-Pathogen; T3-Pathogen + Biocontrol agent; T4-Pathogen + fungicide; T5-Pathogen+ biocontrol agent+ fungicide.

**Table – 3 Fresh and Dry weight of cultivated Tomato plants (30 Days)**

Treatments	Fresh Weight (g) (M±SD) n= 3			Dry Weight (g) (M±SD) n= 3		
	Shoot weight	Leaves weight	Root weight	Shoot weight	Leaves weight	Root weight
T1	0.13±0.005	0.09±0.020	0.01±0.001	0.012±0.006	0.008±0.001	0.001±0.0005
T2	0.12±0.006	0.08±0.030	0.02±0.005	0.012±0.006	0.010±0.008	0.001±0.0005
T3	0.21±0.007	0.33±0.010	0.04±0.002	0.020±0.005	0.040±0.002	0.002±0.0001
T4	0.21±0.008	0.14±0.002	0.03±0.001	0.020±0.005	0.020±0.001	0.001±0.0001
T5	0.23±0.009	0.28±0.016	0.02±0.005	0.050±0.002	0.050±0.003	0.001±0.0001

Values are expressed in Mean±Standard deviation; n=3.

T1-Control; T2-Pathogen; T3-Pathogen + Biocontrol agent; T4-Pathogen + fungicide; T5-Pathogen+ biocontrol agent+ fungicide.

**Table – 4 Biochemical analyses of Tomato leaves (30 Days)**

Treatments	Biochemical analyses (M±SD) n= 3					
	Chlorophyll a (g/100 ml)	Chlorophyll b (g/100 ml)	Total chlorophyll (g/100 ml)	Protein (mg/ml)	Carbohydrate (mg/ml)	Phenol (mg/ml)
T1	768.98±14.58	380.56±19.64	01.119±0.08	0.84±0.02	15.7±0.98	085±2.87
T2	407.89±17.47	261.57±10.52	669.28±10.9	0.74±0.06	07.7±0.65	130±5.64
T3	884.01±18.94	438.85±21.67	01.322±0.07	11.0±0.09	21.7±0.37	072±8.41
T4	826.01±15.41	438.85±24.87	01.265±0.04	1.74±0.04	15.7±0.48	084±7.94
T5	738.98±16.28	380.56±14.84	01.119±0.09	10.4±0.07	19.0±0.67	084±6.71

Values are expressed in Mean±Standard deviation; n=3.

T1-Control; T2-Pathogen; T3-Pathogen + Biocontrol agent; T4-Pathogen + fungicide; T5-Pathogen+ biocontrol agent+ fungicide.

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