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# To study the Efficacy of *Trichoderma harzianum* against phytopathogenic fungi

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**Abstract**
*Trichoderma* species are significant potential bioagents that can combat a variety of soil-borne fungal infections. Compared to their counterparts (bacteria, nematodes, viruses, and protozoa), *Trichoderma* based biocontrol agents are more effective at promoting plant growth and soil remediation activities.
Cultural characteristics of *T. harzianum* isolates showed light green sporulation throughout the plates and fluffy growth at margin. *T. harzianum* significantly highest mycelial inhibition was observed by *Fusarium oxysporum* f.sp. *lycopersici*(75.00 %) with 22.00 mm average colony diameter after seven days of incubation which was followed by *Macrophomina phaseolina* (55.73%), *Sclerotium rolfsii* (60.00%) isolates with average colony diameters 34.10 mm respectively.
*T. harzianum* showed maximum antagonistic potential in dual culture technique against *Sclerotium rolfsii, Macrophomina phaseolina and F. oxysporum f. sp. Lycopersici. whereas T. harzianum* isolates showed maximum antagonistice effect to *F. oxysporum f. sp. Lycopersici* followed by *Sclerotium rolfsii, Macrophomina phaseolina*

**Keywords:** *Trichoderma harzianum, Sclerotium rolfsii,* antagonistic, *Macrophomina phaseolina*

## Introduction
According to contemporary agriculture has recently confronted the difficulty of effectively controlling plant diseases in an environmentally acceptable way. The extensive use of pesticides and organic compounds to manage plant infections has resulted in accumulation and entry into the food chain, which can be hazardous to mammals. Numerous soil-borne phytopathogenic fungus, such as *Fusarium, Phytophthora, Sclerotium, Macrophomina,* and others, have become widely distributed in recent years as a result of farming changes that have a negative impact on economically significant crops (Chet et al., 1997) [3]. *Trichoderma* species have been recognized for 70 years to act as biocontrol organisms, attack other fungus, and create antibiotics that harm other pathogenic organisms.
*Trichoderma* employs competition, colonization, antibiosis, and direct mycoparasitism as strategies to counteract phytopathogenic fungi (Howell, 2003) [6]. As an alternative to using chemicals to manage a variety of plant diseases, the antagonistic potential of various *Trichoderma* strains provides the foundation for their successful biological control applications (Chet, 1987) [2]. It has no phytotoxic effects and is environmentally benign. It creates complexes of enzymes that support the growth of plants. Its affinity for root exudates has led to some host specificity. Through a symbiotic association akin to that of nitrogen-fixing bacteria and legume roots or that of mycorrhiza and root system, it can minimize and protect the host plant.

## Material Method
### Phenotype Characters of the *Trichoderma harzianum*:
The morphological and cultural characteristics of *Trichoderma harzianum* were studied in PDA media. Mycelial discs (6 mm) of young growing culture of *Trichoderma harzianum* was inoculated on the Petri plates containing PDA media and incubated at 28 ± $2^0$ C for one week. Colony radius was measured at 24, 48 and 72 h. each growth rate experiment was repeated three times in triplicate and the results were averaged for each isolate. Additional characters i.e conidia and conidiophores was examined under a light microscope.

**Testing efficacy of *Trichoderma harzianum* against major soil borne pathogen under *in vitro* condition.**

Sterilized PDA was aseptically transferred into 90 mm-diameter sterilized Petri dishes. Seven day old mycelia discs (6 mm) containing an actively developing culture of the bioagent and the test pathogens were cut apart and position about 4 cm apart on solidified PDA. In order to compare growth, the experiment was conducted four times with their controls, in which the test pathogen was exposed alone. Every plate that has been inoculated was kept at room temperature (27±20C). After seven days of incubation, the radial growth of test pathogens in treated and control plates was measured, and the Bliss formula (1934) was used to determine the percentage inhibition of the pathogens' mycelia growth.

In other words, I = (C-T)/C ×100, where I is the inhibition percentage and C is the colony diameter.

## Results and Discussion

### Cultural characteristics:

The study on cultural characteristics of *T. harzianum* isolates showed light green sporulation throughout the plate, green raised colony, whitish green mycelial growth and fluffy growth at margin.

**Table 1:** Growth rate (mm) of *Trichoderma harzianum*

| Sr. No | Time period | *Average colony diameter (mm) of *T. harzianum* |
|---|---|---|
| 1 | 24 hr | 22 |
| 2 | 48hr | 54 |
| 3 | 72hr | 82 |

**Fig 1:** Initial growth of *Trichoderma harzianum*

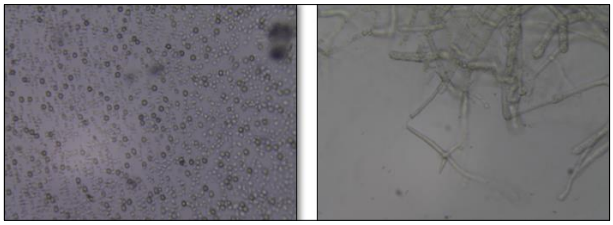

**Fig 2:** Microscopic structure of conidia and conidiophores

### *In vitro* condition testing efficacy of *T. harzianum* against three soil borne pathogens:

The *T. harzianum* were tested efficacy against three soil-borne pathogens *viz., Sclerotium rolfsii, Macrophomina phaseolina* and *Fusarium oxysporum* f.sp. *lycopersici*by using dual culture technique. The results presented in Table 2 & Fig 3. revealed antagonists effect of pathogenic fungi. Among the *T. harzianum* significantly highest mycelial inhibition was observed by *Fusarium oxysporum* f.sp. *lycopersici*(75.00 %) with 22.00 mm average colony diameter after seven days of incubation which was followed by *Macrophomina phaseolina* (55.73%) with 30.10 mm, *Sclerotium rolfsii* (60.00%) isolates with average colony diameters 34.10 mm respectively.

**Table 2:** Antagonistic effect of *Trichoderma harzianum* against *Sclerotium rolfsii, Macrophomina phaseolina, Fusarium oxysporum* f. sp. *Lycopersici*, by dual culture technique

| Sr. No | *Pathogen* | *Average colony diameter of pathogen (mm) | % inhibition of mycelium growth (PIMG) |
|---|---|---|---|
| ***Trichoderma harzianum*** | | | |
| 1 | *Sclerotium rolfsii* | 34.10 | 60.00 |
| 2 | *Macrophomina phaseolina* | 30.10 | 55.73 |
| 3 | *Fusarium oxysporum* f. sp. *Lycopersici* | 22.00 | 75.00 |
| 4 | Control | 88.00 | - |

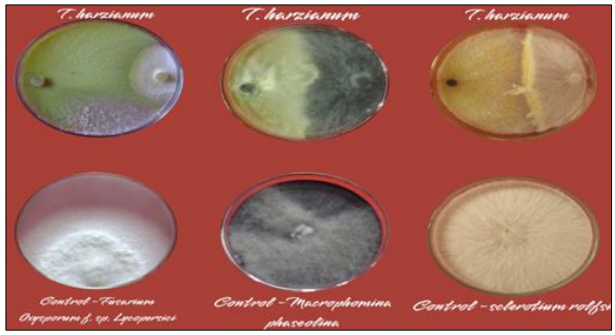


**Fig 3:** Antagonistic effect of *Trichoderma harzianum* against *Sclerotium rolfsii, Macrophomina phaseolina, Fusarium oxysporum* f. sp. *Lycopersici*, by dual culture technique

## Conclusion

Cultural characteristics of *T. harzianum* isolates showed light green sporulation throughout the plate and fluffy growth at margin. *Trichoderma harzianum* proved effective against all the test pathogens *i.e. Sclerotium rolfsii, Macrophomina pheaseolina* and *F. oxysporum* f.sp. *lycopersici* in tested dual culture technique.

*harzianum* were observed maximum mycelium growth inhibition of the pathogens *F. oxysporum* f. sp. *Lycopersici* followed by *Macrophomina pheaseolina and Sclerotium rolfsii.*

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