Nepalese Journal of Biosciences **3(1): 54-56 (2013)** https://doi.org/10.3126/njbs.v3i1.41445

Biocontrol agents of sclerotial blight in tea

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Abstract

One of the important fungal pathogens *Sclerotium rolfsii*, causing seedling blight disease in tea was found to be predominant in the nursery grown plants. *In vitro* interaction of *S. rolfsii* with *Trichoderma harzianum* and *T. viride* was studied. Both bioagents inhibited the growth of *S. rolfsii.*

***Key words*:** Inhibition of mycelia growth, inoculums, *Sclerotium rolfsii, Trichoderma harzianum, T. viride*

Introduction

Tea [*Camellia sinensis* (L.) O. Kuntze] is the most important hot beverage in the world today. It occupies a very important position in Nepalese and Indian economy being one of the major foreign exchange earners. Sclerotial blight caused by *Sclerotium rolfsii* Sacc. is one of the fungal diseases which appears in the nursery grown tea seedlings. The *Trichoderma harzianum* and *T. viride* are the most commonly used bioagents for the management of soil borne plant pathogens. An attempt was made to evaluate their antagonistic potentials against soil borne pathogen (Papavizas, 1985; Pan *et al.*, 2001; Jash & Pan, 2004).

Materials and Methods

Biocontrols *T. harzianum* and *T. viride* (antagonist) were obtained from laboratory of the North Bengal University, Siliguri. *Trichoderma* species prepared in several media *viz*., wheat bran media (wheat-bran: sand 1:1, and 25 ml of water for 150 g of inoculum in each polythene packet); Saw dust media (saw dust and water), tea waste media (tea waste and water) were used.

Antagonistic properties of *Trichoderma harzianum* and *T. viride* were studied through dual plate method. Mycelial discs of 6 mm dia cut from the margin of 5-day-old cultures of both test pathogen (*Sclerotium rolfsii*) and antagonists (*T. harzianum* and *T. viride*) were placed opposite to each other on PDA in Petri plates (9 cm dia). The distance between inoculum blocks was 7cm. A set of plates was inoculated with *S. rolfsii* and after 24 h the same plates were inoculated with the antagonist. In the second set, the antagonists were inoculated first and after 24 h *S. rolfsii* was inoculated. In the third set, *S. rolfsii* and antagonists were inoculated simultaneously. Each treatment was replicated thrice and petriplates were incubated at 28^0C for 8 days and also appropriate control was maintained. Observations on colony diameter of *S. rolfsii* were recorded to calculate inhibition zone.

Results and Discussion

The maximum inhibition of mycelial growth of *S. rolfsii* was recorded in *T. harzianum* when inoculated 24 h prior to inoculation of *S. rolfsii* The inhibition degree of mycelial growth of *S. rolfsii* decreased when antagonists were inoculated 24 h after inoculation with *S. rolfsii, T. harzianum* and *T. viride* were at par with one another in their ability to inhibit the pathogen. Simultaneously, *T. harzianum* and *T. viride* were equally effective in inhibiting the radial growth of *S. rolfsii.*

After 8 days, *T. harzianum* and *T. viride* overgrew the pathogen and lysed it over a period of time. The pathogen formed an inhibition zone around it though pathogen also was not able to grow further. *T. harzianum* and *T. viride* inhibited the mycelial growth of the pathogen by 61.11 and 58.44%, respectively on simultaneous inoculation with a least number of sclerotial productions (Table 1).

Table 1. *In vitro* antagonistic effect of biotic agent on mycelial growth of *Sclerotium rolfsii.*

Antagonists	24 h prior to the inoculation of *S. rolfsii*		24 h after inoculation of *S. rolfsii*		Simultaneous inoculation	
	Mycelial growth (cm)	Inhibition (%)	Mycelial growth (cm)	Inhibition (%)	Mycelial growth (cm)	Inhibition (%)
T.harzianum	1.8	80	4.3	52.22	3.5	61.11
T.viride	2.0	77.8	4.2	53.33	3.74	58.44
Control	9.0	0.0	9.0	0.0	9.0	0.0

Data from the Table 2 indicate that 25% concentration of culture filtrates of *T. harzianum* and *T. viride* after 5 days reduced the mycelial weight of sclerotial blight pathogen by 55.56% and 50% respectively. This observation thus indicates that the volatile and non-volatile extracellular extracts of *Trichoderma* spp. may have some inhibitory growth effect against this pathogen. Consequent to the study, experiments were conducted *in vivo* for the management of the disease. Both antagonists overgrew the pathogen and restricted the growth of *S. rolfsii in vitro* but *T. harzianum* was the most effective. Similar observations were reported on wilt of potato caused by *S. rolfsii* (Rao *et al.*, 2004). Studies were made by them to understand the antagonistic activity of microorganisms on mycelial growth, sclerotial production, and inhibition zone against *S. rolfsii*. This result led to their application in integrated disease management practices.

Table 2. Effect of culture filtrates of bioagents on mycelial dry weight of *Sclerotium rolfsii*

Name of the culture	**Dry weight (g)**
Sclerotium rolfsii	0.68
S. rolfsii + 25% culture filtrate of *T. harzianum*	0.26
S. rolfsii + 25% culture filtrate of *T. viride*	0.27

There are several reports on the ability of *T. harzianum* and *T. viride* to inhibit the growth of pathogen in *in vitro* condition. Patel and Anahosur (2001) tested antagonistic potential of *T. harzianum* against four soil borne pathogens isolated from chickpea plants *viz. Fusarium oxysporum, F. solani, Macrophomina phaseolina* and *S. rolfsii in vitro*. In dual culture, the

mycoparasite overgrew the pathogen and inhibited their growth by producing antibiosis through the production of some antifungal substances. Sharma and Sharma (2001) reported that among the antagonists tested by them *T. harzianum* and *T. viride* were most effective in inhibiting mycelial growth of *Dematophora netrix* in dual culture. Prasad *et al.* (1999) obtained three *T. harzianum* isolates that were highly effective in controlling root / collar rot of sunflower caused by *S. rolfsii* under green house conditions.

Acknowledgement

The author is grateful to University Grants Commission, Nepal for the financial support.

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