ACKNOWLEDGEMENT

We thank Dr. G. R. Stirling Department of Primary Industries, Queensland, Australia for sparing the culture of *Pasteuria penetrans*.

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J. Biol. Control, 1 (1), 57-59, 1987

Biological Control of Sheath Blight Disease of Rice

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ABSTRACT

Trichoderma aureoviride restricted the mycelial growth and sclerotial initiation in a virulent isolate of *Rhizoctonia solani* over culture medium by 52.7 and 95.3% respectively. Microscopic examination of the *R. solani* mycelium near the inhibition zone revealed that more than 25% of the mycelia were lysed and most of the hyphal tips showed bulb-like terminal enlargements. Pot culture experiments showed that soil amendment with *T. aureoviride* brought down considerably the incidence and severity of the sheath blight disease in TKM-9 rice.

Key words : Sheath blight, rice, *Rhizoctonia solani*, biological control, *Trichoderma aureoviride*.

Biological control is increasingly capturing the attention of plant pathologists as a practical tool for the control of soil borne pathogens. There are certain soil fungi, bacteria and actinomycetes called antagonists which inhibit the growth of other microbes. The inhibition is mediated by specific or non-specific toxic metabolites of microbial origin, by lytic agents or by direct hyperparasitism. In the present study, an attempt was made to use an antagonist *Trichoderma aureoviride* against *Rhizoctonia solani*, the soil borne pathogen causing sheath blight disease of rice.

MATERIALS AND METHODS

Organisms :

The antagonistic fungus *T. aureoviride* was isolated from a garden soil using soil plate technique. The isolate of *R. solani* used in the present study was isolated from the infected rice sheaths by the senior author (Manian, 1981).

Antagonism over culture medium:

The inhibition of mycelial growth of *R solani* by the antagonist was studied on PDA medium using co-culture technique. Four replicates were maintained. After two days of incubation, the radial mycelial growth in mm was measured and the per cent inhibition was calculated. Eight days after incubation, the number of sclerotia/ petri dish was counted and the mean percentage inhibition of sclerotial initiation was calculated. In the same way, the effect of culture filtrate of *T aureoviride* on the mycelial growth and sclerotial initiation of *R. solani* was studied by amending culture medium with filtrate. For the amendment, one ml of the filter sterilized culture filtrate of *T. aureoviride* from 10 days old-Richard's broth was added aseptically to 20 ml of molten and warm (40°C) PDA medium.

Soil amendment studies :

About 450 g of rice field soil was taken in 14 cm wide earthen pots and autoclaved for 2 hr for two successive days. Fifty grams of rice-sand medium (River sand : rice : water = 20 : 1 : 4 and autoclaved) inoculated with 4 day old *R. solani* culture and incubated for 10 days was mixed with the sterile soil in each pot and incubated for one week. Pre-germinated susceptible TKM-9 rice seeds (2g) were sown in the *R. solani* infested moist soil. Disease severity index (DSI) was calculated on the 20 day - old seedlings.

$$DSI = \text{Mean lesion length in cm} \times \text{Average number of lesions per seedling}$$

Biological control of sheath blight disease was tried through soil amendment with *T. aureoviride* For this, 20 g of the 10 day - old cultures of *T. aureoviride*, grown over rice-sand medium was transfered to the *R solani* infested soil at the time of sowing the rice seeds.

RESULTS AND DISCUSSION

In the present study, the growth of *T. aureoviride* in the vicinity restricted the radial mycelial growth and sclerotial initiation in a virulent isolate of *R. solani* over culture medium by 52.7 and 95.3% respectively. The ability to suppress the sclerotial initiation may be significant because,

the population of sclerotia in soil represents the possible degree of primary infection in field (Kitani *et al.*, 1958).

Microscopic observation of *R. solani* mycelium near the inhibition zone revealed that more than 25% of the mycelia were lysed. Most of the hyphal tips showed bulb-like terminal enlargements. Rombouts (1953) and Vasudeva and Govindaswamy (1953) reported similar morphological changes in the mycelia of *R. solani* by antagonistic *Streptomyces* and bacteria. The possible release of certain water soluble toxic principle(s) from the antagonist, altering the cell wall composition and permeability, might be responsible for the inhibitory effect. The release of such lethal metabolites to *R. solani* by *Trichoderma* spp. has already beed reported (Richardson, 1954; Aluko and Hering, 1970). Observation of the inhibitory effect of *T. aureoviride* culture filtrate on the radial mycelial growth (13.8%) and sclerotial initiation (66.7%) in *R. solani* further elucidates this point.

Amendment of soil with *T. aureoviride* culture brought down the incidence and severity of the sheath blight disease considerably (Table 1). Such protection could be attributed to the suppression of the mycelial growth of *R solani* in the amended soil. Suppressiveness of *R solani* in association with the propagules of *Trichoderma* spp. was also reported by earlier workers (Mew and Rosales, 1984; Venkatasubbaiah *et al.*, 1984; Lewis and Papavizas, 1985; Strashnov *et al*, 1985). Further study of *T. aureoviride* under field conditions seems an interesting proposition.

TABLE 1. Pathogenicity of *R. solani* on rice as influenced by *T. aureoviride* amendment.

Treatment	DSI*	% disease incidence
R. solani	2.25	83.21
R. solani + *T. aureoviride*	1.02	15.57

* Disease severity index (DSI) = Mean lesion length in cm × Average number of lesions per plant

ACKNOWLEDGEMENT

We thank our Principal Dr. M. Aruchami for his encouragement and facilities provided.

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