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Short communication

Antagonistic effect of soil microbes against rice pathogens

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Abstract

Antagonistic effect of two isolates obtained from paddy field soil sample by using serial dilution method *viz.*, the fungus, *Trichoderma viride,* and the bacterium *Pseudomonas fluorescens,* was tested against the pathogens, namely, *Helminthosporium oryzae, Sarocladium oryzae* and *Rhizoctonia solani*. *Trichoderma viride* showed more antagonistic effect than *Pseudomonas fluorescens.*

Keywords: angatonistic effect, biocontrol agent, *Helminthosporium, Pseudomonas, Rhizoctonia,* rice pathogens, *Sarocladium,* soil microbes, *Trichoderma*

INTRODUCTION

India is the world's second largest producer and consumer of rice next to Thailand. Plant surface is a natural habitat of both pathogens and non-pathogens and the rice crop is often affected by this plant pathogens. *Rhizoctonia solani, Sarocladium oryzae, Helminthosporium oryzae* cause sheath blight (Park and Bertus, 1932; Chakravarty and Biswas, 1978) sheath rot (Chin, 1974) and brown spot (Padmanabhan, 1948) disease, respectively, in rice. Antagonistic microorganisms are often used in disease control as a farm of biological control. This paper deals with antibiotic interactions between the above mentioned paddy pathogens and the antagonistic organisms, namely, *Trichoderma viride* and *Pseudomonas fluorescens*.

MATERIALS AND METHODS

(i) Isolation of soil bacteria and fungi

The antagonistic microorganisms, *T. viride*, and *P. fluorescens* were isolated on PDA and nutrient agar medium, respectively, using serial dilution plating technique of soil sample.

(ii) Test organisms

The test pathogens *Helminthosporium oryzae, Sarocladium oryzae* and *Rhizoctonia oryzae* were obtained from Tamil Nadu Rice Research Institute, Aduthurai, India. *H.oryzae* and *R.solani* were maintained on PDA medium. *S.oryzae* was maintained on Richard's medium.

Antibiotic interaction (Food poisoning technique)

Agar blocks (3 mm dia) cut from the pure cultures of *T. viride* and *P. fluorescens* were separately inoculated in to the PD broth and nutrient broth and incubated at 25 ± 2°C for the fungus and 37° C ± 2°C for the bacterium, for 15 days. After 15 days of incubation, the cultures were filtered through No.1 Whatmann membrane filter. The culture filtrates were collected and added separately to the PDA medium at various concentrations (*i.e.*, 5, 10, 15 and 20%). Addition of antibiotic (30 µg /ml of streptomycin sulfate) in the PDA medium prevented the growth of bacteria. The medium was poured into the Petri plates and allowed to solidify. After solidification, agar blocks cut from test fungi, namely, *R. solani*, *S. oryzae* and *H. oryzae* were inoculated at the centre of the plate. The plates were incubated at room temperature for 5 days for *R.solani* and *H.oryzae* and the incubation time was extended to 7 days for *S. oryzae*, because of its slow growing nature.

The radial growth was measured every day and mean growth rate was calculated. A control was also maintained for each filtrate. The percent growth inhibition was calculated as follows.

$$\text{Per cent of inhibition of growth} = \frac{\text{Growth in control} - \text{Growth in treatment}}{\text{Growth in control}} \times 100$$

RESULTS AND DISCUSSION

Antagonistic effects of *T. viride* and *P. fluorescens* were studied against the paddy pathogens, *viz.*, *Helminthosporium oryzae, Sarocladium oryzae* and *Rhizoctonia solani* in *in vitro* condition. *T. viridae* was found very effective in inhibiting the growth suppression of *R.. solani, H. oryzae* and *S. oryzae* over PDA medium, and *P. fluorescens* was proved to be less effective than *T. viridae* in controlling these pathogens (Table 1).

Earlier Skidmore and Dickinson (1976), observed different types of interactions in dual culture experiments and stated that the mutual intermingling growth of test organisms with soil fungi and bacteria with zone of inhibition indicated the success of the production of antibiotics either by pathogen or by

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Table 1. Effect of culture filtrates of soil fungi and bacteria on the growth of rice pathogens

S. No	Culture filtrate used	Concentration of the culture filtrate (%)	Test Pathogens					
			H. oryzae		*S. oryzae*		*R. solani*	
			Growth rate[a] (mm / day)	% of growth inhibition	Growth rate[a] (mm / day)	% of growth inhibition	Growth rate[a] (mm / day)	% of growth inhibition
1	*Trichoderma viridae*	5	40.0 ± 0.15	20.0	30 ± 0.15	14.2	30 ± 0.25	25
		10	30.0 ± 0.25	40.0	26 ± 0.30	25.7	26 ± 0.35	35
		15	25.0 ± 0.31	50.0	18 ± 0.35	48.5	18 ± 0.30	55
		20	15.0 ± 0.20	70.0	10 ± 0.15	72.4	12 ± 0.20	70
	Control	-	50.0 ± 0.1	-	35 ± 0.1	-	40 ± 0.1	-
2	*Pseudomonas fluorescens*	5	40.0 ± 0.16	11.1	20 ± 0.21	41.2	35 ± 0.25	22.2
		10	35.0 ± 0.24	22.2	18 ± 0.35	47.0	30 ± 0.36	33.3
		15	25.0 ± 0.36	44.4	15 ± 0.25	55.8	26 ± 0.15	42.2
		20	15.0 ± 0.25	66.6	10 ± 0.16	70.5	20 ± 0.24	55.5
	Control	-	45.0 ± 0.1	45.0 ± 0	34 ± 0.1	-	45 ± 0.1	-

[a]Values are expressed as mean ± S.D.

antagonist. The fungus, *Trichoderma* spp., was proved to be a good antagonistic fungi against plant pathogens earlier by Singh (1988) Gupta *et al.* (1991) and Deore and Sawant (2002), also.

In the present investigation *T. viride* and *P.fluorescens* showed maximum inhibition of growth of 72.4% and 70% respectively of *S. oryzae*. Hence the present laboratory study suggests that these organisms could be used for the control of paddy pathogens.

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