



Field efficacy of fungal and bacterial antagonists against brown spot of rice

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ABSTRACT: Efficacy of two antagonists, namely, *Trichoderma harzianum* and *Pseudomonas fluorescens* was evaluated against brown spot of rice under field conditions. Three sprays of *P. fluorescens* (Talc based) at weekly interval @10g per litre, proved effective in reducing the disease severity and increasing the yield. It reduced the severity from 35.8 per cent to 24.5 per cent in case of rice variety PR116 and from 20.1 per cent to 8.5 per cent in case of Basmati rice 386.

KEY WORDS: Brown spot, rice, *Pseudomonas fluorescens*, *Trichoderma harzianum*

Brown spot of rice caused by *Helminthosporium oryzae* Breda de Haan is a serious disease of rice in Punjab (Pannu *et al.*, 2002; Lore and Raina, 2003). The disease occurs in poor soil and under water stress conditions (Pannu *et al.*, 2005). Rathaiyah (1997) reported brown spot could cause heavy losses in quality and quantity. Brown spot disease of rice with 42 per cent severity can cause up to 34.4 per cent loss in yield (Pannu *et al.*, 2006). The disease is currently managed through application of chemical fungicides, which are highly recalcitrant, toxic, and non-eco friendly (Dath, 1990). The use of antagonists as biocontrol agents against the pathogen has been viewed as an alternative disease management strategy. Further, bioagents isolated from a particular environment may proliferate and may be effective under certain specific conditions only. The present study was undertaken to evaluate the efficacy of

bioformulation of *T. harzianum* and *P. fluorescens* against brown spot of rice.

Talc based formulations of *T. harzianum* (Th) and *P. fluorescens* (Psf) and their combination (Th + Psf) were evaluated against brown spot of rice. The field experiment was conducted in randomized block design with a plot size of 100 m² and there were four replications for each treatment. The experiment was conducted on PR116 variety of rice during 2004. Similar experiment was conducted on *Basmati* rice variety 386 during 2005, where both talc as well as oil based formulations were used. The crop was raised under standard agronomic practices (125 kg N and 30 kg P₂ O₅/ha) and under natural infection of the disease. During both the years, the antagonists were compared with chemical fungicide dithiocarbamate (Indofil Z 78) @ 1.25 kg per hectare in 500 litres of water and untreated

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control. The formulations were obtained from Department of Plant pathology, GB Pant University of Agriculture and Technology, Pantnagar through Project Directorate of Biological control, Bangalore.

Foliar sprays of antagonists @ 10g/ litre were initiated, just after the appearance of disease. First spray was given after recording the preliminary data on severity of disease. Two more sprays were given at weekly interval. The observations on disease severity were recorded near maturity stage and calculated by comparing the leaves as per the diagram given by Mayee and Datar (1986) and by using the formula:

$$\text{Disease severity (Area) \%} = \frac{\text{Area of the plant tissue affected by disease}}{\text{Total Area}} \times 100$$

The final grain yield was recorded on the basis of whole plot.

The severity of infection before spray varied from 23.4 to 26.6 per cent in different treatments during 2004 on rice and there was no significant difference between them. Similarly, during the year

2005, severity of disease varied from 6.0 to 7.7 per cent in different treatments in *Basmati* rice before spraying. The terminal severity during 2004 in the treatment was significantly lower than control (35.8%) (Table 1). The lowest terminal severity (24.4 %) was observed in plots sprayed with chemical fungicide and was on par with spray of Psf where 24.5 per cent terminal severity was observed and both were significantly superior to all other treatments. The highest yield (64.9 q/ ha) during 2004 was recorded in spray of Psf, which was on par with chemical control (64.2 q/ ha) but was significantly higher than other treatments. During 2005 after three sprays, the terminal severity was found to be lowest in Psf (Talc) i.e. 8.5 per cent and was significantly lower than all other treatments except chemical control where severity was 9.3 per cent. All the treatments (antagonists/ fungicide) reduced the terminal severity significantly as compared to control. It was further found that talc based formulation of Psf showed better efficacy than oil based Psf formulation. All the treatments were significantly superior in increasing grain yield as compared to control in both the years (Table 1). Highest yield (29.2 q/ ha) during 2005 was obtained

Table 1. Efficacy of antagonists for the control of brown spot of rice

Treatment	Rice (2004)		Basmati rice (2005)	
	Terminal severity	Yield (q/ha)	Terminal severity	Yield (q/ha)
1. <i>Trichoderma harzianum</i> (Talc) (10g/ litre)	29.5(32.9)	63.3	14.5(22.3)	23.3
2. <i>Pseudomonas fluorescens</i> (Talc) (10g/ litre)	24.5(29.9)	64.9	8.5(17.1)	29.2
3. Spray of Th + PsF (Talc) (10g/ litre)	30.1(33.2)	62.4	-	-
4. <i>Trichoderma harzianum</i> (Oil) (10ml/ litre)	-	-	17.6(24.7)	22.3
5. <i>Pseudomonas fluorescens</i> (Oil) (10ml/ litre)	-	-	13.2(21.3)	23.3
6. Dithiocarbamate (Indofil Z-78) @ 1.25 kg/ ha	24.4(29.8)	64.2	9.3 (17.7)	28.5
7. Control	35.8(36.7)	58.3	20.1(26.6)	17.7
CD (P = 0.05)	(1.11)	(1.5)	(1.5)	(4.1)

Figures in parentheses are arcsine transformed values; Th: *Trichoderma harzianum*; Psf: *Pseudomonas fluorescens*

with talc-based formulation of Psf and it was on par with chemical control (28.5q/ ha) and both the treatments were significantly superior to all other treatments.

Based on the severity of brown spot and grain yield, three sprays of talc based formulation of PsF at weekly interval were on par with three sprays of dithiocarbamate in reducing the severity of brown spot. Singh & Singh (2005) have reported that Talc based formulation of Psf @ 8g per litre gave maximum reduction of disease severity of sheath blight and increased grain yield. Khan and Sinha (2005) reported that *T. harzianum* gave moderate control of sheath blight, but was inferior to chemical control.

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