



Effect of Fungicides on Mycelium Growth of *Rhizoctonia solani* of Rice under *In-vitro*

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Sheath blight of rice caused by *Rhizoctonia solani* Kuhn is emerging as very destructive disease causing heavy yield losses. This experiment was conducted at Department of plant Pathology, College of Agriculture, Rewa (M.P.) during 2018-19. This experiment was carried out in a complete randomized design (CRD) with eight treatments including untreated control. Seven fungicides viz., Flusilazole 12.5%+carbendazim 25% SC, Azoxystrobin 18.2% w/w+difenoconazole 11.4 w/w SC, Azoxystrobin 11%+Tebuconazole 18.3% w/w SC, Tricyclazole 18%+ mancozeb 62%WP, Zineb 68% + hexaconazole 4% WP, Trifloxystrobin 25%+Tebuconazole 50%WG, Mancozeb 50%+carbendazim 25%WS, were evaluate against *R. solani* of rice at different concentrations

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under *in-vitro* by poisoned food technique. The present study, among the tested fungicides Azoxystrobin 11%+Tebuconazole 18.3% w/w SC at 200 ppm and 100 ppm was found significantly superior in inhibiting the mycelial growth of *R. solani* over untreated check at 96 hrs. after incubation.

Keywords: *Oryza sativa*; Sheath blight; fungicides and mycelial growth.

1. INTRODUCTION

“Rice (*Oryza sativa* L.) is one of the most important cereal crops. It is one of the most important staple food crop grown in different ecology zones and contributes 40% of total food grain production in India. Productivity of rice can be increased by adopting hybrid rice, integrated nutrient and pest management for combating the economic losses due to biotic stresses. In India, area 46.38 Mha with production 130.29 Mt and productivity 2809 kg/ha” [1]. “Sheath Blight disease of rice caused by *Rhizoctonia solani* Kühn is one of the most important and widely distributed diseases in all the rice growing regions of the world and caused considerable lost in grain yield of 54.3 per cent” According to Chahal et al. [2]. “The natural infection of the sheath blight disease occurs at the seedling, tillering and booting stages of rice. Infection usually starts near the water line of rice plants in paddy fields. Lesions develop upward to the upper leaf sheaths and leaf blades. The centre of lesion become grayish white with brown margin, later several spots coalesce and show blight symptoms” [3]. “Fungicide application is the most common approach among the farmers for the management of sheath blight throughout the world. The complex genetic nature of resistance to sheath blight and genetic variability of the pathogen increases the difficulty in developing resistant host genotypes, as well as in effectively deploying available tolerant cultivars” [4,5]. Regrettably, no rice variety is currently known to be immune to sheath blight disease or to have a high level of tolerance to it. Fungicides are the primary means of controlling these illnesses when donors who are suitable and resistant are not available. The goal of the current study is to compare the effectiveness of several fungicides in the management of rice sheath blight.

2. MATERIALS AND METHODS

The present investigation was carried out in a complete randomized design (CRD) with eight treatments including untreated control and replicated fours. “Seven fungicides viz., Flusilazole 12.5%+carbendazim 25% SC,

Azoxystrobin 18.2% w/w+difenoconazole 11.4 w/w SC, Azoxystrobin 11%+Tebuconazole 18.3% w/w SC, Tricyclazole 18%+ mancozeb 62%WP, Zineb 68% + hexaconazole 4% WP, Trifloxystrobin 25%+Tebuconazole 50%WG, Mancozeb 50%+carbendazim 25%WS, were evaluate against *R. solani* of rice at different concentrations. The present study was conducted under laboratory conditions to find out their efficacy to inhibit the mycelial growth on PDA medium by poisoned food technique” [6]. The required quantity of fungicides were added to the PDA medium at luke warm stage and thoroughly mixed before pouring into petriplate so as to get the desired concentration of active ingredient of each fungicides separately. 20 ml of fungicide- amended medium was poured in each of 90 mm sterilized petriplate and allowed to solidify. After solidification, each plate was inoculated with 5 nmm discs of 3 day old culture of *R. solani* were cut with sterile cork borer and transferred aseptically to the centre of the poisoned medium petriplate. Similarly, control plates were maintained by placing 5 mm disc of the pathogen in the centre of the non-poisoned PDA medium petriplate. Four replications were maintained in respect of each isolate and each concentration. All the inoculated petriplate were incubated at 27±2 °C in BOD incubator for seven days. The colony diameter was measured when the control plates were filled with fungal growth. Per cent inhibition over control was calculated by the following formula suggested by Vincent [7].

$$I = \frac{C - T}{C} \times 100$$

Where,

I = Per cent inhibition in growth of *R. solani*
 C = Mycelial growth (mm) in control
 T = Mycelial growth (mm) in treatments

3. RESULTS AND DISCUSSION

The data on bio efficacy of fungicides against Sheath blight of rice is presented in Table 1. and Fig. 1. The data indicate that among the seven tested fungicides at different concentrations, Azoxystrobin 11% + tebuconazole 18.3% w/w

Table 1. Mycelial growth of *R. solani* as influenced by different fungicides *in Vitro*

Sl. No.	Treatments	Mycelial growth (mm)			% inhibition over control
		48hrs	72hrs	96hrs	
Concentration 50 ppm					
T1	Flusilazole 12.5% + carbendazim 25% SC	24.25	34.5	47	35.6
T2	Azoxystrobin 18.2% w/w + difenoconazole 11.4% w/w SC	21	32	37	49.3
T3	Azoxystrobin 11% + tebuconazole 18.3% w/w SC	18	30	35	52.0
T4	Tricyclazole 18% + mancozeb 62% WP	24	34	45	38.3
T5	Zineb 68% + hexaconazole 4% WP	23.8	33.5	43	41.0
T6	Trifloxystrobin 25% + tebuconazole 50% WG	23	32.9	40	45.2
T7	Mencozeb 50% + carbendazim 25% WS	24.7	35.2	49	32.8
T8	Control	28	45	74	0.0
	CD (5%)	2.226	2.551	2.349	
Concentration 100 ppm					
T1	Flusilazole 12.5% + carbendazim 25% SC	14.1	27.1	37.2	50.4
T2	Azoxystrobin 18.2% w/w + difenoconazole 11.4% w/w SC	11	22.2	29.4	60.8
T3	Azoxystrobin 11% + tebuconazole 18.3% w/w SC	8	16	0	100
T4	Tricyclazole 18% + mancozeb 62% WP	13.5	26.5	35	53.3
T5	Zineb 68% + hexaconazole 4% WP	13	26.3	34	54.6
T6	Trifloxystrobin 25% + tebuconazole 50% WG	12.4	24.7	32.6	56.5
T7	Mencozeb 50% + carbendazim 25% WS	15.1	29	38	49.2
T8	Control	28	45	74	0.0
	CD (5%)	2.462	3.015	2.418	
Concentration 200 ppm					
T1	Flusilazole 12.5% + carbendazim 25% SC	9.1	18	28.5	61.5
T2	Azoxystrobin 18.2% w/w + difenoconazole 11.4% w/w SC	6	12.2	20.2	72.2
T3	Azoxystrobin 11% + tebuconazole 18.3% w/w SC	0	0	0	100
T4	Tricyclazole 18% + mancozeb 62% WP	8.8	16.3	27.3	63.1
T5	Zineb 68% + hexaconazole 4% WP	7.6	15.9	25.6	65.4
T6	Trifloxystrobin 25% + tebuconazole 50% WG	7	14	23	68.9
T7	Mencozeb 50% + carbendazim 25% WS	10.6	20	30	59.4
T8	Control	28	45	74	0.0
	CD (5%)	1.764	3.000	2.514	

SC at 200 ppm was found to be most effective (0.0 mm) followed by Azoxystrobin 18.2% w/w + difenoconazole 11.4% w/w SC (20.2 mm) over untreated check (74.0 mm) after 96 hrs of incubation. The study also reveals that Azoxystrobin 11% + tebuconazole 18.3% w/w SC at low concentration was even superior to other fungicide for inhibiting the mycelia growth. Thus, it may be summarized that Azoxystrobin 11% + tebuconazole 18.3% w/w SC and Azoxystrobin 18.2% w/w + difenoconazole 11.4% w/w SC at 50 ppm, 100 ppm and 200 ppm drastically inhibited the growth of test fungi. However, it was observed that Trifloxystrobin 25% + tebuconazole 50% WG at 200 ppm drastically inhibited the growth of test fungus (23 mm) after 96 hrs of incubation whereas, Zineb 68% + hexaconazole 4% WP, Tricyclazole 18% + mancozeb 62% WP, Flusilazole 12.5% + carbendazim 25% SC and Mencozeb 50% + carbendazim 25% WS gave moderate inhibition of mycelial growth 25.6 mm, 27.3 mm, 28.5 mm and 30.0 mm respectively over untreated check (74.0 mm) under study. The other tested concentration 50 ppm and 100 ppm also gave inhibitory effect to check the mycelial growth of test fungus.

Azoxystrobin 11% + tebuconazole 18.3% w/w SC to recorded maximum % inhibition over control at 200 ppm and caused complete inhibition of the *R. solani* followed by Azoxystrobin 18.2% w/w + difenoconazole 11.4% w/w SC (72.2%) Other tested fungicides caused growth inhibition in the range of 59.4 to 68.9% at 200 ppm concentration. At 100 ppm concentration, Azoxystrobin 11% + tebuconazole 18.3% w/w SC caused complete inhibition of growth of the *R. solani* followed by Azoxystrobin 18.2% w/w + difenoconazole 11.4% w/w SC caused 60.8% inhibition of growth of the *R. solani*. Rest of the fungicides caused growth inhibition in the range of 49.2 to 56.5 at 100 ppm concentration. At lower concentration of 50 ppm, 52.0% growth inhibition was recorded with Azoxystrobin 11% + tebuconazole 18.3% w/w SC followed by Azoxystrobin 18.2% w/w + difenoconazole 11.4% w/w SC effected 49.3% growth inhibition. Other fungicides exhibited moderate inhibition. Among the fungicides Mancozeb 50% + carbendazim 25% WS showed least inhibition. The similar results was also reported by Agrawal et al. [8] Srinivas et al [9] and Mushineni et al. [10] and confirmed the present findings.

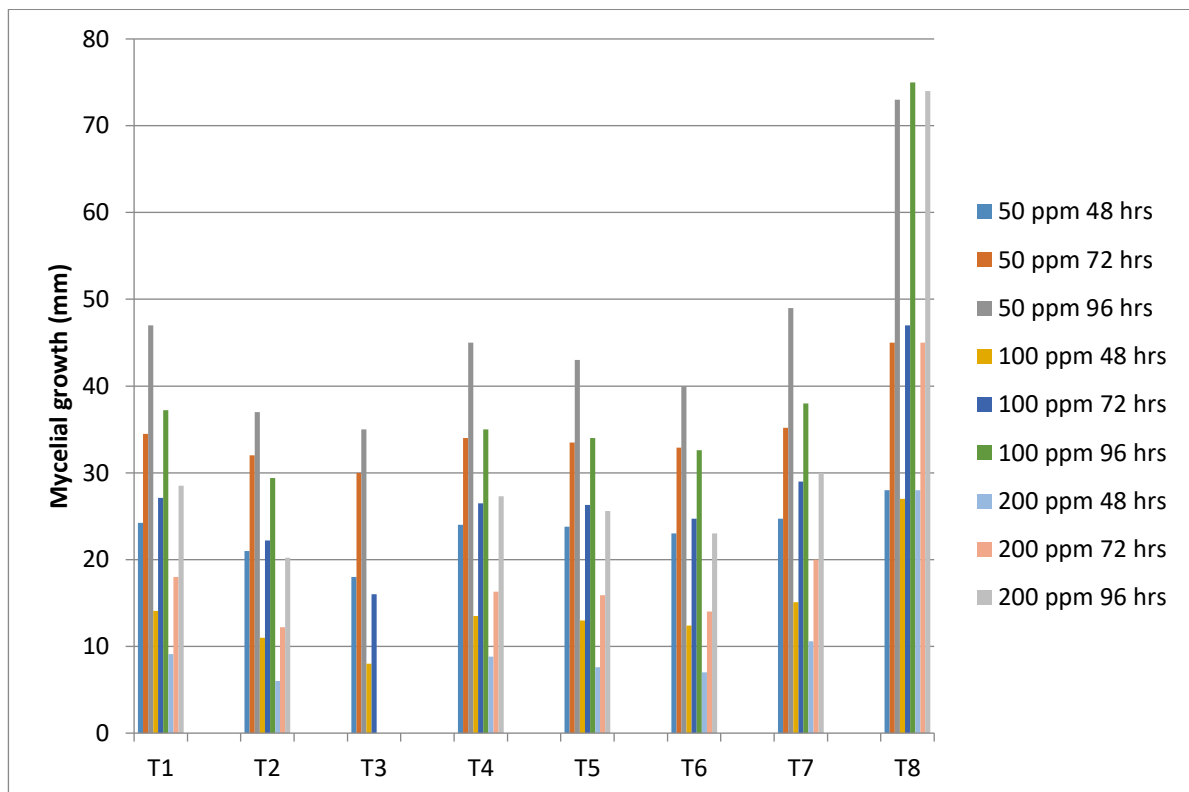


Fig. 1. Mycelial growth of *R. solani* as influenced by different fungicides *in Vitro*

CONCLUSION

It can be concluded that among the tested fungicides, Azoxystrobin 11%+Tebuconazole 18.3% w/w SC at 200 ppm and 100 ppm was found significantly superior in inhibiting the mycelial growth of *R. solani* over untreated check at 96 hrs. after incubation.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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