Effect of fungicides on Mycelium growth of *Rhizoctonia solani* of rice under *in-vitro*

ABSTRACT

Sheath blight of rice caused by *Rhizoctonia solani* Kuhnis 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.*,Flusilazole12.5%+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 under *in-vitro* by poisoned food technique. The present study,among the tested fungicides Azoxystrobin 11%+Tebuconazole 18.3% w/w SC at 200 ppmand 100 ppmwas found significantly superior in inhibiting the mycelial growth of *R. solani* over untreated check at 96 hrs. after incubation.

Key words: *Oryza sativa,*Sheath blight, Fungicides and Mycelial growth

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" (Anon, 2022). "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 lostin grain yield of 54.3 per cent" According to Chahal *et al*. (2003)."The naturalinfectionofthesheathblightdisease occurs at the seedling, tillering and booting stages of rice.Infectionusuallystartsnearthewaterlineofrice plants in paddy fields. Lesions develop upward to the upperleafsheathsandleafblades.Thecentreoflesion becomegrayishwhitewithbrownmargin,laterseveral spots coalesce and show blight symptoms" (Ou, 1985). "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" [9,10].Regretfully, 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.

MATERIALS AND METHODS

The present investigation was carried outin a complete randomized design (CRD) with eighttreatments including untreated control and replicated fours. "Seven fungicides *viz.*,Flusilazole12.5%+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 underlaboratory conditions to find out their efficacy to inhibit the mycelial growth on PDA medium by poisoned food technique" (Nene and Thapliyal, 1979). 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, controlplateswere 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 ºC in BOD incubator for seven days. The colony diameter was measured when the control plates were filled with fungal growth.Per centinhibition over control wascalculated bythe following formula suggested by Vincent (1947).

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

Where,

I = Per cent inhibitionin growth of *R. solani*

C = Mycelial growth (mm) in control

T = Mycelial growth (mm) in treatments

RESULTS AND DISCUSSION

The data on bio efficacy of fungicides against Sheath blight of riceis 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 SC at200ppm was found to be mosteffective (0.0mm) followed by Azoxystrobin 18.2% w/w + difenoconazole 11.4% w/w SC (20.2mm) over untreated check (74.0mm)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 50ppm, 100ppm and 200ppm drastically inhibited the growth of test fungi. However, it was observed that Trifloxystrobin 25% + tebuconazole 50% WGat 200ppm drastically inhibited the growth oftest fungus (23mm) 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 moderateinhibition of mycelial growth 25.6mm, 27.3 mm, 28.5mm and 30.0 mm respectivelyover untreated check (74.0mm) under study. The other tested concentration50ppm and 100ppm 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 50ppm, 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 SCeffected 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.(*2012), Srinivas *et al.(*2014) and Mushineni *et al*.(2017) and canfirmed the present findings.

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

Sl. No.	Treatments	Mycelial growth (mm)			% inhibition over control
	Concentration 50 ppm	48 hrs	72 hrs	**96** hrs	
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%	8	16	0	100

	w/w SC				
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**	

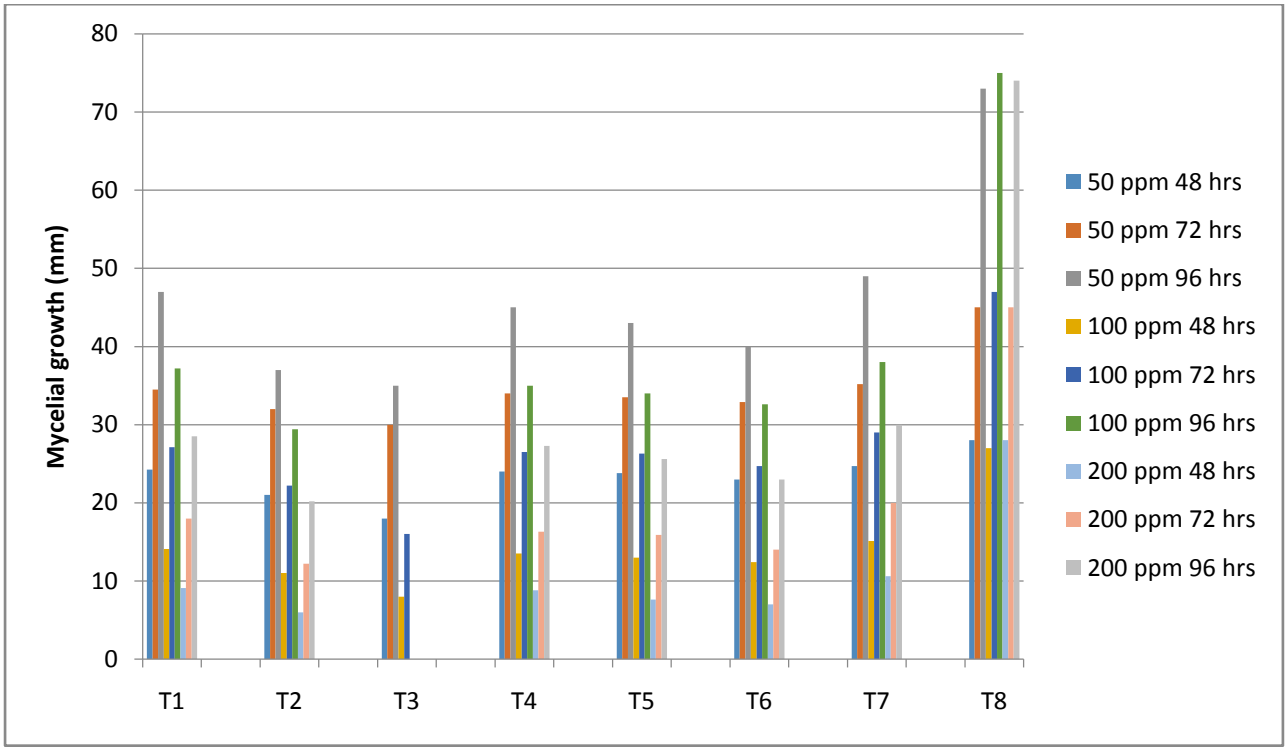

Fig-1. Mycelial growth of *R. solani* as influenced by different fungicides *in Vitro*