



EVALUATION OF FUNGICIDES AND BOTANICALS *IN VITRO* AGAINST SHEATH BLIGHT, *RHIZOCTONIA SOLANI* IN RICE (*ORYZA SATIVA* L.)

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Abstract

Out of eight fungicides and six different botanicals tested *in vitro* against *R. solani*, except Validamycin 3L, rest of the seven fungicides *viz.*, Propiconazole 25 EC @ 0.2 per cent, Carbendazim 50 WP @ 0.2 per cent, Benomyl 50 WP @ 0.2 per cent, Iprobenphos 48 EC @ 0.3 per cent, Hexaconazole 5 SC @ 0.3 per cent, Hexaconazole + Captan 004-75 WP @ 0.2 per cent and Epoxyconazole + Carbendazim 250 EC @ 0.3 per cent were found to be highly effective as all these fungicides completely inhibited the radial growth of *R. solani*. Among six different botanicals tested *in vitro* against *R. solani* Neem gold @ 0.3 per cent and Wanis @ 0.80 per cent were found to be best for inhibition of radial growth of *R. solani*.

Key words : *Rhizoctonia solani* Kuhn., sheath blight, fungicides, botanicals.

Introduction

Rice (*Oryza sativa* L.) is one of the most important cereal crop of the world. In India, it occupies an area of 42.86 million hectares with production of 95.97 million tonnes and productivity of 2.239 tonnes ha⁻¹ (Anonymous, 2011). It contributes 20.25 per cent of agricultural G.D.P. This crop is attack by many diseases caused by fungi, bacteria, viruses, nematodes and several physiological disorders, which caused annual loss of 12 to 25 per cent of the total production, while fungal diseases alone caused annual damage of 12 to 20 per cent of its production. Among these diseases, the sheath blight caused by *Rhizoctonia solani* Kuhn. earlier considered as minor disease is now regarded as an internationally important. In India, the disease was first reported by Paracer and Chahal in the year 1963 from Gurdaspur (Punjab). It is also designated as a sclerotial banded blight disease of rice in North India. The pathogen mainly infect leaf sheath but symptoms may be produced on any aerial part of the rice plant. Thus, sheath blight caused by *Rhizoctonia solani* Kuhn. is most economically important disease and have possessed challenge to the farmers for successful cultivation of rice and ultimately to the plant pathologists. Keeping this fact in view, evaluation of fungicides and botanicals against this pathogen were under taken in lab conditions.

Materials and Methods

Eight fungicides pertaining to different chemical groups and six neem based commercially available products with recommended doses were evaluated at three different concentrations for studying their inhibitory effect on the mycelial growth of *R. solani* using Poisoned Food Technique under laboratory condition. Glassware, used throughout the study, were pre-sterilized. The required amounts of wetttable antifungal agents were weighed on electronic balance. Stock solution of each agent was prepared in distilled water and incorporated into Potato dextrose agar medium and mixed thoroughly before autoclaving at 1.05 kg/cm² for 20 minutes. Fungicides and botanicals available as liquid preparation were measured with the help of pipette. After autoclaving the medium was poured aseptically in sterilized Petri plates of 9 cm size in inoculation chamber and allowed to cool. Each concentration of fungicides and neem based products was replicated four times. After solidification of medium in Petri plates each plate was centrally inoculated with 1.5 mm sclerotia from the edge of seven days old culture of *R. solani* using sterilized forceps under aseptic condition. Un-named PDA plates inoculated centrally with test pathogen served as check. Inoculated plates were incubated at 28±2°C and arranged according

Table 1 : Effect of fungicides on radial growth of *R. solani* *in vitro*.

S. no.	Treatments	Concentration (%)	After 48 hrs		After 72 hrs		After 96 hrs	
			Average diameter (mm)	Per cent inhibition over check	Average diameter (mm)	Per cent inhibition over check	Average diameter (mm)	Per cent inhibition over check
1.	Propiconazole 25 EC	0.05	5.00	93.00	6.25	92.04	6.63	91.91
		0.10	1.75	97.55	1.75	93.78	2.00	97.56
		0.20	0.00	100.00	0.00	100.00	0.00	100.00
2.	Carbendazim 50 wp	0.05	6.50	90.91	7.38	90.60	8.13	90.09
		0.10	1.25	98.25	2.00	97.45	2.25	97.26
		0.20	0.00	100.00	0.00	100.00	0.00	100.00
3.	Validamycin 3L	0.125	40.75	43.01	43.13	45.06	45.75	44.21
		0.25	19.00	73.43	20.00	74.52	21.25	74.09
		0.30	10.25	85.56	10.38	86.68	13.75	83.23
4.	Benomyl 50 WP	0.05	5.00	93.01	6.13	92.20	7.25	91.16
		0.10	1.50	97.90	2.38	96.97	2.63	96.79
		0.20	0.00	100.00	6.00	100.00	0.00	100.00
5.	Iprobenphos 48 EC	0.10	1.50	97.90	1.50	98.09	3.25	96.04
		0.20	1.13	98.42	1.13	98.56	1.50	98.17
		0.30	0.00	100.00	0.00	100.00	0.00	100.00
6.	Hexaconazole 5 SC	0.10	2.25	96.85	4.25	94.59	4.88	94.05
		0.20	1.38	98.07	1.25	98.09	1.88	97.71
		0.30	0.00	100.00	0.00	100.00	0.00	100.00
7.	Hexaconazole + Captan 004-75WP	0.05	7.75	89.16	9.63	87.73	10.75	86.89
		0.10	4.00	94.41	5.75	92.75	6.50	92.07
		0.20	0.00	100.00	0.00	100.00	0.00	100.00
8.	Epoxyconazole + carbendazim 250 EC	0.10	18.75	73.38	23.5	70.06	27.25	66.77
		0.20	5.00	93.01	9.00	88.54	11.50	85.98
		0.30	0.00	100.00	0.00	100.00	0.00	100.00
9.	Check	Untreated	71.50		78.50		82.00	
		SEm ±	0.64		0.84		0.87	
		CD at 5%	1.92		2.42		2.02	

to Completely Randomized Design (CRD). Colony diameter was measured with the help of a plastic scale, 48, 72 and 96 hours after inoculation.

Results and Discussion

Eight fungicides were tested in laboratory against *Rhizoctonia solani* for their efficacy against radial growth. Data presented in table 1, fig. 1 clearly showed that all the fungicides taken in this investigation were effective against *R. solani* and significantly inhibited the radial growth *in vitro* at different concentrations. Out of which Propiconazole 25 EC (0.2 per cent), Carbendazim 50 WP (0.2 per cent), Benomyl 50 WP (0.2 per cent),

Iprobenphos 48 EC (0.3 per cent), Hexaconazole 5 SC (0.3 per cent), Hexaconazole + Captan 004-75 WP (0.2 per cent) and Epoxyconazole + Carbendazim 250 EC (0.30 per cent) completely inhibited the radial growth of the fungus at test concentrations on Potato dextrose agar medium. The fungicide Validamycin 3L (0.3 per cent) was found least effective. Similar fungitoxicant like Carbendazim, Epoxyconazole + Carbendazim, Hexaconazole and Propiconazole have been reported for complete inhibition of *R. solani* at 100 ppm concentration by Tiwari *et al.* (2002). Abhimanyu and Singh (2002) have also reported the complete growth inhibition of *R. solani* with 2 per cent Carbendazim and 0.1 per cent

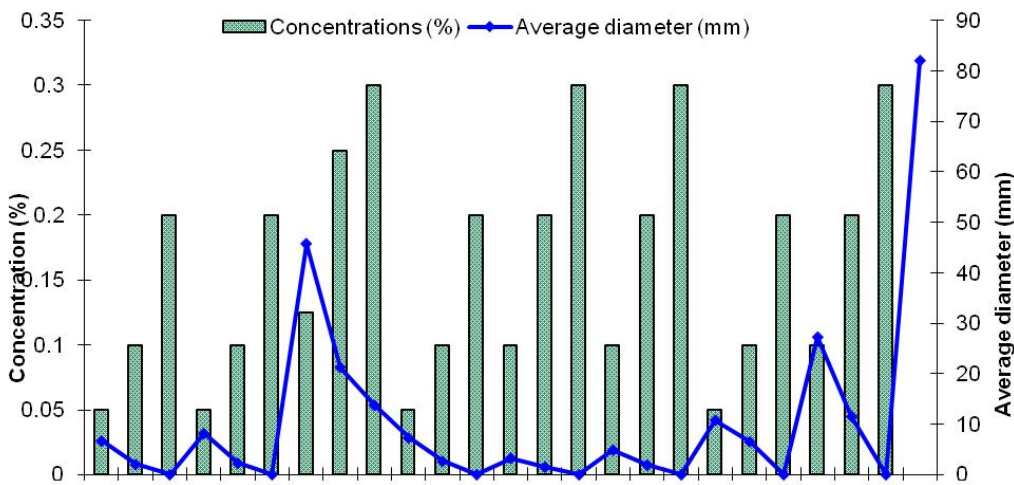


Fig. 1 : Effect of fungicides on radial growth of *R. solani* *in vitro* after 96 hrs.

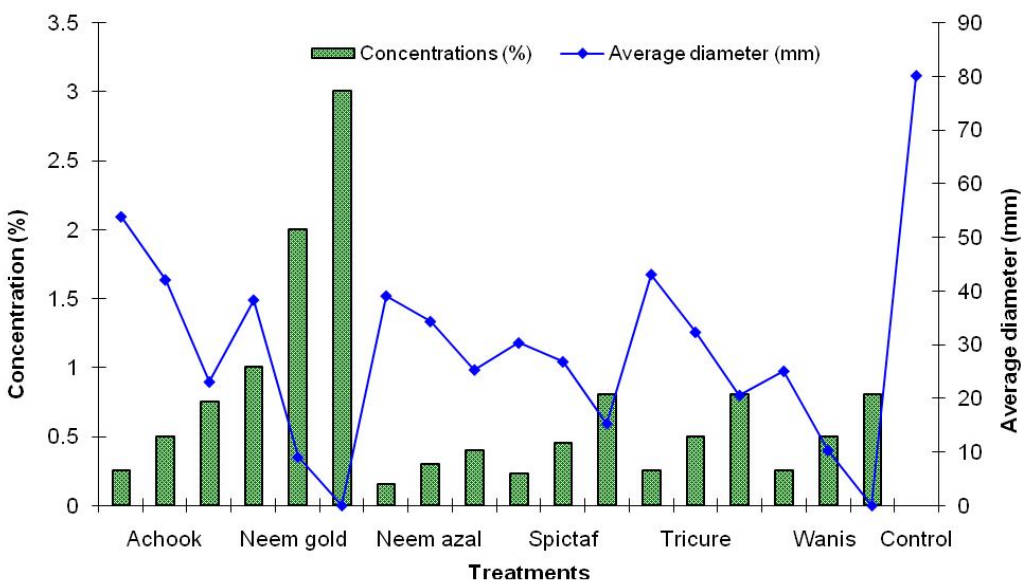


Fig. 2 : Effect of botanicals on radial growth of *R. solani* *in vitro* after 96 hr.

Hexaconazole. Carbendazim, Hexaconazole and Propiconazole have also been reported by Kumar and Dubey (2002) for complete inhibition of mycelial growth of *T. cucumeris*. Gupta (2002) has reported that Carbendazim inhibited 95-100 per cent fungal growth of *R. solani*. The variation in the level of concentration for complete inhibition may be because during present investigation the 100 per cent inhibitory concentrations were due to higher doses used.

It is evident from table 2, fig. 2 that all the neem based products significantly inhibited the growth of *R. solani*. Out of six botanicals, Neem gold (3 per cent) and Wanis (0.8 per cent) inhibited 100 per cent growth of the fungus on Potato dextrose agar medium followed by Spictaf (0.8 per cent) and Tricure (0.8 per cent) which were second in effectivity rank as they inhibited 80.94 and 74.35 per cent radial growth of *R. solani*. The

botanical Achook (0.75 per cent) was the least effective which inhibited only 71.25 per cent mycelial growth. These findings are in accordance with the findings of Kotasthane and Lakpale (1994) and Kurucheva *et al.* (1997). The inhibitory effect of the plant products on the radial growth of the fungus might be attributed to the presence of some antifungal ingredients in these plants. *Azadirachata indica* is known for possessing various types of antimicrobial components belonging to triterpenoid and flavanoid groups such as nimbin, solanin, thionemore and azadiractin. It may be the possible reason that these components either individually or collectively affected the fungal growth (Thakur *et al.*, 1981). Similar antifungal effect has been noticed in several other plant species like *Prosopis glabra*, which was found to inhibit the mycelial growth of *R. solani* (Mishra and Tiwari, 1990).

Table 2 : Effect of botanicals on radial growth of *R. solani* *in vitro*.

S. no.	Treatments	Concentration (%)	After 48 hrs		After 72 hrs		After 96 hrs	
			Average diameter (mm)	Per cent inhibition over check	Average diameter (mm)	Per cent inhibition over check	Average diameter (mm)	Per cent inhibition over check
1.	Achook	0.25	31.75	50.58	46.25	33.93	53.75	37.50
		0.50	28.00	56.42	38.50	45.00	42.00	47.50
		0.75	9.75	84.82	21.75	68.93	23.00	71.25
2.	Neem gold	1.00	19.50	69.65	28.00	60.00	38.25	52.19
		2.00	4.00	93.77	8.50	87.86	9.00	88.75
		3.00	0.00	100.00	0.00	100.00	0.00	100.00
3.	Neem azal	0.15	33.50	47.86	36.25	48.21	39.00	51.51
		0.30	27.00	57.98	29.50	57.86	34.25	57.19
		0.40	18.28	71.59	22.50	67.86	25.25	68.44
4.	Spictaf	0.23	25.00	61.10	27.25	61.07	30.25	62.19
		0.45	24.25	62.23	25.25	63.93	26.75	66.56
		0.80	13.25	73.39	14.50	79.29	15.25	80.94
5.	Tricure	0.25	37.75	41.25	41.00	41.43	43.00	46.25
		0.50	28.00	56.42	30.50	56.43	32.25	59.69
		0.80	16.25	74.71	16.00	77.14	20.50	74.38
6.	Wanis	0.25	19.25	70.04	22.50	67.86	25.00	68.75
		0.50	5.00	92.22	7.50	89.29	10.25	87.19
		0.80	0.00	100.00	0.00	100.00	0.00	100.00
7.	Check	Untreated	64.25		70.00		80.00	
		S.Em. ±	1.36		1.26		1.30	
		CD at 5%	3.84		3.56		3.67	

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