research article | International Journal of Plant Sciences, (January to June, 2010) Vol. 5 Issue 1 : 254-257

Systemic and non-systemic fungicides tested for their bio-efficacy against *Fusarium moniliforme*

H.S. WABALE AND H.L. CHAUHAN

Accepted : November, 2009

SUMMARY

The bio-efficacy of fungicides against *F. moniliforme* revealed that Topsin-M 75% WP (500, 1000 and 1500 ppm) and Emisan 6 % WP (3000 ppm) were highly fungitoxic in growth inhibition up to 7 days of incubation. Whereas, Tilt 25% EC, Thiram 75% WP, Cosko 75% ds and Captan 75% D were found moderately fungitoxic and rest of fungicides were least effective.

Key words : Rice, Seed, Fungi, Fungicides

The majority of rice pathogens are reported seed borne in nature, providing primary inoculum to initiate the endemic and epidemic disease in rice growing area of Gujarat. Many workers *viz*., Acharya *et al*. (2004), Jayaweera *et al*. (1988), Duraiswamy (1982) and Anonymous (1995) etc., have studied various seed borne diseases of rice and they were reported to cause seed discoloration by many pathogens *viz*., *Curvularia* spp., *Fusarium* sp., *Helminthosporium* sp., *Pyricularia* sp., *Alternaria* sp., *Sarocladium* sp. and *Phoma* sp. They reduce germination and seed weight (Zulkifli *et al*., 1991) and mortality of seedling (Joi and Ahmed, 1976; Bora and Gogoi, 1992 and Anonymous, 1995). Among which *Fusarium* spp. are the dominant fungi reported from South Gujarat conditions (Anonymous, 1995). Therefore, the screening of fungicides *in vitro* was carried out as it saves time, labour, cost of testing fungicides in the field and also provides information of the bio-efficacy and persistence of various fungicides and their dose against the pathogens.

MATERIALS AND METHODS

The diseased and healthy panicles/seed samples of widely cultivated rice varieties *viz*., Jaya, Gurjari, Masuri, GR-4, GR-6, GR-11, IR-24, IR-28 were collected from NARP Farm, NAU, Navsari and from farmer's fields. The isolation was carried out using potato dextrose agar medium.

Eleven fungicides consisting of systemic and non-systemic each with its three concentrations were evaluated against *F. moniliforme* employing the poisoned food technique.

The 500 ml conical flasks containing 250 ml PDA medium were sterilized in autoclave at 1.2 Kg cm^{-2} pressure for 20 minutes. The calculated quantity of test fungicides was added aseptically in autoclaved lukewarm PDA medium and mixed well by stirring to facilitate uniform mixing of fungicides in the medium. Afterwards, 20 ml of medium with respective fungicide was poured in previously sterilized and labelled Petriplate. Three replications were maintained in each treatment. The Petriplate containing PDA medium without addition of fungicide served as control. The fungal block of 5 mm diameter was kept aseptically in the centre of each Petriplates and was then incubated at room temperature ($27 \pm 2^{o}C$).

The observations were recorded daily for radial growth in mm up to full growth in any Petriplate. The per cent growth inhibition (PGI) was worked out using the following formula given by Vincent (1947).

$$\% \text{ growth inhibition} = \frac{C - T}{C} \times 100$$

where, C = Growth in control Petriplate in mm

T = Growth in treated Petriplate in mm

The data was statistically analyzed.

RESULTS AND DISCUSSION

The fungus *F. moniliforme* was isolated from pink to pinkish yellow discolored seed collected from rice panicle.

The bio-efficacy of eleven fungicides tested against *F. moniliforme* (Table 1) indicated that among all the fungicides tested, three concentrations of Topsin-M 75% WP and higher concentration of Emisan 6% WP were

Correspondence to:
H.S. WABALE, Department of Plant Pathology, N.M. College of Agriculture, Navsari Agriculture, NAVSARI (GUJARAT) INDIA
Authors' affiliations:
H.L. CHAUHAN, Department of Plant Pathology, N.M. College of Agriculture, Navsari Agriculture, NAVSARI (GUJARAT) INDIA

Table 1 : Percentage growth inhibition of *Fusarium moniliforme*

Sr. No.	Name of fungicides	Conc. (ppm)	Per cent growth inhibition (up to 7 days)		
			4 days	7 days	Mean
1.	Topsin-M 75% WP	500	90.0* (100.0)**	90.0 (100.0)	90.0 (100.0)
		1000	90.0 (100.0)	90.0 (100.0)	90.0 (100.0)
		1500	90.0 (100.0)	90.0 (100.0)	90.0 (100.0)
		Mean	90.0 (100.0)	90.0 (100.0)	90.0 (100.0)
2.	Emisan 6%WP	1000	72.0 (90.4)	71.5 (89.9)	71.8 (90.2)
		2000	83.6 (96.7)	73.7 (92.2)	78.7 (94.5)
		3000	90.0 (100.0)	90.0 (100.0)	90.0 (100.0)
		Mean	81.7 (95.7)	78.4 (94.0)	80.2 (94.9)
3.	Tilt 25% EC	500	66.6 (84.3)	64.9 (82.1)	65.8 (82.3)
		1000	90.0 (100.0)	68.2 (86.2)	79.1 (93.1)
		1500	90.0 (100.0)	70.1 (88.4)	80.1 (94.2)
		Mean	82.2 (94.8)	67.7 (85.6)	75.0 (90.2)
4.	Thiram 75% WP	1000	69.4 (87.6)	67.6 (85.4)	68.5 (86.5)
		2000	72.0 (90.4)	70.4 (88.8)	71.2 (89.6)
		3000	90.0 (100.0)	72.6 (91.0)	81.3 (95.5)
		Mean	77.1 (92.7	70.2 (88.4)	73.6 (90.5)
5.	Cosko 75% ds	500	68.9 (87.1)	67.0 (84.7)	67.9 (85.9)
		1000	70.9 (89.3)	68.5 (86.6)	69.7 (87.9)
		1500	90.0 (100.0)	70.4 (88.8)	80.2 (94.4)
		Mean	76.6 (92.1)	68.6 (86.7)	72.6 (89.4)
6.	Captan 75% D	1000	68.5 (86.5)	64.9 (82.1)	66.7 (84.3)
		2000	71.5 (89.9)	68.5 (86.6)	70.0 (88.2)
		3000	90.0 (100.0)	70.1 (88.4)	80.0 (94.2)
		Mean	76.7 (92.1)	67.8 (85.7)	72.2 (88.9)
7.	Contaf 5% EC	750	63.7 (80.3)	62.3 (78.4)	63.0 (79.3)
		1000	68.0 (86.0)	64.9 (82.1)	66.4 (84.0)
		1500	70.4 (88.8)	68.5 (86.6)	69.4 (87.7)
		Mean	67.4 (85.0)	65.2 (82.4)	66.3 (83.7)
8.	Beam 75% WP	500	62.9 (79.2)	61.7 (77.6)	62.3 (78.4)
		1000	68.0 (86.0)	64.9 (82.1)	66.4 (84.0)
		1500	72.0 (90.4)	68.2 (86.2)	70.1 (88.3)
		Mean	67.6 (85.2)	64.3 (82.0)	66.2 (83.6)
9.	Sixer 75% WP	500	53.8 (65.2)	50.6 (59.7)	52.2 (62.5)
		1000	57.6 (71.4)	54.6 (66.4)	56.1 (68.9)
		1500	65.3 (82.6)	61.0 (76.5)	63.2 (79.6)
		Mean	58.9 (73.0)	55.4 (67.5)	57.2 (70.3)
10.	Master 72% WP	500	49.8 (58.4)	41.6 (44.0)	45.7 (51.2)
		1000	52.5 (62.9)	46.3 (52.2)	49.4 (57.6)
		1500	59.1 (73.6)	49.3 (57.5)	54.2 (65.6)
		Mean	53.8 (65.0)	45.7 (51.2)	49.8 (58.1)
11	Antracol 70% WP	1000	43.7 (47.8)	31.4 (27.2)	37.6 (37.5)
		2000	46.3 (52.2)	40.3 (41.8)	43.3 (47.0)
		3000	52.5 (62.9)	49.9 (58.6)	51.2 (60.8)
		Mean	47.5 (54.3)	40.5 (42.5)	44.0 (48.4)
12	Control		0.3 (0.0)	0.3 (0.0)	0.3 (0.0)
			0.3 (0.0)	0.3 (0.0)	0.3 (0.0)
			0.3 (0.0)	0.3 (0.0)	0.3 (0.0)
		Mean	0.3 (0.0)	0.3 (0.0)	0.3 (0.0)
	Concentration				
	1st		64.5 (78.8)	61.2 (73.7)	62.9 (76.3)
	2nd		70.0 (84.1)	64.6 (78.6)	67.3 (81.4)
	3rd		78.1 (90.8)	69.1 (83.8)	73.6 (87.3)
	Mean		70.9 (84.6)	65.0 (78.7)	67.9 (81.7)

* Figures those out side are arcsine transformed values

** Figures in parenthesis are original values

Sr. No.	Source	S. E. ±	C.D. (P=0.05)	C.V. %
1.	Fungicides (F)	0.4	1.0	
2.	Concentration (C)	0.2	0.5	
3.	F x C	0.6	1.7	
4.	Period (P)	0.1	0.4	2.4
5.	F x P	0.5	1.4	
6.	C x P	0.3	0.7	
7.	F x C x P	0.9	2.4	

found significantly superior to rest of fungicides in checking the growth up to 7 days. This was followed by Tilt 1000 and 1500 ppm,

Thiram 3000 ppm, Cosko 1500 ppm, Captan 3000 ppm and were at par up to 4 days. All these fungicides cent per cent inhibited the growth of *F. moniliforme*.

Among all the concentrations, higher concentration produced maximum inhibition zone, incase of all the fungicides. The range of per cent inhibition was found from 76.3 per cent at the lowest concentration to 87.3 per cent at higher concentration with an average of 81.7 per cent. It is evident from the results that the per cent inhibition was decreased significantly with increase in period from 4 days (84.6%) to 7 days (78.7%), suggesting the breakdown or degradation of fungicides.

It is also apparent form this study that interactions between fungicides and concentrations, fungicides and periods, concentrations and periods as well as interaction among fungicides, concentrations and periods were also found significant. Among the most efficient fungicides, all three concentration of Topsin-M 75% WP and higher concentration of Emisan 6% WP had produced cent per cent inhibition. These fungicides persist for long period up to 7 days.

The fungicides and period interaction was also found significant, the same trend was exhibited by Topsin-M and higher concentration of Emisan and produced cent per cent inhibition up to 7 days. Thus, establishing that the efficiency remained at same level up to 7 days of incubation. For the other fungicides the toxicity reduced with the passage of time. The interactions between concentrations and periods were also found highly significant for tested concentrations. However, with an increase in concentration, the per cent inhibition was found significantly increased in case of most of fungicides.

Similar to present results Raza *et al*. (1993), Javaid and Ilyas (1995) and Ilyas and Iftikhar (1997) reported Topsin-M highly effective in growth inhibition of *F. moniliforme*. Tailor (1998) reported the effectiveness of Thiram, Emisan and Topsin-M against *F. moniliforme*. Mahaling and Anahosur (1998) reported Emisan most effective against *F. moniliforme*.

REFERENCES

Acharya, S., Basu, A., Sarkar, M.K. and Sengupta, P. K. (2004). Seed borne infection in sheath blight of rice and its effect on seedling health. *Indian Phytopathol.*, **57** (1): 82-83.

Anonymous (1995). 30th PPSC report, NARP, GAU, Navsari Path., pp.811-812.

Bora, L. C. and Gogoi, R. (1992). Seed borne microflora of deep water rice. *Oryza*, **29**: 355-357.

Duraiswamy, V. S. (1982). Fungicidal control of rice grain discoloration. *IRRN*, 7 (4): 4.

Ilyas, M. B. and Iftikhar, K. (1997). Screening of rice germplasms and fungitoxicants against bakanae disease of rice. *Pakistan J. Phytopathol.*, **9** (1): 67-73.

Javaid, M. S. and Ilyas, M. B. (1995). Effect of various fungicides on the control of bakanae disease of rice and rice yield. *Pakistan J. Phytopathol.*, **7** (1):53-55.

Jayaweera, K.P., Wijesundera, R. E. C. and Medis, S. A. (1988). Seed borne fungi of *Oryzae sativa* L.. *Indian Phytopathol.*, **41**: 355-358.

Joi, M. B. and Ahmed, L. (1976). Seed borne mycoflora of rice (*Oryza sativa* L.). *J. Maharashtra agric. Univ*., **1** (1): 37-39.

Mahaling, D. M. and Anahosur, K. H. (1998). *In vitro* evaluation of fungicides against grain mold and stalk rot of sorghum. *J. Mycol. Pl. Pathol*., **28** (2): 174-176.

Pandey, V.; Agarwal, V. K. and Pandey, M. P. (2000). Location and seed transmission of fungi in discolored seeds of hybrid rice. *Indian Phytopathol*., **53** (1): 45-49.

Raza, T.; Ahmed, I. and Nasir, M. A. (1993). Extent of infection of *Fusarium moniliforme* Sheld. in different rice seed samples and *in vitro* effect of certain fungicides on the fungus. *Sharad J. agric.*, **9** (3):231-233.

Tailor, H. C. (1998). Management of sorghum grain molds. M.Sc. (Ag.) Thesis, Gujarat Agricultural University, Sardar Krushinagar (Gujarat).

Vincent, J. M. (1947).The esters of 4-hydroxy benzoic acid and relate compounds. Part I. Methods for study of their fungistatic properties. *J. Soc. Chem. Land*, **66** (5):149-155.

Zulkifli, E., Klap, J. and Castano, J. (1991). Effect of grain discoloration in upland rice in some yield components. *IRRN*, **16** (4): 20.

****
*****