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Systamic and Contact Combi Fungicides for Rice Grain Discolouration Disease Control in Kuttanad

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Abstract

Field experiments were conducted at Rice Research Station, Kerala Agricultural University, Moncompu during *Kharif 2010, Kharif 2011* and *Rabi 2011-12* to evaluate the some systemic and contact action fungicides for management of rice grain discolouration. Anew systemic fungicide Kresoxim methyl 40% + Hexaconazole 8 % WG with different doses of 0.75 ml and 1.0 ml/lit and commercially available fungicides were tested against grain discolouration disease. Pooled analysis of three seasons showed that kresoxim methyl 40% + hexaconazole 8 % WG @ 1.0 ml/l and carbendazim 12% + mancozeb 63% @ 1.5 g/l were promising compared to standard check fungicides. The molecules were promoted for farm trials at six different farmers field of Kuttanad region during *Rabi 2012-13* and confirmed that the above two molecules performed better in restricting the appearance of both grain discoloured panicles (2.43 and 2.56 %) and spikelets (1.67 and 1.92%) compared to the standard check fungicide mancozeb 45 WP (2.49 and 1.81 %).

Keywords: Rice, grain discolouration, systemic, contact, fungicide

Introduction

Grain discoloration was considered as aminor disease in earlier days. Now it has become major problem in Kuttanad region due to increasing biotic and abiotic stresses. Grain discoloration is caused by many fungal pathogens like *Drechsleraoryzae, Curvularialunata, Helmithosporiumoryzae, Sarocladiumoryzae, Phoma sp., Microdochiumsp., Nigrosporasp. And Fusariumsp.* Its common symptom can be observed as darkening of glumes or spikelets, brown to black color in rotten glumes by one or more pathogens. The intensity ranges from sporadic discoloration to discoloration of whole glumes. The discoloration may appearexternally on the glumes or internally on the kernels or both. On the glumes, symptoms accordingly vary. The symptoms depends on type of organism involved and the degree of infection. The extent of yield loss can vary from 20 to 55 per cent depending on extent of infection (Ghose *et al.*,1960). The disease has been found to increase every year in the Kuttanad with higher damageable level. Grain discolouration not only decrease the yield but also affect the seed grain quality. The present studies were conducted to evaluate the efficacy of selected fungicides against grain discolouration.

Materials and Methods

Field experiments were conducted at Rice Research Station, Moncompu, Alappuzha, Kerala for three seasons *Kharif 2010, Kharif 2011* and *Rabi 2011-12* with the objective of evaluating some systemic action combination fungicides for grain discolouration management. The evaluated fungicides were kresoxim methyl 40% + hexaconazole 8% WG, hexaconazole 5 SC, propeiconazole 25 EC, tricyclozole 75 WP andcarbendazim 12% + mancozeb 63%. The trial was carried out in the direct sown crop of medium duration susceptible variety, Uma. The experiments were laid out in randomized block design with 3 replications in 5x2 m^2 plot size. The N,P,K fertilizers and all other cultural operations were applied as per Package of Practices recommendation (90:45:45 kg/ha) by Kerala Agricultural University. The chemicals were sprayed as prophylactic mannerat the time of panicle emergence. The details are given in Table 1. Three sampling units of 1 sq.m area were fixed in each plot at random. The percentage of panicles and spikelets affected were recorded at 15 days before harvest. The percentage of panicle affected was calculated based on the number of panicles affected from the total number of panicles present in the sampling area. The spikelet percentage was recorded by counting the infected grains from each panicle and converted in terms of percentage. Grain yield of the each plot was recorded and expressed in kg/plot at 14 % moisture. Percentages data were transformed to arcsine and analysis of variance was performed with transformed values. The confirmatory farm trials were conducted for testing the effective molecules during *Rabi 2012-13* at six locations namely Champakulam, Veeyapuram, Neelamperoor, Venattukad, E-block kayal and Thuruthy area of Kuttanad region. The four treatments were kresoxim methyl 40%

+ hexaconazole 8 % WG @ 1.0 ml/l,carbendazim 12% + mancozeb 63% @ 1.5 g/l, standard POP recommended fungicidemancozeb 45 WP @ 4.0 g/l and untreated check plot. The farm trial was laid out in a randomized complete block design (RBD), using MO 16 (Uma) as the test variety in the farmers field. Pregerminated seeds were used for direct sowing with the plot size of 20x10 m^2. Fertilizers were applied @ 90:45:45 NPK kg/ha as per Package of Practices, Kerala Agricultural University. Observations on panicles and spikelets affected were recorded 15 days before harvest. Percentage of panicles and spikelets affected was calculated on 25 plants per sampling unit, by counting the number of infected panicles/spikelets as per the SES of rice, IRRI (1996).

Results and Discussion

The results of three season station trials showed that the combination fungicides *viz.,* carbendazim 12% + mancozeb 63% and kresoxim methyl 40% + hexaconazole 8 % WG were very effective and could significantly reduce the grain discolouration disease. The analysis of pooled data of three seasons on panicle percentage affected showed that carbendazim 12% + mancozeb 63%, kresoxim methyl 40% + hexaconazole 8 % WG were highly effective than tricyclozole 75 WP, propeiconazole 25 EC and hexaconazole 5 SC. The data on spikelet affected indicated that tricyclozole 75 WP, carbendazim 12% + mancozeb 63%, and kresoxim methyl 40% + hexaconazole 8 % WG were significantly superior to all other fungicides tried (Table 1). The maximum yield was obtained from kresoxim methyl 40% + hexaconazole 8 % WG @ 1.0 ml/l (5647 kg ha^{-1}) treated plot followed by carbendazim 12% + mancozeb 63% @ 1.5 g/l (5640 kg ha^{-1}). The control plot recorded with lowest yield of 4303 kg ha^{-1}. Several workers have reported on the scope for controlling grain discolouration disease by application of fungicides like edifenphos and copper oxy chloride (Govindarajan and Kannaiyan, 1982), propiconazole (Lore *et al.*, 2007), captan 70% + hexaconazole 5% (Kumar and Kumar, 2011) and azoxystrobin and propiconazole (Hossain *et al.*, 2011). The farm trial results showed that the systemic fungicide kresoxim methyl 40 % + hexaconazole 8 % WG @ 1 g/l was effective against glume discolouration disease in restricting the incidence of disease in the panicles (2.43 %) as well as individual spikelets (1.67 %) in panicles (Table 2 and 3). It was also on par with carbendazim 12% + mancozeb 63 % @ 1.5 g/l (2.56 and 1.92%) and standard check fungicide mancozeb (dithane M 45) @ 4 g/l. There was no significant difference in the grain yield (Table 4). Dithane M 45 treated plot gave highest yield of 6015kg ha^{-1} (Fig. 1) followed by kresoxim methyl 40 % + hexaconazole 8 % WG (5937 kg ha^{-1}) and carbendazim 12% + mancozeb 63 % (5890 kg ha^{-1}).

Conclusion

It is concluded that new systemic combination product of kresoxim methyl 40 % + hexaconazole 8 % WG @ 1 g/l and commercially available carbendazim 12% + mancozeb 63 % (Saaf 75 WP) @ 1.5 g/lwere found to be equally effective and on par with standard check fungicide mancozeb (dithane M 45) against rice grain discolouration disease. The quality of grain was comparatively better in the combination fungicides treated plotsthan the standard check contact fungicide mancozeb and it can be recommended for the control of grain discolouration and improve the quality of the seed in Kuttanad region.

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Table 1: Glume discolouration on panicles and spikelets and grain yield as influenced by newer fungicides (analysis of pooled data of three seasons)

Sl. No.	Fungicides	Dose/l	Panicles affected (%)				Spikelets affected (%)				Yield (kg/ ha)
			Kharif 2010	*Kharif* 2011	*Rabi* 2011-12	Mean	*Kharif* 2010	*Kharif* 2011	*Rabi* 2011-12	Mean	
1	Kresoxim methyl + Hexaconazole	1.0ml	2.23 (4.46)	2.27 (4.65)	2.21 (4.40)	2.24 (4.50)	2.50 (5.74)	2.91 (8.00)	1.31 (1.21)	2.34 (4.98)	5647
2	Kresoxim methyl + Hexaconazole	0.75ml	1.84 (2.90)	2.77 (7.19)	1.96 (3.35)	2.23 (4.48)	2.56 (6.05)	3.04 (8.75)	1.38 (1.41)	2.43 (5.40)	5289
3	Hexaconazole	2 ml	2.70 (6.80)	4.05 (15.90)	1.97 (3.37)	3.03 (8.69)	2.15 (4.14)	3.15 (9.43)	1.13 (0.78)	2.30 (4.78)	5253
4	Propiconazole	1 ml	2.92 (8.03)	2.85 (7.64)	2.09 (3.87)	2.65 (6.51)	2.54 (5.94)	2.97 (8.34)	1.25 (1.07)	2.37 (5.12)	5334
5	Tricyclazole	0.6 g	2.64 (6.45)	2.54 (5.93)	2.42 (5.36)	2.53 (5.91)	2.03 (3.52)	2.78 (7.21)	1.25 (1.07)	2.10 (3.93)	5475
6	Carbendazim +Mancozeb	1.5 g	1.32 (1.25)	1.56 (1.93)	1.89 (3.06)	1.61 (2.08)	2.27 (4.56)	2.99 (8.42)	1.45 (1.60)	2.31 (4.86)	5640
7	Check		3.27 (10.18)	4.56 (20.34)	2.70 (6.78)	3.60 (12.43)	3.18 (9.64)	3.35 (10.71)	1.89 (3.09)	2.88 (7.81)	4303
	CD (0.05)					0.89				0.29	NS

Figures in parentheses are original values. Data transformed to $(\sqrt{x+0.5})$

Table 2: Influence of kresoxim methyl + hexaconazole and saafon glume discolouration spikelets affected (%)

Fungicide	Locations						Mean
	Champakulam	Veeyapuram	Neelamperoor	Venattukad,	E-block kayal	Thuruthy	
Kresoxim methyl 40%+ Hexaconazole 8%	2.07 (3.8)	1.18 (0.9)	1.27 (1.13)	2.13 (4.05)	1.84 (2.92)	1.55 (1.91)	1.67 (2.45)
Carbendazim 12% + Mancozeb 63 % (Saaf 75 WP)	2.13 (4.06)	1.45 (1.26)	1.80 (2.76)	1.90 (3.12)	2.63 (6.4)	1.62 (2.14)	1.92 (3.29)
Mancozeb (Dithane M 45)	1.82 (2.83)	1.54 (1.88)	1.58 (2.02)	2.31(4.84)	1.88 (3.05)	1.72 (2.46)	1.81 (2.84)
Control	2.22 (4.43)	1.58 (2.01)	1.90 (3.11)	2.66 (6.61)	2.70 (6.79)	1.93 (3.23)	2.17 (4.36)
CD (0.05)				0.26			

Table 3: Influence of kresoxim methyl + hexaconazole and saafon glume discolouration panicles affected (%)

Fungicide	Locations						Mean
	Champakulam	Veeyapuram	Neelamperoor	Venattukad	E-block kayal	Thuruthy	
Kresoxim methyl 40% + Hexaconale 8%	2.80 (7.3)	2.27 (4.66)	2.07 (3.8)	2.52 (5.9)	2.54 (6.0)	2.36 (5.10)	2.43(5.46)
Carbendazim 12% + Mancozeb 63%(Saaf 75 WP)	3.03 (8.71)	2.32 (4.9)	2.42 (5.4)	2.21 (4.4)	2.84 (7.6)	2.56 (6.10)	2.56 (6.18)
Mancozeb (Dithane M 45)	2.76 (7.16)	2.25 (4.6)	2.32 (4.9)	2.56 (6.07)	2.41(5.35)	2.64(6.52)	2.49 (5.76)
Control	3.19 (9.70)	2.43 (5.44)	2.73 (7.0)	2.89 (7.9)	2.79 (7.33)	2.70 (6.8)	2.79 (7.36)

CD(0.05)	0.19

Table 4: Influence of kresoxim methyl + hexaconazole, saaf and mancozeb on grainyield

Fungicide	Locations						Mean
	Champakulam	Veeyapuram	Neelamperoor	Venattukad	E-block kayal	Thuruthy	
Kresoxim methyl 40 %+ Hexaconazole 8%	5531	7327	4730	6112	4798	5319	5937
Carbendazim 12% + Mancozeb 63 % (Saaf 75 WP)	5136	6112	6181	7327	5254	5327	5890
Mancozeb (Dithane M 45)	4639	7110	6518	7110	5327	5383	6015
Control	3719	7436	4168	7436	4429	5138	5138
CD (0.05)	NS						

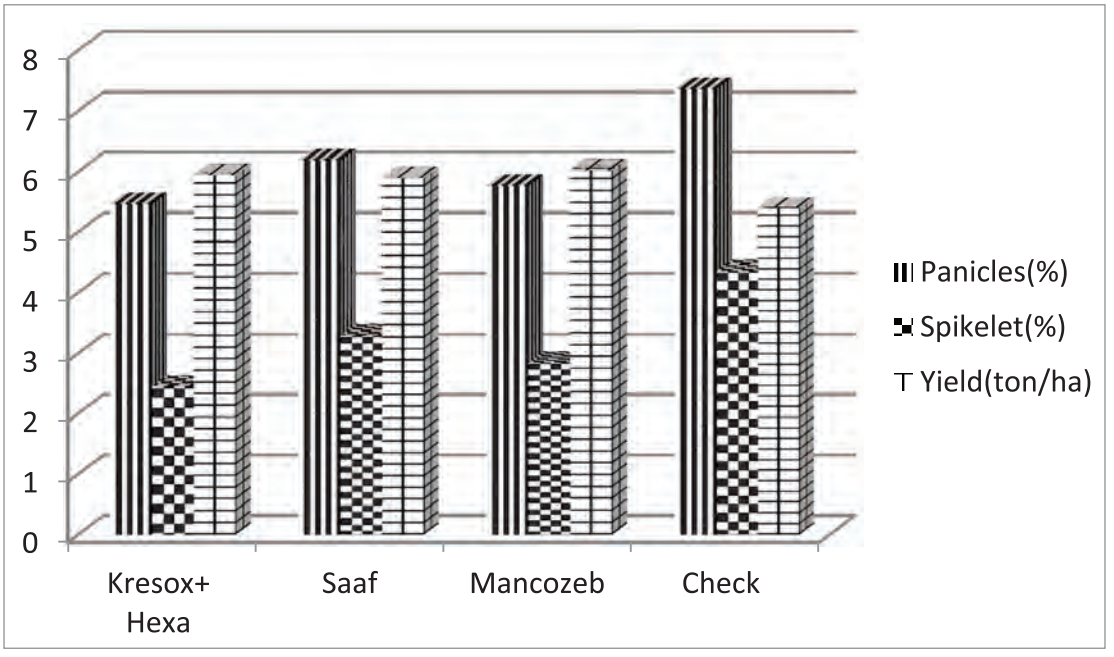

Fig. 1. Influence of kresoxim methyl + hexaconazole and saaf on glume discolouration and grain Yield