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Research Article

Efficacy of fungicides used for controlling leaf blast in transplanted rice

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Abstract

A field study was conducted to evaluate the efficacy of seven different fungicides i.e. Copper Oxychloride;Carbendazim;Cholorothalonil+Metalyxal;Cymiching;Teboconazole+Floroxystrobin;Teboconazole and Kasugamycin against control of blast with RCBD in transplanted rice at Adaptive Research Farm Gujranwala during kharif 2009-2011. Maximum disease control was recorded by Kasugamycin (74.45%) followed by Teboconazole+Floroxystrobin (69.70%); Cymiching (67.07%) and Teboconazole (61.12%) treated plots than control (0%) during kharif 2009. Similarly maximum disease control was recorded by Kasugamycin (70.52%) followed by Teboconazole+Floroxystrobin (64.63%) and Teboconazole (61.79%) than control (0%) during 2010. During 2011, significantly higher disease control was recorded by Kasugamycin (72.28%) followed by Teboconazole+Floroxystrobin (59.74%), Teboconazole (56.40%) than control (0%). Kasugamycin showed significantly highest yield (3.71 tha^{-1}; 3.69 tha^{-1} & 3.67 tha^{-1}) followed by Teboconazole+Floroxystrobin (3.58 tha^{-1}) were statistically non-significant with each other but differed statistically with all other treatments. However during 2010, Teboconazole+Floroxystrobin (3.51 tha^{-1}) showed statistically non-significant difference in yield to Teboconazole+Floroxystrobin (3.58 tha^{-1}); Teboconazole (3.47 tha^{-1}) & Copper oxychloride (3.45 tha^{-1}) during 2009. Kasugamycin (3.67 tha^{-1}) showed statistically significant result however Teboconazole+Floroxystrobin (3.48 tha^{-1}), Teboconazole (3.40 tha^{-1}) were statistically at par with each other during 2011. Maximum incremental benefit was recorded by Kasugamycin (Rs.18925 ha^{-1}) with CBR (1:8.60) followed by Teboconazole+Floroxystrobin (Rs.12850 ha^{-1}) with CBR (1:6.35); Teboconazole (Rs.8875 ha^{-1}) with CBR (1:4.44); Copper oxychloride (Rs. 6625 ha^{-1}) with CBR (1:2.94) during 2009-2011. The farmers are advised to use Kasugamycin; Teboconazole+ Floroxystrobin; Teboconazole for controlling leaf blast.
Keywords: disease, Basmati Super, Kasugamycin; Teboconazole+ Floroxystrobin, Teboconazole

Introduction

Rice (*Oryza sativa*) plays a vital role in economy of Pakistan; however it not only meets the major domestic requirements but also source of foreign exchange earnings. It is grown on an area of 1.98 million hectares with total annual production 3.64 million tones with an average yield of 1842 kgha^{-1} (Anonymous, 2010). It is an important cereal, ranking third, after Cotton and Wheat among the major food crops grown in the country (Anonymous, 2007). Rice crop is affected by many diseases such as Blast (*Pyricularia oryzae*), Brown leaf Spot (*Helmenthosporium oryzae* (Shafaullah *et al*. 2011). The susceptibility of rice crop to blast fungus is increased by cold stress (Koga *et al*., 2005). The survey report depicted that, the blast disease was 1st found in California in 1996 at a moderate rate (Geer *et* *al*., 2001). Rice blast caused by *Pyricularia oryzae* or *Magnapothe grisea* belongs to class ascomycete is the most important rice disease (Couch *et al*., 2002). The pathogen enters into the leaf by mitochondrial respiration that provides the energy for fungal development by linking NADH oxidation and coupled proton translocation with ATP synthesis (Yamaguchi *et al*., 2005). However many other factors like crop protection, irrigation practices, low soil fertility and poor agronomic practices are responsible for disease development. This disease is serious threat for Pakistan to its food security and caused economic loss upto 65% (Bhatt, 1988). Basmati fetches a premium price in world market for its aroma, length and other good characteristics, and also high yielding variety. In Pakistan diseases caused huge loss in yield upto 50% (Anonymous, 1992). This disease can be managed by fungicides application, resistant cultivars, agronomic practices and bio-technological methods (Ribot *et al.*, 2008). However the study had been planned to evaluate the most effective fungicides used against blast (*Pyricularia oryzae)* in transplanted rice at Adaptive Research Farm, Gujranwala

Materials and Methods

A field study was conducted to evaluate the effect of seven different fungicides i.e. Copper Oxychloride;Carbendazim;Cholorothalonil+Metalyxal;Cymiching;Teboconazole+Floroxystrobin;Teboconazole and Kasugamycin used for controlling blast in transplanted rice at Adaptive Research Gujranwala during kharif 2009-2011. The experiment was laid-out with Randomized Complete Block Design with three replications with net plot size of 40x60 ft^2 area. Fertilizers were broadcasted after puddling just before planking @ 125 $kgha^{-1}$ DAP along with 125 $kgha^{-1}$ SOP. Four merlas nursery of rice was transplanted manually keeping PxP distance 9 inches. Pre-emergence herbicide acetochlor was broadcasted @ 250 ml ha^{-1} in the field with shaker bottle after 03 days of transplanting (DAT). Chelated Zinc 5% was broadcasted in the field @ 5 $kgha^{-1}$ at 25 DAT. Urea was broadcasted manually @ 150 $kgha^{-1}$ in two splits. Two split doses of Cartap were broadcasted @ 22.5 kg ha^{-1} 60 and 90 DAT after thorough pest scouting. Before spraying specific plots were laid out and data were recorded. Fungicides were sprayed against blast, however data on the yield were recorded by making 3x2 m section within each plot using a wire frame method; tillers within the frame were cut and harvested (Seebold *et al*., 2004). All the other agronomic and plant protection measures were kept constant to avoid any biasness. The parameters recorded were disease injury (%), yield (tha^{-1}) and economic analysis (CBR). For measurement of diseased leaf area 15 tillers $plant^{-1}$ were randomly selected, disease was rated by using rating scale which was illustrated previously (Chaudary *et al*., 2009). Normality of the data was tested by Shapiro-wilk Test. Normality distribution data was analysed statistically by analysis of variance technique at 5% level of probability (Steel *et al*., 1997).

Results and Discussion

Disease control (%)

Significantly maximum disease control was recorded by Kasugamycine (74.45%) followed by Teboconazole+Floroxystrobin (69.70%); Cymiching (67.07%) and Teboconazole (61.12%) treated plots than control (0%) during kharif 2009. However maximum disease control was recorded by Kasugamycine (70.52%) followed by Teboconazole+Floroxystrobin (64.63%) and Teboconazole (61.79%) than control (0%) during 2010. During 2011 significantly higher disease control was recorded by Kasugamycine (72.28%) followed by Teboconazole+Floroxystrobin (59.74%), Teboconazole (56.40%) than control (0%) (Fig.1). These results were in accordance to (Narayana *et al*., 2009; Tiwari *et al*., 1983) who reported that Kasugamycin was sprayed in standing rice showed disease severity (6.70%). These results were confirmatory to Mousanejad *et al*., 2010) and Ghazanfar *et al*., 2009) who reported that Teboconazole+Floroxystrobin was effective management strategy against severity of rice blast (11.46%), (12.15%) and (12.85%) in the 1st, 2nd and 3rd week of September. However these results were in accordance to the Gouramanis, (1995) who reported that Carbendazim reduced blast in transplanted rice.

Yield (tha^{-1})

Maximum yield was recorded in Kasugamycin (3.71 tha^{-1}; 3.69 tha^{-1} & 3.67 tha^{-1}) followed by Teboconazole+Floroxystrobin (3.58 tha^{-1}) which were statistically non-significant ($P>0.05$) within block with each other but differed statistically ($P<0.05$) with all

Fig: 1. Disease Control (%) using different fungicides

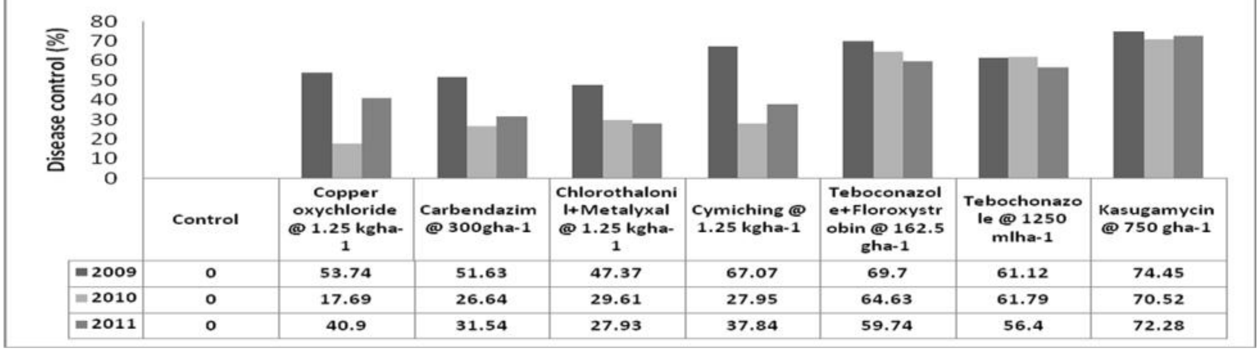

Table. 2. Efficacy of fungicides against blast; its impact on yield (tha^{-1}) and economic analysis during 2009-2011

Treatments	Yield tha^{-1}			Cost of Production (Rs.ha^{-1})	Total Income (Rsha^{-1})	Net Return (Rs.ha^{-1})	Incremental Cost (Rs.ha^{-1})	Incremental Benefit (Rs.ha^{-1})	Cost Benefit Ratio
	2009	2010	2011						
Control	3.18e	3.21d	2.99e	102500	117250	14750	-	-	-
Copper oxychloride @ 1.25 kgha^{-1}	3.45bcd	3.35cd	3.29c	104750	126125	21375	2250	6625	1:2.94
Carbendazim @ 300gha^{-1}	3.29de	3.22d	3.25cd	104500	122000	17500	2000	2750	1:1.38
Chlorothalonil+Metalyxal @ 1.25 kgha^{-1}	3.27e	3.29cd	3.15d	103500	121375	17875	1000	3125	1:3.13
Cymiching @ 1.25 kgha^{-1}	3.34cde	3.24d	3.30c	105500	123500	18000	3000	3250	1:1.08
Teboconazole+Floroxystrobin @ 162.5 gha^{-1}	3.58ab	3.51b	3.48b	104525	132125	27600	2025	12850	1:6.35
Tebochonazole @ 1250 mlha^{-1}	3.47bc	3.38c	3.40bc	104500	128125	23625	2000	8875	1:4.44
Kasugamycin @ 750 gha^{-1}	3.71a	3.69a	3.67a	104700	138375	33675	2200	18925	1:8.60

LSD 0.162 0.117 0.134 Paddy yield @ 37500 t^{-1}

other treatments. However during 2010, non significant effect (P>0.05) was recorded in Teboconazole+Floroxystrobin (3.51 tha^{-1}) than Teboconazole+Floroxystrobin (3.58 tha^{-1}); Teboconazole (3.47 tha^{-1}) & Copper oxychloride (3.45 tha^{-1}) during 2009. Kasugamycin (3.67 tha^{-1}) showed statistically significant (P<0.05) yield however Teboconazole+Floroxystrobin (3.48 tha^{-1}), Teboconazole (3.40 tha^{-1}) were statistically at par (P>0.05) with each other during 2011. However Carbendazim (3.29 tha^{-1}; 3.22 tha^{-1} & 3.25 tha^{-1}); Chlorothalonil+Metalyxal (3.27 tha^{-1}; 3.29 tha^{-1} & 3.15 tha^{-1}) and Cymiching (3.34 tha^{-1}, 3.24 tha^{-1} & 3.30 tha^{-1}) showed statistically (P>0.05) similar trend (table-2). These results were contradictory to Narayana *et al*., (2009) who reported that maximum yield was recorded in Teboconazole+Floroxystrobin (3.87tha^{-1}) treated plot. Bhatt, (1988) reported that yield loss was recorded up to 65% in susceptible rice blast cultivars.

Economic analysis

Maximum incremental benefit was recorded by Kasugamycin (Rs.18925ha^{-1}) with CBR (1:8.60) followed by Teboconazole+Floroxystrobin (Rs.12850 ha^{-1}) with CBR (1:6.35); Teboconazole (Rs.8875 ha^{-1}) with CBR (1:4.44); Copper oxychloride (Rs. 6625 ha^{-1}) with CBR (1:2.94). However the minimum income was recorded by Cymiching (Rs. 3250 ha^{-1}) with CBR

(1:1.08); Chlorothalonil+Metalyxal (Rs.3125 ha^{-1}) with CBR (1:3.13) during 2009-2011 (table-2). The economic analysis was carried out by same method as followed by Kahloon *et al*., (2012).

Conclusion

Although all the fungicides were involved for controlling disease however the farmers are advised to use Kasugamycin; Teboconazole+ Floroxystrobin; Teboconazole for controlling leaf blast because these are most affective and economical.

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