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Research Article

Evaluation of best fungicide for controlling brown leaf spot in transplanted rice

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Abstract

The study had been planned to evaluate the best fungicide viz. Mencozeb @1250 gha^{-1}, Propineb @ 1250 gha^{-1}, Chlorothelonil + Metalyxal @ 750 gha^{-1}, Difenaconazol @ 313 $mlha^{-1}$ and Copper hydro-oxide @ 1250 gha^{-1} for controlling brown leaf spot of basmati rice at Adaptive Research Farm, Gujranwala during Kharif 2011 and 2012 with RCBD. Maximum disease control was recorded by Copper hydro-oxide (31.16%) followed by Difenaconazol (29.18%) during kharif 2011. However Copper hydro-oxide gave (33.18%) and Difenaconazol (32.65%) showed non significant control but differed statistically with all other treatments during 2012. 1000 grain wt. of Copper hydro-oxide (23.23g) and Difenaconazol (23.42g) were statistically non significant to each other but differing from other treatments during Kharif 2011. However Copper hydro-oxide (25.79g) showed statistically significant result than other treatments during Kharif 2012. Maximum yield (tha^{-1}) was recorded by Copper hydro-oxide (3.49 & 3.47) and Difenaconazol (3.47; 3.33) during both the years respectively. Copper hydro-oxide gave maximum net return (Rs.24450 ha^{-1}) with incremental benefit (Rs.18575 ha^{-1}) followed by difenaconazol (Rs.22196 ha^{-1}) with incremental benefit (Rs.16321 ha^{-1}) than other treatments. However difference in incremental cost of Copper hydro-oxide and Difenaconazol was (Rs.746 ha^{-1}) resulting incremental benefit was increased (Rs.2254 ha^{-1}). Due to these reasons CBR of Copper hydro-oxide was minimum (1:5.24) compared to Difenaconazol (1:5.82). Copper hydro-oxide @ 1250 gha^{-1}, difenaconazol 313$mlha^{-1}$ were effective for controlling disease because these were economical & profitable.

Keywords: Fungicides; Control; Brown Leaf Spot; Transplanted; Rice

Introduction

Basmati Rice (*Oryza sativa*) plays an important role in the economy of Pakistan. It not only meets the major domestic requirements of people but also source of foreign exchange earnings. It is grown on an area of 1.98 million hectares with total production 3.64 million tones and an average annual production in yield was 1.84tha^{-1} (Anonymous, 2010). Paddy yield of Pakistan is lower compared to advance rice growing countries of the world. Reasons of low yield attributed to various factors but disease like brown leaf spot has significant importance in decreasing the yield and quality of rice. Brown spot is caused by fungus *Bipolaris oryzae* previously called *Helminthosporium oryzae*; most prominent symptoms of disease appeared on leaves and glumes at maturity of the plant. Later on symptoms appeared on young seedlings and panicle branches in older plants. Brown leaf spot disease considered seed borne, and air borne, leaf spot vary in size and circular to oval in shape depending upon the environmental conditions. The smaller spots are dark brown to reddish brown and larger spots have dark brown margin and reddish brown to grey centers. Damage by brown spot is particularly noticeable when crop nutritionally deficient (K). It was observed that brown spot was appeared on basmati and course varieties of rice in Pakistan. Brown leaf spot has been reported in all rice growing areas in the world; especially common in rain fed and upland area (Sing

et al. 2000). The disease can be appeared on all crop development stages, the pathogen entered into the infect coleoptiles, leaves, leaf sheath, panicle branches glumes and panicles. The disease caused seedling blight, with small circular, yellow brown or brown lesions distort primary and secondary leaves (Webster *et al*. 1992). The pathogen penetrated in the rice husk causing spotting and discoloration of grains ultimately reduced grain quality. The pathogen can survive on infected rice stubbles, weeds, seeds and caused brown spot on subsequent crop. It produced conidia that infect plant tissues when dispersed, spores are air born, allowing the pathogen to spread quickly; survive on infected seeds. A plant grown in sandy soils was also reported to be susceptible to brown leaf spot. The disease also developed on plants affected by Akiochi nutritional disorder (Ou, 1985; Moletti *et al*. 1996). Akiochi caused by excessive concentration of hydrogen sulphide in the soil, resulted in reduction of nutrient uptake (Dobermann *et al*. 2000). It spread in irrigated fields poorly drained and having excessive organic matter; particularly when rice crop sown by direct seeded technique; brown spot disease infection increased due to shortage of water supply (Savary *et al*. 2005). Direct Seeded crop have shallow root system and become more sensitive to water stress (Castillo, 1962). Brown leaf spot can be managed by improving soil fertility and application of balanced fertilizers. The foliar application of fungicides against brown leaf spot had been controlled successfully (Singh *et al.* 1985). Therefore the study had been planned to evaluate the best one fungicide used for controlling brown leaf spot of rice in the area of Adaptive Research Farm, Gujranwala.

Materials and Methods

The study had been planned to evaluate the best fungicide viz. Mencozeb @1250gha^{-1}, Propineb @ 1250gha^{-1}, Chlorothelonil + Metalyxal @ 750 gha^{-1}, Difenaconazol @ 313 mlha^{-1} and Copper hydro-oxide @ 1250gha^{-1} for controlling brown leaf spot in basmati rice at Adaptive Research Farm, Gujranwala during Kharif 2011 and 2012. 125 kgha^{-1} DAP along with 125 kgha^{-1} SOP was applied after puddling of soil just before planking. Basmati super nursery was transplanted manually keeping in view the PxP distance 9 inches and assured 200,000 plant populationsha^{-1}. Pre-emergence herbicide acetachlor @ 250mlha^{-1} was applied 5 days after transplantation (DAT) of nursery with shaker bottle and maintained water level up to 3 inches. Crystalline Zinc Sulphate 21% was broadcasted manually @ 25kgha^{-1} 25 DAT however urea was applied @ 250 kgha^{-1} in two split applications at 30-35 DAT and 55-60 DAT. Two split doses of Cartap monohydrate was applied in the field @ 22.5 kgha^{-1} at the age of 60 and 90 days after thorough pest scouting keeping in view economic threshold level of pest. No any fungicide was sprayed in the field against diseases however all the agronomic practices and plant protection measures were kept constant to avoid-biasness. The crop was sprayed at panicle initiation stage and disease control data were recorded before spraying. Disease control (%) was recorded 15 days after spraying; however 2nd dose of fungicides were applied and disease (%) data were assessed after 15 days after 2nd spraying. Disease control (%) was calculated before 1st spray; after 2nd spray compared with control. The disease control (%) was calculated by number of infected leaves divided by total no. of leaves multiplied by 100. On maturity the crop was harvested and threshed manually to record data of 1000 grain weight grain yield (tha^{-1}) and economic analysis.

Results and Discussion

DISEASE CONTROL (%)

Maximum disease control was recorded by Copper hydro-oxide (31.16%) showed statistically non significant (P>0.05) result with Difenaconazol (29.18%) during kharif 2011. However Copper hydro-oxide (33.18%) showed statistically non significant (P>0.05) control with Difenaconazol (32.65%) but differed statistically (P<0.05) than other treatments during 2012. However mencozeb (16.40%); Propineb (17.32%) showed statistically non significant (P>0.05) control with one an other but differed significantly (P<0.05) with Chlorothelonil + Metalyxal (13.98%) and other treatments during kharif 2012 (table-1). These results were in accordance to Miah (1985); Mia *et al*. (2001); Aluko (1975); Singh *et al*. (1985) and Ahmad *et al*. (2002) who reported that diseases were controlled by fungicides. These results were confirmatory to Mew *et al*. (2002) who reported that seed dressing fungicides or hot water were use-full management strategy for controlling diseases in transplanted rice.

1000 GRAIN WEIGHT (g)

In 1000 grain weight, Copper hydrooxide (23.23g) and Difenaconazole (23.42g) were same statistically

(P>0.05) with one another but differing significantly (P<0.05) than other treatments during Kharif 2011. However Copper hydro-oxide (25.79g) showed statistically significant (P<0.05) 1000 grain weight than all other treatments during Kharif 2012. Minimum 1000 grain weight was recorded in control plot (19.79g; 17.98g) during both the years. The trend remained same by Copper hydro-oxide both the years which indicated that brown leaf spot disturbed grain filling resultantly grain quality and weight of grain was reduced. These results were in accordance to Shabana *et al*. (2008) who reported that diseases can be controlled by using anti-oxidants.

Table. 1. Evaluation of best fungicide for controlling brown leaf spot of rice; its impact on 1000 grain wt. and disease control (%) in transplanted rice

Treatments	1000 grain wt. (g)		Disease Control (%)	
	2011	2012	2011	2012
Control	19.79c	17.98d	0.00f	0.00d
Mencozeb @1250 gha^{-1}	20.44bc	18.13cd	14.20e	16.40b
Propineb @ 1250 gha^{-1}	20.92b	18.62c	20.34c	17.32b
Chlorothelonil + Metalyxal @ 750 gha^{-1}	20.17c	18.30cd	17.00d	13.98c
Difenaconazol @ 313 $mlha^{-1}$	23.42a	24.38b	29.18a	32.65a
Copper hydro-oxide @ 1250 gha^{-1}	23.23a	25.79a	31.16a	33.18a

Means with different letters are highly significant

YIELD (tha^{-1})

Statistically non significant (P>0.05) yield was recorded by Copper hydro-oxide (3.49 tha^{-1} & 3.47 tha^{-1}) but differed statistically (P<0.05) with Propineb (3.33 tha^{-1}); Chlorothelonil + Metalyxal (3.35 tha^{-1}) & Mencozeb (3.26 tha^{-1}) than control (3.20 tha^{-1}) during Kharif 2011. However statistically non significant (P>0.05) yield was recorded by Copper hydro-oxide (3.47 tha^{-1}) and Difenaconazol (3.33 tha^{-1}) but differed statistically (P<0.05) with all other treatments during 2012. Similarly yield of Propineb (2.73 tha^{-1}) and Mencozeb (2.69 tha^{-1}) sprayed plot were statistically at par (P>0.05) with each other and differed statistically (P<0.05) with Chlorothelonil+Metalyxal (2.48 tha^{-1}) however the lowest yield was recorded by control (2.58 tha^{-1}) during Kharif 2012 (table-2). These results were supported to Savary *et al*. (2000) who reported that brown leaf spot caused yield loss up to 5% along with qualitative loss. Fungicides were effective for controlling diseases as reported by Moletti *et al*. (2000); Cortesi *et al*. (2003); Mandal *et al*. (2008) and Mia *et al*. (2001).

ECONOMIC ANALYSIS

Maximum net return was recorded by Copper hydro-oxide (Rs.24450 ha^{-1}) followed by difenaconazol (Rs.22196 ha^{-1}) compared to all other treatments. However difference in incremental cost of Copper hydro-oxide and difenaconazol was (Rs.746 ha^{-1}) resulting incremental benefit was increased (Rs.2254 ha^{-1}). Due to these reasons CBR of Copper hydro-oxide was minimum (1:5.24) compared to difenaconazol (1:5.82) (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 to some extant however the farmers are advised to spray copper hydro-oxide @ 1250 gha^{-1} and difenaconazole 313 $mlha^{-1}$ for controlling brown leaf spot in transplanted rice because these gave better results; most economical and profitable.

Table. 2. Evaluation of best fungicide for controlling brown leaf spot of rice, its impact on yield (tha^{-1}) and economics of rice during 2011-12

Treatments	Yield (tha^{-1})		Cost of Cultivation (Rsha^{-1})	Total Income (Rsha^{-1})	Net Return (Rsha^{-1})	Incremental Cost	Incremental Benefit (Rs. ha^{-1})	CBR
	2011	2012						
Control	3.20d	2.58c	102500	108375	5875	-	-	-
Mencozeb @1250 gha^{-1}	3.26c	2.69b	104800	111750	6950	2300	1075	1:0.47
Propineb 1250 gha^{-1}	3.33b	2.73b	105275	113625	8350	2775	2475	1:0.90
Chlorothelonil + Metalyxal 750 gha^{-1}	3.35b	2.48c	104700	109500	4800	2250	-1075	1:-0.48
Difenaconazole @ 313 mlha^{-1}	3.47a	3.33a	105304	127500	22196	2804	16321	1:5.82
Copper hydro-oxide @ 1250 gha^{-1}	3.49a	3.47a	106050	130500	24450	3550	18575	1:5.24

Means with different letters are highly significant Paddy @ 37500t^{-1}

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