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FIELD EVALUATION OF NEW FUNGICIDES AGAINST RICE (*ORYZA SATIVA*) DISEASES

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A B S T R A C T

Rice crop is attacked by various pathogens in the field which are responsible for low yield. In order to control the diseases new chemicals were tested in the field against rice blast, bacterial leaf blight of rice and brown leaf spot in rice. All chemicals were found effective for reducing diseases incidence and improved paddy yield as compared to control with varying degree. Susceptible variety Basmati C-622 was planted in puddled field. Heavy dose of NPK @ 150:85:00 (Kg/ha)was applied to encourage disease to increase blast incidence. Gem Star Super 325 SC & TC @ 296.4 mL/ha was the most effective treatment against Paddy Blast while in case of bacterial leaf blight of rice basmati 2000 was test variety. Nativo75 WG @160.55gm/ha was highly effective against bacterial blight whereas Score 250EC@ 308.5mL/ha outclassed all the tested fungicides against brown leaf spot of rice on basmati super variety.

Keywords: Bacterial Leaf blight, Brown leaf spot, Paddy blast, Chemical control.

INTRODUCTION

Rice is an important cereal crop and staple food for a large part of world's population, especially in East and South Asia, Middle East, Latin America and West Indies. Rice is the third largest crop grown after wheat and cotton in the Pakistan. Rice covers an area of 2.9 million acres, yielding an annual production of 7 million tones with an average yield 1080 Kg per acre(Anonymous, 2013).Pakistan is the third largest exporter of rice in the world and earns about 500 million US $ annually. Pakistan basmati rice is famous in the world for particular aroma but most of the Basmati varieties cultivated in the country are susceptible to the rice diseases.

Different biotic and abiotic factors affect the rice crop production in the field and reduce yield. Among biotic factors, diseases are major factor affecting the rice production. Among 74 diseases of rice in the world (Ou, 1985) only 15 have been recorded in Pakistan. Major diseases of rice which affect the economics of rice crop in the Punjab are paddy blast (*Pyricularia oryzae* Cav.), bacterial leaf blight (*Xanthomonas oryzae* pv. oryzae) and stem rot of rice (*Sclerotium oryzae* Catt) (Dubey, 1995).Diseases can be flare up under conducive environment and gain economic importance are Brown leaf spot (*Helminthosporium oryzae*), Narrow Brown leaf spot (*Cercospora oryzae*), Satck burn (*Alternaria alternata*), Sheath blight of Rice (*Rhizoctonia solani*), Grain discoloration(Singh *et al*., 2007).

Rice diseases can be controlled by cultivation resistant varieties, cultural practices and chemical application. Host resistance alone seems to be unreliable. Besides other control measures chemicals are important tool to protect the crop (Kumbhar, 2005; Ghazanfar *et al*., 2009). Chemical control offers great potential and will constitute an important role in reducing diseases crop losses caused by the rice diseases in the field. Several chemicals have been suggested to control rice diseases (Gill,1999). To find out effective chemicals/fungicides for controlling major rice diseases, some of the new fungicidal formulations were evaluated in the field; together with some other chemicals and Bio-fungicides

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formulation against bacterial leaf blight, blast and brown leaf spot in rice. Present study was an effort to evaluate new chemicals for recommendations to rice growers.

MATERIALS AND METHODS

Field trials were conducted at Rice Research Institute (RRI) Kala Shah Kaku during kharif season 2012. Thirty five days old nursery was transplanted in well prepared puddled field while experiments were conducted in randomized complete block design (RCBD) with three replicates and plots size dimensions (2m x 6m) and applied fertilizer NPK @ 150:85:00 (Kg/ha). For Paddy blast susceptible variety C-622 was used. The crop was inoculated with leaves infected with the disease containing sporulating lesions. Test fungicides were sprayed at late booting stage and 4-5 days after panicle emergence. Data regarding blast incidence and paddy yield was recorded following the scale IRRI (Anonymous, 1996).

For Bacterial leaf Blight susceptible variety Basmati 2000 was transplanted for field trials. Inoculation was done with freshly prepared (soaking of leaves in distilled water) inoculum of *Xanthomonas oryzae* pv *oryzae*. Test fungicides were sprayed at booting stage and repeated after 10 days. Data regarding BLB incidence was recorded two weeks after second spray following the scale devised by IRRI(Anonymous, 1996).

For brown leaf spot management commercially grown Super Basmati was used as test variety. Inoculation was done with *Helminthosporium oryzae* from field infected leaves. The initial application of the various chemicals was sprayed at late boot and early flowering stages of plant development. Controls plots were sprayed with water only. An average disease index on a scale of 1-5 (1 = no leaf lesions, 2 = 25%, 3= 50%, 4 = 75%, and 5= 100% of leaf area covered with lesions) was determined.

All plots were hand harvested 25 days after the last fungicide application and or maturity of each test plot. A standardized inner square of 1 X 1 m was hand harvested for yield determination. The data was subjected to statistical analysis and tested at 5% level of significance to interpret the treatment differences Duncan's Multiple Range Test(DMRT) was applied.

RESULTS AND DISCUSSION

Paddy Blast: Fungicidal treatments effected significantly at (P=0.05)as compared to control (untreated plot) with some degree of variation according to DMR test (Table-1).Minimum paddy blast incidence (6.63 %) was recorded after application of Gem Star Super 325 SC and showed protection value of 92.11% whereas Castle 50% WP was least effective fungicide in managing blast diseases as compared to control treatment(76.25%).

Table 1. Efficacy of different fungicides against Paddy Blast (*Pyricularia oryzae*).

Treatment (Trade Name)	Generic Name	Dose/ha	Blast Incidence (%)	Protection value (%)	Paddy Yield t/ha
Anvil 5 SC	Hexaconazole	988.10 ml	13.04^{de}	84.47	2.973^{b}
Gem Star Super 325 SC &TC	Azoxystrobin + Difenconazole	296.40 ml	6.630^{g}	92.11	3.120^{a}
Castle 50% WP	Kasugamycin + Copper Oxycholoride)	617.50gm	19.95^{b}	76.25	2.910^{bc}
Filia 525 SC	Propiconazole + Tricyclazole	741.00ml	17.41^{c}	79.27	2.767^{e}
Nativo 75 WG	(Tebuconazole+ Trifloxystrobin)	160.55gm	11.08^{ef}	86.80	2.843^{cd}
Score 250 EC	Difenconazole	308.75ml	10.16^{f}	88.02	2.790^{de}
Proway 45 EW	Procholoraz	494.00ml	10.23^{f}	87.82	3.087^{a}
State 75WP	Tricyclazole	296.40gm	13.96^{d}	83.38	2.883^{c}
Rabcide 30 WP	Pathalic acid	617.5g	11.94^{ef}	85.78	2.890^{c}
Control	H_2O	247 l	84.0^{a}		2.50^{f}
	DMR value		1.873		0.072

*Means sharing the common letters are not significantly different at (P=0.05) according to Duncan's multiple range test.

Similarly Score 250EC and Proway 45EW was also effective in reducing disease incidence (10.16%) and (10.23%). Similar behavior was observed in case of State 75WP and Anvil 5SC with disease incidence (13.96) and (13.04) respectively. This was followed by application of Filia 525 SC, which decrease disease to an extent of 79.27% compared to control. Yield level was only 2.50 t/ha in control while application of Proway was effective and improved yield upto3.087t/ha. Paddy yield was also improved significantly in case of Gem Star Super 325 SC (3.12 t/ha). Various workers supported the higher yield due to disease control efficiency of the chemical (Viswanathan and Narayanaswamy, 1991). The results of current study are corroborated with findings of many researchers tested different fungicidal formulation. These fungicides were highly effective in controlling Paddy blast and increasing grain yield. Chemical evaluation against control of paddy blast revealed that from time to time and place to place, different chemicals has given good response for controlling the disease (Rohilla and Singh; 1999; Kumbhar 2005).

Bacterial Leaf blight of Rice: Similarly some new fungicides were also tested against bacterial leaf blight of rice. Treatment effects were significant (P=0.05) in controlling the bacterial leaf blight and improved paddy yield compared to untreated plots as mentioned intable2. In the present study, all the chemicals tested controlled the disease with varying degree of success. Among tested treatments, application of Nativo 65WG was found highly effective in controlling Bacterial leaf blight as it controlled incidence (9.233%) as it was up to (87.19%) against untreated plots. The right time of application coupled with effective chemical may check disease progress. All tested chemicals except Castle 50WP resulted in increased yields after reducing bacterial leaf blight of rice(Table 2).Effectiveness ofsome fungicides and antibiotics for the control of bacterial leaf blight in rice has already been tested by many research workers. Chaudhary *et al*. (2011) tested Copperoxychloride50%@ 1.25kg/ha),Oxytetracycline@0.75L/hand Streptomycin @0.50kg/ha alone and also in combination with each other were tested and compared with untreated plot at research farm and farmer's field, respectively. The results revealed that Bordeaux mixture proved more effective, broad spectrum and economical than copper oxychloride and antibiotics. Sing h *et al*. (1980) applied antibiotics and fungicides in the field for control of bacterial leaf blight of rice caused by *Xanthomonas oryzae*. Agric. Teramycin 17, Brestanol, Agrimycin 500 and a combination of Agrimycin 100 + Fytolan gave effective control of the blight phase of the disease. Fungicides treatment Copper oxycholoride and Vigran blue was effective as foliar spray against BLB and improved yield (Khan *et al*.,2005).

Table 2: Effect of different chemicals against bacterial leaf blight (*Xanthomonas oryzae pv. oryzae*).

Treatments (Trade Name)	(Generic Name)	Dose/ha	Disease Incidence	Protection value (%)	Paddy Yield t/ha
Gem Star Super 325 SC	Difenconazole +Azoxystrobin)	296.40 ml	12.73^{b*}	82.34	3.903^{c}
Score 250 EC	Difenconazole	308.75ml	13.33^{b}	81.51	3.857^{c}
Nativo 75 WG	(Tebuconazole+ Trifloxystrobin)	160.55gm	9.233^{c}	87.19	4.707^{a}
Castle 50% WP	Kasugamycin + Copper Oxycholoride)	617.50gm	13.67^{b}	81.04	3.537^{d}
Anvil 5SC	Hexaconazole	123.50 ml	12.13^{b}	83.17	4.280^{b}
Taegro (Spray Application)	*Bacilliussubtillus* var. *amylioliquifaciens* Strain FZB	494.00 gm	12.33^{b}	82.89	4.363^{b}
Tegro (Spray+Soil)	$1.0x10^{10}$ cfu/gram		12.33^{b}	82.89	4.307^{b}
Control	H_2O	247 ltr	72.10^{a}		3.730^{d}
		DMR (Value)	2.49		0.256

*Means sharing the common letters are not significantly different at (P=0.05) according to Duncan's multiple range test.

One component of integrated disease control is biological management. The application of new Biocontrol formulation was found very effective as compared to Castle 50% WP containing antibiotic (Kasugamycin + Copper oxycholoride) the most commercially used chemicals in the field against Bacterial Leaf Blight of Rice. Bacterial species Bacillus and Pseudomonas, have been also proved in controlling the plant diseases as bio-protectors and bio-stimulators (Mark *et al.,* 2006). Application of *Streptomyces* spp. as spray treatment @ 10^7cell g $^{-1}$ reduced BLB severity when compared to that of untreated plots Hastuti*et al*. (2012). These commercial formulations of bicontrol agents are effective in management of BLB in field conditions and can be used as an eco-friendly disease management strategy for rice farmers.

Brown Leaf Spot of Rice: Seven fungicides were tested for the management of brown leaf spot of rice in the field. Score 250 EC significantly (P= 0.05) controlled brown spot (9.33% of infected leaf area)as compared to control(Untreated plot) which showed 60% of disease incidence. Similar response was followed by Thiovet WG (13.00%) and Sulfex Gold 80%WGD (13.67%),Topsin M 70%WP (13.67%), Armur 300 EC (14.33%) and Kumulus (15.67 %) and Anvil 5SC(14.67%) respectively(Table 3).Yields increased in all fungicide- treated plots. However, plots sprayed either with Sulfex Gold, Thiovit Jet and Score produced the high yield records. Results are in accordance with different workers regarding chemical control of brown leaf spot. Brown leaf spot has been managed by foliar application of fungicides Armure 30EC @ 0.1 per cent, Tilt 25EC @ 0.1 per cent, Contaf 5EC @ 0.2 per cent moreover paddy yield was also improved after management of disease (Singh *et al*.,2007). Fungicides Benomyl50WP ,Mancozeb ,Fenapanil 50 WP and Iprodione50 flowable resulted in significantly better control of brown leaf spot of wild rice *Zizania aquaticat* caused by Dreschlera (*Bipolaris oryzae*) and *D. sorokiniana (B. sorokinianat*) (Percich and Nickelson 1982).

Table 3: Effect of different fungicides against Brown Leaf spot(*Helminthosporium oryzae*).

Treatments (Trade Name)	Generic Name	Dose/ha	Disease Incidence (%)	Protection value (%)	Paddy Yield Tonns/ha
Thiovit Jet 80WG	Sulphur	1976 g	13.00^{f}	78.33	4.573^{a}
Armur 300 EC	Propeconazole +Difenconazole	296.40ml	14.33^{d}	76.11	4.433^{ab}
Sulfex Gold 80% WDG	Sulphur	1976g	13.67^{e}	77.21	4.623^{a}
Score 250 EC	Difenconazole	308.75ml	9.33^{g}	84.45	4.750^{a}
Kumulus 80%WG	Sulphur	1976 g	15.67^{b}	73.88	3.943^{c}
Anvil 5SC	Hexaconazole	1235 ml	14.67^{c}	75.55	4.197^{bc}
Topsin-M 70WP	Thiphonate Methyl	988 g	13.67^{e}	77.21	4.191^{bc}
Control	Water	247litre	60.00^{a}		3.527^{d}
	DMRT Value		2.487		0.327

*Means sharing the common letters are not significantly different at (P=0.05) according to Duncan's multiple range test.

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