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Influence of various fungicides on the management of rice blast disease

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Abstract

Evaluation of different fungicides against rice blast disease was carried out during kharif 2007, at Rice Research Institute, Kala Shah Kaku. A highly susceptible rice variety Basmati C-622 was planted in Randomized Complete Block Design and the application of various fungicides viz Rabicide 30WP, Nativo SC, Thiovit 80 WP, Cuproxit 345 SC, Score 250 EC, Filia 525 SC, Armure, Tilt 250 EC, and WSH004 were made with dose rates of 3 g/liter H_2O, 0.8 gm/liter H_2O, 10 gm/liter of H_2O, 3 ml/liter of H_2O, 1.25 ml/liter of H_2O, 3 ml/liter H_2O, 1.2 ml/liter H_2O, 0.8 ml/liter of H_2O and 10 ml/liter of H_2O. All the fungicides proved to be affective in the management of rice blast disease but Rabicide, Nativo and Score proved effective in all the three weeks in reducing the disease percentage more in 3rd week with 11.46%, 12.15% and 12.85%.. The control of disease in case of neck blast was shown by Rabcide, Score and Nativo with 12.81%, 14.24% and 17.01% disease respectively. WHS004 was proved the least effective in controlling leaf and neck blast.

Key words: Control, fungicides, *Pyricularia oryzae*, rice blast *Oryza sativa* L, screening.

Introduction

Blast disease caused by *Pyricularia oryzae* Cavara [Synonym *Pyricularia grisea* Sacc., the anamorph of *Magnaporthe grisea* (T.T Hebert) Yaegashi and Udagawa], upsets production statistics of rice in Pakistan (Jia *et al.*, 2000). Rice is cultivated on an area of 2581 thousand hectares with total production 5483 million tons the average yield being 2806 kg/ha (Anonymous, 2007). Production of rice is very low in Pakistan as compared to other rice growing countries of the world mainly due to poor management strategies of the diseases particularly the rice blast disease that reduces quality as well as quantity of the crop. The fungus *Pyricularia oryzae* attacks at all stages of the crop and symptoms appear on leaves and nodes (Seebold *et al.*, 2004).The symptoms are more severe in case of neck blast that is characterized by the infection at the panicle base and its rottening (Bonman *et al.*, 1989). Heavy yield losses have been reported in many rice growing countries. For example 75, 50 and 40 percent grain loss may occur in India (Padmanabhan, 1965), Philippines (Ou, 1985) and Nigeria (Awodera and Esuruoso, 1975). In Pakistan during the last two decades, rice blast is mostly found in districts of Faisalabad, Toba Tek Singh, Vehari and place like Gaggoo Mandi (Arshad *et al.*, 2008). The most usual approaches for the management of rice blast disease include planting of resistant cultivars application of fungicides, and manipulation of planting times, fertilizers and irrigations (Georgopoulos and Ziogas, 1992; Moletti, 1988; Mbodi *et al.*, 1987; Naidu and Reddy, 1989).This paper reports on the influence of various fungicides on the management of rice blast disease and their impact on rice yield.

Materials and Methods

Rice nursery of highly susceptible cultivar Basmati C-622 was sown in the month of May. The healthy seeds were placed in the form of heaps on the Gunny bags and water was sprayed on the seeds with help of sprinkler, so that seed may get sprouted for sowing after 2 days. The land was prepared by puddling method by applying one ploughing followed by two ploughing after one week. The plot size for each treatment was 2 × 6 meters with eight rows in each plot and plant to plant and row to row distance was 25 cm. Fertilizer was applied @ 100, 50 0 Kg of NPK and Padan was used as insecticides @ 9 Kg/acre and weeds were control by Machete as weedicide @ 800ml/acre. The experiment was laid in RCBD with four replications and the fungicides were applied at the recommended rates of manufactures (Table 1). Three applications of fungicides at weekly interval were given, the first at booting

stage. The data regarding the occurrence of the blast disease was collected one week after the last application of fungicides by using the disease rating scale of 0-9 developed by International Rice Research Institute (IRRI. 1996) and then converting into percent disease by using the formulas.

$$\text{Disease \%} = \frac{\text{Average of the disease score X 100}}{9}$$

or

$$\text{Disease \%} = \frac{\text{Sum of the scores X 100}}{\text{Number of observation X higest number in rating sacle}}$$

The data on the yield were recorded by marking 3 × 2 m section with-in each plot using a wire frame as described by (Seebold *et al.*, 2004) and tillers with-in the frame were cut and harvested in order to determine the yield.

Results and Discussion

Evaluation of different fungicides on leaf and neck blast under field conditions and their ultimate effect on crop yield is given in the (Fig 1, 2 and 3). The results showed that after the application of various fungicides against leaf blast after the first week, the fungicides Armure (Propiconazol + Difenoconazole), Rabicide (Tetrachlorophthalide), Score (Difenoconazole), showed the best results with disease percentage of 28.11%, 30.61% and 30.92% respectively. The fungicides like Nativo (Tebuconazole + Trifloxystobin) and Tilt (Propiconazole) showed intermediate results and the disease percentage recorded was 31.44% and 32.63%. WSH004 was the least effective of all the fungicides in controlling the blast disease and the disease percentage was recorded up to 38.11%. Similar results were shown after 2nd week in Rabicide, Natvio and Score remained more effective against blast, disease percentage recorded was 24.08%, 25.48% and 26.72%. Cuproxa, Tilt, Armure exhibited intermediate effectiveness and disease percentage recorded was 27.36%, 26.72% and 27.36%. Haq *et al.*, (2002) conducted an experiment to evaluate various fungicides like Captan, Acrobat, Bayeltan, Sunlet, Dithane M-45 Trimiltox and Derosal in controlling the mycelial growth of *Pyricularia oryzae* under the laboratory conditions and found that Captan and Acrobat were the most effective fungicides.

The fungicides viz Rabicide, Nativo and Score were the most effective against leaf blast disease with great reduction in the disease percentage which was 11.46%, 12.15% and 12.85% respectively after the third week, while Tilt and Armure, exhibited intermediate effectiveness with 15.97% and 17.36% disease percentage. In all the three weeks WSH004 proved least effective for the management of the disease.

In case of neck blast (Fig 2) Armure, Tilt and Score was the most effective during first week of spray at heading stage with 31.32%, 32.56% and 33.33% disease occurrence, where as Rabicide, Cuproxat and Filia showed intermediate results, 34.07%, 36.94% and 37.19%. In second week fungicide application for the purpose to control neck blast Rabicide, Score, Armure were more efficient of all fungicides used and disease recorded was 29.08%, 30.33%, and 30.40%. respectively On the other hand Tilt, Nativo, Thiovit were statistically at par with each other and showed 30.89%, 32 89%,and 34.39% disease. In third week of spray disease percentage recorded was 12.81%, 14.24%, 17.01% by the application of Rabicide, Score and Nativo, for the control of rice neck blast disease. The fungicides Pulsor, Tilt, Filia showed intermediately response with 21.18%, 21.18%, and 22.57%.disease WSH004 was the less effective of all the fungicides in reducing the rice neck blast in all the three weeks with 40.89%, 42.0% and 52.08% disease.

Similar results regarding the efficacy of various fungicides has been reported by different researchers through out the world like Varier *et al.*, (1993) used eight fungicide for management of rice blast and seed treatment with tricyclazole @ 4kg/kg seed proved effective after 40 days of sowing. Dubey (1995) conducted field trails of eight fungicides for control of *Pyricularia oryzae*, Topsin M + Indofil M-45 was proved to be most effective against leaf blast disease of rice. Minami and Ando (1994) reported that probenazole induce a resistant reaction in rice plants against infection by rice blast fungus. Gouramanis (1995) found that fungicides carbendazim, pyroquilon, thiophanate methyl and chlobenthiazone reduce the leaf blast disease of rice on the other hand tricyclazole was effective in reducing the neck blast. Enyinnia (1996) evaluated two systemic fungicides Benomyl and Tricylazole on Faro / 29, a rice cultivar, at full booting stage and reported good control of natural infection of rice leaf blast. Filippi and Prabhu (1997) reported that propagation fungicide (40 g a.i. per Kg of seed) was effective in controlling leaf and panicle blast. Sood and Kapoor, (1997) evaluated 7 fungicides

against leaf and neck blast of rice caused by *Magnaporthe grisea.* The fungicides were sprayed at the recommended rates at booting and heading stage. Tricylazole was the most effective, reducing leaf and neck blast by 89.2% and 97.5% and increasing the yield 43.3% as compared with untreated control. Moletti *et al*., (1998) conducted field trial against *Pyricularia oryzae*, and found that pyroqulion granules or wettalble powder 2 kg / ha once or twice give good results against leaf blast. Tirmali and Patil, (2000) conducted field experiment on susceptible rice cultivar E. K. 70 and 5 new fungicide formulation viz. Antaco 170, Carpromid 30 SC, Fliqiconazate 25 WP, Ocatve 50 WP and Opus 15.5 SC. These fungicides were sprayed at tillering, booting and heading stages of crop. The new formulation reduce neck blast incidence by 16.27% to 29.23%, Opus 15.5 SC was highly effective in controlling neck blast to 29.23% and increasing grain yield. Tirmali *et al*. (2001) reported the efficicacy of new fungicides in controlling rice neck blast caused by *Pyricularia oryzae* on rice cultivar Ek- 70 (blast susceptible) treated with win 30 sc (Capropamid), Folicur 250, WE Swing 250 Ec and Beam 75 WP at maximum tillering panicle initiation and at heading stage of crop and found that all these new fungicides have significantly reduced neck blast.

The effect of various fungicides on the yield of Paddy is given in the (Fig. 3) Rabicide, Nativo and Tilt showed maximum increase in yield after three application in field conditions that was 2.88 %, 2.80% and 2.77%. Score, Pulsor, Cuproxit also give good result after their spray and increase the yield at intermediate level with 2.63%, 2.58%, and 2.55% increase in yield. Our results are in conformity with those of Sood and Kapoor, (1997), Tirmali *et al*, (2001), and Prabhu *et al*. (2003) reported that fungicides application increases the yield of rice.

Table 1: Fungicides, active ingredients, dosage rates tested for the control of Rice Blast caused by *Pyricularia oryzae*

Fungicides	**Manufacturer**	**Active Ingridents**	**Dose rates used**
Rabicide 30WP	Arista Agro Pvt	Tetrachlorophthalide	3 g/ liter H_2O
Nativo SC	Bayer Crop Sciences	Tebuconazole + Trifloxystobin	0.8 gm/ liter H_2O
Thiovit 80 WP	Bayer Crop Sciences	Sulphur	10 gm/ liter of H_2O
Cuproxit 345 SC	Dow Agro Sciences	Copper Sulfate	3 ml/ liter of water
Score 250 EC	Syngenta	Difenoconazole 25%	1.25 ml/ liter of H_2O
Filia 525 SC	Syngenta	Propiconazole + Tricyclazole	3 ml/ liter H_2O
Armure	Syngenta	Propiconazole + Difenoconazole	1.2 ml/ liter H_2O
Tilt 250 EC	Syngenta	Propiconazole	0.8 ml/ liter of H_2O
WSH004	Homeopathic	----	10 ml/ liter of H_2O
Control	-	-	-

Table: 2 Scale used for rating of blast disease.

Scale	**Description**	**Host Behavior**
0	No lesion observed	Highly Resistant
1	Small brown specks of pin point size	Resistant
2	Small roundish to slightly elongated, necrotic gray spots, about 1-2 mm in diameter, with a distinct brown margin. Lesions are mostly found on the lower leaves	Moderately Resistant
3	Lesion type same as in 2, but significant number of lesions on the upper leaves	Moderately Resistant
4	Typical susceptible blast lesions, 3 mm or longer infecting less than 4% of leaf area	Moderately Susceptible
5	Typical susceptible blast lesions of 3mm or longer infecting 4-10% of the leaf area	Moderately Susceptible
6	Typical susceptible blast lesions of 3 mm or longer infecting 11-25% of the leaf area	Susceptible

7	Typical susceptible blast lesions of 3 mm or longer infecting 26-50% of the leaf area	Susceptible
8	Typical susceptible blast lesions of 3 mm or longer infecting 51-75% of the leaf area many leaves are dead	Highly Susceptible
9	Typical susceptible blast lesions of 3 mm or longer infecting more than 75% leaf area affected	Highly Susceptible

(IRRI System, 1996)

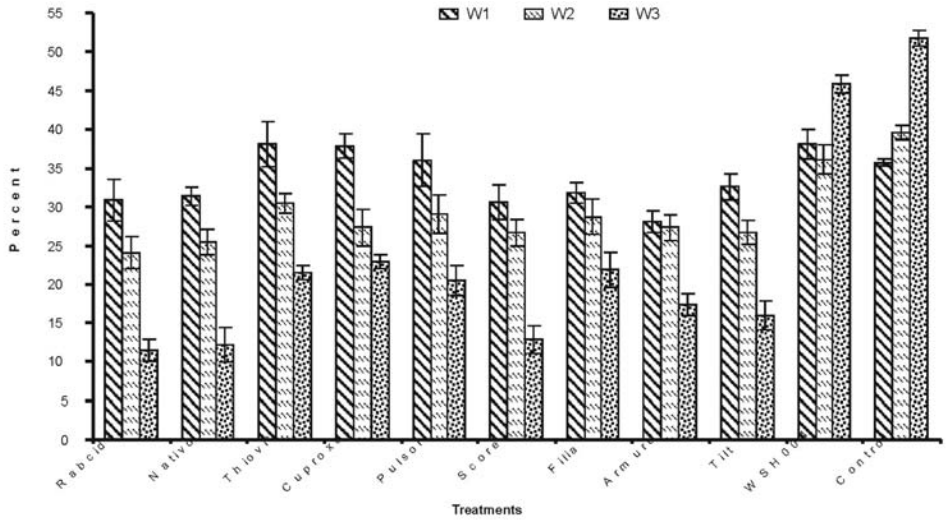

Fig 1: Effect of different fungicides on the occurrence of rice leaf blast disease.

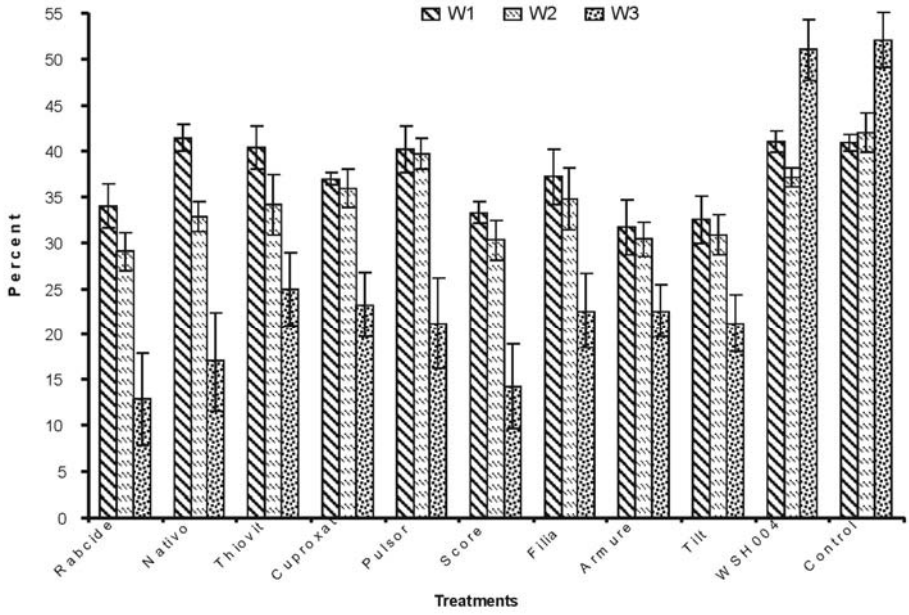

Fig 2: Effect of different fungicides on the occurrence of rice neck blast disease.

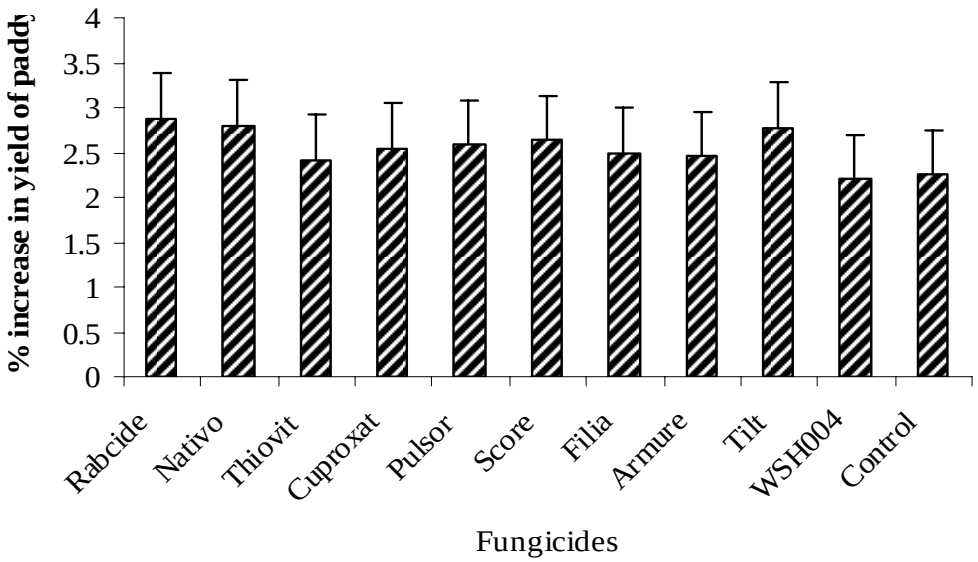

Fig 3: Effect of different fungicides on the yield of rice.

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