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RESEARCH ARTICLE

Efficacy of various fungicides on the management of rice blast disease caused by *Pyricularia oryzae* (Cav.) under field condition in Dharwad district of Karnataka

■ **Gurupada Balol, S.C. Talekar and R.G. Satish**

SUMMARY

Rice blast caused by *Pyricularia oryzae*, Cav. (synonym *Pyricularia grisea* Sacc. The anamorph of *Magnaporthe grisea*), is one of the most destructive and wide spread diseases. The results of present study revealed that, after 14 days of second spray, least PDI of 12.95 and 13.23 was noticed in Picoxystrobin 22.52% w/w SC@ 1200 ml/ha and750 ml/ha, respectively followed by Picoxystrobin 22.52% w/w SC @ 600 ml/ha with a PDI of 13.43 where as Picoxystrobin 7% + Propiconazole 12% SC 600 ml/ha recorded the PDI of 16.56 and Tricyclazole 75% WP @ 400 g/ha recorded the PDI of 16.89 when compared to maximum PDI of 41.55 in untreated control.

Key Words : Blast, *Pyricularia oryzae,* fungicide, Management

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Rice (*Oryza sativa* L.) is considered to be the most important cereal crop grown in different countries around the world. Rice is the major cereal crop with 95% of rice production observed in Asian continent and consumed by more than 4 billion people in the world. In India, rice is grown in an area of 43 million hectares, with 112 mt production and 2.6 tha^{-1} productivity (Pathak *et al.,* 2020). The Indus valley civilization is credited with the domestication of rice in India. In Kerala, rice is planted below sea level; most rice-growing locations of the country are located at or near sea level, as well as at heights above 2000 metres in Kashmir. However, rice is cultivated in all corners of the world except Antarctica (Rathna Priya *et al.,* 2019). After China, India is the world's second largest producer of rice, accounting for 22.5 per cent of global rice production.

Plant disease and pest outbreaks are becoming

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more common, resulting in lower crop yields, endangering global food security. The important diseases include rice blast (Jia *et al.,* 2000), chickpea dry root rot (Talekar *et al.,* 2017), sorghum downey mildew (Sharma *et al*., 2010), chickpea phyllody (Balol *et al.,* 2021) groundnut leaf spots (Kolekar *et al.,* 2016) and bud necrosis (Balol and Patil, 2014) and sunflower necrosis (Sundaresha *et al*., 2012) affecting the yield levels significantly.

Rice blast caused by *Pyricularia oryzae*, Cav. (synonym *Pyricularia grisea* Sacc. The anamorph of *Magnaporthe grisea*), is one of the most destructive and wide spread disease (Jia *et al.*, 2000). Blast epidemics happened across various rice growing countries including India, China, Korea, Vietnam and United States to the extent of 50 % yield loss (Wilson and Talbot, 2009). *M. oryzae* in rice brings forth typical disease symptoms such as leaf blast, nodal blast, neck blast or panicle blast. Compared to leaf blast, neck blast causes highest yield loss since it affects the panicle directly. An area with high rainfall and cooler climate are sternly affected (Ghatak *et al*., 2013). The commonly used management approaches to deal with blast are fungicides or to develop resistant varieties. Several plant genes confer rice blast resistance. However, most of these resistant varieties are short-lived and the resistance is broken down due to variable nature of fungal pathogen. Keeping the above points in view the present work was taken upto evaluate some fungicides against the rice blast caused by *Pyricularia oryzae*.

MATERIAL AND METHODS

Field experiment was conducted at ARS, Mugad, UAS, Dharwad during *Rabi* 2020 in RCBD with 3 replications and 7 treatments including control to evaluate different fungicides against rice blast disease under field condition. The plot size for each treatment was 4x5 meters with plant to plant 10 cm and row to row distance was 20 cm. 25 days old seedlings of susceptible cultivar (HR-12) were planted. The agronomic practices were followed as per package of practices for raising the crop. Picoxystrobin 22.52% w/w SC was evaluated against rice blast disease. The area has been experienced high rice blast disease pressure due to the prevailing high relative humidity which more than 75% and other suitable weather conditions and cropping systems for the development of the disease.

The test fungicides such as Picoxystrobin 22.52% w/w SC @ 450 ml/ha, Picoxystrobin 22.52% w/w SC @ 600 ml/ha, Picoxystrobin 22.52% w/w SC @ 750 ml/ha, Picoxystrobin 22.52% w/w SC @ 1200 ml/ha, Picoxystrobin 7% + Propiconazole 12% SC 600 ml/ha and Tricyclazole 75% WP @ 400 g/ha were applied using a knapsack sprayer at the first appearance of disease symptoms and then repeated once after 14 days following the manufacturer's recommendation rate for each fungicide.

The observations on occurrence of leaf blast were recorded as per cent disease intensity (PDI) at 10 days after the second or final spray by using 0-9 scale given by IRRI (1996). Finally, the grain yield in each plot was recorded and expressed in kg/ha. The leaf blast incidence was calculated by using formula (Wheeler, 1969).

$$\text{PDI} = \frac{\text{Sum of individual rating}}{\text{Number of leaves assessed x Maximum disease grade value}} \text{ x 100}$$

The results of field experiment revealed that, there was a significant difference among the treatments with respect to per cent disease intensity (PDI) of blast disease and all the treatments recorded significantly lower per cent disease intensity and higher yield compared to untreated control plots. Efficacy of different fungicides against leaf blast under field condition and their ultimate effects on crop yield is given in the (Table A).

Grade	Symptoms
0	No lesions
1	Small lesion on leaf or secondary branches
3	Small roundish to oval lesion of 1-2 mm on leaf or on primary branches/ panicle axis
5	Narrow lesion of 1-2 mm breadth and 3 mm long on leaf or around base of uppermost internodes or lower part of panicle axis.
7	Broad spindle shaped lesion yellow, brown, purple margin on leaf and completely around panicle base with more than 30% filled grains
9	Complete lesion

RESULTS AND DISCUSSION

Rice blast caused by (*Pyricularia oryzae*) disease is one of the major disease which leads to greater yield losses. All treatments have reduced disease severity significantly compared to untreated control. The disease severity before treatment imposition was relatively consistent on all the treatments and they were statistically

Table 1 : Evaluation of different fungicides against leaf blast (*Pyricularia oryzae*) disease in rice crop

Treatments	Treatment details	PDI	Yield (q/ha)
T_1	Control	41.55 (40.16)	22.24
T_2	Picoxystrobin 22.52% w/w SC @ 450 ml/ha	19.70 (26.37)	31.35
T_3	Picoxystrobin 22.52% w/w SC @ 600 ml/ha	13.43 (21.51)	34.87
T_4	Picoxystrobin 22.52% w/w SC @ 750 ml/ha	13.23 (21.34)	35.99
T_5	Picoxystrobin 22.52% w/w SC @ 1200 ml/ha	12.95 (21.11)	36.12
T_6	Check 1: GALILEO	16.56 (24.02)	32.65
T_7	Check 2: Tricyclazole 75% WP @ 400 g/ha	16.89 (24.28)	31.64
C.D. (P=0.05)		2.48	3.01
CV		5.46	5.26

*Arcsine values

on par with each other. However, treatments involving test chemical differed significantly after the spray. Significantly highest PDI of 41.55 was noticed with untreated control at 30 days after the treatment imposition indicating sufficient disease pressure for drawing the conclusions.

The results of field experiment revealed that, after 14 days of second spray, least PDI of 12.95 and 13.23 was noticed in Picoxystrobin 22.52% w/w SC@ 1200 ml/ha and750 ml/ha, respectively followed by Picoxystrobin 22.52% w/w SC @ 600 ml/ha with a PDI of 13.43 where as Picoxystrobin 7% + Propiconazole 12% SC 600 ml/ha recorded the PDI of 16.56 and Tricyclazole 75% WP @ 400 g/ha recorded the PDI of 16.89 when compared to maximum PDI of 41.55 in untreated control (Table 1). The treatments Picoxystrobin 22.52% w/w SC@ (1200 ml/ha and750 ml/ha were on par with each other in reducing the disease severity. Thus, the minimum dose of test chemical Picoxystrobin 22.52% w/w SC@ 600 ml per ha *i.e.* 1.2 ml/lit was effective in reducing the severity of the disease and there by increased the grain yield compared to untreated check. Our result also corroborates with the findings of Usman *et al.* (2009) and Magar *et al.* (2015) where fungicide application increased the rice yield. Similar reports were there on other crops such as chickpea (Basamma *et al.*, 2021 and Sangeeta *et al.,* 2022) and urdbean (Balol *et al.,* 2020) where fungicide application has reduced the disease and increased the yield.

Conclusion:

Diseases are a major problem and reduce the yield of rice. Diseases reduce the crop yield, deteriorate the quality of farm produce and hence reduce the market value of rice. From the research, it was found that fungicides treatments were effective against leaf blast as compared to control one. Picoxystrobin 22.52% w/w SC @ 600 ml per ha *i.e.* 1.2 ml/l was effective in reducing the severity of the blast disease of rice and there by increased the grain yield compared to untreated check and this is found to be the minimum effective dose in reducing the blast disease.

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