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Efficacy of tricyclazole 75% wp on paddy blast

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Abstract
Rice blast disease caused by *Pyricularia oryzae* is one of the most destructive and widely distributed diseases of rice, resulting in severe economic losses worldwide. It is particularly problematic in temperate regions, hilly tracts, tropical uplands, and delta areas, posing a major constraint to sustainable rice production. A field experiment was conducted at the Agricultural Research Station (ARS), Gangavati, to evaluate the efficacy of Tricyclazole 75% WP against rice blast (*Pyricularia oryzae*). The experiment was laid out in a Randomized Block Design (RBD) with six treatments and four replications. The fungicide was assessed along with standard checks and an untreated control for its effectiveness in managing blast incidence in rice. Results from both seasons of the study revealed that Tricyclazole 75% WP was highly effective in reducing disease severity. The treatment Tricyclazole 75% WP @ 300 g a.i./ha recorded the lowest disease severity, with 22.22 and 21.21 Percent Disease Index (PDI) and corresponding disease control of 48.72% and 47.59%, during Kharif 2011-12 and Kharif 2012-13, respectively. The same treatment also achieved the highest grain yields of 64.36 q/ha and 65.00 q/ha in the two seasons, the untreated control plots recorded the maximum disease severity (43.33% and 40.47% PDI) and the lowest grain yields (46.72 q/ha and 47.90 q/ha) during the respective years, the field trials clearly demonstrated that Tricyclazole 75% WP @ 300 g a.i./ha was superior and more effective than other treatments in minimizing the severity of rice blast and significantly improving grain yield under field conditions.

Keywords: Blast, fungicide, percent disease index, rice, Tricyclazole 75% WP

Introduction
Plant diseases are among the most serious biotic constraints limiting global crop productivity, often leading to significant food security challenges (Khoa *et al*., 2017) [14]. In rice (*Oryza sativa* L.), diseases pose a major threat to both yield and grain quality, thereby reducing overall production efficiency (Law *et al*., 2017) [21]. Among these, rice blast, caused by *Pyricularia oryzae* (syn. *Magnaporthe grisea*), is recognized as one of the most devastating and widespread fungal diseases of rice worldwide. It remains a critical barrier to achieving global rice production targets, resulting in substantial economic losses (Pan *et al*., 1999; Wang *et al*., 2015) [30, 35].

Globally, rice blast has been reported to cause yield reductions ranging from 30% to 50%, and preventing such losses could potentially provide food for more than 60 million people (Zeigler *et al*., 1994; Nalley *et al*., 2016) [39, 28]. In severe outbreaks, the disease can cause complete crop loss (up to 100%) if effective management practices are not implemented (Sharma, 2012) [33]. In India, blast incidence is particularly prevalent in temperate regions, hilly tracts, tropical uplands, and delta areas, where favorable climatic conditions promote the disease. Under intensive rice cultivation systems, blast has emerged as a major production threat in recent decades (Savary *et al*., 1995; Cu *et al*., 1996) [32, 6].

Although several cultural, biological, and chemical control measures have been explored for managing rice blast (Yellareddygari *et al*., 2014; Datta and Vurukonda, 2017) [38, 7], chemical control remains the most widely adopted and effective strategy for disease suppression in susceptible varieties. Seed treatments with systemic fungicides and subsequent foliar applications have proven effective in reducing both leaf and neck blast severity (Manandhar, 1984; Chaudhary and Sah, 1998; Manandhar *et al*., 1985; Sah and Karki, 1988; Chaudhary, 1999) [23, 3, 24, 31, 2].

Currently, disease management strategies primarily rely on the deployment of resistant cultivars and the judicious use of fungicides (Kumar *et al*., 2021) [20]. However, because pathogen populations can rapidly evolve to overcome host resistance, fungicidal applications continue to play a vital role in mitigating yield losses (Chou, 2020; Kumar *et al*., 2021) [5, 20]. Fungicides remain indispensable due to their convenience, accessibility, rapid action, and broad-spectrum efficacy.

Several fungicides, including chlorothalonil, tricyclazole, hexaconazole, carbendazim, and propiconazole, have demonstrated effectiveness against rice blast (Dutta *et al*., 2012) [8]. Among these, Tricyclazole has consistently shown superior control, recording the lowest leaf blast incidence (8.41%) and significant reduction in neck blast severity (Mohiddin *et al*., 2021) [26]. Modern fungicidal options for rice blast management include isoprothiolane, probenazole, pyroquilon, and tricyclazole, which can be applied as foliar sprays, seed-box treatments, seed dressings, or granular formulations depending on the rice ecosystem (Anon., 1992; Filippi and Prabhu, 1997) [1, 10].

Given the rising demand for rice in domestic and export markets, and the continued threat posed by blast disease, effective and timely chemical interventions are essential. Hence, the present study was undertaken to evaluate the efficacy of Tricyclazole 75% WP for the management of rice blast disease under field conditions.

Materials and Methods

The experiment was laid out to know the effect of Tricyclazole 75% WP on the blast (*Pyricularia oryzae*) of rice with six treatments and replicated four times in RBD design at ARS, Gangavati. The variety BPT-5204 was sown in plot size of 8 X 5 m^2 with all regular agronomic practices followed as per the standard package of practice of University of Agricultural Sciences, Raichur. The evaluation of the fungicide was done along with standard checks and untreated control against the incidences of blast in rice. Treatments details were as follows; T_1-Tricyclazole 75% WP @ 225g; T_2-Tricyclazole 75% WP @ 250; T_3-Tricyclazole 75% WP @ 300g; T_4-Tricyclazole 75% WP @ 350g; T_5-Isoprothiolane 40% EC @ 300ml; T_6-Control. The fungicides were applied as foliar spray treatment in the replicated plots just after the appearance of blast disease in the main field and standard agronomic practices were adopted for the *Kharif* 2011-12 and 2012-13 cultivation season. The plots were inspected regularly to see the disease development and further one more spray were applied at an interval of 15 days. To know the effect of Tricyclazole 75% WP on the blast (*Pyricularia oryzae*) of rice crop observation for disease incidence were recorded from the randomly selected ten hills per plot and efficacy of molecule in controlling of these diseases.

Method of Observation

Disease assessment for rice blast was carried out using the 0-9 disease rating scale as per the Standard Evaluation System (SES) of the International Rice Research Institute (IRRI, 2002) [12]. Scoring was performed before each fungicidal spray to assess the progression of the disease.

For each treatment, five clumps were randomly selected, and observations were recorded on ten leaves per clump. Disease incidence was noted seven days after each spray and at the time of harvest. The intensity of blast disease was assessed for each replicated plot, and the Percent Disease Index (PDI) was calculated following the standard method proposed by Wheeler (1969) [36] using the following formula:

$$\text{Percent Disease Index (PDI)} = \frac{\text{Sum of numerical rating}}{\text{Total no. of plants observed X Maximum rating scale}} \text{ X } 100$$

After the final harvest, plants from each plot were sun-dried, threshed, and winnowed to separate the grains. The grain yield from each treatment was recorded plot-wise and expressed as quintals per hectare (q/ha). The yield data were then subjected to statistical analysis using appropriate methods to determine treatment significance and variation among replications.

Results and Discussion

The fungicide Tricyclazole 75% WP was found to be effective in reducing the severity of the blast disease in both the season of experiments. During *Kharif* 2011-12, the treatment Tricyclazole 75% WP @ 300 g a.i./ha provided maximum disease control of 48.72 per cent with lowest disease severity of 22.22 Per cent Disease Index and it is statistically on par with Tricyclazole 75% WP @ 250 g a.i./ha with the disease control of 41.03 per cent (PDI 25.55%), when compared to the Untreated control (PDI 43.33%). The next best treatment was Isoprothiolane 40% EC @ 300g a.i./ha (PDI 27.77%) with 35.91 per cent disease reduction (Table 1). Similar trend were noticed in the second season of *Kharif* 2012-13 in reducing the severity of the blast disease. The results of the field study indicated that the application of Tricyclazole 75% WP @ 300 g a.i./ha recorded the lowest blast incidence (21.21% PDI) with the maximum disease control of 47.59%, followed closely by Tricyclazole 75% WP @ 250 g a.i./ha, which recorded 23.65% PDI and 41.56% disease control. Both these treatments were statistically at par and significantly superior compared to the untreated control (40.47% PDI). The next most effective treatment was Isoprothiolane 40% EC @ 300 g a.i./ha, which recorded 25.44% PDI with a disease reduction of 37.14% (Table 2).

The superior performance of Tricyclazole in reducing blast severity aligns with earlier findings by Kongcharoen *et al*. (2020) [16], who reported a 67.90% reduction in disease incidence following Tricyclazole application. Similarly, Sood and Kapoor (1997) [34] observed that Tricyclazole was highly effective in minimizing leaf blast, achieving 89.2% disease reduction compared to the untreated control. Ganesh *et al*. (2012) [11] also reported that Tricyclazole provided significant control of rice blast, recording the lowest PDI (16.01%) and the highest percent disease control.

In related studies, Magar *et al*. (2015) [22] demonstrated that the combination of Tricyclazole + Hexaconazole was the most effective fungicidal treatment, achieving 87.08% disease control against leaf blast. Moreover, Chen *et al*. (2013) [4] reported blast reductions ranging from 73-76% and 75-77% with Tricyclazole and Epoxiconazole, respectively. These findings confirm the high efficacy and consistent performance of Tricyclazole-based fungicides in suppressing rice blast disease across diverse agro-climatic conditions.

Several chemical formulations are in use for the control of blast in rice. Even though both systemic and non-systemic fungicides are used for chemical management, systemic fungicides offer better management of the disease (Naik *et al*., 2017) [27], timely application of selective fungicides offers effective protection against the disease. The fungicide tricyclazole found to be effective in reducing the rice blast severity (Mohiddin *et al*.,

2021) [26]. The fungicide group triazoles, are single-site inhibitors, inhibits sterol biosynthesis (Kramar and Schirmer, 2007) [17]. Tricyclazole prevents melanin biosynthesis in appressoria of *Pyricularia oryzae* and penetration of rice plants via appressoria by inhibiting either polyhydroxynapthaline reductase (Kumar *et al*., 2013) [18]. Tricyclazole inhibits the NADPH-dependent reduction of 1,3,6,8-tetrahydroxynaphthaline to scytalone and 1,3,8-trihydroxynaphthaline to vermelone (Wheeler, 1982) [37].

Yield

During *Kharif* 2011-12, the maximum grain yield of 64.36 q/ha was recorded with Tricyclazole 75% WP @ 300g a.i./ha which was statistically superior and comparatively effective than rest of the treatments. The treatments Tricyclazole 75% WP @ 350 g a.i./ha (58.76 q/ha), Tricyclazole 75% WP @ 250g a.i./ha (60.00 q/ha) and Tricyclazole 75% WP @ 225 g a.i./ha (58.96 q/ha) are all on par among themselves in recording grain yields. The minimum yield of 46.72q/ha was recorded with untreated control (Table 1). During *Kharif* 2012-13, the maximum grain yield of 65.00 q/ha was recorded with Tricyclazole 75% WP @ 300g a.i./ha which was statistically superior and comparatively effective than rest of the treatments. The treatments Tricyclazole 75% WP @ 350 g a.i./ha (58.10 q/ha), Tricyclazole 75% WP @ 250g a.i./ha (60.20 q/ha) and Tricyclazole 75% WP @ 225 g a.i./ha (58.80 q/ha) are all on par among themselves in recording grain yields. The minimum yield of 47.90q/ha was recorded with untreated control (Table 2). The data clearly showed that highest increase in yield over untreated control was recorded with Tricyclazole 75% WP @ 300g a.i./ha and Tricyclazole 75% WP @250 g a.i./ha next best most effective treatments and found to be superior over treatments. The lowest grain yield was recorded with 46.72 q/ha in untreated control (Table-2). Tricyclazole was also reported as the fungicide with maximum efficiency, reducing blast disease with 43.3 per cent increase in yield as compared to the control (Sood and Kapoor, 1997) [34]. The fungicide tricyclazole found to be as effective as n reducing the rice blast and increasing the rice yields (Mohiddin *et al*., 2021) [26]. The chemical method of control is applicable for all areas, irrespective of varieties and has an advantage in a reduction in disease occurrence, spread and enhance yield. Increased rice yields with tricyclazole application have also been reported by other workers (Kongcharoen *et al*., 2020; Pandey, 2016) [16, 29].

Table 1: Evaluation of the Tricyclazole 75% WP against paddy blast (*Kharif* 2011)

Treatments	Blast (PDI%)	Reduction in disease incidence over control (%)	Yield (Q/ha)	Increased yield over control (%)
T_1 - Tricyclazole 75% WP @ 225 g	28.88 (32.51)*	33.35	58.96	26.20
T_2 - Tricyclazole 75% WP @ 250 g	25.55 (30.37)	41.03	60.00	28.43
T_3 - Tricyclazole 75% WP @ 300 g	22.22 (28.12)	48.72	64.36	37.78
T_4 - Tricyclazole 75% WP @ 350 g	31.11 (33.90)	28.20	58.76	25.77
T_5 - Isoprothiolane 40% EC @ 300 ml	27.77 (31.80)	35.91	59.92	27.40
T_6 - Control	43.33 (41.23)	-	46.72	-
S.Em (±)	0.84	-	0.42	-
CD (P = 0.05)	2.53	-	1.27	-

* Figures in the parentheses represent arcsine transformed values

Table 2: Evaluation of the Tricyclazole 75% WP against paddy blast (*Kharif* 2012)

Treatments	Blast (PDI%)	Reduction in disease incidence over control (%)	Yield (Q/ha)	Increased yield over control (%)
T_1 - Tricyclazole 75% WP @ 225 g	27.72 (31.77)*	31.51	58.80	22.76
T_2 - Tricyclazole 75% WP @ 250 g	23.65 (29.10)	41.56	60.20	25.68
T_3 - Tricyclazole 75% WP @ 300 g	21.21 (27.43)	47.59	65.00	35.70
T_4 - Tricyclazole 75% WP @ 350 g	28.84 (32.48)	28.74	58.10	21.29
T_5 - Isoprothiolane 40% EC @ 300 ml	25.44 (30.29)	37.14	60.60	26.51
T_6 - Control	40.47 (39.50)	-	47.90	-
S.Em (±)	0.97	-	1.12	-
CD (P = 0.05)	2.94	-	3.34	-

* Figures in the parentheses represent arc sine transformed values

Conclusion

The fungicide Tricyclazole 75% WP at different doses were evaluated at Agriculture Research Station, Gangavati was found effective in reducing the severity of paddy blast and thereby increased the paddy grain. Field trial conducted clearly indicated that Tricyclazole 75% WP @ 300 g a.i./ha which was statistically superior and comparatively effective than rest of the treatments in reducing the severity of paddy blast. The dose Tricyclazole 75% WP @ 300g a.i./ha resulted better yield than other treatments.

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