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Bio-efficacy of azoxystrobin 120 + tebuconazole 240SC against blast of rice

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Abstract
According to reports, the blast disease is a significant barrier to rice production and can seriously harm crop yield. Consequently, it is necessary to manage crops effectively from the outset of disease development, which can be ensured by using the right fungicides. Standard agronomic practices were implemented for the Kharif 2016-17 and 2017-18 cultivation seasons in order to determine the impact of the fungicides Azoxystrobin 120 + Tebuconazole 240 SC on the Blast (*Pyricularia oryzae*) of rice. The fungicides were applied as foliar spray treatments in the replicated plots shortly after the appearance of blast disease in the main field. The plots were routinely checked to monitor the spread of the disease, and two more sprays were administered at 15-day intervals. Ten randomly chosen hills per plot were used to record crop observations for disease incidence and the effectiveness of molecules in suppressing these diseases. Based on the diseases' scores according to the disease rating scale, observations were made. The fungicide Azoxystrobin 120 + Tebuconazole 240 SC, applied foliar application at 676 to 830 ml/ha, effectively reduced the incidence of blast disease and increased rice yield. All of the observation days Revealed that the fungicides Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha and Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha were performing similarly. Therefore, it can be concluded that the fungicide Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha is effective in managing the blast diseases based on the effectiveness and economics of fungicide use in rice.

Keywords: Blast, disease, fungicide, paddy

Introduction
Rice (*Oryza sativa* L.) is the world's most significant staple food crop, feeding 2.7 billion people, and is crucial to global food security. India produces 22.1 percent (105 million tonnes) of the world's rice output (476 million tonnes) on an area of 44 million hectares (Anon., 2020) [1]. Rice illnesses caused by fungi are regarded as the primary limitation in rice production, resulting in both qualitative and quantitative losses (Law *et al*. 2017) [3]. The most serious disease, rice blast disease caused by *Pyricularia oryzae* (*Magnaporthe grisea*), has been observed to cause yield losses of up to 50% (Nalley *et al*., 2016) [2]. The most serious and pervasive rice disease in the world, rice blast (*Pyricularia oryzae*) has a major economic impact. Currently, blast is a major issue in India's delta regions, tropical uplands, mountainous tracts, and temperate zones. The pathogen causes leaf blast, nodal blast, collar blast, and neck blast when it infects the leaf, node, collar, and neck. Because of this, novel compounds, pesticides, and fungicides make up a large portion and have a significant impact on disease control. It's mostly due to their wide range, efficacy, accessibility, and convenience. In these situations, chemical fungicides are applied to rice cultivars that are vulnerable to the disease (Chou *et al*., 2020) [5]. Therefore, chemical management is currently the most effective method for managing crop losses from blasts worldwide and is being used extensively (Kumar *et al*., 2021) [4]. As a result, the bioefficacy of the novel fungicide Azoxystrobin 120 + Tebuconazole 240 SC against rice blast was investigated.

Materials and Methods
The experiment was laid out with 8 treatments and replicated three times in RBD design at ARS, Gangavati. The variety BPT-5204 was sown in plot size of 5 X 5 m^2 with all regular agronomic practices followed as per the standard package of practice of University of Agricultural Sciences, Raichur. Shortly after blast disease first appeared in the main field, the fungicides were foliar sprayed in the duplicated plots, and conventional agronomic methods were implemented for the Kharif 2016-17 and 2017-18 cultivation seasons.

The plots were routinely checked to monitor the spread of the disease, and two more sprays were administered at 15-day intervals. In order to determine the impact of Tebuconazole 240 SC and Azoxystrobin 120 on the Blast (*Pyricularia oryzae*) of rice crops, illness incidence was observed from ten randomly selected hills per plot, and the effectiveness of the molecule in suppressing these diseases was noted. Based on the disease ratings according to the SES, IRRI (2002) disease rating scale, observations were made. For every treatment, the intensity of the diseases was noted in a repeated plot, and the percentage of disease occurrence was computed using a conventional approach. Crop was harvested from each duplicated plot individually in order to record the yield, and the average paddy yield was calculated and expressed as q/ha.

Results and Discussion

As compared to the untreated control, which had 26.50 PDI of leaf blast disease at terminal observation, the treatments that performed best during Kharif 2016-17 were Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha and Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha, with 3.11 PDI and 4.44 PDI of leaf blast disease in rice recorded, respectively (Table 1). Throughout all of the observation days, the superiority of Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha and Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha was noted. Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha and Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha showed statistically similar effects on blast disease control when applied topically. With an incidence of 5.45 TDI, Kresoxim Methyl 44.3% SC was the next best treatment for blast illness. Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha (2.43 PDI) and Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha (3.99 PDI) showed a similar trend of decreased panicle blast incidence, which was followed by Kresoxim Methyl 44.3% SC (4.12 PDI). In untreated control, the highest frequency of 17.21 PDI was observed.

The treatment with Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha produced the highest paddy yield (Table 3), or 62.50 q/ha. This was also comparable to the paddy yield reported by Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha, which was 60.80 q/ha. Comparing all of the therapies to the control, they were noticeably better. 39.60 q/ha, or the minimum paddy yield, was observed in the untreated control condition.

The treatment that reduced the incidence of the disease the most during Kharif 2017-18 were Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha and Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha. The treatments with the lowest reported PDIs after the first spray were Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha and Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha, respectively. In a similar vein, following the second spray, Azoxystrobin 120 + Tebuconazole 240 SC at 830 ml/ha and 5.13 PDI and 4.54 PDI, respectively, were reported as the disease incidence. At terminal observation following the third and final spray, the treatments Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha and Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha recorded 3.33 PDI and 4.29 PDI of leaf blast, respectively, compared to 23.96 PDI of leaf blast disease in the untreated control (Table 2). Throughout all of the observation days, the superiority of Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha and Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha was noted. Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha and Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha showed statistically similar effects on blast disease control when applied topically. With an incidence of 4.67 PDI, Kresoxim Methyl 44.3% SC was the next best treatment for blast illness. Treatments with Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha and Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha showed a similar trend of decreased panicle blast incidence, which was followed with Kresoxim Methyl 44.3% SC. Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha (2.24 PDI) and Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha (3.33 PDI) had the lowest incidence of panicle blast, followed by Kresoxim Methyl 44.3% SC (3.33 PDI). In untreated control, the highest incidence of 15.27 PDI was observed.

The treatment with Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha produced the highest paddy yield (Table 3), or 64.00 q/ha. This was comparable to the paddy yield reported by Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha, which was 62.50 q/ha. Comparing all of the therapies to the control, they were noticeably better. Under untreated control, a minimum paddy yield of 40.30 q/ha was obtained. According to Mohiddin *et al*. (2021) [6] the fungicides azoxystrobin + difenoconazole and azoxystrobin + tebuconazole were shown to be equally efficient as tricyclazole in lowering the severity of rice blast and raising rice yields. Tested for efficacy at a constant dosage of 1.0 ml/1, the various strobilurin group of molecules in combination with Triazole molecules (Azoxystrobin 18.2% + Difenconazole 11.4% SC; Metiram 55% + Pyraclostrobin (5%) WG; Tebuconazole 50% + Trifloxystrobin 25% w/w (75 WG)) effectively reduced the blast disease PDI to 26.66%, 20.63%, and 14.6%, respectively, compared to the control PDI of 54.46% (Rajeswari *et al*., 2023) [7]. Based on the investigations, it is evident that the foliar application of Tebuconazole 240 SC + Azoxystrobin 120 fungicide at 676 to 830 ml/ha effectively controlled the incidence of blast disease and increased rice yield. All of the observation days revealed that the fungicides Azoxystrobin 120 + Tebuconazole 240 SC @ 676 ml/ha and Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha were performing similarly. Therefore, it can be concluded that the fungicide Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha is beneficial in regulating the blast diseases of rice, considering both the economics and efficacy of fungicide application.

Table 1: Efficacy of Azoxystrobin 120 + Tebuconazole 240 SC on blast disease incidence of Rice during *Kharif* 2016-17

Tr. No.	Treatment details	Dosage per hectare		Percent Disease Index (PDI) 10 days after			
		A.I. (gm)	Formn. (ml)	I spray	II spray	III spray	Panicle blast
T_1	Azoxystrobin 120 + Tebuconazole 240 SC	156	520	7.22 (15.55)	6.89 (15.11)	6.35 (14.59)	5.42 (13.17)
T_2	Azoxystrobin 120 + Tebuconazole 240 SC	203	676	6.44 (14.58)	5.44 (13.44)	4.44 (12.13)	3.99 (10.57)
T_3	Azoxystrobin 120 + Tebuconazole 240 SC	249	830	4.89 (12.72)	3.56 (10.65)	3.11 (10.04)	2.43 (8.06)
T_4	Hexaconazole 5% EC	50	1000	12.80 (20.96)	17.72 (24.58)	23.67 (29.13)	16.33 (23.83)
T_5	Tebuconazole 25.9% EC	187.5	750	8.56 (16.95)	10.78 (19.01)	13.28 (21.39)	9.36 (17.55)

T_6	Kresoxim Methyl 44.3% SC	250	500	6.56 (14.84)	5.89 (13.97)	5.45 (13.46)	4.12 (11.08)
T_7	Kitazin 48% EC	0.10%	0.20%	10.37 (18.72)	13.97 (21.85)	18.56 (25.55)	11.07 (19.36)
T_8	Untreated control	-	-	18.21 (25.25)	21.89 (27.78)	26.50 (30.98)	17.21 (24.33)
	S.Em (±)	-	-	1.09	0.82	1.24	0.90
	CD (P = 0.05)	-	-	3.25	2.48	3.75	2.74

*Data in the parenthesis is angular transformed value

Table 2: Efficacy of Azoxystrobin 120 + Tebuconazole 240 SC on blast disease incidence of Rice during *Kharif* 2017-18

Tr. No.	Treatment details	Dosage per hectare		Percent Disease Index (PDI) 10 days after			
		A.I. (gm)	Formn. (ml)	I spray	II spray	III spray	Panicle blast
T_1	Azoxystrobin 120 + Tebuconazole 240 SC	156	520	6.67 (14.97)	6.46 (14.24)	5.86 (14.03)	5.25 (13.26)
T_2	Azoxystrobin 120 + Tebuconazole 240 SC	203	676	5.25 (13.26)	5.13 (13.09)	4.29 (11.29)	3.33 (10.53)
T_3	Azoxystrobin 120 + Tebuconazole 240 SC	249	830	4.67 (12.48)	4.54 (12.32)	3.33 (10.52)	2.24 (8.63)
T_4	Hexaconazole 5% EC	50	1000	11.65 (19.98)	13.21 (21.33)	16.53 (24.01)	15.14 (22.91)
T_5	Tebuconazole 25.9% EC	187.5	750	7.69 (16.12)	9.12 (17.60)	11.65 (19.98)	7.22 (15.55)
T_6	Kresoxim Methyl 44.3% SC	250	500	5.98 (14.16)	5.13 (13.09)	4.67 (12.48)	3.33 (10.53)
T_7	Kitazin 48% EC	0.10%	0.20%	8.12 (16.57)	9.43 (17.70)	11.10 (19.48)	9.36 (17.55)
T_8	Untreated control	-	-	17.63 (24.88)	19.54 (26.25)	23.96 (29.32)	15.27 (23.01)
	S.Em (±)	-	-	0.99	1.20	0.54	0.72
	CD (P = 0.05)	-	-	2.98	3.61	1.63	2.16

*Data in the parenthesis is angular transformed value

Table 3: Efficacy of Azoxystrobin 120 + Tebuconazole 240 SC on yield of Paddy during *Kharif* 2016-17 and *Kharif* 2017-18

Tr. No.	Treatment details	Dosage per hectare		Yield (Q/ha)	
		A.I. (gm)	Formulation (ml)	*Kharif* 2016-17	*Kharif* 2017-18
T_1	Azoxystrobin 120 + Tebuconazole 240 SC	156	520	58.10	60.00
T_2	Azoxystrobin 120 + Tebuconazole 240 SC	203	676	60.80	62.50
T_3	Azoxystrobin 120 + Tebuconazole 240 SC	249	830	62.50	64.00
T_4	Hexaconazole 5% EC	50	1000	50.30	53.70
T_5	Tebuconazole 25.9% EC	187.5	750	55.70	57.60
T_6	Kresoxim Methyl 44.3% SC	250	500	58.40	61.40
T_7	Kitazin 48% EC	0.10%	0.20%	47.80	50.60
T_8	Untreated control	-	-	39.60	40.30
	S.Em (±)	-	-	1.21	1.33
	CD (P = 0.05)	-	-	3.73	4.00

Conclusion

Chemical management is now the most widely used and most successful disease control strategy for mitigating crop losses from blasts globally. The yield produced will be disease free and superior quality. Fungicide Azoxystrobin 120 + Tebuconazole 240 SC @ 830 ml/ha is effective in managing the blast diseases based on the effectiveness and economics of fungicide use in rice.

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