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Bio-efficacy of tricyclazole 22.5% W/V + azoxystrobin 7.5% W/V against sheath blight disease of paddy

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Abstract
A new combination fungicide Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W) was tested against rice sheath blight diseases under field condition during *Kharif* 2015 and *Rabi* 2015-16. The combination fungicide Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W) at 1000 ml/ha was found effective against sheath blight diseases by recording least Percent Disease Index (PDI) of 14.44 during *Kharif* 2015 and 13.35 during *Rabi* 2015-16. Significant increase in grain yield (61.53 q/h) was also observed in the plots treated with Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W) at 1000 ml/ha in *Kharif* 2015 (61.53 q/ha) and *Rabi* 2015-16 (64.62 q/ha), whereas, other fungicide treatments recorded the yield in a range of 48.88 – 59.53 q/ha (*Kharif* 2015) and 46.26 – 61.28 q/ha (*Rabi* 2015-16).

Keywords: Combination fungicides, rice, sheath blight, tricyclazole 22.5% W/V, azoxystrobin 7.5% W/V (6.79% W/W)

Introduction
Rice (*Oryza sativa* L.) is one of the most important food crops worldwide. In Asia, more than 90% of the rice is grown and consumed by nearly 60% of the world's population [1, 2]. It is affected by many biotic and abiotic stresses, among the biotic stresses; sheath blight is very important disease. The pathogen, *Rhizoctonia solani* has a wide host range infecting different crops and weeds [3]. Sheath disease of rice is a complex biotic stress, caused by *R. solani* (sheath blight), *R. oryzae* (sheath spot) and *R. oryzae-sativae* (aggregate sheath spot) [2]. Among these three, sheath blight of rice caused by *R. solani* (teleomorph: *Thanatephorus cucumeris*) is a destructive disease in many rice growing areas of the world, and this could reduce the grain yield by 58.60% [1, 4, 5]. In India, an estimation of losses due to the sheath blight disease alone has been up to 54.3% [6-8]. The disease has got more importance in intensive rice production systems due to excess use of nitrogenous fertilizers [8,9].
Previously, in India either solo or combination fungicides have been reported against different fungal diseases of rice such as blast [10-12], sheath blight [8, 10, 11, 13, 14], sheath rot [14], stem rot [15] and false smut [16-18]. Sheath blight disease is one of the most important diseases of rice but there is no genetic resistance available in rice against this disease [19]. Management of sheath blight of rice through fungicides is successful in majority of the cases [8, 11, 14, 20, 21]. For sheath blight, most of the fungicides like carbendazim, captafol, mancozeb, thiophanate, carboxin, zineb, benomyl, chloroneb, edifenphos, iprobenphos, etc. have been found effective under field conditions [8, 11, 22-24]. Along with theses fungicides some of the new molecules have arrived which have combination fungicides like Trifloxystrobin 25% + Tebuconazole 50% 75WG, Azoxystrobin 18.2% + Difenoconazole 11.4% SC, Kresoxim methyl 40% + Hexaconazole 8% WG and Azoxystrobin 11% + Tebuconazole 18.3% w/w SC have been shown to control the sheath blight disease under field condition [8, 11, 20, 21, 25].
Although, fungicides are very effective in managing the fungal diseases, continuous use of same fungicide can lead to development of fungicide tolerance or even resurgence in fungal population; therefore, it is inevitable to search for new group of molecules with different mode

of action. New information generated on diverse fungicides with different modes of action can be offered to farmers for effective control of fungal diseases. In this view, the present study was undertaken to appraise the field efficacy of Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W) against sheath blight disease of paddy under field conditions.

Materials and methods

A field experiment was carried out to evaluate bioefficacy of a fungicide Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W) during *Kharif* -2015 and *Rabi* 2015-16 on sheath blight disease of rice at the AICRP-Rice, ARS, Gangavathi (UAS Raichur), Karnataka. The test variety BPT5204 was used. The experimental plots were laid out in randomized block design with three replications of eight treatments with a plot size of 40 sq. m and seedlings of 30 days old were planted in trail plots at 20×15 cm spacing.

The experiment comprises of eight treatments with three replications. A new fungicide Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W) was tested in four doses (@ 800, 900, 1000 and 2000 ml/ha) along with Tebuconazole + Trifloxystrobin 75 WG (@200 g/ha), Tricyclazole 75% WP (@300 g/ha), Azoxystrobin 25% SC (@300 ml/ha). Two sprays of the fungicide were made at 15 days interval starting from the initiation of the disease. Artificial inoculation of sheath blight disease was done at 45 days after transplanting by following the 'mycelium with typha grass' method described previously [26].

Observations were recorded on disease severity in each treatment before and after two sprays as per the standard method. The observations of severity of sheath blight disease were recorded using 0-9 scale (SES, IRRI, 1996) at before and after each spray. In each replicated plot of the treatments, twenty randomly selected hills were selected and scored as per scale. The percent disease index (PDI) of plants was calculated by the following formula as presented below.

$$\text{PDI} = \frac{\text{Sum of numerical rating}}{\text{Total no. of hills observed X Maximum grade}} \text{x } 100$$

Results and discussion

In the recent years, combination fungicides are being widely used for the management of fungal diseases under field conditions due to their broad spectrum, curative action and low dosage compared to their solo formulation. In paddy, the efficacy of such combination products in managing fungal disease has been reported previously [8, 11, 14, 20, 21, 25].

In the present study, field experiment revealed that the treatment of Tricyclazole22.5% W/V (20.36% W/W) + Azoxystrobin7.5% W/V (6.79% W/W) at 1000 ml/ha after two applications at 15 days interval recorded least PDI of sheath blight disease in *Kharif* 2015 (14.44) and *Rabi* 2015-16 (13.35). The same dose was statistically on par with that of same treatment at 2000 ml/ha. The data also suggest that the standard check treatment Tebuconazole + Trifloxystrobin 75 WG at 200 g/ha recorded significantly more PDI over that Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W) at 1000 ml/ha at final observation. Maximum PDI was recorded in untreated control (Table 1). The higher field bio-efficacy of combination fungicides against sheath blight disease of paddy has been reported previously where, combination fungicides Azoxystrobin 11% + Tebuconazole 18.3% w/w SC at 750-1000 ml/ha and Trifloxystrobin 25% + Tebuconazole 50% at 0.4 g/l were reported as effective against sheath blight disease of paddy [8, 11].

Optimum use of fungicides has been reported to enhance the crop yield due to reduction in disease load [8, 11, 12, 27, 28]. In the present study different level of severity of sheath blight in different treatment was observed (Table 1) and that was reflected in the final grain yield (Table 2). Significant increase in the grain yield in *Kharif* 2015 (61.53 q/ha) and *Rabi* 2015-16 (64.62 q/ha) was observed in the treatment treated with Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W) at 1000 ml/ha followed by the same chemical at 2000 ml/ha (Table 2). Whereas, the other fungicidal treatments recorded the yield in a range of 48.88 – 59.53 q/ha in *Kharif* 2015 and 46.26 – 61.28 q/ha in *Rabi* 2015-16. The fair raise in the yield was mainly due to the reduced severity in the sheath blight disease of paddy. Our results are in conformity with those of previous reports [8, 11, 12, 20, 27] reported that fungicides application increases the yield of rice.

In conclusion, present investigation provides the field efficacy of a fungicide Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W) at 1000 ml/ha for management of sheath blight disease of paddy.

Table 1: Effect of Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W) application of against Sheath blight disease of rice

S. No.	Treatments	Dose	Sheath Blight (PDI)						Pooled	Percent Disease Reduction over Control	
			Kharif -2015			*Rabi* -2015-16					
			Initial score	15 days after 1st spraying	15 days after 2nd spraying	Initial score	15 days after 1st spraying	15 days after 2nd spraying		*Kharif* - 2015	*Rabi* - 2015-16
1	Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W)	800	25.33	23.33	21.53	29.99	25.55	20.03	20.78	52.7	63.94
2	Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W)	900	33.33	25.55	20.55	31.33	22.22	21.55	21.05	54.8	61.2
3	Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W)	1000	31.55	18.88	14.44	31.11	17.77	13.35	13.89	68.3	75.96
4	Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W)	2000	25.55	16.45	13.55	35.55	17.56	11.23	12.39	70.25	79.78
5	Nativo (Tebuconazole +	200	31.11	28.58	22.53	29.99	22.55	19.55	21.04	50.5	64.8

	Trifloxystrobin 75 WG)										
6	Tricyclazole 75% WP	300	33.33	35.55	39.99	28.88	39.99	45.55	42.77	12.2	18.01
7	Azoxystrobin 25 SC	300	29.99	27.77	25.55	30.33	25.55	24.44	24.99	43.9	56.00
8	Control	--	33.33	39.99	45.55	26.66	41.11	55.55	50.55	--	--
CV @ 5%			NS	11.5	10.8	NS	10.5	12.85			
CD			NS	3.95	4.2	NS	3.42	4.6			

Table 2: Effect of application of Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W) on grain yield *Kharif*–2015 and *Rabi* -2015-16

S. No.	Treatments	Product Dose (ml or gm/ ha)	Grain Yield (q/ha)	
			***Kharif* – 2015**	***Rabi* – 2015-16**
1	Tricyclazole 22.5%W/V (20.36%W/W) + Azoxystrobin 7.5% W/V (6.79% W/W)	800	52.55	58.65
2	Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W)	900	53.55	54.82
3	Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W)	1000	61.53	64.62
4	Tricyclazole 22.5% W/V (20.36% W/W) + Azoxystrobin 7.5% W/V (6.79% W/W)	2000	59.53	61.28
5	Nativo (Tebuconazole + Trifloxystrobin 75 WG)	200	54.26	55.23
6	Tricyclazole 75% WP	300	49.53	48.85
7	Azoxystrobin 25 SC	300	48.88	46.26
8	Control	--	41.53	39.25
CV @5%			13.56	10.22
CD			3.8	4.11

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