Original Research Article

Evaluation of a new combination fungicide azoxystrobin 11% + tebuconazole 18.3% w/w SC for management of sheath blight disease of paddy

ABSTRACT:

Aims: Present study was under taken to determine the field efficacy of a new combination fungicide azoxystrobin 11% + tebuconazole 18.3% w/w SC against sheath disease of rice.

Study design: Randomized complete block design (RCBD).

Place and Duration of Study: All India Co-ordinated Rice improvement Programme, Agricultural Research Station, Gangavathi (5.4319° N, 76.5315°E), Karnataka, India, during *Kharif* 2014 and *Rabi* 2014-15

Methodology: Experiment was designed with seven treatments of three replications each. A new formulations *viz*., azoxystrobin 11% + tebuconazole 18.3% w/w SC was tested in three dosages (500, 750 & 1000 g/ha) along with other fungicidal treatments such as azoxystrobin23 % SC at 500 gm/ha, tebuconazole 25.9 % EC at 750 g/ha and validamycin 3% L at 2000 g/ha. Bioefficacy was analysed after spraying all the test chemicals thrice at 15 days interval starting from initiation of the disease

Results: The combination fungicide azoxystrobin 11% + tebuconazole 18.3% w/w SC at 1000 ml/ha was found effective against sheath blight disease recording least percent disease index (PDI) of 10.93 during *Kharif* 2014. Similar result was observed in *Rabi* 2014-15 where same test fungicide azoxystrobin 11% + tebuconazole 18.3% at 1000 ml/ha recorded the least PDI of 11.60. Compared to azoxystrobin 11% + tebuconazole 18.3%, other test fungicides such as azoxystrobin 23 % SC, tebuconazole 25.9 % EC and validamycin 3% L recorded highest PDI in both *Kharif* 2014 and *Rabi* 2014-15. Significant increases in the grain yield over other treatments (7527 kg/ha) was observed in the plots treated with test chemical azoxystrobin 11% + tebuconazole 18.3% w/w SC at 1000 ml/ha in *Kharif* 2014 and 5796 kg/ha in *Rabi* 2014-15. Whereas, other fungicidal treatments recorded the yield range of 5925-6217 kg/ha in *Kharif* 2014 and 4584 – 5682 kg/ha in *Rabi* 2014-15.

Conclusion: Present investigation provides the field efficacy of the fungicide mixture Azoxystrobin 11% + Tebuconazole 18.3% w/w SC at 750-1000 ml/ha for management of sheath blight disease of paddy.

Key words: *Rice*, *Azoxystrobin, Tebuconazole, Sheath blight, percent disease index, Rhizoctonia solani*

1. INTRODUCTION

Rice (*Oryza sativa* L.) is one of the most important cereals of the world and is consumed by 50% of the world population (1). In India, it is cultivated on an area of 53.2 million hectares with a total production of 99.8 million tons. In Karnataka it is cultivated on an area of 1.53 million hectares with a total production of 3.80 million tons (2). Rice crop under field condition is affected by many biotic constraints. Among the biotic constraints, disease caused by fungal pathogen like rice sheath blight is more frequent and destructive in irrigated rice of both temperate and subtropical areas and it causes damage at all the stages of crop growth (3).

Sheath blight is caused by *Rhizoctonia solani* Kuhn., is an important disease of rice occurs in all the rice production areas of the world and causes more economic yield losses (4-6) . In India, a modest estimation of losses due to sheath blight disease alone has been up to 54.3 % (7,8) and this disease is particularly most prevalent in intensive rice cultivation system due to excess use of nitrogenous fertilizers. And 5-10% yield loss reported in subtropical low land paddy cultivars of Asia (5).

Under field condition, fungicide based management is most successful in majority of the cases (9-11). Most of the fungicides such as benomyl, carbendazim, chloroneb, captafol, mancozeb, zineb, edifenphos, iprobenphos, thiophanate, carboxin, *etc*. have been found effective under field conditions (12-14). Recently many combination fungicides such as kresoxim methyl 40% + hexaconazole 8%, azoxystrobin 18.2% + difenoconazole 11.4% SC, trifloxystrobin 25% + tebuconazole 50% 75 WG, and kasugamycin 5% + copper oxychloride 45% WP, have been shown to control the sheath blight disease under field condition (10, 15-18).

Continuous use of same group fungicides having same mode of action will lead to the development of resistant strain of same fungi and hence, it is necessary to search for a new molecule with different mode of action (18). Thus, present study was under taken to determine the field efficacy of a new combination fungicide azoxystrobin 11% + tebuconazole 18.3% w/w SC against sheath blight disease of rice under field conditions.

2. METHODOLOGY

2.1. Layout, Fungicides and Crop establishment: A field experiment was conducted at the experimental fields of Agricultural Research Station, Gangavathi, Karnataka (5.4319° N, 76.5315° E) during *Kharif* 2014 and *Rabi* 2014-15 in randomized complete block design (RCBD). A popular rice variety BPT5204 which is susceptible to sheath blight disease was used for the study. Seeds of the

rice variety BPT5204 were sown in the month of July and planted in August (for *Kharif* 2014 experiment). Whereas, for *Rabi* 2014-15 experiment, seeds were sown the month of November and planted in the month of December. Land was prepared as per the standard agronomical practices. The experiment was laid out in RCBD with a plot size of 5 x 4 m each for all treatments. Seedlings of 30 days old were planted in trail plots at 20X10 cm spacing. All standard agronomic practices were followed except using higher nitrogenous (200 kg/ha) and lower pottasic (50 kg/ha) fertilizer dose than the normal dose (N2:P2O5:K2O::150:75:75).

Experiment was designed with seven treatments of three replications each. A new formulations *viz*., azoxystrobin 11% + tebuconazole 18.3% w/w SC was tested in three dosages (500, 750 & 1000 g/ha) along with other fungicidal treatments such as azoxystrobin23 %SC at500 gm/ha, tebuconazole 25.9 %EC at 750 gm/ha and validamycin 3% L at 2000 gm/ha. Bioefficacy was analysed after spraying all the test chemicals thrice at 15 days interval starting from initiation of the disease.

2.2. Artificial inoculation:

A virulent local isolate of *R. solani* was artificially multiplied on typha grass and were used for artificially inoculation to all experimental treatments after 45 days of planting following the 'mycelium with typha grass' method described previously (18).

2.3. Disease assessment and statistical analysis:

In both Kharif-14 and Rabi-2014-15 experiment, sheath blight disease was measured in all treatments 10 days after the fungicide application. The disease was measured using the disease rating scale of 0-9 developed by International Rice Research Institute (IRRI. 1996) for sheath blight disease. Further, the scored data was converted into per cent disease index (PDI) using formula given below. The data on the yield were recorded by marking 2x 2 m section within each plot using a wire frame as described by (19).

$$PDI = \frac{\text{Sum of the scores}}{\text{Number of Observation X Highest Number in Rating Scale}} \times 100$$

2.4. Statistical analysis:

All the observation on disease severity and yield parameters were subjected to appropriate statistical analysis.

3. RESULTS and DISCUSSION:

In recent years the combination fungicides are most widely used for disease management under field condition because of their curative action, broad host range and lower dosage compared to solo

fungicides. In paddy the efficacy of such combination products in managing much fungal disease has been reported (10,15-17).

Present field experiement revealed that the treatment azoxystrobin 11% + tebuconazole 18.3% w/w SC at 1000ml/ha recorded lowest PDI of sheath blight in *Kharif* 2014 (10.93) and *Rabi* 2014-15 (11.60) compared to other treatments. In *Kharif* 2014 and *Rabi*-2014-15, the data also suggested that other fungicides such as Azoxystrobin 23 %SC at 500 ml/ha, validamycin 3% L at 2000 ml/ha and tebuconazole 25.9 %EC at 750 ml/ha are at par with among themselves but stands next to the azoxystrobin 11% + tebuconazole 18.3% w/w SC at 750-1000 ml/ha (Table 1 & 2). These findings are in consistent with the results of previous investigations, where trifloxystrobin 25% + tebuconazole 50 % w/w SC at 0.4 g/l performed better in reducing the sheath blight disease severity (16). Results reported by Bhuvaneshwari and Raju (10) where better efficacy of combination fungicide azoxystrobin 18.2% + difenconazole 11.4% SC (strobilurin + triazole) against sheath blight disease is much better than other solo fungicides. Various reviews confirmed that strobilurin compounds found to be effective in controlling many diseases like leaf blast, (18, 19), sheath blight (18-23), grain discolouration (16) and sheath rot and brown leaf spot (25). In this experiment, our report also confirms the better efficacy of strobilurin derived fungicide against sheath blight disease of rice.

Application of fungicides has been reported to enhance the crop yield due to reduction in disease load (18, 20-27). In our experiment, the difference in disease severity of sheath blight in different treatment was observed (Table 1& 2) and it was finally reflected in the grain yield (Table 3). Significant increase in the grain yield in *Kharif* 2014 (75.27 q/ha) and Rabi 2014-15 (57.96 q/ha) was observed in the plot treated with test chemical azoxystrobin 11% + tebuconazole 18.3% w/w SC at 1000 ml/ha. Whereas, other fungicidal treatments recorded the yield range of 59.25- 62.17 q/ha in *Kharif* 2014 and 45.84 - 56.82 q/ha in Rabi 2014-15. The increased yield is mainly due to reduced disease severity of sheath blight disease of rice.

4. CONCLUSION:

Present investigation provides the field efficacy of the fungicide mixture Azoxystrobin 11% + Tebuconazole 18.3% w/w SC at 750-1000 ml/ha for management of sheath blight disease of paddy.

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Table. 1. Effect of Azoxystrobin 11% +Tebuconazole 18.3% w/w SC application of against sheath blight disease on rice during *Kharif* - 2014

SL. No	Treatments	Product Concentration (%)	Product ml or g/ha	Sheath blight PDI				Percent disease Control
				Initial score	Ten day after 1st spraying	Ten day after 2nd spraying	Terminal score (Ten days after 3rd spraying)	
1	Azoxystrobin 11% +Tebuconazole 18.3% w/w SC	55+91.5	500	6.67 (14.96)	10.93 (19.30)	13.33 (21.42)	16.67 (24.09)	58.71
2	Azoxystrobin 11% +Tebuconazole 18.3% w/w SC	82.5+137.25	750	6.11 (14.31)	7.41 (15.79)	9.26 (17.72)	11.11 (19.47)	72.47
3	Azoxystrobin 11% +Tebuconazole 18.3% w/w SC	110+183	1000	6.48 (14.75)	7.22 (15.59)	9.07 (17.53)	10.93 (19.30)	72.93
4	Azoxystrobin 23 %SC	125	500	6.30 (14.53)	10.00 (18.43)	12.04 (20.30)	15.37 (23.08)	61.93
5	Tebuconazole 25.9% EC	187.5	750	6.11 (14.31)	11.11 (19.47)	13.15 (21.26)	15.93 (23.52)	60.54
6	Validamycin 3% L	60	2000	6.48 (14.75)	10.37 (18.79)	12.78 (20.94)	15.74 (23.37)	61.01
7	Control	-	-	6.11 (14.31)	16.11 (23.66)	27.22 (31.45)	40.37 (39.45)	-
			CD at 5% level	N.S.	1.51	1.73	1.81	
			Coefficient of Variation @ 5%	NS	15.55	10.23	13.84	

Note: The figures in the parenthesis are Arc sin transformed values

Table 2: Effect of Azoxystrobin 11% +Tebuconazole 18.3% w/w SC application of against sheath blight disease on rice during *Rabi* – 2014-15

S. No	Treatments	Product Concentration (%)	Product ml or g/ha	Percent Disease Index (PDI)				Percent disease Control
				Initial score	Ten day after 1st spraying	Ten day after 2nd spraying	Ten days after 3rd spraying)	
1	Azoxystrobin 11% +Tebuconazole 18.3% w/w SC	55+91.5	500	8.00 (16.43)	11.60 (19.91)	13.67 (21.69)	17.33 (24.61)	58.71
2	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	82.5+137.25	750	7.45 (15.84)	8.08 (16.52)	9.59 (18.04)	11.78 (20.07)	71.95
3	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	110+183	1000	7.80 (16.22)	7.89 (16.31)	9.40 (17.86)	11.60 (19.91)	72.38
4	Azoxystrobin 23 %SC	125	500	7.67 (16.08)	10.67 (19.07)	12.37 (20.59)	16.04 (23.61)	61.81
5	Tebuconazole 25.9% EC	187.5	750	7.45 (15.84)	11.78 (20.07)	13.48 (21.54)	16.60 (24.05)	60.48
6	Validamycin 3% L	60	2000	7.83 (16.25)	11.04 (19.41)	13.11 (21.23)	16.41 (23.90)	610.93
7	Control	-	-	7.45 (15.84)	18.78 (25.68)	28.68 (32.38)	42.00 (40.40)	-
CD at 5% level				N.S.	1.87	2.10	2.27	
Coefficient of Variation @ 5%				NS	13.26	12.58	14.44	

Note: The figures in the parenthesis are Arc sin transformed values

Table 3: Effect of application of Azoxystrobin 11% +Tebuconazole 18.3% w/w SC against Sheath blight of rice during *Kharif* – 2014 and Rabi-2014-15

SL. No.	Treatments	Product Concentration (%)	Product ml or g/ha	Grain Yield (kg/ha)	
				Kharif - 2014	Rabi 2014-15
1	Azoxystrobin 11% +Tebuconazole 18.3% w/w SC	55+91.5	500	5925	4594
2	Azoxystrobin 11% +Tebuconazole 18.3% w/w SC	82.5+137.25	750	7483	5682
3	Azoxystrobin 11% +Tebuconazole 18.3% w/w SC	110+183	1000	7527	5796
4	Azoxystrobin 23 %SC	125	500	6217	4886
5	Tebuconazole 25.9% EC	187.5	750	6168	4619
6	Validamycin 3% L	60	2000	6215	4584
7	Control	-	-	5225	3800
			CD at 5% level	302	289
			Coefficient of Variation @ 5%	11.06	15.22