

**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 blight 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 azoxystrobin 23-% 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.

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

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

## 37 1. INTRODUCTION

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

45 Sheath blight, is caused by *Rhizoctonia solani* Kuhn., is an important disease of rice occurs  
46 in all the rice production-growing areas of the world and causes more economic yield losses (4-6) . In  
47 India, a modest estimation of losses due to sheath blight disease alone has been up to 54.3 % (7,8)  
48 and this disease is particularly most prevalent in intensive rice cultivation system due to excess use of  
49 nitrogenous fertilizers. And 5-10% yield loss reported in subtropical low land paddy cultivars of Asia  
50 (5).

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

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

## 63 2. METHODOLOGY

64 **2.1. Layout, Fungicides and Crop establishment:** A field experiment was conducted at the  
65 experimental fields of Agricultural Research Station, Gangavathi, Karnataka (5.4319° N, 76.5315° E)  
66 during Kharif 2014 and Rabi 2014-15 in randomized complete block design (RCBD). A popular rice  
67 variety BPT5204 which is susceptible to sheath blight disease was used for the study. Seeds of the

68 rice variety BPT5204 were sown in the month of July and planted in August (for *Kharif* 2014  
69 experiment). Whereas, for *Rabi* 2014-15 experiment, seeds were sown the month of November and  
70 planted in the month of December. Land was prepared as per the standard agronomical practices.  
71 The experiment was laid out in RCBD with a plot size of 5 x 4 m each for all treatments. Seedlings of  
72 30 days old were planted in trail plots at 20X10 cm spacing. All standard agronomic practices were  
73 followed except using higher nitrogenous (200 kg/ha) and lower pottasic (50 kg/ha) fertilizer dose than  
74 the normal dose (N<sub>2</sub>:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O::150:75:75).

75 Experiment was designed with seven treatments of three replications each. A new  
76 formulations *viz.*, azoxystrobin 11% + tebuconazole 18.3% w/w SC was tested in three dosages (500,  
77 750 & 1000 g/ha) along with other fungicidal treatments such as azoxystrobin23 %SC at500 gm/ha,  
78 tebuconazole 25.9 %EC at 750 gm/ha and validamycin 3% L at 2000 gm/ha. Bioefficacy was  
79 analysed after spraying all the test chemicals thrice at 15 days interval starting from initiation of the  
80 disease.

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## 82 **2.2. Artificial inoculation:**

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

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## 87 **2.3. Disease assessment and statistical analysis:**

88 In both *Kharif*-14 and *Rabi*-2014-15 experiment, sheath blight disease was measured in all treatments  
89 10 days after the fungicide application. The disease was measured using the disease rating scale of  
90 0-9 developed by International Rice Research Institute (IRRI. 1996) for sheath blight disease. Further,  
91 the scored data was converted into per cent disease index (PDI) using formula given below. The data  
92 on the yield were recorded by marking 2x 2 m section within each plot using a wire frame as  
93 described by (19).

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96

Sum of the scores

97

PDI = ----- x 100

98

Number of Observation X Highest Number in Rating Scale

99

## 100 **2.4. Statistical analysis:**

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

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## 104 **3. RESULTS and DISCUSSION:**

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

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

109 Present field experiment revealed that the treatment azoxystrobin 11% + tebuconazole  
110 18.3% w/w SC at 1000ml/ha recorded lowest PDI of sheath blight in *Kharif* 2014 (10.93) and *Rabi*  
111 2014-15 (11.60) compared to other treatments. In *Kharif* 2014 and *Rabi*-2014-15, the data also  
112 suggested that other fungicides such as Azoxystrobin 23 %SC at 500 ml/ha, validamycin 3% L at  
113 2000 ml/ha and tebuconazole 25.9 %EC at 750 ml/ha are at par with among themselves but stands  
114 next to the azoxystrobin 11% + tebuconazole 18.3% w/w SC at 750-1000 ml/ha (Table 1 & 2). These  
115 findings are in consistent with the results of previous investigations, where trifloxystrobin 25% +  
116 tebuconazole 50 % w/w SC at 0.4 g/l performed better in reducing the sheath blight disease severity  
117 (4617). Results reported by Bhuvaneshwari and Raju (10) where better efficacy of combination  
118 fungicide azoxystrobin 18.2% + difenconazole 11.4% SC (strobilurin + triazole) against sheath blight  
119 disease is much better than other solo fungicides. Various reviews confirmed that strobilurin  
120 compounds found to be effective in controlling many diseases like leaf blast, (18, 19), sheath blight  
121 (4817-23), grain discolouration (16) and sheath rot and brown leaf spot (25). In this experiment, our  
122 report also confirms the better efficacy of strobilurin derived fungicide against sheath blight disease of  
123 rice.

124 Application of fungicides has been reported to enhance the crop yield due to reduction in  
125 disease load (18, 20-27). In our experiment, the difference in disease severity of sheath blight in  
126 different treatment was observed (Table 1 & 2) and it was finally reflected in the grain yield (Table 3).  
127 Significant increase in the grain yield in *Kharif* 2014 (75.27 q/ha) and *Rabi* 2014-15 (57.96 q/ha) was  
128 observed in the plot treated with test chemical azoxystrobin 11% + tebuconazole 18.3% w/w SC at  
129 1000 ml/ha. Whereas, other fungicidal treatments recorded the yield range of 59.25- 62.17 q/ha in  
130 *Kharif* 2014 and 45.84 - 56.82 q/ha in *Rabi* 2014-15. The increased yield is mainly due to reduced  
131 disease severity of sheath blight disease of rice.

#### 132 4. CONCLUSION:

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

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UNDER PEER REVIEW

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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 1 <sup>st</sup> spraying	Ten day after 2 <sup>nd</sup> spraying	Terminal score (Ten days after 3 <sup>rd</sup> 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	

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

212 **Table 2: Effect of Azoxystrobin 11% +Tebuconazole 18.3% w/w SC application of against sheath blight disease on rice during Rabi –**  
 213 **2014-15**

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S. No	Treatments	Product Concentration (%)	Product ml or g/ha	Percent Disease Index (PDI)				Percent disease Control
				Initial score	Ten day after 1 <sup>st</sup> spraying	Ten day after 2 <sup>nd</sup> spraying	Ten days after 3 <sup>rd</sup> 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	

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

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**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)	
				<i>Kharif</i> - 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

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