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EFFICACY OF NEW FUNGICIDE FOR THE MANAGEMENT OF SHEATH BLIGHT DISEASE OF RICE UNDER FIELD CONDITIONS

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ABSTRACT

Sheath blight of rice caused by *Rhizoctonia solani* Kühn is one of the most devastating diseases in Chhattisgarh. Due to widespread cultivation of susceptible variety Swarna, the disease has spread in large scale and sometimes cause severe damage even 100% crop loss also occurs. Cultural practices combined with spraying fungicides are the most common practice to manage the disease. An attempt was made to evaluate the efficacy of a new fungicide – a combination of two systemic fungicides *viz*., Azoxystrobin 18.2% w/w (Strobilurin compound) and Difenoconazole 11.4% w/w SC (Triazole compound) along with other commercially available fungicides Kresoxim methyl 40% + Hexaconazole 8% WG (Ayaan), Tebuconazole 50% + Trifloxystrobin 25% (Nativo), Thifluzamide 24% SC, Hexaconazole 75% WG (Epic), Hexaconazole 5% EC (Contaf plus 5% SC), Tricyclazole 75% WP, Difenoconazole 25 EC, Propiconazole 25% EC, Validamycine 3% L, Azoxystrobin 12.5% + Febuconazole 12.5% SC w/w under challenge inoculation condition. Among all fungicides, Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC was highly effective in reducing the sheath blight intensity with minimum percent disease index (PDI) 22.22% and 14.07%, respectively and gave higher grain yield. The new fungicide was most effective in decreasing disease severity and increasing grain yield.

Key words : Sheath blight, *Rhizoctonia solani*, New fungicide molecule.

Introduction

Rice (*Oryza sativa* L.) is regarded as one of the most important cereal crops and a major food grain contributor to the whole world. Rice belongs to Poaceae family and consider as one of the important staple foods for Asian countries. Sheath Blight of rice caused by *Rhizoctonia solani* Kühn is one of the most important and widely distributed diseases in all the rice growing regions of the world and causes considerable losses in grain yield (Ou, 1985). Its occurrence in India was reported by Paracer and Chahal (1963) from Gurudaspur in the Punjab. Sheath blight of rice caused by *Rhizoctonia solani* Kuhn is a serious threat in rice growing areas. A modest estimation of losses due to sheath blight disease alone in India has been up to 54.3% (Rajan, 1987; Roy, 1993).

The disease is particularly important in intensive rice production systems (Savary and Mew, 1996). The pathogen has a wide host range and can infect plants belonging to more than 32 plant families and 188 genera (Gangopadyay and Chakrabarti, 1982). The disease appears at tillering stage on leaf sheath as elliptical or oval to irregular, 1-3 cm long, greenish grey spots with brown margin at or above the water line. Presence of many such spots on the leaf sheath gives the appearance of snake skin. Under favorable conditions, the infection spreads rapidly to the upper plant parts and also to the neighboring plants by means of normal emergence and expansion of the ears and results in poor filling of the grains.

The pathogen is also known to cause panicle infection resulting in production of unfilled or partially filled discolored seed bearing brownish black spots or black to ashy grey patches (Acharya *et al.*, 2004). The yield losses ranging from 4-50% have been reported depending on the crop stage at the time of infection, severity of the

disease and environmental conditions (Singh *et al.*, 2004; Zheng *et al.*, 2013; Bhunkal *et al.*, 2015). Chemical control of the sheath blight disease is successful at field level in majority of the cases (Kandhari *et al.*, 2003). The present study was undertaken to evaluate the different fungicides in different formulations for efficient control of sheath blight of rice.

Materials and Methods

Field trials were conducted during Kharif season 2020-21 and 2021-22 in a Randomized Block Design (RBD) with three replications and plot size of 5.0m X 2.0 m with spacing 15cm × 20 cm on rice variety Swarna (which is highly susceptible to sheath blight disease) at Indira Gandhi Krishi Vishwavidyalaya, Raipur (21°14'07.4"N 81°41'55.5"E) to study the efficacy of different fungicides against sheath blight of rice.

These fungicides *viz.*; Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC, Rallis (Ril- 243/cf), Kresoxim methyl 40% + Hexaconazole 8% WG (Ayaan), Tebuconazole 50% + Trifloxystrobin 25% (Nativo), Thifluzamide 24% SC, Hexaconazole 75% WG (Epic), Contaf plus 5% SC used in kharif 2020-21 and Tricyclazole 75% WP, Azoxystrobin18.2% w/w + Difenoconazole 11.4% w/w, Difenoconazole 25EC, Hexaconazole 5% EC, Propiconazole 25% EC, Validamycine 3% L Azoxystrobin 12.5% + Febuconazole 12.5% SC (Kitoshi) used in kharif 2021-22 were sprayed twice with recommended formulation. Grain yield was observed and recorded on plot basis and expressed as kg/ha.

A pure culture of a virulent isolate of *Rhizoctonia solani* was multiplied on typha leaf bits (Bhaktavatsalam *et al.*, 1978). Inoculation with *R. solani* was carried out at tillering stage. The colonized typha bits were placed between the tillers of rice plant, 5-10 cm above the water level. The disease was first noticed in maximum tillering stage. The disease severity was recorded in percent and yield in kg/ha.

Disease severity of sheath blight was recorded after each spray by Relative Lesion Height (RLH) method (IRRI, 2002) by using the following formula:

$$RLH = \frac{Lession\ height}{Plant\ height} \times 100$$

Disease Scale

0 - No infection, 1 - Vertical spread of the lesions up to 20% of plant height, 3 - Vertical spread of the lesions 21 - 30% of plant height, 5 - Vertical spread of the lesions 31 - 45% of plant height, 7 - Vertical spread of the lesions 46 - 65% of plant height, 9 - Vertical spread of the lesions > 65% of plant height.

Fig. 1 : Map of the study site.

$$PDI = \frac{Sum\ of\ all\ disease\ ratings}{Total\ no.of\ obsevation \times Maximum\ disease\ grade} \times 100$$

Where,

PDI = Percent Disease Index.

Results and Discussion

Field evaluation of fungicides, the result indicated that the two season (*Kharif* 2020-21 and 2021-22) foliar spray of the Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC treatment was found highly effective with minimum percent disease index (PDI) 22.22% and 14.07%, respectively. The Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC treatment was also statically on par with the Rallis (Ril-243/cf) 50% WG, Kresoxim methyl 40% + Hexaconazole 8% WG (Ayaan), Tebuconazole 50% + Trifloxystrobin 25% (Nativo), Thifluzamide 24% SC, Hexaconazole 75% WG (Epic), Hexaconazole 5% EC (Contaf plus 5% SC), Tricyclazole 75% wp, Difenoconazole 25 EC, Propiconazole 25% EC, Validamycine 3% L, Azoxystrobin 12.5% + Febuconazole

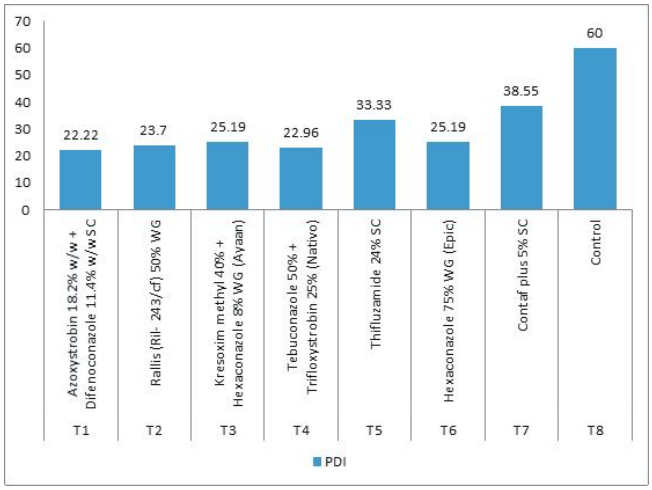

Fig. 2 : Field evaluation of fungicides against sheath blight of rice during *Kharif* season (Year 2020-21).

Table 1 : Field evaluation of fungicides against sheath blight of rice during Kharif season (year 2020-21).

Treatment	Chemical	Dose	PDI	Yield (kg/ha)
T_1	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC	1.125ml	**22.22**	**8500**
T_2	Rallis (Ril- 243/cf) 50% WG	1.5g	23.70	7880
T_3	Kresoxim methyl 40% + Hexaconazole 8% WG (Ayaan)	1.5g	25.19	8460
T_4	Tebuconazole 50% + Trifloxystrobin 25% (Nativo)	0.6g	22.96	8160
T_5	Thifluzamide 24% SC	1.125ml	33.33	8260
T_6	Hexaconazole 75% WG (Epic)	0.22g	25.19	8110
T_7	Contaf plus 5% SC	2.47ml	38.55	7800
T_8	Control	-	60.00	7210

Table 2 : Field evaluation of fungicides against sheath blight of rice during *Kharif* season (Year 2021-22).

Treatment	Chemical	Dose	PDI	Yield (kg/ha)
T_1	Tricyclazole 75% WP	0.6 gm	45.92	7033
T_2	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC	1 ml	**14.07**	**7900**
T_3	Difenoconazole 25 EC	1 ml	18.51	7366
T_4	Hexaconazole 5% EC	2 ml	16.29	7450
T_5	Propiconazole 25% EC	1 ml	15.18	7233
T_6	Validamycine 3% L	1 ml	48.14	7116
T_7	Azoxystrobin 12.5% + Febuconazole 12.5% SC w/w	0.22 ml	41.47	6850
T_8	Control	-	62.88	6416

Fig. 3 : Field evaluation of fungicides against sheath blight of rice during *Kharif* season (Year 2020-21).

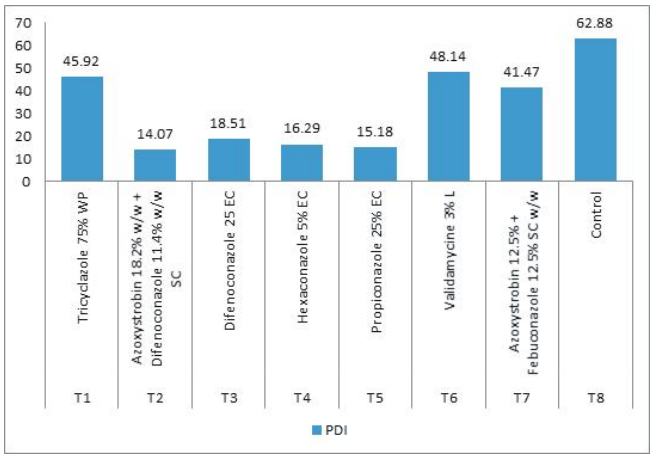

Fig. 4 : Field evaluation of fungicides against sheath blight of rice during *Kharif* season (Year 2021-22).

Fig. 5 : Field evaluation of fungicides against sheath blight of rice during *Kharif* season (Year 2021-22).

12.5% SC w/w treatment.

The highest grain yield was also recorded in Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC treatment followed by Kresoxim methyl 40% + Hexaconazole 8% WG (Ayaan), Thifluzamide 24% SC,

Tebuconazole 50% + Trifloxystrobin 25% (Nativo), Hexaconazole 5% EC (Contaf plus 5% SC), Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC, Rallis (Ril-243/cf) 50% WG, Difenoconazole 25 EC, Propiconazole 25% EC, Validamycine 3% L, Tricyclazole 75% WP treatment.

The result obtained under the *in vivo* conditions in the study clearly revealed that all fungicides significantly reduced the disease intensity over control and increased the grain yield of rice. Among all fungicides the Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC was highly effective in reducing the sheath blight intensity and was statistically on at par with Kresoxim methyl 40% + Hexaconazole 8% WG (Ayaan), Thifluzamide 24% SC, Tebuconazole 50% + Trifloxystrobin 25% (Nativo). The results of the current study are in conformity with previous studies that reported that different fungicide combinations namely; difenoconazole + azoxystrobin (Kumar, 2020), difenoconazole + azoxystrobin (Bhuvaneswari and Krishnam Raju, 2012), trifoxystrobin + tebuconazole (Bag, 2009; Visalakshmi *et al*., 2016).

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