



Efficacy of Fungicides for Management of Sheath Blight (*Rhizoctonia solani*) of paddy

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ABSTRACT

Rice sheath blight, caused by *Rhizoctonia solani*, causes significant yield losses in rice crop worldwide by damaging leaf sheaths and reducing grain quality. A field trial was conducted during *kharif* 2023 and 2024 seasons to evaluate the effectiveness of two fungicides namely Glo-it (propiconazole 13.9% + difenconazole 13.9% EC @500 ml/ha) and Pulser (Thiﬂuzamide 24 SC at 1 ml/L) in managing rice sheath blight in variety Sabour Sampann under natural conditions. Out of two fungicides tested, propiconazole 13.9% + difenconazole 13.9% EC @500 ml/ha was found to be the most effective in controlling the disease. The data revealed that the percentage of disease incidence and severity were significantly lower in crop treated with a combination (propiconazole 13.9%+difenconazole 13.9%EC) at 500ml/ha (63.08% and 40.76%) followed by crop treated with thiﬂuzamide 24 SC at 1 ml/L (66.97% and 43.69%). Significantly higher grain yield (37.72 q/ha) was also observed in the crop treated with combination product (propiconazole 13.9% + difenconazole 13.9% EC) @ 500 ml/ha followed by thiﬂuzamide 24 SC @ 1 ml/L (36.28 q/ha) and the lowest yield of 34.25 q/ha was recorded in the farmers' practice plot. The benefit cost ratio was also found higher in tested propiconazole 13.9% + difenconazole 13.9% EC (1:2.41) and thiﬂuzamide 24 SC (1:2.32) sprayed plots compared to farmers' practice plots. Hence, it can be concluded that propiconazole 13.9%+difenconazole 13.9%EC at a rate of 500 ml/ha, followed by thiﬂuzamide 24 SC at 1 ml/L, were effective fungicides in reducing sheath blight severity and increasing grain yield.

Key Words : Disease, Fungicide, Management, Paddy, Sheath blight.

INTRODUCTION

Rice productivity worldwide is influenced by various biotic and abiotic factors. Approximately 50 different biotic factors, including fungi, bacteria, viruses, nematodes, and insects, can contribute to potential yield losses in rice. Sheath blight (*Rhizoctonia solani* Kuhn) is a significant issue in the rice-growing areas worldwide. The disease was first reported in Gurdaspur, Punjab and now found in nearly all rice-growing states of India, leading to yield losses of up to 50%. depending on the stage of the crop at the time of infection, the disease's severity, and the environmental conditions. The disease is becoming more concerning due to the intensive cultivation of modern high-yielding varieties coupled with the heavy use of nitrogenous fertilizers. Sheath blight progression is accelerated by high plant density, a closed canopy, and increased nitrogen fertilizer levels. Additionally,

elevated pathogen levels in the soil contribute to greater disease pressure. Symptoms of the disease can be seen in both nursery and transplanted crops. The early symptoms of sheath blight manifest as circular, oblong, or ellipsoid greenish-grey, water-soaked spots approximately 1 cm in length, typically found on leaf sheaths near the water line. When conditions are favorable, the infection swiftly spreads to the upper leaf sheaths and leaf blades of both the same and nearby tillers. Lesions on the upper section so the plant spread quickly from the water level to the flag leaf, covering the entire tiller eventually causing the death of the leaf, tiller, and plant. A 1% rise in sheath blight incidence led to 0.38% reduction in grain yield (Saikia and Baruah, 1990). Currently, there are no rice varieties known to be immune to or highly resistant to sheath blight disease. In the lack of appropriate resistant donors, fungicides remain the primary solution to control these diseases. Several

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fungicides, including benomyl, carbendazim, chloroneb, captafol, mancozeb, zineb, edifenphos, iprobenphos, thiophanate, and carboxin, have proven effective in controlling the disease under field conditions. (Singh and Sinha, 2004). Amarajyothi and Chinnam naidu (2020) also reported that preventive measures are more effective in reducing the incidence of rice blast and sheath blight. Although various methods are used to control pests in different pest management systems, yet use of pesticides continue to be the major component of most of the pest control programmes and will probably remain so in the near future (Singh *et al*, 2013).

A variety of new fungicide formulations are now available in the market and farmers are trying to control the disease through 3-4 sprays under field condition. This study aims to assess the effectiveness of two fungicides Glo-it (propiconazole 13.9% + difenconazole 13.9% EC @500 ml/ha). Propiconazole interferes with the production of sterols in cell membranes, preventing the growth of fungi. Whereas Difenconazole is a sterol demethylation inhibitor that inhibits fungus growth by blocking cell membrane ergosterol biosynthesis. and Pulser (Thi fluzamide 24 SC at 1 ml/L) . It is systemic fungicide with protective and curative action. It effectively controls *Rhizoctonia solani* fungus which is major cause sheath blight in paddy. It is rapidly absorbed by roots and leaves and translocated in xylem and apoplast throughout the plant. Both the fungicide sprayed 45 day after transplanting of paddy for controlling rice sheath blight.

MATERIALS AND METHODS

Field trials were carried out during the *Kharif* seasons of 2022 and 2023 using a Randomized Block Design (RBD) across ten farmer plots (10 replications with a plot size of 5.0m x 2.0m, spacing 15cm x 20cm) on the rice variety Sabour Sampann in various villages of Madhepura district in north Bihar. The fungicides Glo-IT (propiconazole 13.9% + Difenconazole 13.9% EC), Pulser (Thi fluzamide 24 SC), and Contaf (Hexaconazole 5 EC), commonly used by farmers, were applied according to the

recommended formulations. Grain yield was measured and recorded on a per-plot basis, then expressed in quintal per hectare (q/ha).

The percent disease index (PDI) and disease severity of sheath blight were assessed after each spray using the Relative Lesion Height (RLH) method (IRRI, 2002) with the following formula:

$$RLH = \text{Lesion Height} / \text{Plant Height} \times 100$$

In each plot, five random sampling units of 1m² were marked. Disease severity was recorded on fifteen plants from each sampling unit. The percentage of disease control over the check was calculated.

RESULTS AND DISCUSSION

The data (Table 3) revealed that the fungicide propiconazole 13.9% + difenconazole 13.9% EC @ 500 ml/ha (T2) was highly effective in controlling sheath blight disease in paddy compared to thi fluzamide 24 SC @ 1 ml/L (T3) and hexaconazole 5 EC @ 2 ml/L T1. The highest disease incidence and severity were recorded in T1 and T3 treatments as 94.39% and 75.97%, respectively. No significant difference was observed among the treatments concerning sheath blight incidence. The lowest disease incidence was recorded with T2 (propiconazole 13.9% + difenconazole 13.9% EC at 500 ml/ha (63.08%), followed by T3 (Thi fluzamide 24 SC at 1 ml/L (66.97%), which was significantly different from the farmer's practice fungicide, hexaconazole 5% EC at 2.0 L /ha (94.39%). Propiconazole 13.9% + difenconazole 13.9% EC at 500 ml/ha reduced the disease by 31.5% followed by Thi fluzamide 24 SC at 1 ml/L, which showed a 29.04% reduction. The highest grain yield and benefit-cost ratio were observed in the plots treated with T2 (propiconazole 13.9% + difenconazole 13.9% EC at a rate of 500 ml/ha). (37.72 q/ha and 1:2.41), T3 thi fluzamide 24 SC @ 1 ml/ L (36.28 q/ha and 1:2.32) compared to T1 plot (34.25q/ha) (Table 3). Maximum grain yield (10.13%) increase over farmers' practice was recorded in crop

Efficacy of Fungicides for Management

Table 1. Treatments including fungicide along with their doses.

Treatment	Treatment Detail
T1 (Farmers' practice)	Spray of hexaconazole 5 EC@ 2 Liter/ ha
T2	Spray of propiconazole 13.9% + difenconazole 13.9% EC @ 500 ml/ha.
T3	Spray of thifluzamide 24 SC @ 1ml/L of water (45 days after transplanting).

Table 2. Effect of fungicides on disease parameters in rice sheath blight.

Treatment		Per cent Diseases Severiy	Per cent Diseases Incidence	Per cent disease control over FP	Yield (q/ha)	Per cent increase in yield over FP (average)
T1 (FP)	Spray of hexaconazole 5 EC @ 2L / ha	75.97	94.39	-	34.25	-
T2	Spray of combind product (propiconazole 13.9% + difenconazole13.9%EC) @500 ml/ha.	40.76	63.08	31.51	37.72	10.13
T3	Spray of thifluzamide 24 SC @ 1 ml/ L of water (45 days after transplanting).	43.69	66.97	29.04	36.28	5.92
CD @ 5%		0.499	1.177	-	0.135	-
SEm (+ -)		0.706	0.393	-	0.04	-

Table 3. Impact of fungicides on yield and economic outcomes in rice.

Technological options		Mean grain yield (q/ha)	Gross --	Gross return (₹)	Net return (₹)	BCR
T1 (FP)	Spray of hexaconazole 5 EC@ 2ml / L	34.25	33234	74768	71364	2.24
T2	Spray of propiconazole 13.9% + difenconazole 13.9% EC @ 500 ml/ha.	37.72	34130	82343	98873	2.41
T3	Spray of thifluzamide 24 SC @ 1 ml/ L of water (45 days after transplanting).	36.28	34118	79199	93558	2.32

Support price ₹ 2183

treated with propiconazole 13.9% + difenconazole 13.9% EC @ 500 ml/ha followed by crop treated with thifluzamide 24 SC @ 1 ml/L (5.92%). Present findings were in accordance with Kandhari (2007) who found Armure 30 EC (propiconazole + defenconazole) best among

seven fungicides tested showing a disease severity of 31.3% in comparison to 77.9% in check and Singh *et al* (2015). *Rhizoctonia solani* is a seed- and soil-borne pathogen, which survives through sclerotia and mycelia in infected seeds or soil in tropical environments (Senapati *et al*, 2022).

CONCLUSION

Sheath blight is one of the major concerns in rice with the potential to affect rice production and productivity. The causal agent (*R. solani*) is a dynamic pathogen with a wide host range which enables it to overwinter and survive. Because of its versatility, the pathogen is very difficult to manage. Chemical control has been the most commonly used approach for management, which is not only environmentally unsafe but also leads to the evolution of novel virulent strains of the pathogen. Although there are other approaches such as cultural practices and biological control to reduce the disease severity, utilizing host plant resistance is the most sustainable approach for managing this fungal disease. The current findings revealed that propiconazole 13.9% + difenconazole 13.9% EC at 500 ml/ha, followed by thifluzamide 24 SC at 1 ml/L, were effective fungicides in reducing sheath blight severity and achieving higher grain yield.

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