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# Field evaluation of various fungicides against sheath blight of rice caused by *Rhizoctonia solani* Kuhn

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**Abstract**
Rice is the second important cereal crop and serving as staple food for more than half of the world's population. Sheath blight of rice caused by *Rhizoctonia solani* Kuhn is an economically important disease posing serious threat to rice cultivation. This disease is distributed in almost all the rice growing states in India. The disease is in alarming condition due to increased cultivation of high yielding varieties, application of higher doses of nitrogenous fertilizers and lack of resistance gene. Hence study was conducted to evaluate the efficacy of various commercial fungicides in alternation with bio-control agents under field conditions. Among the treatments, Amistar Top @ 1ml/L and *Bacillus amyloliquefaciens* recorded least mean PDI of 11.90 and 10.56 during *Kharif* 2019 and *Kharif* 2020 when compared to other treatments. Similarly, highest % ROC of 59.98 and 68.80 was also recorded in the same treatment during both seasons. Highest yield was recorded in Ayaan @ 1gm/L (48.51q/ha) in *Kharif* 2019 and Amistar Top @ 1ml/L (51.46q/ha) in *Kharif* 2020.

**Keywords:** *Rhizoctonia solani*, fungicides, sheath blight, management

## 1. Introduction

Rice (*Oryza sativa* L.) is one of the most important cereal crop. Approximately 90% of the world's rice is grown in the Asian continent and it is serving as staple food for >60% of the world's population. In way of increasing production to meet the growing demand, many high yielding varieties and hybrids have been developed which led to change in the disease scenario. And Sheath blight of rice caused by *Rhizoctonia solani* Kuhn, once minor has now become a major malady creating a hawock in the farmer's field. This disease was first time reported from Japan in 1910 by Miyaki. In India, its occurrence was reported by Paracer and Chahal in 1963 from Gurdaspur in Punjab. The disease became established in many oriental countries and as a result is often referred to as "Oriental leaf and sheath blight", sheath blight, *Pellicularia* sheath blight, sclerotial blight and banded blight of rice (Dath and Premalatha, 1990) [4]. Damage is estimated upto 100% in favourable climatic conditions and yield loss of rice varies from 5.2-50% depending on disease incidence (Bag *et al.*, 2016) [2]. In absence of suitable resistant varieties, chemical control becomes an obvious choice for management of Sheath blight. But many of the recently launched fungicides are tend to have single site of action which poses the risk of resistance development. Hence alternation of fungicides with bio-control agent became the major objective of this experiment. Hence present study was undertaken to develop sustainable combination of fungicides and bio-control agent against *Rhizoctonia solani*.

## 2. Materials and Methods

The present experiment was conducted at Sathanur, Mandya, Karnataka during *Kharif* 2019 and *Kharif* 2020. The experiment was conducted in randomized block design with three replications using the susceptible rice variety, Jyothi. Nursery was raised and 25 days old seedlings were transplanted to the main field at a spacing of 15 x 10 cm in 12 $m^2$ sized plots.

**Table 1:** Treatment details

| Trt. No. | Treatment Details | | |
|---|---|---|---|
| | 60DAT | 70DAT | 80DAT |
| T1 | Adexar @ 1.5ml/L | *Bacillus amyloliquefaciens* | Cenator @ 1.5ml/L |
| T2 | Ayaan @ 1gm/L | *Bacillus amyloliquefaciens* | Ayaan @ 1gm/L |
| T3 | Amistar Top @ 1ml/L | *Bacillus amyloliquefaciens* | Amistar Top @ 1ml/L |
| T4 | Adexar @ 1.5ml/L | Adexar @ 1.5ml/L | Adexar @ 1.5ml/L |
| T5 | Ayaan @ 1gm/L | Ayaan @ 1gm/L | Ayaan @ 1gm/L |
| T6 | Amistar Top @ 1ml/L | Amistar Top @ 1ml/L | Amistar Top @ 1ml/L |
| T7 | *Bacillus amyloliquefaciens* | *Bacillus amyloliquefaciens* | *Bacillus amyloliquefaciens* |
| T8 | Control | | |

### 2.1 Mass Multiplication and Artificial Inoculation

*Rhizoctonia solani* was mass multiplied in sterilized typha stem bits in a conical flask. The culture discs were inoculated to typha bits and incubated for one week. One bit was placed at the sheath region of paddy hills just above the water line at 55 days after transplanting.

### 2.2 Spray operation

Foliar spray of fungicides and bio-control agents were taken up five days after inoculation using knapsack sprayer fitted with flat-fan nozzle. Three sprays were taken up at an interval of 10 days.

### 2.3 Disease assessment and Statistical analysis

Observations were recorded before spray and 10 days after each spray using disease rating scale of 0-9 (SES, 2002) [10]. Further, the scored data was converted into per cent disease index (PDI) using formula given below. The data on yield was recorded by marking 2x2 m section within each plot using a wire frame (Seebold, *et al.*, 2004) [9] and tillers were cut and harvested in order to determine the yield. Subsequently, data on disease severity and yield parameters were subjected to appropriate statistical analysis.

$$PDI = \frac{\text{Total sum of numerical ratings}}{\text{Total no. of tillers observed x Highest number of rating}} \times 100$$

## 3. Results and Discussion

Fungicides were evaluated singly and in combination with the effective bio-control agent as alternate application against sheath blight of rice. Study during *Kharif* 2019 revealed that all treatments significantly reduced sheath blight severity when compared to control. Treatment, $T_3$ recorded least mean PDI (Per cent Disease Index) of 11.90 followed by $T_1$ which recorded a PDI of 11.96. Next best treatments were $T_6$ and $T_4$ which recorded mean PDI of 12.02 and 12.06, respectively. $T_7$ recorded a mean PDI of 16.04 as compared to 29.74 in control. Similarly, highest % ROC (Reduction Over Control) was recorded in $T_3$ (59.98) followed by $T_1$ (59.78). $T_6$ (59.57) and $T_4$ (59.44). Highest yield was recorded in $T_5$ (48.51q/ha) which was on par with $T_4$ (46.26 q/ha) & $T_6$ (45.88 q/ha). Lowest yield was recorded in control (33.42 q/ha).

Study conducted during *Kharif* 2020 revealed that all treatments significantly reduced sheath blight severity when compared to control. Among the treatments, $T_3$ recorded least mean PDI (Per cent Disease Index) of 10.56 which was followed by $T_1$ (10.89). Next best treatments were $T_6$ (11.05) and $T_4$ (11.07). Mean PDI of 19.07 was recorded in $T_7$ as compared to control (33.85). Similarly, highest % ROC (Reduction Over Control) was recorded in $T_3$ (68.80) followed by $T_1$ (67.82), $T_6$ (67.35) and $T_4$ (67.30). Yield data revealed that $T_6$ recorded highest yield of 51.46 q/ha followed by $T_4$ (50.82 q/ha) which were on par with each other. This was followed by $T_5$ (49.21 q/ha). Lowest yield was recorded in control (35.30 q/ha).

Pramesh *et al.* (2016) [7] reported Trifloxystrobin 25% + Tebuconazole 50% (Nativo 75WG) @ 0.4 g/l (PDI 24.70). Our result also confirms the better efficacy of strobilurin derived combination of fungicides against Sheath blight of rice in combination with biocontrol agent (Bag *et al.*, 2016) [2]. Raji *et al.* (2016) [8] also reported that Tebuconazole + Trifloxystrobin 75WG (1.4g/L) was effective in reducing sheath blight severity and improving yield. Bhuvaneswari and Raju, 2012 have also reported that Azoxystrobin 18.2% and Difenconazole 11.4% SC @ 1.25ml/L & 1.0ml/L was most effective with the least disease incidence of 9.36 & 16.43 and severity of 17.19 & 21.37 per cent, respectively. Though several fungicides like Carbendazim, Validamycin and Triazoles have been recommended for sheath blight disease management, but in areas which regularly suffer with severe sheath blight disease, application of a strobilurin + triazole combination may be advocated for management of disease (Adhikari, 2011) [1].

## 4. Conclusion

Hence it can be concluded that alternation of Amistar Top and *Bacillus amyloliquefaciens* recorded least mean PDI of Sheath blight when compared to other treatments. Hence we can recommend fungicide alternated with bio-control agent for effective disease management and also helping prolong the resistance development of new generation fungicides with single site of action thus prolonging the product stewardship.

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