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Short Communication

Management of Sheath Blight of Rice Using Microbial Formulations under i*n vivo* Condition

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ABSTRACT

An effort was made to explore the efficacy of microbial formulations against sheath blight (*Rhizoctonia solani*) of rice. Efficacy of nine microbial formulations *viz.*, Jawahar *Azotobacter*, Jawahar Phosphorus Solubilizing Bacteria (PSB), Jawahar Blue Green Algae (BGA), Jawahar *Mycorrhiza*, Jawahar *Azospirillum*, Jawahar *Acetobacter*, Jawahar *Tricoderma*, Jawahar *Pseudomonas*, Jawahar consortia were tested. The Jawahar *Pseudomonas* microbial formulations was recorded minimum disease incidence in both years and were found very effective as compared to control. The maximum disease incidence was observed in Jawahar Blue Green Algae (BGA)

Key Word- Management, Microbial formulations, Rice, Sheath blight,

INTRODUCTION

Rice (*Oryzae sativa* L.) is a cereal crop belonging to the family Poaceae. As a tropical crop, it can be grown during the two distinct seasons (dry and wet) of the year provided that sufficient water is made available (Kawure *et al,* 2022). Sheath blight is a soil borne disease caused by the fungus *Rhizoctonia solani* Kuhn AG1-IA. The fungus affects the crop from tillering to heading stage. Initial symptoms are noticed on leaf sheaths near water level on the leaf sheath oval or elliptical or irregular greenish grey spots are formed. As the spots enlarge, the centre becomes greyish white with an irregular blackish brown or purple brown border. The pathogen *Rhizoctonia solani* Kunh AG1-IA (Anamorph), *Thanatephorus cucumeris* (Frank) Donk (Teleomorph) is a soil-dwelling saprotroph and facultative parasite. The pathogen causes lesions on the sheath affecting grain filling and yield in rice (Wu *et al*,-2012). As sclerotia is a secondary inoculum of *Rhizoctonia solani* their studies on sclerotial viability are needed so as to effectively manage the pathogen under field conditions. The fungus spreads rapidly via contact between plant parts such as tillers and leaves, and also via sclerotia (secondary inoculum) present in surface water (Tsiboe *et al*, -2017). Under favorable conditions, the sclerotia germinate to form mycelia, which on establishing contact with the rice plant surface grows and produces infection structures such as infection cushions and lobate appressoria.

Biological control through microbial formulations has been suggested as a very promising strategy to manage neurotropic fungus (Gupta and Tomar, 2017; Tiwari *et al*, 2023). Modern farming systems affect soil health, it is important of developing long-term, eco-friendly, and environmentally sound alternative agricultural approaches like microbial formulations based on Jawahar *Azotobacter*, Jawahar Phosphorus Solubilizing Bacteria (PSB), Jawahar Blue Green Algae (BGA), Jawahar *Mycorrhiza*, Jawahar *Azospirillum*, Jawahar *Acetobacter*, Jawahar *Tricoderma*, Jawahar *Pseudomonas*, Jawahar consortia.

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Table 1. Treatment details of microbial formulation.

Treatment	Treatment details	Dose/ha	Treatment	Treatment details	Dose /ha
T_1	Jawahar *Azotobacter*	3.5 kg	T_6	Jawahar *Acetobactor*	3.5 kg
T_2	Jawahar Phosphorus Solubilizing Bacteria (PSB)	3.5 kg	T_7	Jawahar *Tricoderma*	2.5 l
T_3	Jawahar Blue Green Algae (BGA)	3.5 kg	T_8	Jawahar *Pseudomonas*	2.5 l
T_4	Jawahar *Mycorrhiza*	10 kg	T_9	Jawahar consortia	3.5 l
T_5	Jawahar *Azospirillum*	3.5 kg	T_{10}	Control	

MATERIALS AND METHODS

Two field trials were conducted during 2023 and 2024 at Breeder Seed Production unit JNKVV Jabalpur Madhya Pradesh in a randomized block design (RBD) with 10 treatments including control with 3 replications. The treatments consisted of microbial formulations. The experimental field was ploughed twice and soil was brought to a fine tilth and plots of size 1X1m were prepared. On completion of field preparation 25-day old Kranti seedlings were transplanted in the plots at a spacing 20x15cm. Controlled irrigation was given uniformly throughout the cropping season. Plots were given irrigation at an interval of 20 days. All the microbial formulations as par recommended dose were sprayed in respective plots after 65 and 85 days after planting.

The disease severity was recorded with the help of randomly selected five hills in a plot. The selected hills were tagged for identification. These tagged hills were taken for recording observations on disease severity with the help of 0 to 9 rating scale of standard evaluation system (SES) for rice (IRRI, 2002). The per cent disease incidence was calculated.

RESULTS AND DISCUSSION

Evaluation of different microbial formulation against sheath blight of rice

The results obtained from the present investigation as well as relevant discussion have been summarized. During both the crop season it was observed that all treatments (Table 2) showed significant reduction in disease incidence over the untreated control. Among the various approaches assessed against sheath blight of rice. At before spray in 2023, disease incidence was recorded from 7.51% to 9.60% whereas, after first spraying the minimum disease incidence (11.84%) was recorded in T_8 - Jawahar *Pseudomonas* which was at par with T_2 - Jawahar Phosphorus Solubilizing Bacteria (PSB) (12.59 %) , T_1 - Jawahar *Azotobacter* (12.69%), T_6 - Jawahar *Acetobactor* (13.62%), T_7 - Jawahar *Tricoderma* (14.24%), T_5 - Jawahar *Azospirillum* (15.96%) followed by T_4 - Jawahar *Mycorrhiza* (17.90%), T_9 - Jawahar consortia (18.11%). The maximum disease incidence (20.52 %) was recorded in T_3 - Jawahar Blue Green Algae (BGA) as compared to control (24.88%). After second spray the minimum disease incidence (14.80%) was recorded in T_8 - Jawahar *Pseudomonas* which was at par with T_2 - Jawahar Phosphorus Solubilizing Bacteria (PSB) (15.61 %) , T_1 - Jawahar *Azotobacter* (17.90%), T_6 - Jawahar *Acetobactor* (19.17%) followed by T_7 - Jawahar *Tricoderma* (20.19%), T_5 - Jawahar *Azospirillum* (21.66%) T_4 - Jawahar *Mycorrhiza* (23.52%), T_9 - Jawahar consortia (25.73%). The maximum disease incidence (27.34 %) was recorded in T_3 - Jawahar Blue Green Algae (BGA) as compared to control (36.25%). According to (Singh and Sinha, 2005) *Trichoderma harzianum* and *Pseudomonas fluorescens* as soil application for managing rice sheath blight, and all the methods of application significantly reduced disease severity and incidence as compared to control.

Table 2. Evaluation of microbial formulation on *R. solani* of rice in field.

Treatment	Percent Disease Incidence 2023			Percent Disease Incidence 2024			Percent Disease Incidence Pooled		
	Before Spray	After first spray	After second spray	Before Spray	After first spray	After second spray	Before Spray	After first spray	After second spray
T_1 - Jawahar *Azotobacter*	7.51	12.69	17.90	10.77	15.71	19.12	9.14	14.20	18.51
T_2 - Jawahar Phosphorus Solubilizing Bacteria (PSB)	9.60	12.59	15.61	12.25	14.62	18.80	10.92	13.26	17.20
T_3 - Jawahar Blue Green Algae (BGA)	8.88	20.52	27.34	11.00	24.91	30.31	9.94	22.68	28.83
T_4 - Jawahar *Mycorrhiza*	8.98	17.90	23.52	11.00	20.22	26.43	9.99	18.57	24.97
T_5 - Jawahar *Azospirillum*	8.51	15.96	21.66	10.22	19.87	25.56	9.36	17.57	23.61
T_6 - Jawahar *Acetobactor*	8.01	13.62	19.17	9.94	16.25	21.81	8.97	14.78	20.49
T_7 - Jawahar *Tricoderma*	9.23	14.24	20.19	11.34	18.32	23.03	10.28	14.46	21.61
T_8 - Jawahar *Pseudomonas*	7.57	11.84	14.80	9.82	12.70	16.44	8.69	11.92	15.62
T_9 - Jawahar consortia	8.23	18.11	25.73	10.33	22.26	28.67	9.28	19.76	27.20
Control	9.46	24.88	36.25	11.37	29.54	39.01	10.42	25.54	37.63
C. D. at 5 %	N/A	4.92	4.71	N/A	6.41	5.29	N/A	4.90	3.77
SE(m)±1	1.22	1.64	1.57	1.29	2.14	1.77	1.23	1.63	1.26

As before spray in 2024, disease incidence was recorded from 9.82% to 12.25% whereas, after first spraying the minimum disease incidence (12.70%) was recorded in T_8 - Jawahar *Pseudomonas* which was at par with T_2 - Jawahar Phosphorus Solubilizing Bacteria (PSB) (14.62 %) , T_1 - Jawahar *Azotobacter* (15.71%), T_6 - Jawahar *Acetobactor* (16.25%), T_7 - Jawahar *Tricoderma* (18.32%) followed by T_5 - Jawahar *Azospirillum* (19.87%), T_4 - Jawahar *Mycorrhiza* (20.22%), T_9 - Jawahar consortia (22.26%). The maximum disease incidence (24.91 %) was recorded in T_3 - Jawahar Blue Green Algae (BGA) as compared to control (29.54%). After second spray the maximum disease incidence (16.44%) was recorded in T_8 - Jawahar *Pseudomonas* which was at par with T_2 - Jawahar Phosphorus Solubilizing Bacteria (PSB) (18.80 %) , T_1 - Jawahar *Azotobacter* (19.12%) followed by T_6 - Jawahar *Acetobactor* (21.81%) T_7 - Jawahar *Tricoderma* (23.03%), T_5 - Jawahar *Azospirillum* (25.56%) T_4 - Jawahar *Mycorrhiza* (26.43%), T_9 - Jawahar consortia (28.67%). The maximum disease incidence (30.31 %) was recorded in T_3 - Jawahar Blue Green Algae (BGA) as compared to control (39.01%).

The pooled data of 2023 and 2024 at before spray disease incidence was recorded from 8.69% to 10.92% whereas, after first spraying the minimum disease incidence (11.92%) was recorded in T_8 - Jawahar *Pseudomonas* which was at par with T_2 - Jawahar Phosphorus Solubilizing Bacteria (PSB) (13.26 %) , T_1 - Jawahar *Azotobacter* (14.20%), T_7 - Jawahar *Tricoderma* (14.46%) T_6 - Jawahar *Acetobactor* (14.78%), followed by T_5 - Jawahar *Azospirillum* (17.57%), T_4 - Jawahar *Mycorrhiza* (18.57%), T_9 -

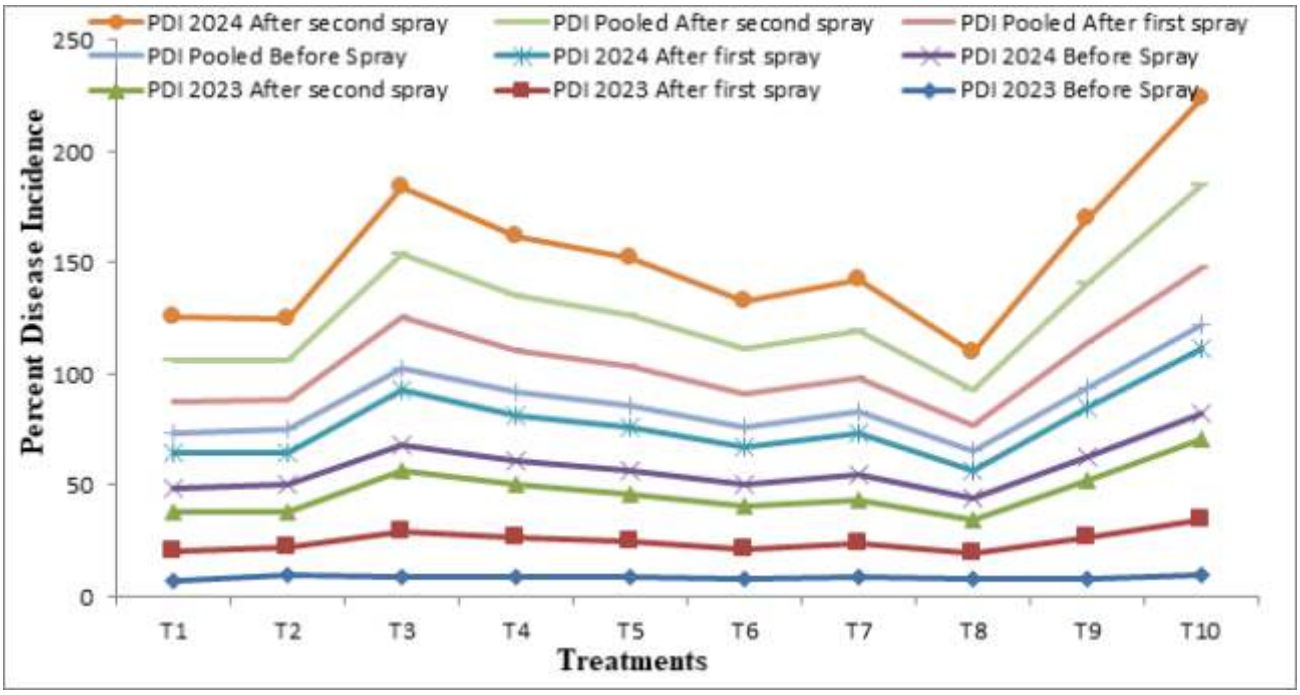

Fig.1- Graphical representation of Percent disease incidence of Sheath Blight of rice
T1- Jawahar Azotobacter, T2-Jawahar Phosphorus Solubilizing Bacteria (PSB),
T3-Jawahar Blue Green Algae (BGA), T4-Jawahar Mycorrhiza, T5-Jawahar Azospirillum,
T6-Jawahar Acetobacter, T7-Jawahar Tricoderma, T8-Jawahar Pseudomonas,
T9-Jawahar consortia, T10- Control

Jawahar consortia (19.76%). The maximum disease incidence (22.68 %) was recorded in T_3 - Jawahar Blue Green Algae (BGA) as compared to control (25.54%). After second spray the minimum disease incidence (15.62%) was recorded in T_8 - Jawahar *Pseudomonas* which was at par with T_2 - Jawahar Phosphorus Solubilizing Bacteria (PSB) (17.20 %), T_1 - Jawahar *Azotobacter* (18.51%) followed by T_6 - Jawahar *Acetobactor* (20.49%), T_7 - Jawahar *Tricoderma* (21.61%), T_5 - Jawahar *Azospirillum* (23.61%) T_4 - Jawahar *Mycorrhiza* (24.97%), T_9 - Jawahar consortia (27.20%). The maximum disease incidence (28.83 %) was recorded in T_3 - Jawahar Blue Green Algae (BGA) as compared to control (37.63%). According to Durga Prasad and Ramji Singh (2018) treatments where *Trichoderma harzianum* (Th) and *Pseudomonas fluorescens* (Pf) was applied to field soil effective in reducing the incidence of sheath blight rice.

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