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EFFECT OF DIFFERENT BIDM MODULES ON MANAGEMENT OF RICE BLAST DISEASE AND ITS IMPACT ON YIELD OF BASMATI PADDY

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ABSTRACT

The present investigation "Effect of different BIDM modules on management of Rice blast disease and its impact on growth parameters and yield of Basmati paddy" during the study different bio-agent, botanicals, Azotrix (Combination of Azoxystrobin 16.7 % + Tricyclazole 33.3% SC) fungicide and different nanofungides with combination were used for the management of rice blast caused by *Magnoporthae grisea* in Randomized Block Design (RBD) with 17 treatments and each treatment replicated thrice using susceptible rice variety PB01 at S.I.F research farm of Chandra Shekhar Azad University of Agriculture and Technology, conducted during *Kharif* (2021-22 & 2022-23). All the spray treatments except control, proved effective and reduced the blast incidence and its severity. It also significantly increased the grain yield compared to control. Among the treatments Soil application @ 2.5kg/ha + seed treatment @ 10g/kg with *T. viride*, + 2 F.S with AgNPs @ 10 ppm proved significantly superior over rest of the treatments.

Key words : BIDM, *Magnoporthae grisea*, Bioagents, Silver nanofungicide, Basmati rice.

Introduction

Rice (*Oryza sativa* L.) belongs to the family *Poaceae* and sub-family *Oryzoideae*. It is an essential food crop grown worldwide and gaining importance for more than half of world population. Rice is an annual crop which flourishes comfortably in hot and humid climates. It is good nutritional source of carbohydrate which provides an instant energy. Rice is also utilised in cereals, snack foods, brewed beverages, flour, oil (rice bran oil), syrup and religious ceremonies. Rice is widely utilised for medical purposes, particularly in India. Rice is a nutritious cereal crop which used mainly for human consumption. Rice protein is the most digestible cereal protein (88%) and contains minerals and fibres.

Rice provides 50-80% of the daily caloric intake for the impoverished. It is the main source of energy and is an important source of protein providing substantial amounts of the recommended nutrient intake of zinc and niacin (Biology of RICE.pmd – GEAC, www.geacindia.gov.). The Composition per 100 g of edible portion of milled Indian basmati rice provided 327 kcal of energy, 7.69 grams of protein and 1.92 grams of total lipid (fat). It has 73.08 grams of carbohydrates, with 1.9 grams of dietary fiber and 1.92 grams of total sugars. The calcium content is 38 mg and it provides 1.38 mg of iron. Sodium is present at 1019 mg, while the vitamin C content is 4.6 mg. It contains 192 IU of vitamin A. There are no saturated or total trans fatty acids and it has 0 mg of cholesterol. (Source: U.S. Department of Agriculture, Agricultural Research Service). In Uttar Pradesh the rice is cultivated on about 6.0 million hectares with the production of 15.27 million tonnes and productivity of 2,042 kg per ha. In Uttar Pradesh total Basmati production is estimated at 2049.69 thousand tons (Directorate of Rice Development). The productivity of rice in Uttar Pradesh as comparing to West Bengal is quite low due to several biotic and abiotic stresses. Among the biotic stresses, diseases are the major constraints. The major diseases of rice crop are caused due to bacterial, fungal, viral and nematodes etc. Among these biotic challenges, a fungal disease known as rice blast, caused by *Magnaporthe oryzae* (Herbert), creates a significant danger to rice yield, it accounts for yield losses of 10-30% per year and

complete loss (100%) during pandemic years (Dean *et al*., 2012; Skamnioti and Gurr, 2009 and Zhu *et al*., 2005).

Materials and Methods

This study was conducted during the period 2021-2023 at Student Instructional Farm, Chandra Shekhar Azad University of agriculture and Technology, under Department of Plant Pathology, Kanpur. The bio-agents are applied as seed and foliar spray of botanicals extract, fungicides and Nano fungicides at 45 Days after transplanting as post inoculation method and data to be recorded for Disease severity. Disease severity is the percentage of relevant host tissues or organ covered by symptom or lesion or damaged by the disease.

Per cent disease incidence (PDI) was calculated based on the following formula.

$$PDI = \frac{\text{Sum of individual disease ratings}}{\text{Total number of leaves examined} \times \text{Maximum number of disease rating}} \times 100$$

Results and Discussion

Suitable bidm modules for management of blast of rice

Kharif 2021-22

The results of the field experiment conducted during *kharif* 2021-22 are given in the (Table 1 and Fig. 1). The results of the study indicated that 45 DAT, all the seventeen treatments were on par with absolute control when incidence of blast disease was considered. Among the selected nine treatments, T_3 (S.A @ 2.5kg/ha + S.T @ 10g/kg with *T. viride* + 2 F.S with AgNPs @ 10 p pm.) had significantly lowest percentage of disease incidence (15.86%) and this was on par with T_6 (S.A @ 2.5kg/ha + S.T @ 10g/kg with *P. fluroscence* + 2 F.S with AgNPs @ 10 ppm.) and T_{13} (S.A @ 2.5kg/ha + S.T @ 10g/kg with *T. viride* + 2 F.S with Azotrix @ 1ml/L.) having 16.98% and 17.56, respectively. When compared with absolute control, above three treatments along with other two treatments also had significantly lower values with respect to the percentage of disease incidence, *viz*., T_{15} (S.A @ 2.5kg/ha + S.T @ 10g/kg with *P. fluroscence* + 2 F.S with Neem formulation @10ml/L) with 31.64% and T_{16} (S.A @ 2.5kg/ha + S.T @ 10g/kg with *T. viride*, + 2 F.S with Bael leaf extract @10ml/L.) with 32.94%. In case of Disease severity during the same field experiment year the same trend was followed (Table 1) i.e., T_3 (S.A @ 2.5kg/ha + S.T @ 10g/kg with *T. viride* + 2 F.S with AgNPs @ 10 p pm.) had lowest value of disease severity (7.24%) with the highest yield at 36.4 q/ha followed by T_6 (S.A @ 2.5kg/ha + S.T @ 10g/kg with *P. fluroscence* +2 F.S with AgNPs @ 10 ppm.) with and T_{13} (S.A @ 2.5kg/ha + S.T @ 10g/kg with *T. viride* + 2 F.S with Azotrix @ 1ml/L.) having (7.86%) yield 36.1 q/ha and (9.15%) yield 35.9 q/ha, respectively and all these three treatments had significantly low disease severity than Treatment T_{17} (control). The result was in line with findings of Pandit *et al.* (2024), Balgude and Gaikwad (2019) and Choudhary *et al.* (2021).

Kharif 2022-23

This experiment indicated that some of the treatments were significantly different during *kharif* season of 2022-23 (Table 1 and Fig. 2), with respect to the per cent of disease incidence but the best result were found in Treatment T_3 (S.A @ 2.5kg/ha + S.T @ 10g/kg with *T.viride*, + 2 F.S with AgNPs @ 10 ppm.) with minimum disease incidence (16.06%), which was slightly higher than previous year trial followed by T_6 (S.A @ 2.5kg/ha + S.T @ 10g/kg with *P.fluroscence* +2 F.S with AgNPs @ 10 ppm.) was(18.01%) after that T_{13} (S.A @ 2.5kg/ha + S.T @ 10g/kg with *T.viride* + 2 F.S with Azotrix @ 1ml/L.) having yield 39.28 q/ha. While maximum disease incidence (33.07%) was found in treatment T_{16} (S.A @ 2.5kg/ha + S.T @ 10g/kg with *T. viride* + 2 F.S with Bael leaf extract @10ml/L.), but it is somehow significantly lower than control (29.83%). Disease severity during the same field experiment year (Table 1)

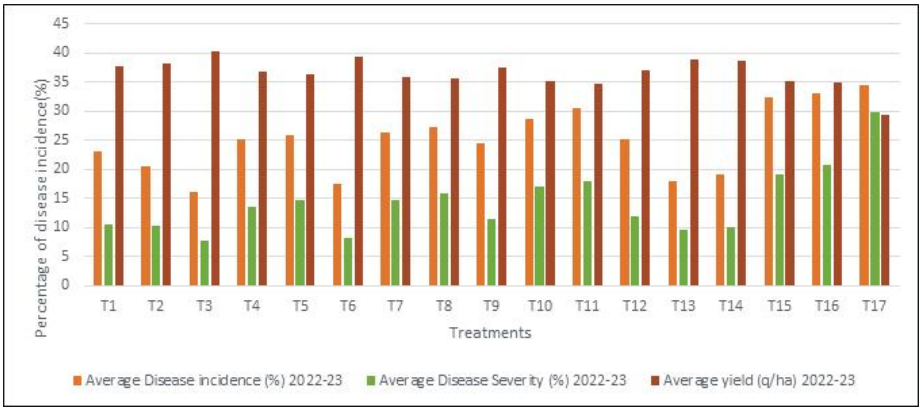

Fig. 1 : Efficacy of different treatments on percentage of disease index effect and yield of rice *Kharif* (2021-22).

Table 1 : Efficacy of different treatments on percentage of disease index effect and yield of rice.

Treatments	Average Disease incidence (%)		Average Disease Severity (%)		Average yield (q/ha)	
	2021-22	2022-23	2021-22	2022-23	2021-22	2022-23
T_1, S.A @ 2.5kg/ha + S.T @ 10g/kg + 2 F.S with salicylic acid @ 100 ppm.	22.82	23.01	10.14	10.48	33.9	37.72
T_2, S.A @ 2.5kg/ha + S.T @ 10g/kg + 2 F.S with Cu-chitosan @20 ppm.	20.23	20.56	9.88	10.23	34.2	38.26
T_3, S.A @ 2.5kg/ha + S.T @ 10g/kg + 2 F.S with AgNPs @ 10 p pm.	15.86	16.06	7.24	7.63	36.4	40.22
T_4, S.A @ 2.5kg/ha + S.T @ 10g/kg + 2 F.S with salicylic acid @ 100 ppm.	25.16	25.21	12.68	13.43	32.5	36.78
T_5, S.A @ 2.5kg/ha + S.T @ 10g/kg + 2 F.S with Cu-chitosan @20 ppm.	25.98	25.78	14.12	14.72	32.1	36.36
T_6, S.A @ 2.5kg/ha + S.T @ 10g/kg + 2 F.S with AgNPs @ 10 ppm.	16.98	17.42	7.86	8.23	36.1	39.28
T_7, S.A of FYM @ 2.5ton/ha + S.T with *T. viride* @ 10g/kg + 2 F.S with salicylic acid @ 100 ppm.	26.42	26.38	14.1	14.57	31.9	35.96
T_8, S.A of FYM @ 2.5ton/ha + S.T with *T.viride* @ 10g/kg + 2 F.S with Cu-chitosan @20 ppm.	26.94	27.23	15.38	15.78	31.5	35.66
T_9, S.A of FYM @ 2.5ton/ha + S.T with *T.viride* @ 10g/kg + 2 F.S with AgNPs @ 10 ppm.	24.43	24.49	11.15	11.45	33.3	37.48
T_{10}, S.A of FYM @ 2.5ton/ha + S.T with *P.fluorescens* @ 10g/kg + 2 F.S with salicylic acid@100 ppm.	28.31	28.71	16.96	17.07	31.2	35.11
T_{11}, S.A of FYM @ 2.5ton/ha + S.T with *P.fluorescens* @ 10g/kg + F.S with Cu-chitosan @20 ppm.	29.98	30.43	17.58	18.01	31.1	34.78
T_{12}, S.A of FYM @ 2.5ton/ha + S.T with *P.fluorescens* @ 10g/kg + 2 F.S with AgNPs @ 10 ppm.	24.94	25.06	11.72	11.92	34.1	37.12
T_{13}, S.A @ 2.5kg/ha + S.T @ 10g/kg + 2 F.S with Azotrix @ 1ml/L.	17.56	18.01	9.15	9.45	35.9	38.94
T_{14}, S.A @ 2.5kg/ha + S.T @ 10g/kg + 2 F.S with Azotrix @ 1ml/L	18.98	19.03	9.74	9.98	35.5	38.68
T_{15}, S.A @ 2.5kg/ha + S.T @ 10g/kg + 2 F.S with Neem formulation @10ml/L	31.64	32.33	18.95	19.03	33.02	35.24
T_{16}, S.A @ 2.5kg/ha + S.T @ 10g/kg + 2 F.S with Bael leaf extract @10ml/L.	32.94	33.07	20.59	20.75	32.96	34.88
T_{17}, Control.	34.23	34.53	29.68	29.83	28.5	29.44
CD at 5%	**2.23**	**2.251**	**1.532**	**1.329**	**1.38**	**1.70**
SE (m) ±	**0.771**	**0.778**	**0.575**	**0.459**	**0.48**	**0.59**

S.A. = Soil application S.T. = Seed treatment F.S. = Foliar spray

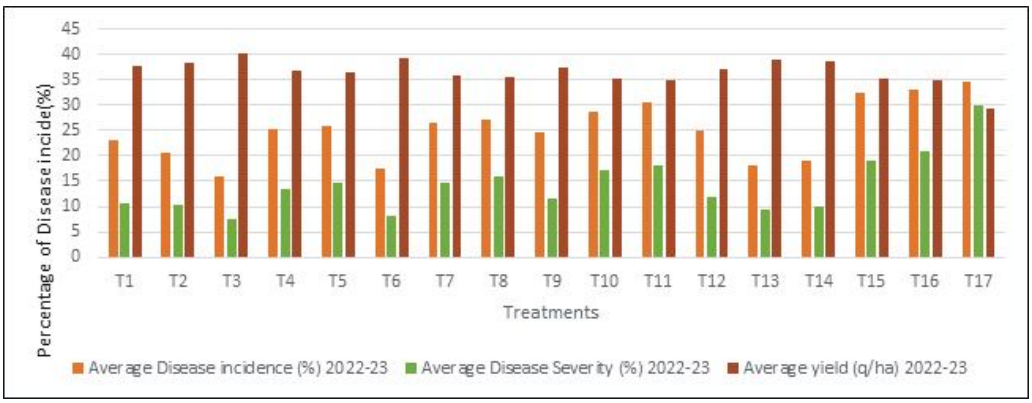

Fig. 2 : Efficacy of different treatments on percentage of disease index effect and yield of rice *Kharif* (2022-23).

Treatment T_3 (S.A @ 2.5kg/ha + S.T @ 10g/kg with *T. viride* + 2 F.S with AgNPs @ 10 p pm.) had lowest value of disease severity (7.63 %) with the highest yield at 36.4 q/ha followed by T_6 (S.A @ 2.5kg/ha + S.T @ 10g/kg with *P.fluroscence* + 2 F.S with AgNPs @ 10 ppm.) with (8.23%) and T_{13} (S.A @ 2.5kg/ha + S.T @ 10g/kg with *T.viride*, + 2 F.S with Azotrix @ 1ml/L.) with (9.45 %) disease severity, having yield (36.1 q/ha)and (35.9 q/ha), respectively and all these three treatments had significantly low disease severity than Treatment T_{17} (control). The result of the present study revealed that different bio-agents and fungicides combination were significantly effective in reducing the disease severity enhancing the yield parameters of rice. The above findings were similar with some researcher and scientist work like, Mishra and Sinha (2000), Heera (2002), Singh *et al.* (2013), Sunder *et al.* (2010), Lore *et al.* (2007), Sharma and Sugha (1995) and Yadav and Yadav (2018) and Persaud *et al.* (2021).

Conclusion

S.A @ 2.5kg/ha + S.T @ 10g/kg with *T. viride* + 2 F.S with AgNPs @ 10 p pm was best in managing disease of rice, which was however found to be on par with S.A @ 2.5kg/ha + S.T @ 10g/kg with *P. fluroscence* + 2 F.S with AgNPs @ 10 ppm. Further, this product did not show any phytotoxicity effects even at higher dose and found to be safe and increased in the yield and the net returns.

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