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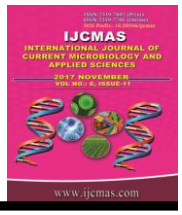

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Studies on the Interaction between Varietal Resistance and Management Practices against Leaf Blast of Rice

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A B S T R A C T

Field experiment was conducted at All India Coordinated Rice Improvement Project (AICRIP), RRTTS, Chiplima during kharif season of 2014 and 2015 to find out the efficacy of disease management practices against leaf blast disease of rice and their interaction with regard to varietal resistance. The experiment was laid out in split plot design having three varieties in main plot and two management levels in sub plot. The result revealed that the disease pressure remained low in both moderately resistant and hybrid variety as compared to the susceptible variety in all the plots irrespective of management practices. In case of moderately resistant and hybrid variety, a single spray of tricyclazole @ 0.6 g/l was sufficient to minimize the disease below ETL level where as in case of susceptible variety, disease pressure was high and three spraying of tricyclazole @ 0.6 g/l were required to check the disease (7.33 % severity) as compared to control plots with 28.65 % disease severity. The present study ascertains the response of resistant as well as the hybrid variety to effective dose of nitrogen (2/3rd of the recommended dose applied in 3 splits), seed treatment (carbendazim @ 2g/kg seed), line transplanting, FYM application (10 t/ha) and a single fungicidal spray (tricyclazole @ 0.6 g/l) as an effort to manage the leaf blast disease in an integrated way.

Introduction

A number of diseases infect rice crop which are of fungal, bacterial and viral origin. Among the fungal diseases, blast caused by *Pyricularia grisea* is the most important and devastating disease of rice. It causes 5-70 per cent yield loss depending upon the stage of the crop infected and severity of the disease (Dubey, 1995).The pathogen mainly attack at the leaf and neck or panicle region of the plant and named as leaf blast and neck blast accordingly. Though the disease attacks different plant parts but leaf infection is the most common one leading to huge economic loss and therefore need to pay special attention. Leaf blast symptoms can be visible from seedling stage and may last till the maturity of the crop. Use of a resistant or moderately resistant variety is the best option to combat the disease. But a new race of the pathogen may turn a resistant variety into a susceptible one anytime. In modern agriculture, application of chemical fungicides is the most common practice to combat diseases all over the world but it has

adverse effects on both environment and human health. Moreover use of same chemical fungicide year after year creates resistance and resurgence among pathogen against the fungicide. So, neither breeding nor fungicides have fully overcome the pathogen's ability to adapt or change its genetics for survival. With a view to this, the present investigation was carried out to find out a combined management practice integrating different principles of disease management to make it environment friendly. Early literature proved that nitrogenous fertilizers favours blast disease development and spread. So management of nitrogenous fertilizers can be a good option to manage the disease. Seed treatment is another approach to manage the disease which can be incorporated with other practices. Random transplanting, a common practice among farmers encourages weed growth and a thick crop canopy making the micro climate more suitable for blast infection and spread. On the contrary, line transplanting ensure uniform plant density and also make plant protection procedures like weeding and spraying operations much easier which can be advocated along with other measures. Application of FYM has a great prospect to improve the soil health and increase the rice productivity in a sustainable way in addition to its capacity to boost the systemic resistance of plants against diseases. So, all of these principles were combined in management plots to find out their combined effect on leaf blast management with a view to minimize the use of chemical pesticides and reduce environmental pollution.

Materials and Methods

Field trial was taken up in the research field of AICRIP, RRTTS, Chiplima, Sambalpur, Odisha during kharif season of two consecutive years 2014 and 2015. The experiment was laid out in split plot design with four replications. Three rice varieties, Swarna (popular but susceptible), Pratikshya (moderately resistant) and Ajay (hybrid) were selected for the study in main plots and designated as V_1, V_2 and V_3 respectively. Seedlings of the test varieties were transplanted at 15x15 cm in 20 sqm plot. The two management levels designated as M_1 and M_2 were maintained in sub plots and the details of management practices are narrated below.

Disease management practices (M_1):

Seed treatment with carbendazim @ 2g/kg seed

Line transplanting

Application of FYM @ 10 t/ha during final puddling

Nitrogen reduced to 2/3rd of the recommended dose and applied in 3 splits

Need based spraying of tricyclazole @ 0.6g/l

Three spraying of tricyclazole @ 0.6g/l was given to V_1M_1 plots where as a single spraying of tricyclazole @ 0.6g/l was conducted in V_2M_1 and V_3M_1 plots.

No disease management (M_2):

No seed treatment
Random transplanting
No FYM application
Full nitrogen dose applied as basal only
No spraying

Natural infection of the disease was permitted. Observations on disease severity and yield were collected. Three sampling units of one m^2 area were fixed in each plot at random for observation of disease severity. The final disease severity was recorded 15 days after the last spray using SES scale

(IRRI, 2003). The grain yield of each plot was recorded at the time of harvest and converted to q/ha. All these collected data were analyzed statistically.

Results and Discussion

The result revealed that the susceptible variety Swarna (V_1) recorded highest disease severity during both the years of experiment (31.35 % and 25.93 % during 2014 and 2015 respectively) in M_2 plots where no management practice was followed. But after the adoption of a combination of management practices in M_1 plots, the disease severity reduced to 9.85 % and 4.80% during 2014 and 2015 respectively. Among the varieties, Pratikshya (V_2) recorded the least disease severity of 4.15 % and 2.55 % during 2014 and 2015 respectively in M_1 plots. Pratikshya recorded less than 10 % disease severity in M_2 plots also without any management practice. The hybrid variety Ajay (V_3) also recorded low disease severity (4.73 % and 3.7 % during 2014 and 2015 respectively) in M_1 plots and was statistically at par with Pratikshya (V_2). The pooled data also reflected the same result in case of all the three varieties. The interaction between the disease severity and treatments were also found statistically significant to each other (Table 1).

After comparison of pooled data of 2014 and 2015, it can be said that the disease pressure remained low in both moderately resistant and hybrid variety as compared to the susceptible variety in all the plots irrespective of management practices. In case of moderately resistant and hybrid variety, a single spray of tricyclazole @ 0.6 g/l was sufficient to minimize the disease below ETL level along with a couple of management practices where as in case of susceptible variety, disease pressure was high and three spraying of tricyclazole @ 0.6 g/l were required to check the disease.

Table.1 Effect of different management practice on leaf blast disease and yield of rice

Main plot (Variety)	Sub plot Treatment	Leaf blast severity %			Yield(q/ha)			BC ratio
		2014	2015	Pooled	2014	2015	Pooled	
V_1 (Swarna)	(M_1)	9.85 (18.26)*	4.80 (12.61)	7.33 (15.67)	41.5	56.6	49.10	1.38
	(M_2)	31.35 (34.02)	25.93 (30.55)	28.65 (32.34)	34.0	46.0	40.03	1.16
V_2 (Pratikshya)	(M_1)	4.15 (11.72)	2.55 (9.14)	3.38 (10.56)	36.0	53.5	44.75	1.46
	(M_2)	9.73 (18.09)	6.43 (14.63)	8.10 (16.50)	33.3	46.4	39.83	1.17
V_3 (Ajay)	(M_1)	4.73 (12.48)	3.70 (11.06)	4.23 (11.83)	47.3	72.8	60.03	1.73
	(M_2)	10.60 (18.89)	8.25 (16.61)	9.48 (17.85)	38.5	62.0	50.28	1.42
Transformation								
CD (0.05)								
Main		1.37	2.93	1.87	3.99	6.81	3.23	
Sub		1.39	0.82	0.70	2.60	4.93	2.72	
Interaction								
M in S		2.48	1.51	1.30	NS	NS	NS	
S in M		2.18	3.09	2.05	NS	NS	NS	

* Transformed value. M_1- management, M_2- no management

While considering the yield, the highest yield was achieved from M_1 plots of Ajay (V_3) during both the years of experiment. The hybrid variety produced a pooled yield of 60 q/ha in management plots and was significantly superior to other varieties in terms of yield. The yield of M_1 plots differed significantly from that of M_2 plots irrespective of varieties. The varieties differed significantly from each other in yield level both under main and sub plots but the interaction between the yield data and treatments were statistically non-significant. Significant increase in yield was also achieved in M_1 plots of Swarna (49.1 q/ha) as compared to M_2 plots (40 q/ha) after adoption of a combination of management practices. The hybrid variety Ajay with management practices gave the highest BC ratio (1.73) followed by the moderately resistant variety Pratikshya (1.46).

The experiment was designed to find out an effective disease management practice against leaf blast of rice using three varieties with different levels of resistance along with a couple of management practices. New chemicals were found effective against the disease (Pal and Mandal, 2015) but large scale use of these chemicals is not feasible on the basis of environmental safety. Combining two or more methods of disease management ultimately lead to lesser use of chemicals and hence are viable so far as environment is concerned. This helped to minimize the frequency and amount of chemical use in order to manage the disease. In this experiment only a single spray of tricyclazole @ 0.6g/l was effective to check the disease along with other management practices in case of moderately resistant and hybrid variety. Panday *et al.,* (2005) opined that, need based plant protection measures applied in management programme were cost effective and achieved economic yield with less environmental pollution than sole chemical methods. Seed treatment with carbendazim @ 2g/kg seed also helped the rice plants to avert early infection of leaf blast. Hegde *et al.,* (2000) reported that seed treatment with carbendazim @ 2g/kg and three spraying of tricyclazole @ 0.6g/l effectively controlled blast disease. Application of FYM @ 10 t/ha appeared to have contributed not only to plant nutrition but also to disease resistance. FYM was effective in increasing resistance to blast by supplying silicic acid to rice plants as silica is known for increasing the resistance of rice plants to blast. Line transplanting conducted in management plots also helped in minimising the disease severity. Among several factors which influence the occurrence and severity of blast, rate of nitrogen fertilization has been found to affect the disease to a great extent (Kapoor and Sood, 2000). Reducing the nitrogen dose to 2/3rd of the recommended dose certainly reduced the disease severity in management plots as higher level of nitrogen aggravates the disease situation. So, disease management practices adopted had certainly a good effect in controlling the disease irrespective of varieties. Moreover the frequency of chemical use could be minimized through the adoption of moderately resistant and hybrid variety which should be encouraged with a view to environmental safety.

So it can be concluded from the present experiment that leaf blast of rice can be managed in an integrated way by using moderately resistant as well as hybrid varieties along with a couple of management practices like seed treatment with carbendazim @ 2g/kg seed, nitrogen dose reduced to 2/3rd of the recommended dose and applying in 3 splits, line transplanting, FYM application @10 t/ha and a single spray of tricyclazole @ 0.6 g/l. The result confirms a perfect combination between varietal resistance and different management practices to combat leaf blast disease in an eco-friendly way.

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