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Original Research Article

Management of Rice Blast Caused by *Pyricularia grisea (Sacc.)* of Eastern U.P. India

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A B S T R A C T

Blast disease caused by *Pyricularia oryzae Cav.* fungus, is infecting rice crop. Yield losses due to blast depending on the intensity of the disease. At a high degree of the disease intensity, yield loss reaches up to 90%. Symptoms of the disease often appear on rice leaf (leaf blast) or in the panicle neck (neck blast). The fungus has many races which are easily adapting to the environmental conditions. A field experiment was laid out during Kharif 2017-18 at supervision of Asha Bhagwan Bax Singh P.G. College Ayodhya, in the 7 farmer's field of Ayodhya and Ambedkarnager district of Uttar Pradesh, on integrated management of blast by using fungicides, plant extracts and bio control agents. The Neck Blast and Leaf Blast causing major loss of production. The experiment consisted of eight treatments viz. T1- tricyclazole 0.06% + Ocimum sanctum 15%, + Pseudomonas fluorescens @ 1.8g/l., T2- tricyclazole 0.06% + Ocimum sanctum 15% @ 1.5 g/l., T3- Ocimum sanctum @ 1.0 g/letter, T4- Flusilazole 12.5% + carbendazim 25% SC@ 1.0ml+/lg/l., T5- Azoxystrobin 18.2 % w/w @ 1.0ml/l, T6- Tricyclazole 18 % + mancozeb 62 % WP @ 2.5g/l., T7- Prochloraz 45% EC @ 2.0ml/l. and T8- Untreated control (Spray of plain water), were applied the recommended dose of each product to diseased plants at the rate of two sprays with an intravel of 15 days.. Observations were recorded at 20 days after the second spray. Analysis of the data showed that among the treated with Tricyclazole 18 % + mancozeb 62 % WP @ 2.5 g/l was found best in checking the disease severity leaf blast (9.5%,), neck blast (9.2%) and incidence was leaf blast and neck blast (14.4%), (10.0%) respectively and the better grain yield 5255 kg/ha was recorded. While severity and incidence of leaf blast and neck blast had gone to the extent of 47.3, 49.8, 53.5 and 55.7 % respectively in unsprayed plots. In check plots reduced grain yield was recorded (3280 kg/ha). In spite of increase in grain yield of 60.20 percent respectively, followed by Flusilazole 12.5% + carbendazim 25% SC @ 1.0ml+/lg /l. the disease severity leaf blast (13.2%,), neck blast (12.9%) and incidence (17.8%), (13.2%) respectively and grain yield 4805 kg/ha.

Keywords

Rice Leaf blast, Neck blast, Incidence, Severity, Incidence

Introduction

Agriculture and allied sectors are critical in terms of employment and livelihoods for the small and marginal farmers, who dominate the agriculture ecosystem in India. To attain the Sustainable Development Goals (SDGs) of ending poverty and bringing in inclusive

growth, activities related to agriculture need to be closely integrated with the SDG targets. Rice (Oryza sativa L.) is the staple food for more than 60 per cent of the world's population and more than 90 per cent of the rice produced in the world is consumed in the Asian countries. Globally, during 2011-12 rice crop occupied an area of about 159.22 million hectares with 465.81 million tonnes of production and productivity of 4.36 metric tonnes per hectare (USDA, 2013). Rice blast disease, caused by the fungus *Magnaporthe oryzae*, has been observed in almost every rice growing country, and it has brought about significant yield losses in the production of rice which is the principal axis of agriculture in most Asian countries. The fungus is able to infect and produce lesions on all organs of the rice plant except the root. Leaf blast when the fungus attacks a young leaf, purple spots can be observed after an incubation period, changing into a spindle shape which has a gray centre with a purple-to-brown bord e r, and then surrounded by a yellow zone as time passes. Brown spots appear only on the older leaves or leaves of resistant cultivars. In young or susceptible leaves, lesions coalesce and cause withering of the leaves themselves, especially at the seedling and tillering stages. The most usual approaches for the management of the disease include planting of resistant cultivars, manipulation of planting time, recommended application of fertilizers and irrigation management. Among them, fungi alone account for more than thirty diseases of which rice blast caused by *Pyricularia grisea* Sacc is one of devastative and destructive diseases of rice worldwide, causing yield losses to the extent of 70-80% in various rice ecosystems (Ratna Madhavi, 2011). The discovery of several methods for the control of rice blast (*Oryza sativa* L.) caused by heterothallic Ascomycete, Magnaporthe grisea Barr (*anamorph, Pyricularia oryzae Cav. or Pyricularia grisea*) was the target for research (Georgopoulos and Ziogas, 1992; Ntanos and Giamoustaris, 1991; Ntanos and Filippou, 1991; Thanassoulopoulos, Tzavella-Klonari and Katis, 1990). The anamorph of *Magnaporthe grisea*), is one of the most destructive and wide spread disease (Jia *et al.,* 2000). Blast epidemics happened across various rice growing countries including India, China, Korea, Vietnam and United States to the extent of 50 % yield loss (Wilson and Talbot, 2009). An area with high rainfall and cooler climate are sternly affected (Ghatak *et al.,* 2013) large scale cultivation. In this context management of the disease by adopting cultural practices combined with need based application of the fungicide is the best practice to minimize the loss due to disease and to attain economical yield. Further repeated use of same fungicides in the same field or plot sometimes become less or not effective may result in development of fungicide resistance in the pathogen. In this view, the present exploration was undertaken to appraise the efficacy of new combination fungicides against neck blast and leaf blast diseases under field conditions.

Materials and Methods

The experiment were carried out at various parts of different villages in Ayodhya and Ambedkarnager of Uttar Pradesh viz. Marna and Jogapur (Ayodhya), Kewari, Parmanand (Ambedkarnager), were evaluated against blast disease of rice the most popular variety Sambha Mahsuri. Experiment was laid out in one village one replication. Most popular variety used was Sambha Mahsuri and the gross plot size was 50 sq. metres and all packages of practices were followed for conducting the experiment. This experiment was laid out in randomized block design with seven replications (four village of Ayodhya viz. Sarairasi, Marna, Jogapur and three village of Ambedkarnager viz. Chachikpur,

Barahi and Raniva). One village one replication, the soil of the farmers' field was sandy loam in texture, neutral in reaction and had low nitrogen and medium phosphorus and potassium contents. To evaluate the efficacy of new molecules/chemicals against wilt, were tested. Eight treatment combinations viz. T1- tricyclazole 0.06% + *Ocimum sanctum* 15%, + Pseudomonas fluorescens @ 1.8g/l., T2- tricyclazole 0.06% + *Ocimum sanctum* 15% @ 1.5 g/l., T3- Ocimum sanctum @ 1.0 g/letter, T4- Flusilazole 12.5% + carbendazim 25% SC@ 1.0ml+/lg/l., T5- Azoxystrobin 18.2 % w/w @ 1.0ml/l, T6- Tricyclazole 18 % + mancozeb 62 % WP @ 2.5g/l., T7- Prochloraz 45% EC @ 2.0ml/l. and T8- Untreated control (Spray of plain water). The treatments were sprayed twice at 15 days interval starting from just appearance of disease symptoms under natural inoculation. Control plot were sprayed with ordinary water. Disease observations were recorded after 15 days last spray by fixing 5 sampling unit of one square metre in each plot. The rice variety Sambha Mahsuri was sown in nursery 20-26 June in both years. The 25-28 days old seedling was used for transplanting keeping 2-3 seedling/hill in main field. Transplanting was done at 20x15 cm spacing with recommended dose of fertilizer 100:60:20 kg NPK/ha in all treatments. The data on grain yield of each plot were recorded separately by threshing the harvested Sambha Mahsuri on tarpaulin followed by proper sun drying and winnowing, grain yield measured in kilogram. The data so obtain were subjected to statistical analysis after necessary transformation for final statistical analysis. Severity was scored and calculated by area of rice plant parts affected by total area of plant parts examined.

1. Disease Incidence (%) = No. of infected plant/total plant examined X100
2. disease Severity (%) = No. of plant tissue affected /total area of plant parts affected X100

Results and Discussion

There was significant difference among the treatments in leaf blast and neck blast disease severity and yield. The data on different disease parameters is summarised in table 1. Treated with Tricyclazole 18 % + mancozeb 62 % WP @ 2.5 g/l was found best in checking the disease severity leaf blast (9.5%,), neck blast (9.2%) and incidence was leaf blast and neck blast (14.4%), (10.0%) respectively and the grain yield 5255 kg/ha was recorded presented in Table-1& 2. While severity and incidence of leaf blast and neck blast had gone to the extent of 47.3, 49.8, 53.8 and 55.7 % respectively in unsprayed plots. In check plots reduced grain yield was recorded (3280 kg/ha). In this treatment 60.20 increased grain yield over untreated check was observed. The plot treated with T5- Flusilazole 12.5% + carbendazim 25% SC @ 1.0ml+/lg/l the leaf blast and neck blast disease severity (13.2, 12.9%,) and 17.8, 12.5 % disease incidence, along with grain yield 4805 kg/ha was recorded. In treatment combinations T1- Tricyclazole 0.06% + *Ocimum sanctum* 15%, + Pseudomonas fluorescens @ 1.0 ml/l, showed response of leaf blast and neck blast disease severity (15.8, 20.9%) and 20.1, 23.2 % disease incidence, along with grain yield 4585 kg/ha was recorded. In the plot treated with T2- Tricyclazole 0.06% + *Ocimum sanctum* 15% @ 1.5 g/l. 21.5, 23.9% leaf blast and neck blast disease severity and 24.5, 25.0% disease incidence along with grain yield 4284 kg/ha. was recorded. The plot treated with T5- Azoxystrobin 18.2 % w/w @ 1.0 ml/l. 24.7, 27.3% leaf blast and neck disease severity and 26.0, 26.0 % disease incidence with yield 4185 kg/ha was recorded.

Table.1 Effect of different treatments on severity and incidence of leaf blast and neck blast of rice

Sl No.	Treatments	Dose	Disease Incidence %(Leaf blast)			Disease Severity %(Leaf blast)			Disease Incidence %(Neck blast)			Disease Severity %(Neck blast)		
			2017	2018	Mean	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean
T1-	Tricyclazole 0.06% + *Ocimum sanctum* 15%, + Pseudomonas fluorescens	1.8g/l	18.8	21.4	20.1	15.4	16.2	15.8	22.6	23.7	23.2	20.6	21.2	20.9
T2-	Tricyclazole 0.06% + *Ocimum sanctum* 15%	1.5 g/l	23.7	25.2	24.5	20.6	22.4	21.5	24.2	25.8	25.0	23.6	24.2	23.9
T3-	Ocimum sanctum	1.g/l	30.6	31.9	31.3	28.4	29.2	28.8	26.6	28.8	27.7	25.8	26.9	26.4
T4-	Flusilazole 12.5% + carbendazim 25% SC	1.0ml+/lg	15.6	19.9	17.8	12.8	13.6	13.2	11.2	13.8	12.5	12.6	13.2	12.9
T5-	Azoxystrobin 18.2 % w/w	1.0ml/l	24.8	27.2	26.0	23.7	25.6	24.7	25.2	26.8	26.0	26.8	27.8	27.3
T6-	Tricyclazole 18 % + mancozeb 62 % WP	2.5g/l	12.2	16.6	14.4	8.7	10.2	9.5	9.8	10.2	10.0	8.6	9.7	9.2
T7-	Prochloraz 45% EC	2.0ml/l	28.8	30.6	29.7	24.4	26.2	25.3	29.8	30.2	30.0	26.4	28.8	27.6
T8-	Control		50.8	56.8	53.8	45.7	48.9	47.3	52.6	58.8	55.7	47.9	51.7	49.8

Table.2 Effect of treatments on grain yield

Sl No.	Treatments	Dose	Grain Yield kg/ha			Increase in yield over control (%)		
			2017	2018	Mean	2017	2018	Mean
T1-	Tricyclazole @ 0.06% + *Ocimum sanctum* @ 15%, + Pseudomonas fluorescens	1.8g/l	4560	4610	4585	40.31	39.27	39.79
T2-	Tricyclazole 0.06% + *Ocimum sanctum* 15%	1.5 g/l	4210	4357	4284	29.53	31.63	30.58
T3-	Ocimum sanctum	1.g/l	3650	3722	3686	12.30	12.44	12.37
T4-	Flusilazole 12.5% + carbendazim 25% SC	1.0ml/l	4790	4820	4805	47.38	45.61	46.50
T5-	Azoxystrobin 18.2 % w/w	1.0ml/l	4110	4260	4185	26.46	28.70	27.58
T6-	Tricyclazole 18 % + mancozeb 62 % WP	2.5g/l	5150	5360	5255	58.46	61.93	60.20
T7-	Prochloraz 45% EC	2.0ml/l	3770	3910	3840	16.00	18.12	17.06
T8-	Control		3250	3310	3280	–	–	–

The plot treated with T7- Prochloraz 45% EC @ 2.0ml /l. 25.3, 27.6% leaf blast and neck blast disease severity and 29.7, 30.0%, disease incidence with yield 3840 kg/ha was recorded. The plot treated with T3- *Ocimum sanctum* @ 1.0g /l., 28.8, 26.4% leaf blast and neck blast disease severity and 31.3, 27.7%, disease incidence with yield 3686 kg/ha was recorded.

All seven treatments significantly reduced the disease severity and incidence at all test locations when compared to control. The combination product viz., Tricyclazole 18 % + mancozeb 62 % WP @ 2.5 g/l was significantly reduced the severity and increase the grain yield of rice over check, followed by Flusilazole 12.5% + carbendazim 25% SC @ 1.0ml+/lg /l.. Minimization of disease severity may be one of the possible reasons for enhancement of grain yield by the spraying of these fungicides.

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