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Full Length Research Paper

Evaluation of different aromatic rice genotypes for the management of rice blast

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Abstract

Rice an important staple food crop directly feeds more population than any other crop in the world. Rice crop is exposed to various biotic and abiotic stress which ultimately leads to yield loss. The blast disease caused by *Pyricularia oryzae* Cavara is one of the important diseases in the world. It is the most serious disease, prevailing in almost every rice growing regions in the world. Identifying genotypes showing resistance reaction against pathogen is one of the best ways to manage rice blast since it offers a cheap way of managing disease and have long-lasting effect. The experiment to evaluate suitable aromatic rice genotypes for blast resistance was conducted in the farm of Rice Research Station, Kaul during *kharif* 2021. In order to screen the promising resistant sources, 47 genotypes were screened for their resistance towards neck blast disease and observations were recorded as per the scale following SES of IRRI, (Anonymous, 2013) [1]. Out of forty-seven genotypes screened against neck blast, none of the genotypes was found to be highly resistant. Four genotypes *viz.,* HKR19-405 HKR 03-408, PB 1509 and HKR19-412 were susceptible with the disease score of 7. Whereas, forty-three genotypes were highly susceptible with the disease score of 9.

Key words: *Pyricularia oryzae,* genotypes, resistance

1. Introduction

Rice (*Oryza sativa L.*) a member of family *poaceae* an important food crop feeding more than half of the population in the world. China, India, Indonesia, Bangladesh, Vietnam, Thailand, Philippines, Brazil, and Japan are some of the major countries known for rice production. In India, rice is cultivated on an area of 45 million hectares with a total production and productivity of 178.3 million tonnes and 3.96 metric tonnes per hectare, respectively (FAOSTAT, 2020) [2]. India leads the export of basmati rice in the world. Rice crop is susceptible to variety of abiotic and biotic stresses which leads to yield losses. Various elements of Biotic stress affects rice which includes fungi, bacteria, viruses, and insect pest. Rice is subjected to many fungal diseases such as blast (*Pyricularia oryzae*), brown leaf spot (*Bipolaris oryzae*), stem rot (*Sclerotium oryzae*), sheath blight (*Rhizoctonia solani*) and sheath rot (*Sarocladium oryzae*). Rice blast disease is the most serious disease- causing leaf, node, neck, and panicle blast symptoms from seedling stage to maturity of crop (Webster, 1992) [9]. Basmati rice is highly susceptible to rice blast under conducive weather conditions (Pandey *et al.*, 2018) [6]. For the effective management of rice blast disease chemical treatment is the most common option among all the farmers. These treatments, however, are expensive and detrimental to the environment and the pathogen might develop resistance to the fungicides used. For successful disease management, an integrated disease management strategy should be followed. Host resistance is an important constituent of integrated disease management and this includes identifying genotypes showing resistance reaction against pathogen since it offers a cheap way of managing disease and have long- lasting effect.

2. Materials and Methods

Screening of the suitable aromatic rice genotypes for neck blast resistance under field conditions

A total of 47 scented rice genotypes including commercially grown rice varieties and elite lines were screened during *Kharif* 2021 to identify the sources of resistance against *P. oryzae* under field conditions. For each genotype, 25 days old seedling were transplanted in two rows of 3m length at 20cm x 15 cm spacing. Disease severity was recorded after the panicle emergence following SES of IRRI, (Anonymous, 2013) [1]. The neck blast incidence was recorded in five hills randomly selected from each plot. Accordingly, the the panicles were scored for disease reaction using disease scale.

Neck blast

For neck blast incidence, five hills were randomly selected from each plot and total number of panicles per hill and number of infected panicles in that plot was counted. Collected data was converted into per cent neck blast incidence by using formula given by Hosagoudar (2018) [3].

$$\text{Per cent neck blast incidence (\%)} = \frac{\text{Infected panicles}}{\text{Total number of panicles}} \times 100$$

Table 1: Scoring for neck blast done at harvesting stage following SES of IRRI, 2013

Rating scale	Disease scale for Panicle blast	Disease Reaction
0	No incidence	Highly Resistant
1	Less than 5% infected panicles	Resistant
3	5-10% infected panicles	Moderately Resistant
5	11-25% infected panicles	Moderately Susceptible
7	26-50% infected panicles	Susceptible
9	More than 50% infected panicles	Highly Susceptible

3. Results and Discussion

Screening of the suitable aromatic rice genotypes for blast resistance under field conditions.

The most practical and affordable approach of disease control is the use of resistant varieties or cultivars, which can minimise the economic losses and helps farmers by providing sustainable alternative. Although the genetic pool of basmati rice is small, the scented rice has a large diversity. The experiment on suitable aromatic rice genotypes for blast resistance was conducted in the farm of Rice Research Station, Kaul during *kharif* 2021. In order to screen the promising resistant sources, 47 genotypes were screened for their resistance towards neck blast disease and observations were recorded as per the scale following SES of IRRI, (Anonymous, 2013) [1]. Out of forty-seven genotypes screened against neck blast, none of the genotypes was found to be highly resistant. Four genotypes *viz.*, HKR19-405 HKR 03-408, PB 1509 and HKR19-412 were susceptible with the disease score of 7. Whereas, forty- three genotypes *viz.*, HKR19-404, HKR19-410, HKR19- 416, HKR19-420, HKR19-425, HKR19 - 429, HKR19-429, HKR19-435, HKR19-438, HKR19-444, HKR19-454, HKR19-459, HKR19-462, HKR19-463, HKR19-465, HKR19-468, HKR19-480, PB 1121, HB2, HKR18-419, HKR18-425, HKR18-436, HKR18-465, HKR18-468, HKR18-475, HKR18-479, CSR 88, PUSA 1557-06-08-176-162-156, PUSA 1718-14-2-150, CSR 90, PB1692, HKR 06- 443-66, HKR15-455, HKR15-488, HKR16-459, HKR17-422, HKR17-424, HKR19-408, HKR19-418, HKR19-440, HKR18-414, PUSA 1656-10-705 and HBC19 were highly susceptible with the disease score of 9 (Table 2.1).

Screening of rice genotypes and their response against blast disease have been studied earlier by many scientists and research scholars. Kumar *et al.*, (2018) [4] screened 20 varieties to find out blast resistance source and found that five genotypes *viz.*, Pusa Basmati-6, Pusa Basmati-1121, Pusa Basmati-1509, Type-3, UnnathPusa Basmati-1were moderately resistant. Turiadar *et al.*, (2018) [8] screened 30 traditional rice varieties (TRVs) along with resistant (Tetep) and susceptible check (HR 12). None of the TRVs were highly resistant and resistant, but two TRVs *viz.*, Baigan Munji and Adri Batta were moderately resistant and Tetep was resistant reaction against blast. Similarly, Sidhu *et al.*, (2021) evaluated a total 30 aromatic rice genotypes against neck blast and found that most the genotypes were highly susceptible to neck blast disease. Two genotypes *viz.*, Kalikhasa and UPR-2828-7-1 were found to be susceptible while two genotypes Pusa Basmati 1637 and Tetep were moderately resistant. Ninety-nine folk rice cultivars from Sub-Himalayan Terai region were collected and screened for resistance against blast disease under field conditions and observed that cultivars ‘Sadanunia’, ‘T4M-3-5’, ‘Chakhao Sampark’ were found to be highly resistant to the blast disease whereas ‘Kalonunia’, ‘Gobindabhog’, ‘Konkanijoha’ were found to be highly susceptible (Mondal *et al.*, 2021) [5].

Table 2: Screening of aromatic rice genotypes for neck blast resistance

Score	Disease reaction	Genotypes
0	Highly resistant	Nil
1	Resistant	Nil
3	Moderately Resistant	Nil
5	Moderately Susceptible	Nil
7	Susceptible (4)	HKR19-405, HKR 03-408, PB 1509 and HKR19-412.
9	Highly susceptible (43)	HKR19-404, HKR19-410, HKR19-416, HKR19-420, HKR19-425, HKR19-429, HKR19-429, HKR19-435, HKR19-438, HKR19-444, HKR19-454, HKR19-459, HKR19-462, HKR19-463, HKR19-465, HKR19-468, HKR19-480, PB 1121, HB2, HKR18-419, HKR18-425, HKR18-436, HKR18-465, HKR18-468, HKR18-475, HKR18-479, CSR 88, PUSA 1557-06-08-176-162-156, PUSA 1718-14-2-150, CSR 90, PB1692, HKR 06-443-66, HKR15-455, HKR15-488, HKR16-459, HKR17-422, HKR17-424, HKR19-408, HKR19-418, HKR19-440, HKR18-414, PUSA 1656-10-705 and HBC19.

4. Conclusion

The most practical and affordable approach of disease control is the use of resistant varieties or cultivars, which can minimise the economic losses and helps farmers by providing sustainable alternative. Although the genetic pool of basmati rice is small, the scented rice has a largediversity. During present study 47 genotypes were screened for neck blast resistance under field conditions. None of the genotypes were resistant to neck blast. Four genotypes *viz*., HKR19-405 HKR 03-408, PB 1509 and HKR19-412 were susceptible**,** while forty-three genotypes were highly susceptible. There is much scope in screening for resistant genotypes and incorporating the same in the breeding programme since India is known for diverse genetic pool of plants and identifying suitable resistant genotype helps in reducing cost of production by limiting the dependence on chemicals such as fungicides thereby reducing pollution pressure on environment and use of resistant cultivars is most effective way to manage disease compared to other means of managing the disease.

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