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Screening of Rice Genotypes for Leaf and Neck Blast Disease Resistance

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ABSTRACT: Rice blast, caused by *Pyricularia oryzae* with high pathogen plasticity and mutation rate considered as the most damaging disease in rice. It is responsible for yield losses of about 10% to 30% annually. In favorable conditions, this disease can devastate entire rice plants within 15 to 20 days and cause yield losses of up to 100%. There is always a continuous need of screening germplasm lines to identify resistant genotypes, which is a sustainable approach to disease management. A total of 143 rice genotypes, with resistant (Tetep) and susceptible check (HR12) were screened against leaf blast and neck blast (*Pyricularia oryzae*) disease under high disease pressure. It is found that for leaf blast, 3 rice genotypes were resistant, while for neck blast, genotype (G226) was highly resistant, and 32 genotypes were resistant. Leaf and neck infection were positively correlated and non-significant (r = 0.228). While genotypes G177 and G701 were resistant to both leaf and neck blast, and can be used in blast resistance breeding programs as prospective resistant sources.

Keywords: Breeding lines, Leaf blast, *Pyricularia oryzae*, Neck blast, Screening and Resistance.

INTRODUCTION

Pyricularia oryzae, a heterothallic ascomycete, causes rice blast, which is one of the most important biotic limitations on rice productivity (Deng *et al*., 2017). Rice blast may infect the plant at any stage of development. Over the previous few decades, India and Japan have seen repeated outbreaks and recurrent breakdowns of rice blast resistance, resulting in output losses of 20–100 percent (Khush and Jena 2009; Sharma *et al*., 2012). Disease kills seedlings in nurseries and crops at the tillering stage when environmental circumstances are ideal. The use of host resistance genes is critical to its control (Zhai *et al*., 2014).

Leaf blast lowers the quantity of bearing panicles and the weight of individual grains by stunting plant height (Thruston 1998). Barren panicles develop from stem node infections, while late neck infections result in 'broken necks,' chalky kernels, and sterile grains (Candole *et al.,* 1999). Leaf blast also boosts plant respiration while lowering maximal photosynthetic rate at light saturation and early light efficiency (Pinnschmidt *et al.,* 1994). Under intensive agriculture and high nitrogen levels in highland areas, disease becomes prominent and pandemic (Bonman 1992).

Host cultivars, resistant to leaf and panicle blast, are the most widely used method of disease control (Bonman 1992). Partial resistant cultivars are more effective to manage blast in irrigated rice of the tropics (Bonman and Mackill 1988; Yeh and Bonman 1986). Some partial resistant cultivars showed durable resistance (Johnson, 1981). Variability and population biology of the blast fungus (Correa- Victoria and Zeigler 1993; Zeigler *et al*., 1994); behavior of resistance genes (McCouch *et al*., 1994), and host–parasite interaction in the rice-blast pathosystem (Notteghem and Silue 1992) are essential in the breeding programme. Effective and efficient screening techniques are keys in successful breeding programs for blast resistance.

The continuously evolving genome of *Pyricularia oryzae* as well as existence of geographically diverse strains are challenges for the rice breeders. Genome studies of the rice blast fungus have revealed high probabilities of transposons mediated inactivation of genes involved in host specificity. Moreover, the high genetic variability in *Pyricularia oryzae* allows the fungus to broaden the host range and infect formerly resistant genotypes (Dean *et al.*, 2005). It is therefore important to build a repository of resistant accessions. Thus, the present experiment was conducted to examine and screen out the different rice lines resistant to both leaf and neck blast as well as to show the relationship between them.

MATERIAL AND METHODS

A set of 143 rice genotypes of rice germplasm material were obtained from the International Rice Gene bank (IRG) of the International Rice Research Institute (IRRI), Philippines as listed in Annexure 2. The International Rice Germplasm Collection (IRGC) of IRG holds more than 120,000 accessions from different geographical regions of the world (129 countries) and were screened phenotypically for blast resistance at ZARS, V. C. Farm, Mandya adopting Uniform Blast Nursery design. Each test entries were sown in a single row of 50 cm long with row to row spacing of 10 cm with two rows of local susceptible check (HR 12) after every ten test entries and resistant check of two rows (Tetep) was planted in every bed (Fig. 1), respectively.

Isolate and inoculum production. The pure culture of *Pyricularia oryzae* was grown on rice flour agar medium (2% rice flour, 0.2% yeast extract and 2% agar) and incubated at 25^{o}C for 12 hours per day of fluorescent light conditions for 8-10 days. Fungal colonies were scraped out of the surface for further sporulation and incubated under the same culture conditions for 1 to 2 days. After conidia formation, the conidia were harvested using sterile distilled water. The inoculums were adjusted to a concentration of 5×10^4 conidia per ml using sterilized distilled water to which 0.1% Twenty 20 was added before spraying. The spore suspension was inoculated using atomizer at fourth leaf stage after the sunset at around 6 pm. After inoculation, the plants were covered with polythene for 14 h *i.e*., from 6pm to 8 am for 3-4 days till the symptom appearance.

Rice lines evaluation to leaf and neck blast:

Artificial blast nursery for leaf blast. Seeds of rice variety HR12 were planted as a border row in 20 cm diameter containers containing wetland soil for leaf blast scoring. Using a pneumatic hand sprayer, the decanted spore solution containing 5×104 spores per ml was sprayed at fourth leaf stage after the sunset at around 6 pm To increase disease incidence, spraying was repeated every three days, when the susceptible check was extensively infected with blast, with a leaf blast score of 9, the observations were made. Individual plants in each submission were graded on a 0-9 scale for leaf blast intensity using the Standard Evaluation System (SES, IRRI, 1996) given in Table 1.

Table 1: Scale for scoring of rice leaf blast disease (IRRI, 1996).

Scale	Disease severity	Host response
0	No lesions observed	Highly Resistant (Immune)
1	Small brown specks of pin point size	Resistant (R)
2	Small roundish to slightly elongated, necrotic gray spots, about 1-2 mm in diameter, with a distinct brown margin. Lesions are mostly found on the lower leaves	Moderately Resistant (MR)
3	Lesions type is same as in scale 2, but a significant number of lesions on upper leaf area	Moderately Resistant (MR)
4	Typical susceptible blast lesions, 3 mm or longer infecting less than 4 % of leaf area	Moderately Susceptible (MS)
5	Typical susceptible blast lesions of 3 mm or longer infecting 4-10% of the leaf area	Moderately Susceptible (MS)
6	Typical susceptible blast lesions of 3 mm or longer infecting 11 – 25% of the leaf area	Susceptible (S)
7	Typical susceptible blast lesions of 3 mm or longer infecting 26 - 50% of the leaf area	Susceptible (S)
8	Typical susceptible blast lesions of 3 mm or longer infecting 51-75% of the leaf area and many leaves are dead	Highly Susceptible (S)
9	Typical susceptible blast lesions of 3 mm or longer infecting more than 75% leaf area affected	Highly Susceptible (S)

Open field conditions for neck blast natural infection. Screening for natural infection against neck blast was carried at I block, ZARS, V. C. Farm, Mandya during winter season which is the most favorable condition for neck blast disease development (Fig. 1). The sowing was carried out as per the guidelines given by IRRI. The observation of disease reaction was recorded when the susceptible check was severely infected by neck blast. Disease severity was assessed on 10 plants of each entry for neck blast and infested neck area. The observations were recorded when the susceptible check was severely infected with blast with a neck blast score of 9. Individual plants in each entry were scored based on the neck blast severity following Standard Evaluation System on 0-9 scale (SES, IRRI, 2013) given in Table 2.

Fig. 1. General view of uniform blast nursery (UBN) for Leaf and Neck blast disease.

Table 2: Scale for scoring of rice neck blast disease (IRRI, 2013).

Scale	Disease severity	Host response
0	No visible lesion or observed lesions on only a few pedicels	Highly Resistant (Immune)
1	Lesions on several pedicels or secondary branches	Resistant (R)
3	Lesions on a few primary branches or the middle part of panicle axis	Moderately Resistant (MR)
5	Lesion partially around the base (node) or the uppermost internode or the lower part of panicle axis near the base	Moderately Susceptible (MS)
7	Lesion completely around panicle base or uppermost internode or panicle axis near base with more than 30% of filled grains	Susceptible (S)
9	Lesion completely around panicle base or uppermost internode or the panicle axis near the base with less than 30% of filled grains.	Highly Susceptible (S)

Disease assessment and statistical analysis. Disease scoring was done at weekly intervals after inoculation at different growth stages. Area Under Disease Progress Curve (AUDPC) was calculated for quantitative disease resistance assessment using the following formula (Das *et al*., 1992).

$$AUDPC = \sum_{i=1}^{n-1} [(x_{i+1}+x_i)/2](t_{i+1} - t_i)$$

where xi = disease severity on the i^{th} date, ti = date on which the disease was scored (i^{th} day), n = number of dates on which disease was scored. AUDPC measures the amount of disease as well as rate of progress, and unit less.

Similarly, for the neck blast, total numbers of infected necks were scored, counted and disease incidence (DI) % was calculated using formula DI% = (number of infected plants/total number of plants counted in a plot). Based on the neck incidence percentage, lines were classified as resistant (R) with 0–15% neck infection, moderately resistant (MR) with 15.1–30% infection, moderately susceptible (MS) 30.1–50% with infection, and 50.1–100% infection as susceptible. Simple correlation coefficient and regression was determined to test the mean and interaction effect between leaf and neck infection using Microsoft Excel (2000).

Individual plants in each entry were assessed on a 0-9 scale for leaf blast intensity using the Standard Evaluation System (SES, IRRI, 1996).

RESULTS AND DISCUSSION

The blast pathogen affects different parts of a rice plant during pathogenesis. One of the serious forms of rice blast is neck blast. However, due to the very complex nature of *Pyricularia oryzae*, the epidemiology of pathogen is not completely understood and the screening technique for neck blast is not standardized. In contrast to neck blast, the leaf blast is well studied and the screening method for the same is precisely standardized.

A set of 143 lines with checks (Tetep-resistant check, HR 12-susceptible check) were evaluated for the blast resistance using uniform blast nursery method, with artificial inoculation of *Pyricularia oryzae,* following 0-9 standard evaluation scale for rice blast (SES IRRI, 1996 and 2013) and all test entries were categorized into different categories based on their response to *Pyricularia oryzae.*

It was identified that the lines G177, G701, G814, G830 and Tetep (Resistance check), shown resistance reaction, with a phenotypic score of 1 but none of test entries shown to be highly resistant with a score of 0 (Fig. 2). However, the 24 lines corresponded to moderate resistance. Further, 31 lines were found to be moderately susceptible against leaf blast disease with phenotypic scores of 4 and 5. Twenty seven lines were found to show susceptible reaction to leaf blast disease with phenotypic scores of 6 and 7. The highest susceptibility with phenotypic score of 8 and 9 was recorded by 57 lines and susceptible check HR 12 (Table 3). Similar field screening experiments were conducted for identification of location specific blast resistant lines by Srijan *et al*. (2015), Hosagoudar and Jairam Amadabade (2017); Vinayak *et al*. (2018) also.

Under natural hotspot screening of different landraces for neck blast resistance, it was observed that genotype G226 is highly resistant against neck blast. Thirty-two genotypes showed resistant reaction with a score of 1. However, 37 were moderately resistant against neck blast disease with phenotypic scores of 3.32 entries were moderately susceptible against neck blast with a score of 5. While 27 genotypes were found to be susceptible with a score of 7 and remaining 14 entries were highly susceptible with a score of 9, against neck blast (Table 4).

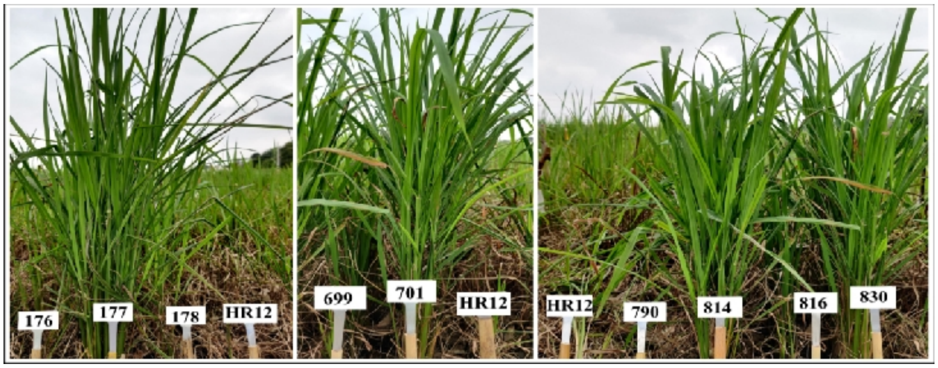

Fig. 2. Field view of resistant Genotypes in Uniform Blast Nursery against leaf blast.

Table 3: Response of genotypes to leaf blast at ZARS, Mandya during *Kharif* 2020.

Reaction	Genotypes	Score	Total
HR	-	0	0
R	G177, G701, G814, G830, Tetep (Resistant check)	1	4
MR	G14, G56, G171, G176, G194, G226, G238, G270, G279, G289, G332, G352, G353(a), G358, G362, G365, G368, G379, G493, G699, G702, G704, G740, G823	2 to 3	24
MS	G37, G42, G55, G64, G98, G122, G137, G138, G145, G167, G192, G200, G203, G268, G280, G353(b), G354, G373, G381, G401, G446, G459, G478, G505, G538, G570, G757, G761, G764, G771, G812	4 to 5	31
S	G1, G32, G52, G126, G133, G143, G147, G148, G161, G193, G204, G205, G208, G234, G236, G329, G343, G346, G447, G500, G520, G528, G581, G657, G750, G773, G832	6 to 7	27
HS	G3, G13, G21, G39, G82, G86, G89, G90, G93, G127, G129, G130, G131, G142, G153, G154, G178, G184, G187, G191, G209, G215, G216, G232, G246, G250, G259, G263, G265, G271, G275, G318, G322, G333, G336, G360, G370, G375, G376, G382, G384, G385, G404, G421, G556, G565, G626, G638, G647, G649, G650, G652, G712, G736, G782, G790, G816, HR-12 (susceptible check)	8 to 9	57

Table 4: Response of genotypes to neck blast at ZARS, Mandya during *Kharif* 2020.

Reaction	Genotypes	Score	Total
HR	G226	0	1
R	G37, G137, G154, G177, G236, G238, G268, G270, G271, G318, G332, G352, G353(b), G354, G362, G365, G368, G373, G376, G379, G401, G404, G478, G493, G699, G701, G704, G712, G736, G790, G812, G823, Tetep (Resistant check)	1	32
MR	G3, G14, G55, G56, G127, G138, G153, G162, G171, G176, G194, G204, G259, G279, G289, G329, G336, G358, G370, G375, G381, G382, G446, G459, G500, G505, G520, G581, G638, G652, G657, G757, G761, G771, G773, G814, G816	3	37
MS	G1, G13, G42, G52, G64, G89, G122, G131, G133, G147, G148, G192, G193, G200, G203, G205, G209, G246, G275, G343, G346, G353(a), G360, G384, G385, G528, G570, G650, G740, G764, G830, G832	5	32
S	G21, G86, G93, G98, G126, G129, G142, G143, G161, G167, G184, G191, G208, G215, G232, G234, G250, G265, G322, G421, G447, G538, G556, G626, G702, G750, G782	7	27
HS	G32, G39, G82, G90, G130, G178, G187, G216, G263, G280, G333, G565, G647, G649 , HR-12 (susceptible check).	9	14

Genotype G226 was highly resistant to neck blast and moderately resistant to leaf blast. While G177, G701 were resistant to both neck and leaf blast. G238, G270, G332, G352, G353 (a), G362, G365, G368, G379, G493, G699, G704, G823 were resistant to neck blast and moderately resistant to leaf blast. Puri *et al.* (2009) reported differential behavior of lines, (Barkhe 1006, Barkhe 1032, Barkhe 3004 were resistant to neck blast and had intermediate reaction to leaf) to leaf and neck blast, as our findings.

Leaf and neck blast infection was positively correlated and non-significant (r = 0.228) (Fig. 4). Leaf blast susceptible varieties have shown resistance to neck blast and vice versa (Ono and Suzuki 1960). Ou (1985); Ou and Nuque (1963) reported lines resistant to leaf blast to seedling stage, are completely resistant to neck blast and susceptible at the seedling stage are susceptible to neck blast. Bhardwaj and Singh (1983); Balal *et al.* (1977) also showed the positive correlation between leaf and neck infection. However, Koh *et al.* (1987); Bonman (1992) found some cultivars resistant in seedling stage appeared susceptible to neck infection.

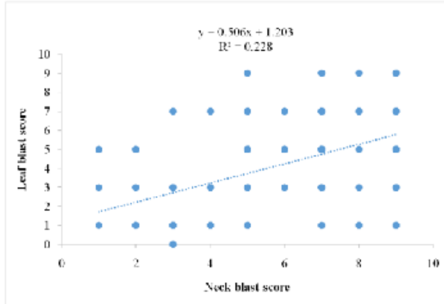

Fig. 4. Relationship between leaf and neck blast resistance**.**

Area under disease progressive curve. AUDPC were calculated based on the disease severity percentage, using the formula as presented in the materials and methods chapter. Lowest total AUDPC was observed on G177 with a value of 22.5, whereas highest value was observed on G13, G86, G89, G127, G131, G142, G153, G178, G209, G259, G271, G275, G333, G376, G382, G384, G385, G565, G736 followed by G82, G129 and G322. Based on the Total AUDPC value, rice genotypes were listed on the five categories from resistant to highly susceptible which are shown in the Tables 3 and 4. The AUPDC Values along with their disease score after every week has been depicted in Annexure 1.

Disease progress in rice lines. Rice lines showed increasing disease progress and AUDPC value up to 25 days after inoculation (DAI) and trend remained constant (Fig. 3). In G1, AUDPC was increasing at a higher rate compared to G42, G167, G365 and G505. In G1, G42, G167, G365, G505, G161, G205, G236, G270, G701, G814, G830 it was constant throughout all days. In G21, G37, G52, G122, G133, G137, G138, G147, G184, G187, G191, G204, G208, G215, G232, G246, G250, G263, G268, G332, G360, G375, G404, G657, G740, G773, G782, G812. G823, G832 AUDPC was increasing after 28 DAI. G82, G129 and G322 had higher and G177 had minimum AUDPC value. None of the genotypes had decreasing AUDPC values. G86, G89, G127, G131, G142, G153, G178, G209, G259, G271, G275, G333, G376, G382, G384, G385, G565, G736 a higher level AUDPC value was recorded, showing constant susceptible disease reaction with a score of 9. As shown in Table 5, among the selected top 12 genotypes resistant to blast disease, G177 was resistant with AUDPC value 22.5.

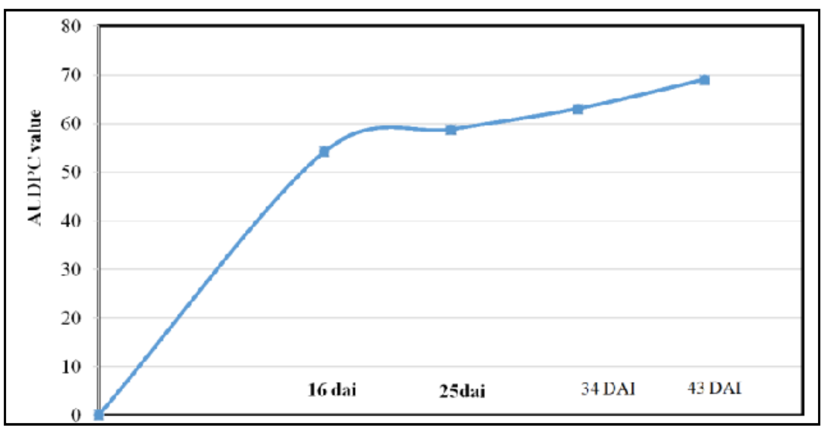

Fig. 3. Leaf blast progress in Uniform Blast Nursery (DAI = days after inoculation).

Table 5: Disease severity at different DAI.

Sr. No.	Genotype	Disease severity on				AUPDC
		16 DAS	25 DAS	34 DAS	43 DAS	
1.	G177	0	1	1	1	22.5
2.	G701, G814, G830	1	1	1	1	27
3.	G704	1	1	1	2	31.5
4.	G365	1	1	1	3	36
5.	G740, G823	1	1	2	2	40.5
6.	G1	0	1	1	6	45
7.	G194	1	1	2	3	45
8.	G279	1	2	2	2	49.5
9.	G505	1	1	2	4	49.5

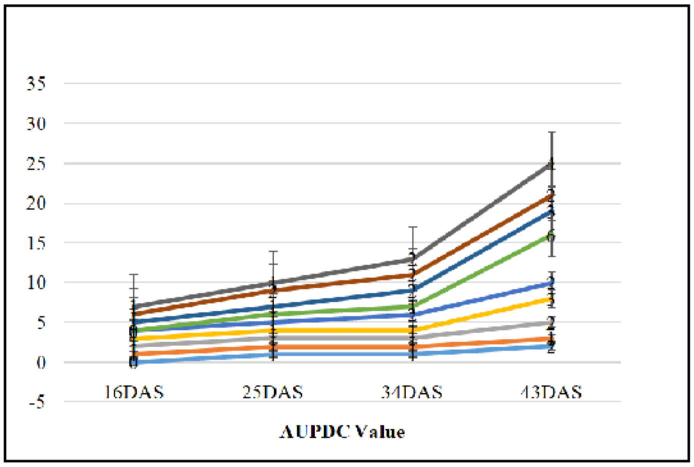

Fig. 5. Area under disease progress for leaf blast disease at different time interval for top best resistant lines.

AUDPC value of genotypes G701, G814, G830 were constant with score of 27, whereas for G704 and G365 disease progress was increasing after 34 DAS with AUPDC value of 31.5 and 36 respectively, for G740, G823 AUPDC value was 40.5, disease progress was increasing after 25 DAS. G1 showed a drastic increase after 34 DAS. G279 and G505 showed increased disease rate after 25 and 34 DAS, both with AUPDC value of 49.5 (Fig. 5). Thus, the rice genotypes used in this study having different genetic background showed different interaction to leaf blast. Such result was also supported by the work of Chaudhary *et al.*, (2001) and Puri *et al.* (2006). Several researchers have reported having higher degree of blast resistance (Chaudhary *et al.*, 2005 and Joshi *et al.*, 2017). The most important challenge in front of the rice scientists is to do accumulation of resistance genes which could be used against continuously evolving and geographically diverse races of *P. oryzae* (Sharma *et al.*, 2012). Thus, such studies need to be continued to monitor virulence of the blast pathogen and to identify new sources of resistance which will help in national breeding program for the development of blast resistant rice varieties in future.

CONCLUSION

Identification or screening of the available germplasm against a disease is a fundamental work, before the start of gene introgression or heterosis breeding. In the present study, we identified that genotypes viz. G177 and G701 were resistant to both leaf and neck blast, while none of the genotypes were highly resistant to leaf blast. While the genotype G226 was highly resistant to neck blast. From these findings we conclude that these entries could be used as parents in blast resistance breeding programs, at the area of study.

FUTURE SCOPE

The identified leaf and neck blast resistant genotypes G177 and G701 be further evaluated for yield and quality traits and consequently inducted into resistance breeding programme. Further research is recommended on the varieties mentioned above for further certainty; in addition, further research work such as comparison of plant yield with disease can be done and also molecular study of the plant varieties is further recommended.

ANNEXURE 1: Disease severity and AUPDC Value of genotypes against leaf blast.

Genotype Name	16 DAI	25 DAI	34 DAI	43 DAI	AUPDC Value	Genotype Name	16 DAI	25 DAI	34 DAI	43 DAI	AUPDC Value
IRGC121233	0	1	1	6	45	IRGC 122181	7	7	9	9	216
IRGC121618	7	7	7	9	198	IRGC 127647	7	7	9	9	216
IRGC 126261	9	9	9	9	243	IRGC128492	3	5	5	5	126
IRGC 126184	2	2	2	3	58.5	IRGC 127209	5	5	7	7	162
IRGC 125754	5	7	9	9	207	IRGC128330	1	1	2	3	45
IRGC 128327	5	7	7	7	180	IRGC127881	4	4	4	5	112.5
IRGC 127981	3	3	5	5	108	IRGC127489	4	4	4	5	112.5
IRGC 128064	7	9	9	9	234	IRGC127572	6	6	7	7	175.5
IRGC127344	2	2	2	5	67.5	IRGC127882	7	7	7	7	189
IRGC 128069	5	5	7	7	162	IRGC 127160	5	5	7	7	162
IRGC 128072	3	4	4	4	103.5	IRGC 127230	9	9	9	9	243
IRGC 128092	2	3	3	3	76.5	IRGC127221	7	7	8	8	202.5
IRGC 132308	3	3	3	5	90	IRGC127222	7	8	8	8	211.5
IRGC125836	8	9	9	9	238.5	IRGC 127877	3	3	3	3	81
IRGC125726	9	9	9	9	243	IRGC127661	7	7	8	8	202.5
IRGC 127201	9	9	9	9	243	IRGC127664	5	5	6	7	153
IRGC 127379	7	7	7	9	198	IRGC 127667	7	7	7	7	189
IRGC127580	5	6	7	8	175.5	IRGC127389	2	3	3	3	76.5

IRGC127904	3	3	3	4	85.5	IRGC 127544	7	7	8	8	202.5
IRGC 125868	4	4	5	5	121.5	IRGC 127535	7	7	8	8	202.5
IRGC 125853	4	4	5	6	126	IRGC 127107	9	9	9	9	243
IRGC 126294	9	9	9	9	243	IRGC 127163	7	7	9	9	216
IRGC 126251	8	9	9	9	238.5	IRGC 127168	7	7	8	8	202.5
IRGC 126008	7	9	9	9	234	IRGC 127128	3	3	4	4	94.5
IRGC 125627	9	9	9	9	243	IRGC 127932	3	3	3	3	81
IRGC126043	4	5	7	7	157.5	IRGC 127132	9	9	9	9	243
IRGC 126042	3	3	4	4	94.5	IRGC127355	9	9	9	9	243
IRGC 126264	4	4	5	5	121.5	IRGC132418	1	2	2	2	49.5
IRGC 126011	9	9	9	9	243	IRGC 127972	3	5	5	5	126
IRGC 126000	7	7	7	7	189	IRGC 127131	2	3	3	3	76.5
IRGC 125648	3	3	3	5	90	IRGC 128090	7	8	8	8	211.5
IRGC 125869	4	5	6	6	144	IRGC127738	8	9	9	9	238.5
IRGC 125815	5	7	7	7	180	IRGC127343	4	4	5	6	126
IRGC 125655	9	9	9	9	243	IRGC127547	2	2	3	3	67.5
IRGC 125637	8	8	8	9	220.5	IRGC127583	9	9	9	9	243
IRGC 126158	7	7	7	7	189	IRGC127817	7	9	9	9	234
IRGC125654	2	2	3	5	76.5	IRGC 128121	4	5	5	6	135
IRGC 125845	1	2	2	3	54	IRGC 127167	3	7	7	7	171
IRGC 125636	1	2	2	3	54	IRGC 127952	2	3	3	3	76.5
IRGC125653	0	1	1	1	22.5	IRGC127953	2	2	3	5	76.5
IRGC125695	9	9	9	9	243	IRGC 132241	3	3	3	4	85.5
IRGC 126280	7	7	9	9	216	IRGC 132319	2	2	2	3	58.5
	16	25	34	43			16	25	34	43	
IRGC 131967	8	8	9	9	229.5	IRGC 132279	1	1	1	2	31.5
IRGC 132320	2	2	2	3	58.5	IRGC 125813	7	8	8	9	216
IRGC 127969	1	1	1	3	36	IRGC 127425	9	9	9	9	243
IRGC 127929	2	2	2	3	58.5	IRGC 127212	1	1	2	2	40.5
IRGC 127936	8	8	8	9	220.5	IRGC 125840	3	4	4	6	112.5
IRGC 127945	3	3	3	5	90	IRGC127049	3	3	3	4	85.5
IRGC 127960	8	8	9	9	229.5	IRGC121582	4	5	5	5	130.5
IRGC 127963	9	9	9	9	243	IRGC132039	2	3	3	5	85.5
IRGC 127158	2	2	2	3	58.5	IRGC128368	2	4	4	4	99
IRGC 127159	5	5	5	5	135	IRGC 128098	5	5	7	7	162
IRGC 127965	9	9	9	9	243	IRGC 125913	7	7	8	8	202.5
IRGC 128229	9	9	9	9	243	IRGC 125658	7	8	8	8	211.5
IRGC 127968	9	9	9	9	243	IRGC 121342	3	3	4	4	94.5
IRGC 128095	4	4	4	4	108	IRGC125835	1	1	1	1	27
IRGC 128146	7	7	8	8	202.5	IRGC125603	5	7	8	8	193.5
IRGC 120921	7	8	8	8	211.5	IRGC 128205	1	1	2	2	40.5
IRGC 127196	3	3	3	4	85.5	IRGC127428	1	1	1	1	27
IRGC 127740	4	6	6	6	153	IRGC 126064	5	5	6	6	148.5
IRGC 132357	3	3	3	4	85.5	IRGC 127171	2	2	2	3	58.5
IRGC 127885	3	3	3	4	85.5	IRGC 132279	1	1	1	1	27
IRGC 127979	2	2	2	3	58.5	IRGC 125813	2	2	2	3	58.5
IRGC 127632	5	5	5	6	139.5	IRGC 127425	1	1	1	2	31.5
IRGC 127484	1	1	2	4	49.5	IRGC 127212	7	8	8	9	216
IRGC 127319	6	6	6	7	166.5	IRGC 125840	9	9	9	9	243
IRGC126974	4	4	4	6	117	IRGC127049	1	1	2	2	40.5
IRGC 122088	2	2	2	4	63	IRGC121582	3	4	4	6	112.5
IRGC 127434	5	5	5	8	148.5	IRGC132039	3	3	3	4	85.5
IRGC127729	9	9	9	9	243	IRGC128368	4	5	5	5	130.5
IRGC 125965	4	4	4	5	112.5	IRGC 128098	2	3	3	5	85.5
IRGC 126003	5	5	5	6	139.5	IRGC 125913	2	4	4	4	99
IRGC 127576	7	7	9	9	216	IRGC 125658	5	5	7	7	162
IRGC128258	5	6	6	8	166.5	IRGC 121342	7	7	8	8	202.5
IRGC125866	5	6	6	9	171	IRGC125835	7	8	8	8	211.5
IRGC126223	6	6	7	8	180	IRGC125603	3	3	4	4	94.5
IRGC127628	7	9	9	9	234	IRGC 128205	1	1	1	1	27
IRGC 127850	7	9	9	9	234	IRGC127428	5	7	8	8	193.5
IRGC132362	4	5	6	6	144	IRGC 126064	1	1	2	2	40.5
IRGC 127177	2	2	2	3	58.5	IRGC 127171	1	1	1	1	27
IRGC 127121	1	1	1	1	27	IRGC 132279	5	5	6	6	148.5
IRGC 127171	2	2	2	3	58.5						

ANNEXURE 2: List of Genotypes of IRRI used in the present study

Sr. No.	GEN_RIC NO	ACCESSION	NAME	Sr. No.	GEN_RIC NO	ACCESSION	NAME
1.	GEN_RIC 01	IRGC121233	JAGLI BORO::IRGC 27516-2	72.	GEN_RIC 289	IRGC 127131	ARC 10894::IRGC 21122-1
2.	GEN_RIC 03	IRGC121618	JABOR SAIL::IRGC 66831-1	73.	GEN_RIC 318	IRGC 128090	KOLONGI BAO::IRGC 24135-2

3.	GEN_RIC 013	IRGC 126261	PUILLIPINA KATARI::IRGC 77293-1	74.	GEN_RIC 322	IRGC127738	POONGAR::IRGC 28611-1
4.	GEN_RIC 014	IRGC 126184	BAZAIL::IRGC 27526-1	75.	GEN_RIC 329	IRGC127343	DUBRAJ::IRGC 34904-1
5.	GEN_RIC 021	IRGC 125754	GOJOL GORIA::IRGC 26629-1	76.	GEN_RIC 332	IRGC127547	LAL TAURA::IRGC 35017-1
6.	GEN_RIC 032	IRGC 128327	KABERI::IRGC 66801-1	77.	GEN_RIC 333	IRGC127583	M 142::IRGC 35054-1
7.	GEN_RIC 037	IRGC 127981	BADAL::IRGC 26290-2	78.	GEN_RIC 336	IRGC127817	SLO 19::IRGC 35157-1
8.	GEN_RIC 039	IRGC 128064	KALA DIGHA::IRGC 26367-2	79.	GEN_RIC 343	IRGC 128121	OR 117-8::IRGC 39680-2
9.	GEN_RIC 042	IRGC127344	DUDHSAR::IRGC 26458-1	80.	GEN_RIC 346	IRGC 127167	ARC 7056::IRGC 40914-1
10.	GEN_RIC 052	IRGC 128069	KAL SHULI::IRGC 31665-2	81.	GEN_RIC 352	IRGC 127952	ARC 13888::IRGC 41288-2
11.	GEN_RIC 055	IRGC 128072	KARTIKHAMA::IRGC 37149-2	82.	GEN_RIC 353	IRGC127953	ARC 13919::IRGC 41313-2
12.	GEN_RIC 056	IRGC 128092	KUMRI::IRGC 37182-2	83.	GEN_RIC 354	IRGC 132241	ARC 13934::IRGC 41325-2
13.	GEN_RIC 064	IRGC 132308	DUDHSWAR 15-157::IRGC 37967-2	84.	GEN_RIC 358	IRGC 132319	ARC 15063::IRGC 41909-2
14.	GEN_RIC 082	IRGC125836	MEI FENG 9::IRGC 63735-1	85.	GEN_RIC 360	IRGC 131967	ARC 15505::IRGC 42066-1
15.	GEN_RIC 086	IRGC125726	DENG DENGQI::IRGC 72036-1	86.	GEN_RIC 362	IRGC 132320	ARC 15743::IRGC 42127-2
16.	GEN_RIC 089	IRGC 127201	BAI MI TIE QIU::IRGC 59414-1	87.	GEN_RIC 365	IRGC 127969	ARC 18371::IRGC 42423-2
17.	GEN_RIC 090	IRGC 127379	GAO LIANG ZAO::IRGC 59563-1	88.	GEN_RIC 368	IRGC 127929	ARC 10120::IRGC 42557-2
18.	GEN_RIC 093	IRGC127580	LUO AI ZAO 3::IRGC 63730-1	89.	GEN_RIC 370	IRGC 127936	ARC 11245::IRGC 42651-2
19.	GEN_RIC 098	IRGC127904	YI LI ZHONG::IRGC 67382-1	90.	GEN_RIC 373	IRGC 127945	ARC 12800::IRGC 42720-2
20.	GEN_RIC 122	IRGC 125868	PARA NELLU::IRGC 50009-1	91.	GEN_RIC 375	IRGC 127960	ARC 14709::IRGC 42976-2
21.	GEN_RIC 126	IRGC 125853	NCS 237::IRGC 62202-1	92.	GEN_RIC 376	IRGC 127963	ARC 14868::IRGC 43009-2
22.	GEN_RIC 127	IRGC 126294	XITTO::IRGC 6671-1	93.	GEN_RIC 379	IRGC 127158	ARC 15163::IRGC 43106-1
23.	GEN_RIC 129	IRGC 126251	NCS 840::IRGC 62530-1	94.	GEN_RIC 381	IRGC 127159	ARC 15385::IRGC 43174-1
24.	GEN_RIC 130	IRGC 126008	SURMATIYA::IRGC 74779-1	95.	GEN_RIC 382	IRGC 127965	ARC 15387::IRGC 43175-2
25.	GEN_RIC 131	IRGC 125627	UPRH 233::IRGC 61667-1	96.	GEN_RIC 384	IRGC 128229	ARC 15862::IRGC 43242-1
26.	GEN_RIC 133	IRGC126043	ARC 18597::IRGC 43299-1	97.	GEN_RIC 385	IRGC 127968	ARC 15929::IRGC 43269-2
27.	GEN_RIC 137	IRGC 126042	ARC 12884::IRGC 22417-1	98.	GEN_RIC 401	IRGC 128095	LANJALI::IRGC 46236-2
28.	GEN_RIC 138	IRGC 126264	RAJHUSAI (ACR 12)::IRGC 53630-1	99.	GEN_RIC 404	IRGC 128146	RANACHANDRABHOG::IRGC 46567-2
29.	GEN_RIC 142	IRGC 126011	TYPE 50::IRGC 74782-1	100.	GEN_RIC 421	IRGC 120921	CSR-90 IR-2::IRGC 117327-1
30.	GEN_RIC 143	IRGC 126000	NIRGUNI::IRGC 61127-1	101.	GEN_RIC 446	IRGC 127196	B 3913 B 16-20 ST 28::IRGC 63099-1
31.	GEN_RIC 145	IRGC 125648	ARC 14060::IRGC 41374-1	102.	GEN_RIC 447	IRGC 127740	PORONG::IRGC 76983-1
32.	GEN_RIC 147	IRGC 125869	PATALASAFED SUNGHAWADO::IRGC 61133-1	103.	GEN_RIC 459	IRGC 132357	NARUN::IRGC 18320-2
33.	GEN_RIC 148	IRGC 125815	KUTTA::IRGC 52184-1	104.	GEN_RIC 478	IRGC 127885	VARY LAHY::IRGC 69908-1
34.	GEN_RIC 153	IRGC 125655	ARC 18112::IRGC 42274-1	105.	GEN_RIC 493	IRGC 127979	BAANYALOJOPOIHUN::IRGC 7928-2
35.	GEN_RIC 154	IRGC 125637	ARC 10754::IRGC 12603-1	106.	GEN_RIC 500	IRGC 127632	MOSHI::IRGC 70648-1
36.	GEN_RIC 161	IRGC 126158	MAKRO::IRGC 74763-1	107.	GEN_RIC 505	IRGC 127484	KAMPTI::IRGC 75626-1
37.	GEN_RIC 167	IRGC125654	ARC 18092::IRGC 42256-1	108.	GEN_RIC 520	IRGC 127319	DIAMBARANG::IRGC 56726-1
38.	GEN_RIC 171	IRGC 125845	MULLIKURUVA::IRGC 77529-1	109.	GEN_RIC 528	IRGC126974	BUCAYAB::IRGC 44357-1
39.	GEN_RIC 176	IRGC 125636	ARC 10594::IRGC 12524-1	110.	GEN_RIC 538	IRGC 122088	IR 1561-228-3-3::IRGC 32627-C1
40.	GEN_RIC 177	IRGC125653	ARC 15873::IRGC 43250-1	111.	GEN_RIC 556	IRGC 127434	IR 19058-107-1::IRGC 72997-1
41.	GEN_RIC 178	IRGC125695	CAUVERY::IRGC 45255-1	112.	GEN_RIC 565	IRGC127729	PILIT (7480) SELN (CI 12007)::IRGC 3758-1

42.	GEN_RIC 184	IRGC 126280	T 315::IRGC 54792-1	113.	GEN_RIC 570	IRGC 125965	HAWM KRUA::IRGC 64333-1
43.	GEN_RIC 187	IRGC 122181	NONA BOKRA::IRGC 22710-C1	114.	GEN_RIC 581	IRGC 126003	RD 15::IRGC 47705-1
44.	GEN_RIC 191	IRGC 127647	NAPDAI::IRGC 52009-1	115.	GEN_RIC 626	IRGC 127576	LOUK PASOM::IRGC 98136-1
45.	GEN_RIC 192	IRGC128492	TUNAGANNAPNANG::IRGC 52046-1	116.	GEN_RIC 638	IRGC128258	CHAO DO::IRGC 106666-1
46.	GEN_RIC 193	IRGC 127209	BARAMANJ::IRGC 52067-1	117.	GEN_RIC 647	IRGC125866	PALEPYU::IRGC 33549-1
47.	GEN_RIC 194	IRGC128330	KALISAL::IRGC 52324-1	118.	GEN_RIC 649	IRGC126223	KHAO THI RATE::IRGC 58041-1
48.	GEN_RIC 200	IRGC127881	VAIKATHARYAN::IRGC 52805-1	119.	GEN_RIC 650	IRGC127628	MOE GAUNG PYU::IRGC 58120-1
49.	GEN_RIC 203	IRGC127489	KANPURI::IRGC 53278-1	120.	GEN_RIC 652	IRGC 127850	TAUNG LWIN::IRGC 58222-1
50.	GEN_RIC 204	IRGC127572	LOCAL::IRGC 53300-1	121.	GEN_RIC 657	IRGC132362	PADINTHUMA::IRGC 70762-2
51.	GEN_RIC 205	IRGC127882	VANKALI::IRGC 53339-1	122.	GEN_RIC 699	IRGC 127177	ATT CHHMOUS::IRGC 87030-1
52.	GEN_RIC 208	IRGC 127160	ARC 15480::IRGC 53799-1	123.	GEN_RIC 701	IRGC 127121	AM BEUS::IRGC 87189-1
53.	GEN_RIC 209	IRGC 127230	BIR BAHADUR::IRGC 53889-1	124.	GEN_RIC 702	IRGC 127171	ARNG'-KAR PHAR ONG::IRGC 87196-1
54.	GEN_RIC 215	IRGC127221	BHAINSA MUNDARIYA::IRGC 60893-1	125.	GEN_RIC 704	IRGC 132279	DAMNOEUB KRACHAK SESS::IRGC 87380-1
55.	GEN_RIC 216	IRGC127222	BHATA PYAGI::IRGC 60895-1	126.	GEN_RIC 712	IRGC 125813	KURULUTUDU::IRGC 36304-1
56.	GEN_RIC 226	IRGC 127877	UPRH 265::IRGC 61689-1	127.	GEN_RIC 736	IRGC 127425	GARURA::IRGC 64111-1
57.	GEN_RIC 232	IRGC127661	NCS 599::IRGC 62373-1	128.	GEN_RIC 740	IRGC 127212	BARKHE TAULI::IRGC 16116-1
58.	GEN_RIC 234	IRGC127664	NCS 766::IRGC 62478-1	129.	GEN_RIC 750	IRGC 125840	MILYANG 77::IRGC 69340-1
59.	GEN_RIC 236	IRGC 127667	NCS 830::IRGC 62518-1	130.	GEN_RIC 757	IRGC127049	HP 3319-2WX-6-4-1-B::IRGC 117331-1
60.	GEN_RIC 238	IRGC127389	GORA DHAN 2::IRGC 66269-1	131.	GEN_RIC 761	IRGC121582	TAK::IRGC 73124-1
61.	GEN_RIC 246	IRGC 127544	LALI GURMATIA::IRGC 70854-1	132.	GEN_RIC 764	IRGC132039	RATUA 81::IRGC 6829-1
62.	GEN_RIC 250	IRGC 127535	KUNJUKUNJU::IRGC 75448-1	133.	GEN_RIC 771	IRGC128368	LOC TRANG MUON::IRGC 73216-1
63.	GEN_RIC 259	IRGC 127107	ADT 12::IRGC 6254-1	134.	GEN_RIC 773	IRGC 128098	LUA HUONG T 1::IRGC 7082-2
64.	GEN_RIC 263	IRGC 127163	ARC 6052::IRGC 12196-1	135.	GEN_RIC 782	IRGC 125913	TAIPEI WOO CO::IRGC 112-1
65.	GEN_RIC 265	IRGC 127168	ARC 7236::IRGC 12335-1	136.	GEN_RIC 790	IRGC 125658	ASU::IRGC 62154-1
66.	GEN_RIC 268	IRGC 127128	ARC 10581::IRGC 12514-1	137.	GEN_RIC 812	IRGC 121342	GEANT W 7::IRGC 9620-1
67.	GEN_RIC 270	IRGC 127932	ARC 10846::IRGC 12656-2	138.	GEN_RIC 814	IRGC125835	MAYBELLE::IRGC 78629-1
68.	GEN_RIC 271	IRGC 127132	ARC 10905::IRGC 12669-1	139.	GEN_RIC 816	IRGC125603	BOND::IRGC 66755-1
69.	GEN_RIC 275	IRGC127355	EDAKKADAN 0-69-27::IRGC 19560-1	140.	GEN_RIC 823	IRGC 128205	ZACATEPEC::IRGC 16901-2
70.	GEN_RIC 279	IRGC132418	ARC 5756::IRGC 20220-2	141.	GEN_RIC 830	IRGC127428	IH PEN SHIM MING::IRGC 26067-1
71.	GEN_RIC 280	IRGC 127972	ARC 6015::IRGC 20314-2	142	GEN_RIC 832	IRGC 126064	IRGA 959-1-2-2F-4-1-4A-6-CA-6X::IRGC 117006-1

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REFERENCES

Balal, M. S., Selim, A. K., Hassanian, S. H. and Maximoss, M. A. (1977). Inheritance of resistance to leaf and neck blast to rice. *Egyptian Journal of Genetics and Cytolology, 6*: 332–341.

Bhardwaj, C. L. and Singh, B. M. (1983). Evaluation of blast resistant rice varieties in Himachal Pradesh. *Indian Phytopathology, 36*: 453-456.

Bonman, J. M. and Mackill, D. J. (1988). Durable resistance to rice blast. *Oryza, 25*: 103-110.

Bonman, J. M. (1992). Durable resistance to rice blast-environmental influences. *Euphytica, 63*: 115–123.

Candole, B. L., Siebenmorgen, T. J., Lee, F. N. and Cartwright, R. D. (1999). The effect of panicle blast on the physical properties and milling quality of rice cultivar 'M202'. *Res Ser-Arkansas Agric Exp Stn., 468*: 142–147.

Chaudhary, R. N. (1996). Techniques for screening rice genotypes for resistance to the blast fungus and its crude extract toxin. Thesis, M.Sc. Kasetsart University, Bangkok, Thailand, p. 97.

Chaudhary, B. (2001). Rice blast: Pathogenic variability and host resistance. M.Sc. Thesis, Tribhuvan University, Institute of Agriculture and Animal Sciences, Rampur, Chitwan, Nepal.

Chaudhary, B., Shrestha, S. M. and Sharma, R. C. (2005). Resistance in Rice Breeding Lines to the Blast Fungus in Nepal. *Nepal Agriculture Research Journal, 6*: 49-56.

Correa-Victoria, F. J. and Zeigler, R. S. (1993). Pathogenic variability in *Pyricularia grisea* at a rice blast 'hot spot' breeding site in Eastern Colombia. *Plant Disease, 77*: 1029–1035.

Das, M. K., Rajaram, S., Mundt, C. C. and Kronstad, W. E. (1992). Inheritance of slow rusting resistance to leaf rust in wheat. *Crop Science, 32*: 1452–1456.

Dean, R. A., Talbot, N. J., Ebbole, D. J., Farman, M. L., Mitchell, T. K., Orbach, M. J., Thon, M., Kulkarni, R., Xu, J. R., Pan, H., Read, N. D., Lee, Y. H., Carbone, I., Brown, D., Oh, Y. Y., Donofrio, N., Jeong, J. S., Soanes, D. M., Djonovic, S., Kolomiets, E., Rehmeyer, C., Li, W., Harding, M., Kim, S., Lebrun, M. H., Bohnert, H., Coughlan, S., Butler, J., Calvo, S., Ma, L. J., Nicol, R., Purcell, S., Nusbaum, C., Galagan, E. J, and Birren, B. W. (2005). The genome sequence of the rice blast fungus *Magnaporthe grisea*. *Nature, 434*: 980–986.

Deng, Y., Zhai, K., Xie, Z., Yang, D., Zhu, X., Liu, J., Wang, X., Qin, P., Yang, Y., Zhang, G., Li, Q., Zhang, J., Wu, S., Milazzo, J., Mao, B., Wang, E., Xie, H., Tharreau, D. and He, Z. (2017). Epigenetic regulation of antagonistic receptors confers rice blast resistance with yield balance. *Science, 355*: 962–965.

Hosagoudar, G. N. and Jairam, A. (2017). Evaluation of rice genotypes for leaf blast reaction, yield and yield attributing traits. *Journal of Farm Science, 30*(3): 382-386.

International Rice Research Institute (1996). IRRI towards 2000 and beyond. International Rice Research Institute, Manila, p. 66.

International Rice Research Institute (2013). IRRI towards 2000 and beyond. International Rice Research Institute, Manila.

Johnson, R. (1981). Durable resistance: definition of, genetic control, and attainment in plant breeding. *Phytopathology, 71*: 567.

Joshi, P., Dangal, N. K., Chaudhary, B., Rai, S. and Sherpa, A.T. (2017). Evaluation of rice genotypes for resistance to leaf blast under field condition. National Rice Research Program, Hardinath, Dhanusha, Nepal. Nepal Agricultural Research Council, Kathmandu, Nepal. pp 473-478.

Khush, G. S. and Jena, K. K. (2009). Current status and future prospects for research on blast resistance in rice (*Oryza sativa* L.)". *Advances in Genetics, Genomics and Control of Rice Blast Disease, 10*.

Koh, Y. J., Hwang, B. K. and Chung, H. S. (1987). Adult plant resistant to rice blast. *Phytopathology, 77*: 232-236.

McCouch, S., Nelson, R., Tohme, J. and Zeigler, R. (1994). Mapping blast resistance genes in Rice. In: Zeigler RS *et al* (eds) Rice blast disease. CAB International, Wallingford, IRRI, Manila, pp 167–186.

Notteghem, J. L. and Silue, D. (1992). Distribution of mating type alleles in *Magnaporthe grisea* population pathogenic on rice. *Phytopathology, 82*: 421–434.

Ono, K. and Suzuki, H. (1960). Studies on mechanism of infection and ecology of blast and stem rot of rice plants (in Japanese, English summary). *Special Report: Forecast Disease Insect Pests,* p. 156.

Ou, S. H. and Nuque, F. L. (1963). The relation between leaf and neck blast resistant to the rice blast disease. International Rice Commonwealth Newsletter, *12*: 30–34.

Ou, S. H. (1985). Rice diseases, 2nd edn. Commonwealth Mycological Institute, Kew, p 380.

Pinnschmidt, H. O., Teng, P. S. and Yong, L. (1994). Methodology for quantifying rice yield effects of blast. In: Zeigler RS (eds) Rice blast disease. CAB International, Wallingford, in association with IRRI, Manila, pp 381–408.

Puri, K. D., Shrestha, S. M., Joshi, K. D. and KC, G. B. (2006). Reaction of different rice lines against leaf and neck blast under field condition of Chitwan valley. *Journal of Institute of Agriculture and Animal Science, 27*: 37-44.

Puri, K. D., Shrestha, S. M., Chhetri, G. B. K. and Joshi, K. D. (2009). Leaf and neck blast resistance reaction in tropical rice lines under green house condition. *Euphytica, 165*: 523–532.

Priya, V. (2008). Studies on the variability of *Pyricularia grisea* (Cooke) Sacc. M.Sc. (Ag) Thesis, Tamil Nadu Agricultural University, Tamil Nadu, India, p.90.

Sharma, T. R., Rai, A. K., Gupta, S. K., Vijayan, J., Devanna, B. N. and Ray, S. (2012). Rice Blast Management Through Host-Plant Resistance: Retrospect and Prospects. *Agricultural Research, 1*(1): 37–52.

Srijan, A., Sudheer, K. S., Jagadeeshwar, R. and Damodar, C. H. (2015). Identification of better parents and hybrids for blast resistance by UBN (Uniform Blast Nursery) method in rice (*Oryza sativa* L.). *Research Journal of Agricultural Sciences, 6*(4): 892-895.

Thruston, H. D. (1998). Tropical plant diseases, 2nd edn. APS press. American Phytopathological Society. St. paul, 31-40.

Vinayak, T., Mahendra, R., Ramachandra, A., Krupa, K. N., Ningaraj, D., Deepak, C. A. and Harini Kumar K. M. (2018). Screening of traditional rice varieties (TRVs) for blast resistance. *Journal of Pharmacognosy and Phytochemistry, 7*(1): 1384-138.

Yeh, W. H. and Bonman, J. M. (1986). Assessment of partial resistance to *Pyricularia oryzae* in six rice cultivars. *Plant Pathology, 35*: 319–323.

Zhai, C., Zhang, Y., Yao, N., Lin, F., Liu, Z., Dong, Z., Wang, L. and Pan, Q. (2014). Function and interaction of the coupled genes responsible for Pik-h encoded rice blast resistance. *PLoS One, 9*: e98067.

Zeigler, R. S., Tohme, J., Nelson, R. J., Levy, M. and Correa-Victoria, F. J. (1994). Lineage exclusion: a proposal for linking blast population analysis to resistance breeding. In: Zeigler RS *et al* (eds) Rice blast disease. CAB International, Wal-lingford, IRRI, Manila, pp. 267–292.

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