Screening of Rice Genotypes against Blast Disease in Blast Screening Nursery at Parwanipur, Bara

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Abstract: Various rice genotypes received from National Rice Research Program, Hardinath, Dhanusha were tested against leaf blast disease at DoAR, Madhesh province, Parwanipur, Bara in 2020 and 2021. During 2020 four hundred and seven rice genotypes including susceptible and resistant check were evaluated whereas four hundred and sixty four rice genotypes including checks were evaluated in the year 2021. *Sesbania bispinosa* (Dhanicha) was planted around screening nursery to augment the diseases. Rice nursery was sown in single row of 1 m length designated for one entry and rows to rows distance maintained at 0.15 m. The disease scoring was done at 25 days after seeding using 0-9 scale for rice. During 2020, out of 407 evaluated genotypes; 32 genotypes were immune, 102 genotypes were resistant, 225 genotypes were moderately resistant, 38 genotypes were moderately susceptible, and 10 genotypes were susceptible against rice blast disease. During 2021, out of 464 genotypes evaluated 266 genotypes were immune, 161 genotypes were resistant, 35 genotypes were moderately resistant, and 2 genotypes were moderately susceptible against rice blast disease. The immune and resistant rice genotypes can be used as source of blast resistance for developing improved rice cultivars in future breeding program.

Keywords: Blast, Genotypes, Rice, Resistant, Parwanipur

Introduction

Rice (*Oryza sativa* L.) is one of the major staple food that contributes to more than 20% of calorie intake globally (Abdullah et al., 2015). However, rice production is constrained by various factors among them blast disease is one of the most defective conditions with a fatality of plant deaths, caused by *Pyricularia grisea* (Cooke) Sayc., (cyn.*: P. oryzae* Cavara), or the teleomorph *Magnaporthe oryzae* (Hebert) Barr. (Choi et al 2013). Rice blast is major constraints for rice production responsible for 25-30 per cent yield loss annually (Wopereis et al., 2009). Blast disease directly decreased the rice yields along with increased production costs, which become one of the largest challenges in increasing rice production (Skamnioti and Gurr, 2009). It causes about 10-20% yield reduction in Nepal in susceptible varieties, but in severe case it reach up to 80% (Manandhar et al., 1992). It occurs worldwide around eighty four countries where rice is commercially grown (CMI, 1981). Predisposition factors such as higher relative humidity (> 85-89%), presence of dew, high temperature values, drought stress and excessive use of nitrogen are responsible for disease epidemic resulting more as 70-80% of yield loss (Piotti et al., 2005).

Usually, fungicides used to control rice the blast disease creates extra costs in rice crop production, causes pollution of environment and foods, so method of crop protection that is both economically and environmentally sustainable is required that could be use of resistant genotypes. Till now about 100 rice leaf blast resistance genes have been recognized and among them 45%, 51%, 4% from japonica types, Indica lines and rest from wild species of rice respectively (Sharma et al., 2012). Blast resistance, tended to be unpredictable resistance is repeatedly breaking down, under field conditions. Even though several blast resistant varieties were developed every year, the leaf blast resistance is not stable as a result of severe pathogen plasticity in the field conditions which renders single leaf blast resistance gene crack down next 3 to 5 years after the rice cultivar release (Lang et al., 2009). Resistant populations of the pathogen may also emerge due to extensive use of antibiotics or fungicides (Chen et al., 2019). Hence, the utilization of blast-resistant varieties is considered as the most economical, efficient, effective and environmental-friendly method to prevent the rice blast disease incidence (Ghazanfar et al., 2009; Mau et al., 2018).

Therefore, the present study was carried out to screen different rice genotypes along with resistant (Sabitri) and susceptible (Sankharika) check to find the sources of leaf blast resistance at Directorate of Agricultural Research, Madhesh Province, Parwanipur, Bara in 2020 and 2021.

Material and Methods

Experimental Site

The experiment was conducted at Directorate of Agricultural Research, Madhesh Province, Parwanipur, Bara, Nepal in 2020 and 2021. The collection of indigenous and exotic rice genotypes received from National Rice Research Program Hardinath, Dhanusha was used for the experiment.

Experimental Materials, Design and Setup

A total of 407 rice genotypes during 2020 whereas 464 rice genotypes during 2021 were evaluated for rice blast resistance at Directorate of Agricultural Research, Madhesh Province, Parwanipur, Bara. Sabitri and Sankharika/Mansuli were used as resistant and susceptible checks which were repeatedly planted in 19th and 20th rows, respectively. Trial was conducted during summer season under natural epiphytotic condition in a rod row design with single replication. Single genotype sown in single rows of 1m spaced 15 cm apart. The nursery was surrounded by 2-rows of susceptible border mixture to produce sufficient inoculums to infect the test entries. Similarly, conducive environment for blast development was created by planting Dhaincha around the experimental plot. Natural spread of the pathogen in the test lines was allowed from border lines/inoculum rows planted around the nursery. Before planting of test entries, the susceptible variety Mansuli was planted prior to one month. Conducive environment for blast development was created by planting four rows of Dhaincha around the experimental plot before 35 days of seeding of tested genotypes. Dhaincha served as wind break and created humid condition inside the experimental field which allowed landing and germination of the conidia of the pathogen available in the air. Inside Dhaincha, two rows of susceptible mixture were planted at weekly interval of two weeks after planting of wind break. These inoculums rows received conidia from air and started sporulation of lesions. After one month, the test entries were sown in dry seed bed raised 15 cm. Two rows of susceptible variety (Masuli) were also sown around each seedbed while seeding time of test entries.

Disease Assessment

Scoring of leaf blast was done 25 days after sowing using Standard Evaluation System (SES) scale, International Rice Research Institute (IRRI), Philippines (IRRI 2002) as presented in Table 1.

Table 1: Description of SES scale (IRRI 2002) for blast disease scoring

0-9 Scale	Scale description	Disease severity
0	No lesion observed.	Immune
1	Small brown specks of pin point size (smaller than 0.5 mm in diameter)	Resistant
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
3	Lesion types same as in 2 with 1-3 mm in diameter, but significant number of lesions on the upper leaves.	Moderately Resistant
4	Typical spindle shaped susceptible blast lesions, 3 mm or longer infecting less than 4% of leaf area.	Moderately Susceptible
5	Typical susceptible blast lesions of 3 mm or longer infecting 4- 10% of the leaf area.	Moderately Susceptible
6	Typical susceptible blast lesions of 3 mm or longer infecting 11-25% of the leaf area.	Susceptible
7	Typical susceptible blast lesions of 3 mm or longer infecting 26-50% of the leaf area.	Susceptible
8	Typical susceptible blast lesions of 3 mm or longer infecting 51-75% of the leaf area many leaves are dead.	Highly Susceptible

9	Typical susceptible blast lesions of 3 mm or longer infecting more than 75% leaf area affected	Highly Susceptible

Data Collection and Severity Class

Each rice genotypes were scored using 0-9 standard scale according to IRRI (2002) and genotypes were categorized as in Table 1.

Results and Discussion

Meterological Information

The weather data at Parwanipur Bara, during found to be favorable for disease development (Figure 1). Again during October, the weather remains congenial to disease development (Figure 1 and 2). The cumulative rainfall during the experimental period of 2020 was 1732.52 mm (Figure 1) while it was recorded 692.2 mm during 2021 (Figure 2).

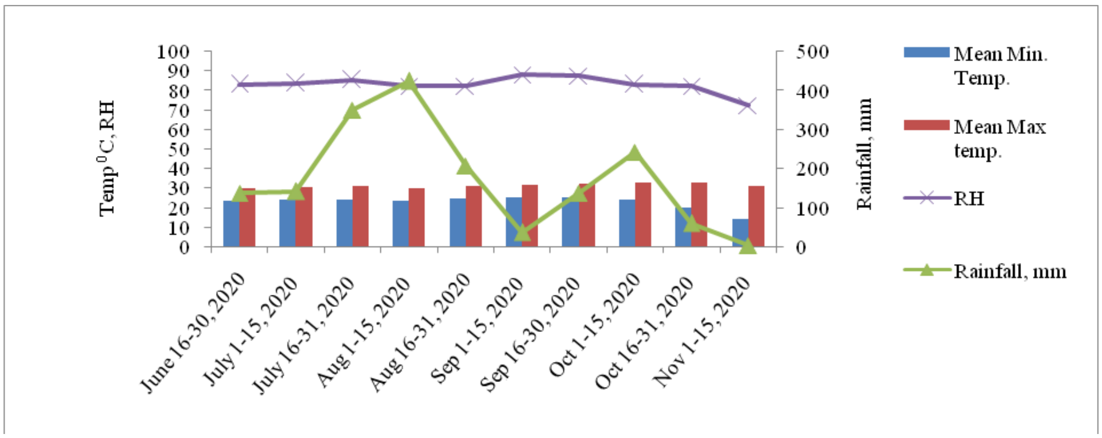

Figure 1: Weather data during experimental period of 2020

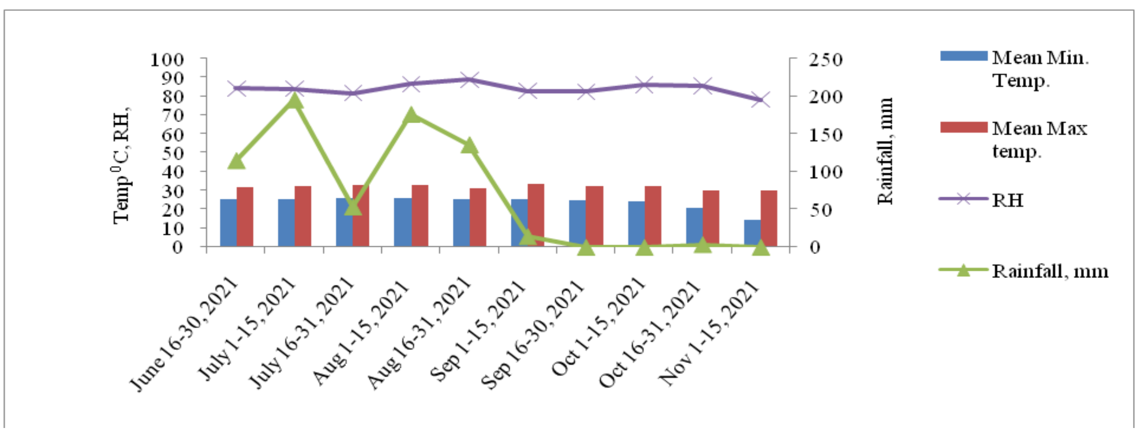

Figure 2: Weather data during experimental period of 2021

Disease Information

Rice is the staple food crop for a large part of the human population in the world even today. Failures of entire rice crops have resulted directly from rice blast epidemics. Generally, rice blast is favored by moderate temperatures (24°C) and periods of high moisture that are 12 hour or longer, conditions readily attainable and flooded rice fields (Rijal et al., 2017). Although it has been widely studied throughout the world, the rice blast has never been eliminated from a region in which rice is grown. The pathogen attacks leaves, stem nodes, all parts of panicle and grains; stunts plant growth; reduces the number of bearing panicles; results in chalky kernels, sterile grains or losses at harvest (Candole et al., 1999).

During 2020, out of 407 genotypes, 32 genotypes were immune; 102 genotypes were resistant; 225 genotypes were moderately resistant; 38 genotypes were moderately susceptible; and 10 genotypes were susceptible against rice blast disease (Figure 3, Table 2).

During 2021, out of 464 genotypes evaluated 266 genotypes were immune; 161 genotypes were resistant; 35 genotypes were moderately resistant; and 2 genotypes were moderately susceptible against rice blast disease (Figure 3, Table 3).

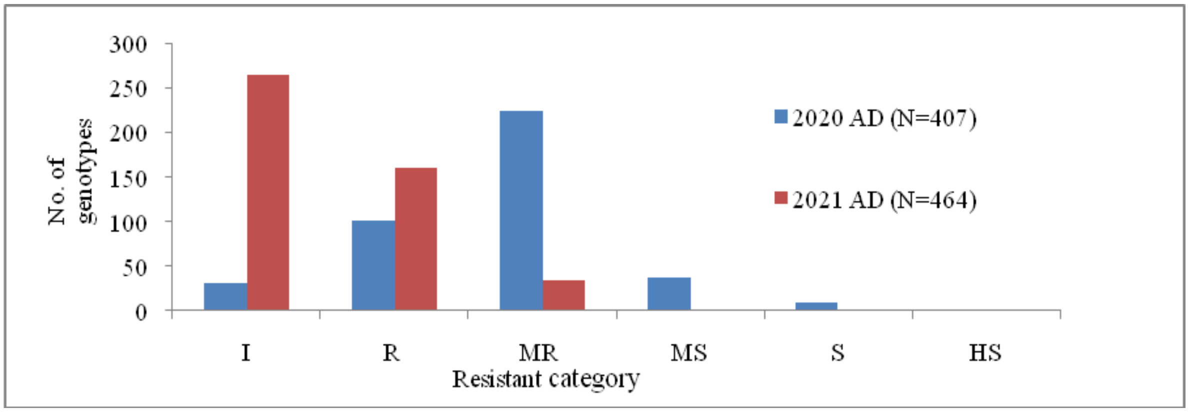

Figure 3: Rice genotypes showing different level of resistance to leaf blast during 2020 and 2021

During 2021 most of the entries showed highly resistant compared to the entries in the year 2020 which might be host specificity of pathogen, climatic factor or genetic character of genotypes. Environment influences the expressions of varieties develop from horizontal resistance (Suh et al., 2009). Maximum genotypes were found to be resistance when 97 genotypes were evaluated against leaf blast (Madhusudhan et al., 2021). Dangal et al. (2013) reported that 58 resistant genotypes during 2011 and 63 resistant genotypes during 2013 out of 134 rice genotypes evaluated each year. Similar results were obtained by Sharma et al. (2020), during 2018 when 128 lines were evaluated against leaf blast disease 59 were highly resistant, 34 were resistant, 26 were moderately resistant, 5 moderately susceptible, 4 were susceptible and none were highly susceptible to leaf blast; again in 2019 out of 291 genotypes 6 were highly resistant, 70 were resistant, 196 moderately resistant, 15 were moderately susceptible, 4 susceptible and none were highly susceptible.

Table 2: List of rice genotypes according to disease score against leaf blast disease in 2020 at Directorate of Agricultural research, Madhesh Province, Parwanipur Bara, Nepal

Disease Score	Genotypes
0	HHZ21-DT4-LT1; HHZ-2-5-DT12-L11-L11;IR 108541:12-27-1-11-B-B;IR 108541:8-66-1-4-B-B;IR 15L 1717;IR 16 L 1636; IR 16L 1661; IR 16L 1678; IR 16L 1708; IR 17L 1588; IR 99739-2-1-1-2-1; IR 99761-196-52-2-12-B; IR14L560; IR16A5125; IR17A1793; IR17A2237; NR 2169-10-4-1-1-1-1-1; NR 2187-33-2-3-4-1; NR 2188-13-5-2-5-1; NR 2188-43-1-2-2-5-1; NR 2188-8-2-1-2-1; NR 2199-63-1-1-1-1; NR 2199-9-1-1-1-1; NR 2207-33-1-2-3-1; NR 2264-4-1-6-4; NR 2380-RGA1-RGA2; SVIN 036; SVIN 188; SVIN 209; SVIN 257; SVIN069; TP 30529; TP 30539
1	Dejgora; GSR 310; HARDINATH-1; HHZ23-SAL13-4; IR 101465-5-25; IR 103587-22-2-3-B; IR 106522-39-37-1-1-B-B-5; IR 106523-25-34-3-2-B-1-1; IR 106523-25-34-3-2-B-44-3; IR 106523-25-34-3-2-B-5-3; IR 108541:12-27-1-3-B-B; IR 108541:6-36-1-22-B-B; IR 108541:8-66-2-12-B-B; IR 14 D 134; IR 16 L 1844; IR 16F 1014; IR 16L 1591; IR 16L 1619; IR 16L 1637; IR 16L 1704; IR 16L 1753; IR 16L 1755; IR 16L 1768; IR 16L 1795; IR 16L 1801; IR 16L 1855; IR 16L 1859; IR 17 L 13837; IR 17 L 1544; IR 17A 1208; IR 17A 1222; IR 17L 1323; IR 17L 1341; IR 17L 1387; IR 17L 1408; IR 17L 1415; IR 17L 1423; IR 17L 1506; IR 17L 1588; IR 64; IR05F 102; IR105469:72-18-2; IR106523-25-34-3-2-B-2-2; IR112208-B-B RGA-B RGA-B RGA-190 RGA; IR112208-B-B-RGA-B RGA-B RGA-143 RGA; IR127152-3-22-45-1-B; IR127153-4-18-14-1-B; IR127165-1-27-9-1-B; IR13N152; IR15D1055; IR15F1400; IR16A1847; IR16A2577; IR16A3025; IR16A3708; IR16F1148; IR16F1156; IR17A 1196; IR17A1157; IR17A1287; IR17A1293; IR17A1466; IR17A1909; IR17A2117; IR17A2159; IR17A2364; IR17A2488; NR

	2169-10-1-1-6-2-1-3-1; NR 2175-66-2-3-1-1; NR 2179-82-2-4-1-1-1-1; NR 2182-22-1-3-1-1-1; NR 2184-233-3-1-2-1; NR 2187-2-1-1-2-1; NR 2187-33-1-3-5-1; NR 2187-33-2-3-4-1; NR 2188-9-1-1-1-1; NR 2189-11-4-1-2-1; NR 2191-122-2-1-1-1; NR 2191-178-1-1-1-1; NR 2191-236-3-1-3-1; NR 2191-6-2-6-2-1; NR 2194-10-1-2-3-5; NR 2199-14-1-2-2-1; NR 2208-14-3-2-2-1; NR 2264-4-1-6-5; Radha-13; SVIN 028; SVIN 051; SVIN 052; SVIN 055; SVIN 178; SVIN 179; SVIN 224; SVIN 238; SVIN 248; SVIN 253; SVIN 312;; SVIN 324; SVIN 334; SVIN 357; SVIN 368; SVIN060; SVIN064; SVIN076; SVIN096; SVIN099; SVIN100; SVIN114; SVIN127; SVIN133; SVIN137; SVIN285; TP 26777; TP 30531; TP 30535; TP 30617;
2	BP 1121; BP 1126; Ciherang Sub-1; Ghaiya-1; HHZ-22-DT1-Y1-Y1-Y1; IR 106523-25-34-3-1-B-23-1; IR 106523-25-34-3-2-B-1-2; IR 106529-20-40-3-2-B; IR 108541:6-29-1-9-B-B; IR 16 L 1421; IR 16 L 1591; IR 16 L 1737; IR 16 L 1792; IR 16 L 1795; IR 16 L 1831; IR 16L 1591; IR 16L 1637; IR 16L 1657; IR 16L 1661; IR 16L 1678; IR 16L 1713; IR 16L 1743; IR 16L 1753; IR 16L 1755; IR 16L 1767; IR 16L 1769; IR 16L 1831; IR 16L 1844; IR 16L 1855; IR 17 L 1323; IR 17 L 1365; IR 17 L 1420; IR 17L 1360; IR 17L 1365; IR 17L 1415; IR 17L 1430; IR 17L 1451; IR 17L 1481; IR 17L 1571; IR 42; IR 98846-2-1-4; IR 99739-2-1-1-2-3; IR05N341; IR103388-B-B-2-3; IR106281-B-B-B-1-5; IR106463-B-B-B-1-6; IR11A293; IR127153-2-3-21-1-B; zIR127153-4-18-6-1-B; IR14L297; IR15A1103; IR15D1028; IR15D1058; IR15D1080; IR16A2577; IR16A3708; IR16A5125; IR16F1065; IR16L1478; IR17A1089; IR17A1141; IR17A1157; IR17A1287; IR17A1644; IR17A1656; IR17A1715; IR17A1885; IR17A2117; IR17A2134; IR17A2252; IR17A2295; IR17A2418; IR17A2441; IR17A2478; IR17A2504; IR86385-194-2-1-B; IR90020:22-283-B-4; IR99742:2-22-4-1-9-B; NR 2170-1-1-1-4-1-1-1; NR 2170-5-5-1-6-1-1-3-1; NR 2181-15-1-1-6-1-1-1; NR 2181-60-4-1-2-1-1-1-1; NR 2184-187-1-1-1-1; NR 2184-187-1-1-3-1-1; NR 2184-20-2-1-7-1; NR 2184-35-2-1-4-1-1; NR 2184-9-2-1-3-1; NR 2187-25-2-3-3-1; NR 2187-25-2-4-3-1; NR 2187-33-1-2-1-1; NR 2187-6-2-2-1-1; NR 2188-43-1-2-2-5; NR 2189-1-1-1-2-1; NR 2190-41-2-1-2-1; NR 2191-1-6-2-1-2-1; NR 2191-1-6-2-4-5-1; NR 2191-18-1-3-4-1; NR 2191-21-1-1-1-1; NR 2191-22-1-4-1-1; NR 2191-240-1-1-3-1; NR 2191-50-3-3-2-1; NR 2191-6-2-1-2-1; NR 2191-6-2-4-5-1; NR 2191-67-1-1-3-1; NR 2191-80-1-2-1-1; NR 2192-16-1-1-1-1; NR 2193-22-2-1-2-1; NR 2195-22-1-1-2-1; NR 2199-19-1-1-1-1; NR 2199-54-2-1-2-1; NR 2199-54-2-1-4-1; NR 2199-54-2-1-6-1; NR 2200-8-1-1-2-1; NR 2210-15-1-1-5-1; NR 2212-3-2-4-1-1; NR 2264-4-3-2-1; NR 2264-4-3-2-2; NR2157-122-1-2-1-1-1; Radha-4; Sabitri(RC); SVIN 054; SVIN 074; SVIN 123; SVIN 141; SVIN 168; SVIN 241; SVIN 301; SVIN 302; SVIN 303; SVIN 307; SVIN 328; SVIN 331; SVIN 333; SVIN 335; SVIN 350; SVIN 363; SVIN 364; SVIN 367; SVIN 368; SVIN 374; SVIN067; SVIN 075, SVIN 106; SVIN 109; SVIN118; SVIN 121; SVIN 131; SVIN 136; SVIN 183; SVIN 276; SVIN 286
3	BRRI DHAN 55; CHAITE-5; Hardinath-3; HHZ25-DT9-Y1-Y1; HHZ26-DT1-L11-L11; IR 106523-25-34-3-1-B-45-1; IR 106523-25-34-3-2-B-1-2; IR 14L 363; IR 15 L 1133; IR 16 L 1411; IR 16L 1591; IR 16L 1636; IR 16L 1713; IR 16L 1743; IR 16L 1755; IR 16L 1844; IR 16L 1849; IR 16L 1855; IR 17 L 1481; IR 17 L 1571; IR 17L 1420; IR 17L 1454; IR 92521-172-5-1-1; IR 95784-21-1-1-2; IR 98846-2-1-4-3; IR 99993-B-B-RGA-1RGA-2RGA; IR102885-29-98-1-1-19; IR103421-B-B-5-3; IR103575-76-1-1-B; IR103787-B-B-3-3; IR105469:72-18-2; IR108040-B-B-B-4-B-B; IR112208-B-B RGA-B RGA-B RGA-190 RGA; IR112208-B-B-RGA-B RGA-B RGA-143 RGA; IR117823-B-43-1-1-1; IR127153-2-3-14-1-B; IR127165-1-12-41-1-BIR12L353; IR12M112; IR15A4029; IR15D1023; IR16A3025; IR16F1028; IR16F1063; IR17A1261; IR17A1273; IR17A1293; IR17A1409; IR17A1885; IR17A2134; IR17A2267; IR17A2295; IR17A2364; IR17A2418; IR17A2488; IR17A2493; IR17A2528; IR17A2621; IR17A2670; IR91648-B-117-B-1-1; IR98853-6-1-3-2; IRRI 174; NR 2157-122-1-2-1-1-1; NR 2169-10-4-1-1-1-1-1; NR 2181-465-1-1-1-1; NR 2184-35-2-1-4-1; NR 2184-53-2-1-3-1-1; NR 2187-25-1-3-3-1; NR 2187-25-2-7-4-1; NR 2192-7-1-1-1-1; NR 2199-19-1-1-2-1; NR 2199-54-2-1-4-1; NR 2199-54-2-1-6-1; NR 2210-15-1-1-3-1; NR 2264-4-3-2-3; NR 2381-RGA1-RGA2; Radha-13; SVIN 038; SVIN 051; SVIN 056; SVIN 079; SVIN 149; SVIN 156; SVIN 189; SVIN 195; SVIN 221; SVIN 244; SVIN 268; SVIN 277; SVIN 312; SVIN 316; SVIN 323; SVIN 326; SVIN 330; SVIN

	372; SVIN063; SVIN 079; SVIN 092; SVIN 093; SVIN 095; SVIN 098; SVIN105; SVIN 112; SVIN 113; SVIN 128; SVIN132; SVIN191; SVIN255; TP 30578;TP30257
5	IR 17L 1283; IR 17L 1368; IR 17L 1381; IR16A4291; IR17A1883; IR17A2253; IR17A2267; IR17A2670; NR 2182-33-3-2-1-1-1; NR 2187-2-1-1-2-2; NR 2191-1-2-2-1-3; SVIN 022; SVIN 072; SVIN 350; SVIN116
6	IR 17L 134; IR14L537; IR16A1131; IR98786-13-1-2-1; IR99742:2-11-17-1-9-B; NR 2187-6-5-2-1-2; SVIN 188; SVIN 231; SVIN 340; TN1 (SC)

Table 3: List of rice genotypes according to disease score against leaf blast disease in 2021 at Directorate of Agricultural research, Madhesh Province, Parwanipur Bara, Nepal

Disease Score	Genotypes				
0	2015SA10	IR 17A 2267	NR 2191-18-1-3-4-1	PB 1121	SVIN 193
	2015SA9	IR 17L 1408	NR 2192-7-1-1-1-1	Chaite-5	SVIN 204
	B 6149 F-MR-7	IR 17L 1451	NR 2215-6-6-2-2-2	Sarbati	SVIN 241
	Bahuguni-2	IR 86385-194-2-1-B	NR 2219-3-2-2-1-1	Dejgora	SVIN 255
	Sunaulo Sugandha	IR 98786-13-1-2-1	NR 2235-2-2-1-1-5	SVIN 018	SVIN 268
	Pusa basmati-1	IR 99761-196-52-2-12-13	NR 2239-5-3-2-2-2	SVIN 036	SVIN 273
	Sabitri (RC)	IR07W120	NR 2249-12-2-1-1-2	SVIN 052	SVIN 280
	Sambha masuli SUB-1	IR08L181	NR 2250-7-3-3-3-1	SVIN 054	SVIN 298
	HHZ25-DT9-Y1-1	IR106523-25-34-3-1-13	NR 2255-4-4-1-1-2	SVIN 061	SVIN 323
	HHZ26-DFL11 (RGA)	IR108541:12-27-1-3-B-B	NR 2264-4-1-6-5	SVIN 067	SVIN 364
	IR 106522-39-37-1-1-B-B-5	IR12L353	NR 2264-9-2-4-2-2	SVIN 072	SVIN 386
	IR 106523-25-34-3-2-B-1-1	IR14L545	NR 2267-1-2-1-4-2	SVIN 077	SVIN 431
	IR 106523-25-34-3-2-B-42-1	IR15F1907	NR 2268-18-4-2-2-1	SVIN 095	SVIN 438
	IR 106523-25-34-3-2-B-5-3	IR16F1148	NR 2380-RGA1-RGA2	SVIN 099	SVIN 460
	IR 106523-25-34-3-3-B-45-2	IR17A1287	NR2182-33-3-2-1-1-1	SVIN 105	SVIN 643
	IR 126952-28-55-23-10-5-6-B	IR17A2159	NR2184-35-2-1-4-1	SVIN 112	SVIN 701
	IR 126952-28-55-37-1-10-2-B	IR17A2504	NR2187-2-1-1-2-1	SVIN 113	SVIN 717
	IR 126952-28-55-37-4-24-12-B	IR17L1451	NR2191-178-1-1-1-1	SVIN 123	SVMET 142
	IR 126974-B-70-2-2-3	IR90020:22-283-13-4	NR2208-14-3-2-2-1	SVIN 129	SVMET 158
	IR 126975-B-41-1-2-2	IRRI 161	NR2233-3-1-1-3-3	SVIN 130	SVMET 230
	IR 127001-B-39-1-3-3	NR 2179-82-2-4-1-1-1-1	NR2239-9-1-2-3-3	SVIN 131	SVMET 302
	IR 12L 353	NR 2187-2-1-1-2-2	NR2241-11-1-2-2-2	SVIN 136	SVMET 316
	IR 16L 1704	NR 2187-25-2-7-4-1	NR2260-10-1-2-1-2	SVIN 179	Tarahara-109
	IR 16L 1855	NR 2188-43-1-2-2-5-1	NR2260-11-4-3-2-1	SVIN 187	YAAS-U1
	2015 SA 8	IR 82635-B-B-75-2	NR 2264-4-1-6-4	IR 16L 1619	SVIN 271
	2015SA26	IR07W120	Makawanpur-1	IR 17L 1283	SVIN 277
	NR2235-2-2-1-1-2	IR103575-76-1-1-B	NGRC 05866	SVIN 263	SVIN 286
	NR 2272-7-3-5-1-1	IR106285-B-B-B-2-1	NR 2157-122-1-2-1-1-1	Sukkha-6	SVIN 292
	NR2184-9-2-1-3-1	IR106523-25-34-3-2-13-1-2	NR 2181-15-1-1-6-1-1-1	GSR310	SVIN 303

	IR 17A 1208	IR108040-B-B-B-4-B-B	NR 2184-20-2-1-7-1	IR 16L 1831	SVIN 351
	NR2192-16-1-1-1-1	IR108541:8-66-2-12-B-B	NR 2187-25-2-4-3-1	SVIN 248	SVIN 363
	IR 96322-34-260-B-5-1-1-4-B	IR112208-B-B-RGA-B RGA-B RGA-143 RGA	NR 2264-4-3-2-1	Hardinath-1	SVIN 368
	IR 103575-20-4-2-B	IR13N152	NR 2187-33-2-3-4-1	Hardinath-3	SVIN 372
	IR 106523-25-34-3-2-B-1-2	IR14D134	NR 2188-8-2-1-2-1	Radha-13	SVIN 405
	IR 126952-28-55-37-1-10-3-B	IR15D1023	NR 2189-1-1-1-2-1	SVIN 049	SVIN 432
	IR 126952-28-55-37-2-20-2-B	IR15D1024	NR 2189-11-4-1-2-1	SVIN 060	SVIN 456
	IR 126952-443-172-6-3-54-B	IR15L1505	NR 2191-21-1-1-1-1	SVIN 071	SVIN 632
	IR 126959-B-38-1-3-3	IR16A3708	NR 2191-236-3-1-3-1	SVIN 089	SVIN 640
	IR 127003-B-30-2-1-1	IR16A5125	NR 2191-240-1-1-3-1	SVIN 096	SVIN 138
	IR 127009-B-8-2-1-2	IR16L1795	NR 2191-50-3-3-2-1	SVIN 109	SVIN 334
	IR 127026-B-34-3-1-2	IR16L1855	NR 2195-22-1-1-2-1	SVIN 127	SVIN 687
	NR 2199-54-2-1-4-1	IR17A1089	NR 2258-13-1-2-1-1	SVIN 134	SVMET 294
	NR2270-4-1-1-1-2	IR17A1715	NR 2215-2-1-2-1-3	SVIN 135	TP 26777
	NR2244-5-2-2-2-1	IR17A1793	NR 2215-6-4-1-1-2	SVIN 139	YAAS-U 6
	IR 16L 1829	IR17A2364	NR 2215-9-2-4-1-1	SVIN 183	IR 17L 1387
	HHZ25-DT9-Y1-Y1	IR17A2418	NR 2219-14-6-3-3-2	SVIN 185	YAAS-U2
	NR 2187-33-1-3-5-1	IR17A2488	NR 2219-15-6-1-2-1	SVIN 188	YAAS-U3
	IR 17A 12038	IR17L1165	NR 2219-8-6-1-2-2	SVIN 189	IRRI 132
	IR 17A 1208	IR17L1360	NR 2224-3-1-1-2-1	SVIN 202	Tarahara-107
	IR 17A 1287	IR17L1430	NR 2226-4-2-3-1-1	SVIN 231	IR 16L 1844
	NR 2258-13-1-2-1-1	IR17L1481	NR 2229-4-2-1-1-1	SVIN 235	IR 14L 363
	R 17L 1341	IR18L1127	NR 2236-5-1-5-2-2	SVIN 244	IR 15L 1065
	IR 17L 1423	IR18L1160	NR 2239-1-1-1-3-1		
	IR 17L 1430	IR92521-172-5-1-1	NR 2243-14-1-1-1-3		
1	IR106523-25-34-3-3-B-45-1	IR103795-B-B-2-1	IR17A1293	IR 64	SVIN 257
	NR2224-7-1-1-2-2-	IR105469:72-18-2	IR17A2295	Garima	SVIN 264
	2015SA14	IR108028-B-B-B-1-B-B	IR17L1443	2015SA7	SVIN 266
	NR2190-41-2-1-2-1	IR108043-B-B-B-6-B-B	IR17L1454	2015 SA 5	SVIN 269
	2015SA21	IR108541:6-36-1-22-B-B	IR18L1172	2015SA15	SVIN 276
	NR2215-6-1-1-1-1	IR122310:7-2-2	IR98786-13-1-2-1	IR 16F 1014	SVIN 288
	IR99742:2-11-117-1-1-B	IR127153-2-3-14-1-B	NR2268-19-1-1-3-1	PR 101	SVIN 292
	Ghaiya-1	IR127153-4-18-14-1-B	IRRI 119	Radha-4	SVIN 301
	IR103791-B-B-3-1	IR16L1844	NR 2254-2-3-1-1-2	SVIN 224	YAAS-U6
	IR 106523-25-34-3-2-B-44-3	IR13N102	IRRI 154	Sarbati	SVIN 307
	IR 126952-28-55-37-2-20-4-B	IR14F690	IRRI 175	SVIN 001	SVIN 312
	IR 126952-28-55-37-4-24-11-B	IR14F717	NR 2169-10-4-1-1-1-1-1	SVIN 020	SVIN 316
	NR 2268-17-3-2-1-1	IR14L537	NR 2181-465-1-1-1-1	SVIN 028	SVIN 326
	IR 16L 1591	IR15A1479	NR 2182-22-1-3-1-1-1	SVIN 038	SVIN 331
	IR 16L 1657	IR15D1055	NR 2184-187-1-1-3-1-1	SVIN 053	SVIN 334

	IR 16L 1713	IR15D1056	NR 2187-6-2-2-1-1	SVIN 064	SVIN 352
	IR 16L 1801	IR15D1058	NR 2191-6-2-4-5-1	SVIN 069	SVIN 358
	IR 16L 1859	IR15D107	NR 2191-6-2-6-2-1	SVIN 069	SVIN 367
	IR 17 L 1360	IR16A3025	NR 2200-8-1-1-2-1	SVIN 074	SVIN 435
	IR 17A 1196	IR16D1045	NR 2210-15-1-1-3-1	SVIN 094	SVIN 458
	IR 17A 2252	IR16D1056	NR 2212-3-2-4-1-1	SVIN 098	SVIN 630
	IR 17L 1323	IR16F1023	NR 2215-6-1-2-3-4	SVIN 106	SVIN 702
	IR 17L 1341	IR16F1065	NR 2215-6-4-2-2-2	SVIN 118	SVMET 294
	IR 17L 1415	IR16F1083	NR 2219-14-3-1-1-3	SVIN 132	SVMET 295
	IR 17L 1454	IR16F1156	NR 2219-3-5-2-1-1	SVIN 133	Swarna
	IR 17L 1571	IR16F1172	NR 2219-3-7-1-1-4	SVIN 138	TP 30535
	NR 2381-RGA1-RGA2	IR16L1619	NR 2220-3-6-2-3-3	SVIN 168	TP30529
	IR 95784-21-1-1-2	IR16L1657	NR 2231-2-1-4-2-1	SVIN 191	Vandana
	IR 99853-555-1-2-2	IR16L1743	NR 2248-12-1-1-2-1	SVIN 195	YAAS-5
	IR100842-B-BRGA-BRGA-BRGA-9	IR16L1831	NR 2252-5-2-3-2-1	SVIN 209	YAAS-U4
2	Ciherang Sub-1	IR127153-2-3-21-1-B	NR2250-7-3-3-3-1	SVIN 690	SVIN 306
	IR 16L 1661	IR15T1303	Sukkhadhan-3	IR42	IR17L1411
	IR 16L 1767	IR16F1028	IR72667-16-1-B-B-3	SVARN 175	
	IR 17L 1365	IR16F1063	Namuna Basmati	SVIN 100	
	IR04A429	IR16L1591	NR 2191-22-1-4-1-1	SVIN 268	
	IR05N341	IR16L1755	NR2194-10-1-2-3-5	SVIN 294	
3	IR14D166	IR16F1066	Lalka basmati	NR2191-39-2-2-2-1	Tarahara 101
4	Channanchur				
5	Masuli/Sankharika (SC)				

Conclusions

During 2020, the tested genotypes were immune (7.9%), resistant (25.1%), moderately resistant (55.3%), moderately susceptible (9.3%) and susceptible (2.4%), while during 2021 the evaluated genotypes were immune (57.3%), resistant (34.7%), moderately resistant (7.5%) and moderately susceptible (0.5%). Most of the genotypes evaluated were highly resistant, resistant and moderately resistant to blast in both years indicating good sources of resistance in the available genotypes.. This will help pathologist as well as breeder to incorporate them in future crop improvement program towards breeding for blast resistance. These resistant and moderately resistant genotypes with desirable agronomical character can be used as donor parent in resistant breeding program as durable source of disease resistant.

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Authors' Contributions

B. P. Yadav designed this research and revised the article for publication. P. Wagle, J. B. Prasad, B. Yonjan, P. Budhathoki, and R. K. Mahato conducted the trial and recorded data. P. Wagle, A. Chaudhary, A. Mishra and S. Shrestha wrote the final manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

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