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Research Article

Identification of Resistant Genotypes on Rice against Blast Disease under Field Condition at Rampur, Chitwan

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Abstract

Blast disease is considered as a major limiting factor in the global rice production because of its wide distribution and destructiveness and it has been causing significant yield loss in all rice growing areas of Nepal. Host resistance is the most desirable means of managing blast, especially in developing countries. Considering the importance of this disease field screening experiment was conducted to identify resistant rice genotypes against this disease. A total of 314 and 346 rice genotypes with resistant (Sabitri) and susceptible checks (Sankarika) were evaluated under epyphytotic conditions during 2016 and 2017 summer seasons at Rampur, respectively. During 2016 disease severity varied from 1 to 9 and only five genotypes; Sabitri, IR 12L 110, WAS122-IDSA14-WASB-FKRI, IR 10F 559and IR 10F 616 were resistant, 30 moderately resistant, 150 susceptible and 129 highly susceptible against blast disease. Similarly during 2016 out of 346 genotypes, 23 resistant as ARIZE SWIFT GOLD, IR95784-21-1-1-2, NR2169-10-4-1-1-1-1-1-2, NR2169-10-2-3-1-1-1-1-1, NR2181-165-1-1-1-1-1-1-1, NR2167-48-5-1-2-1-1, NR2171-2-1-1-3-1-1-2, NR2170-5-5-1-6-1-1-3-1, NR2170-31-1-1-5-1-1-1-1, NR2167-41-1-1-3-1, NR2172-34-1-1-1-1-1-1-1, Sabitri, IR82589-B-B-114-3, IR79913-B-238-3-3, IR93823-36, IR08L 152, IR82589-B-B-51-4, IR09F 434, IR55423-01, IR94391-131-353-19-B-1-1-1-1-1, NR2154-8-1-1-1-1-1, NR 2124-43-3-1-1-1, NR2160-68-1-1-1-1-1., 72 moderately resistant, 191 susceptible and 155 were highly susceptible. Most of the highly susceptible genotypes were knocked down at the time of disease scoring.

Keywords: Resistant; susceptible; disease severity; epiphytotic

Introduction

Rice (Oryza sativa) is one of the major food crops that constitute the staple diet all over the world. It is cultivated everywhere in the world except Antarctica and has tremendous economic importance. More than 23% of the calories consumed by the world population come from rice. Of the total area under rice cultivation 92%, of the rice is grown in Asia, which is home to more than half of the world population. Rice blast is by far the most important disease of the many diseases that attack rice. Rice blast is caused by *Pyricularia grisea* Cavara [perfect stage *Magnaporthe grisea* (Herbert) Barr], is one of the most serious diseases of rice in Nepal. It occurs worldwide around eighty four countries where rice is commercially grown (CMI, 1981). The disease causes complete seedling blight on susceptible

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rice cultivars in the dry seed bed (Chaudhary *et al., 1994, Chaudhary* and Sah, 1997 and Sah, 1998). The disease also adversely affects vegetative growth and grain yield in the transplanted field (Manandhar *et al.,* 1985). On an estimate it annually destroys rice, which can feed around 60 million people. The pathogen, *Pyricularia grisea* can infect nearly all parts of the shoot and is commonly found on the leaf blade and the panicle neck node. Severe attack can completely destroy rice nurseries and crops at the tillering stage. Infection of stem nodes results in barren panicles; late neck infection (after grain filling) results in' broken necks'. Further if the infection on the panicle results with chalky kernels, sterile grans or losses of grain yield at harvest (Candole *et al.,* 1999). Leaf blast increases plant respiration and reduces the maximum photosynthetic rate at light saturation and the initial light use efficiency (Pinnschmidt *et al.,* 1994) Commonly the disease causes 10-20% yield reduction in susceptible varieties, but in severe cases the losses may go up to 80% (Manandhar *et al.,* 1992). There was 34.84% grain yield reduction in control plots as compared to plots treated with Beam (Tricyclazole) (Chaudhary, 1999). There was reduction of 67 and 40% of grain yield and straw yield respectively due to blast disease (Chaudhary and Sah, 1996). Chin (1975) reported that losses up to 70% in fields attacked by neck blast.

Materials and Methods

Site Selection

The field experiment was conducted at Agronomy field of National Maize Research Program, Rampur, Chitwan during summer (17 July to 01 November, 2015 & 2016) under rain-fed conditions. The site is situated between 84^0 19'E longitude and 27^0 40' latitudes and 282 m above the seas level. Climatically, Chitwan lies in humid sub-tropical region with average rainfall of 1905 mm (mainly during early to late summer).

Experimental Setup

Field experiment was conducted during 2015 and 2016 summer season at Rampur, Chitwan with screening of 314 & 346 rice genotypes against blast disease of rice in rod-row design. 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 Masuli was planted prior to one month. Conducive environment for blast development was created by planting four rows of Dhaincha (*Sesbania esculenta*) 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 *S. esculenta*, two rows of susceptible mixture were planted at weekly interval of two weeks after planting of wind break. These inoculum 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 and each entry was sown continuously in 2 rows of 1 m length with 0.1m row to row spacing. Chemical fertilizer @ 100:50:0 kg NPK/ha was applied as basal dose. Two rows of susceptible variety (Masuli) were also sown around each seedbed while seeding time of test entries. The spreader rows were watered in the evening before sun set if there was no rainy days.

Disease Assessment

Disease scoring was done using Standard Evaluation System (0-9scale) for rice (IRRI, 1988) as follows:

0 = No lesion

1 = small brown specks of pinpoint size or longer brown specks without sporulating center.

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.-R

3 = lesion type is the same as in scale 2, but a significant number of lesions are on the upper leaves.

4 = typical susceptible blast lesions, 3mm or longer, infecting less than 2% of the leaf area-MS

5 = typical blast lesion infecting 2-10% of the leaf area

6 = typical blast lesion infecting 11-25% of the leaf area

7 = typical blast lesion infecting 26-50% of the leaf area

8 = typical blast lesion infecting 51-75% of the leaf area and many leaves dead.

9 = more than 75% leaf area affected.

Data Collection and Severity Class

Each rice genotypes were scored using 0-9 standard scale. According to IRRI (1985), 0-2 scale as resistant whereas 3-4, 5-6 and 7-9 were considered as moderately resistant, susceptible and highly susceptible, respectively.

Results and Discussions

Rice genotypes screened against blast disease reacted resistant to highly susceptible in both the years. During 2015, out of 314 tested genotypes majority were highly susceptible and only five were resistant namely; Sabitri, IR 12L 110, WAS122-IDSA14-WASB-FKRI, IR 10F 559 and IR 10F 616 and thirty genotypes as, IR06 M143, IR 11A287, IR04N522, NR 2154-8-1-1-1-1-1-1, NR 2124-43-3-1-1-1, NR 2160-47-1-3-1-1, IR82589-B-B-2-3, IR79913-B-238-3-3, NR 2157-166-2-1-1-1, IR83750-B-30-3, IR 83383-B-B-141-2, IR 09F434, HHZ25-DT9-Y1-Y1, TME 80518, HHZ5-DT8-DT1-Y1, IR 09L 166, IR 08L 201, IR 09L 348, IR 12F 164, IR 11F 186, CT 18148-6-9-5-1-3-4-MMP, IRRI 154, IR 12A 136, NR 2154-8-1-1-1-1-1-1, HHZ2-Y3-Y1-Y1, IR06N 102, HHZ75-DT9-Y1-Y1, HHZ14-SAL10-DT1-DT1 andHHZ25-DT9-Y1-Y1 were moderately resistant and rest of the genotypes were susceptible to highly susceptible for blast disease. Similarly, during 2016 a total of 346 rice genotypes were screened and resistant for blast were ARIZE SWIFT GOLD, IR95784-21-1-1-2, NR2169-10-4-1-1-1-1-1-2, NR2169-10-2-3-1-1-1-1-1, NR2181-165-1-1-1-1-1-1-1, NR2167-48-5-1-2-1-1, NR2171-2-1-1-3-1-1-2, NR2170-5-5-1-6-1-1-3-1, NR2170-31-1-1-5-1-1-1-1, NR2167-41-1-1-3-1, NR2172-34-1-1-1-1-1-1-1, Sabitri, IR82589-B-B-114-3, IR79913-B-238-3-3, IR93823-36, IR08L 152, IR82589-B-B-51-4, IR09F 434, IR55423-01, IR 94391-131-353-19-B-1-1-1-1-1, NR2154-8-1-1-1-1-1, NR2124-43-3-1-1-1 and NR2160-68-1-1-1-1-1 with the disease severity score of 0-2. The genotypes reacted to moderately resistant (3-4) were: HHZ14SALI10-DT1-DT1, IR82589-B-B-95-2, IR82589-B-B-7-2, IR09L 179, IR74371-70-1-1, IR 91326-19, IR 10L 390, IR11L 319, IR82589-B-B-149-4, IR82589-B-B-36-2, IR82589-B-B-142, IR83376-B-B-130-2, IR83754-B-B-40-2, IR70210-39-CPA-7-1, B11586-FMR-11-R-2-11, IR88965-39-16-4, 08 FAN2, IR09L 342, NR2157-66-2-3-1-1-1, NR2158-13-1-1-2-4, NR2157-166-1-3-5-1, NR2158-13-1-2-4-5, GSR336, IR06A146, GSR126, GSR120, NR2180-10-5-1-1-1-1-1-1, NR10-4-1-2-1-1-1-1, IR96321-558-64-B-4-1-1, HHZ6-DT1-LI1-LI1, HHZ15-SAL13-Y1, HHZ21-Y4-Y2-Y1, HHZ24-DT1-LI1-LI1, HHZ10-DT8-DT1-DT1, BHS825, HHZ24-DT1-LI1-LI1, IR 11N-304, IR11N 293, NR2170-158-5-3-2-1-1-1, NR2170-5-5-1-6-1-1-4-1, IR93405-B-B-96-2, IR83388-B-B-8-3, NR2160-47-1-3-1-1, NR2188-3-2-4-1, HHZ24-DT11-LI-LI, SUGANDHIT DHAN 1, IR10L 185, NR452-23-1-2-1-1-1-1, NR2159-10-1-1-6-2-3-1, IR96322-34-202-B-2-1-2, IR96322-34-223-B-1-1-1, IR11L 226**,** IR 14L 160, IR14L 110, IR95781-15-1-1-4, IR96279-33-3-1-2, NR2170-32-3-1-1-1-1-5-1, IRO7A 179, NR2181-15-1-1-6-1-1-1-1, IR10A 134, DY-79, DY-79, DY-99, ARE TEJ GOLD, ARIZE 6444 GOLD, NR11142-B-B-B-9-3, IR12L 110, IR12L 101, IR12L 369, IR91326-19-2-1-2 and NR2181-40-2-1-4-1-1-1-1 (Fig.1). Table 1. Shows Blast disease reaction on rice genotypes at Rampur 2015.

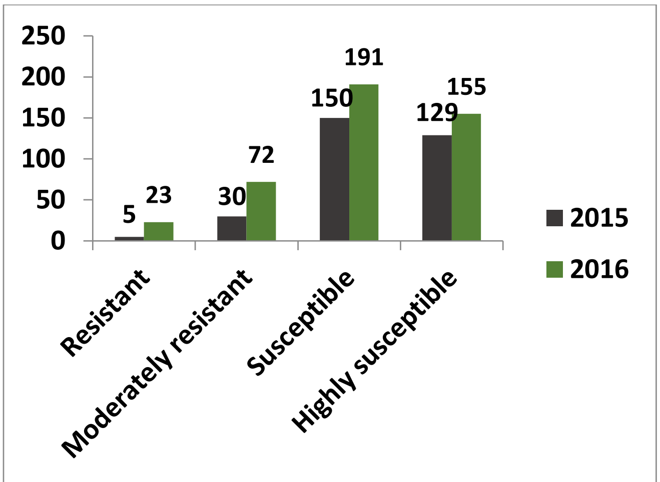

Fig. 1: Frequency of rice genotypes exhibiting leaf blast reaction during 2015 and 2016

Discussions

Rice is the staple food crop for a large part of the human population in the world today. It is found wherever rice is grown and always important as well as always a threat for successful rice cultivation. Failures of entire rice crops have resulted directly from rice blast epidemics. Generally, rice blast is favored by moderate temperatures (24ºC) and periods of high moisture that are 12 hour or longer, conditions readily attainable n flooded rice fields. The challenge for research continues to be to produce high quality food, in ever-increasing amounts at lower costs, all while n the presence of an unfavoring and unrelenting pathogen. Rice blast has never been eliminated from a region in which rice is grown, and a single change in the way in which rice is grown or in the way resistance genes are deployed can result in significant disease losses even after years of successful management. Rice blast has been widely studied throughout the world. The pathogen attacks leaves, stem nodes, all parts of panicle and grains. Severe attack can completely destroy rice nurseries and any stage of the rice crop. Later leaf attack stunts plant growth and reduces the number of bearing panicles and the weight of grains. Infection on stem nodes results in barren panicles, late neck infection results in 'broken necks'. Infection on the panicles results in chalky kernels, sterile grains or losses at harvest (Candole *et al.*, 1999). The successful management of rice blast results from a comprehensive series of recommendations that employ several different management strategies. Genetic resistance is a strategy that has long been the mainstay of successful rice production. Control of rice blast is usually necessary to prevent crop losses or total failure of susceptible cultivars grown under conditions that are favorable to the pathogen. Excessive levels of nitrogenous fertilizer and moisture stress increase disease severity (Prabhu *et al.*, 1996). Closer planting of rice favors the microclimate for disease development (Chaudhary, 1999). Silicon soil amendments are also known to increase host resistant (Kozaka 1965; Thiagalingam and Chin, 1976). Rice varieties that are resistant against leaf and panicle blast have been the most widely used to manage this disease (Bonman *et al.*, 1992). Dangal *et al.* (2013) evaluated 134 rice genotypes during 2011 and 2012 and found 58 and 63 genotypes resistant, respectively.

Conclusion

Rice genotypes were identified for resistant to highly susceptible reactions against blast disease. Most of the genotypes reacted susceptible to highly susceptible reactions to this disease. However, Sabitri which is already released variety and still popular among the farmers and showed resistant reaction in both the years and other genotypes as IR12L 110, WAS122-IDSA14-WASB-FKRI, IR10F 559, IR10F 616, ARIZE SWIFT GOLD, IR95784-21-1-1-2, NR2169-10-4-1-1-1-1-1-2, NR2169-10-2-3-1-1-

1-1-1, NR 2181-165-1-1-1-1-1-1-1, NR 2167-48-5-1-2-1-1, NR 2171-2-1-1-3-1-1-2, NR2170-5-5-1-6-1-1-3-1, NR2170-31-1-1-5-1-1-1-1, NR2167-41-1-1-3-1, NR2172-34-1-1-1-1-1-1-1, IR 82589-B-B-114-3, IR79913-B-238-3-3, IR93823-36, IR08L 152, IR82589-B-B-51-4, IR09F 434, IR55423-01, IR 94391-131-353-19-B-1-1-1-1-1, NR2154-8-1-1-1-1-1, NR2124-43-3-1-1-1 and NR2160-68-1-1-1-1-1 were reacted resistant against blast disease and can be used in rice breeding program as a source of resistant for the development of blast disease resistant varieties/cultivars.

Table 1: Blast disease reaction on rice genotypes at Rampur 2015

Resistant (0-2)	**Moderately resistant (3-4)**	**Susceptible (5-6)**	**Highly susceptible (7-9)**
ARIZE SWIFT GOLD, IR 95784-21-1-1-2, NR 2169-10-4-1-1-1-1-1-2, NR 2169-10-2-3-1-1-1-1-1, NR 2181-165-1-1-1-1-1-1-1, NR 2167-48-5-1-2-1-1, NR 2171-2-1-1-3-1-1-2, NR 2170-5-5-1-6-1-1-3-1, NR 2170-31-1-1-5-1-1-1-1, NR 2167-41-1-1-3-1, NR 2172-34-1-1-1-1-1-1-1, Sabitri(RC), IR 82589-B-B-114-3, IR79913-B-238-3-3, IR 93823-36, IR 08L 152, IR 82589-B-B-51-4, IR 09F 434, IR55423-01, IR 94391-131-353-19-B-1-1-1-1-1, NR 2154-8-1-1-1-1-1, NR 2124-43-3-1-1-1, NR2160-68-1-1-1-1-1.	HHZ14SALI10-DT1-DT1, IR 82589-B-B-95-2, IR82589-B-B-7-2, IR 09L 179, IR 74371-70-1-1, IR 91326-19, IR 10L 390, IR 11L 319, IR 82589-B-B-149-4, IR 82589-B-B-36-2, IR 82589-B-B-142, IR 83376-B-B-130-2, IR83754-B-B-40-2, IR 70210-39-CPA-7-1, B11586-FMR-11-R-2-11, IR88965-39-16-4, 08 FAN2, IR 09L 342, NR 2157-66-2-3-1-1-1, NR 2158-13-1-1-2-4, NR 2157-166-1-3-5-1, NR 2158-13-1-2-4-5, GSR336, IR 06A146, GSR 126, GSR 120, NR 2180-10-5-1-1-1-1-1-1, NR 10-4-1-2-1-1-1-1, IR 96321-558-64-B-4-1-1, HHZ 6-DT1-LI1-LI1, HHZ15-SAL13-Y1, HHZ21-Y4-Y2-Y1, HHZ24-DT1-LI1-LI1, HHZ10-DT8-DT1-DT1, BHS825, HHZ24-DT1-LI1-LI1, IR 11N-304, IR 11N 293, NR 2170-158-5-3-2-1-1-1, NR 2170-5-5-1-6-1-1-4-1, IR 93405-B-B-96-2, IR 83388-B-B-8-3, NR 2160-47-1-3-1-1, NR 2188-3-2-4-1, HHZ24-DT11-LI-LI, SUGANDHIT DHAN 1, IR 10L 185, NR 452-23-1-2-1-1-1-1, NR2159-10-1-1-6-2-3-1, IR96322-34-202-B-2-1-2, IR96322-34-223-B-1-1-1, IR 11L 226, IR 14L 160, IR 14L 110, IR 95781-15-1-1-4, IR 96279-33-3-1-2, NR 2170-32-3-1-1-1-1-5-1, IRO7A 179, NR 2181-15-1-1-6-1-1-1-1, IR 10A 134, DY-79, DY-79, DY-99, ARE TEJ GOLD, ARIZE 6444 GOLD, NR 11142-B-B-B-9-3, IR 12L 110, IR 12L 101, IR 12L 369, IR 91326-19-2-1-2, NR 2181-40-2-1-4-1-1-1-1	IR82589-B-B-84-3, IR 09L 171, IR 93835-167, IR 08L 201, IR 08L 348, IR 82635-B-B-47-1, BP9474C-1-1-B, WAS122-IDSA-1-WAS-B, IR 82635-B-B-25-4, IR77537-24-1-3, IR83373-B-B-24, IR 09L 270, IR 08L 181, HHZ12-SAL2-Y3-Y2, HHZ10-DT7-Y1, IR 11N 400, IR 09N 542, IR 80285-34-3-3-2, IR 96322-34-202-13-2-1-2, GSR102, GSR 132, IR 05N419, IR09A133, GSR219, IR 9 6321-1447-651-B-1-1-2, IR 04A 115, HHZ3-SAL13-Y-SAL1, IR 11N 294, NR 2170-2179-82-2-4-1-1-1-1-1, NR 2168-44-2-1-1-1-1, NR 2168-63-1-1-1-1-2-1-1, NR 2176-112-2-2-4-1-1-6-1-1, NR 2179-88-1-3-2-1-2-1-1, NR 2180-19--1-1-2-1-1-1-1, NR 2157-122-1-2-1-1-1, NR 2181-160-4-1-2-1-1-1-1, IR 10A-2051, IR 81068-B-94-63-3, HHZ-10-BT8-BT1-DT1, HHZ4-DT3-Y1-Y1, BH5-579, IR-11-L413, IR09N-503, IR09N-538, NR 2168-65-1-2-3-1-1-1-1, IR N09a-228, H-3798, CHAITE-2, NR 2154-8-1-1-1-1-1-1, IR 10N 270, SAMBHA MASURI SUB-1, CT19021-3-5-2V1-1, NR2157-122-1-2-1-1, NR456-5-3-1-1-1-17, IR09L 337, IR94391-131-152-3-B-3-1-1, IR96322-34-202-B-2-1-2, 2015 SA 7, 2015 SA 8, 2015 SA 9, SELECTED LINES OF KALANAMAK, HHZ75-DT9-Y1-Y1, HHZ14-SAL10-DT1-DT1, IR09F173, NR 2180-20-2-5-1-1-1-1-1, NR 2168-52-2-2-1-1-1-1-2, IR 12L 107, IR 12L 115, IIR 83106-B-B-5, IR 95836-14-3-1-2, IR 14L 103, 2015 SA 14, 2015 SA 22, 2015 SA 23, 2015 SA 26, IR 09L 226, IR 09L	Sankharika(SC), IR 79615-9-3-1-3, IR 87754-42-2-2, TOX322-6-5-2-2-2-2, IR83377-B-B-105-4, IR83373-B-B-25-3, IR 10L 151, IR 10L 182, IR 09L 229, HHZ1-DT3-Y1-Y1, NR 2157-144-1-3-1-1, IR04A381, HHZ- 22-Y-DT1-Y1, GSR 310, NR 2157-122-1-2-1-1-1, IR 11A 546, NR 2179-15-1-5-2-1-1-1-1, NR 2179-82-24-3-1-1-1-1, NR 2181-69-2-3-2-1-1-1-1, IR 87615-9-3-1-3, HUA 565, HARDINATH-1, IR 03N-337, IR 04a-395, IET-13652, IR 10F-388, IR 80430-B73-3, ABRN, HHZ4-SALZ-L11-L11, HHZ21-DT7-Y1-Y1, IR11N-169, IR 03N-337, TOLRENT, HARDINATH-1, HHZ3-SAL4-Y1-Y1, HHZ5-DT8DT1-Y1, **IR 13L 188,** IR 14L 101, IR 92521-120-1-3-2, IR 91326-20-2-1-4, NR 695-B-B-B-5-1, NR 682-B-B-B-2, NR 682-B-B-B-3, NR 10914-1-4-1-3-2, NR 10859-1-7-2-1, DRMALI B, PR 29399-B-2-2-1, NR 10838-B-B-4, NR 10695-B-B-B-5-3-1, NR 10682-B-B-B-4, NR 10682-B-B-B-5-3, NR 10682-B-B-B-2, NR 695-B-B-B-5-1, NR 11050-B-B-B-B-22, NR 11115-B-B-31-3, NR 10876-12-3-1-2-2, NR 11105-B-B-27, NR 11052-B-B-B-B-66, 08FAN-10, NR 10769-4-2-2, NR 11105-B-B-20-2, NR 11130-B-B-B-12, NR 11130-B-B-B-16, NR 11011-B-B-B-B-29, NR 11130-B-B-B-19, NR 11130-B-B-B-B, IR 87751-20-4-4-2, NR 11100-B-B-16-3-3, NR 11100-b-B-15-2-1, NR 11216-B-25-1, NR 11139-B-B-B-13-3, NR 11142-B-B-B-1-1, NR 11289-B-16-3, NR 11196-B-

Table 1: Blast disease reaction on rice genotypes at Rampur 2015

Resistant (0-2)	**Moderately resistant (3-4)**	**Susceptible (5-6)**	**Highly susceptible (7-9)**
		226, HHZ25-DT9-Y1-Y1, IR 95809-25-1-1-1, IR 93810-2-1-1-1, NR 2171-16-1-2-1-1-1-1-1, NR 2179-26-4-4-3-1-1-1-1, IR 12L 353, IR 13L 137, IR 92521-143-7-2-1, IR 97135-8-3-1-3, IR 97073-32-2-1-3, SUGANDHA-2, NR 11082-B-B-B-5-3, KHUMAL-4, NR 11105-B-B-20-2-1, NR 11139-B-B-B-6-2, DY-12, DY-18, DY68, ARIZE-6129 (GOLD), INIT-12023	25-3, NR 11289-B-16-1, NR 11220-B-11-2, NR 11130-B-B-B-2, NR 11214-B-4-1, NR 11296-B-43-1, NR 11153-B-B-18, NR 11130-B-B-B-B-3, BLACK RICE, IR 139A-116, 08FAN-6, OM-5769, IR-8376-12-2-3-3, BP-9454F2-1-3, IR 10N-118, HHZ-21-SALI-13-Y1-Y1, HHZ4-SLI-SLI1-1-L11, HHZ2-SUB-2-DT1-DT1, BP11820-5F-KN-10-2, HARDINATH-1, CHAITE-2, IR826035-B-B-47-2, OM 4900, IR 445-229, IR 0O9N-445, IR 06N-119, HHZ12-Y4-Y1-DT1, IR 05N 359, IR 05N 170, HHZ10-DT5-LII-LII, NR2146-9-1-1-121, IR 09L 204, HHZ5-Y4-SALI-Y1, 2015 SA 3, 2015 SA 4, 2015 SA 5, 2015 SA 10, 2015 SA 11, 2015 SA 12, 2015 SA 13, 2015 SA 15, 2015 SA 16, 2015 SA 21, HHZ14-DT12-L11-L11, HHZ11-Y6-Y2-Sub-1, IR 14L 116, IR 95801-6-3-1-1, IR96279-33-3-1-2, IR 95795-53-1-1-2, NR 2180-19-1-2-1-1-1-1-1-1, HHZ10-DT7-Y1, SAMBHA MASULI FIXED LINE 1, HHZ25-DT9-Y1-Y1, HHZ17-Y16-Y3-Y1, IR83810-17-1-2-3, IRRI-172, NR 2168-31-1-2-3-1-1-1-2, IR 83388-B-B-140-4, IR 88869-2-2-2-2, IR 88839-3-1-2-2, IR 88960-22-1-1-1, IR 12L 355, NR-11105-B-B-16-2, NR 11105-B-B-49-3, IR 13L 118, IR 12L 356, B11598C-TB-2-1-B-7, IR 12L 357, IR 13L 397, IR 91326-7-13-1-1, IR 93835-74-2-1-1, NR 10676-B-5-3

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