Identification of Landraces of Rice from Jharkhand and Bihar Resistant to Bacterial Blight

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Bacterial leaf blight of rice, the second most devastating disease of rice causes substantial yield loss. Study of pathogenic variability and identification of resistance genes are key factors in breeding against this disease. Bacterial leaf blight is now a serious constraint for rice production in the irrigated and low land ecologies in all rice growing countries. 223 lines (landraces) were collected from different regions of Bihar and Jharkhand and were screened against bacterial blight. Out of 223 lines, eight lines, namely Bhathani, Hardi Muri, Sitwa dhan, Jhulat, Lambasari, Karijiri, Swarna gora and Sita gora were found to be highly resistant.

Key Words: Basmati rice, Bacterial Blight (BB), Virulence, Land race

Introduction

Rice is a major food crop of the world and in India also 2/3rd of the population uses it in various forms. In India rice is cultivated round the year in one part or the other of country; in diverse ecologies spread over 44 million hectares with a production of 90 million tons. One of the major reasons of low productivity is damage by insects-pests and diseases, which cause an annual loss of 10-15% to rice yield

Bacterial Blight caused by *Xanthomonas oryzae* pv *oryzae* (Ishiyama) Swing *et al.* (1990), Xoo is the second most important disease of rice after blast and most important bacterial disease in terms of economic loss. It causes an annual loss of 20-30% in Japan and 6-60% in India. It caused major epidemic in Punjab, Haryana and western Uttar Pradesh in 1979 and 1980 and caused complete destruction of crop (Durgapal, 1985). It has been observed that none of the designated resistance genes produce resistance to most isolates found in Punjab and Haryana. Indian traditional rice germplasms may contain resistance genes that may be more suitable to counter act virulent Indian patho-types more effectively than the resistance genes identified abroad. Considering this, 223 germplasms were tested against the most virulent and aggressive Xoo isolate for identifying new resistance sources.

Materials and Methods

Two hundred and twenty three traditional rice line (landraces) were collected from Jharkhand and Bihar including some lines received through NGO named Gene Campaign, Ranchi.

These lines were grown at Division of Genetics, IARI, New Delhi in randomized block design in three replications during *Kharif* 2006. All these germplasm lines were grown at CRRI Cuttack in *Rabi* 2007 also. Each line was grown as a single row of 3m length with a distance of 60 X 20 cm between rows and plants, respectively. Recommended agronomical practices were followed to raise the crop.

These germplasms were artificially inoculated with most virulent and aggressive Xoo isolate by leaf tip clipping method (Satya *et al.*, 2004). The concentration of bacterial suspension used for inoculation was 10^{10} cells /ml (Mew, 1987). Standard Evaluation System (SES) advocated by IRRI for scoring the resistance based on the percent area infected by the pathogen after a certain interval was used. Decision of degree of resistant or susceptible (0->15.0) is taken after 15 days of inoculation. The observations were taken on the basis of average lesion length (cm) of ten leaves per plant (Table 1) as per scale proposed by Ogawa (1993).

Results and Discussion

The results of data are presented in Table 1. It can be observed that out of 223 germplasms only 13 lines as resistant, 168 lines as moderately resistant, 27 lines as moderate susceptible and only 2 lines as highly susceptible. Resistant lines were Bhathani, Bhaainagora, Hardimuri, Jhulat, Khilbhojni, Khodraphool, Lalbhog, Lamba-Asaari, Nardha, Sonpiya, Sitwadhan, Swarngoda and Sitagora. Among 168 lines, 21 lines were moderate resistant i.e. Asamia, Chhotkadahia, Jonga, Jhona, Khilbhosni, Karhainai, Kalamdani, Khirdat, Karijiric (B), Kohraphool, Kankesaal(B), Lalkisita, Mahoorinaata, Netadhan,

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Table 1. BLB Score on the basis of lesion length in cm

S.N.	Variety	Delhi (kharif-2005)	Cuttack (Rabi-2005)	S.N.	Variety	Delhi (kharif-2005)	Cuttack (Rabi-2005)	S.N.	Variety	Delhi (kharif-2005)	Cuttack (Rabi-2005)	S.N.	Variety	Delhi (kharif-2005)	Cuttack (Rabi-2005)	S.N.	Variety	Delhi (kharif-2005)	Cuttack (Rabi-2005)
1.	Amma Dhoka	9.5 MR	10.0MS	46.	Charka Govind Bhog	10.0 MS	11.5MS	92.	Jhuna	6.5 MR	7.0 MR	137.	Kalam Daani Choota	7.0 MR	8.5 MR				
2.	Asamia	7.0MR	7.5 MR	47.	Charka Sonachur	8.0 MR	7.5 MR	93.	Jhuller (B)	7.0 MR	7.5 MR	138.	Kherka Kuchi (B)	9.5 MR	9.0 MR	182.	Rutugora	9.0 MR	8.5MR
3.	Anjani	8.0MR	8.5 MR	48.	Chhot Pansera	7.5 MR	8.5 MR	94.	Jhilli	7.0 MR	7.5 MR	139.	Kidi Bot	9.5 MR	10.5MS	183.	Rani Kajar (A)	7.0 MR	7.0MR
4.	Asamia (B)	6.5MR	8.5 MR	49.	Charka Gora	10.5MS	11.5MS	95.	Juhu (B)	8.5 MR	8.0 MR	140.	Lolan Dhan	6.5 MR	7.0 MR	184.	Rani Kesar	8.0 MR	8.5MR
5.	Arjun	8.0 MR	8.5 MR	50.	Charka Rani	7.5 MR	8.5 MR	96.	Jhulat	3.5R	3.0 R	141.	Lal Bhog	5.5R	8.0 MR	185.	Rupsri	7.5 MR	9.0MR
6.	Aamchhotka	7.5MR	8.0 MR	51.	Charka Kherka Kuchi	8.5 MR	9.5 MR	97.	Khil Bhojni	6.0R	8.5 MR	142.	Lal Mansaal	8.5 MR	9.0 MR	186.	Ramdilal	6.5 MR	7.0MR
7.	Barka Mansuri	8.5 MR	8.0 MR	52.	Chotka Suman	8.5 MR	9.0 MR	98.	Khilbhosni	6.5 MR	8.0 MR	143.	Lal Ki Sita	6.5 MR	7.0 MR	187.	Rani Kajar (B)	9.5 MR	10.5MS
8.	Baraha Saal	8.0 MR	10.0 MS	53.	Charka Nardha	9.0 MR	10.5MS	99.	Kalam Kathi (A)	7.0 MR	9.5 MR	144.	Lalbhog (B)	7.5 MR	8.5 MR	188.	Raz Bhokta	6.5 MR	8.0MR
9.	Bachcha Kalamdani	9.0 MR	10.0 MS	54.	Doodh Kandar	7.5 MR	8.0 MR	100.	Khodra Phool	5.5R	6.5 MR	145.	Lal Mugdi	9.5 MR	9.0 MR	189.	Rajsri	6.5 MR	7.0MR
10.	Baa S Buda	9.0 MR	8.5 MR	56.	Dhan Phooly	8.0 MR	7.0 MR	101.	Ketki	9.0 MR	7.0 MR	146.	Lamba Asari	1.6R	1.7R	190.	Sirhanthi	6.5 MR	8.0MR
11.	Barka Dhusri	7.5 MR	7.5 MR	57.	Dhusri Safed	15.5S	12.0MS	102.	Karmu Saal	9.0 MR	7.0 MR	147.	Lal Jari	7.5 MR	8.5 MR	191.	Son Piya	6.0 R	6.5MR
12.	Bagh Panjaar	7.0 MR	7.5 MR	58.	Dudha Raaes	8.0 MR	9.5 MR	103.	Kala Zira	7.5 MR	7.0 MR	148.	Lal Dhani Barka	7.0 MR	8.5 MR	192.	Sur Guja	7.5 MR	8.0MR
13.	Badshah Bhog	9.0 MR	8.5 MR	59.	Dhusria	7.0 MR	8.0 MR	104.	Khir Beej	7.0 MR	7.0 MR	149.	Lahi	8.5 MR	10.5MS	193.	Sona Mati	12.5MS	11.0MS
14.	Barka Swarna	10.0 MS	9.0 MR	60.	Dudh Kobi	8.5 MR	9.0 MR	105.	Kankesaal	7.5 MR	8.0 MR	150.	Lal Moti	8.5 MR	9.5 MR	194.	Sira Hatti	8.5 MR	7.5MR
15.	Bhannjani	7.0 MR	7.5 MR	61.	Dahia (A)	7.5 MR	8.0 MR	106.	Kherka Kuchi (A)	9.0 MR	8.5 MR	151.	Miri Mitti	9.0 MR	7.0 MR	195.	Sorna	9.5 MR	8.0MR
16.	Boka Dhan	11.0 MS	10.5MS	62.	Dahia (B)	7.0 MR	7.5 MR	107.	Khutuwa	9.0 MR	8.5 MR	152.	Maina Thori	8.0 MR	7.0 MR	196.	Sonagoti	9.0 MR	10.2MS
17.	Bhojni	10.0MS	8.5 MR	63.	Daani Gora	9.0 MR	9.5 MR	108.	Kala Parwat	8.0 MR	10.0MS	153.	Makar Kalma	7.0 MR	7.5 MR	197.	Sona Par	9.0 MR	8.5MR
18.	Budhnu Nanhia	9.0 MR	10.5 MR	64.	Dudh Kandar (B)	8.5 MR	9.5 MR	109.	Kera Kandhi	7.0 MR	7.5 MR	154.	Mango Sar (A)	8.0 MR	7.5 MR	198.	Sonachur	8.5 MR	8.0MR
19.	Bhadwa Kalmdani	9.0 MR	9.5 MR	65.	Dudhia	8.5 MR	9.5 MR	110.	Karmi Dhan	7.0 MR	8.0 MR	155.	Manjhla-Natta (A)	8.5 MR	9.0MR	199.	Sitwa Dhan	2.2R	1.35R
20.	Bara Sitwa	8.5 MR	9.0 MR	66.	Dehati Gora (A)	9.0 MR	10.5MS	111.	Kadwadhan	11.0 MS	9.0 MR	156.	Maiya Dulari	8.0 MR	7.5MR	200.	Suga Thor	9.0 MR	10.5MS
21.	Bas Mansuri	15.5S	12.5MS	67.	Dehati Gora (B)	9.5 MR	10.0MS	112.	Karhaini	6.5 MR	8.0 MR	157.	Mehra Dhan	10.0MS	8.5MR	201.	Sir Pathi	14.5MS	13.5MS
22.	Barka Tilasaar	9.0 MR	9.5 MR	68.	Ejaan	7.5 MR	8.5 MR	113.	Kalam Daani	6.5 MR	6.5 MR	158.	Mango Sar (B)	9.0 MR	11.5MS	202.	Sonam	6.5 MR	7.0MR
23.	Budhnu	10.0MS	9.5 MR	69.	Futua	9.5 MR	10.5MS	114.	Kherka Kuchi (B)	7.0 MR	7.0 MR	159.	Manjhla-Natta (B)	9.5 MR	8.5MR	203.	Suleet	9.0 MR	8.5MR
24.	Bala Dhusri	7.5 MR	8.5 MR	70.	Gutuwa	10.5 MS	10.0MS	115.	Kalam Kathi (B)	7.5 MR	7.5 MR	160.	Motka-Dahia	8.5 MR	8.0MR	204.	Songa-Bas	8.0 MR	10.0MS
25.	Barka Sanam	7.5 MR	8.5 MR	71.	Garib Saal	11.5 MS	10.5MS	116.	Kadwa Dhan (B)	7.0MR	8.0 MR	161.	Mahi Dhan	7.5 MR	8.5MR	205.	Sita	7.5 MR	8.5MR
26.	Badya	10.0MS	9.5 MR	72.	Gada Jhadi	8.5 MR	7.5 MR	117.	Kanak	8.0 MR	7.5 MR	162.	Mahsoori Natta	6.5 MR	6.0R	206.	Sonachurlal	10.6MS	11.5MS
27.	Bhathani	2.1R	2.0R	73.	Gudna	8.0 MR	8.5 MR	118.	Kanas Chaapa	10.0MS	8.5 MR	163.	Mehsuri	7.5 MR	8.5MR	207.	Sarna	6.5 MR	7.5MR
28.	Bala Joga	8.5 MR	8.0 MR	74.	Guda	9.5 MR	10.5MS	119.	Katika	9.0 MR	8.5 MR	164.	Nanhiya (A)	8.0 MR	8.5MR	208.	Sathi	8.5 MR	9.5MR
29.	Bala Gora	8.5 MR	9.0 MR	75.	Garib Saal (B)	8.5 MR	9.5 MR	120.	Kanak (B)	15.5S	12.0MS	165.	Nanhiya (B)	9.5 MR	8.0MR	209.	Sanamdhan	7.0 MR	8.5MR

Contd.

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30.	Bas 370	8.0 MR	10.0MS	76.	Has Kalma (A)	13.0MS	12.0MS	121.	Karhaini (B)	6.5 MR	7.0MS	166.	Naditi Kaur	7.5 MR	8.5MR	210.	Sugandha	6.5 MR	8.0MR
31.	Burah Dhan	9.5 MR	10.5MS	77.	Has Kalma (B)	8.5MR	9.0 MR	122.	Karijiri	3.5R	3.0R	167.	Nardha	6.0R	8.5MR	211.	Tarori-Basmati	7.0 MR	8.0MR
32.	Barka Kalma	8.0 MR	9.0 MR	78.	Hazari Mahak	6.5 MR	7.0 MR	123.	Khirdhat	6.5 MR	7.0MR	168.	Nambri Dhan (A)	10.0 MS	11.5MS	212.	Tulsi Maanjar	8.0 MR	8.5MR
33.	Banphool (A)	8.0 MR	9.5 MR	79.	Hardi Muri	1.25R	2.3R	124.	Khutura	10.0MS	9.5 MR	169.	Neta-Dhan	6.5 MR	8.5MR	213.	Thubka	9.0 MR	9.5MR
34.	Banphool (B)	9.0 MR	9.5 MR	80.	Hans Kalma (A)	7.5 MR	10.0MS	125.	Kohra Phool	6.5 MR	6.0R	170.	Nanka-Dhusri	7.5 MR	8.5MR	214.	Tulsi Ketki (A)	12.0MS	11.0MS
35.	Bahar	11.5 MS	12.5MS	81.	Hardi Murilal	9.5 MR	10.5MS	126.	Kanak (B)	9.0 MR	10.5MS	171.	Nanhiya Nanka	7.5 MR	8.5MR	215.	Tulsi Ketki (B)	10.0MS	9.5MR
36.	Barka Dhan	8.0 MR	8.5 MR	82.	Hans Kalma (B)	8.0 MR	9.5 MR	127.	Kanke Saal (B)	6.5 MR	8.0 MR	172.	Nardha-Ashoka	8.0 MR	10.5MS	216.	Tulsi Manjari	7.0 MR	8.0MR
37.	Bas Kuchi	8.5 MR	9.5 MR	83.	Hazarek	7.5 MR	8.5 MR	128.	Karhaini Chhota	9.0 MR	10.2MS	173.	Nambri-Dhan (B)	6.5 MR	7.5MR	217.	Tila Saar	10.0MS	10.5MS
38.	Charin Lukia	8.0 MR	8.5 MR	84.	Is Kalma	7.5 MR	10.5MS	129.	Khir Dhat (B)	6.5 MR	6.0R	174.	01 Hajar 01	9.5 MR	10.5MS	218	Tin Thoka	9.5 MR	10.0MS
39.	Chhotka Sitwa	7.0 MR	6.5 MR	85.	I Jun	10.0MS	9.5 MR	130.	Khera	9.5 MR	8.5 MR	175.	Pusa Basmati-1	11.0MS	11.5MS	219.	Thupa Dhan	8.5 MR	11.5MS
40.	Chhotka Pansala	7.0 MR	7.5 MR	86.	Jihul	7.0 MR	6.5 MR	131.	Konhra Phool	10.5MS	11.5MS	176.	Pusa -2-21	7.0 MR	6.5MR	220.	Ujla Basmati	7.0 MR	6.5MR
41.	Chhotka Dahia	6.5 MR	8.0 MR	87.	Jhinga Saal	8.5 MR	9.0 MR	132.	Kodowa	8.5 MR	9.0 MR	177.	Pala Parbat	10.2MS	9.0MR	221.	Yes Kalma	7.5 MR	7.0MR
42.	Chaanagora	6.0R	8.0 MR	88.	Jonga	6.5 MR	8.0 MR	133.	Kala Basmati	8.0 MR	8.5 MR	178.	Panch –Saala	8.5 MR	8.0MR	222.	Swarna Gora	2.5 R	1.6 R
43.	Chairai Nerhi (A)	10.0MS	11.0MS	89.	Jhuller (A)	8.5 MR	8.0 MR	134.	Kalam Daani (B)	8.0 MR	9.0 MR	179.	Panjhali	6.5 MR	8.5MR	223.	Sita Gora	2.4 R	1.7 R
44.	Chairai Nerhi (B)	8.5 MR	7.0 MR	90.	Jagan Nath	6.5 MR	9.0 MR	135.	Karanga	9.0 MR	10.5MS	180.	Ratgoli	7.5 MR	8.0MR				
45.	Charka Nanka	9.5 MR	9.0 MR	91.	Juhu (A)	7.5 MR	8.5 MR	136.	Karanga (B)	11.5MS	12.5MS	181.	Roopasari	7.0 MR	7.5MR				

Nambridhan (B), Kanjhali, Ramdilal, Razbhokata, Rajasri, Sonam, Sarna and Sugandha. 21 lines were closer to resistant which is very near to resistant lesion length only 6.5 cm while on other hand Ammadhoka, Burahdhan, Chrkananka, both Dehatigora, A and B, Futua, Guda, Hardimurilal, Kherka, Kharkakuchi (B), Idibot, Lalmugudi, Manjhlanaata (B), Nanhia (B), 01Hajari, Ranikajjar (B), Tinthoka, near to MS with lesion length (9.5) cm.

A set tested at CRRI Cuttack in rabi-2007 with 5th isolates from Kaul, revealed that 10 lines were in resistant group, 151 were in MR group, and 48 were in MS group. Generally, all lines show more lesion length in Cuttack compared to Delhi except few, which indicate Cuttack is more favourable to Delhi for bacterial leaf blight.

Bhatani, Hardimuri, Jhulat, Karijiri (B), Lamba-asari, Mahsoori-Natta, Swarna-Gora, Sita-Gora, Sitwa-Dhan, Kohra-Phool, show high degree of resistance and except Kohra-Phool and Mahsoori-Natta, rest of the 8 lines show very high degree of resistant at both places Delhi and Cuttack. While Mahsoori-Natta is resistant in Cuttack but MR in Delhi and similarly Kohra-Phool is resistant in Cuttack but MR in Delhi with lesion length 6.5 cm.

On another side, 6 lines show resistance in Delhi like Chaaina-Gora, Khilbhojni, Khodre-Phool, Lal-bhog, Nardha, Sonpiya but they are MR in Cuttack. Chhotka-Sitwa, Sonpiya, Jlabasmati are minimum lesion length in MR group. The 19 lines namely Bhadwa Kalmdani, Barka Tilasaar, Budhnu, Badya, Banfool (A), Banfool (B), Bas-Kuchi, Charka-Khereka Kuchi, Dudharaaes, Dudhkandar (B), Dudhia, Garibsaal (B), Hanskalma (B), 1 Jun, Kalamkathi Khutura, Lalmoti, Thubka, Tulsiketki (B) are with lesion length and put in moderate resistance group and are very near to moderate susceptible group. Amma-Dhoka, Barahsaal, Bachcha-Kalamdani. Basmati 370, DehatiI-Gora (B), Gutuwa, Hans-Kalma, Kala-Parwat, Tinthoka are minimum leisure length in moderate susceptible group. Line Sir Phathi shows maximum lesion length at CRRI Cuttack (Table 1).

Eight lines Bhatani, Hardimuri, Jhulat, Karijiri (B), Lamba-asari, Swarna-Gora, Sita-Gora, Sitwa-Dhan were highly resistant in both places IARI Delhi and CRRI Cuttack. These lines were tested in next season Kharif-2007 in both of stages (Nursery and in Planted Field) and were found highly resistant so these lines can be used in breeding programs to develop bacterial leaf blight resistant variety.

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