Genetics of resistance to brown planthopper *Nilaparvata lugens* (Stål) in rice

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The brown planthopper (BPH) *Nilaparvata lugens* is a serious pest of rice in several Asian countries. The IGAU in Raipur, India, possesses a unique rice germplasm collection, but it has not yet been used extensively for genetic studies. Thirteen rice accessions found to be resistant to BPH under glasshouse conditions at Raipur were subjected to genetic analysis during 1996-97.

To study the inheritance of genes for BPH resistance, these BPH-resistant cultivars were crossed with TN1 (a susceptible cultivar). Crosses were made among resistant cultivars to determine the allelic relationships of the genes.

Seven of 13 rice cultivars had a dominant gene for resistance to BPH, with the F_2 plant population segregating into a ratio of 3:1. Six cultivars exhibited recessive genes for resistance with a segregation ratio of 1:3 (Table 1).

In studies of allelic relationships, five cross combinations segregated in a 7:9 ratio and one in a 15:1 ratio for BPH resistance (Table 2).

These results indicated that the resistance to BPH in cultivars in each of these crosses is governed by two independent recessive genes and two independent dominant genes. No segregation was observed in the four crosses, indicating that the genes for resistance to BPH are allelic to each other (Table 2). It is not known whether the BPH resistance genes of resistant cultivars used are the same as the 10 BPH genes already identified in rice cultivars. These BPH donors can be used in rice improvement.

Table 1. Reaction to BPH of F_1 and F_2 plant populations derived from crosses between BPH-resistant cultivars and -susceptible cultivar TN1.

		F_2 population				
Cross	F_1 reaction [a]/	Seedlings (no.)	R	S	Ratio	X^2 value
TN1/OR1334-8	R(1)	456	340	116	3:01	0.046
TN1/CRK-7-2-8	R(0)	495	374	121	3:01	0.081
TN1/TTB148-174-32-1	R(1)	487	360	127	3:01	0.24
TN1/RP1579-1662-72-52	R(1)	536	400	136	3:1	0.038
TN1/RP1976-18-6-4-2	R(0)	426	319	107	3:1	0.003
TN1/RP1579-1627-32-220	R(1)	458	345	113	3:01	0.072
TN1/B6932-MR 25-1	R(0)	473	355	118	3:01	0.001
TN1/Basangi (B:2682)	S(7)	504	124	380	1:03	0.041
TN1/Bakada (B:2699-I)	S(9)	541	138	403	1:03	0.074
TN1/Barhi (B:1253-I)	S(7)	499	132	367	1:03	0.561
TN1/Barhi (B:1253-II)	S(9)	488	125	363	1:03	0.097
TN1/Lal Basant (L:289-I)	S(9)	501	120	381	1:03	0.114
TN1/Budhiya Banko (B:57-II)	S(9)	531	141	390	1:03	0.682

[a]/ Numbers in parentheses are the average plant damage scores based on 10-15 F_1 plants, using the 0-9 scoring system (0 = resistant, 9 = susceptible). R = resistant, S = susceptible.

Table 2. Reaction to BPH of F_1 and F_2 plants obtained from resistant and resistant crosses.

Cross	F_1 reaction [a]/	F_2 population				
		Seedlings (no.)	R	S	Ratio	X^2 value
Lal Basant/Budhiya Banko (L:289-I) (B:57-II)	S(7)	513	235	278	7:09	0.88
Lal Basant/Basangi (L:289-I) (B:2682)	S(9)	461	212	249	7:09	1.2
Barhi (B:1253-II)/ Budhiya Banko (B:57-II)	S(9)	542	222	320	7:09	1.71
Barhi (B:1253-I)/ Lal Basant (L:289-I)	S(9)	533	245	288	7:09	1.064
Barhi (B:1253-II)/ Basangi (B:2682)	S(7)	540	250	290	7:9	1.422
OR1334-8/TTB148-774-32-1	R(1)	489	448	41	15:01	3.79
RP1579-1662-72-52/ RP1976-18-6-4-2	R(1)	478	478	0	1:0	-
B6932-MR 25-1/CRK 7-2-8	R(1)	545	545	0	1:0	-
RP1579-1627-32-220/ RP1976-18-6-4-2	R(0)	461	461	0	1:0	-
Bakada (B:2699-I)/ Barhi (B:1253-I)	R(0)	448	448	0	1:0	-

[a]/ Numbers in parentheses are the average plant damage scores based on 10-15 F_1 plants using the 0-9 scoring system (0 = resistant, 9 = susceptible). R = resistant, S = susceptible.

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