INTERNATIONAL JOURNAL OF PLANT PROTECTION | VOLUME 7 | ISSUE 1 | APRIL, 2014 | 55-58
e ISSN-0976-6855 | *www.researchjournal.co.in* | Open Access

IJPP

RESEARCH ARTICLE

Evaluation of different rice genotypes for BPH, *Nilaparvata lugens* (Stal.) resistance

■ S.K. VARMA*, M.G. SABLE, D.K. RANA AND V.K. DUBEY

Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, RAIPUR (C.G.) INDIA

ARITCLE INFO

Received : 04.09.2013
Revised : 02.02.2014
Accepted : 17.02.2014

Key **W**ords :
Rice, BPH, Screening, Varietal resistance, *Nilaparvata*

***Corresponding author:**

ABSTRACT

One hundred sixty seven rice genotypes were screened against *Nilaparvata lugens*, in the Glass House, Department of Entomology, College of Agriculture, IGKV, Raipur (C.G.) during 2012-2013. Among the screened material, 39 genotypes were categorized as resistant, whereas 24 as moderately resistant, 12 as moderately susceptible and 92 as susceptible to BPH. Among all the genotypes screened, the genotype R 1723-1413-3-357-1 had the least plant damage score (1.03) followed by R 1688-2077-1-262-1(1.04) due to BPH infestation. Out of the fifteen resistant rice genotypes tested, R1700-309-1-171-1 had the highest (34.88) average probing marks followed by R1700-304-1-161-1(34.25), which was significantly higher than TN1.

How to view point the article : Varma, S.K., Sable, M.G., Rana, D.K. and Dubey, V.K. (2014). Evaluation of different rice genotypes for BPH, *Nilaparvata ugens* (Stal.) resistance. *Internat. J. Plant Protec.*, **7**(1) : 55-58.

INTRODUCTION

Rice is one of the most important food crops of India and 2nd of the world. Among different pest the brown planthopper (BPH) *Nilaparvata lugens* (Stal.) (Hemiptera: Delphacidae) is a typical sucking pest of rice, which feeds on phloem sap and thus affects the growth of rice and results in 'hopperburn' in rice fields (Watanabe and Kitagawa, 2000). The brown plant hopper (BPH) is a major threat to rice production and causes significant yield loss annually. In addition to the feeding damage, it also transmits grassy stunt (Rivera *et al*., 1966), ragged stunt (Ling *et al*., 1978) and wilted stunt viral disease of rice (Chen and Cheng, 1978), which are serious diseases in the tropical region (Du, 2007). Host-plant resistance is an important strategy which is compatible in IPM to reduce the damage caused by BPH and increase rice productivity. The IGKV's collection of rice germplasm is the largest in India and second largest in the world, which is a good source of plant resistance.

Looking to the above mentioned fact, screening was conducted in the Glass House, Department of Entomology, College of Agriculture, IGKV, Raipur during the year 2012-13.

MATERIAL AND METHODS

Screening of rice genotypes :

The experimental material consisted of 167 rice genotypes received from the Department of Genetics and Plant Breeding along with TN1 and Ptb33 as standard susceptible and resistant checks, respectively. To get the regular supply of insect for screening, the brown plant hopper (BPH), was mass reared at 30° ± 5°C on potted TN1 (Taichung Native) variety.

Screening of rice genotypes was carried out as per methodology suggested by Kalode *et al*. (1979). The observations were recorded on the basis of 0-9 scale, when more than 90 per cent TN1 seedling were killed by the brown planthopper insect. The whole reaction was completed in 8-14 days after the release of insects. Observations of seedlings were taken on the basis of visual plant damage symptoms (0-9 scale) which are as follows:

Probing mark test was carried out according to methodology suggested by Natio (1964). The test was performed on 7 days old seedlings of selected resistant genotypes.

Table 1: Plant damage score of resistant rice genotypes caused by BPH, *Nilaparvata lugens* (Stal.)

Sr. No.	Designation	Parentages	*Average plant damage score
1.	R 1723-1413-3-357-1	Nidhee × IR 36	1.03
2.	R 1688-2077-1-262-1	R 975-897-1-1 × Tarori Basmati	1.04
3.	IR 78554-145-1-3-2	Not Available	1.13
4.	R 1688-2077-1-262-1	R 975-897-1-1 × Tarori Basmati	1.24
5.	Dubraj (Rajeev)	Not Available	1.26
6.	R 1458-231-1-275-1	Abhaya / Madhri	1.33
7.	R 1700-301-1-155-1	Danteshwari × Amrit Bhog	1.35
8.	R 1605-315-1-31-1	SR 12 × Jira Shanker	1.46
9.	R 1667-1025-1-97-1	R 1060-1674-1-1 × Chandrahasini	1.47
10.	R 1747-4941-1-515-1	Rastic Br 240-47 × Shay- Jira	1.49
11.	R 1700-304-1-161-1	Danteshwari × Amrit Bhog	1.54
12.	R 1675-1844-2-1257-1	R 1037-649-1-1 × Mahamaya	1.58
13.	R 1656-1146-5-513-1	Swarna × Jira Shanker	1.59
14.	Indira Sugandhit Dhan 1	(Check)	1.61
15.	IR 81166-29-1-2-3	Not Available	1.61
16.	R 1700-2243-2-2312-1	Danteshwari × Amrit Bhog	1.74
17.	R 1723-1411-1-355-1	Nidhee × IR 36	1.75
18.	R 1757-540-3-286-1	IR 64 × Bishanu Bhog	1.81
19.	PSB RC 68	Not available	1.84
20.	R 1682-1997-6-1754-1	IR 36 × Triguna	1.92
21.	R 1688-2150-5-2660-1	R 975-897-1-1 × Tarori Basmati	1.92
22.	R 1700-309-1-171-1	Danteshwari × Amrit Bhog	1.95
23.	R 1744-4901-1-510-1	IR 36 x Pau 3056	2.02
24.	R 1695-2169-1-274-1	Danteshwari × Poornima	2.05
25.	R 1700-2240-4-2295-1	Danteshwari × Amrit Bhog	2.06
26.	R 1700-2240-4-2295-1	Danteshwari × Amrit Bhog	2.10
27.	R 1700-302-1-156-1	Danteshwari × Amrit Bhog	2.15
28.	R 1720-2550-4-2644-1	BG 380-2 × IR 64	2.15
29.	R 1536-1170-5-140-1	R 302-111 × Ganga Baru	2.21
30.	R 1700-308-3-170-1	Danteshwari × Amrit Bhog	2.23
31.	IR 64	(Check)	2.25
32.	IR 83376 B – B 110-3	Not available	2.28
33.	R 1629-234-7-1884-1	HMT × Jira Shanker	2.29
34.	PR 26703-3-B – PT25	Not available	2.33
35.	IR 77537-24-1-1-3	Not Available	2.36
36.	R 1711-2485-4-2593-1	R 1037-649-1-1 × Nidhee	2.37
37.	Chandrahasini	(Check)	2.48
38.	R 1656-1199-2-551-1	Swarna × Jira Shanker	2.53
39.	R 1652-2701-2915-1	Madhuri × R 979-1528-2-1-1	2.82

* Plant damage score based on 0-9 scale
* Average plant damage score based on 3 replications

Score*	Rating	Symptoms
0	Highly resistant	No visible damage
1	Resistant	Partial yellowing at first leaf
3	Moderately resistant	Partial yellowing first and second leaves
5	Moderately susceptible	Pronounced yellowing and some wilting
7	Susceptible	More than halves of the plants are wilted or dead and remaining plants severely stunted
9	Highly susceptible	All plants dead

* Mean score of plant damage (Anonymous, 1996)

RESULTS AND DISCUSSION

Among 167 rice genotypes tested, 39 were categorized as resistant, 24 as moderately resistant, 12 as moderately susceptible and rest of other 92 genotypes were susceptible to BPH.

The average plant damage score of resistant genotypes ranged from 1.03 to 2.82 (Table 1). The genotype R 1723-1413-3-357-1 showed the least plant damage score (1.03) followed by R 1668-2077-1-262-1 (1.04) and IR 78554-145-1-3-2 (1.13), whereas it was highest in R 1652-2701-2915-1 (2.82) followed by R 1656-1199-2-551-1 (2.53) and Chandrahasini (2.48).

The average plant damage score of moderately resistant genotypes ranged from 3.00 to 4.98 (Table 2). Among moderately resistant genotypes tested, the genotype showed least R 1553-1369-2-252-1 (3.00) plant damage score followed by R1860-783-3-426-1 while it was the highest in the genotype R 1599-594-2-305-1 (4.98) followed by R 1670-1134-1-115-1 (4.89) and R1860-783-2-425-1 (4.87).

In all the selected resistant rice genotypes, the average probing marks per seedling ranged from 20.50 to 34.88 and in resistant check Ptb33, the probe marks was 38.78 per seedling per female (Table 3).

Out of the fifteen resistant rice genotypes tested, R1700-309-1-171-1 had the highest (34.88) average probing marks followed by R1700-304-1-161-1(34.25) and R1723-1411-1-355-1 (32.00), which was significantly higher than TN1. The resistant check rice genotype *i.e.* Ptb33 had the maximum number of probe marks (38.78) which was significantly higher than any other rice genotype tested.

Table 2 : Plant damage score of moderately resistant rice genotypes caused by BPH, *Nilaparvata lugens* (Stal.)

Sr. No.	Designation	Parentages	*Average plant damage score
1.	R 1553-1369-2-252-1	Mahamya / Nidhee	3.00
2.	R 1625-1211-2-765-1	Denteshwari / Tarori Basmati	3.10
3.	R1860-783-3-426-1	R 1099-2596-1-1 × RF13	3.10
4.	R 1519-781-1-594-1	Rastic Br 240-47 / Charder	3.15
5.	IRH 43	Not Available	3.17
6.	R 1518-725-849-3	IR 64 / Laxmi Bhog	3.21
7.	R 1695-2152-1-268-1	Danteshwari × Poornima	3.27
8.	R 1661-1372-1-601-1	R 1004-5552-1-1×Nagri Dubraj	3.30
9.	Jaya	(Check)	3.32
10.	Sasyasree	(Check)	3.41
11.	R1902-917-1-517-1	Denteshwari × JGL 1118	3.50
12.	R 1432-251-103-1-1	IET 14876 / Pusa Basmati-1	3.67
13.	R 1938-620-1-163-1	Abhaya × B 644-FMR-6-0-0	3.73
14.	R1656-77-1-45-1	Swarna × Jira Shankar	3.76
15.	R 1677-1891-3-1435-1	R 1037-649-1-1 × Danteshwari	3.80
16.	R 1678-4410-1-493-1	R 1037-649-1-1 × Poornima	4.00
17.	R 1677-1891-3-1435-1	R 1037-649-1-1 × Danteshwari	4.24
18.	R 1677-1880-8-1381-1	R 1037-649-1-1 × Danteshwari	4.26
19.	IRH-84	Not Available	4.29
20.	R 1695-2169-1-274-1	Danteshwari × Poornima	4.66
21.	R 1779-311-2-103-1	Danteshwari × WGL 320100	4.73
22.	R1860-783-2-425-1	R 1099-2596-1-1× RF13	4.87
23.	R 1670-1134-1-115-1	Samleshwari × Poornima	4.89
24.	R 1599-594-2-305-1	MTU 1010 × Mahamaya	4.98

* Plant damage score based on 0-9 scale.

* Average plant damage score based on 3 replications

Table 3 : Average probing marks on resistant rice genotypes caused by BPH

Sr. No.	Designation	Average probing marks
1.	R1675-1844-2-1257-1	28.00 (31.81)
2.	R1723-1411-1-355-1	32.00 (34.36)
3.	R1723-1413-3-357-1	29.20 (32.61)
4.	R1682-1997-6-1754-1	29.62 (32.91)
5.	PBS RC 68	20.50 (26.61)
6.	R1605-315-131-1	28.87 (32.36)
7.	R1656-1146-5-513-1	25.63 (30.30)
8.	Indira Sugandhit Dhan 1	31.80 (34.09)
9.	R1688-2150-5-2060-1	27.22 (31.29)
10.	R1747-4941-1-515-1	24.50 (29.62)
11.	R1700-301-1-155-1	27.30 (31.45)
12.	R1700-304-1-161-1	34.25 (35.81)
13.	R1700-309-1-171-1	34.88 (36.16)
14.	IR78554-145-1-3-2	30.11 (33.16)
15.	IR81166-39-1-2-3	28.22 (32.01)
16.	PTB 33	38.78 (38.47)
17.	TN 1	11.80 (20.01)
	SEm ±	1.17
	CD	3.28

**Average of ten replications
Figures in the parentheses are arc sine transformed value

Among all resistant genotype tested, the genotype PBS RC 68 had the lowest average probing marks (20.50) followed by R1747-4941-1-515-1 (24.50) per seedling.

The lowest average probing marks per seedling (11.80) was observed in susceptible check TN1. Statistically numbers of probes received by all resistant genotypes tested were significantly high as compared to susceptible check TN1. Several workers like Sogawa and Pathak (1970), Veronica (1985), Reddy (1979) and Reddy and Kalode (1985) indicated that the resistant varieties receive more number of probing punctures than susceptible ones which is the sign of plant resistance. It is crystal clear that susceptible host received less probe marks due to easier penetration of insect stylets as well as the adequate host suitability to the insect. The resistant genotypes probably contain feeding deterrent, thereby restricted feeding activity by BPH. Molecular studies of these genotypes will expose the cause of resistance.

REFERENCES

Anonymous (1996). Standard evaluation system, IRRI, Philippines.

Chen, C.N. and Cheng, C.C. (1978). The population level of *Nilaparvata lugens* (Stal.) in relation to yield loss of rice. *Plant Protec. Bull.,* (Taiwan), **20** (3) : 197-209.

Du, P.V. (2007). Yellowing syndrome of rice: Etiology, current status and future challenges. *Omon Rice,* **15** : 94–101.

Kalode, M.B., Krishna, T.S. and Gour, T.B. (1979). Studies on pattern of resistance to brown plant hopper (*Nilaparvata lugens* Stal.) in some rice varieties. *Pro. Indian. Nat. Sci. Acad.*, **44** : 43-48.

Ling, K.C., Tiongco, E.R. and Aguiero, V.M. (1978). Rice ragged stunt, a new virus disease. *Plant Dis. Rep.,* **62** : 701-705.

Natio, A. (1964). Methods of detecting feeding marks of leaf and plant hopper and its application. *Plant Prot. Japan,* **18**(12): 482-484.

Reddy, K.V. and Kalode, M.B. (1985). Mechanism of resistance in rice varieties showing differential reaction to brown plant hopper. *Proc. Indian Acad. Sci. (Anim. Sci.),* **94** (1) : 37-48.

Reddy, K.V. (1979). Varietal resistance to brown plant hopper, *Nilaparvata lugens* (Stal.) in rice. M.Sc. (Ag.) Thesis Andhra Pradesh Agricultural University, Hyderabad. 110 p.

Rivera, C.T., Ou, S.H. and Lida, T.T. (1966). Grassy stunt disease of rice and its transmission by *Nilaparvata lugens* (Stal). *Plant Dis. Reptr.,* **50** : 453-456.

Sogawa, K. and Pathak, M.D. (1970). Mechanism to brown planthopper resistance to Mudgo variety of rice (Hemiptera : Delphacidae). *Appl. Ent. Zool.,* **5** : 145-158.

Veronica, B.K. (1985). Studies on multiple resistance to leaf and plant hopper in rice varieties. Ph.D. Thesis, Osmania University, HYDERABAD (INDIA).

Watanabe, T. and Kitagawa, H. (2000). Photosynthesis and translocation of assimilates in rice plants following phloem feeding by the plant hopper, *Nilaparvata lugens* (Homoptera: Delphacidae). *J. Economic Entomol.,* **93** (4) : 1192-1198.