

# Varietal screening of rice against green leaf hopper, *Nephotettix virescens* distal

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## ABSTRACT

The findings on per cent hill damage due to green leaf hopper indicated that GR-101, GR-102, GR-103, and GR-104 found resistant (R) and recorded per cent hill damage between 1 to 10 per cent. While, variety IR-28, GR-11 and Masuri were categorized as susceptible (S) as well as Gurjari and Jaya were grouped into the highly susceptible category (HS).

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## INTRODUCTION

Rice is life and princess among the cereals, the staple food of 65 per cent of the total population in India. South Gujarat is an important rice growing tract of the state belonging to Dang, Valsad, Navsari and Surat districts of State. In rice among the biotic factors insect pests cause about 10-15 per cent yield losses. The average yield losses in rice have been estimated to vary between 21-51 per cent (Krishnaiah and Varma, 2010).

Attempts are being made in the Gujarat state to increase the rice production by the high yielding varieties, adopting intensive cultivation including double cropping in a year. Such efforts in turn increased pest intensities and losses caused by pests remained an important constraint to achieve high rice yields (Waddington *et al.*, 2010). Similarly, lack of pest resistant varieties, poor water management and lack of suitable pest and disease

management strategies are the major constraints in rice production.

A list of major, minor and sporadic pests attacking paddy crop in Gujarat is reported by Korat and Pathak (1997). Rice hoppers complex infest all stages of the rice crop and both nymphs and adults suck the sap from the base of the tillers, resulting in yellowing and drying of the plants. The symptoms spread as patches of infestation from a point outwards within the field. This condition is known as 'hopper burn'. Outbreaks of plant hoppers recently have caused serious concern and in the last decade plant hoppers have rapidly spread to newer non-traditional areas.

## MATERIAL AND METHODS

The experiment was undertaken at Wheat Research Station, Navsari Agricultural University, Bardoli during

*Kharif* 2012 and 2013 with the 18 rice varieties. The seedlings were transplanted when they were 25 days old with a spacing of 20 x 15 cm. All the post sowing recommended agronomic practices were followed and the experimental area was kept free from insecticidal spray throughout the crop season in order to record the observations on Green leaf hopper incidence.

To know the incidence of green leaf hopper, *N. virescens* the observations were recorded by counting total number of nymph and adults on twenty randomly selected spots each comprising five hills at weekly interval. Similarly, to assess the damage intensity the observations were recorded by counting the total number of damaged and healthy hills from randomly selected twenty spots of one m<sup>2</sup> area. The spots were selected by walking “M” or “W” fashion in the field.

The damage intensity of paddy leaves due to green leaf hopper was counted by examining selected hills. Observations were recorded at weekly interval from 10 randomly selected hills till harvest of paddy crop (Table A).

Sr. No.	% damage hills	Scale	Reaction
1.	0	0	HR (Highly resistant)
2.	1 – 10	1	R (Resistant)
3.	11 – 25	3	MR (Moderately resistant)
4.	26 – 50	5	MS (Moderately susceptible)
5.	51 – 75	7	S (Susceptible)
6.	76 – 100	9	HS (Highly susceptible)

The scale and reaction for resistance/susceptibility score was judged by using Standard Evaluation System for Rice (SES) for the insect pest (Anonymous, 1996) which is as above.

## RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under the following heads:

### I year (*Kharif* 2012):

Out of the eighteen varieties evaluated against *N. virescens*, the results revealed that none of the variety was free from the attack of green leafhopper and the difference in hill damage in different varieties was found significant (Table 1 and Fig. 1). The variety GR-104 was

found less susceptible due to the low hill damage (0.13%) and found at par with GR-103 (0.18%), GR-101 (0.20%) and GR-102 (0.22%). The variety GNR-2 reported 0.55 per cent hill infestation and was comparable with GAR-1 (0.57%), Narmada (0.59%) and GR-7 (0.63%). The other varieties NAUR-1, GNR-3, and GAR-2 exhibited 0.87, 0.88 and 0.93 per cent hill damage and found at par with each other. The moderately higher hill damage due to green leafhopper was registered in variety IR-22 (1.13%) and GR-12 (1.19%) than all the evaluated varieties of paddy. The next varieties reporting higher hill damage were IR-28, GR-11 and Masuri which recorded 1.68, 1.72 and 1.88 per cent, respectively and were at par with each other. Significantly highest hill damage was found in variety Gurjari and Jaya with 2.23 and 2.77 per cent infestation.

### II year (*Kharif* 2013):

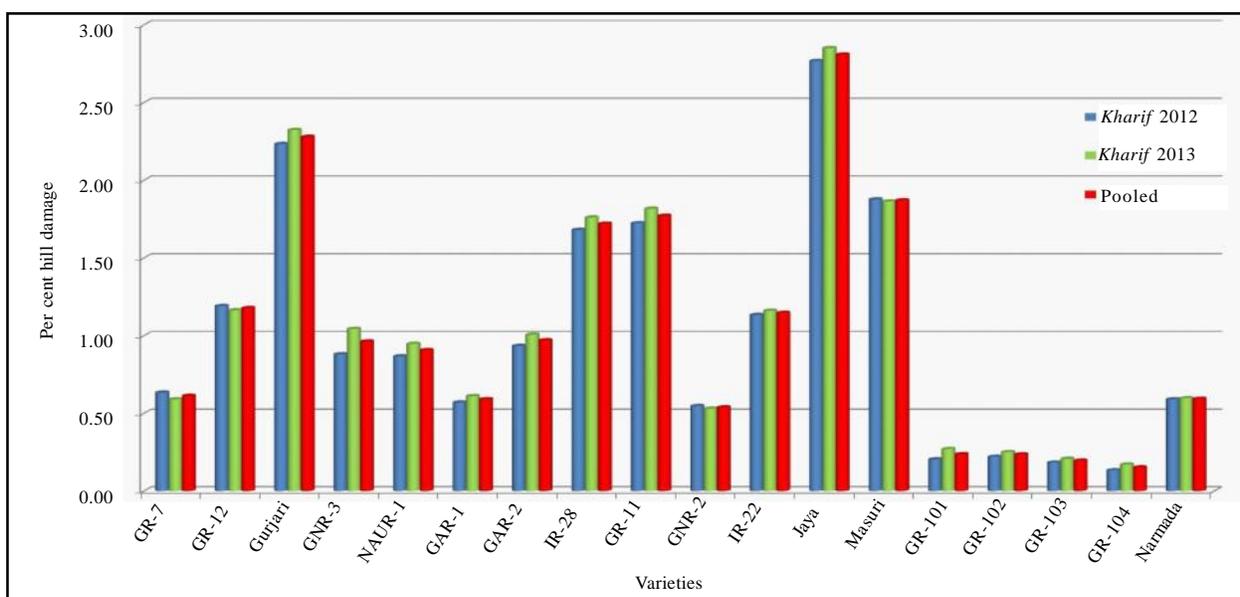
During 2013-14 also, same 18 varieties were evaluated against *N. virescens* (Table 1 and Fig.1) and the difference in hill damage in different varieties was found significant. The variety GR-104 was found more resistant due to the low hill damage (0.17%), but showed at par results with GR-103 (0.21%), GR-102 (0.25%) and GR-101 (0.27%). The variety GNR-2 reported 0.53% hill damage and at par with GR-7 (0.59%), Narmada (0.60%) and GAR-1 (0.61%). The varieties viz., NAUR-1, GAR-2, GNR-3, IR-22 and GR-12 exhibited 0.95, 1.01, 1.04, 1.16 and 1.16 per cent hill damage and found at par with each other. The higher hill damage due to green leafhopper was registered in variety IR-28 (1.76%), which was at par with GR-11 and Masuri and showed 1.82 and 1.86 per cent infestation, respectively. The significantly highest hill damage was found in variety Gurjari and Jaya with 2.32 and 2.85 per cent hill damage, respectively.

The pooled data on evaluation of 18 varieties against *N. virescens* revealed the significant difference in hill damage in varieties (Table 2 and Fig.1), where the variety GR-104 showed significantly low hill damage (0.15%). In susceptibility order, GR-103 (0.20%), GR-102 (0.24%) and GR-101 (0.24%) were also recorded less susceptibility and found at par with each other. The next variety GNR-2 reported moderate 0.54 per cent hill infestation and was found at par with GAR-1 (0.59%), Narmada (0.59%), while GR-7 showed significantly moderate hill damage (0.61%). The other varieties viz.,

**Table 1: Varietal screening of rice against green leafhopper during Kharif 2012 and 2013**

Sr. No.	Varieties	Kharif 2012				Kharif 2013			
		Hill damage (%)	Corr. % damage	Scale	Reaction	Hill damage (%)	Corr. % damage	Scale	Reaction
<b>Early varieties</b>									
1.	GR-7	4.56 (0.63)	22.89	3	MR	4.38 (0.59)	20.70	3	MR
2.	GR-12	6.26 (1.19)	43.01	5	MS	6.18 (1.16)	40.82	5	MS
3.	Gurjari	8.59 (2.23)	80.72	9	HS	8.76 (2.32)	81.52	9	HS
4.	GNR-3	5.37 (0.88)	31.81	5	MS	5.84 (1.04)	36.61	5	MS
5.	NAUR-1	5.32 (0.87)	31.33	5	MS	5.56 (0.95)	33.22	5	MS
6.	GAR-1	4.31 (0.57)	20.60	3	MR	4.47 (0.61)	21.40	3	MR
7.	GAR-2	5.52 (0.93)	33.73	5	MS	5.73 (1.01)	35.32	5	MS
8.	IR-28	7.44 (1.68)	60.72	7	S	7.61 (1.76)	61.75	7	S
<b>Mid-late varieties</b>									
9.	GR-11	7.54 (1.72)	62.29	7	S	7.74 (1.82)	63.74	7	S
10.	GNR-2	4.23 (0.55)	19.76	3	MR	4.15 (0.53)	18.60	3	MR
11.	IR-22	6.10 (1.13)	40.96	5	MS	6.17 (1.16)	40.70	5	MS
12.	Jaya (Sus. check)	9.57 (2.77)	--	9	HS	9.72 (2.85)		9	HS
<b>Late varieties</b>									
13.	Masuri	7.87 (1.88)	67.83	7	S	7.83 (1.86)	65.38	7	S
14.	GR-101	2.57 (0.20)	7.35	1	R	2.98 (0.27)	9.47	1	R
15.	GR-102	2.67 (0.22)	7.95	1	R	2.86 (0.25)	8.77	1	R
16.	GR-103	2.43 (0.18)	6.63	1	R	2.60 (0.21)	7.25	1	R
17.	GR-104	2.09 (0.13)	4.82	1	R	2.34 (0.17)	5.96	1	R
18.	Narmada	4.37 (0.59)	21.33	3	MR	4.42 (0.60)	20.94	3	MR
S. E. $\pm$			0.26				0.27		
C. D. (P=0.05)			0.73				0.78		
C. V.			8.21				8.53		

\*Values in outside the parentheses are arc sine transformed values and inside are original values



**Fig. 1 : Varietal screening of rice against green leaf hopper**

NAUR-1, GNR-3 and GAR-2 exhibited 0.91, 0.96 and 0.97 per cent hill damage and found at par with each other. The moderately higher hill damage due to green leafhopper was registered in variety IR-22 (1.15%) and GR-12 (1.18%) than other evaluated varieties of paddy. The next varieties reporting higher hill damage were IR-28 and GR-11 recorded 1.72 and 1.77 per cent, respectively and were at par with each other. Significantly highest hill damage was found in variety Masuri, Gurjari and Jaya with 1.87, 2.28 and 2.81 per cent infestation, respectively. The interaction effect between varieties and two year was non-significant revealed consistent performance of varieties.

On corrected mortality index basis (Table 2), GR-101, GR-102, GR-103 and GR-104 grouped into resistant (scale 1) and recorded hill damage between 1 to 10 per

cent. While, GNR-2, GAR-1, Narmada and GR-7 and were categories into moderately resistant (scale 3) with hill damage between 11 to 25 per cent. Other varieties viz., NAUR-1, GNR-3, GAR-2, IR-22 and GR-12 were found moderately susceptible reaction (scale 5) and showed hill damage between 26 to 50 per cent. The variety IR-28, GR-11 and Masuri were recorded susceptible (scale 7) with hill damage between 51 to 75 per cent, whereas, Gurjari and Jaya were grouped into the highly susceptible category (scale 9) and showed hill damage from 76 to 100 per cent.

The present was supported by the finding of Garg (1997) who reported the greatest population on the most susceptible variety T(N)1, followed by Ratna, Jaya, IR-20, Mudgo and Vijaya.

Sekizawa and Ogawa (1980) studied on rice

**Table 2: Varietal screening of rice against green leafhopper (Two years pooled)**

Sr. No.	Varieties	Hill damage (%)	Corrected % damage	Scale	Reaction
<b>Early varieties</b>					
1.	GR-7	4.47 (0.61)	21.78	3	MR
2.	GR-12	6.22 (1.18)	41.90	5	MS
3.	Gurjari	8.68 (2.28)	81.13	9	HS
4.	GNR-3	5.61 (0.96)	34.24	5	MS
5.	NAUR-1	5.44 (0.91)	32.28	5	MS
6.	GAR-1	4.39 (0.59)	21.01	3	MR
7.	GAR-2	5.63 (0.97)	34.54	5	MS
8.	IR-28	7.53 (1.72)	61.25	7	S
<b>Mid-late varieties</b>					
9.	GR-11	7.64 (1.77)	63.03	7	S
10.	GNR-2	4.19 (0.54)	19.17	3	MR
11.	IR-22	6.14 (1.15)	40.83	5	MS
12.	Jaya (Sus. check)	9.65 (2.81)	--	9	HS
<b>Late varieties</b>					
13.	Masuri	7.85 (1.87)	66.59	7	S
14.	GR-101	2.77 (0.24)	8.43	1	R
15.	GR-102	2.77 (0.24)	8.37	1	R
16.	GR-103	2.52 (0.20)	6.94	1	R
17.	GR-104	2.21 (0.15)	5.40	1	R
18.	Narmada	4.39 (0.59)	21.13	3	MR
S. E. $\pm$ (T)			0.17		
S. E. $\pm$ (TxY)			0.26		
C. D. (P=0.05) (T)			0.26		
C. D. (P=0.05) (TxY)			NS		
C. V.%			8.38		

\* Values in outside the parentheses are arc sine transformed values and inside are original values

NS= Non-significant

varieties resistant to green leaf hopper, *N. cincticeps* for nymphs and adults on rice seedlings were showed significant differences in their mortality and preference for different varieties. Varietal differences were also seen in the growth of the nymph and inhibition of plant elongation caused. Values for resistance to *N. impicticeps* were different from those for *N. cincticeps*, indicating that different resistance factors may be involved. Almost all varieties resistant to *N. cincticeps*.

#### Conclusion:

The findings on per cent hill damaged due to green leaf hoppers indicated significant differences among evaluated varieties and on the basis of corrected mortality index basis, GR-101, GR-102, GR-103, and GR-104 found resistant and recorded per cent hill damage between 1 to 10 per cent. While, GNR-2, GAR-1, Narmada and GR-7 and were categories into moderately resistant with hill damage between 11 to 25 per cent. Other varieties viz., NAUR-1, GNR-3, GAR-2, IR-22 and GR-12 were found moderately susceptible showed hill damage between 26 to 50 per cent. Variety IR-28, GR-11 and Masuri were recorded susceptible with hill damage between 51 to 75 per cent, whereas, Gurjari and Jaya were grouped into the highly susceptible category and showed hill damage from 76 to 100 per cent.

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