



# Screening of rice varieties against leaf folder *Cnaphalocrocis medinalis* Guenee (Lepidoptera : Pyralidae)

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## ABSTRACT

The findings on per cent leaf damage due to leaf folder showed that varieties like GR-102, GR-103 considered as resistant (R). However, the variety GR-101 found susceptible (S) and varieties considered as highly susceptible (HS) were GR-12, Jaya, GR-104 and Masuri.

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## INTRODUCTION

Rice (*Oryza sativa* L.) is the world's second most important cereal crop. Asia is considered to be 'rice bowl' of world, where more than 90 per cent of world's rice is produced and consumed. At global level, it is a staple food crop of paramount importance to more than half of the population with regard to food value and is consumed by more than 60 per cent of the world population. 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).

The incidence of leaf folder in Gujarat is more

pronounced compared to other defoliating larvae. It has attained major pest status with the introduction of high yielding varieties and particularly in areas of high fertilizer use. It was recorded on paddy crop in the state for first time in 1964 (Patel *et al.*, 1964) and a sudden outbreak took place for first time in Gujarat during September-October, 1971 (Upadhyay *et al.*, 1975). For every unit increase in the leaf folder incidence at tillering, early earing and milky seed stage led to 2.81, 2.50 and 1.27 per cent loss in yield during wet season, respectively (Pandya *et al.*, 1994).

Of all insect control methods, the planting of pest resistant varieties is the most effective because it leaves no insecticide residue in food or the environment and is constantly effective and generally compatible with other insect control measures. In absence of natural heritable resistance in rice varieties, resistance could be induced

by alternate strategies to suppress certain pests. Besides these farmers are always worried about cost of production due to rise in inputs prices year by year. Host plant resistance is one of the reliable and sustainable components of integrated pest management (IPM). There has been substantial progress in this area and number of paddy varieties/lines have been developed and required to be screened out for their major insect pest susceptibility. Hence, the present investigation is carried out on screening of rice varieties against leaf folder, *Cnaphalocrocis medinalis* Guenee.

## MATERIAL AND METHODS

The seedlings were transplanted when they were 25 days old. 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 Leaf folder incidence.

To assess the damage done by leaf folders, the observations were recorded as per standard week starting from 30 days after transplanting till harvest. The observations were taken by counting the number of damaged leaves and total number of leaves from randomly selected five spots consisting of five plants in each spot. The data thus, obtained were converted to per cent infestation. Corrected per cent damage was calculated from formula given by (Garg, 1984).

$$\text{Corrected \% damage} = \frac{\% \text{ damaged leaves in test entry}}{\% \text{ damaged leaves in susceptible check}} \times 100$$

The scale and reaction for resistance/susceptibility score was judged by using standard evaluation system for rice (SES) for the insect pest (Anonymous, 1996)

Experimental details			
1.	Location	:	Wheat Research Station Farm, N.A.U., Bardoli
2.	Season and year	:	Kharif 2012 and 2013
3.	Design	:	Randomized Block Design (RBD)
4.	Area of experiment	:	1000 m <sup>2</sup>
5.	Spacing	:	20 cm x 15 cm
6.	Method of sowing	:	Transplanting

Table A : Scale and reaction for resistance/susceptibility score			
Sr. No.	% damaged leaves	Scale	Reaction
1.	0 %	0	HR (Highly resistant)
2.	1-10 %	1	R (Resistant)
3.	11-20 %	3	MR (Moderately resistant)
4.	21-35 %	5	MS (Moderately susceptible)
5.	36-50 %	7	S (Susceptible)
6.	51-100 %	9	HS (Highly susceptible)

Table B : Details of varieties used for their reaction against rice leaf folder			
Sr. No.	Early varieties	Mid-late varieties	Late varieties
1.	GR-7	GR-11	Masuri
2.	GR-12	GNR-2	GR-101
3.	Gurjari	IR-22	GR-102
4.	GNR-3	Jaya	GR-103
5.	NAUR-1		GR-104
6.	GAR-1		Narmada
7.	GAR-2		
8.	IR-28		

which is as under.

## RESULTS AND DISCUSSION

The data on per cent damaged leaves due to leaf folder is presented in Table 1 and 2 and graphically depicted in Fig. 1. The results showed that all varieties showed more or less per cent damaged leaves.

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

The first year findings on per cent damaged leaves (Table 1 and Fig. 1) revealed significant differences in eighteen varieties. However, among all varieties evaluated, the variety GR-102 exhibited least 0.31 per cent damage of the leaf folder and was statistically at par with GR-103 (0.32%), GNR-3 (0.32%), Gurjari (0.37%) and IR-22 (0.45%), followed by the variety GNR-2 registered 0.47 per cent damage and was at par

with NAUR-1 (0.48%) and IR-28 (0.54%). The variety GAR-1, GR-7, Narmada and GAR-2 registered 0.66, 0.69, 0.79 to 0.83 per cent leaf damage due to leaf folder and were at par with each other. Among the tested varieties, GR-11, GR-101 and GR-12 showed significantly higher leaf damage of 0.92, 1.59 and 2.38 per cent due to leaf folder, respectively, followed by Jaya (2.82%) and GR-104 (3.08%) and were at par with each other. While, the highest leaf damage of 3.55 per cent was recorded in Masuri.

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

The results of second year on evaluation of screening in different varieties (Table 1 and Fig. 1) indicated significant differences in per cent damaged leaves. Among all varieties, GR-103 and GR-102 exhibited least 0.18 and 0.24 per cent damage of the leaf folder,

**Table 1: Varietal screening of rice against leaf folder during *Kharif 2012* and *2013***

Sr. No.	Varieties	<i>Kharif 2012</i>				<i>Kharif 2013</i>			
		Leaf damage (%)	Corr. % damage	Scale	Reaction	Leaf damage (%)	Corr. % damage	Scale	Reaction
<b>Early varieties</b>									
1.	GR-7	4.76 (0.69)	19.42	3	MR	4.68 (0.67)	18.46	3	MR
2.	GR-12	8.86 (2.38)	67.07	9	HS	9.11 (2.52)	69.01	9	HS
3.	Gurjari	3.45 (0.37)	10.41	3	MR	4.10 (0.52)	14.17	3	MR
4.	GNR-3	3.26 (0.32)	9.10	1	R	3.98 (0.49)	13.35	3	MR
5.	NAUR-1	3.98 (0.48)	13.60	3	MR	4.23 (0.55)	15.08	3	MR
6.	GAR-1	4.64 (0.66)	18.48	3	MR	4.29 (0.56)	15.36	3	MR
7.	GAR-2	5.21 (0.83)	23.26	5	MS	5.49 (0.92)	25.14	5	MS
8.	IR-28	4.21 (0.54)	15.29	3	MR	4.65 (0.67)	18.28	3	MR
<b>Mid-late varieties</b>									
9.	GR-11	5.50 (0.92)	25.89	5	MS	5.84 (1.04)	28.61	5	MS
10.	GNR-2	3.94 (0.47)	13.32	3	MR	4.05 (0.50)	13.71	3	MR
11.	IR-22	3.84 (0.45)	12.66	3	MR	3.94 (0.48)	13.07	3	MR
12.	Jaya	9.66 (2.82)	79.27	9	HS	9.82 (2.91)	79.80	9	HS
<b>Late varieties</b>									
13.	Masuri (Sus. check)	10.86 (3.55)	100.00	9	HS	11.00 (3.65)	100	9	HS
14.	GR-101	7.21 (1.59)	44.75	7	S	7.21 (1.58)	43.24	7	S
15.	GR-102	3.21 (0.31)	8.82	1	R	2.79 (0.24)	6.49	1	R
16.	GR-103	3.22 (0.32)	9.10	1	R	2.43 (0.18)	5.03	1	R
17.	GR-104	10.11 (3.08)	86.77	9	HS	10.11 (3.11)	85.28	9	HS
18.	Narmada	5.10 (0.79)	22.23	5	MS	5.44 (0.90)	24.68	5	MS
	S.E.±		0.23				0.24		
	C. D. (P=0.05)		0.66				0.70		
	C. V.		7.09				7.32		

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

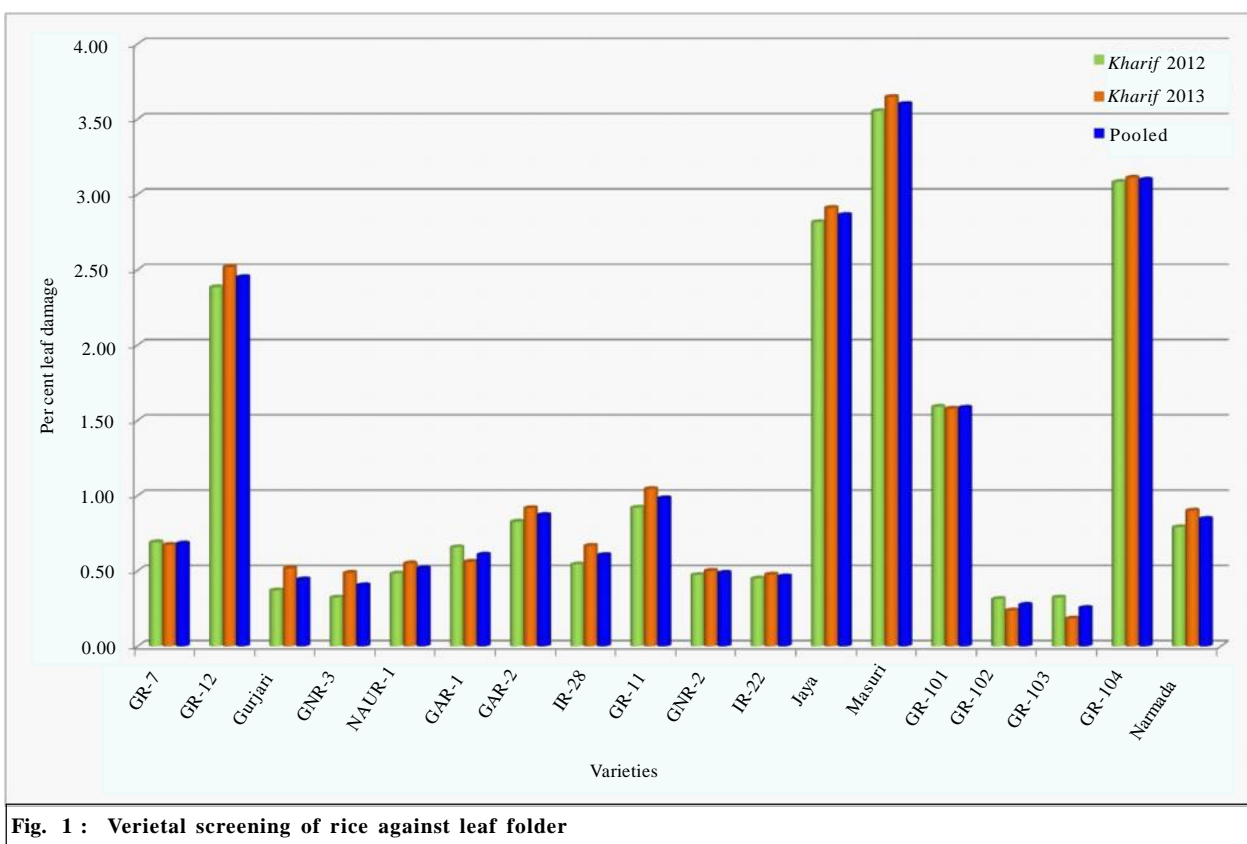
respectively and statistically at par with each other. The varieties viz., IR-22, GNR-3, GNR-2, Gurjari, NAUR-1 and GAR-1 registered 0.48, 0.49, 0.50, 0.52, 0.55 and 0.56 per cent damaged leaves, respectively and were statistically at par with each other, which was followed by IR-28 and GR-7 showed 0.67 per cent damaged and found at par with each other as well as with previous last five varieties. The variety Narmada, GAR-2 and GR-11 recorded 0.90, 0.92 and 1.04 per cent leaf damage due to leaf folder, respectively and were at par with each other. Among the tested other varieties, GR-101, GR-12, Jaya and GR-104 revealed significantly higher leaf damage of 1.58, 2.82, 2.91 and 3.11 per cent due to leaf folder, respectively, later two were at par with each other. While, the highest leaf damage of 3.65 per cent was found in Masuri.

**Pooled:**

The pooled data on per cent damaged leaves (Table 2 and Fig. 1) indicated significant differences in eighteen varieties. Among all varieties of paddy evaluated, the varieties GR-103 and GR-102 exhibited least 0.25 and 0.28 per cent damage of the leaf folder, respectively and

statistically at par with each other. The varieties viz., GNR-3 (0.41%), Gurjari (0.44%), IR-22 (0.46%) and GNR-2 (0.49%) were found significantly more resistant than remaining varieties and at par with each other. This resistant trend was followed by the varieties like NAUR-1, IR-28 and GAR-1, which registered 0.52, 0.61 and 0.61 per cent damage and was at par with each other. The variety GR-7 (0.68%) showed significantly moderate resistant leaf damage due leaf folder, followed by Narmada, GAR-2 and GR-11 registered 0.85, 0.87. and 0.98 per cent leaf damage due to leaf folder and were at par with each other. Among the other tested varieties, GR-101 and GR-12 showed significantly higher leaf damage of 1.58 and 2.45 per cent due to leaf folder, respectively, followed by Jaya (2.86%) and GR-104 (3.10%) and both were at par with each other. The highest leaf damage of 3.60 per cent was observed in Masuri. The interaction effect between varieties and year was non-significant, which revealed consistent performance of different varieties during the period of both years.

Based on corrected per cent leaf damage and scale (Table 2), the varieties having scale 1 are GR-102, GR-



**Fig. 1 : Varietal screening of rice against leaf folder**

103 considered as resistant with 1 to 10 per cent leaf damage, while eight varieties having scale 3 and considered as moderately resistant are GNR-3, Gurjari, IR-22, GNR-2, NAUR-1, IR-28, GAR-1 and GR-7 showed leaf infestation ranged between 11 to 20 per cent. The varieties recorded leaf damage between 21 to 35 per cent having scale 5 are Narmada, GAR-2 and GR-11 were considered as moderately susceptible. The variety GR-101 found susceptible in scale 7 with leaf damage between 36-50 per cent. However, varieties considered as highly susceptible having scale 9 are GR-12, Jaya, GR-104 and Masuri with leaf damage between 51 to 100 per cent.

In earlier findings, Korat *et al.* (2003) showed significantly low incidence of leaf folder in IET-12150 and IET-12537 cultivar than susceptible check Jaya and

GR-11 cultivar, while Nigam *et al.* (2008) from Faizabad reported rice germplasms *viz.*, IET 13310, NDR 6023, IET 10649-1, Masuri, NDR 6232 and NDR 6175 were resistant to leaf folder damage. These findings support the present experimental results.

However, Patel (2006) revealed that the minimum per cent damaged leaves was found in variety GR-103 coincided with scale 1, followed by the variety GR-102, GR-11, IR-28, kada, GR -7, Ratna, GR -3, GR -101, GR -12, GR -1, GR -5, TN-1, Jaya, GR-9, IR-66, GR-10, GR-6, Gurjari, GR-104 and Masuri. Likewise, in the results of Sankpal (2011), the genotype NWGR-7075 exhibited significantly least damage of the leaf folder than IET-21568, NWGR-7028, IET-21582, NWGR-4014, NWGR-4011 and NWGR-6072. Variety GR-11 showed significantly highest leaf damage due to *C. medinalis*,

**Table 2: Varietal screening of rice against leaf folder (Two years pooled)**

Sr. No.	Varieties	Leaf damage (%)	Corrected % damage	Scale	Reaction
<b>Early varieties</b>					
1.	GR-7	4.72 (0.68)	18.94	3	MR
2.	GR-12	8.99 (2.45)	68.06	9	HS
3.	Gurjari	3.78 (0.44)	12.31	3	MR
4.	GNR-3	3.62 (0.41)	11.25	3	MR
5.	NAUR-1	4.10 (0.52)	14.35	3	MR
6.	GAR-1	4.47 (0.61)	16.90	3	MR
7.	GAR-2	5.35 (0.87)	24.21	5	MS
8.	IR-28	4.43 (0.61)	16.81	3	MR
<b>Mid-late varieties</b>					
9.	GR-11	5.67 (0.98)	27.27	5	MS
10.	GNR-2	4.00 (0.49)	13.52	3	MR
11.	IR-22	3.89 (0.46)	12.87	3	MR
12.	Jaya	9.74 (2.86)	79.54	9	HS
<b>Late varieties</b>					
13.	Masuri (Sus. check)	10.93 (3.60)	100	9	HS
14.	GR-101	7.21 (1.58)	43.98	7	S
15.	GR-102	3.00 (0.28)	7.64	1	R
16.	GR-103	2.83 (0.25)	7.04	1	R
17.	GR-104	10.13 (3.10)	86.02	9	HS
18.	Narmada	5.27 (0.85)	23.47	5	MS
S. E. $\pm$ (T)			0.17		
S. E. $\pm$ (TxY)			0.24		
C. D. (P=0.05) (T)			0.48		
C. D. (P=0.05) (TxY)			NS		
C. V. %			7.21		

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

NS= Non-significant

followed by GR-4 and GR-12. These results confirm and support the present investigation data.

Also, similar type of trend was found in the experiment of Gole (2012) who reported that the genotype NWGR-4031 and variety Gurjari exhibited significantly least damage of the leaf folder. Among the tested genotypes/varieties, GR-11 showed significantly highest (9.55%) leaf damage due to leaf folder.

### Conclusion:

The findings on per cent damaged leaves due to leaf folder showed significant differences in eighteen varieties and GR-102, GR-103 considered as resistant with 1 to 10 per cent leaf damage, while 8 varieties considered as moderately resistant are GNR-3, Gurjari, IR-22, GNR-2, NAUR-1, IR-28, GAR-1 and GR-7 showed leaf infestation ranged between 11 to 20 per cent. The varieties recorded leaf damage between 21 to 35 per cent were Narmada, GAR-2 and GR-11 and were considered as moderately susceptible. The variety GR-101 found susceptible with leaf damage between 36-50 per cent. However, varieties considered as highly susceptible were GR-12, Jaya, GR-104 and Masuri with leaf damage between 51 to 100 per cent.

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