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Research Article

VARIETAL SCREENING OF RICE AGAINST BLUE BEETLE, *Leptispa pygmaea* [BALY]

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Abstract: The results on per cent leaf damage due to blue beetle revealed that 7 varieties *viz*., GAR-1, GR-102, IR-22, GAR-2, GR-103, GNR-2 and GR-104 are considered as resistant (R). However, varieties *viz*., Masuri, Gurjari and Jaya considered as susceptible (S) while the variety Jaya was considered as highly susceptible (HS).

Keywords: *Blue beetle, Resistant, Susceptible*

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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 percent 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 percent of the world population. Rice is life and princess among the cereals, the staple food of 65 percent of the total population in India. The average yield losses in rice have been estimated to vary between 21-51 percent [1]. A list of major, minor and sporadic pests attacking paddy crop in Gujarat was reported by Korat and Pathak, (1997) [2]. Now days, rice blue beetle occupying a major status at some hot spot area in South Gujarat. This pest in grub and adult stage feeding on the upper surface of rice leaves, causing longitudinal white streaks. In severe incidence, the leaves fold longitudinally and dry up. Losses caused by such pests remained an important constraint to achieve high rice yields [3]. 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. 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 Varietal screening of rice against blue beetle, *Leptispa pygmaea* Baly.

Materials and Methods

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 m²
5	Spacing	20 cm x 15 cm
6	Method of sowing	Transplanting

The seedlings were transplanted when they were 25 days old. All the post sowing 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 Blue beetle incidence. The damage caused by rice blue beetle was recorded as per standard week starting from 15 days after transplanting till harvest. The observations were recorded by counting the number of damaged leaves and total number of leaves from randomly selected twenty spots, each consisting of five hills. The data thus obtained were converted to percent infestation.
Percent damage was calculated from formula given by Garg, (1984) [4].

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

The scale and reaction for resistance/susceptibility score was judged by using Standard Evaluation System for Rice (SES) for the insect pest which is as under [5].

SN	% damaged leaves	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)

Details of varieties used for their reaction against rice leaf Folder:

SN	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		

The data on percent damaged leaves due to blue beetle is presented in [Table-1] and [Table-2] and graphically depicted in [Fig-1]. The findings showed that all varieties varying degree of damage and none of the varieties was found to be free from infestation. The infestation was observed at early period of crop.

Table-1 Varietal screening of rice against blue beetle during Kharif 2012 and 2013

SN	Varieties	*Kharif* 2012				*Kharif* 2013			
		Leaf damage (%)	Corr. % damage	Scale	Reaction	Leaf damage (%)	Corr. % damage	Scale	Reaction
A	Early Varieties								
1	GR-7	3.16(0.31)	13.07	3	MR	3.36(0.35)	14.90	3	MR
2	GR-12	3.74(0.43)	18.18	3	MR	3.59(0.39)	16.91	3	MR
3	Gurjari	6.55(1.30)	55.54	7	S	6.71(1.37)	58.74	7	S
4	GNR-3	3.26(0.32)	13.78	3	MR	3.15(0.30)	13.04	3	MR
5	NAUR-1	4.80(0.70)	29.83	5	MS	4.98(0.76)	32.66	5	MS
6	GAR-1	2.11(0.14)	5.82	1	R	1.82(0.10)	4.44	1	R
7	GAR-2	2.21(0.15)	6.39	1	R	2.10(0.14)	5.87	1	R
8	IR-28	3.77(0.43)	18.47	3	MR	3.63(0.40)	17.19	3	MR
B	Mid-late varieties								
9	GR-11 (Sus. check)	8.79(2.35)	100	9	HS	8.75(2.33)	100	9	HS
10	GNR-2	2.36(0.17)	7.24	1	R	2.15(0.14)	6.16	1	R
11	IR-22	2.17(0.14)	6.11	1	R	2.01(0.13)	5.44	1	R
12	Jaya	6.57(1.32)	56.11	7	S	6.92(1.45)	62.32	7	S
C	Late varieties								
13	Masuri	6.35(1.23)	52.41	7	S	6.44(1.26)	54.15	7	S
14	GR-101	4.61(0.65)	27.70	5	MS	4.81(0.71)	30.37	5	MS
15	GR-102	2.01(0.12)	5.26	1	R	2.06(0.13)	5.59	1	R
16	GR-103	2.16(0.14)	6.11	1	R	2.33(0.17)	7.16	1	R
17	GR-104	2.40(0.18)	7.53	1	R	2.57(0.20)	8.74	1	R
18	Narmada	4.66(0.66)	28.13	5	MS	4.88(0.73)	31.23	5	MS
S. E. (m)		0.19				0.22			
C. D. at 5%		0.56				0.62			
C. V.		8.41				9.30			

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

Table-2 Varietal screening of rice against blue beetle (Two years pooled)

SN	Varieties	Leaf damage (%)	Corrected % damage	Scale	Reaction
A.	Early Varieties				
1.	GR-7	3.26(0.33)	13.98	3	MR
2.	GR-12	3.66(0.41)	17.55	3	MR
3.	Gurjari	6.63(1.34)	57.13	7	S
4.	GNR-3	3.20(0.31)	13.41	3	MR
5.	NAUR-1	4.89(0.73)	31.24	5	MS
6.	GAR-1	1.97(0.12)	5.14	1	R
7.	GAR-2	2.16(0.14)	6.13	1	R
8.	IR-28	3.70(0.42)	17.83	3	MR
B.	Mid-late varieties				
9.	GR-11 (Sus. check)	8.77(2.34)	100	9	HS
10.	GNR-2	2.26(0.16)	6.70	1	R
11.	IR-22	2.09(0.14)	5.78	1	R
12.	Jaya	6.74(1.38)	59.20	7	S
C.	Late varieties				
13.	Masuri	6.40(1.25)	53.28	7	S
14.	GR-101	4.71(0.68)	29.03	5	MS
15.	GR-102	2.03(0.13)	5.42	1	R
16.	GR-103	2.24(0.16)	6.63	1	R
17.	GR-104	2.49(0.19)	8.13	1	R
18.	Narmada	4.77(0.69)	29.67	5	MS
S. E. (m)± (T)		0.14			
S. E. (m)± (TxY)		0.20			
C. D. at 5% (T)		0.40			
C. D. at 5% (TxY)		NS			
C. V. %		8.87			

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

i. I year (Kharif 2012)

The first-year data [Table-1] and [Fig-1] on percent leaf damage due to blue beetle recorded significant results and revealed that the infestation of the pest in different varieties was varied from 0.12 to 2.35 percent. From the varieties screened, significantly lowest infestation was registered in variety GR-102 (0.12%) and was found comparable with GAR-1 (0.14%), GR-103 (0.14%), IR-22 (0.14%), GAR-2 (0.15%), GNR-2 (0.17%) and GR-104 (0.18%). Similarly, varieties GR-7 and GNR-3 also registered significantly lower infestation of 0.31 and 0.32% than susceptible check GR-11 and also found at par with each other, followed by 0.43% leaf damage in GR-12 and IR-22. The other variety *viz*., GR-101 (0.65%) was less effective variety, but it was at par with Narmada (0.65%) and NAUR-1 (0.70%). Varieties like Masuri, Gurjari and Jaya were also less effective amongst above other varieties and were at par with each other with 1.23, 1.30 and 1.32 percent leaf damage, respectively. The paddy variety GR-11 registered highest (2.35%) infestation due to blue beetle.

ii. II year (Kharif 2013)

The results of second year on percent leaf damage due to blue beetle showed significant findings [Table-1] and [Fig-1]. From the varieties screened, significantly lowest infestation was exhibited in variety GAR-1 (0.10%), but recorded at par results with IR-22 (0.13%), GR-102 (0.13%), GAR-2 (0.14%), GNR-2 (0.14%) and GR-103 (0.17%). Similarly, varieties GR-104 and GNR-3 also registered significantly lower infestation of 0.20 and 0.30%, respectively and found at par with each other.

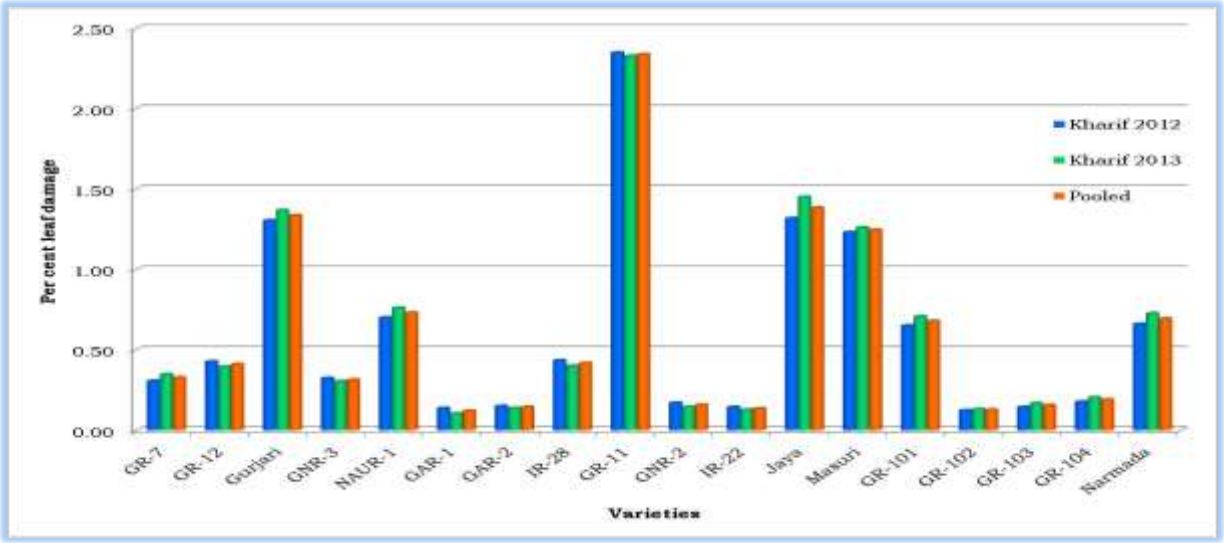

Fig-1 Varietal screening of rice against blue beetle

This trend of ascending order leaf damage was followed by the varieties like GR-7, GR-12 and IR-28 registering 0.35, 0.39 and 0.40 percent leaf damage, respectively. Later on, GR-101 (0.71%) was less effective variety and it was also at par with Narmada (0.73%) and NAUR-1 (0.76%). The varieties *viz*., Masuri and Gurjari were also less effective amongst above other varieties and were at par with each other with 1.26, and 1.37 percent leaf damage, respectively. The paddy varieties Jaya (1.45%) and GR-11 (2.33%) registered highest infestation due to blue beetle.

iii. Pooled:

The pooled data [Table-2] and [Fig-1] on percent leaf damage due to blue beetle recorded significant results and revealed that the infestation of the pest in different varieties was varied from 0.12 to 2.34%. From the 18 varieties screened, significantly lowest infestation was registered in variety GAR-1 (0.12%) and was showed at par results with GR-102 (0.13%), IR-22 (0.14%) and GAR-2 (0.14%). Similarly, GR-103 and GNR-2 were registered 0.16 percent leaf damage and found less susceptible to blue beetle, followed by GR-104 (0.19%). The varieties GNR-3 and GR-7 also registered significantly lower infestation of 0.31 and 0.33% than susceptible check GR-11 and also found at par with each other. These were followed by GR-12, IR-22, GR-101, Narmada and NAUR-1 exhibited 0.41, 0.42, 0.68, 0.69 and 0.73 per leaf damage, respectively and were less effective varieties, where former two and later three were at par with each other. Masuri (0.125%) was less effective amongst above other varieties, followed by Gurjari and Jaya with 1.34 and 1.38 percent leaf damage, respectively. The paddy variety GR-11 registered highest (2.34%) infestation due to blue beetle. 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 percent leaf damage and scale [Table-2], the seven varieties having scale 1 are GAR-1, GR-102, IR-22, GAR-2, GR-103, GNR-2 and GR-104 considered as resistant with 1 to 10% leaf damage, while four varieties grouped under scale 3 *viz*., GNR-3, GR-7, IR-12 and IR-28 showed leaf infestation ranged between 11 to 25% considered as moderately resistant. The varieties recorded leaf damage between 26 to 50% having scale 5 are GR-101, Narmada and NAUR-1 considered as moderately susceptible. However, varieties having scale 7 *viz*., Masuri, Gurjari and Jaya considered as susceptible with leaf damage between 51 to 75%, while the variety having scale 9 is Jaya considered as highly susceptible with 100% leaf damage. The present experimental results are matching with the findings of Patel (2008) [6]. who showed that the varieties having scale 1 were IR-22, GR-102, GR-103 and GR- 104 considered as resistant, varieties having scale 3 are IR-28, GR-6, GR-7, Ratna and GR-12 considered as moderately resistant, varieties having scale 5 *viz*., GR-10, Narmada and GR-101 as moderately susceptible, varieties having scale 7 *viz*., Gurjari, Jaya and Masuri considered as susceptible and varieties having scale 9 *viz*., GR-3, GR-11 and GR-66 considered as highly susceptible.

Summary and Conclusion

The results on percent leaf damage due to blue beetle recorded significant results and revealed that 7 varieties *viz*., GAR-1, GR-102, IR-22, GAR-2, GR-103, GNR-2 and GR-104 are considered as resistant with 1 to 10% leaf damage, while 4 varieties *viz*., GNR-3, GR-7, IR-12 and IR-28 showed leaf infestation ranged between 11 to 25% considered as moderately resistant.

Application of research: The varieties recorded leaf damage between 26 to 50% are GR-101, Narmada and NAUR-1 considered as moderately susceptible. However, varieties *viz*., Masuri, Gurjari and Jaya considered as susceptible with leaf damage between 51 to 75%, while the variety Jaya is considered as highly susceptible with 100% leaf damage.

Research Category: Agriculture Entomology

Abbreviations:

N. M.= Navinchandra Mafatlal
N.A.U.= Navsari Agricultural University
Fig.= Figure
CD= Critical Difference
C.V.= Co-efficient of variance
et al.,= et allii ; and co-workers
etc.= Etcetera; and rest, so on
S. E. m + = Standard Error of mean
i.e. = That is

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