International Journal of Plant Protection | **Volume 5 | Issue 1 | April, 2012 | 163-166**

IJPP

Research Article

Screening of traditional rice cultivars against brown plant hopper *Nilaparvata lugens* Stal. in Malnad tracts of Karnataka

■ SANGAMESHA HAKKALAPPANAVAR[1]*, S.K. VINOD[2], SHILPA B. BIRADAR[3], MANJUNATH TATTIMANI[4] AND C. S. DANARADDI[5]

[1]Department of Agricultural Entomology, College of Agriculture, Navile, SHIMOGA (KARNATAKA) INDIA
[2]Department of Agricultural Engomology, University of Agricultural Sciences, RAICHUR (KARNATAKA) INDIA
[3]Department of English, Kuvempu University, SHIMOGA (KARNATAKA) INDIA
[4]Department of Agronomy, C.C.S. Haryana Agricultural University, HISAR (HARYANA) INDIA
[5]Department of Agricultural Entomology, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

ARITCLE INFO

Article Chronicle :
Received : *10.10.2011*
Revised : *20.11.2011*
Accepted : *25.03.2012*

Key words :
Traditional cultivars, *Nilaparvata lugens*, Resistance, Rice

*Corresponding author:

ABSTRACT

Twenty two traditional rice cultivars and five recommended varieties were tested against the brown plant hopper, under field condition at Agricultural Research Station, Honnavile, Shimoga during *Kharif*, 2009. Resistance was assessed based on the 0-9 damage score as per the SES. Six cultivars were found to be resistant and recorded a damage score of '1'. Seven cultivars were found to be moderately resistant by recording a damage score of '3'. Four cultivars were found to be moderately susceptible with a damage score of '5'. Eight cultivars were susceptible to brom plant hopper with damage score of '7' and the remaining two cultivars were highly susceptible and recorded a damage score of '9'.

How to view point the article **:** Hakkalappanavar, Sangamesha, Vinod, S.K., Biradar, Shilpa B., Tattimani, Manjunath and danaraddi, C.S. (2012). Screening of traditional rice cultivars against brown plant hopper *Nilaparvata lugens* Stal. in Malnad tracts of Karnataka. *Internat. J. Plant Protec.*, **5**(1) : 163-166.

INTRODUCTION

Rice (*Oryza sativa* L.) is one of the important cereal crops of the world and forms the staple food for more than 65 per cent of the world population and known as king of cereals. Nearly 90 per cent of the area, production and consumption of rice are confined to South East Asian countries (Mathur *et al.,* 1999). It is essentially a crop of warm humid environment and grown mainly under assured rainfall or irrigation. Since mid sixties despite the cultivation of high yielding varieties, the rice production and productivity had not made an impact due to the unholy triple alliance of insects, diseases and weeds. Therefore, the traditional rice cultivars are highly adapted to the regions and also have special uses and varying levels of resistance to biotic and abiotic stresses. However, traditional rice cultivars are important reservoirs of valuable traits and need special attention for future conservation. It possesses valuable traits *viz.*, medicinal properties, nutrition, taste, aroma, tolerance to drought, submergence and other special uses. More than 50 per cent of rainfed rice in Karnataka is under traditional rice, thus sheltering a potential genetic diversity (Hanamaratti *et al*., 2008).

Insect pests constitute the major yield limiting biotic stresses throughout the rice growing countries. About 300 species of insects have been reported to attack rice crop in India, out of which 20 have been found to be the major pests (Arora and Dhaliwal, 1996). Among the insect pests, brown plant hopper (*Nilaparvata lugens* Stal.) is predominant in Malnad tracts of Karnataka. It caused direct damage by feeding on the stem which removes excessive amount of phloem sap, resulting hopper burn which is probably caused by disruption of photosynthetic flow to the root system causing leaf senescence (Anonymous, 1983). In the present study attempts have been made to assess the incidence of brown plant hopper on 22 traditional rice cultivars and evaluate them for resistance against brown plant hopper.

MATERIALS AND METHODS

The field experiment was conducted at Agricultural

Research Station, Honnavile, Shimoga during *Kharif*, 2009. The experiment consisted of 22 traditional rice cultivars and five recommended varieties. These traditional cultivars are infrequently grown in Malnad regions and were collected from Organic Farming Research Centre, Navile, Shimoga. The experiment was laid out in RCBD design totaling 27 treatments. The plot size was 2.4 m x 1.8 m. The seeds of different traditional and recommended cultivars of rice are sown in nursery. Twenty five day old seedlings were transplanted to main field during second week of August, 2009 at 20 cm x 10 cm spacing and all the agronomic practices were followed as per the recommended package of practices, except plant protection measures (Anonymous, 2006a).

The extent of damage was assessed visually from ten randomly selected hills in each treatment at fortnightly interval as per the 'Standard Evaluation System for Rice' (Anonymous, 1988) and the data were subjected to statistical analysis (DMRT). Varieties were also scored against the 0-9 damage score and were classified for varietal reaction as follows:

Damage score	Scale (symptoms)	Varietal reaction
0	No damage	Highly resistant
1	Slight yellowing of a few plants	Resistant
3	Leaves partially yellow but with no hopperburn	Moderately resistant
5	Leaves with pronounced yellowing and some stunting or wilting and 10-25% of plants with hopper burn, remaining plants severely stunted	Moderately susceptible
7	More than half the plants wilting or with hopperburn, remaining plants severely stunted	Susceptible
9	All plants dead	Highly susceptible

RESULTS AND DISCUSSION

The data presented in the Table 1 and Fig. 1 reveal that brown plant (BPH) damage was first noticed in different traditional and recommended rice cultivars during the second week of September, due to cloudy weather (32.33°C), heavy rain (11.20 mm) and high relative humidity (78%) which was congenial for build-up of the pest population. Selum sanna recorded significantly lower damage score of 0.73, which was on par with Andhra basumati (1.00), Navalisale (1.03), Mysore mallige (1.07) and MTU-1001 (1.10), whereas significantly higher damage score (8.83) was noticed in Gandhasale and Navara, which were at par with each other. The BPH damage gradually increased during first week October, Selum sanna (1.03), MTU-1001 (1.03) and MTU-1010 (1.07) recorded significantly lower damage compared to Gandhasale (9.00) and Navara (9.00).

During October second and November first week MTU-1001 noticed significantly lower damage (1.13 and 1.27 score) followed by MTU-1010 (1.23 and 1.37) and Andhra basumati (1.27 and 1.37) which were at par with each other. Whereas Navara (9.13 and 9.17) recorded significantly higher damage followed by Gandhasale (9.07 and 9.17). Later during second week of November, incidence declined this might be due to the loss of succulency in the plant. Lowest damage of 1.07 was recorded in MTU-1001 followed by MTU-1010 (1.30) and it was on par with Andhra basumati (1.30), Mysore mallige (1.50) and Selum sanna (1.60).

However, overall seasonal mean damage (Table 1) revealed that MTU-1001 (1.12) recorded significantly lower damage throughout the season and it was on par with Andhra basumati (1.21), Selum sanna (1.25), MTU-1010 (1.27), Navalisale (1.28) and Mysore mallige (1.39). They possessed antixenosis or genetic mechanisms of resistance to BPH and this can be effectively utilized in resistant breeding programme (Omoloye *et al*., 1999). Whereas Navara (9.03) registered significantly higher seasonal mean damage score followed by Gandhasale (9.02).

Grain yield indicated that, recommended variety, MTU-1001 recorded comparatively higher yield (48.40 q/ha) than rest of the cultivars and it was on par with Jaya (46.23 q/ha). This was followed by JGL-1798 (45.27 q/ha), Selum sanna (45.10 q/ha), MTU-1010 (42.47 q/ha) and this was mainly because of these cultivars showing resistance and moderately resistance to brown plant hopper damage. Whereas Gandhasale recorded significantly lower yield (21.00 q/ha) followed by Navara (22.87 q/ha), which was mainly because of these cultivars showing highly susceptible to brown plant hopper damage.

In general the results revealed that among the different cultivars, recommended varieties recorded significantly higher yield compared to traditional cultivars except Selum sanna (45.10 q/ha), Andhra basumati (43.97 q/ha), Jeerige sanna (39.67 q/ha) and Mukkannu sanna (37.67 q/ha) and were comparable to recommended varieties.

The result of the experiment indicated (Table 2) that six cultivars *viz.,* Selum sanna, Mysore mallige, Navalisale, Andhra basumati, MTU-1001 and MTU-1010 were resistant and recorded damage score of '1'. The seven cultivars *viz.,* Karimundaga, Ratnachudi, Anandi, Jeerige sanna, Mukkannu sanna, JGL-1798 and Jaya were found to be moderately resistant recording damage score of '3'. Four cultivars *viz.,* Pusa sugandhi, Gouri sanna, Malgudi sanna and Jyothi were found moderately susceptible with damage score of '5'. Eight cultivars *viz.,* Chinniponni, Dehali basumati, Kanadatumba, Sugandhi, Gangadale, N.M.S-2, HMT and Bangaru sanna were susceptible to the BPH with damage score of '7' and the

Table 1 : Incidence of brown plant hopper (*Nilaparvata lugens* Stal.) in traditional and recommended rice varieties

Traditional variety	Plant damage score [a]/10 hills**					Seasonal mean	VR	Yield (q/ha)
	Sep. II	Oct. I	Oct. II	Nov. I	Nov. II			
Selum sanna	0.73 [f]	1.03 [e]	1.40 [e]	1.47 [e]	1.60 [f]	1.25 [e]	R	45.10 [bc]
Mysore mallige	1.07 [ef]	1.30 [e]	1.53 [e]	1.57 [e]	1.50 [f]	1.39 [e]	R	28.03 [mn]
Kari mundaga	2.87 [d]	2.97 [d]	3.33 [d]	3.47 [d]	3.67 [d]	3.26 [d]	MR	25.63 [nop]
Chinniponni	6.83 [b]	7.00 [b]	7.20 [b]	7.30 [b]	7.77 [a]	7.22 [b]	S	32.73 [ijk]
Pusa sugandhi	4.77 [c]	5.17 [c]	5.37 [c]	5.47 [c]	5.20 [c]	5.19 [c]	MS	33.67 [hij]
Dehali basumati	6.77 [b]	6.97 [b]	7.23 [b]	7.40 [b]	7.13 [b]	7.10 [b]	S	27.83 [mno]
Gandhasale	8.83 [a]	9.00 [a]	9.07 [a]	9.17 [a]	-	9.02 [a]	HS	21.00 [q]
Ratnachudi	2.83 [d]	3.10 [d]	3.17 [d]	3.27 [d]	3.13 [e]	3.10 [d]	MR	28.90 [lm]
Navalisale	1.03 [ef]	1.27 [e]	1.33 [e]	1.47 [e]	-	1.28 [e]	R	36.60 [fgh]
Gouri sanna	4.77 [c]	5.17 [c]	5.33 [c]	5.47 [c]	5.20 [c]	5.19 [c]	MS	30.17 [klm]
Anandi	2.77 [d]	3.07 [d]	3.20 [d]	3.30 [d]	3.17 [de]	3.10 [d]	MR	36.80 [fgh]
Andhra basumati	1.00 [ef]	1.10 [e]	1.27 [e]	1.37 [e]	1.30 [f]	1.21 [e]	R	43.97 [bcd]
Kanadatumba	7.00 [b]	7.13 [b]	7.17 [b]	7.27 [b]	-	7.14 [b]	S	34.67 [ghij]
Malgudi sanna	5.00 [c]	5.20 [c]	5.10 [c]	5.20 [c]	-	5.13 [c]	MS	36.67 [fgh]
Jeerige sanna	2.83 [d]	3.13 [d]	3.37 [d]	3.17 [d]	3.07 [e]	3.11 [d]	MR	39.67 [ef]
Sugandhi	6.97 [b]	7.03 [b]	7.17 [b]	7.30 [b]	-	7.12 [b]	S	24.67 [op]
Gangadale	7.00 [b]	7.27 [b]	7.27 [b]	7.33 [b]	-	7.22 [b]	S	32.00 [jkl]
N.M.S - 2	7.00 [b]	7.13 [b]	7.17 [b]	7.23 [b]	7.20 [b]	7.15 [b]	S	24.80 [op]
Mukkannu sanna	3.10 [d]	3.33 [d]	3.40 [d]	3.00 [d]	3.17 [de]	3.20 [d]	MR	37.67 [fg]
Navara	8.83 [a]	9.00 [a]	9.13 [a]	9.17 [a]	-	9.03 [a]	HS	22.87 [pq]
HMT	6.77 [b]	7.13 [b]	7.13 [b]	7.13 [b]	7.27 [b]	7.09 [b]	S	33.70 [hij]
Bangaru sanna	6.97 [b]	7.10 [b]	7.20 [b]	7.23 [b]	-	7.13 [b]	S	35.33 [ghi]
JGL- 1798*	2.87 [d]	3.13 [d]	3.30 [d]	2.93 [d]	3.27 [de]	3.10 [d]	MR	45.27 [bc]
Jaya*	2.90 [d]	3.17 [d]	2.97 [d]	3.33 [d]	3.30 [de]	3.13 [d]	MR	46.23 [ab]
Jyothi*	4.97 [c]	5.03 [c]	5.00 [c]	5.10 [c]	5.27 [c]	5.07 [c]	MS	41.60 [de]
MTU-1001*	1.10 [ef]	1.03 [e]	1.13 [e]	1.27 [e]	1.07 [f]	1.12 [e]	R	48.40 [a]
MTU-1010*	1.37 [e]	1.07 [e]	1.23 [e]	1.37 [e]	1.30 [f]	1.27 [e]	R	42.47 [cde]
S.E.±	0.19	0.16	0.19	0.20	0.18	0.18	-	1.06
C.D. (P=0.05)	0.55	0.46	0.54	0.56	0.53	0.52	-	3.18

* Recommended varieties, ** Mean of 3 replication, [a] Scored using 0-9 scale in SES
VR- Varietal reaction
Figures in the same column with similar alphabets are at par

Table 2 : Reaction of brown plant hopper on rice cultivars

Damage score	No. of cultivars	Varietal reaction	Cultivars with damage score [a]
0	0	HR	Nil
1	6	R	MTU-1001* (1.12), Andhra basumati (1.21), Selum sanna (1.25), MTU-1010* (1.27), Navalisale (1.28) and Mysore mallige (1.39)
3	7	MR	Anandi (3.10), JGL- 1798* (3.10), Ratnachudi (3.10), Jeerige sanna (3.11), Jaya* (3.13), Mukkannu sanna (3.20) and Kari mundaga (3.26)
5	4	MS	Jyothi* (5.07), Malgudi sanna (5.13), Pusa sugandhi (5.19) and Gouri sanna (5.19)
7	8	S	HMT (7.09), Dehali basumati (7.10), Sugandhi (7.12), Bangaru sanna (7.13), Kanadatumba (7.14), N.M.S – 2 (7.15), Gangadale (7.22) and Chinniponni (7.22)
9	2	HS	Gandhasale (9.02) and Navara (9.03)

*Recommended rice varieties
[a] Scored using 0-9 scale in SES

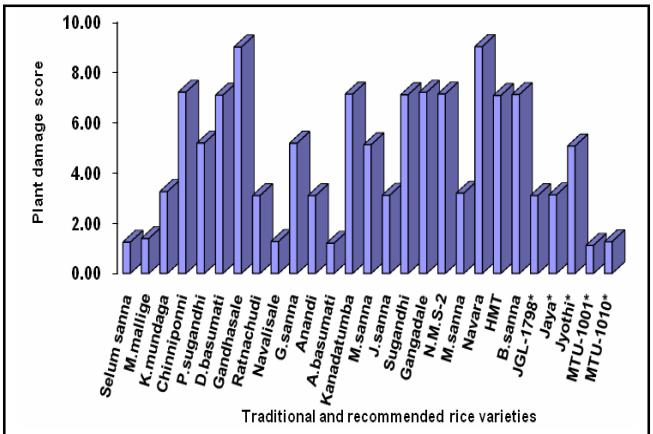
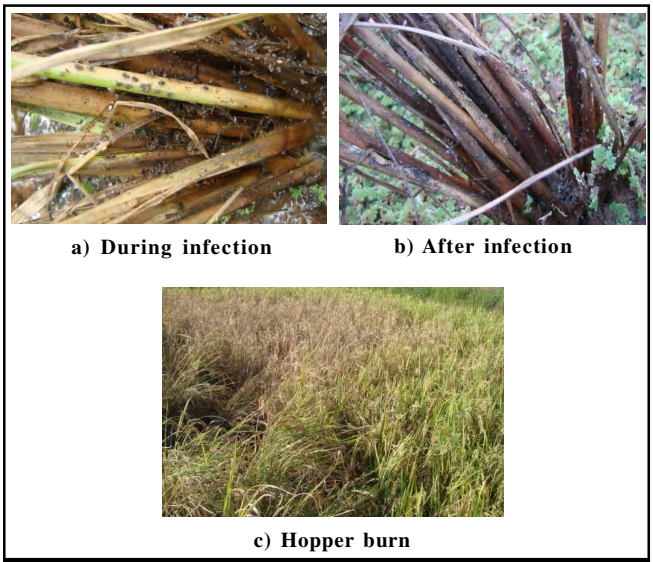


Fig. 1 : Mean incidence of brown plant hopper on different traditional and recommended rice varieties



a) During infection **b) After infection**

c) Hopper burn

Plate 1 : Brown plant hopper damage (Chinniponni)

remaining two cultivars (Gandhasale and Navara) were highly susceptible and recorded damage score of '9'.

The present findings are in close agreement with the report of Misra and Israel (1970) who reported that brown plant hopper is seen during August – September and reaches its peak during October - November and then declines. Naganagoud *et al*. (1999) reported the pest occurs after 60 days of transplanting. Anonymous (2006b) reported that Jyothi shows moderately susceptible against brown plant hopper.

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