

Research Article

## Screening of traditional rice cultivars against yellow stem borer, *Scirpophaga incertulas* Walker in Malnad tracts of Karnataka

■ SANGAMESHA HAKKALAPPAVAR<sup>1\*</sup>, MANJUNATH TATTIMANI<sup>2</sup>, C. S. DANARADDI<sup>3</sup>, SHILPA B. BIRADAR<sup>4</sup> AND MOHAN R. DANDAGI<sup>5</sup>

<sup>1</sup>Department of Agricultural Entomology, College of Agriculture, Naviley, SHIMOGA (KARNATAKA) INDIA

<sup>2</sup>Department of Agronomy, C.C.S. Haryana Agricultural University, HISAR (HARYANA)

<sup>3</sup>Department of Agricultural Entomology, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

<sup>4</sup>Department of English (Optional), Kuvempu University, SHIMOGA (KARNATAKA) INDIA

<sup>5</sup>Department of Seed Science and Technology, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

### ARTICLE INFO

#### Article Chronicle :

Received : 24.09.2011

Revised : 02.11.2012

Accepted : 24.01.2012

#### Key words :

Traditional cultivars,  
*Scirpophaga incertulas*,  
Resistance,  
Rice

### ABSTRACT

Twenty two traditional rice and five recommended cultivars were tested against the stem borer during tillering (dead heart) and flowering (white ear head) stage, under field condition at Agricultural Research Station, Honnavile, Shimoga during *Kharif* 2009. Resistance was assessed based on the percentage of dead hearts and white ears by following 0-9 scale as per the SES. None of the cultivar showed high level of resistance to dead heart. However, five cultivars had a damage score of '1', indicating a resistance to dead heart, while 16 cultivars were moderately resistance (score 3) and the rest six cultivars were moderately susceptible to dead heart and recorded damage score of '5'. Whereas, only one cultivar MTU-1001 was resistant to white ear head damage and recorded damage score of '1'. Seven cultivars were found to be moderately resistant recording damage score of '3'. Five cultivars were found to be moderately susceptible with damage score of '5', while 13 cultivars were susceptible to WEH with damage score of '7' and the cultivar Navalisale was highly susceptible to WEH and recorded damage score of '9'. Cultivars were more susceptible to white ear head than to dead hearts.

**How to view point the article :** Hakkalappanvar, Sangamesha, Tattimani, Manjunath, Danaraddi, C.S., Biradar, Shilpa B. and Dandagi, Mohan R. (2012). Screening of traditional rice cultivars against yellow stem borer, *Scirpophaga incertulas* Walker in Malnad tracts of Karnataka. *Internat. J. Plant Protec.*, 5(1) : 32-35.

\*Corresponding author:

## 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 has 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, stem borer (*Scirpophaga incertulas* Walker) is predominant in Malnad tracts of Karnataka. It attacks the rice plants from

seedling to maturity in almost all ecosystems (Misra *et al.*, 2005). The early infestation causes dead hearts, while later infestation causes white ears. Further, damage may lead to lodging and yield loss due to few panicles and more unfilled grains (Ghose *et al.*, 1960). Catling *et al.* (1982) reported that stem borer is the dominant pest in deepwater as well as shallow deepwater areas causing 26.3 per cent damage. In India, it is a major pest prevalent in lowland tracts, which caused 1-9 per cent yield loss in early planted rice and 38-80 per cent in late planted rice (Catindig and Heong, 2003). Use of resistant or tolerant varieties is one of the important components for its management. In the present study, attempts have been made to assess the incidence of stem borer on 22 traditional rice cultivars and evaluate them for resistance against stem borer.

**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 cultivars. These traditional cultivars infrequently grown in Malnad regions were collected from Organic Farming Research Centre, Navile, Shimoga. The experiment was laid out in RCBD design totalling 27 treatments. The plot size was 2.4 x 1.8 m. The seeds of different traditional and recommended cultivars of rice were sown in nursery. Twenty five day old seedlings were transplanted to main field during the 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, 2006).

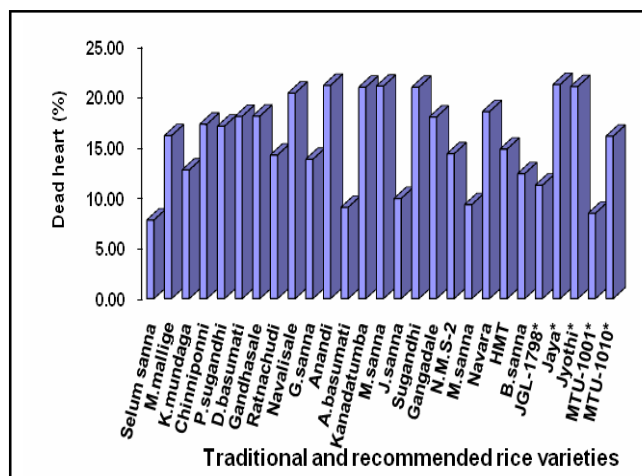
The observation on incidence of stem borer was recorded at 10 randomly selected hills in each treatment at fortnightly interval and per cent dead hearts and white ears was calculated by counting the total number of dead hearts and white ears and total number of potential panicle bearing tillers in each treatment. Based on these, percentage of damage was calculated and scored as per the ‘Standard Evaluation System for Rice’ (Anonymous, 1988) and the data were subjected to statistical analysis (DMRT). Varieties were also scored against 0-9 damage score and were classified for varietal reaction as follows:

Damage score	Scale (Dead hearts)	Scale (White ears)	Varietal reaction
0	No damage	No damage	Highly resistant
1	1-10%	1-5%	Resistant
3	11-20%	6-10%	Moderately resistant
5	21-30%	11-15%	Moderately susceptible
7	31-60%	16-25%	Susceptible
9	61% and above	26% and above	Highly susceptible

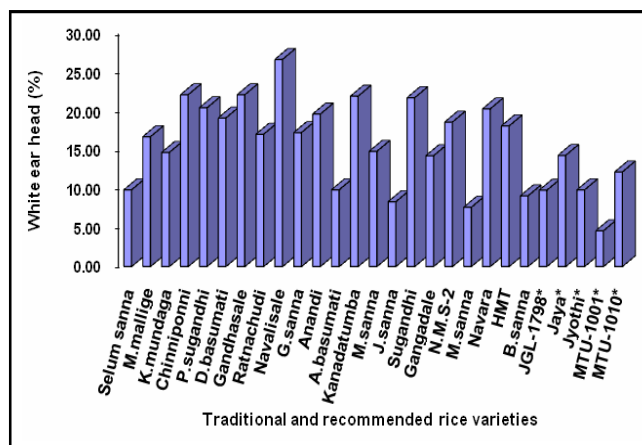
**RESULTS AND DISCUSSION**

The peak activity of dead heart was noticed during the second week of September. The peak damage in the month of September might be due to presence of taller and denser canopies as more preferred for egg deposition. The overall seasonal mean damage (Table 1) revealed that Selum sanna (7.82%) recorded significantly lower damage throughout the season and it was on par with MTU-1001 (8.50), Andhra basumati (9.09), Mukkannu sanna (9.36) and Jeerige sanna (9.96). Whereas Jaya (21.30%) registered significantly higher seasonal mean damage score followed by Anandi (21.22) and it was on par with Malgudi sanna (21.14), Jyothi (21.10), Sugandhi (21.03), Kanadatumba (21.03), Navalisale (20.45), Navara (18.60), Dehali basumati (18.14) and Gangadale (18.07).

Upon classification of cultivars (Table 2) five cultivars *viz.*, Selum sanna, Andhra basumati, Jeerige sanna, Mukkannu



**Fig. 1 :** Mean incidence of dead heart on different traditional and recommended rice varieties



**Fig. 2 :** Mean incidence of white ear head on different traditional and recommended rice varieties

**Table 1 : Incidence of stem borer (*Scirpophaga incertulas* Walker) during tillering and flowering stage in traditional and recommended rice varieties**

Traditional cultivars	Dead heart (%) **	Damage score	Varietal reaction	White ear head (%)**	Damage score	Varietal reaction
Selum sanna	7.82 (15.62) <sup>k</sup>	1	R	9.91 (18.19) <sup>gh</sup>	3	MR
Mysore mallige	16.22 (23.51) <sup>cdef</sup>	3	MR	16.77 (24.10) <sup>cde</sup>	7	S
Kari mundaga	12.80 (20.69) <sup>gh</sup>	3	MR	14.73 (22.53) <sup>def</sup>	5	MS
Chinniponni	17.35 (24.34) <sup>bcd</sup>	3	MR	22.20 (28.09) <sup>b</sup>	7	S
Pusa sugandhi	17.16 (24.28) <sup>bcd</sup>	3	MR	20.51 (26.89) <sup>bc</sup>	7	S
Dehali basumati	18.14 (25.02) <sup>abcd</sup>	3	MR	19.20 (25.91) <sup>bc</sup>	7	S
Gandhasale	18.15 (25.04) <sup>abcd</sup>	3	MR	22.19 (28.09) <sup>b</sup>	7	S
Ratnachudi	14.29 (21.94) <sup>efgh</sup>	3	MR	17.10 (24.37) <sup>cde</sup>	7	S
Navalisale	20.45 (26.73) <sup>ab</sup>	3	MR	26.76 (31.11) <sup>a</sup>	9	HS
Gouri sanna	13.86 (21.57) <sup>fgh</sup>	3	MR	17.31 (24.56) <sup>cde</sup>	7	S
Anandi	21.22 (27.28) <sup>a</sup>	5	MS	19.69 (26.22) <sup>bc</sup>	7	S
Andhra basumati	9.09 (16.89) <sup>k</sup>	1	R	9.92 (17.95) <sup>gh</sup>	3	MR
Kanadatumba	21.03 (27.23) <sup>a</sup>	5	MS	22.00 (27.96) <sup>b</sup>	7	S
Malgudi sanna	21.14 (27.28) <sup>a</sup>	5	MS	14.89 (22.29) <sup>ef</sup>	5	MS
Jeerige sanna	9.96 (18.01) <sup>ijk</sup>	1	R	8.37 (16.76) <sup>h</sup>	3	MR
Sugandhi	21.03 (27.25) <sup>a</sup>	5	MS	21.81 (27.82) <sup>b</sup>	7	S
Gangadale	18.07 (24.89) <sup>abcd</sup>	3	MR	14.32 (22.22) <sup>ef</sup>	5	MS
N.M.S - 2	14.41 (22.02) <sup>efgh</sup>	3	MR	18.67 (25.57) <sup>bc</sup>	7	S
Mukkannu sanna	9.36 (17.62) <sup>jk</sup>	1	R	7.66 (16.05) <sup>h</sup>	3	MR
Navara	18.60 (25.31) <sup>abc</sup>	3	MR	20.37 (26.78) <sup>bc</sup>	7	S
HMT	14.88 (22.45) <sup>defg</sup>	3	MR	18.16 (25.20) <sup>bcd</sup>	7	S
Bangaru sanna	12.44 (20.31) <sup>ghi</sup>	3	MR	9.13 (17.50) <sup>gh</sup>	3	MR
JGL- 1798*	11.28 (19.54) <sup>hij</sup>	3	MR	9.86 (18.21) <sup>gh</sup>	3	MR
Jaya*	21.30 (27.34) <sup>a</sup>	5	MS	14.37 (22.26) <sup>ef</sup>	5	MS
Jyothi*	21.10 (27.15) <sup>a</sup>	5	MS	9.91 (13.16) <sup>i</sup>	3	MR
MTU-1001*	8.50 (16.40) <sup>k</sup>	1	R	4.62 (12.03) <sup>i</sup>	1	R
MTU-1010*	16.15 (23.66) <sup>cdef</sup>	3	MR	12.22 (20.14) <sup>fge</sup>	5	MS
S.E.±	0.87	-	-	0.97	-	-
C.D (P=0.05)	2.60	-	-	2.90	-	-

\* Recommended varieties, \*\* Mean of 10 hills,

Figures in the parenthesis are arcsine transformed values

Figures in the same column with similar alphabets are at par

**Table 2 : Incidence of dead heart on rice cultivars**

Damage score	Dead heart (%)	No. of cultivars	Varietal reaction	Cultivars with dead heart (%)
0	No damage	0	HR	Nil
1	1-10%	5	R	Selum sanna (7.82), MTU-1001* (8.50), Andhra basumati (9.09), Mukkannu sanna (9.36) and Jeerige sanna (9.96)
3	11-20%	16	MR	JGL- 1798* (11.28), Bangaru sanna (12.44), Kari mundaga (12.80), Gouri sanna (13.86), Ratnachudi (14.29), N.M.S – 2 (14.41), HMT (14.88), MTU-1010* (16.15), Mysore mallige (16.22), Pusa sugandhi (17.16), Chinniponni (17.35), Gangadale (18.07), Dehali basumati (18.14), Gandhasale (18.15), Navara (18.60) and Navalisale (20.45)
5	21-30%	6	MS	Kanadatumba (21.03), Sugandhi (21.03), Jyothi* (21.10), Malgudi sanna (21.14) Anandi (21.22) and Jaya* (21.30)
7	31-60%	0	S	Nil
9	> 61%	0	HS	Nil

\*Recommended rice varieties

**Table 3 : Incidence of white ear heads on rice cultivars**

Damage score	White ear head (%)	No. of cultivars	Varietal reaction	Cultivars with white ear head (%)
0	No damage	0	HR	Nil
1	1-5%	1	R	MTU-1001* (4.62),
3	6-10%	7	MR	Mukkannu sanna (7.66), Jeerige sanna (8.37), Bangaru sanna (9.13), JGL- 1798* (9.86), Jyothi* (9.91), Selum sanna (9.91) and Andhra basumati (9.92)
5	11-15%	5	MS	MTU-1010* (12.22), Gangadale (14.32), Jaya* (14.37), Kari mundaga (14.73), and Malgudi sanna (14.89)
7	16-25%	13	S	Mysore mallige (16.77), Ratnachudi (17.10), Gouri sanna (17.31), HMT (18.16), N.M.S- 2 (18.67), Dehali basumati (19.20), Anandi (19.69), Navara (20.37), Pusa sugandhi (20.51), Sugandhi (21.81), Kanadatumba (22.00), Gandhasale (22.19) and Chinniponni (22.20)
9	> 26%	1	HS	Navalisale (26.76)

\*Recommended rice varieties

sanna and MTU-1001 had damage score of '1' indicating resistance to the dead hearts. While 16 cultivars viz., Mysore mallige, Kari mundaga, Chinniponni, Pusa sugandhi, Dehali basumati, Gandhasale, Ratnachudi, Navalisale, Gouri sanna, Gangadale, N.M.S-2, Navara, HMT, Bangaru sanna, JGL-1798 and MTU-1010 were moderately resistant (score-3) and rest of the six cultivars viz., Anandi, Kanadatumba, Malgudi sanna, Sugandhi, Jaya and Jyothi were moderately susceptible and recorded damage score of '5'.

The data revealed (Table 1) that MTU-1001 encountered minimum per cent white ear head (4.62) and it was superior over all the varieties. Whereas Navalisale recorded significantly highest average of 26.76 per cent white ear head. Upon classification of cultivars (Table 3) only MTU-1001 was resistance to WEH and recorded damage score of '1'. The seven cultivars viz., Selum sanna, Andhra basumathi, Jeerige sanna, Mukkannu sanna, Bangaru sanna, JGL-1798 and Jyothi were found to be moderately resistant with damage score of '3'. Five cultivars viz., Kari mundaga, Malgudi sanna, Gangadale, Jaya and MTU-1010 were found moderately susceptible with damage score of '5'. The 13 cultivars viz., Mysore mallige, Chinniponni, Pusa sugandhi, Dehali basumathi, Gandhasale, Ratnachudi, Gouri sanna, Anandi, Kanadatumba, Sugandhi, N.M.S-2, Navara and HMT were found susceptible to WEH recording damage score of '7' and the rest Navalisale was highly susceptible and recorded damage score of '9'.

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