

## Evaluation of selected lowland and medium land rice cultivars against *Scirpophaga incertulas* (Wlk.)

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### ABSTRACT

One hundred lowland rice cultivars from north and north eastern states of India and one hundred eighty medium land cultivars collected from different parts of Orissa were evaluated for resistance against *Scirpophaga incertulas* (Wlk.), the yellow stem borer (YSB) under field condition by egg mass implantation method during wet seasons of 2005-2008. The promising entries were further tested in the laboratory by cut stem bioassay. Lowland entries like Nalihazara, OR1898-2, CR580-5, RAU 500-86-4, Kariawa-4, LPR-14, Bazail-65, TCA-282, CR 383-10, NDR-402, TCA-12, Katakipatali, OR1358-RGA-4, LPR-85, LPR-97, LPR56-49, LPR-96, LPR96-10 and Janaki had score-1, whereas among the medium land entries, Chadheinakhi, Daonara Dahijhil, Brahmanbhajni, Litipiti, Ptb-18, GEB-24, Mahalaxmi and CNM-31 had score 1.

**Key words:** *Scirpophaga incertulas*, resistance, lowland, medium land, rice cultivars

Rice stem borers are distributed in almost all the rice growing tracts of India and occur in all ecosystems and damage the rice crop from seedling to maturity. Mostly six species of rice stem borers occur in India (Rao and Rao, 1979) *Scirpophaga incertulas* (Wlk.), the yellow stem borer (YSB) is the dominant species among all, constituting more than 90% of stem borer population as observed from the stem dissection of the rice crop and stubbles (Senapati and Samalo, 1990; Padhi and Mishra, 1998). Yield loss due to this pest varies between 3-95% in India in different varieties grown under different situations. (Mathur 1983).

It is difficult to control this pest through insecticides and particularly in lowland condition during wet seasons, where it is a major pest. The best way to manage this pest is by using varietal resistance. This component is environmentally safe and economically viable. Differential reaction of rice varieties grown under identical condition reacting differently at a given level of borer population has been used to isolate relatively resistant germplasm. Keeping in view the above constraints and possibilities, rice varieties were screened to identify suitable donors.

One hundred lowland rice cultivars from north and north eastern states of India and one hundred eighty

medium land cultivars collected from different parts of Orissa were evaluated for resistance against YSB under field condition by egg mass implantation method (Pathak *et al* 1971) during wet seasons of 2005-2008. Entries which recorded low borer incidence in the above screening tests in field were subjected to larval infestation under controlled condition in the laboratory by cut stem method (Prakash Rao, 1983). The larval mortality was recorded on the fourth day after release.

In the first screening test, percentage white ear head (WEH) was taken into account, whereas in the second method, percent larval mortality was recorded. The data thus obtained were analysed statistically to assess the performance of the cultivars against YSB. A secondary selection of the varieties were made with seeds collected from un-infested plants of lowland entries. These cultivars were retested in the subsequent season and further selected on the basis of resistance for YSB.

The results (Table 1) indicated that the lowland entries like Nalihazara, OR1898-2, CR580-5, RAU 500-86-4, Kariawa-4, LPR-14, Bazail-65, TCA-282, CR 383-10, NDR-402, TCA-12, Katakipatali, OR1358-RGA-4, LPR-85, LPR-97, LPR56-49, LPR-96, LPR96-10 and Janaki had score-1 (below 5% WEH),

**Table 1. Reaction of rice cultivars to *Scirpophaga incertulas* (Wlk)**

Name of the varieties	% WEH	% larval mortality
Lowland		
Nalihazara (SS)	3.18 (9.98)	88.33 (70.26)
OR1898-2	4.93 (12.74)	77.95 (62.12)
CR 580-5 (SS)	4.98 (12.81)	69.88 (56.73)
RAU 500-86-4	3.65 (10.62)	78.78 (62.65)
Kariawa-4 (SS)	5.08 (12.95)	73.73 (59.19)
LPR-14 (SS)	3.63 (10.77)	69.80 (56.68)
Bazail-65(SS)	4.30 (11.86)	69.63 (56.58)
TCA282 (SS)	4.58 (12.23)	64.60 (53.75)
Pauli (SS)	5.50 (13.36)	69.15 (56.29)
CR 383-10 (SS)	5.0 (12.88)	65.98 (54.33)
NDR-402 (SS)	3.18 (9.98)	88.15 (70.07)
TCA-12 (SS)	5.38 (13.30)	68.45 (55.83)
Katakipatali (SS)	4.65 (12.30)	70.13 (56.89)
OR 1358-RGA-4	3.98 (11.48)	74.30 (59.65)
LPR-85 (SS)	4.50 (12.09)	70.63 (57.19)
LPR-256 (SS)	5.90 (13.89)	70.48 (57.14)
LPR-97 (SS)	4.23 (11.57)	71.25 (57.61)
Shankhuli (SS)	5.95 (14.10)	75.48 (60.39)
Hatidanta	6.30 (14.50)	69.55 (56.57)
Janaki (SS)	4.90 (12.65)	82.15 (65.09)
LPR-96 (SS)	4.98 (12.81)	65.88 (54.33)
LPR-96-10 (SS)	4.50 (12.09)	70.48 (57.14)
LPR-56-49 (SS)	5.1 (13.00)	65.98 (54.36)
TKM-6 ('R' check)	4.18 (11.70)	90.65 (72.59)
Chadheinakhi	3.60 (10.75)	83.28 (66.01)
Daonara	3.68 (10.82)	86.50 (68.83)
Dahijhil	3.50 (10.70)	85.48 (67.79)
Brahmanbhojni	3.88 (11.13)	78.85 (62.77)
Litipiti	3.93 (11.41)	78.15 (62.36)
PTB-18	3.75 (11.09)	89.63 (71.34)
GEB-24	5.62 (13.70)	77.55 (61.80)
CNM-31	5.43 (13.43)	72.13 (58.17)
Punshi	5.70 (13.75)	68.50 (55.85)
Mahalaxmi	4.92 (12.80)	65.95 (54.30)
Jaya ('S' check)	18.63 (25.56)	19.15 (25.92)
Savitri	24.30 (29.50)	16.83 (24.20)
CD (P=0.05)	2.82	4.02

The data presented is mean of four replications  
Values within parentheses are angular transformed values

whereas Pauli, Hatidanta, LPR-256 and Shankhuli were found moderately resistant with score-3 ( 6% WEH) in the SES scale (IRRI, 1996) as against the susceptible

check Savitri with score 7 (24.3 % WEH).

Among the medium land entries, Chadheinakhi, Daonara Dahijhil, Brahmanbhojni, Litipiti, Ptb-18, GEB-24, Mahalaxmi and CNM-31 exhibited resistant reaction along with TKM-6 with score-1 and Punshi with Score-3 as against susceptible check Jaya with score-7 (18.6% WEH).

It was observed that, the borer infestation with egg mass implantation technique reliably reflected the relative resistance of the test entries. In the present investigation no cultivar had nil infestation by YSB. Janaki, TCA-12 (Tiwari *et al.*, 1988) and NDR-402 (Gupta *et al.*, 1989) reported to be less susceptible to YSB was confirmed in the present study. Padhi (2002) also had reported that Janaki, NDR-402, Nalihazara, Shankhuli, LPR 56-49 and Kariawa-4 were less susceptible to YSB.

The most valuable phase of YSB in relation to host plant resistance is the failure of neonate larvae to establish itself inside rice stem. The larval mortality on cutstems indicated that, the highest larval mortality of 90.65% was observed in the resistant check TKM-6 followed by Ptb-18 (89.63%), Nalihazara (88.33%), NDR-402 (88.15%), whereas in Shankhuli, Chadheinakhi, Dahijhil and Daonara, larval mortality ranged between 82-86.5% and in all others the extent of larval mortality was 64 to 78.85% except in the susceptible checks Jaya with 19.15% and Savitri having 16.83%.

Thus in respect of larval mortality, distinct varietal differences were observed. Padhi (2007) reported that Brahmbhojni, Dahijhil, Daonara had high YSB larval mortality, which is confirmed again in the present study.

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