

## Field evaluation of rice cultivars against the yellow stem borer *Scirpophaga incertulas* (wlk.)

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### ABSTRACT

Field evaluation of 92 released rice varieties of different states of India for stem borer resistance was conducted at Central Rice Research Institute, Cuttack during 2003, 2004 and 2005 wet seasons. The varieties, viz., Tara, Punshi, Triveni, CSR-30, Saktiman, Kshira, Tripti, Seema, Mahalaxmi, Ambika, CSR-10, PR-115, Saket-4, VLD-221, Indira, Mandira and Mahamaya showed field reaction. (SES Score-1) over the seasons. The varieties viz. Purnendu, Gayatri and Ketekijoha showed high percentage of white ear head (WEH) damage (>30%). The resistance most popular varieties Lalat and Swarna were found to be highly susceptible.

**Key words:** Field evaluation, rice varieties, YSB

One of the major constraints of rice production in India is the occurrence of insect pests at various stages of crop growth. Among the rice pests, the yellow stem borer (YSB), *Scirpophaga incertulas* (Walker) is the most predominant in rice growing tracts of India, Bangladesh and South-East Asian countries causing serious damage (Islam, 1996). It attacks the rice plants from seedling to maturity almost in all ecosystems and in boro rice also (Misra *et al.*, 2005). Catling *et al.*, (1982) reported that YSB is the dominant pest in deepwater as well as shallow deepwater areas causing 26.3% damage. In India, it is a major pest prevalent in lowland tracts of Uttar Pradesh, Bihar and Orissa (Durbey *et al.* 1984, Senapati *et al.*, 1994), which caused 1-9% yield loss in early planted rice and 38-80% in late planted rice (Catindig and Heong, 2003). Use of resistant/tolerant varieties is one of the important component for its management. But most of the rice varieties are highly susceptible to stem borers. Prakash Rao and Padhi (1987) identified Triveni, Punshi, Sashyasri, Jogen, Sabita, W1253 and W1263 to be field resistant to YSB and Subudhi *et al.* (2007) identified Shravani, Rajeswari, Banja, Jajati, Mahalaxmi, Pratikhya, Mahanadi, Khira and Prachi having field resistance to YSB. Keeping these in view, ninety two released rice varieties of different states of India were screened under field conditions for three consecutive years at the Central Rice Research Institute, Cuttack to find out YSB resistant varieties which can be used

as donors for varietal development programme.

### MATERIALS AND METHODS

Ninety two released rice varieties of different states were screened during 2003, 2004 and 2005 wet seasons in the farm of Central Rice Research Institute, Cuttack, Orissa to evaluate their performance against the stem borer infestation TN-1 was transplanted as susceptible check. With the decline of rainfall usually a rapid build up of YSB moth population is observed during October –November (Prakash Rao and Padhi 1988). Therefore, thirty days old seedlings were transplanted with three replication in RBD design during August in order to synchronize the borer incidence period to the pre flowering stage of the plant. The plot size for each variety was 15 sq mt. with spacing of 15x 20cm. Recommended agronomic practices were followed to raise a good crop. The occurrence of white ear head (WEH) was observed after 50% flowering stage and were recorded in 10% randomly selected hills for each variety. Based on these, percentage of damage was calculated and scored following IRRISSES (Anonymous, 1996). Damage percentage in all the three seasons were pooled together to identify the resistant varieties over the seasons.

### RESULTS AND DISCUSSIONS

It was revealed from the three years data (Table 1)

**Table 1. Percentage of yellow stem borer damage (WEH) and SES Score of rice varieties over seasons**

Variety	Ecosystem	State	Kh03	Kh04	Kh05	Pool	Score	SESScore
			Damage (%)WEH	Damage (%)WEH	Damage (%)WEH	damage (%)WEH		
ADT 39	I	Tamilnadu	3.7	13.9	8.1	8.56	MR	3
ADT36	I	Tamilnadu	14.3	10	1.2	8.5	MR	3
ASD 16	I	Tamilnadu	32.7	17.7	23.3	24.56	S	7
Abhaya	I	AndhraPradesh	4.0	14.7	14.3	11.0	MS	5
Ambika	L	Gujrat	2.0	2.4	2.0	2.13	R	1
Anjali	U	Orissa	18.7	18.5	21	19.4	S	7
Bharati	I	Kerala	16.5	14.4	17	16	S	7
Basmati 370	I	Punjab	22.3	17.5	21.5	20.43	S	7
CSR 10	S	Haryana	2.9	6.5	3.5	4.3	R	1
CSR 30	S	Haryana	2.2	1.0	6.1	3.1	R	1
CSR 27	S	Haryana	8.8	12.2	10.4	10.46	MR	3
CSR 4	S	Haryana	15.3	5.6	12.4	11.1	MS	5
CR 1014	L	Orissa	8.4	5.0	13.5	9.0	MR	3
Dhalaheera	U	Orissa	5.8	4.8	8.7	6.43	MR	3
Dinesh	L	WestBengal	6.5	6.7	7.5	6.9	MR	3
Daya	I	Orissa	19.1	9.5	10.0	12.86	MS	5
Deepa	U	Bihar	22.0	11.5	11.4	15.0	MS	5
Dubraj	L	Orissa	15.8	12.5	13.8	14.03	MS	5
Dhusura	L	Orissa	33.3	13.8	14.8	20.63	S	7
GR-4	I	Gujrat	6.0	9.5	19.0	11.5	MS	5
Gour-3	I	Gujrat	5.6	5.6	6.3	5.83	MR	3
Gautam	I	Bihar	8.5	9.8	22.0	13.43	MS	5
Ghanteswari	U	Orissa	15.5	8.5	12.5	12.16	MS	5
Gayatri	L	Orissa	28.7	45.4	33.3	35.8	HS	9
Heera	U	Orissa	12.3	12.4	12.8	12.5	MS	5
Indira	I	Orissa	2.0	3.8	6.1	3.96	R	1
IR 36	I	Orissa	16.6	7.0	8.3	10.63	MS	5
IR 50	I	Tamilnadu	4.8	8.4	7.4	6.83	MR	3
IR 72	I	Tamilnadu	7.3	2.7	9.8	6.6	MR	3
IR 20	I	Tamilnadu	3.2	14.9	3.8	7.3	MR	3
IR 8	I	Punjab	18.3	16.4	19.5	18.0	S	7
Jitendra	L	WestBengal	10.0	10.3	3.3	7.86	MR	3
Jajati	I	Orissa	33.3	11.2	15.2	19.9	S	7
Jagannath	L	Orissa	27.8	8.7	12.2	16.33	S	7
Jaya	I	Punjab	19.6	26.7	16.8	21.03	S	7
Kshira	I	Orissa	3.2	2.0	3.3	2.83	R	1
Kalinga- 1	I	Orissa	5.6	15.0	12.8	11.13	MS	5
Kalinga -2	I	Orissa	17.5	10.6	12.5	13.53	MS	5
Kalinga- 3	U	Orissa	6.8	2.7	14.5	8.0	MR	3
Katrani	L	Bihar	20.8	32.7	17.2	23.6	S	7
Kranthi	I	MadhyaPradesh	24.6	1.5	6.9	11	MS	5
Kanak	L	Bihar	29.5	4.6	21.8	18.6	MS	5
Kalajeera	L	Orissa	34.2	5.7	22.2	20.7	S	7
Ketekijoha	L	Orissa	28.6	36.3	26.8	30.56	HS	9
Karuna	U	Tamilnadu	5.8	3.0	10.2	6.33	MR	3

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Lalat	I	Orissa	16.6	15.4	10.2	14.06	MS	5
Lunishree	S	Orissa	27.6	22.8	18.0	22.8	S	7
Mahalaxmi	L	Orissa	5.2	2.6	4.8	4.2	R	1
Mandira	L	WestBengal	2.1	7.2	5.0	4.8	R	1
Meher	I	Orissa	20.0	7.5	11.7	13.06	MS	5
Mahamaya	I	MadhyaPradesh	4.1	2.4	5.0	3.8	R	1
Nalini	L	WestBengal	19.5	12.7	15.2	15.8	S	7
Narendra-1	U	UttarPradesh	18.8	2.3	5.4	8.8	MR	3
Punshi	I	Manipur	1.7	4.9	2.4	3.0	R	1
Pusa 33	I	Tamilnadu	8.5	7.4	7.8	7.9	MR	3
PR113	I	Punjab	10.3	6.5	12.8	9.87	MR	3
PR114	I	Punjab	10.3	7.7	2.4	6.8	MR	3
PR115	I	Punjab	9.2	2.0	1.0	4.06	R	1
Padmini	L	Orissa	15.2	5.6	12.6	11.13	MS	5
Parijat	U	Orissa	18.6	8.6	7.8	11.66	MS	5
Pooja	L	Orissa	32.5	40.8	30.5	34.6	HS	9
Panidhan	L	Orissa	17.8	14.3	18.5	16.8	S	7
Poorva	U	MadhyaPradesh	20.5	1.2	9.5	10.4	MR	3
Pimpudibas	L	Orissa	16.5	25.0	23.2	21.5	S	7
Purnendu	L	West Bengal	62.5	30.6	62.5	51.86	HS	9
Pathara	U	Orissa	32.1	8.6	14.9	18.53	S	7
Rohini	I	Kerala	6.7	2.0	12.4	7.03	MR	3
Radhi	I	Orissa	5.8	6.0	12.6	8.13	MR	3
Ratna	I	Orissa	10.6	15.2	12.4	12.73	MS	5
Saktiman	I	Orissa	2.5	1.6	4.6	2.9	R	1
Seema	L	Orissa	1.6	1.9	3.4	2.3	R	1
Saket 4	I	Orissa	5.6	2.9	7.0	5.26	R	1
Sarala	L	Orissa	20.2	40.5	9.7	23.17	HS	9
Sarasa	I	Orissa	15.8	5.7	10.1	10.42	MR	3
Supriya	I	Orissa	20.2	40.5	9.7	23.46	HS	9
Swarna	L	AndhraPradesh	18.4	15.5	15.2	16.36	S	7
Sabita	L	Westbengal	12.6	9.7	4.8	9.03	MR	3
Sugandha	L	Bihar	41.7	25.5	28.0	30.06	HS	9
Sneha	U	Orissa	1.6	8.0	9.0	6.2	MR	3
Sonamani	S	Orissa	31.0	33.8	31.5	32.1	HS	9
Satabdi	I	WestBengal	7.9	5.6	8.5	7.3	MR	3
Tara	I	Orissa	2.4	2.5	5.4	3.43	R	1
Tripti	U	MadhyaPradesh	1.6	4.3	10.3	5.4	R	1
Triveni	L	Kerala	2.8	2.1	4.5	3.13	R	1
Tapaswini	I	Orissa	10.8	7.5	15.7	11.3	MS	5
Taroari basmati	I	Haryana	10.5	8.5	12.3	10.45	MR	3
Vldhan 221	U	UttarPradesh	3.4	1.4	1.8	2.2	R	1
Udaya	I	Orissa	15.4	30.9	30.1	25.1	S	7
Udayagiri	U	Orissa	33.0	11.5	9.4	17.9	S	7
Vytilla-2	I	Kerala	20.3	2.6	7.4	10.1	MR	3
VLdhan-206	I	UttarPradesh	27.5	5.8	21.0	18.1	S	7
Vandana	U	Orissa	16.8	3.9	10.2	10.3	MR	3
TN1	I	Punjab	31.2	35.6	38.4	35.4	HS	9

Score 1=R (Resistant), Score 3= MR (Moderately resistant), Score 5= MS (Moderately susceptible), Score 7=S (Susceptible), Score 9=HS (Highly susceptible). Ecosystem: U= Upland , I=Irrigated, S= Shallow lowland, L=Lowland.

that 17 cultivars viz., Ambika, CSR- 10, CSR-30, Indira, Mahalaxmi, Punshi, PR-115, Tara, Tripti Triveni, VLdhan-221, Kshira, Mahamaya, Seema, Saktiman, Saket-4 and Mandira showed resistant reaction over seasons with a level of damage 1-5% WEH (SES Score-1). It was also observed that many varieties like Dhusura, Daya, Jajati, Jagannath, Kranthi, Kalajeera, Lunishree, Meher, Narendra-1, Parijat, Poorva, Pathara, Udayagiri and VLdhan-206 showed high percentage of damage. Twenty seven varieties viz., ADT-39, ADT-36, Dinesh, Dhalajeera, CSR-27, Gour-3, PR-113, Karuna, IR- 50, IR-72, Sneha, Satabdi , Kalinga- 3 etc were moderately resistant to stem borer and damage ranged from 6-10% (SES Score-3). Nineteen popular varieties like Abhay, CSR-4, Daya, IR-36, Kranthi, Kaling-1, Deepa, Dubraj, GR-4, Ghanteswari, Heera, Goutam etc were moderately susceptible with the damage level of 11-15% (SES Score-5). Twenty varieties Basmati 370, Jaya, Jagannath, Nalini, Pathara, Udaya, Swarna, Panidhan, Anjali, IR-8 etc were susceptible with the extent of damage 16-25% (SES Score-7). Mostly the deepwater varieties like Gayatri, Ketekijoha, Lunishree, Purnendu, Sugandha, Sonamani, Pooja, Sarala etc were highly susceptible to yellow stem borer having damage >25% (SES Score-9). The aromatic varieties like Basmati-370, Pimpudibas, Dhusura, Kalajeera, Katrani were susceptible. Maximum stem borer incidence was observed in Purnendu followed by Sugandha and Amulya. Parijat, Pathara and Supriya were reported earlier as resistant to stem borer (Anonymous, 2000) were having 20-30% WEH. Earlier Krishnamurthy (1987) reported Punshi, Triveni, Mandira and Indira to be resistant to YSB which was confirmed in the present study with 5% WEH while Ratna was moderately resistant. The most popular varieties Lalat, Swarna and Parijat showed susceptible reaction with SES Score-7. Thus the varieties identified having field resistance may be popularized in stem borer endemic areas and used as donors in resistant breeding programme.

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