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Identification of Elite Rice Genotypes through Field Screening for Resistance against Yellow Stem Borer, *Scirpophaga incertulas* Walker (Crambidae: Lepidoptera)

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ABSTRACT: Studies on screening of rice genotypes under natural field condition for identifying resistant entriesagainst Yellow Stem borer (YSB), *Scirpophaga incertulas* (Walker) (Crambidae: Lepidoptera) was carriedout at Tamil Nadu Rice Research Institute (TRRI), Aduthurai during 2021-2022. A total of fiftythreerice genotypes along with three standard check varieties which included two resistant check entries (TKM 6 and PTB 33) and one susceptible check entry (TN-1) of varying duration of 110-120 days were screened for yellow stem borer resistance. The damage intensity of YSB was recorded at vegetative stage on 30 and 45 days after transplanting (DAT) followed by reproductive stage on 60 and 75 DAT as per cent dead heart (DH) and white earhead (WEH) damage respectively and scoring was done by damage percentage and D-value based on Standard evaluation system given by International Rice Research Institute (IRRI). The experimental results shown that eight out of fifty three rice genotypes *viz.*,CO 51, CSR 27, WGL 14377, Altera, Navara, Palkichadi, Rajalaxmi, Rasakadam as well as resistant check PTB 33 expressed field resistance with minimum incidence against yellow stem borer at both vegetative and reproductive stages. Among the two resistant check varieties, TKM 6 shown high resistance with nil DH and WEH damage, followed by PTB 33 which expressed 2.50% DH and 2.17% WEH damage respectively, whereas TN 1 shown high susceptibility with registered very high degree of DH (43.56 %) and WEH (25.00 %) damage at vegetative and reproductive stages respectively. In terms of yield, CO 51 registered highest single hill grain yield (12.05 g/hill) followed by Rasakadam (11.90 g/hill), Palkichadi (11.43 g/hill), and TKM 6 (RC) (11.36 g /hill). The lowest single hill grain yield (6.45 g/ hill) was observed in TN 1 susceptible check.

Keywords: Field screening, yellow stem borer, dead heart, white ear head, grain yield.

INTRODUCTION

Rice (*Oryza sativa* L.) is an important cereal as well as staple food crop for more than two third of the population of the India and nearly half of the global population. India is world's second largest rice producer and consumer next to China (Heinrichs *et al.*, 2017). India produced 116.42 million tonnes of rice on 44.5 million hectares out of the global total of 782 million tonnes on 167.1 million hectares (rainy season: 102.13 m t from 39.27 m ha) (rainyseason: 102.13 m t from 39.27 m ha) (FAO, 2020; GoI, 2020). Demand for rice is increasing with the increase in population and is expected to remain high in India in the future. Indian farmers facemultitude of hurdles in increasing productivity and quality of rice as a result of damage caused by a complex of insect pests (Chatterjee *et al.*, 2020). Among them, rice yellow stem borer (YSB), *Scirpophaga incertulas* (Walker) (Crambidae: Lepidoptera) is considered as a majorthreat for economic crop loss in rice throughout the crop period from seedling to maturity. Feeding by stem borer inside the leaf sheath at the vegetative stage, leads to yellowing and drying of the youngest shoot, resulting in the formation of 'dead-hearts (DHs)'. At the reproductive stage, stem borer feeding inside the stem results in panicles with unfilled grains called 'white ear heads (WEHs)' (Rubia *et al.*, 1996). In fields, both types of injury can inflict enormous yield loss even up to 87.66 per cent when the crop is left unsprayed (Pallavi *et al.*, 2017). In practical, even after the repeated application of insecticides, farmers found it difficult to manage YSB due to its cryptic behaviour and concealed internal feeding habit (Mishra *et al.*, 1990; Rahaman and Stout 2019). The existing resistant rice genotypes are not stable to withstand the YSB attack in fields, because their reactions vary with location, climate, environmental conditions and biotic factors etc. (Panigrahi and Rajamani 2010; Sujay Pandey and Choubey 2011). Therefore, continuous evaluation and identification of resistant sources against

this pest is necessary for maintaining stable production of rice as well as enhancing the livelihood of rice farmers.Because farmers cultivated insect pest-resistant cultivars on a small scale, due to less availability of resistance sources against insect pests (Kabir Eyidozehi *et al*., 2015). Thus Host plant resistance strategy is important in developing and selecting cultivars which are tolerant to pest injury, which in turn aid to mitigate yield loss inflicted by the stem borers. Hence, the present study was taken up with a prime objective to screen and identify the elite rice genotypes against yellow stem borer of rice.

MATERIALS AND METHODS

The different categories of fifty three rice genotypes *viz.*, released varieties, accessions and landraces (Table 1) along with check varieties which included two resistant checks such as, TKM 6 and PTB 33 and one susceptible check, TN 1 were screened against yellow stem borer during December 2021- March 2022 at Tamil Nadu Rice Research Institute, Aduthurai, Thanjavur District, Tamil Nadu situated at 79º 48′ E longitude and 10º 99′ N latitude with an altitude of 19.5 m MSL in the alluvial clay zone of Tamil Nadu. The experiment was laid out in Randomized Block Design with three replications. These different categories of rice genotypes were transplanted in two rows of ten hills each with one skip row between testentries with spacing of 20 × 15 cm^2 (row to row and plant to plant) at single seedling per hill. For every five test entries, two rows of both the susceptible and resistant check entries were transplanted. All the recommended agronomic packages of practices were carried out during the experimentation exceptimposing plant protection measures such as insecticidal treatments. The pest infestation level was determined by counting the infested hills which shown dead heart and white ear head at vegetative and reproductive stages respectively adopting the scoring methods of IRRI (2013). The damage percentage was recorded at vegetative stage on 30 and 45 days after transplanting followed by reproductive stage on 60 and 75 days after transplanting by means of counting dead heart and white ear head respectively. These observations were recorded from randomly selected ten hills of each genotype by recording total unaffected tiller and affected tillers such as dead hearts and white ear heads. The damage percentage and D - value was calculated by using the formula given by Heinrichs *et al.* (1985). In addition, scoring was done based on Standard Evaluation System given by International Rice Research Institute, Philippines (IRRI, 2013).

Table 1: Categories of rice genotypes used for field screening against Rice Yellow Stem borer, ***Scirpophaga incertulas*** **(Walker).**

Category	Rice genotypes tested	Number of entries tested (56)
Check Entries	Susceptible - Taichung Native 1 (TN 1) Resistant - PTB 33, TKM 6	**3**
Variety	ADT 36, ADT 37, ADT 39, ADT 41, ADT 42, ADT 43, ADT 45, ADT 47, ADT 49, ADT 53, ADT 55, ADT 56, ADT 57, Anna (R) 4, ASD 16, CO 51, CO 54, CSR 27, MDU 5, MDU 6, TPS 5, TRY 5, NLR 34449, VGD 1, WGL 14377, White Ponni	**26**
Accessions	AD 17100, AD 17152, AD 18006, AD 18035, AD 19215	**5**
Landraces	Aanaikomban, Altera, Arubatham kuruvai, Bhavani, Chithiraikar, Chinnapunchai, Chinkinikar, Gopalbhog, Illuppai Poo Samba, Jai Sri Ram, Kalanamak, Milagi, Mysore malli, Navara, Onamuttan, Palkichadi, Rajalaxmi, Rasakadam, Sempalai, Swaranamalli, Thirupathisaram, Vasaramundan.	**22**

The damage percentage and D - value was calculated by using the following formula developed by Heinrichs *et al.* (1985).

(i) Dead heart (DHs) damage

$$\text{Percent of DHs} = \frac{\text{No. of dead heart (DHs)}}{\text{Total number of tillers}} \times 100$$

The 'D' values were calculated using the following formula:

$$\text{D' Value} = \frac{\text{Percent dead heart (DHs) in test genotype}}{\text{Percent dead heart (DHs) in susceptible genotype}} \times 100$$

(D - Adjustment Factor)

(ii) White ear head (WEHs) damage

$$\text{Percent of WHs} = \frac{\text{No. of white ears (WEHs)}}{\text{Total number of tillers}} \times 100$$

The 'D' values were calculated using the following formula:

$$\text{'D' Value} = \frac{\text{Percent white ears (WEHs) in test genotype}}{\text{Percent white ears (WEHs) in susceptible genotype}} \times 100$$

(D - Adjustment Factor)

Based on the damage rating scale, the status of rice genotypes was determined by following IRRI's Standard Evaluation System (SES) for yellow stem borer (IRRI, 2013) (Table. 2).

Table 2: Rating scale based on per cent damage and D- value as per IRRI's Standard Evaluation System (SES) for rice Yellow Stem borer.

Dead heart (DH)		White ear head (WEH)		Scale	Resistance rating
Percent damage	D Value	Percent damage	D Value		
No damage	No damage	No damage	No damage	0	Highly resistant
1-10%	1-20%	1-5%	1-10%	1	Resistant
11-20%	21-40%	6-10%	11-25%	3	Moderately Resistant
21-30%	41-60%	11-15%	26-40%	5	Moderately susceptible
31-60%	61-80%	16-25%	41-60%	7	Susceptible
61% and above	81-100%	26%and above	61-100%	9	Highly susceptible

RESULTS AND DISCUSSION

In the present investigation, varying degree of resistance with different categories of rice genotypes against YSBbased on per cent dead heart (DHs) and white head (WEHs) were screened. The YSB incidence started from 30 DAT and the pest intensity was found to be boosted gradually up to 75 DAT, then it began to decrease with the maturity of the crop. The YSB damage was recorded at 30, 45, 60 and 75 DAT in term of damage percentage at vegetative and reproductive stage by means of counting DHs (Fig. 1) and WEHs (Fig. 2) respectively. The results provided in Table 3 and 4 indicated that the test genotypes were found to express varying degreeof resistance and susceptibility against of YSB according to the damage intensity. Accordingly, the resistant check entry TKM 6 used in this study expressed nil DHs and WEHs at respective vegetative and reproductive stages of the rice crop, withstanding its reality of resistance under field condition.

Table 3: Relative incidence of yellow stem borer in different rice genotypes in terms of DHs percentageand D-value for their relative resistance/susceptibility.

Sr. No.	Rice Genotypes	Dead heart (DHs) damage percentage at vegetative stage						Scale	Rating
		30 DAT	D value	45 DAT	D value	Mean D %	Mean D value		
1.	TN 1 (SC)	42.86	100.00	44.26	100.00	43.56	100.00	9	HS
2.	PTB 33 (RC)	1.67	3.90	3.33	7.52	2.50	5.71	1	R
3.	TKM 6 (RC)	0.00	0.00	0.00	0.00	0.00	0.00	0	HR
4.	ADT 36	2.17	5.06	5.08	11.48	3.63	8.27	1	R
5.	ADT 37	16.67	38.89	18.75	42.36	17.71	40.63	5	MS
6.	ADT 39	11.76	27.44	12.28	27.75	12.02	27.59	3	MR
7.	ADT 41	7.94	18.53	16.39	37.03	12.17	27.78	3	MR
8.	ADT 42	12.28	28.65	17.86	40.35	15.07	34.50	3	MR
9.	ADT 43	8.77	20.46	15.25	34.46	12.01	27.46	3	MR
10.	ADT 45	7.84	18.29	11.32	25.58	9.58	21.93	3	MR
11.	ADT 47	10.53	24.57	14.04	31.72	12.29	28.15	3	MR
12.	ADT 48	5.17	12.06	6.78	15.32	5.98	13.69	1	R
13.	ADT 53	15.09	35.21	20.75	46.88	17.92	41.04	5	MS
14.	ADT 55	6.82	15.91	14.89	33.64	10.86	24.78	3	MR
15.	ADT 56	14.89	34.74	17.65	39.88	16.27	37.31	3	MR
16.	ADT 57	1.89	4.41	3.33	7.52	2.61	5.97	1	R
17.	Anna (R)-4	6.52	15.21	10.00	22.59	8.26	18.90	1	R
18.	ASD 16	10.20	23.80	14.00	31.63	12.10	27.71	3	MR
19.	CO 51	6.12	14.28	10.00	22.59	8.06	18.44	1	R
20.	CO 54	6.52	15.21	14.89	33.64	10.71	24.43	3	MR
21.	CSR 27	1.79	4.18	7.02	15.86	4.41	10.02	1	R
22.	MDU 5	1.89	4.41	7.69	17.37	4.79	10.89	1	R
23.	MDU 6	7.02	16.38	16.07	36.31	11.55	26.34	3	MR
24.	TPS 5	5.88	13.72	22.73	51.36	14.31	32.54	3	MR
25.	TRY 5	16.39	38.24	19.35	43.72	17.87	40.98	5	MS
26.	NLR 34449	1.41	3.29	2.90	6.55	2.16	4.92	1	R
27.	VGD 1	11.63	27.13	24.00	54.23	17.82	40.68	5	MS
28.	WGL 14377	0.00	0.00	2.50	5.65	1.25	2.82	1	R
29.	White Ponni	15.56	36.30	26.53	59.94	21.05	48.12	5	MS
30.	AD 17100	15.38	35.88	27.45	62.02	21.42	48.95	5	MS
31.	AD 17152	11.76	27.44	18.52	41.84	15.14	34.64	3	MR
32.	AD 18006	1.89	4.41	15.09	34.09	8.49	19.25	1	R
33.	AD 18035	4.08	9.52	12.96	29.28	8.52	19.40	1	R
34.	AD 19215	5.77	13.46	14.55	32.87	10.16	23.17	3	MR
35.	Aanaikomban	4.08	9.52	5.56	12.56	4.82	11.04	1	R
36.	Altera	1.79	4.18	1.85	4.18	1.82	4.18	1	R
37.	Arupatham kuruvai	9.07	21.16	10.87	24.56	9.97	22.86	3	MR
38.	Bhavani	7.69	17.94	9.80	22.14	8.75	20.04	1	R
39.	Chithiraikar	2.56	5.97	11.36	25.67	6.96	15.82	1	R
40.	Chinnapunchai	5.56	12.97	10.87	24.56	8.22	18.77	1	R
41.	Chinikinikar	6.55	15.28	11.43	25.82	8.99	20.55	3	MR
42.	Gopalbhog	17.02	39.71	21.74	49.12	19.38	44.41	5	MS

43.	Illuppai Poo Samba	8.33	19.44	10.42	23.54	9.38	21.49	3	MR
44.	Jai Sri Ram	10.26	23.94	12.50	28.24	11.38	26.09	3	MR
45.	Kalanamak	10.87	25.36	15.22	34.39	13.05	29.87	3	MR
46.	Milagi	14.81	34.55	18.03	40.74	16.42	37.65	3	MR
47.	Mysore malli	8.11	18.92	13.51	30.52	10.81	24.72	3	MR
48.	Navara	4.65	10.85	6.25	14.12	5.45	12.49	1	R
49.	Onamuttan	25.00	58.33	28.21	63.74	26.61	61.03	7	S
50.	Palkichadi	7.27	16.96	10.34	23.36	8.81	20.16	1	R
51.	Rajalaxmi	4.88	11.39	11.36	25.67	8.12	18.53	1	R
52.	Rasakadam	6.52	15.21	7.55	17.06	7.04	16.14	1	R
53.	Sempalai	9.38	21.89	21.62	48.85	15.50	35.37	3	MR
54.	Swarnamalli	7.55	17.62	13.43	30.34	10.49	23.98	3	MR
55.	Thirupathisaram	15.63	36.47	20.59	46.52	18.11	41.49	5	MS
56.	Vasaramundan	16.67	38.89	27.27	61.61	21.97	50.25	5	MS

RC-Resistant check; SC-Susceptible check; *Based on the scale of SES of IRRI, Philippines (2013).

Extent of dead heart (DHs) damage recorded at vegetative stage. The observations on the incidence of yellow stem borer in the terms of dead heart damage percentage were recorded on 30 DAT and 45 DAT at vegetative stage.The mean results of these two observations at vegetative stage revealed that the rice varieties ADT 36, ADT 48, ADT 57, Anna (R) 4, CO 51, CSR 27, MDU 5, NLR 34449, WGL 14377 and rice accessions AD 18006, AD 18035 and landraces Aanaikomban, Altera, Bhavani, Chithiraikar, Chinnapunchai, Navara, Palkichadi, Rajalaxmi, Rasakadam along with PTB 33 (RC) shown resistance against yellow stem borer with receiving minimum damage percentage of less than 10 % damage as well as less D-Value of below 20 %. The check entry TKM 6 (RC) had shown nil dead heart damage whereas the highest damage was noticed in TN 1 (SC) (43.56 %) at vegetative stage of the rice crop (Table 3).

Fig. 1. Dead heart damage.

Table 4: Relative incidence of yellow stem borer in different rice genotypes in terms of WEHs damage percentage and D-value for their relative resistance/susceptibility.

S. No.	Rice Genotypes	WEHs damage percentage at Reproductive stage						Scale	Rating
		60 DAT	D value	75 DAT	D value	Mean D %	Mean D value		
1.	TN 1 (SC)	22.92	100.00	27.08	100.00	25.00	100.00	9	HS
2.	PTB 33 (RC)	2.17	9.47	3.00	11.08	2.59	10.27	1	R
3.	TKM 6 (RC)	0.00	0.00	0.00	0.00	0.00	0.00	0	HR
4.	ADT 36	3.70	16.14	5.56	20.53	4.63	18.34	3	MR
5.	ADT 37	10.87	47.43	17.39	64.22	14.13	55.82	7	S
6.	ADT 39	2.78	12.13	5.56	20.53	4.17	16.33	3	MR
7.	ADT 41	4.88	21.29	7.32	27.03	6.10	24.16	3	MR
8.	ADT 42	2.78	12.13	5.56	20.53	4.17	16.33	3	MR
9.	ADT 43	4.55	19.85	6.82	25.18	5.69	22.52	3	MR
10.	ADT 45	4.17	18.19	14.58	53.84	9.38	36.02	5	MS
11.	ADT 47	11.43	49.87	17.14	63.29	14.29	56.58	7	S
12.	ADT 48	1.79	7.81	8.93	32.98	5.36	20.39	3	MR
13.	ADT 53	6.25	27.27	18.75	69.24	12.50	48.25	7	S
14.	ADT 55	6.98	30.45	11.63	42.95	9.31	36.70	5	MS
15.	ADT 56	4.55	19.85	6.82	25.18	5.69	22.52	3	MR
16.	ADT 57	4.84	21.12	6.45	23.82	5.65	22.47	3	MR
17.	Anna (R) – 4	6.52	28.45	13.04	48.15	9.78	38.30	5	MS
18.	ASD 16	0.00	0.00	11.11	41.03	5.56	20.51	3	MR
19.	CO 51	0.00	0.00	4.08	15.07	2.04	7.53	1	R
20.	CO 54	8.16	35.60	12.24	45.20	10.20	40.40	5	MS
21.	CSR 27	1.50	6.54	1.85	6.83	1.68	6.69	1	R
22.	MDU 5	6.00	26.18	16.00	59.08	11.00	42.63	7	S
23.	MDU 6	8.70	37.96	19.57	72.27	14.14	55.11	7	S
24.	TPS 5	2.63	11.47	5.26	19.42	3.95	15.45	3	MR
25.	TRY 5	5.26	22.95	10.34	38.18	7.80	30.57	5	MS
26.	NLR 34449	4.76	20.77	7.94	29.32	6.35	25.04	3	MR
27.	VGD 1	11.11	48.47	15.56	57.46	13.34	52.97	7	S
28.	WGL 14377	0.00	0.00	2.33	8.60	1.17	4.30	1	R
29.	White Ponni	6.12	26.70	10.20	37.67	8.16	32.18	5	MS
30.	AD 17100	6.52	28.45	15.22	56.20	10.87	42.33	7	S

31.	AD 17152	7.84	34.21	19.61	72.42	13.73	53.31	7	S
32.	AD 18006	5.55	24.21	12.35	45.61	8.95	34.91	5	MS
33.	AD 18035	6.38	27.84	10.64	39.29	8.51	33.56	5	MS
34.	AD 19215	5.77	25.17	19.23	71.01	12.50	48.09	7	S
35.	Aanaikomban	3.77	16.45	5.66	20.90	4.72	18.67	3	MR
36.	Altera	1.96	8.55	1.96	7.24	1.96	7.89	1	R
37.	Arupatham kuruvai	4.45	19.42	8.95	33.05	6.70	26.23	5	MS
38.	Bhavani	2.04	8.90	4.08	15.07	3.06	11.98	3	MR
39.	Chithiraikar	2.33	10.17	4.65	17.17	3.49	13.67	3	MR
40.	Chinnapunchai	5.26	22.95	10.71	39.55	7.99	31.25	5	MS
41.	Chinikinikar	4.43	19.33	8.64	31.91	6.54	25.62	5	MS
42.	Gopalbhog	6.12	26.70	8.16	30.13	7.14	28.42	5	MS
43.	Illuppai Poo Samba	2.22	9.69	11.11	41.03	6.67	25.36	3	MR
44.	Jai Sri Ram	12.00	52.36	14.43	53.29	13.22	52.82	7	S
45.	Kalanamak	3.45	15.05	10.34	38.18	6.90	26.62	5	MS
46.	Milagi	5.45	23.78	12.73	47.01	9.09	35.39	5	MS
47.	Mysore malli	2.56	11.17	10.26	37.89	6.41	24.53	3	MR
48.	Navara	0.00	0.00	2.38	8.79	1.19	4.39	1	R
49.	Onamuttan	12.50	54.54	17.45	64.44	14.98	59.49	7	S
50.	Palkichadi	0.00	0.00	1.92	7.09	0.96	3.55	1	R
51.	Rajalaxmi	0.00	0.00	2.27	8.38	1.14	4.19	1	R
52.	Rasakadam	0.00	0.00	2.08	7.68	1.04	3.84	1	R
53.	Sempalai	4.33	18.89	8.77	32.39	6.55	25.64	5	MS
54.	Swarnamalli	5.40	23.56	7.69	28.40	6.55	25.98	5	MS
55.	Thirupathisaram	6.25	27.27	9.38	34.64	7.82	30.95	5	MS
56.	Vasaramundan	5.41	23.60	13.51	49.89	9.46	36.75	5	MS

RC-Resistant check; SC-Susceptible check*Based on the scale of SES of IRRI, Philippines (2013).

Extent of white ear headdamage recorded at reproductive stage. The incidence of yellow stem borer in the terms of white ear head damage percentage was recorded on 60 DAT and 75 DAT at reproductive stage. The mean results of these two observations at reproductive stage shown that the rice varieties CO 51, CSR 27, WGL 14377 as well as landraces Altera, Navara, Palkichadi, Rajalaxmi, Rasakadamalong with PTB 33 (RC) shown resistance against yellow stem borer with receiving minimum damage percentage of less than 5 % damage as well as less D-value of below 10 %. The check entry TKM 6 (RC) had shown nil white head damage whereas the highest damage percentage was noticed in TN 1 (SC) (25.00%) at reproductive stage of the rice crop (Table 4).

Fig. 2. White ear head damage.

Susceptibility/resistance status of different rice genotypes against YSB. The observations on the incidence of yellow stem borer in the terms of damage percentage were recorded on 30 and 45 DAT at vegetative stage followed by 60 and 75 DAT at reproductive stage by means of recording dead heart and white ear head damage percentage. A perusal of the overall results revealed that the rice genotypes CO 51, CSR 27, WGL 14377, Altera, Navara, Palkichadi, Rajalaxmi, Rasakadam as well as PTB 33 (RC) expressed field resistance with minimum incidence of yellow stem borer at both vegetative and reproductive stage of the rice crop.The highest yellow stem borer incidence was occurred in TN 1 (SC) with 43.56 % DH and 25 % WEH damage. In contrast resistant entry TKM 6 shown nil dead heart and white ear head damage at both the vegetative and reproductive stages (Table 3 and 4 and Fig. 3).

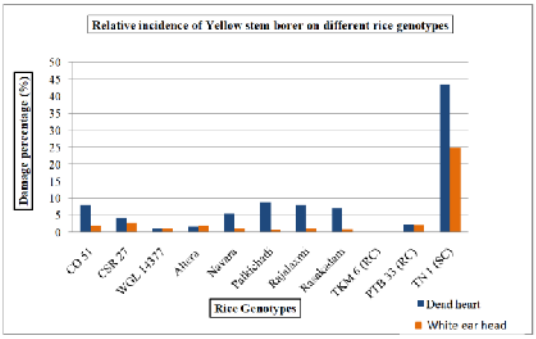

Fig. 3. Relative incidence of YSB at vegetative and reproductive stages.

Table 5: Effect of the mean white ear head incidence of YSB on grain yield in different rice genotypes at reproductive stage.

S. No.	Rice Genotype	Mean WEHs% damage due to YSB at reproductive stage	Resistance Status	Grain yield (g/hill)
1.	CO 51	2.04	R	12.05
2.	CSR 27	2.78	R	10.73
3.	WGL 14377	1.16	R	9.91
4.	Altera	1.96	R	9.63
5.	Navara	1.19	R	10.38
6.	Palkichadi	0.96	R	11.43
7.	Rajalaxmi	1.14	R	10.70
8.	Rasakadam	1.04	R	11.90
9.	PTB 33 (RC)	2.17	R	11.01
10.	TKM 6 (RC)	0.00	HR	11.36
11.	Taichung Native 1(TN 1)(SC)	25.00	HS	6.45

*RC-Resistant check; SC-Susceptible check

Effect of mean WEH incidence of YSB on grain yield in different rice genotypes. The results on the incidence of YSB on grain yield in different rice genotypes are presented in (Table 5 and Fig. 4). Highest single hill grain yield (12.05 g/hill) of rice was obtained in case of CO 51 followed by Rasakadam (11.90 g/hill), Palkichadi (11.43 g/hill), and TKM 6 (RC) (11.36 g /hill). The lowest single hill grain yield (6.45 g/ hill) was observed in TN 1 (SC).Single hill yield of grains in the different genotypes of rice was expressed in decreasing order of: CO 51 (12.05 g/hill) >Rasakadam (11.90 g/hill) > Palkichadi (11.43 g/hill) >TKM 6 (RC) (11.36 g/hill) > PTB 33 (RC) (11.01 g/hill) >CSR 27 (10.73 g/hill) >Rajalaxmi (10.70 g/hill) >Navara (10.38 g/hill) > WGL 14377 (9.91 g/hill) > Altera (9.63 g/hill) > TN 1 (SC) (6.45 g/hill) in the present studies conducted under natural field conditions. The present study revealed that the resistant entries shown less stem borer damage percentage at reproductive stage with high single hill grain yield than susceptible entries.

Similarly, many researchers screened numerous rice genotypes which included various varieties, accessions/ cultures and landraces under natural field conditions to identify the novel donor for resistance against YSB. In prior studies, Rakesh *et al.* (2021); Anil Varma Nalla *et al.* (2020); Reuolin *et al.* (2019); Rajadurai *et al.* (2017); Elanchezhyan *et al.* (2017) and Preetha (2010) screened various sources rice varieties/lines/landraces along with susceptible check entry as TN 1 and resistant checks with TKM 6 and PTB 33 against this stem borer and found some ricevarieties/lines showntolerance to YSB infestation in the respective locations. Moreover these results revealed that same entries exhibited different level of resistance status at vegetative and reproductive stages of the rice crop which confirmed with previous findings of earlier workers (Singh and Pandey 1997) who reported that the rice genotypes which resistant to YSB attack at vegetative stage are not necessarily resistant at reproductive stage and *vice versa*. Theresistant rice genotypes derived from various sources may be utilized for future screening programme of rice yellow stem borer to select most promising genotypes.

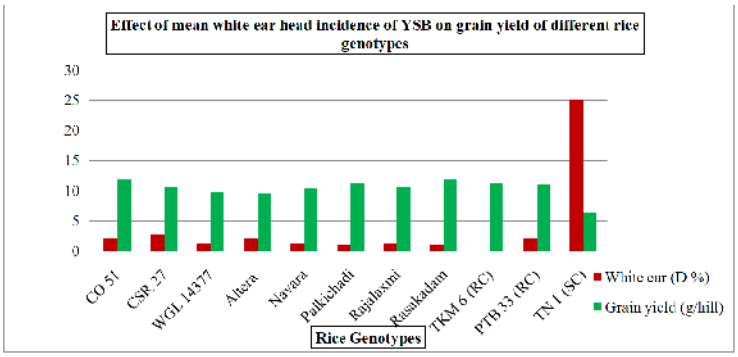

Fig. 4. Effect of mean white ear head (WEHs) incidence of yellow stem borer (YSB) at reproductive stage on grain yield in different rice genotypes.

SUMMARY AND CONCLUSION

The results derived from the present field study on screening of rice genotypes with four observations recorded at both vegetative and reproductive stages of the crop revealed that among fifty three genotypes screened, eight genotypes *viz.*, Co 51, CSR 27, WGL 14377 Altera, Navara, Palkichadi, Rajalaxmi, Rasakadam along with PTB 33(RC) were found resistance while, check entry TN 1 (SC) expressed high susceptibility with highest YSB incidence with 43.56% DH and 25% WEH damage percentage. In contrast, check variety TKM 6 (RC) shown high degree of resistance with nil DHs and WEHs damage respectively at vegetative and reproductive stage of the rice crop. Highest single hill grain yield (12.05 g/hill) of rice was

obtained in case of CO 51 followed by Rasakadam (11.90 g/hill), Palkichadi (11.43 g/hill), and TKM 6 (RC) (11.36 g /hill). The susceptible check (SC) TN 1 registered lowest grain yield of 6.45 g/hill. In conclusion, the afore said eight promising rice genotypes identified in the present study may be utilized for future confirmative screening programme against rice yellow stem borer for selecting cultivars tolerant to YSB injury, and thereby to mitigate yield loss under natural field condition.

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