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Screening of different rice germplasms against yellow stem borer (*Scirpophaga incertulas*)

Soniya Joshi and SN Tiwari

Abstract
Yellow Stem Borer (YSB), *Scirpophaga incertulas* Walker (Lepidoptera: Pyralidae) are considered to be the most destructive and dominant pests of rice crops the world over. It leads to yield loss of 3 to 95 per cent in different areas of India. The current research aimed to study a set of 62 rice germplasms of Stem Borer Screening Test (SBST) were screened under field conditions at the Crop Research Center, G.B. Pant University, Pant Nagar to find out most promising germplasm against yellow stem borer. A set of 62 diverse genotypes that comprises of released varieties, hybrids and selected genotypes from germplasm collection were screened for yellow stem borer resistance under artificial screening methods. In this experiment 14 germplasms found moderately susceptible in SBST-I while 2 germplasms found resistant and 29 germplasms found moderately succeptible in SBST-II trial. It was observed that late sowing of SBST-II showed resistant than early sowing of SBST-I. The present work will be a complementary contribution to the comprehensive study of few rice germplasm lines to assess the extent of resistance to yellow stem borer, *S. incertulas*.

Keywords: Yellow stem borer, rice, germplasm, screening, resistance, susceptible

Introduction

Rice (*Oryza sativa* L.), belongs to the family Gramineae or Poaceae, is the principal staple food crop for more than two thirds worlds' population (Joshi and Tiwari, 2019) [11]. Most of the scientist reported that in India, over 100 insect species feed on rice and 20 of these are considered to be as key pests that causing 30% yield loss (Chandler, 1968; Nisha and Kanagarajan, 2019). Yellow Stem Borer (*Scirpophaga incertulas*) is monophagous insect of paddy i.e. known as most predominant and destructive insect of rain fed low land and flood prone rice ecosystem (Pasalu *et al.*, 2002; Deka and Barthakur, 2010; Sharma *et al.*, 2018) [12, 5]. In India, it is responsible for 3 to 95% yield loss than any other insect pest of rice and therefore accounts for 50% of all insecticides used in rice field (Senapati and Panda, 1999; Huesing and English, 2004; Prasad *et al.*, 2007; Chatterjee *et al.* 2021) [17, 9, 3, 13]. The study of Dhaliwal and Arora, (1996) reported that different pests cause 25 per cent loss in rice. Consequently, for enhancement of productivity, it is most important to control of crop losses due to insects in the field (pre-harvest losses) and during storage (post-harvest losses) (Visalakshmi *et al.*, 2014; DWR, 2015) [20, 6]. Yellow stem borer larvae bore and feed on the internal tissue of growing shoots which leads to "dead heart" and when the infestation is at panicle initiation stage it leads to "white ear head" (Jadhao and Khurad, 2012; Sarao and Kaur, 2014) [10, 15]. For managing the population of YSB many insecticides have been recommended but chemical control is not a satisfactory measure. The excessive use of pesticides has not only increased the cost of cultivation and level of resistance in pest but also have negatively affected the human health, environment, agro-ecosystem and non-target organisms (Rahman *et al.*, 2009; Sarao and Mangat, 2014) [14, 15]. In the case of YSB, it has been verified that chemical control with contact insecticide was futile because insecticides are applied on the surface and larvae of insect feed within the stem pith (Deka and Barthakur, 2010) [5]. Management of YSB with pesticides appears tough and low in cost due to its inner feeding behavior, monophagous nature of the pest and development of resistance to insecticide. Due to this Host Plant Resistance considered as an essential element in the control strategies for yellow stem borer. Host plant resistance is to a great extent effective in integrated pest management (IPM) system, where pesticidal threat is minimized as well as environmental safety, little cost farming by deprived of or minimum pesticide application and proper identification of resistant varieties for selection as parent in crossing programme to develop resistant varieties in future (Fahad *et al.*, 2021) [7].

The aim of this study is to identify the resistance in numerous rice germplasms which can be used as an effective measure to enhance the rice productivity. Only a few resistance resources are accessible for evolving stem borer resistant sorts. Varieties that are sensitive against the attack of insect or pests should be replaced with tolerant germplasms that demonstrate resistance to insects. These studies provide the opportunities for the scientists and rice farmers to exploit the utilization of diverse natural control agents as a substitute for synthetic pesticides.

Material and Method

Plant materials: A set of 62 diverse genotypes that comprises of released varieties, hybrids and selected genotypes from germplasm collection were screened for yellow stem borer resistance under artificial screening methods. The experimental set up was carried at the Crop Research Center, Department of Entomology, Govind Ballabh Pant University of Agriculture and Technology, Pant Nagar, India.

In the trial of SBST, 62 genotypes were evaluated in field with Polythene barrier technique following Heinrichs *et al.* (1985) [8]. The details of genotypes are given in Table -1. seeds from all genotypes were sown in one meter row per entry and each row was marked with aluminum tag having serial number of respective test entry to raise nursery, before transplanting, field was well prepared with the help of puddler and harrow and a basal dose of recommended fertilizer was given to provide favorable soil condition. Twenty-one days old seedlings from each test entry were transplanted in two rows of hills (one seedling per hill) with a spacing of 10x10cm. Susceptible check, TN1 was transplanted within one meter square area, covering test genotypes from all the sides. After installing, erected polythene sheet barrier (2.5 feet height) at 15 days after transplanting (DAT). Not any control measures were applied for insect pests and all the standard agronomical practices were followed for raising the crop. Stemborer eggs were collected from greenhouse and field and then released uniformly on each test entry.

Observations to be taken

From 55 DAT onwards total numbers of Dead heart were counted. The counting was performed on 10 randomly selected plants per variety at 10 days interval up to ten days before the harvesting. Genotypes were rated on population basis as per rating scale given by AICRIP (2018).

The percent dead heart and white head for each test entry were calculated by formula (Heinrichs *et al.*, 1985) [8] as given below:

$$\text{Percent dead hearts} = \frac{\text{Total dead hearts}}{\text{Total tillers}} \times 100$$

Infestation Index =

$$\frac{\text{Dead hearts(\%) in test entry}}{\text{Dead hearts(\%) in susceptible check}} \times 100$$

Infestation index was assigned a corresponding rating of "0-9" scale as given below:

Infestation Index	Dead heart index	Level of resistance
No damage	0	Immune (I)
1-10	1	Highly Resistant (HR)
11-20	3	Resistant (R)
21-30	5	Moderately Resistant (MR)
31-60	7	Moderately Susceptible (MS)
61 above	9	Susceptible (S)

Result and Discussion

Evaluation of Stem Borer Screening Trial (SBST-I) genotypes against YSB under field condition

In the present study, stem borer screening trial test were conducted in 2018 under natural conditions. A number of genotypes demonstrated moderate level of susceptibility at 65 and 75 DAT as given in Table -1. Mean infestation index of several genotypes i.e. JGL 33049, JGL 33508, Sasyasree, JGL 34564, TKM6, HWR 17, RP 5587-B-B-B-41-2, RP5587, RP 5587-B-B-B-267, RP 5587-B-B-B-275-13, RP 5588-B-B-B-B-61, HWR 20, RP 5588-B-B-B-B-223, RP 5588-B-B-B-B-226 and BK 35-155 were recorded as 53.1, 54.8, 54.9, 50.5, 40.7, 50.4, 58.1, 56.3, 54.6, 53.9, 53.8, 56.2, 53.3, 53.6 and 47.6, respectively. These results were also concluded that remaining genotypes were performed very poorly against YSB and referred as susceptible with mean infestation index range from 61.4 to 91.1.

JGL 32979, JGL 33049, Pusa Basmati, JGL 33100, JGL 33508, Sasyasree, JGL 34508, HWR 17, RP5587-B-B-B-41-2, RP5587, RP 5587-B-B-B-267, RP 5587-B-B-B-274-6, RP 5588-B-B-B-275-13, RP 5587-B-B-B-273-1, IET 25109, RP 5588-B-B-B-B-61, HWR 20, RP 5588-B-B-B-B-206, RP 5588-B-B-B-B-223, RP 5588-B-B-B-B-226, BK 64-116 were recorded as susceptible at vegetative stage with infestation index i.e. 71.0, 61.2, 100.0,73.6, 75.3, 61.3, 76.0,67.8, 63.6, 76.6, 74.9, 76.8, 67.9, 71.9, 84.7, 73.9, 74.8, 83.7, 74.8, 76.7 and 66.6, respectively whereas these were observed as moderately susceptible at reproductive stage (75DAT). None of the genotype was found highly resistant, resistant and even moderately resistant due to high infestation of YSB in present study.

The present finding were also coincided with Uniyal (2018) who reported that pusa basmati, RP5587 and BK 49-76 genotypes of SBST-1, were recorded as moderately susceptible. RP 5587-B-B-B-253-2 were known as promising in 2 test locations of AICRIP whereas JGL 32467, JGL 32485, JGL 33430, JGL 33440, JGL 34560, KAUPTB 0627-2-11, RP 5587-B-B-B-262, RP 5588-B-B-B-B-232, BK 39-179, BK 35-155 and JGL 28547 were referred as highly resistant with nil damage of dead heart, at Pattambi (Kerala) in the study of Anonymous, 2018 [2]. Another results of Anonymous, (2018) [2] indicated that JGL 28547 was found promising at 4 tests location of AICRIP, whereas RP 5588-B-B-B-B-232, BK 39-179 and JGL 32467 in 3 test locations and RP 5587-B-B-B-253-2, JGL 33080, JGL 33440, KAUPTB 0627-2-11, RP 5587-B-B-B-253-2, RP5587-B-B-B-258-1 and BK 35-155 were as promising in two locations of AICRIP, at reproductive stage with zero per cent of white ear head (Anonymous, 2018) [2].

Table 1: Reaction of SBST-I AICRIP, genotypes against YSB under field condition

S. No.	Entry No.	Designation	60 DAT		75 DAT		Mean		Final Score	Resistant Grade
			%DH	Infestation Index	%DH	Infestation Index	%DH	Infestation Index		
1	SBST1-1	JGL 24267	34.9	84.8 (9)	38.6	97.4 (9)	36.8	91.1	9	S
2	SBST1-2	JGL 28547	31.6	76.7 (9)	28.6	72.1 (9)	30.1	74.4	9	S
3	SBST1-3	JGL 32429	26.9	65.2 (9)	31.2	78.6 (9)	29.0	71.9	9	S
4	SBST1-4	JGL 32467	31.0	75.3 (9)	31.0	78.3 (9)	31.0	76.8	9	S
5	SBST1-5	JGL 32485	28.7	69.8 (9)	27.8	70.2 (9)	28.3	70.0	9	S
6	SBST1-6	JGL 32979	29.2	71.0 (9)	21.6	54.4 (7)	25.4	62.7	9	S
7	SBST1-7	JGL 33037	34.4	83.5 (9)	35.2	88.7 (9)	34.8	86.1	9	S
8	SBST1-8	JGL 33049	25.2	61.2 (9)	17.9	45.1 (7)	21.5	53.1	7	MS
9	SBST1-9	JGL 33077	26.2	63.7 (9)	28.0	70.6 (9)	27.1	67.1	9	S
10	SBST1-10	Pusa Basmati 1	41.2	100.0 (9)	17.2	43.3 (7)	29.2	71.7	9	S
11	SBST1-11	JGL 33080	30.5	74.1 (9)	29.7	74.9 (9)	30.1	74.5	9	S
12	SBST1-12	JGL 33100	30.3	73.6 (9)	22.8	57.4 (7)	26.6	65.5	9	S
13	SBST1-13	JGL 33124	34.8	84.5 (9)	33.2	83.8 (9)	34.0	84.1	9	S
14	SBST1-14	JGL 33130	31.7	76.8 (9)	26.4	66.5 (9)	29.0	71.7	9	S
15	SBST1-15	JGL 33366	26.3	63.8 (9)	26.2	66.1 (9)	26.3	64.9	9	S
16	SBST1-16	JGL 33399	35.3	85.5 (9)	32.6	82.3 (9)	33.9	83.9	9	S
17	SBST1-17	JGL 33430	29.3	71.2 (9)	34.4	86.8 (9)	31.9	79.0	9	S
18	SBST1-18	JGL 33440	33.3	80.9 (9)	29.7	74.7 (9)	31.5	77.8	9	S
19	SBST1-19	JGL 33508	31.0	75.3 (9)	13.6	34.2 (7)	22.3	54.8	7	MS
20	SBST1-20	Sasyasree	25.3	61.3 (9)	19.2	48.5 (7)	22.3	54.9	7	MS
21	SBST1-21	JGL 33510	26.9	65.3 (9)	26.8	67.5 (9)	26.9	66.4	9	S
22	SBST1-22	JGL 34450	36.2	87.7 (9)	24.8	62.5 (9)	30.5	75.1	9	S
23	SBST1-23	JGL 34505	30.9	75.0 (9)	26.1	65.7 (9)	28.5	70.4	9	S
24	SBST1-24	JGL 34508	31.3	76.0 (9)	20.4	51.3 (7)	25.8	63.6	9	S
25	SBST1-25	JGL 34540	34.8	84.4 (9)	32.0	80.8 (9)	33.4	82.6	9	S
26	SBST1-26	JGL 34560	32.6	79.1 (9)	24.3	61.2 (9)	28.4	70.2	9	S
27	SBST1-27	JGL 34564	30.6	74.2 (9)	10.7	26.9 (5)	20.6	50.5	7	MS
28	SBST1-28	JGL 34569	27.7	67.2 (9)	30.5	76.8 (9)	29.1	72.0	9	S
29	SBST1-29	JGL 34594	29.0	70.3 (9)	39.7	100.0 (9)	34.3	85.2	9	S
30	SBST1-30	TKM6	25.2	61.1 (9)	8.1	20.3 (5)	16.6	40.7	7	MS
31	SBST1-31	KAUPTB 0627-2-11	32.9	79.7 (9)	34.4	86.6 (9)	33.6	83.2	9	S
32	SBST1-32	KAUPTB 0627-2-14	37.6	91.2 (9)	33.7	84.9 (9)	35.6	88.0	9	S
33	SBST1-33	KAUPTB 0627-2-15	31.9	77.5 (9)	28.6	72.0 (9)	30.2	74.7	9	S
34	SBST1-34	HWR 17	27.9	67.8 (9)	13.0	32.9 (7)	20.5	50.4	7	MS
35	SBST1-35	RP 5587-B-B-B-41-2	26.2	63.6 (9)	20.8	52.5 (7)	23.5	58.1	7	MS
36	SBST1-36	RP 5587-B-B-B-46-2	33.6	81.6 (9)	34.0	85.7 (9)	33.8	83.7	9	S
37	SBST1-37	RP 5587-B-B-B-209	NG	-	NG	-	-	-	-	-
38	SBST1-38	RP 5587-B-B-B-253-2	38.4	93.2 (9)	29.1	73.3 (9)	33.7	83.3	9	S
39	SBST1-39	RP 5587-B-B-B-253-13	28.2	68.5 (9)	27.7	69.7 (9)	27.9	69.1	9	S
40	SBST1-40	RP5587	31.6	76.6 (9)	14.2	35.9 (7)	22.9	56.3	7	MS
41	SBST1-41	RP 5587-B-B-B-258-1	31.0	75.2 (9)	27.8	70.0 (9)	29.4	72.6	9	S
42	SBST1-42	RP 5587-B-B-B-262	35.6	86.3 (9)	32.2	81.2 (9)	33.9	83.8	9	S
43	SBST1-43	RP 5587-B-B-B-267*	30.8	74.9 (9)	13.6	34.3 (7)	22.2	54.6	7	MS
44	SBST1-44	RP 5587-B-B-B-274-6*	31.7	76.8 (9)	18.2	45.9 (7)	24.9	61.4	9	S
45	SBST1-45	RP 5587-B-B-B-275-13*	28.0	67.9 (9)	15.8	39.8 (7)	21.9	53.9	7	MS
46	SBST1-46	RP 5587-B-B-B-273-1*	29.6	71.9 (9)	21.0	52.9 (7)	25.3	62.4	9	S
47	SBST1-47	IET 25109	34.9	84.7 (9)	18.7	47.1 (7)	26.8	65.9	9	S
48	SBST1-48	RP 5588-B-B-B-B-61*	30.4	73.9 (9)	13.3	33.6 (7)	21.9	53.8	7	MS
49	SBST1-49	HWR 20	30.8	74.8 (9)	14.9	37.5 (7)	22.9	56.2	7	MS
50	SBST1-50	RP5588	31.8	77.2 (9)	34.0	85.8 (9)	32.9	81.5	9	S
51	SBST1-51	RP 5588-B-B-B-B-177*	32.6	79.1 (9)	28.2	71.0 (9)	30.4	75.0	9	S
52	SBST1-52	RP 5588-B-B-B-B-206*	34.5	83.7 (9)	20.7	52.2 (7)	27.6	68.0	9	S
53	SBST1-53	RP 5588-B-B-B-B-223*	30.8	74.8 (9)	12.6	31.8 (7)	21.7	53.3	7	MS
54	SBST1-54	RP 5588-B-B-B-B- 226*	31.6	76.7 (9)	12.1	30.5 (7)	21.9	53.6	7	MS
55	SBST1-55	RP 5588-B-B-B-B-232*	33.1	80.4 (9)	30.3	76.3 (9)	31.7	78.4	9	S
56	SBST1-56	RP 5588-B-B-B-B-238*	37.5	90.9 (9)	34.6	87.1 (9)	36.0	89.0	9	S
57	SBST1-57	BK 49-76*	32.2	78.0 (9)	23.9	60.3 (9)	28.0	69.2	9	S
58	SBST1-58	BK 39-179*	27.7	67.3 (9)	29.9	75.4 (9)	28.8	71.3	9	S
59	SBST1-59	BK 49-42*	32.8	79.5 (9)	26.3	66.3 (9)	29.5	72.9	9	S
60	SBST1-60	IR64	33.7	81.8 (9)	28.9	73.0 (9)	31.3	77.4	9	S
61	SBST1-61	BK 35-155*	32.4	78.6 (9)	6.6	16.6 (3)	19.5	47.6	7	MS
62	SBST1-62	BK 64-116*	27.4	66.6 (9)	22.5	56.8 (7)	25.0	61.7	9	S

Evaluation of Stem Borer Screening Trial (SBST-II) genotypes against YSB under field condition

Sowing and transplanting of SBST-II were conducted after 15 days of transplanting of SBST-I. Results of SBST-II were shown in Table-2, which revealed that 2 genotypes JGL 33080 and TKM6 that were found to be resistant on which infestation index were noted 18.5 and 20.0, respectively. Only single genotype (JGL 34450) was observed moderate resistant with mean infestation index 28.8 under field condition.

Genotypes *viz.*, JGL 24267, JGL 28547, JGL 32429, JGL 32467, JGL 32485, JGL 33037, JGL 33049, JGL 33077, Pusa Basmati 1, JGL 33124, JGL 33366, JGL 33399, JGL 33430, JGL 33508, Sasyasree, JGL 34508, JGL 34540, JGL 34564, JGL 34569, JGL 34594, KAUPTB 0627-2-14, HWR 17, RP 5587-B-B-B-41-2, RP 5588-B-B-B-B-61, RP 5588-B-B-B-B-238, BK 49-76, BK 49-42 and BK 64-116 exhibited moderate level of susceptibility with mean infestation index range between 35.8, to 55.9 respectively.

Anonymous, (2018) [2] were reported that JGL 34450 was promising at Aduthurai, Coimbatore (Tamil Nadu), Pattambi (Kerala), and Rajendranagar (Telangana State), and these results were also coincided with the present study.

The study of Anonymous, (2017) [1] were revealed that RP 5587-B- B-B-46-2, RP5588, BK 49-76, RP 5588-B-B-B-B-226 and BK 35-155 were observed promising results against YSB in the field screening of SBST-II at Navsari**.** In another study of Chatterjee *et al.*, (2016) [4]**,** IR64 were stated as a resistant with minimum per cent of dead heart, whereas in the present finding it showed susceptibility against YSB.

Table 2: Reaction of SBST2-2018 AICRIP, genotypes against YSB under field condition

S. No.	Entry No.	Designation	60 DAT		90 DAT		Mean		Final Score	Resistant Grade
			% DH	Infestation Index	%DH	Infestation Index	%DH	Infestation Index		
1	SBST2-1	JGL 24267	15.4	49.0 (7)	8.6	22.6 (5)	12.0	35.8	7	MS
2	SBST2-2	JGL 28547	10.3	32.7 (7)	19.1	50.4 (7)	14.7	41.6	7	MS
3	SBST2-3	JGL 32429	23.8	75.6 (9)	11.5	30.3 (7)	17.6	53.0	7	MS
4	SBST2-4	JGL 32467	19.3	61.4 (9)	19.0	50.1 (7)	19.2	55.7	7	MS
5	SBST2-5	JGL 32485	18.8	59.8 (7)	11.4	30.1 (7)	15.1	45.0	7	MS
6	SBST2-6	JGL 32979	23.7	75.3 (9)	17.9	47.2 (7)	20.8	61.3	9	S
7	SBST2-7	JGL 33037	19.4	61.8 (9)	19.4	51.2 (7)	19.4	56.5	7	MS
8	SBST2-8	JGL 33049	21.9	69.5 (9)	18.4	48.4 (7)	20.1	59.0	7	MS
9	SBST2-9	JGL 33077	15.6	49.6 (7)	19.7	51.9 (7)	17.7	50.8	7	MS
10	SBST2-10	Pusa Basmati 1	16.8	53.5 (7)	6.7	17.7 (3)	11.8	35.6	7	MS
11	SBST2-11	JGL 33080	11.7	37.1 (7)	0.0	0.0 (0)	5.8	18.5	3	R
12	SBST2-12	JGL 33100	31.4	100.0 (9)	26.4	69.5 (9)	28.9	84.8	9	S
13	SBST2-13	JGL 33124	15.5	49.3 (7)	20.4	53.6 (7)	17.9	51.5	7	MS
14	SBST2-14	JGL 33130	21.6	68.9 (9)	20.8	54.8 (7)	21.2	61.9	9	S
15	SBST2-15	JGL 33366	9.1	28.8 (5)	6.4	16.8 (3)	7.7	22.8	5	MS
16	SBST2-16	JGL 33399	22.5	71.7 (9)	16.8	44.3 (7)	19.7	58.0	7	MS
17	SBST2-17	JGL 33430	17.4	55.3 (7)	22.2	58.4 (7)	19.8	56.9	7	MS
18	SBST2-18	JGL 33440	21.7	68.9 (9)	27.7	73.0 (9)	24.7	70.9	9	S
19	SBST2-19	JGL 33508	16.7	53.2 (7)	16.5	43.5 (7)	16.6	48.4	7	MS
20	SBST2-20	Sasyasree	12.6	40.0 (7)	13.8	36.3 (7)	13.2	38.2	7	MS
21	SBST2-21	JGL 33510	24.8	78.9 (9)	26.0	68.4 (9)	25.4	73.6	9	S
22	SBST2-22	JGL 34450	16.9	53.8 (7)	1.4	3.8 (1)	9.2	28.8	5	MR
23	SBST2-23	JGL 34505	30.6	97.2 (9)	25.5	67.2 (9)	28.0	82.2	9	S
24	SBST2-24	JGL 34508	19.5	62.0 (9)	18.9	49.9 (7)	19.2	55.9	7	MS
25	SBST2-25	JGL 34540	20.0	63.6 (9)	9.1	24.1 (5)	14.6	43.9	7	MS
26	SBST2-26	JGL 34560	16.7	53.2 (7)	26.1	68.9 (9)	21.4	61.0	9	S
27	SBST2-27	JGL 34564	28.2	89.7 (9)	11.4	30.1 (7)	19.8	59.9	7	MS
28	SBST2-28	JGL 34569	17.8	56.7 (7)	16.6	43.6 (7)	17.2	50.2	7	MS
29	SBST2-29	JGL 34594	17.7	56.2 (7)	14.0	36.9 (7)	15.8	46.6	7	MS
30	SBST2-30	TKM6	12.5	39.9 (7)	0.0	0.0 (0)	6.3	20.0	3	R
31	SBST2-31	KAUPTB 0627-2-11	21.7	69.0 (9)	32.3	85.2 (9)	27.0	77.1	9	S
32	SBST2-32	KAUPTB 0627-2-14	14.6	46.4 (7)	23.9	63.0 (9)	19.3	54.7	7	MS
33	SBST2-33	KAUPTB 0627-2-15	19.9	63.3 (9)	28.0	73.9 (9)	24.0	68.6	9	S
34	SBST2-34	HWR 17	17.0	54.0 (7)	4.7	12.4 (3)	10.9	33.2	7	MS
35	SBST2-35	RP 5587-B-B-B-41-2	28.6	91.1 (9)	1.3	3.3 (1)	14.9	47.2	7	MS
36	SBST2-36	RP 5587-B-B-B-46-2	26.2	83.2 (9)	26.3	69.4 (9)	26.2	76.3	9	S
37	SBST2-37	RP 5587-B-B-B-209	NG	-	NG	-	-	-	-	-
38	SBST2-38	RP 5587-B-B-B-253-2	22.2	70.7 (9)	24.8	65.4 (9)	23.5	68.0	9	S
39	SBST2-39	RP 5587-B-B-B-253-13	24.3	77.2 (9)	18.0	47.4 (7)	21.1	62.3	9	S
40	SBST2-40	RP5587	19.5	62.0 (9)	25.0	65.8 (9)	22.2	63.9	9	S
41	SBST2-41	RP 5587-B-B-B-258-1	21.8	69.4 (9)	31.7	83.6 (9)	26.8	76.5	9	S
42	SBST2-42	RP 5587-B-B-B-262	21.1	67.3 (9)	24.9	65.6 (9)	23.0	66.4	9	S
43	SBST2-43	RP 5587-B-B-B-267	23.2	73.9 (9)	20.6	54.2 (7)	21.9	64.1	9	S
44	SBST2-44	RP 5587-B-B-B-274-6	27.4	87.3 (9)	28.6	75.4 (9)	28.0	81.3	9	S
45	SBST2-45	RP 5587-B-B-B-275-13	19.7	62.6 (9)	26.4	69.5 (9)	23.0	66.1	9	S
46	SBST2-46	RP 5587-B-B-B-273-1	26.0	82.8 (9)	33.9	89.2 (9)	29.9	86.0	9	S

47	SBST2-47	IET 25109	19.3	61.4 (9)	24.0	63.2 (9)	21.6	62.3	9	S
48	SBST2-48	RP 5588-B-B-B-B-61	21.0	66.7 (9)	7.9	20.8 (5)	14.4	43.7	7	MS
49	SBST2-49	HWR 20	21.3	67.7 (9)	25.3	66.5 (9)	23.3	67.1	9	S
50	SBST2-50	RP5588	26.5	84.4 (9)	22.7	59.8 (7)	24.6	72.1	9	S
51	SBST2-51	RP 5588-B-B-B-B-177	20.9	66.4 (9)	30.7	80.9 (9)	25.8	73.7	9	S
52	SBST2-52	RP 5588-B-B-B-B-206	25.3	80.5 (9)	38.0	100.0 (9)	31.6	90.3	9	S
53	SBST2-53	RP 5588-B-B-B-B-223	22.9	72.7 (9)	29.9	78.7 (9)	26.4	75.7	9	S
54	SBST2-54	RP 5588-B-B-B-B- 226	22.3	71.1 (9)	33.3	87.7 (9)	27.8	79.4	9	S
55	SBST2-55	RP 5588-B-B-B-B-232	21.2	67.5 (9)	26.4	69.5 (9)	23.8	68.5	9	S
56	SBST2-56	RP 5588-B-B-B-B-238	14.6	46.3 (7)	15.8	41.7 (7)	15.2	44.0	7	MS
57	SBST2-57	BK 49-76	15.3	48.7 (7)	22.5	59.3 (7)	18.9	54.0	7	MS
58	SBST2-58	BK 39-179	21.4	67.9 (9)	30.0	79.0 (9)	25.7	73.5	9	S
59	SBST2-59	BK 49-42	16.6	52.8 (7)	24.9	65.5 (9)	20.7	59.2	7	MS
60	SBST2-60	IR64	18.4	58.5 (7)	30.1	79.3 (9)	24.3	68.9	9	S
61	SBST2-61	BK 35-155	18.6	59.1 (7)	28.4	74.7 (9)	23.5	66.9	9	S
62	SBST2-62	BK 64-116	17.5	55.6 (7)	21.4	56.3 (7)	19.4	55.9	7	MS

Conclusion
Screening of stem borer resistance genotypes is only ecological and ecofriendly method for management of Yellow stem borer. Therefore, the present studies has shown that SBST -II were more tolerant than SBST-I, against yellow stem borer. Both genotypes JGL 33080 and TKM6 that were found to be resistant and genotype (JGL 34450) was observed moderate resistant against YSB. Many crosses between these germplasms can be used as donors and resistant germplasm for further selection against yellow stem borer. These results could be supportive for proper management of the yellow stem borer in rice.

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Reference
1. Anonymous. All India Co-ordinated Rice Improvement Programme. Directorate of Rice Research. Rajendranagar, Hyderabad (India). IIRR Annual Progress Report. Entomology. 2017, 2.
2. Anonymous. All India Co-ordinated Rice Improvement Programme. Directorate of Rice Research. Rajendranagar, Hyderabad (India). IIRR Annual Progress Report. Entomology. 2018.
3. Chatterjee S, Gangopadhyay C, Dana I, Roy SK, Mondal P. Host plant resistance against yellow stem borer and rice leaf folder through varietal screening of rice. Plant & Environ. 2021;3(1):23-29.
4. Chatterjee S, Ghose M, Gangopadhyay C. Field screening of different rice entries against different insect pests of rice during Kharif seasons. Int. J Agric. Environ. Biotechnol. 2016;9(4):667.
5. Deka S, Barthakur S. Overview on current status of biotechnological interventions on yellow stem borer *Scirpophaga incertulas* (Lepidoptera: Crambidae) resistance in rice. Biotechnol. Adv. 2010;28(1):70-81.
6. DWR. DWR Vision 2050. Directorate of Weed Research, Indian Council of Agricultural Research. New Delhi. 2015, 1-2.
7. Fahad S, Saud S, Akhter A, Bajwa AA, Hassan S, Battaglia M. Bio-based integrated pest management in rice: An agro-ecosystems friendly approach for agricultural sustainability. Sci. 2021;20(2):94-102.
8. Heinrichs EA, Medrano FG, Rapusas HR. Genetic evaluation for insect resistance in rice. IRRI, Los Banos, Philippines. 1985, 356.
9. Huesing JE, English L. The impact of Bt crops on the developing world. Ag Bio Forum. 2004;7(1):84-95.
10. Jadhao MF, Khurad AM. Biology ofScirpophaga incertulas (W.) a major pest of rice in Eastern Vidarbha, Maharashtra. Int. Indexed& Referred Res. J 2012;1(1):14-16.
11. Joshi S, Tiwari S. Evaluation of different rice genotypes against brown planthopper (*Nilaparvata lugens* Stal.), J Entomol. Zool. Stud. 2019;7:690- 695.
12. Pasalu IC, Krishnaiah NV, Katti G, Varma NRG. IPM in rice. IPM News letter, 2002, 45-55.
13. Prasad SS, Gupta PK, Kanaujia BL. Simulation study on yield loss due to *Scirpophaga incertulas* on semi deep water rice. Ann. Plant Sci. 2007;15:491-192.
14. Rahman ML, Jiang W, Chu SH, Qiao Y, Ham TH, Woo MO. High- resolution mapping of two rice brown planthopper resistance genes, Bph20(t) and Bph21(t), originating from *Oryza minuta*. Theor. Appl. Genet. 2009;119(7):1237-1246.
15. Sarao PS, Mangat GS. Manage rice insect-pests to get higher crop yield. Prog. Farming. 2014;50:4-6.
16. Sarao P, Kaur H. Efficacy of Ferterra 0.4% GR (chlomntraniliprole) against stem borers and leaffolder insect-pests of basmati rice. J Environ. Biol. 2014;35(5):815-819.
17. Senapati B, Panda SK. Rice stem borers: insect pests of cereals and their management. Edts. Anand Prakash and Jagadiswami Rao. AZRA pubis. Cuttack. India. 1999, 2-18.
18. Sharma KR, Raju SVS, Jaiswal DK, Prateek S. Efficacy of certain newer insecticide formulations against yellow stem borer, *Scirpophaga incertulas* (Walker) infesting on rice crop. J Exp Zool. 2018;21(2):771-775.
19. Uniyal A. Studies on new sources of resistance and pesticides compatibility against insect pest of rice (*Oryza sativa* L.). Thesis M. Sc. G. B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand (India). 2018.
20. Visalakshmi V, Hari Satyanarayna N, Jyothula DPB, Raju MRB, Ramana Murthy KV. Screening of rice germplasm for resistance to yellow stem borer *Scirpophaga incertulas* Walker. Int. J Plant Animal Env. Sci. 2014;4(2):129-133.