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Screening of rice (*Oryza sativa* L.) varieties and genotypes against *Scirpophaga incertulas* (Walker)

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Abstract
Seventy three varieties/genotypes of rice (*Oryza sativa* L.) were screened under field condition during *Kharif* 2016 & 2017, to evaluate their performance against *Scirpophaga incertulas*. The trial was laid out in randomized block design with three replications, at JNKVV research farm, Jabalpur. White ears were recorded at the time of dough stage of crop. Lowest white ears (pooled mean) were recorded to be 0.00, 0.17, 0.17 & 0.17 /plant on genotypes IR 36, R 1700- 302-1-156-1, Shymla and IR 64, respectively.

Keywords: *Scirpophaga incertulas*, white ears, resistance, screening

1. Introduction
Rice (*Oryza sativa* L.) belongs to the family Gramineae / Poaceae. It is the most important staple food of more than 60 percent of the world population. Rice crop is affected by various biotic and abiotic stresses. Among the biotic stresses insect pests exert profound influence by limiting the production of rice. An approximate 52 percent of the global rice produce is lost annually owing to the damage caused by biotic factors. Out of which 21 percent is attributed to the attack of insect pest fauna [10]. Major insect pest complex of rice cover the yellow stem borer (*Scirpophaga incertulas* Wlk), brown planthopper (*Nilaparvata lugens* Stal.), white backed planthopper (*Sogatella furcifera* Horvath), green leafhopper (*Nephotettix virescens* Distant), gundhi bug (*Leptocorisa acuta* Thumb), rice hispa (*Dicladispa armigera* Oliv), gall midge (*Orseolia oryzae* Wood Mason), leaf folder, (*Cnaphalocrocis medinalis* Gueni), rice horned caterpillar (*Melanitis leda ismena* Cramer), armyworm (*Mythimna seprata*), paddy skipper (*Pelopidas mathias* Fabricius) & case worm *Nymphula depunctalis* (Guenee) causing frequent or sporadic damage to the crop [1]. Among all insect pest, the rice stem borers are the chief devastators and responsible for economic yield losses under natural condition [4]. These are common and impotent pests in Asian countries, responsible for annual yield losses of 5-10 percent of rice crop [5]. Eight species of stem borer of rice are known to be significantly importance in Asia. This insect attacks the crop specifically during seedling stage and causes yield reduction. Symptoms produced by this insect are drying of central shoot known as dead heart at vegetative stage and white ear and chaffy panicle at harvesting stage, which lead to no grain formation. *S. incertulus* causes yield loss of 27- 34 percent every year [6]. Farmers resort to hazardous pesticides for controlling this pest that leads to numerous undesirable consequences. Using resistant planting material is an important component of rice IPM. Field screening was conducted to identify least preferred varieties and genotypes.

2. Material and Methods
The experimental material consisted of seventy three varieties/genotypes of rice (Table 1) collected from All India Coordinated Research Project on rice, Department of Plant Breeding, IGKVV, Raipur (C.G.) and Department of Genetics and Plant Breeding, JNKVV, Jabalpur (M.P.). All the varieties/genotypes were screened under field condition at JNKVV research farm during *kharif* 2016 and 2017. Nursery of these varieties/genotypes was prepared as per the common practices. Thirty days old healthy seedlings were transplanted in experimental field in Randomized Block Design, with three replications, to evaluate them against *S. incertulas*. Single seedling was transplanted per hill. All the recommended agronomical practices were adopted during crop cultivation. Transplanting was done at a spacing of 15×15 cm to enhance the infestation of *S. incertulas*.

Each plot contained six rows of test varieties / genotypes and each row was 2.25 m long, with a total of 15 plants. Total numbers of white ears were recorded at the dough stage of the crop. Sample unit was individual plant and 25 randomly selected plants were observed in every plot.

2.1 Statistical analysis
The mean data of white ears on different varieties and genotypes was subjected to analysis of variance at 5% level of significant. White ears density of both the years was pooled analysed.

3. Result and Discussion
Mean number of white ears by *S. insertullus*, recorded on seventy three rice varieties / genotypes, is presented in (Table 1). Mean number of white ears (2016 and 2017 pooled) of *S. incertulas* ranged between 9.83 (TN 1) and 0.00 (IR 36) /plant. Among all varieties/genotypes the entries least preferred by *S. incertulas* were IR 36 followed by R 1700-302-1-156-1, Shymla, IR 64, Dantashwari, Poornima and Bhuvan (0.00,0.17,0.17,0.17,0.17,0.17 and 0.33 white ears/plant, respectively) and were statistically at par. These findings are in agreement with the finding of [3, 9, 7, 2, 8], which also evaluated rice entries against *S. incertulas* and reported both TN 1 and IR 36 to be susceptible and resistant varieties, respectively.

Table 1: Mean number of white ears/plant on different varieties / genotypes of rice *Kharif* (2016 – 2017 pooled)

Sr. No.	Varieties/ genotypes	Mean number of white ears/plant (Pooled)**		
		Mean 2016	Mean 2017	Pooled Mean 2016-2017
1	Kalinga	4.00 (2.08)	3.33 (1.93)	3.67 (2.04) *
2	Vandana	1.67 (1.46)	1.33 (1.34)	1.50 (1.41)
3	Aditya	1.67 (1.46)	2.00 (1.56)	1.83 (1.53)
4	MTU1060	3.00 (1.86)	2.67 (1.76)	2.83 (1.83)
5	Sasya Shree (IET-2815)	0.67 (1.05)	1.00 (1.22)	0.83 (1.15)
6	PR-103	4.33 (2.20)	3.67 (2.04)	4.00 (2.12)
7	Poornima	0.00 (0.71)	0.33 (0.88)	0.17 (0.81)
8	Danteshwari	0.33 (0.88)	0.00 (0.71)	0.17 (0.81)
9	Indira Barani Dhan 1	2.33 (1.68)	2.00 (1.56)	2.17 (1.63)
10	ASD-16	3.33 (1.93)	2.33 (1.64)	2.83 (1.82)
11	Samlashwari	1.33 (1.29)	1.33 (1.34)	1.33 (1.35)
12	IR 36	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
13	IR 64	0.33 (0.88)	0.00 (0.71)	0.17 (0.81)
14	JRH-5	1.33 (1.34)	1.00 (1.22)	1.17 (1.29)
15	MTU 1010	1.33 (1.34)	0.33 (0.88)	0.83 (1.13)
16	Pant Dhan 11	0.33 (0.88)	0.67 (1.05)	0.50 (1.00)
17	Bhuvan	0.33 (0.88)	0.33 (0.88)	0.33 (0.91)
18	Chandrahasni	1.00 (1.17)	0.67 (1.05)	0.83 (1.15)
19	Karma Masuri	1.00 (1.17)	0.67 (1.05)	0.83 (1.15)
20	IGKVR 1244 (Indira Maheshwari)	0.67 (1.05)	0.33 (0.88)	0.50 (1.00)
21	Sampada	3.33 (1.95)	3.67 (2.04)	3.50 (2.00)
22	Improved Samba Masuri	2.67 (1.77)	2.67 (1.77)	2.67 (1.78)
23	Mahamaya	0.33 (0.88)	0.67 (1.05)	0.50 (1.00)
24	Bamleshwari	1.67 (1.46)	1.33 (1.34)	1.50 (1.41)
25	Vijata (MTU 1001)	1.67 (1.46)	1.33 (1.34)	1.50 (1.41)
26	CR Sugandhit 907	3.67	4.00	3.83

		(2.02)	(2.08)	(2.08)
27	Shymla	0.33 (0.88)	0.00 (0.71)	0.17 (0.81)
28	HMT	2.00 1.56	2.33 1.68	2.17 (1.63)
29	Mahsuri	2.00 1.56	2.00 1.56	2.00 (1.58)
30	Safari 17	1.33 (1.27)	1.67 (1.44)	1.50 (1.41)
31	Jaldubi	1.67 (1.39)	1.00 (1.17)	1.33 (1.35)
32	Swarna (MTU 7029)	1.67 (1.39)	2.00 (1.56)	1.83 (1.53)
33	Badshah bhog	1.33 (1.34)	1.33 (1.34)	1.33 (1.35)
34	Improved Pusa Basmati	4.67 (2.27)	5.33 (2.41)	5.00 (2.34)
35	Indira Sugandhit Dhan 1	3.67 (2.00)	3.67 (2.00)	3.67 (2.04)
36	Sugandhmati	3.33 (1.95)	3.00 (1.86)	3.17 (1.91)
37	Basmati 370	4.00 (2.11)	4.00 (2.11)	4.00 (2.12)
38	R 2029-854-4-319-1	2.33 (1.64)	2.33 (1.64)	2.33 (1.68)
39	R 1882-310-1-256-1	2.33 (1.68)	2.00 (1.56)	2.17 (1.63)
40	R 1656-1939-1-80-1	1.33 (1.34)	1.67 (1.46)	1.50 (1.41)
41	R 1667-1025-1-97-1	2.00 (1.560	2.00 (1.56)	2.00 (1.58)
42	R 2090-818-1-275-1	3.33 (1.95)	2.67 (1.77)	3.00 (1.87)
43	R 1860 - 783 - 1- 424-1	0.67 (1.00)	1.00 (1.17)	0.83 (1.15)
44	R 2093 - 1536 -1-660 -1	1.00 (1.17)	1.33 (1.34)	1.17 (1.29)
45	R 1700- 302-1-156-1	0.00 (0.71)	0.33 (0.88)	0.17 (0.81)
46	R 1750 - 937-1-530-1	1.67 (1.46)	2.00 (1.56)	1.83 (1.53)
47	R 1700-2240-4-2295-1	1.67 (1.39)	2.33 (1.68)	2.00 (1.58)
48	R 1747 -4941-1-515-1	1.67 (1.46)	1.67 (1.46)	1.67 (1.47)
49	R 2058-687-1-208-1	2.00 (1.58)	2.00 (1.58)	2.00 (1.58)
50	R 1959-14-5-13-1	0.33 (0.88)	1.00 (1.17)	0.67 (1.07)
51	R 2032-125-1-89-1	2.00 (1.56)	2.00 (1.56)	2.00 (1.58)
52	R 2032-130-1-95-1	0.67 (1.05)	1.00 (1.22)	0.83 (1.15)
53	R1921-166-1-108-1	3.33 (1.94)	3.33 (1.94)	3.33 (1.96)
54	R 2048 - 185-2-123-1	1.33 (1.34)	1.33 (1.34)	1.33 (1.35)
55	P-1401	5.00 (2.34)	5.00 (2.34)	5.00 (2.35)
56	P-1460	4.00 (2.11)	4.33 (2.18)	4.17 (2.16)
57	Madhuri	3.00 (1.86)	3.00 (1.86)	3.00 (1.87)
58	Chinnor	3.33 (1.94)	2.67 (1.76)	3.00 (1.87)
59	Naveen	0.00 (0.71)	1.00 (1.17)	0.50 (0.97)
60	Pusa 1121 (PS-4)	6.67 (2.68)	7.00 (2.73)	6.83 (2.71)
61	Pusa Sugandha (PS-3)	4.33 (2.20)	4.67 (2.26)	4.50 (2.24)

62	Karnal Basmati	6.33 (2.60)	5.33 (2.40)	5.83 (2.51)
63	Kali Muchh	1.00 (1.17)	1.33 (1.34)	1.17 (1.29)
64	WGL 32100	2.33 (1.66)	2.67 (1.77)	2.50 (1.73)
65	JRH-5 (Hybrid)	4.00 (2.12)	4.33 (2.20)	4.17 (2.16)
66	Hanseshwari	1.33 (1.29)	1.67 (1.46)	1.50 (1.41)
67	Hybrid JRH 19	3.67 (2.00)	3.67 (2.00)	3.67 (2.04)
68	JRH-4	2.00 (1.56)	2.00 (1.56)	2.00 (1.58)
69	NPT 81	1.67 (1.46)	2.33 (1.64)	2.00 (1.58)
70	NPT 15	3.33 (1.95)	3.33 (1.95)	3.33 (1.96)
71	JR 201	1.00 (1.17)	1.33 (1.29)	1.17 (1.29)
72	TN 1 (S)	9.67 (3.18)	10.00 (3.24)	9.83 (3.21)
73	PTB 33 (R)	4.00 (2.11)	4.33 (2.18)	4.17 (2.16)

****** Mean of 25 plants ***** Transformed values (√x)

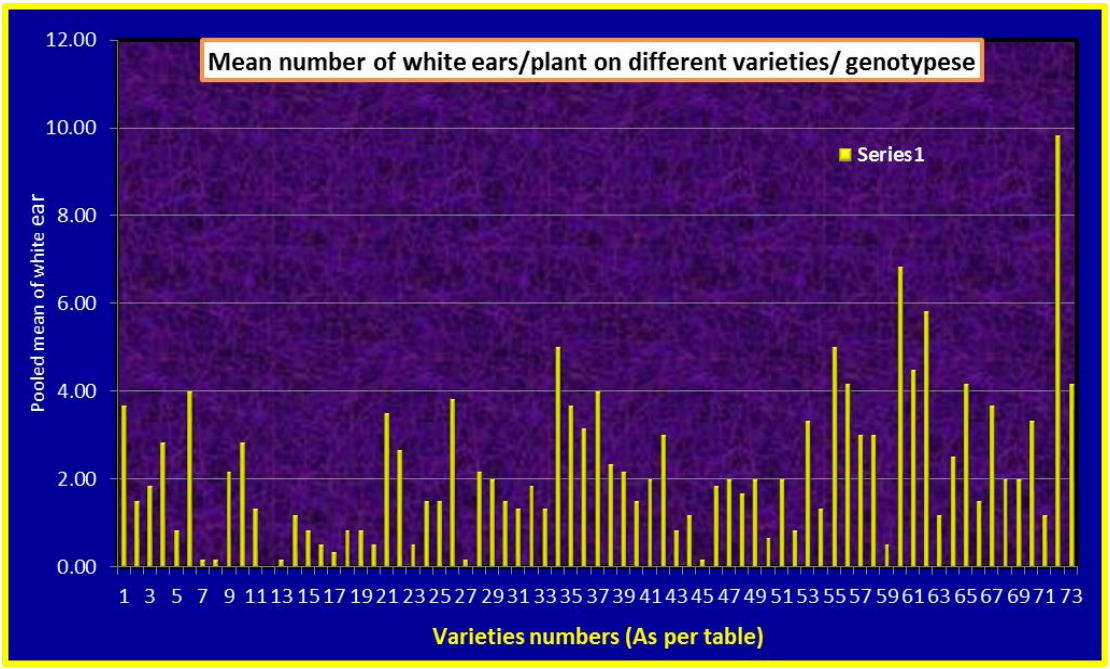

Fig 1: Mean number of white ears/plant on different varieties/genotypes of rice

4. Conclusion

Among all tested rice entries only few entries showed resistance against *S. incertulus.* Entries having lowest white ears were recorded on IR 36, R 1700- 302-1-156-1, Shymla, IR 64, Dantashwari, Poornima and Bhuvan.

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