Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(3): 487-490

Received: 09-03-2018
Accepted: 10-04-2018

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Field screening of rice (*Oryza sativa* L.) varieties & genotypes against hopper complex

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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 hopper complex. The trial was laid out in randomized block design with three replications, at JNKVV research farm, Jabalpur. Susceptible and resistant check varieties were TN-1 and PTB-33, respectively. The population of *Nilaparvata lugens*, *Sogatella furcifera* and *Nephotettix virescens* were recorded throughout the crop period at 10 days intervals. Lowest pooled mean population of *Nilaparvata lugens* were recorded to be 0.84, 1.03 and 1.31 hoppers/plant on genotype R 1750-937-1-530-1, PTB-33 and R 2090-818-1-275-1, respectively. *Sogatella furcifera* population was lowest on genotypes/varieties R 1700-2240-4-2295-1, PTB 33 and MTU 1060 (1.12, 1.69 and 1.98 hoppers/plant, respectively), while lowest mean population of *Nephotettix virescens* was recorded on genotype R 1747-4941-1-15-1, followed by variety IR 64 & genotype R 1700-2240-4-2295-1, (1.08, 1.28, 1.40 hoppers/plant).

Keywords: *Nilaparvata lugens*, *Sogatella furcifera*, *Nephotettix virescens*, population, resistance

1. Introduction
Rice (*Oryza sativa* L.) belongs to family Gramineae/Poaceae. It is the most important staple food of more than 60 per cent of the world's population. Rice crop is influenced by various biotic and abiotic factors. Among the biotic factors insect fauna constitutes a dominant factor for decreasing the production. An approximate 52 per cent of the global rice produce is lost annually owing to the damage caused by biotic factors, out of which 21 per cent is attributed to the attack of insect pest fauna [10]. Major insect pest fauna 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 [2]. Among all insect pest fauna, the hopper complex is one of the most consumptive pest complexes of rice causing enormous yield losses every year throughout the rice grown areas of Asia [5]. In Madhya Pradesh and Chhattisgarh area the brown planthopper (*N. lugens*) assumed greater importance due to it's sever outbreak in 1975 and consequent yield losses reported to the extent of 34.3% [3]. The hopper complex causes direct damage as sucking pest and acts as vector for several viral diseases, causing severe yield losses to susceptible varieties every year [7]. Different recommended agronomical practices viz. close spacing of plants, excess use of fertilizers, etc. also favor a high population of hopper complex in rice ecosystem. Attempts to control this pest with chemical methods have given rise to many problems like pest resurgence, resistance to insecticides, destruction of natural enemies, development of new biotypes, pesticide residues in grains, etc.
Field screening was conducted to identify resistant or tolerant rice varieties and genotypes as a tool for IPM programmes.

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 hopper complex. 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 multiplication of hopper complex as proposed by [6]. Each plot contained six rows of test varieties/genotypes and each row was 2.25 m long, with a total of 15 plants. Susceptible check TN-1 plot was transplanted at the beginning and after every plot of each replication. Resistant check variety PTB-33 was transplanted in one plot in the middle of each replication. Observation on population density of sucking insect pests complex were recorded at 10 days intervals, starting with 10 days old transplanted rice. Sample unit was individual plant and 10 randomly selected plants were observed in every plot. The mean population data of hopper complex on different varieties and genotypes was subjected to analysis of variance at 5% level of significance. Population density of both the years during different observations were pooled and analysed.

2.2 Statistical analysis

The population data of hopper complex on different varieties & genotypes were subjected to the statistical analysis of variance at 5% level of significant.

3. Results and Discussion

Seasonal mean population of *N. lugens*, *S. furcifera* and *N. virescens* recorded on seventy three rice varieties/genotypes are presented in Table 1.

3.1 Nilaparvata lugens

Seasonal pooled mean population (2016 and 2017 pooled) of *N. lugens* ranged between 25.58 (TN-1) and 0.84 (genotype R 1750-937-1-530-1) hoppers/plant. Among all genotypes/ varieties the entries least preferred by *N. lugens* were R-1750-937-1-530-1 followed by PTB-33, R-2090-818-1-275-1, R 2048-185-2-123-1, R 1959-14-5-13-1, R 1656-1939-1-80-1, R-1700-2240-4-2295-1 and Poornima (0.84,1.03,1.31,1.37,1.42,1.63,1.65 and 1.81 hoppers/plant, respectively) and were statistically at par. These finding are in agreement with the finding of [1], [4] and [9], which also evaluated rice entries against plant hopper and reported variety PTB-33 as highly resistant.

3.2 Sogatella furcifera

The seasonal pooled mean (2016 and 2017) population of *S. furcifera* was observed to be between 19.82 (TN1) and 1.12 (R 1700-2240-4-229-1) hoppers/plant. Lowest mean population was observed in genotype R 1700-2240-4-2295-1, followed by PTB 33, MTU 1060, R 2090-818-1-275-1, Bhuvan, R 1750-937-1-530-1, IR 64, R 2048-185-2-123-1 (1.12, 1.69, 1.98, 2.00, 2.03, 2.13, 2.14 and 2.20 hoppers/plant) and were statistically at par. [8] Screened 1224 rice accessions against *S. furcifera*, and reported 57 accessions to be resistant.

3.3 Nephotettix virescens

The seasonal pooled mean (2016 and 2017) population of *N. virescens* was observed to be between 11.25 (TN1) and 1.08 (R 1747-4941-1-515-1) hoppers/plant. Genotype R 1747-941-1-515-1, followed by variety IR 64, genotype R 1700-2240-4-2295-1, R 1656-1939-1-80-1, varieties Bhuvan, IGKVR 1244 (Indira Maheshwari), Chandrahasni, genotype R 2090-818-1-275-1and variety PTB 33 recorded lowest number of this pest (1.08, 1.28, 1.40, 1.43, 1.46, 1.47, 1.54, 1.61 and 1.63 hoppers/plant) and were statistically at par.

Table 1: Seasonal mean population density/plant of *Nilaparvata lugens*, *Sogatella furcifera* and *Nephotettix virescens* on different varieties/genotypes of rice *Kharif* (2016-2017 pooled)

Sr. No.	Varieties/genotypes	Seasonal mean population density/plant (Pooled)		
		Nilaparvata lugens	Sogatella furcifera	Nephotettix virescens
1	Kalinga	5.75 (2.50)*	4.78 (2.30)	3.61 (2.03)
2	Vandana	5.41 (2.43)	4.77 (2.30)	3.02 (1.88)
3	Aditya	13.33 (3.72)	8.35 (2.97)	5.69 (2.49)
4	MTU1060	2.17 (1.63)	1.98 (1.58)	1.93 (1.56)
5	Sasya Shree (IET-2815)	4.34 (2.20)	3.45 (1.99)	2.34 (1.68)
6	PR-103	15.44 (3.99)	8.70 (3.03)	5.56 (2.46)
7	Poornima	1.81 (1.52)	2.39 (1.70)	2.43 (1.71)
8	Danteshwari	14.85 (3.92)	9.80 (3.21)	6.12 (2.57)
9	Indira Barani Dhan 1	15.39 (3.99)	10.23 (3.28)	5.85 (2.52)
10	ASD-16	6.27 (2.60)	5.54 (2.46)	3.60 (2.02)
11	Samlashwari	16.72 (4.15)	9.65 (3.19)	6.46 (2.64)
12	IR 36	6.33 (2.61)	4.16 (2.16)	2.88 (1.84)
13	IR 64	2.04 (1.59)	2.14 (1.62)	1.28 (1.33)
14	JRH-5	5.27 (2.40)	4.21 (2.17)	2.99 (1.87)
15	MTU 1010	4.88 (2.32)	4.68 (2.27)	2.71 (1.79)
16	Pant Dhan 11	4.79 (2.30)	3.52 (2.01)	2.69 (1.78)
17	Bhuvan	2.13 (1.62)	2.03 (1.59)	1.46 (1.40)
18	Chandrahasni	2.22 (1.65)	2.29 (1.67)	1.54 (1.43)
19	Karma Masuri	5.61 (2.47)	4.85 (2.31)	3.92 (2.10)
20	IGKVR 1244 (Indira Maheshwari)	2.35 (1.69)	2.30 (1.67)	1.47 (1.40)
21	Sampada	6.91 (2.72)	6.64 (2.67)	3.49 (1.99)
22	Improved Samba Masuri	15.25 (3.97)	10.39 (3.30)	5.83 (2.52)
23	Mahamaya	17.03 (4.19)	11.77 (3.50)	7.67 (2.86)
24	Bamleshwari	16.43 (4.11)	12.61 (3.62)	7.88 (2.89)
25	Vijata (MTU 1001)	2.44 (1.72)	3.05 (1.88)	2.14 (1.62)
26	CR Sugandhit 907	6.08 (2.57)	4.76 (2.29)	2.82 (1.82)

27	Shymla	8.82 (3.05)	5.98 (2.55)	3.87 (2.09)
28	HMT	16.56 (4.13)	10.70 (3.35)	7.38 (2.81)
29	Mahsuri	18.19 (4.32)	11.78 (3.50)	7.71 (2.86)
30	Safari 17	8.67 (3.03)	6.46 (2.64)	4.75 (2.29)
31	Jaldubi	9.49 (3.16)	7.96 (2.91)	3.93 (2.10)
32	Swarna (MTU 7029)	9.17 (3.11)	6.67 (2.68)	4.18 (2.16)
33	Badshah bhog	2.46 (1.72)	2.57 (1.75)	1.71 (1.49)
34	Improved Pusa Basmati	8.95 (3.07)	7.29 (2.79)	5.26 (2.40)
35	Indira Sugandhit Dhan 1	9.24 (3.12)	7.68 (2.86)	5.05 (2.35)
36	Sugandhmati	10.09 (3.25)	10.06 (3.25)	5.71 (2.49)
37	Basmati 370	6.87 (2.71)	6.99 (2.74)	5.37 (2.42)
38	R 2029-854-4-319-1	3.96 (2.11)	4.82 (2.31)	2.63 (1.76)
39	R 1882-310-1-256-1	4.40 (2.21)	4.52 (2.24)	3.53 (2.00)
40	R 1656-1939-1-80-1	1.63 (1.46)	2.44 (1.71)	1.43 (1.39)
41	R 1667-1025-1-97-1	2.12 (1.62)	2.46 (1.72)	1.75 (1.50)
42	R 2090-818-1-275-1	1.31 (1.35)	2.00 (1.58)	1.61 (1.45)
43	R 1860-783-1-424-1	3.03 (1.88)	2.69 (1.79)	2.28 (1.67)
44	R 2093-1536-1-660 -1	4.05 (2.13)	3.28 (1.94)	2.93 (1.85)
45	R 1700-302-1-156-1	2.69 (1.79)	3.06 (1.89)	2.08 (1.61)
46	R 1750-937-1-530-1	0.84 (1.16)	2.13 (1.62)	2.17 (1.63)
47	R 1700-2240-4-2295-1	1.65 (1.47)	1.12 (1.27)	1.40 (1.37)
48	R 1747-4941-1-515-1	2.92 (1.85)	2.39 (1.70)	1.08 (1.26)
49	R 2058-687-1-208-1	4.12 (2.15)	3.52 (2.01)	2.05 (1.60)
50	R 1959-14-5-13-1	1.42 (1.39)	2.38 (1.69)	1.73 (1.49)
51	R 2032-125-1-89-1	4.24 (2.18)	3.21 (1.93)	2.03 (1.59)
52	R 2032-130-1-95-1	1.84 (1.53)	2.53 (1.74)	1.99 (1.58)
53	R1921-166-1-108-1	2.92 (1.85)	2.97 (1.86)	2.25 (1.65)
54	R 2048-185-2-123-1	1.37 (1.37)	2.20 (1.64)	1.65 (1.47)
55	P-1401	3.61 (2.03)	3.68 (2.04)	3.99 (2.12)
56	P-1460	3.27 (1.94)	4.33 (2.20)	4.13 (2.15)
57	Madhuri	5.02 (2.35)	4.42 (2.22)	2.92 (1.85)
58	Chinnor	3.92 (2.10)	3.87 (2.09)	3.23 (1.93)
59	Naveen	6.56 (2.66)	6.68 (2.68)	4.43 (2.22)
60	Pusa 1121 (PS-4)	17.27 (4.22)	13.15 (3.69)	7.79 (2.88)
61	Pusa Sugandha (PS-3)	18.73 (4.39)	13.64 (3.76)	7.58 (2.84)
62	Karnal Basmati	11.77 (3.50)	8.03 (2.92)	6.22 (2.59)
63	Kali Muchh	6.14 (2.58)	6.04 (2.56)	4.20 (2.17)
64	WGL 32100	11.93 (3.53)	10.59 (3.33)	6.51 (2.65)
65	JRH-5 (Hybrid)	2.39 (1.70)	2.62 (1.77)	2.69 (1.78)
66	Hanseshwari	5.05 (2.36)	4.17 (2.16)	3.24 (1.93)
67	Hybrid JRH 19	6.28 (2.60)	4.60 (2.26)	3.64(2.03)
68	JRH-4	4.86 (2.32)	4.70 (2.28)	3.03 (1.88)
69	NPT 81	7.34 (2.80)	6.27 (2.60)	4.29 (2.19)
70	NPT 15	6.71 (2.69)	5.42 (2.43)	4.11 (2.15)
71	JR 201	3.25 (1.94)	4.76 (2.29)	3.51 (2.00)
72	TN 1 (S)	25.58 (5.10)	19.82 (4.50)	11.25 (3.43)
73	PTB 33 (R)	1.03 (1.23)	1.69 (1.48)	1.63 (1.46)

* Transformed values ($\sqrt{x}$)

4. Conclusion
Among all tested rice entries only few entries showed resistance against hopper complex. Entries were having lowest population density of *N. lugens* were R-1750-937-1-530-1 followed by PTB-33, R-2090-818-1-275-1, R 2048-185-2-123-1, R 1959-14-5-13-1, R 1656-1939-1-80-1, R-1700-2240-4-2295-1 and Poornima. Lowest pooled mean population of *S. furcifera* was observed on genotypes R 1700-2240-4-2295-1, followed by PTB 33, MTU 1060, R 2090-818-1-275-1, Bhuvan, R 1750-937-1-530-1, IR 64, R 2048-185-2-123-1. Varieties/genotype namely R 1747-4941-1-515-1, IR 64, R 1700-2240-4-2295-1, R 1656-1939-1-80-1, Bhuvan, IGKVR 1244 (Indira Maheshwari), Chandrahasni, R 2090-818-1-275-1, & PTB-33 were least preferred by *N. virescens.*

5. Acknowledgement
Special thanks are due to Dr. A.K. Sarawgi (Prof. & Head), Department of Genetics & Plant Breeding and Dr. D.K. Rana (Principal Scientist), Department of Entomology IGKVV Raipur (C.G.) for their valuable advice and for providing rice varieties & germplasm for screening trial.

6. References
1. Alagar M, Suresh S, Saravanan PA. Feeding behavior of *Nilaparvata lugens* on selected rice genotypes. Ann. Pl. Protec. Sci. 2008; 16:43-45.
2. Anonymous. Standard Evaluation System, IRRI, Philippines, 1996, 20.
3. Gangrade GA, Kaushik UK, Patidar GL, Shukla BC, Shrivastava SK, Deshmukh PD *et al*. Insect pests of summer paddy in India. International Rice Research Newsletter. 1978; 3(6):16.
4. Kumar and Tiwari. New sources of resistance against rice brown plant hopper, *Nilaparvata lugens* (Stal.) Indian Journal of Entomology. 2010; 72(3):228-232.
5. Park DS, Song MY, Park SK, Lee SK, Lee JH. Molecular tagging of the Bph locus for resistance to brown

planthopper (*Nilaparvata lugens* Stal) through representational divergence analysis. Molecular Genetics and Genomics. 2008; 280:163-172.
6. Satpathi CR, Chakraborty K, Acharjee P. Impact of seedling spacing and fertilizer on brownn plant hopper, *Nilaparvata lugens* Stal. Incidence in rice field. J Biol. Chem. Res. 2012; 29(1):26-36.
7. Sogawa K, Liu GJ, Shen JH. A review on the hyper-susceptibility of Chinese hybrid rice to insect pests. Chinese Journal of Rice Science. 2003; 17:23-30.
8. Singh Beant, Shukla KK. Screening of rice germplasm against stem borers and white backed planthopper. Indian Journals. 2008; 34(2):157-159.
9. Sri Chandana Bhogadhi, Bentur JS. Screening of rice genotypes for resistance to brown plant hopper biotype 4 and detection of BPH resistance genes. International Journal of Life Sciences Biotechnology and Pharma Research. 2015; 4(2):90-95.
10. Yarasi B, Sadumpati V, Immanni CP, Reddy V, Venkateswara RK. Transgenic rice *O. sativa* expressing *Allium sativum* leaf agglutinin (ASAL) exhibits high-level resistance against major sap-sucking pests. BMC Plant Biology. 2008; 8:102.