RESEARCH ARTICLE

OVIPOSITION PREFERENCE OF BROWN PLANTHOPPER, *NILAPARVATALUGENSE* (STAL.) ON RICE GERMPLASM OF CHHATTISGARH AS A SOURCE OF RESISTANCE

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Abstract: The present studies were conducted in the glass house condition at IGKV Raipur during 2018 -19 with an objectiveovipositional preference of brown planthopper on rice germplasm of Chattisgarh as a source of resistance under control condition. The oviposition and unhatched eggs of female of the brown planthopper, *Nilaparvatalugens*(Stal.) average 75-85.25.The lowest egg laying by female BPH was in accession no. A: 145II and highest in susceptible check TN1 (126.75) and unhatched eggs range from 29.50-57.75, which was highest were resistant germplasm and lowest were TN1(10.25).The average egg laying, nymph emergence and percent unhatched eggs of this pest is described.

Keyword: BPH, Rice germplasm, Screening, Antibiosis, Oviposition

INTRODUCTION

Rice (*Oryzasativa*), belongs to the genus *Oryza* and the family Gramineae or Poaceae. Rice is a major source of calories, consumed by more than half of the world's population. (FAOSTAT - 2006). Rice is a staple food for more than half of human beings. In India, it forms one of the most important grain crops and is cultivated on 42.2 million hectares, which accounts for about 28 percent of the world's acreage. India is the world's second-largest producer and buyer of rice, after china. (Mishra, 2005). Rice covers an area of 3.80 million hectares, yielding 5 mt and 1522 kg per 1 hectare, respectively (Anonymous, 2007). In India, losses caused by various insect pests of rice are reported at 15,120 million rupees, which is also 18.60 percent of total losses (Lal, 1996). To ensure global food security to sustain human growth, it is important to control the various pests that harm rice (Normile, 2008).

Rice production is adversely affected by many biotic and abiotic factors. Among the biotic factor, the brown Planthopper, *Nilaparvatalugens* (Stal.) is major one.The brown planthopper is a small insect repel lent of 2.0-3.5 mm, with a brown in colour, and belong to order Hemiptera, suborder Homoptera, and family Delphinidae. BPH causes damage to the rice plant directly by sucking plant sap and closing the root of the xylem and phloem within its feeding sheaths, resulting in a significant decrease in yield. (Sogawa and Cheng, 1977).

MATERIALS AND METHODS

Mass culture of BPH

The experiment was conducted at the glasshouse, Department of Entomology, Collage of Agriculture, Indira Gandhi KrishiVishwavidyalaya, Raipur (C.G) during the year 2018-19. The initial population of unparasitized brown planthopper nymphs or females were collected from the rice field and its culture is maintained in the glasshouse at 30 °c±5 temperature. The glasshouse was equipped with an air-cooled system to maintain the optimum range of temperature during the summer season. The brown planthopper were reared using a TN1 rice variety as described by Pathak and Khus (1979) potted TN1 plants were placed inside the rear cage for ovulation, as well as at least 2-3 pairs (male and female) of brown planthoppers per hill. When raised nymphs developed in the second instar, they were used for screening rice germplasm.The brown planthopper continues the insect multiplication process - screening of rice germplasm for preference, and non-preference response, oviposition, and nymphal survival test.

Fecundity, Ovicidal Test

The well-germinated seeds of selected different categories of rice germplasm were fertilizer rich soil. After 30 days the old rice plant was covered with a plastic mylar tube and the open end of the tube was covered with a muslin cloth and tied with a rubber band. A pair of adults, i. e a gravid female and male, was released into old rice seedlings with an aspirator, then the open end was closed with a muslin cloth and tied with a rubber band.

The adult was removed from the cage when the female stopped oviposition. Oviposinal test for BPH on various rice germplasm is shown in figure number1.Plants were observed for the emergence of nymphs. The number of hatched out nymphs was counted and removed from the plant daily when the nymphs stop hatching, ie after 15–20 days of adult release, the plants were cut from the base and examined under a stereo binocular microscope to count and record the total number of eggs bunches and unhatched eggs. An unhatched egg was expressed as a percentage of the total, which is the

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sum of the number of nymphs and the number of eggs that emerged.

$$\% \text{ of unhatched eggs} = \frac{\text{Number of unhatched eggs}}{\text{No. of emerged nymphs + No. of unhatched eggs}} \times 100$$

RESULTS AND DISCUSSION

Fecundity, Ovicidal test

The highly resistant and resistant rice germplasm, which served as hosts for BPH, had adverse effect on normal biology of BPH, while the susceptible check, TN1 favoured multiplication of the pest. Effect of different rice germplasm on fecundity and egg hatching are present in (Table1) that indicated decrease in fecundity of BPH when fed on highly resistant and resistant selected rice germplasm compared to the susceptible check, TN1.

The number of eggs / plants laid by the BPH female on all resistant germplasm ranged from 75 to 85.25, which was less than the susceptible check TN1 (126.75). The lowest egg laying of BPH was observed on rice accession AC. A: 145 II (75), followed by A: 88 V and A: 88 II (76) and A: 95 I (76.50), while the resistance test ptb33 having 76.25 and 126.75 eggs on the susceptible check TN 1, respectively. The susceptible check TN 1 (116.50) had a significantly higher average number of nymphs / plant.

There was a very low emergence of nymphs in all resistant rice germplasm. Among resistant rice germplasm, nymphal emergence values ranged from 17.25 to 55.75. Resistance check Ptb 33 had an emergence value of 15.75. The lowest nymphs emergence was found in accession A: 145 II (17.25). Unhatchedeggs was recorded in resistant rice germplasm ranging from 29.50 to 57.75. In general, it was the minimum in susceptible Check TN 1 (10.25), whereas lowest number of unhatched eggs was 24.75 in A: C 114 I (29.50) and A: 296. All resistant germplasmes showed significantly higher numbers of eggs unhatched than the susceptible check TN1.The percentage of egg unhatchedvalue among all resistant rice germplasm ranged from 34.60 to 77 percent, while it was 79.34 percent and 8.09 percent, respectively, in resistant test Ptb 33 and susceptible check TN 1. The highest percentage (77%) of unhatchedeggs was found in A: 145 II followed by A: 88 V (74.34) and A: 88 II (72.37).

Fig. 1. Ovicidal effect test and Unhatched eggs removed from plant tissue of rice germplasmagainst brown planthopper

Table 1. Ovipositional response of different categories of rice germplasm against brown planthopper

S. No.	Collector's No.	Accession. No.	Vernacular Name	AV.No. of nymph emergence / Plant	AV. No. of unhatched egg./Plant	Total fecundity /Plant	Percentunhatched egg.
1	CGR: 10065	A:95 I	Atmashital	24.25 * (5.02)**	52.25 * (7.29) **	76.50	68.30
2	CGR:10108	A:211 VI	Ajan VI	27.50 (5.33)	49.25 (7.08)	76.75	64.17
3	CGR:10111	A:296 I	Ajan	54.25	29.75	84	35.42

				(7.42)	(5.48)		
4	CGR:10114	A:373 II	Ajan	30.50	46.50	77	60.39
				(5.61)	(6.89)		
5	CGR:10189	A:88 V	Anjaniya	19.50	56.50	76	74.34
				(4.52)	(7.58)		
6	CGR:10190	A:88 II	Anjaniya	21.00	55	76	72.37
				(4.68)	(7.47)		
7	CGR:10192	A:145 II	Anjaniya	17.25	57.75	75	77.00
				(4.27)	(7.66)		
8	CGR:10212	AC:33	NA	34.25	43.50	77.75	55.95
				(5.93)	(6.66)		
9	CGR:10224	AC:82	NA	44.25	35.75	80	44.69
				(6.72)	(6.05)		
10	CGR:10229	AC:88	NA	37.00	41	78	52.56
				(6.16)	(6.48)		
11	CGR:10245	AC:105	NA	38.50	39.50	78	50.64
				(6.28)	(6.36)		
12	CGR:10254	AC:114 I	NA	55.75	29.50	85.25	34.60
				(7.53)	(5.52)		
13	CGR:10271	B:326 V	Bacheli	46.75	34.50	81.25	42.46
				(6.90)	(5.95)		
14	CGR:10297	B:577 II	Badhiyaunda II	48.75	32.75	81.50	40.18
				(7.05)	(5.80)		
15	CGR:10387	B:1019 II	Bajraj II	41.00	38	79	48.10
				(6.48)	(6.24)		
16	CGR:10421	B:264	Bangla	51.25	31.50	82.75	38.07
				(7.21)	(5.68)		
17	CGR:10448	R:461	Raja bangle	43.50	36.25	79.75	45.45
				(6.67)	(6.10)		
18	CGR:10568	R: 203 II	Raibanko II	50.00	32	82	39.02
				(7.13)	(5.74)		
19	PTB 33	-	-	15.75	60.50	76.25	79.34
	(R. check)			(4.09)	(7.84)		
20	TN 1	-	-	116.50	10.25	126.75	8.09
	(S. check)			(10.84)	(3.35)		
21	SEm (±)			0.08	0.12		
22	CD at 5%			0.23	0.36		

***Average of four replication,**
**** Figure in the paretheses are squre root transformed value**

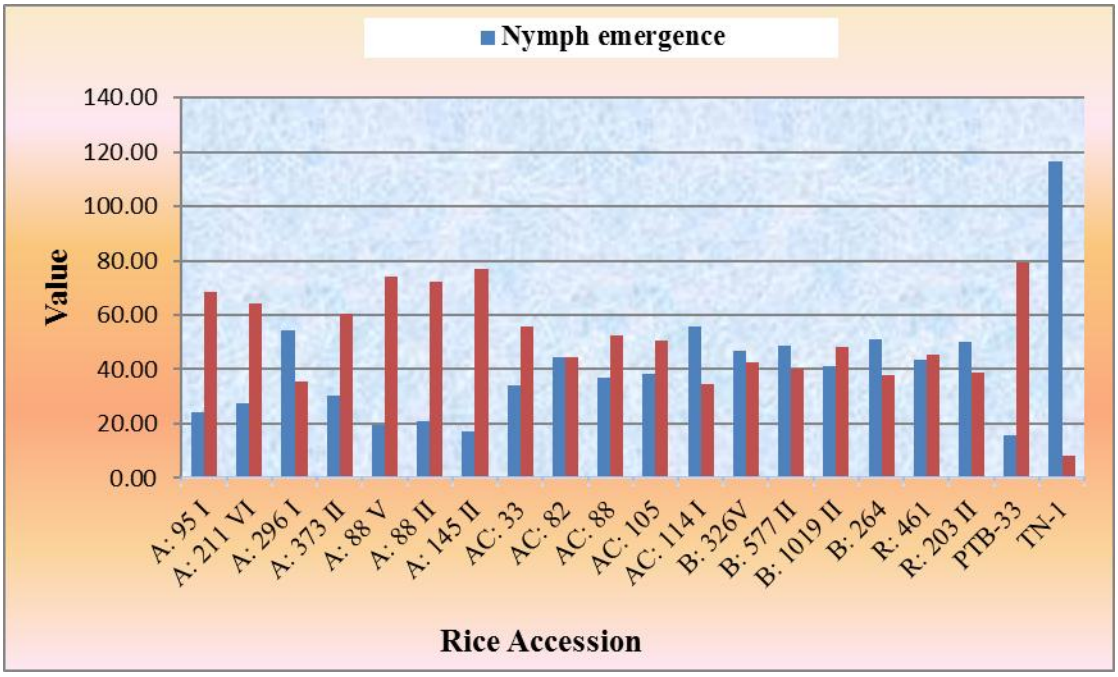

Fig. 2. Mean no. of nymphs emergence and percent unhatched eggs of BPH on resistant rice germplasm

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REFERENCES

Anonymous (2007). Directorate of Economics and Statistics Survey 2007.Govt.of India.Ministry of Finance, Economic Division, New Delhi.pp.14-15.

Food and Agricultural Organization of the United Nations: Statistics (FAOSTAT) (2006). Production of cereals and share in the world.

Heinrichs, E.A., Medrano, F.G. and Rapusas, H.R. (1985). Genetic Evaluation for Insect Resistance in Rice.Manila, Philippines; International Rice Research Institute, 356.

Lal, O.P. (1996). Recent Advances in Entomology, Apl. Publication, New Delhi.p. 392.

Mishra, B. (2005). More crop per drop, The Hindu Survey of Agriculture, 41-46.

Normile, D. (2008). Reinventing rice to feed the world. Science 321:330–333.

Pathak, M.D. and Khush, G.S. (1979). Studies of varietals resistance in rice to the brown plant hopper at the International Rice Research Institute. Brown plant hopper: Threat to rice production in Asia. Los Banos, Philippines. pp.285-301.

Reddy, K.L., Pasalu, I.C. and Reddy, D.D.R. (2005). Studies on antibiosis mechanism of resistance in rice against brown planthopper, Nilaparvatalugens (Stal.). Indian J. Entomol., 67(2): 140-143.

Sogawa, K. and Cheng, C.H. (1977). Economic thresholds, nature of damage and losses caused by brown planthopper. In: Brown planthopper: Threat to rice production in Asia. Proceedings of the international Conference on Brown planthopper, Los Banos, Laguna, 16 –19 November. International Rice Research Institute, Los Banos, Laguna, The Philippines: 125 – 142.