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Field efficacy and economics of certain insecticides against brown plant hopper [*Nilaparvata lugens* (L.)] on paddy [*Oryza sativa* (L.)

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Abstract
The present research study was carried out applying the Randomised Block Design (RBD) approach in three replications during the rabi season of 2022-2023 at the Central Research field, NAI, SHUATS, Prayagraj. Results revealed that, among all the treatments Imidacloprid 17.8 SL was found most effective in suppressing the population of BPH with 6.65 BPH/hill it was significantly superior and followed by Fipronil 5% SC (6.80 BPH/hill) followed by next in row by Spinosad 45% SC with (7.02 BPH/hill) followed by Neem oil 10% (7.16 BPH/hill), next by *Meta rhizium anisopliae* WP with (7.34 BPH/hill) next was by Nisco Sixer Plus (7.39 BPH/hill) and *Beauveria bassiana* @ 1x 1010 (7.66 BPH/hill) respectively. The highest infestation of BPH (13.37 BPH/hill) was recorded in the untreated control plot. Among all the treatments, the highest yield and incremental cost-benefit ratio were recorded in Imidacloprid 17.8 SL (41 q/ha), which gave 1:2.56 during *Kharif*, 2022 and followed Fipronil 5% SC (35 q/ha and 1:2.28), Spinosad 45% SC (34 q/ha and 1:2.21), Neem oil 10% (33 q/ha and 1:2.11), *Metarhizium anisopliae* WP (32 q/ha and 1:2.05), Nisco Sixer Plus (31q/ha and 1:2.04). Whereas the minimum yield and cost benefits ratio 30q/ha and 1:1.96 was observed in the treatment *Beauveria bassiana* 1x 1010.

Keywords: Efficacy, brown plant hopper, yield, cost benefit ratio

Introduction
Rice (*Oryza sativa* L.) belongs to the family- Graminae, and it is one of the world's largest cereal crops that fulfil the caloric need for millions of people. Rice is considered an appropriate crop for our country and plays a significant role in our national food security. The total area under rice cultivation is 44 million ha with Production of 117.94 million tonnes. Uttar Pradesh is the second largest producer of rice after West Bengal occupying a 5.5 million ha area under rice with an annual production of 15.3 million tonnes (Anonymous, 2019-20) [2]. The major basmati rice- producing states are Haryana, Punjab, Uttar Pradesh, Jammu and Kashmir, Uttarakhand, and Himachal Pradesh. Haryana is the major basmati rice cultivating state, producing more than 60 percent of the total basmati rice produced in India, total area of basmati rice cultivation in India was 1555 million ha, and in U.P. is occupied 256.2 million ha (Anonymous 2017) [1]. Rice production is adversely affected by numerous biotic as well as abiotic stresses. Approximately, about 52 percent of annual rice production is in chaos owing to the damage of biotic factors globally, among which insect pest attack accounts for about 21 percent (Yarasi *et al.*, 2008) [13]. Rice is prone to the attack of various species of insects, out of which twenty cause damage economically. They infest all plant parts at every growth stage and few have the capability to transmit viral diseases (Pathak and Khan, 1994) [8]. In India, among the 35 insect species feeding on paddy, 10 are serious ones (Fletcher, 1920). In Asia about 30% of loss in yield is due to insect pests (Pathak and Dhaliwal, 1981) [9]. The three plant hopper species reported in rice are brown plant hopper (BPH), *Nilaparvata lugens* (Stal.), white backed plant hopper (WBPH), *Sogatella furcifera* (Horvath) and smaller brown plant hopper (SBPH), *Laodelphax striatellus* (Fallén) (Shukla, 1979) [11]. BPH and WBPH cause a great economic damage to the crop while the BPH and SBPH can transmit viral diseases such as rice ragged stunt and rice grassy stunt causing severe yield loss (Sogawan *et al.*, 2003) [12]. In Asia, brown plant hopper (BPH), *Nilaparvata lugens* (Stal.) is one which is a very destructive pest of rice (Park *et al.*, 2008) [14]. In India, it became a Sporadic pest during 1958 and 1962 and severe outbreak was seen at the end of 1973 in Kerala as well as in Andhra Pradesh and Tamil Nadu during 1974 (Koya, 1974) [4]. Andhra Pradesh, West Bengal, Punjab, Tamil Nadu, Karnataka, Uttar Pradesh, Bihar, Madhya Pradesh, Haryana and Orissa recorded

a great loss by 1975 (Dale, 1994) [3].

Materials and Method

The experiment was conducted at the experimental research plot of the Department of Entomology, Central Research Field, Sam Higginbottom University of Agriculture Technology and Sciences, during the *Kharif* season of 2022, in a Randomized Block Design with eight treatments replicated three times using variety Rupali in a plot size of 2 m×1 m at a spacing of 20 cm×10 cm with a recommended package of practices excluding plant protection. The soil of the experimental site was well drained and medium high. Research field is situated at 25027" North latitude 80005" East longitudes and at an altitude of 98 meter above sea level. The maximum temperature reaches up to 47 °C in summer and drops down to 2 °C in winter. Pest population was estimated by observing five hills selected randomly from each treatment for the presence of nymphal population and nymph at one day prior to insecticide application and at 3rd, 7th and 14th days after each application. The population overcontrol against brown plant hopper (*Nilaparvata lugens*) was calculated by considering the mean of three observations recorded at 3rd, 7th and 14th days after first and second spraying.

$$\text{Mean population} = \frac{\text{Total number of nymph}}{\text{Total number of tillers/Hills}}$$

The healthy marketable yield obtained from different treatments was collected separately and weighed. The cost of insecticides used in this experiment was recorded during *kharif* season. Gross return was calculated by multiplying the total yield with the market price of the produce. The cost of cultivation and cost of treatment imposition was deducted from the gross returns, to find out net returns and cost-benefit ratio by the following formula was used:

$$\text{B: C} = \frac{\text{Gross returns}}{\text{Total Cost of incurred}}$$

Where,
B: C = Benefit Cost Ratio

Result and Discussion

The Data on nymphal population of *Nilaparvata lugens* after first spray revealed that all the treatments were significantly superior to the control. Among all the treatments, the plot treated with T5 Imidacloprid 17.8% SL was found to have the least population i.e., 7.59 BPH/ hill. Further the next was followed by T2 Fipronil 5% (7.61 BPH/ hill) followed by T1 Spinosad 45% SC (7.92 BPH/ hill), T3 Neem oil 10% (8.13 BPH/ hill), T7 *Metarhizium anisopliae* WP (8.43 BPH/ hill), T6 Nisco Sixer Plus (8.44 BPH/ hill) and highest population of 8.53 BPH/ hill in T4 *Beauveria bassiana* @ 1x 1010. The control was having the population of 12.24 BPH/hill. After second spray, all the insecticides were again found superior over untreated control. The overall mean analysis showed that T5 Imidacloprid 17.8% SL was highest effective among all the treatments used as it was having lowest population of 5.71 BPH/ hill. In the row next was followed by T2 Fipronil 5% (6.00 BPH/ hill), T1 Spinosad 45% SC (6.13 BPH/ hill), T3 Neem oil 10% (6.20 BPH/ hill), T7 *Metarhizium anisopliae* WP (6.25 BPH/ hill), T6 Nisco Sixer Plus (6.34 BPH/ hill) and T4 *Beauveria bassiana* @1x 1010 (6.80 BPH/ hill). All the data observed is mentioned in Table 1. Yields among the treatment were significant. Ramu *et al.* (2005) [10] observed that the field efficacy of imidaclorprid against BPH and green leaf hopper of rice and imidacloprid @ 0.25 ml/l was found very effective against the sucking pest of rice followed by Fipronil @ 1.5 ml/1. In the record it was found that fipronil applied at 30 days after transplanting in controlling, stem borer, brown plant hopper and leaf folder infesting paddy crop is effective Panda *et al.* (2004) [7].

The highest yield was recorded in T5- Imidacloprid 17.8% SL (41 q/ha) followed by T2- Fipronil 5% (35 q/ha), T1 Spinosad 45 SC (34 q/ha), T3- Neem oil 10% (33q/ha), T7 *Metarhizium anisopliae* WP (32q/ha), T6- Nisco Sixer Plus (31 q/ha) and T4- *Beauveria bassiana* @1x 1010 (30 q/ha) as compared to T0 control (25 q/ha). Among all the treatments the lowest net profit (70500 Rs/ha) was calculated from the treatment Beauveria *bassiana* @ 1x1010. The maximum incremental cost benefits ratio was recorded in the treatment of Imidacloprid 17.8 SL, which gave 1:2.56 during *Kharif*, 2022 (Table-1). And followed by Fipronil 5% SC, Spinosad 45% SC, Neem oil 10%, *Metarhizium anisopliae* WP, Nisco Sixer Plus and *Beauveria bassiana* 1x 1010 with incremental cost-benefit of 1:2.28, 1:2.21, 1:2.11, 1:2.05, 1:2.04, 1:1.96 respectively. Whereas the minimum cost benefits ratio of 1:0.25 was observed in the untreated plot. According to Kumar and Kumar (2017), a fipronil 5 SC @ 75 gm a.i./ha treated plot demonstrated a minimum population of BPH (3.08 and 3.48) and gave a higher yield (40.00 and 37.7 q/ha).

Table 1: Efficacy and economics of insecticides against brown plant hopper (*Nilaparvata lugens* Stal.)

Treatments		Number of nymphs/ 5 hills (No.)												Yield (q/ha)	B: C ratio
		1st spray						2nd spray							
		Dosages	1 DBS	3 DAS	7 DAS	14 DAS	Mean	1 DBS	3 DAS	7 DAS	14 DAS	Mean	Overall mean		
T1	Spinosad 45%SC	0.2 ml/l	9.87	8.67	8.13	8.27	7.92	8.27	7.13	6.47	4.87	6.13	7.02	34	1:2.21
T2	Fipronil 5%	2 ml/l	9.27	8.60	8.07	8.13	7.61	8.13	7.07	6.40	4.80	6.00	6.80	35	1:2.28
T3	Neem oil 10%	2 ml/lit	9.73	8.87	8.20	8.33	8.13	8.33	7.20	6.51	4.93	6.20	7.16	33	1:2.11
T4	*Beauveria bassiana* @ 1x 1010	2 g/l	10.67	9.40	8.80	8.87	8.53	8.87	7.73	7.07	5.80	6.80	7.66	30	1:1.96
T5	Imidacloprid 17.8% SL	125 ml/ha	9.40	8.00	7.60	7.87	7.59	7.87	6.87	6.33	4.33	5.71	6.65	41	1:2.56
T6	Nisco Sixer Plus	1 ml/lit	10.27	9.00	8.33	8.53	8.44	8.53	7.40	6.60	5.47	6.34	7.39	31	1:2.04
T7	*Metarhizium anisopliae* wp	2.0 gm/l	10.20	8.93	8.27	8.40	8.43	8.40	7.30	6.53	5.00	6.25	7.34	32	1:2.05
T0	Control	-	11.87	12.07	13.27	13.33	12.24	13.33	14.20	14.47	15.07	14.50	13.37	25	1:0.25
SEm (±)			0.11	0.08	0.06	0.09	0.05	0.09	0.05	0.05	0.08	0.05	0.13		
CD at 5% Level		-	0.35	0.23	0.19	0.26	0.16	0.26	0.14	0.16	0.25	0.16	0.41		
F- test		-	NS	S	S	S	S	S	S	S	S	S	S		

Conclusion

It was concluded from the present research that the efficacy of insecticides against brown plant hopper was found effective than untreated control. Among all the treatments Imidacloprid 17.8 SL was found most effective treatment. The population of brown plant hoppers in paddy occurs from the vegetative stage when the number of tillers per plant increases to till harvest. The maximum yield and net profits were recorded in treatment Imidacloprid 17.8 SL but the cost of treatment was found more as compared to other treatments. The highest C: B ratio (1:2.56) was recorded in Imidacloprid 17.8 SL whereas the lowest C: B ratio (1:1.96) was obtained from Beauveria bassiana 1x 1010.

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Reference

1. Anonymous. Basmati survey report, 2017 APEDA, New Delhi; c2017.
2. Anonymous. Third advance estimates of production of food grains for 2019-20. Agricultural Statistics Division, Directorate of Economics and Statistics Department of Agriculture, Cooperation and Farmers Welfare, Govt. Of India; c2019.
3. Dale D. Insect pests of the rice plant-their biology and ecology. In: Biology and Management of Rice Insects. 1994. p. 438-442.
4. Koya VKM. Brown hopper, the destructive pest. Kurukshetra. 1974;22:13.
5. Kumar ER, Guruprasad GS, Hosamani AK, Srinivas AG, Pramesh D. Bio-efficacy of novel insecticides against brown plant hopper in direct seeded rice, Plant Archives. 2017;17(2):1047-1051.
6. Narayanasamy M, Kennedy JS, Geethalakshmi V. Effect of temperature on life history of brown plant hopper Nilaparvata lugens (Stal). African Journal of Agriculture Research. 2015;10(38):3678-3685.
7. Panda SK, Nayak SK, Behra UK. Field evaluation of few chemicals against rice stem borer and brown plant hopper. Shaspa. 2002;9(1):97-99.
8. Pathak MD, Khan ZR. Insect Pests of Rice. International Rice Research Institute, Philippines; c1994. p. 89.
9. Pathak MD, Dhaliwal GS. Trends and Strategies for Rice insect Problems in Tropical Asia. International Rice Research Institute Research Paper Series no. 64, International Rice Research Institute, Manila, Philippines. 1981;13:257-294.
10. Ramu PS, Punnaiah KC, Rao GR. Bio-efficacy of certain new insecticides against sucking insect pests of rice, Journal of Entomology Research. 2005;29(3):211-213.
11. Shukla KK. Occurrence of a new insect, small brown plant hopper, *Laodelphax striatellus* (Fallen) in India. Current Science Journal. 1979;48:548
12. Sogawan KG, Liu J, Shen JH. A review on the hyper susceptibility of Chinese hybrid rice to insect pests. Zhenggu. Shuidao Kexve. Chinese Journal of Rice Science. 2003;17:23-30.
13. Yarasi B, Sadumpati V, Immanni CP, Vudem DR, Khareedu VR. Transgenic rice expressing Allium sativum leaf agglutinin (ASAL) exhibits high-level resistance against major sap-sucking pests. BMC Plant Biology. 2008;(8):102-115.
14. Park J, Park J, Jang S, Kim S, Kong S, Choi J, *et al*. FTFD: an informatics pipeline supporting phylogenomic analysis of fungal transcription factors. Bioinformatics. 2008 Apr 1;24(7):1024-1025.