Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(4): 1798-1800

Received: 07-05-2020
Accepted: 09-06-2020

Ratnakar V
Krishi Vigyan Kendra, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Shiva B
Krishi Vigyan Kendra, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Veeranna G
Krishi Vigyan Kendra, Regional Agriculture Research Station, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Jagan Mohan Rao P
Krishi Vigyan Kendra, Regional Agriculture Research Station, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Raghurami Reddy P
Agricultural College, Palem, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Corresponding Author:
Ratnakar V
Krishi Vigyan Kendra, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Management of brown plant hopper (BPH), *Nilaparvata lugens* (Stal) in rice of Bhadradri Kothagudem district

Ratnakar V, Shiva B, Veeranna G, Jagan Mohan Rao P and Raghurami Reddy P

Abstract
The study was undertaken to demonstrate on the management of brown plant hopper (BPH), *Nilaparvata lugens* in rice with formation of alleyways, recommended dose of nitrogen fertilizer, alternate wetting and drying, spraying of pymetrozine 50 WG 0.6 g/l and spraying azardiractin 1500 ppm 5ml /l for adult management. When results were compared with farmers practiced plots the hopper incidence was lower in the technology demonstrated plot with 10.1 and 15.7 adults /hill in tillering stage and 20.9 and 29.8 adults /hill in panicle stage with increased yield of 7.5 and 7.7 per cent during corresponding *Kharif* 2018 and *Kharif* 2019. The cost benefit ratio (BC Ratio) was higher with 2.1:1 and 2.6:1 in technology demonstrated plot and lower in farmer practiced plot with 1.70:1 and 1.86:1 in corresponding *Kharif* 2018 and *Kharif* 2019.

Keywords: *Nilaparvata lugens*, rice and insecticide

Introduction
The brown plant hopper (BPH), *Nilaparvata lugens* (Stål) (Hemiptera: Delphacidae), is a key economic pest of rice (*Oryza sativa* L.) throughout South, Southeast Asia, Far East, Indo-China and Pacific Islands. It is a monophagous herbivore and affects the rice crop through direct feeding causing nutrient depletion in the plant. Brown plant hopper is one of the major culprits for huge economic crop losses of rice. It attacks the crop from late vegetative stage to grains hardening stage. Both the nymphs and adults of this insect suck the sap from the plant resulting in chlorotic, wilting and drying up of rice plant. This feeding damage is commonly known as 'hopper-burn' which begins in patches but spread rapidly as the hoppers move from dying plants to adjacent plants [10]. Generally the yield losses due to hoppers ranges from 10% to 90% but if timely control measures are not taken up, there may be possibility of total crop loss within a very short period. BPH is also an efficient vector for various rice viruses, including ragged rice stunt and grassy stunt virus. These combined can cause significant damage to rice crops, with up to 60% loss of yield in susceptible cultivars [5]. Insecticide induced resurgence is thought to be a prime factor causing *N. lugens* to become a major pest of rice in tropical Asia in the last decade. It is rather widely distributed but is found mainly in South, Southeast, and East Asia. It damages the rice plant by directly feeding on it and by transmitting the grassy stunt disease [4]. The losses due to *N. lugens* in Asia have been estimated as more than $300 million annually [15]. It is often difficult to control this pest due to its high fecundity and its long distance migratory behavior as well as adapting to resistant varieties rapidly [19]. In the absence of effective natural enemies and their production methods, control of BPH has mainly relied on the application of various chemical insecticides [7]. The application of chemical insecticides has been the preferred method to control BPH, however, this has inevitably led to the evolution of resistance and a reduction in effectiveness. Resistance has affected many of the major classes of insecticides including organophosphates, carbamates, pyrethroids, neonicotinoids and phenylpyrazoles [14]. The evaluation of new insecticides must also be a regular practice so as to search for safer and effective alternatives to minimize the planthoppers damage [11, 16]. In this context, the present Front Line Demonstration was undertaken to manage the *N. lugens* using integrated pest management at Bhadradri Kothagudem district of Telangana state.

Materials and Methods

The present study was undertaken at 10 different farmers field of Bhadradi Kothagudem Districts of Telangana with irrigated black soil and cropping pattern of rice followed by rice crop. The treatments of spraying of acephate 1.5 g/l and imidacloprid 0.3 ml/l after noticing the *N. lugens* infestation (Farmer practice) were applied on the appearance of *N. lugens.* The treatments of formation of alleyways, recommended dose of nitrogen fertilizer, alternate wetting and drying, spraying of pymetrozin 0.6g/l and spraying azardiractin 1500 ppm 5ml /l for adult management (Technology Demonstrated). The rice variety BPT 5204 and the experiment conducted in two different years *i.e. Kharif* 2018 and *Kharif* 2019 in plot size of 0.4 ha each in 10 locations of each treatment. The nymph/ adult population of brown plant hopper was three days after treatment of each treatment by randomly selecting 10 hills/ plot. To find out the economic impact of treatments on brown plant hopper incidence and rice yield the cost benefit ratio was calculated.

Results and Discussion

Results revealed that the incidence of *N. lugens* was lower in the field demonstrated with formation of alleyways, recommended dose of nitrogen fertilizer, alternate wetting and drying, spraying of pymetrozin 0.6g/l and spraying azardiractin 1500 ppm 5ml /l for adult management with 7.3 adults /hill in tillering stage and 15.9 adults /hill in panicle stage during *Kharif* 2018 followed by low infestation of BPH with 5.8 adults /hill in tillering stage and 15.1 adults /hill in panicle stage during *Kharif* 2019. The higher infestation was observed in farmer practices with 10.1 adults /hill in tillering stage and 20.9 adults /hill panicle stage during *Kharif* 2018 followed by high infestation of BPH with 15.7 adults /hill tillering stage and 29.8 adults /hill in panicle stage during *Kharif* 2019 (Table 1).

The yield was higher in technology demonstrated plots with 6440 (Kg/ha) and 6500 (Kg/ha) in *Kharif* 2018 and 2019 respectively whereas lower yield was recorded comparatively in farmers practiced plots with 5406 (Kg/ha) and 6031 (Kg/ha) in *Kharif* 2018 and 2019 respectively. The per cent of increase in technology demonstrated plot when compared with the farmers practiced plot was 7.5 and 7.7 in *Kharif* 2018 and 2019 respectively.

The net return was higher in technology demonstrated plots with Rs.62356/- and Rs. 62457/- in *Kharif* 2018 and 2019, respectively whereas net return was lower comparatively in farmers practiced plots with Rs. 45691/- and Rs. 51215/- in *Kharif* 2018 and 2019, respectively.

The cost benefit ratio (BC Ratio) was higher in technology demonstrated plots with 2.1: 1 and 2.36:1 in *Kharif* 2018 and 2019 respectively whereas cost benefit ratio (BC Ratio) was lower comparatively in farmers practiced plots with 1.70: 1 and 1.86:1 in *Kharif* 2018 and 2019 respectively. Therefore it concluded that the technology demonstrated treatment can be recommended in large scale to manage brown plant hoppers in rice fields in ensuing cropping seasons (Table 2).

It is evident from Table 3 that abundance of number of brown planthopper population in term of per hill and correlation coefficient between different weather parameters and population of brown plant hopper in demonstrated plot revealed that the maximum and minimum temperatures were observed negative correlation and rainfall has shown positive correlation in *Kharif* 2018, the maximum and minimum temperatures and rainfall has shown positive correlation in *Kharif* 2019.

The results are in concurrence with [1] who revealed that pymetrozine 50 WG 150 g a.i./ha proved to be the superior insecticide against brown planthoppers. Significantly lowest per cent mortality of green miridbugs was recorded in pymetrozine 50 WG [6] similar results were reported by [2] and [11] where pymetrozine showed moderate initial and persistent toxicity to BPH nymphs [12]. Indicated that pymetrozine would be an effective alternative for the control of brown planthopper which gave very good control of 1st and 2nd instar nymphs of BPH [9]. Has reported that pymetrozine inhibits the feeding of brown planthopper.

Results are similar to the [13] who reported that application of N fertilizers to the rice plants increased the N concentrations both in rice plants and BPH while application of P and K fertilizers increased their concentrations in plant tissues only but not in BPH. A combination of neem oil + urea at a ratio of 1:10 when applied 3 times at the basal, tillering and panicle initiation stages gave a superior level of control of brown planthopper [3]. Cent per cent of *N. lugens* were died after exposure to 40 per cent of neem extract, for 72 hours at 30 ºC [17]. The results showed that neem extract can be an effective insecticide to prevent the outbreaks of *N. lugens*. The higher infestation of BPH was found in farmers plot which is in similar to the at farmer practices (28.71 /hill) and lowest in farmer practices (36.14 q/ha) lowest in farmer practices (1:2.00) [8]. The incidence of the pest was severe in the last September to last October which is similar to [18].

The incidence of BPH in the beginning was very low and the population increased along with the growth of the crop [20].

Table 1: Brown planthoppers incidence in ten locations during *Kharif* 2018 and *Kharif* 2019

Locations	1	2	3	4	5	6	7	8	9	10	Mean
During *Kharif* 2018 (Farmers practiced plots)											
Adults /hill in tillering stage	9.5	11.9	12.3	7.9	8.9	7.1	12.1	11.1	10.1	10.8	10.1
Adults /hill in panicle stage	23.6	26.8	23.1	20.9	23.1	19.7	17.9	18.9	15.9	20	20.9
During *Kharif* 2018 (Technology Demonstrated plots)											
Adults /hill in tillering stage	7.8	6.7	7.9	4.9	4.6	6.7	7.8	9.6	7.9	9.4	7.3
Adults /hill in panicle stage	17.9	14.2	15.6	12.6	17.3	18.9	14.7	11.9	17.6	19.1	15.9
During *Kharif* 2019 (Farmers practiced plots)											
Adults /hill in tillering stage	16.1	13.2	14.3	13.8	15.8	20.9	13.1	10.9	18.9	20	15.7
Adults /hill in panicle stage	26.9	23.4	26.7	30.1	33.2	24.7	27.6	29.8	37.5	38.7	29.8
During *Kharif* 2019 (Technology Demonstrated plots)											
Adults /hill in tillering stage	2.3	6.7	4.5	4.9	5.8	6.3	8.1	4.1	5.1	11	5.8
Adults /hill in panicle stage	17.1	16.2	13.2	14.3	16.1	17.8	18	12.1	16.1	10.1	15.1

Table 2: Economic impact of experiment during *Kharif* 2018 and *Kharif* 2019

	During *Kharif* 2018		During *Kharif* 2019	
	Farmers practiced plot	**Technology Demonstrated plot**	**Farmers practiced plot**	**Technology Demonstrated plot**
Yield (Kg/ha)	5406	6440	6031	6500
Per cent increase over farmers practice	-	7.5	-	7.7
Net Return (Rs.)	45691	62356	51215	62457
B:C ratio	1.7:1	2.1:1	1.86:1	2.36:1

Table 3: Correlation of weather parameters with BPH infestation

BPH incidence	Correlation coefficient values (r)		
	Maximum temp.(^{0}C)	**Minimum temp (^{0}C)**	**Rainfall (mm)**
Kharif 2018	-0.252	-0.214	0.897
Kharif 2019	0.304	0.953	0.973

Conclusion
The per cent of increase in technology demonstrated plot when compared with the farmers practiced plot was 7.5 and 7.7 with corresponding B:C ratios of 2.1: 1 and 2.36:1 in *Kharif* 2018 and 2019 respectively. The rainfall has shown positive correlation in two different years.

Reference

1. Adhikari BJ, Padhi, Dohling. PNK. Pymetrozine: An effective insecticide for management of planthoppers in rice. Journal of Entomology and Zoology Studies. 2019; 7(1):528-531.
2. Atanu S, Naik BS. Evaluation of some insecticides against brown plant hopper, *Nilaparvata lugens* (Stal) in Rice, *Oryza sativa* L. International Journal of Bio-resource and Stress Management. 2017; 8(2):268-271.
3. Babu GR, Rao GM, Rao PA. Efficacy of neem oil and neem cake for the control of green leafhoppers, brown planthoppers and their effect on predators of brown plant hoppers. Shashpa.1998; 5(1):91-94.
4. Bottrell DG, Schoenly KG. Resurrecting the ghost of green revolutions past: The brown plant hopper as a recur-ring threat to high-yielding rice production in Tropical Asia. Journal of Asia-pacific Entomology. 2012; 15:122-140.
5. Cheng J. Rice plant hopper problems and relevant causes in China, in: K.L. Heong, B. Hardy (Eds.), Plant hoppers: New Threats to the Sustainability of Intensive Rice Production Systems in Asia, International. Rice Research Institute, Los Baños, Philippines. 2009, 157-177.
6. Deekshita K, Ramarao CV. Pymetrozine: A Pyridine Azomethine insecticide for management of rice brown planthopper in Indi. Chemical Science Review and Letters. 2018; 7(25):335-339
7. Endo S, Tsurumachi M. Insecticide susceptibility of the brown plant hopper and the white-backed plant hopper collected from Southeast Asia. Journal of Pesticide Science.2001; 26:82-86.
8. Hasan W, Singh NK, Rani Shobha, Sohane RK. On Farm Trials for the Management of Brown Plant Hopper (BPH), Nilaparvata lugens Stal in Paddy. Advances in Life Sciences. 2015; 4(2):62-65.
9. He Y, Zhang J, Chen J, Wu Q, Chen L *et al*. Influence of Pymetrozine on Feeding Behaviors of Three Rice Planthoppers and a Rice Leafhopper Using Electrical Penetration Graphs. Journal of Economic Entomology. 2011; 104(6):1877-1884.
10. Krishnaiah NV. A Global Perspective of Rice Brown Planthopper Management III - Strategies for BPH Management N.V. Rice Genomics and Genetics. 2014: 5(1)
11. Lakshmi VJ, Krishnaiah NV, Katti G, Pasalu IC, Chirutkar PM. Screening of insecticides for toxicity to rice hoppers and their predators. Oryza. 2010; 47(4):295-301.
12. Liu J, Zhang J, Qin X, Chen Y, Yuan F, Zhang R. Toxic effects of Pymetrozine on the brown planthopper, *Nilaparvata lugens* (Stal.) (Homoptera: Delphacidae). Journal of Entomological Science. 2013; 48(1):17-22.
13. Mamunur MR, Jahan M, Islam KS. Impact of Nitrogen, Phosphorus and Potassium on Brown Planthopper and Tolerance of Its Host Rice Plants. Rice Science. 2016; 23(3):119-131.
14. Matsumura M, Morimura SS. Recent status of insecticide resistance in Asian rice plant hoppers, Japan Agriculture Research. 2010; 44:225-230.
15. Min S, Lee SW, Choi BR, Lee SH, Kwon DH. Insecticide resistance monitoring and correlation analysis to select appropriate insecticides against *Nilaparvata lugens* (Stal), a migratory pest in Korea. Journal of Asia Pacific Entomology. 2014; 17:711-716
16. Ratnakar V, Jhansi Lakshmi V, Srinivas C, Jagadeeshwar R, Satendra K Mangrauthia. Bioefficacy of commonly used insecticides against rice brown planthopper, *Nilaparvata lugens* (Stål). The Journal of Research. PJTSAU. 2019; 47(4):28-32.
17. Salleh NHM, Mohamed AR, Abdullah S, Sohaimi KS, Munirah ANR *et al*. Optimization of Insecticides Extracted from Neem Leaves on Nilaparvata lugens, Brown Planthopper. Journal of Advanced Research in Engineering Knowledge. 2018; 4(1):1-7
18. Sandeep C, Raghuraman M, Harit Kumar. Seasonal abundance of brown plant hopper Nilaparvata lugens in Varanasi region, India. International Journal of current Microbiology and Applied Science. 2014: 3(7):1014-1017
19. Su JY, Wang ZW, Zhang K, Tian XR, Yin YQ *et al*. Status of insecticide resistance of the white backed plant hopper, *Sogatella furcifera* (Hemiptera: Delphacidae). Florida Entomologist. 2013; 96:948-956.
20. Sarkar D, Baliarsingh A, Mishra HP, Nanda A, Panigrahi *et al*. Population dynamics of brown plant hopper of paddy and its correlation with weather parameters. International Journal of Chemical Studies. 2018; 6(6):920-923.