

Integrated Pest Management of Brown Plant Hopper (BPH), *Nilaparvata lugens* (Stal) in rice of Mancherial District, Telangana State

Abstract

A front line demonstration on integrated pest management of brown plant hopper, *Nilaparvata lugens* (Stal) in rice has been conducted in different villages of various mandals of Mancherial district of Telangana state during the *kharif* (June – December), season of 2018–19, 2019–20 and 2020–21 respectively to create of awareness among the farming community on the integrated pest management practices. The adoption of IPM practices includes formation of alleyways, recommended dose of nitrogen fertilizer, alternate wetting and drying, spraying of need based insecticides like Dinotefuran 20 SG @ 0.4 g or Pymetrozine 50 WDG @ 0.6 g l⁻¹ of water etc. were carried out. The study reveals that the lowest hoppers incidence was witnessed in the demonstrated plot with 1.84, 12.18 and 19.0 adults hill⁻¹ in tillering stage and 7.76, 24.95 and 52.38 adults hill⁻¹ in panicle stage over farmers practice (3.33, 35.40 and 25.42 adults hill⁻¹ in tillering stage and 19.84, 50.30 and 63.47 adults hill⁻¹). The average yields of IPM module demonstrated plot was 7130, 5513 and 5065 kg ha⁻¹ whereas in farmer practice the yield was

6733, 4851 and 4768 kg ha⁻¹ during (June–December), 2018–19, 2019–20 and 2020–21 respectively with an increased yield of 5.88%, 13.64% and 6.22% during corresponding *kharif* (June–December), 2018–19, 2019–20 and 2020–21. Further the Cost-Benefit ratio of 1.88, 2.68 and 1.78 respectively in the technology demonstrated plots whereas in farmers practice the recorded Cost-Benefit ratio of 1.43, 1.94 and 1.48 during corresponding *kharif* (June–December), 2018–19, 2019–20 and 2020–21 respectively.

Keywords: Brown Plant Hopper, Insecticides, Integrated Pest Management, Rice

1. Introduction

Rice (*Oryza sativa* L.) is an important cereal crop of the world and second largest cultivated crop after wheat (Hosseini et al., 2012) and providing a staple food for more than half of the world population (Kulagod, 2011). It is the principal nutritional energy source for 17 Asian and Pacific countries, 9 North and South American countries and 8 African countries and it alone provides the 20% of the world's dietary energy supply (FAO, 2004). The crop is attacked by 300 insect pests in the different stages of the crop and among them only 23 species causes notable damage (Pasalu and Katti, 2006). Among which brown plant hopper, *Nilaparvata lugens* (Stal), (Hemiptera: Delphacidae) is one of the most economically significant insect-pests of rice in most of the Asian countries causing a noticeable damage to the crop by reducing the yields ranges from 10%–90% and in Asia the loss have been estimated as more than \$300 million annually (Min et al., 2014). If timely control measures are not taken up, there may be a chance of total crop loss within a very short period (Cheng, 2009). In addition to this it also transmits the ragged stunt virus, striped virus and grassy stunt virus (Gurr et al., 2011, Bottrell and Schoenly, 2012). Recently, most of the rice cultivars depend solely on chemicals to manage the pest and the outbreaks are due to excessive insecticide use (Way and Heong, 1994). The search and evaluation of new insecticide molecules must also be a systematic practice so as to develop safer and effective alternatives to minimize the brown plant hoppers damage (Lakshmi et al., 2010, Ratnakar et al., 2019). This continuous and indiscriminate use of one insecticide has resulted in the rapid development of insecticide resistance and exhaustion of most insecticide options in many rice-growing regions (Wang et al., 2009) including organophosphates, carbamates, pyrethroids, neonicotinoids and phenylpyrazoles (Matsumura and Morimura, 2010). Insecticides remain, as a significant weapon in the integrated pest management (IPM) system because of its speedy, efficient, economical and easy to use against pests (Karunaratne et al., 2007, Xue et al., 2010, Perry et al., 2011). To overcome these lapses KVKs acts as a Knowledge and Resource Centre at district level to demonstrate the technologies (Sharma et al., 2017) and the output of the research is disseminated to farmers through conduction of frontline demonstrations about the developed

technologies (Singh et al., 2007). For this IPM technologies need to be practiced in cluster approach to manage the pest (Shankar et al., 2022). Integrated pest management (IPM) practices is one of the eco-friendly approaches, which can be applied to regulate the indiscriminate use of insecticides to control rice insect pests (Singh et al., 2018, Trivedi and Ahuja, 2011). Hence, the following integrated pest management module under front line demonstrations were formulated with all integrated approaches like formation of alleyways, recommended dose of nitrogen fertilizer, alternate wetting and drying are being added along with chemical control to manage brown plant hopper, *Niaparvatha lugens* (Stal) in the present study conducted by Krishi Vigyan Kendra, Bellampalli, Mancherial District, which was undertaken during kharif (June–December), 2018–19, 2019–20 and 2020–21 respectively to manage the brown plant hopper, *Niaparvatha lugens* (Stal) by instigating integrated pest management practices in the farmer fields of villages in the various mandals of Mancherial district of Telangana state.

2. Materials and Methods

The present study was carried out, in *kharif* season in the different villages of Mancherial district during *kharif* (June–December), 2018–19, 2019–20 and 2020–21 by the Krishi Vigyan Kendra, Bellampalli. In this study, 30 farmers were selected for the demonstration of the technology. The improved technology were imposed, consisting formation of alleyways, recommended dose of nitrogen fertilizer, alternate wetting and drying, spraying of need based insecticides like Dinotefuran 20 SG @ 0.4 g or Pymetrozine 50 WDG @ 0.6 g l⁻¹ of water. The treatments of spraying of Acephate 75 SP @ 1.5 g or Imidacloprid 17.8 SL @ 0.25 ml or Buprofezin 25 SC @ 1.6 ml or Imidachloprid+Ethiprole 40 WG @ 0.25 g l⁻¹ of water after noticing the heavy infestations of *N. lugens* (Farmers practice). The hopper population (nymph or adult) hill⁻¹ was recorded during the vegetative and reproductive stage of the crop after each spray and 7 days after each application and percent reduction over control of hoppers was calculated. Finally, the grain yield (kg ha⁻¹) and cost - benefit ratios of demonstrated plots and farmers practice were also recorded and calculated.

3. Results and Discussion

Results revealed that the incidence of *N. lugens* was lower in the demonstrated plots with 1.84 nymphs or adults hill⁻¹ in the vegetative stage and 7.76 nymphs or adults hill⁻¹ in reproductive stage during *kharif*, 2018–19 and with 12.18 nymphs or adults hill⁻¹ in the vegetative stage and 24.95 nymphs or adults hill⁻¹ in reproductive stage during *kharif*, 2019–20 and with 19.0 nymphs or

	mo	er's Practi ce	mo	er's Practi ce	mo	r's Practi ce	19	20	21	19	20	21	19	20	0– 21
Vegetati ve Period	1.84	3.33	12.1 8	35.40	19. 00	25.42	31.3	30.6	30.3	23.1	23.4	30.6	346.7	379.0	263. 8
Reprodu ctive Period	7.76	19.84	24.9 5	50.30	52. 38	63.47	32.0	30.4	30.2	17.8	18.5	18.2	12.12	44.1	35. 9
*Vegetative period (August–September) and Reproductive Period (October–December)															

Table 2: Economic impact of experiment during *kharif* (June–December), 2018–19, 2019–20 and 2020–21

Parti cular s	Yield (Kg ha ⁻¹)			Percent increase in yield over check (%)			Cost of cultivation (₹ ha ⁻¹)			Gross returns (₹ ha ⁻¹)			B:C Ratio		
	201 8–1 9	201 9–2 0	202 0–2 1	201 8–1 9	201 9–2 0	202 0–2 1	201 8–1 9	201 9–2 0	202 0–2 1	201 8–1 9	201 9–2 0	202 0–2 1	201 8–1 9	201 9–2 0	202 0–2 1
IPM mod ule	713 0	551 3	5065	5.88	13.6 4	6.22	5495 0	3806 8	4991 5	1033 78	1019 81	886 42	1.88	2.68	1.78
Farm er pract ice	673 3	485 1	4768	-	-	-	6823 8	4635 3	6565 3	9763 6	8974 4	834 40	1.43	1.94	1.27

4. Conclusion

In IPM module, documented higher paddy yield with net returns of ₹48428, ₹63913 and ₹38727 ha⁻¹ which was about 5.88%, 13.64% and 6.22% with corresponding B:C ratios of 1.88, 2.68 and 1.78 higher than the non IPM module with ₹29398, ₹43391 and ₹17787 ha⁻¹ during *kharif*, 2018–19 2019–20 and 2020–21 respectively. The IPM based practices were found effective in comparison to farmer practice. From the above study, it can be concluded that by adopting IPM based brown plant hopper management strategies in in can be efficiently managed instead of practicing chemical control measure alone.

5. References

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