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# BIOEFFICACY OF SOME NEWER INSECTICIDES AGAINST BROWN PLANTHOPPER, *Nilaparvata lugens* IN RICE CROP

**S.P. Rath and M. Raghuraman**
*Department of Entomology & Agricultural Zoology, Institute ofAgricultural Sciences, Banaras Hindu University, Varanasi-221 005, E-mail: raghu_iari@yahoo.com, Corresponding Author: M. Raghuraman*

***Abstract:*** *An experiment was conducted on Bioefficacy of some newer insecticides against brown planthopper (Nilaparvata lugens) during kharif season, 2011 in rice crop, at agricultural Research Farm, B.H.U. Varanasi. The experiment consisted of eight treatments. The observations on the incidence of BPH were recorded by randomly selecting five hills per plot at 1, 3, 7, and 10 days after spraying. Insecticide Triazophos 40 EC (450g ai/ha) found to be most effective treatment in significantly reducing the population of Brown Planthopper after first spray. However, Imidacloprid 17.8 SL (50g ai/ha) was superior among all the treatments after second spray. Fipronil 80 WG (100g ai/ha) showed highest percentage increase in yield over untreated control. Fipronil 80 WG (100g ai/ha) found to be superior than Fipronil 80 WG (50g ai/ha) and Fipronil 5 SC (50g ai/ha) in reducing population of test insect as well as percent increase in yield over untreated control.*
***Keywords:*** *Rice, BPH, management*

**Introduction:** Rice is the most important cereal crop in the developing world and is the staple food of over half of the world's population [1]. Rice, classified primarily as a tropical and sub-tropical crop, is grown in over 100 countries today, on every continent except Antarctica, extending from 50-53$^0$N to 40$^0$S and from sea level to an altitude of 3000 m [2]. Almost 90% of the world's rice acreage is supported by Asia, which is a hub of about 60% of the world's population. In India, rice is the predominant crop both in terms of land use and dietary importance. India having the largest acreage under rice in the world with an area of about 44.5 mha largely depended upon monsoon rain. It appears that the negative impact of vagaries of monsoon is such that due to which in 2009-10 the rice production came down to 89.1 million tonnes from a record 99.2 million tonnes of the previous year (Directorate of Economics and Statistics, Department of Agriculture and Co-operation, 2010).

The fauna are dominated by micro and macro invertebrates (especially arthropods) inhabiting the vegetation, water and soil sub-habitats of the rice fields, while vertebrates are also associated with rice fields. In relation to the rice crop, the fauna and flora in rice fields include pests, their natural enemies (predators and parasitoids) and neutral forms. The rice plant is subject to attack by more than 100 species of insects; 20 of them can cause economic damage. Together they infest all parts of the plant at all growth stages, and a few transmit viral diseases [2]. Planthoppers constitute a large group of phytophagous insects in the Order Hemiptera. Distributed worldwide, all members of this group are plant-feeders and some species are considered pests. In Asia, two planthoppers of economic importance are the brown planthopper (BPH), *Nilaparvata lugens* (Stål), and the whitebacked planthopper (WBPH), *Sogatella furcifera* (Horvath) of the Family Delphacidae. They damage plants directly by sucking the plant sap and by ovipositing in plant tissues, causing plant wilting or hopper burn [3]. The brown planthopper, *Nilaparvata lugens* (BPH), is one of the major pests of rice. Damage to the rice crop is caused directly by feeding on the phloem [4] and indirectly by transmitting plant viral diseases like grassy stunt and wilted stunt viruses [5]. In Eastern Uttar Pradesh, the insects like brown planthopper, green leafhopper, white backed planthopper, leaffolder, grasshopper and gundhibug are a permanent threat to rice cultivation [6].

The use of pesticides has now become a common means for control because of their quick knockdown effect. This continuous use of pesticides has been the root of basic problems like environmental pollution, human and livestock health risk, build-up of pest resistance and resurgence and has disturbed the ecological balance. Therefore, the time has now come to control the pests in an eco-friendly and more amicable manner. Hence, attempts were made to know the efficacy of some traditional insecticides, some novel insecticides and commercial neem formulations.

## Materials and Methods

An experiment was during *kharif* season, 2010 to evaluate the bio-efficacy of certain insecticides against Brown planthopper (BPH) in Rice crop. Rice variety HUBR 2-1 was transplanted on July 28 in 2010 for field trail. Crop was raised according to recommended agronomic practices. The field was properly ploughed and kept exposed to sun for several days to destroy the underground insects and weeds and then puddle thoroughly with the help of a tractor. The plant geometry was 20 X 15 cm, three replications and eight treatments viz. Fipronil 80 WG (50 g ai/ha), Fipronil 80 WG (100 g ai/ha), Fipronil 5 SC(50 g ai/ha), Triazophos 40 EC (450 g ai/ha), Imidacloprid 17.8 SL (50 g ai/ha), Thiamethoxam 25 WG (25 g ai/ha), Neem (Azadirachtin 300 ppm) including untreated control, follow the RBD design and plot size was 4 x 5 $cm^2$. Observations were made at weekly intervals throughout the crop season on number of Brown planthopper per hill. The weekly meteorological data were collected from Agro-meteorological Observatory, Department of Agronomy, Institute of Agricultural Sciences, BHU for *Kharif* season 2010-11. In the present experiment, brown planthopper were monitored at regular intervals and when damage reached the Economic Threshold Level, pesticides were sprayed as per the schedule laid out in two sprays, first spray on 3$^{rd}$ October 2010 second spray on 13$^{th}$ October 2010. The insecticidal spray solution of desired concentration as per each treatment was freshly prepared every time at the experimental site just before the start of spraying operation. The quantity of spray was adjusted for its volume by adding remaining quantity of water. To this extract, the soap powder at the rate of 0.2% (200g/100 lit. water) was added to have a better coverage of material on the crop. In the present experiment, the BPH populations were taken into account in phases i.e. before spray and after spray. The observations were recorded at randomly selected three hills in each treatment plot. Harvesting was done on 8$^{th}$ November 2010 plot wise. Threshing and recording of grain yield was done on 23$^{rd}$ November. The yield per plot and treatment was converted to quintals per hectare. The per cent reduction in the pest population was calculated by using Henderson and Tilton's formula (1955) are as,

$$\% \text{ Reduction in pest population} = 1 - \left[ \frac{T_a}{T_b} \times \frac{C_b}{C_a} \right] X\ 100$$

Where,

$T_a$ = Population in the treated plot after spray

$T_b$ = Population in the treated plot before spray

$C_a$ = Population in the control plot after spray

$C_b$ = Population in the control plot after spray

## Result and discussion

Present investigation is emphasis on eco-friendly insecticides to fight with the menace of insect-pests everywhere because the synthetic insecticides are posing serious threat by degrading the ecological balance. Under present study we tried to evaluate some newer insecticides molecules viz. Fipronil 80 WG (50g ai/ha), Fipronil 80 WG (100g ai/ha), Fipronil 5 SC (50g ai/ha), Triazophos 40 EC (450g ai/ha), Imidacloprid 17.8 SL (50g ai/ha), Thiamethoxam 25 WG (25g ai/ha), Neem (Azadirachtin 300 ppm) including an untreated control against BPH during *kharif* rice 2010. These treatments were sprayed twice at 67 days after transplanting and 77 days after transplanting.

Results showed that among all the treatments Triazophos 40 EC (450g ai/ha) was very effective after first spray. However, Imidacloprid 17.8 SL (50 g ai/ha) was superior after second spray. Fipronil 80 WG (100g ai/ha) showed highest percentage increase in yield over untreated control. Fipronil 80 WG (100g ai/ha) found to be superior than Fipronil 80 WG (50g ai/ha) and Fipronil 5 SC (50g ai/ha) in reference to both population control and yield response**.** Application of granular fipronil was more pronounced in restricting the planthopper population to a minimum level (3.78/hill) at its peak activity period [7]. Similar results are also obtained and presented in (Table 1 and 2).

**Table 1: Bioefficacy of newer insecticides against BPH in rice (First Spray)**

| Treatment | Dose (g ai/ha) | Average Pre-count | Average number of Brown Plant Hopper per hill (Days After Spraying) | | | |
|---|---|---|---|---|---|---|
| | | | 1 | 3 | 7 | 10 |
| Fipronil 80 WG | 50 | 9.66 | 3.55 | 3.88 | 4.77 | 7.15 |
| Fipronil 80 WG | 100 | 9.17 | 3.40 | 3.48 | 3.66 | 6.11 |
| Fipronil 5 SC | 50 | 9.37 | 3.88 | 4.02 | 4.58 | 4.85 |
| Triazophos 40 EC | 450 | 9.39 | 2.55 | 3.05 | 3.44 | 4.43 |
| Imidacloprid 17.8 SL | 50 | 9.33 | 3.37 | 3.69 | 4.62 | 6.90 |
| Thiamethoxam 25 WG | 25 | 8.27 | 2.95 | 3.29 | 3.77 | 4.83 |
| Neem (Aza. 300ppm) | | 9.03 | 4.66 | 5.22 | 5.87 | 7.88 |
| Untreated control | - | 9.33 | 10.33 | 12.26 | 13.25 | 11.38 |
| SEm ± | | NS | 0.22 | 0.17 | 0.12 | NS |
| CD (P≥0.05) | | -- | 0.67 | 0.52 | 0.36 | -- |

**Table 2: Bioefficacy of newer insecticides against BPH in rice (Second Spray)**

| Treatment | Dose (g ai/ha) | Average Precount | Average number of Brown Plant Hopper per hill (Days After Spraying) | | | |
|---|---|---|---|---|---|---|
| | | | 1 | 3 | 7 | 10 |
| Fipronil 80 WG | 50 | 7.15 | 3.77 | 3.98 | 4.79 | 3.69 |
| Fipronil 80 WG | 100 | 6.11 | 3.40 | 3.59 | 3.68 | 3.54 |
| Fipronil 5 SC | 50 | 4.85 | 3.92 | 4.12 | 4.48 | 4.26 |
| Triazophos 40 EC | 450 | 4.43 | 2.55 | 2.96 | 3.44 | 3.45 |
| Imidacloprid 17.8 SL | 50 | 6.90 | 3.48 | 3.69 | 4.62 | 4.63 |
| Thiamethoxam 25 WG | 25 | 4.83 | 2.95 | 3.20 | 4.02 | 4.11 |
| Neem (Aza. 300ppm) | | 7.88 | 4.00 | 5.20 | 5.89 | 4.92 |
| Untreated control | - | 11.38 | 11.33 | 11.21 | 9.02 | 5.23 |
| SEm ± | | NS | 0.24 | 0.18 | 0.17 | NS |
| CD (P≥0.05) | | -- | 0.74 | 0.56 | 0.52 | -- |

Fipronil and thiamethoxam had been found to have excellent toxicity to BPH [8]. Several workers have documented the effectiveness of imidacloprid effective and efficient in controlling brown plant hopper. Imidacloprid, thiamethoxam were effective in suppressing the BPH population in rice. Also it has been found thatd thiamethoxam 25 WG at 50 g a.i./ha and imidacloprid 17.8 SL at 50 g a.i./ha recorded the lowest BPH population after spray and the highest grain yield over other treatments [8]. Fipronil was also found promising in controlling the pest as well as increasing rice grain yield (Table 3) [9]. It could be concluded that granular formulation of fipronil can be recommended for the suitable management of BPH.

**Table 3: Overall Bioefficacy of newer insecticides against BPH in rice and yield response**

| Treatment | Dose (g ai/ha) | % reduction of BPH population over control after | | Yield (Kg/ha) | % Increase in yield over control |
|---|---|---|---|---|---|
| | | First spray | Second spray | | |
| Fipronil 80 WG | **50** | 68.23 | 45.32 | 4852 | 61.09 |
| Fipronil 80 WG | **100** | 69.01 | 42.28 | 5210 | 72.97 |
| Fipronil 5 SC | **50** | 65.18 | 16.37 | 4829 | 60.33 |
| Triazophos 40 EC | **450** | 75.37 | 37.25 | 4925 | 63.51 |
| Imidacloprid 17.8 SL | **50** | 68.75 | 47.58 | 4845 | 60.86 |
| Thiamethoxam 25 WG | **25** | 68.84 | 35.76 | 4885 | 62.18 |
| Neem (Aza. 300ppm) | | 54.81 | 41.1 | 4026 | 33.67 |
| Untreated Control | -- | -- | -- | 3012 | -- |
| SEm± | | | | 126 | |
| CD (P≥0.05) | | | | 378 | |

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