IMPACT OF GRANULAR FORMULATION OF CONVENTIONAL AND NEWER INSECTICIDES AGAINST BROWN PLANTHOPPER NILAPARVATA LUGENS IN RICE CROP

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Abstract
An experiment was conducted on hybrid rice variety PHB 71 to study field efficacy of granular formulation of fipronil and conventional insecticides viz., carbofuran and cartap hydrochloride against brown planthopper in rice crop at Banaras Hindu University research farm, Varanasi. The trials were laid in RBD with seven treatments including control, replicated thrice. The overall performance of various granular insecticidal treatments were assessed based on per cent increase in grain yield over control. Plots treated with Fipronil 0.6% GR @ 60g a.i./ha was the most effective and significantly superior over all other treatments in reducing the hopper infestation (2.0/hill) as compared to untreated control (13.7/hill) and realizing 60.0 per cent increase in grain yield over control. Fipronil 0.3% GR @ 60g a.i./ha stood second in order of effectiveness which recorded 58.27 percent. Cartap Hydrochloride 4% GR @ 750g a.i./ha proved least effective in which 28.86 per cent increase in yield was observed.

Key words : Fipronil, granules, brown planthopper, management.

Introduction
The lag in the yield level is attributed to many reasons and problem due to pests is one among them. Insect pests have been recognized as major biotic stress responsible for reduction in yield of rice in different system zones of India. Among various insect pests in rice, brown planthopper, Nilaparvata lugens (Stal) is quite serious in several rice growing areas of India. The brown planthopper is a small insect (2.0-3.5 mm in body length), brownish sucking insect, belonging to order Hemiptera, suborder Homoptera, and family Delphacidae. The BPH is a monophagous insect restricted to cultivated rice and its allied wild forms such as Oryza perenis and Oryza spontanea (Kisimoto, 1965). It causes direct damage to rice plant by sucking the plant sap. In addition to the feeding damage, it also transmits grassy stunt (Rivera et al., 1966), ragged stunt (Ling, 1978) and wilted stunt virus disease of rice (Chen et al., 1978). Heavy damage caused by brown planthopper in the field can be identified by the development of circular patches in the field, which is termed as “Hopper Burn”. The brown planthopper alone causes 10-30 per cent loss in rice yield (Li et al., 1996). The first severe outbreak occurred in Kerala in 1973-74, damaging about 50, 000 ha of rice (Bai et al., 1992). Several insecticides in different formulations have been reported effective against these hoppers (Varma et al., 2003; Krishnaiah et al., 2004; Kendappa et al., 2005; Wang et al., 2008 and Catindig et al., 2009). The indiscriminate use of insecticides over the years has led to the development of insecticide resistance in planthoppers (Krishnaiah et al., 2006). In order to evolve effective and economic pest control, it is necessary to evaluate the new groups and new formulations of chemicals. Hence, this study was undertaken.

Materials and Methods
The investigations on “Field efficacy of granular insecticides against brown plant hopper in rice” were carried out at the Research Farm Department of Entomology, B.H.U. Varanasi (U.P.), India; during Kharif, 2012. The edaphic and climatic conditions of experimental site under which the experiments were conducted along with the techniques applied and materials used are being described here with.

Rice variety 'PHB 71' was grown in plot of size 4m x 2.5m at spacing of 20cm x 20cm with recommended agronomic practices for growing the rice crop in eastern
Table 1: Bioefficacy of Fipronil 0.6% GR against BPH in rice.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dose (g a.i./ha)</th>
<th>Avg. population of BPH/hill</th>
<th>Yield (kg/ha)</th>
<th>% increase in grain yield over control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADBT Days after</td>
<td>Days after 7 DAT 14 DAT Mean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fipronil 0.6% GR</td>
<td>40</td>
<td>13.2</td>
<td>3.2 5.2 4.2</td>
<td>5012.0 31.96</td>
</tr>
<tr>
<td>Fipronil 0.6% GR</td>
<td>50</td>
<td>12.8</td>
<td>2.6 3.8 3.2</td>
<td>5809.0 52.95</td>
</tr>
<tr>
<td>Fipronil 0.6% GR</td>
<td>60</td>
<td>13.2</td>
<td>2.0 2.4 2.2</td>
<td>6115.0 61.00</td>
</tr>
<tr>
<td>Fipronil 0.3% GR</td>
<td>60</td>
<td>12.8</td>
<td>2.8 3.2 3.0</td>
<td>6011.0 58.27</td>
</tr>
<tr>
<td>Carbofuran 3 GR</td>
<td>750</td>
<td>13.2</td>
<td>2.4 4.2 3.3</td>
<td>5403.0 42.26</td>
</tr>
<tr>
<td>Cartap Hydrochloride 4% GR</td>
<td>750</td>
<td>12.6</td>
<td>4.2 6.6 5.4</td>
<td>4818.0 28.86</td>
</tr>
<tr>
<td>Untreated Control</td>
<td></td>
<td>12.8</td>
<td>13.7 15.4 14.5</td>
<td>3798.0</td>
</tr>
</tbody>
</table>

DAT = Days after Treatment. ADBT = A day before treatment.

Dash et al. (2008) found application of granular fipronil was more pronounced in restricting the plant hopper insect population over control was worked out in order to judge and express the efficacy of the respective treatments against it. The per cent reduction in the pest population also calculated.

Results and Discussion

Field efficacy of all the treatments after granular application is showed in table 1. All the treatments showed significant reduction in population of BPH after 7 days after treatment compared to untreated control. Fipronil 0.6% GR @ 60g a.i./ha followed by Carbofuran 3 GR @ 750g a.i./ha were found most effective among all the treatments after 7 DAT. They showed reduction of BPH population from 13.20 to 2.40 and 1120 to 2.40 per hills after 7 DAT, respectively. At the 14 DAT Fipronil 0.6% GR @ 60 g a.i./ha followed by Fipronil 0.3% GR @ 60g a.i./ha were found most effective among all treatments. They showed reduction of BPH population to 2.40 and 3.20 per hills respectively. All other treatments were at par themselves except Cartap HCI 4% GR @ 750g a.i./ha which was least effective among all treatments showing 4.20 and 6.60 BPH population per hills after 7 DAT and 14 DAT, respectively.

Results showed that among all the treatments Fipronil 0.6% GR @ 60g a.i./ha was very effective In case of granular application. The performance of the treatments are in the order of granular insecticides (persent increase over control) Fipronil 0.6% GR @ 60g a.i./ha > Fipronil 0.3% GR @ 60g a.i./ha > Fipronil 0.6% GR @ 50g a.i./ha > Carbofuran 3 GR @ 750g a.i./ha and Fipronil 0.6% GR @ 40g a.i./ha > Cartap HCI 4% GR @ 750g a.i./ha.

Statistical analysis

The ANOVA of data recorded during the experiment was made for the insect under study and the calculated ‘F’ was compared with tabulated ‘F’ at 5 per cent level of significance, following standard procedures (SPSS® software for agriculture). The significance of difference between treatments was judged by CD at 5 per cent level of significance. The per cent reduction of the test
population to a minimum level (3.78/hill) at its peak activity period. Similar results are also obtained in the present studies. DeJin et al. (2009) also reported that fipronil had excellent toxicity to BPH. Carbofuran was also effective in suppressing the population of BPH next to fipronil. Kalita and Ahmed (2008) have reported the efficacy of carbofuran against BPH and they have attributed the effectiveness of this insecticide due to its systemic and persistent activity. Effectiveness of cartap hydrochloride against BPH has been documented by several workers (Sahithi and Misra, 2006; Prasad et al., 2005).

In this experiment, the highest yield of rice (61.15 q/ha) (table 2) was obtained in the treatment with Fipronil 0.6% GR @ 60g a.i./ha. This treatment recorded 23.17 q/ha and 61.15 per cent increase in yield over control. The next best treatment is Fipronil 0.3% GR @ 60g a.i./ha which recorded 60.11 q/ha yield of rice and 22.13 q/ha, 58.27 per cent increase in yield over control. The next best treatment was Fipronil 0.6% GR @ 50g a.i./ha which recorded 58.09 q/ha yield with 20.11 q/ha and 52.95 per cent increase over control and found at par with Carbofuran 3 GR @ 750g a.i./ha and Cartap HC1 4% GR @ 750g a.i./ha(50.12 q/ha) (table 2) was obtained in the treatment with Fipronil 0.6% GR @ 60g a.i./ha. This treatment recorded 23.17 q/ha and 61.15 per cent increase in yield over control. The next best treatment is Fipronil 0.3% GR @ 60g a.i./ha which recorded 60.11 q/ha yield of rice and 22.13 q/ha, 58.27 per cent increase in yield over control. The next best treatment was Fipronil 0.6% GR @ 50g a.i./ha which recorded 58.09 q/ha yield with 20.11 q/ha and 52.95 per cent increase over control and found at par with Carbofuran 3 GR @ 750g a.i./ha and Cartap HC1 4% GR @ 750g a.i./ha(50.12 q/ha) and Cartap HC1 4% GR @ 750g a.i./ha(48.18 q/ha). The untreated control recorded lowest of 37.98 q/ha yield of rice. The results are in agreement with Dash et al. (2004) and Panda et al. (2004) who reported they that fipronil and cartap hydrochloride recorded the highest grain yield with the maximum increase over the untreated control. Mayabini (2004) also reported that fipronil was found promising in controlling the pest as well as increasing rice grain yield. It can be concluded that granular formulation of fipronil can be used as an important component of pest management programme for suitable management of brown planthopper in rice.

References


