*Research Paper :*

# Evaluation of some management schedules against brown plant hopper in rice

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## SUMMARY

**A field trial was conducted during *Kharif* season, 2004, repeated in *Rabi* season, 2004-05 and *Kharif* season, 2005 at the Regional Research and Technology Transfer Station (RRTTS), Keonjhar, OUAT Bhubaneswar. The performances of the neem derivatives like neem seed extract (NSE), neem oil (NO), mulltineem (commercial product of neem based pesticide) and a commercial Bt. formulation (Halt) were evaluated for their bioefficacy against brown plant hopper (BPH). Populations of BPH were recorded at 30 and 50 DAT. Results indicated that first round application with neem pesticides at 20 DAT and subsequent application with the same neem pesticides or with chemical pesticide like chlorpyriphos at 40 DAT could be the appropriate step to handle the BPH population in rice crop.**

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The BPH occupies the major pest status because of accelerating momentum in its occurrence in rice ecosystem. In ecological term, BPH is a typical 'r' strategist and its population is kept under natural check only under low densities but if the population escapes this catch, it rapidly grows exponentially. So in the present investigation an attempt has been made to formulate an eco-friendly management schedule against BPH of transplanted rice by integrating neem derivatives, Bt formulation and synthetic pesticide, chlorpyriphos. A field trial was conducted during *Kharif* season, 2004 and the same experiment was repeated in *Rabi* season, 2004-05 and *Kharif* season, 2005 at the Regional Research and Technology Transfer Station (RRTTS), Keonjhar, Orissa operating under the control of Orissa University of Agriculture and Technology, Bhubaneswar to develop a bio-rational management strategy for brown plant hopper.

## MATERIALS AND METHODS

The experiments were designed in a Randomized Complete Block Design (Factorial). A rice variety moderately resistant to insect pests, *Lalat,* generated by OUAT, Bhubaneswar, Orissa and a susceptible rice variety *Jaya* were included in the test. Neem derivatives like neem seed extract (NSE), neem oil (NO) and multineem (commercial product of neem based pesticide) were also included in the experiment. A commercial Bt. formulation (Halt) was also utilized in the experiment. The performances of these biopesticides were studied for their bioefficacy against brown plant hopper. Recommended IPM practice and untreated check treatments were also included in the field experiments for the relative comparison of results. The nymphal and adult population of brown plant hoppers was collected by adopting water pan sampling technique on 10 hills. In a yellow plastic pan of 9'' diameter, a small amount of water to the level of 1/5$^{th}$ of height of the yellow pan was taken and two to three drops of liquid detergent was added to the water taken in the yellow plastic pan. The pan was placed at the base of the hill and the hill was struck 3 times to dislodge the arthropods into the pan. In this manner, collection was made for individual treatment of each replication separately. After the collection of arthropods into the pan, they were

transferred into a funnel fitted with a fine screen and then the arthropods were collected on the screen. The funnel was gently inverted and a specimen tube was placed correctly touching to the edge of the funnel. Ethyl alcohol (70%) was allowed to pass through the pipe side of the funnel from a wash bottle very gently for the purpose of getting the arthropods collected into the specimen tube. After that the specimen tube was capped and carried from the field to the laboratory for identification. Population of BPH was then recorded. Such observations were noted at 30 and 50 DAT.

## RESULTS AND DISCUSSION

Brown plant hopper population was recorded both at 30 DAT and 50 DAT in all the treatments over three seasons. Natural pest load by BPH was found above the ETL at both 30 DAT and 50 DAT except the cropping season of *Kharif*, 2004 at 30 DAT. Three protection schedules comprising neem derivatives (NSE, NO and Multineem) applied as foliar sprays at 20 DAT plus chlorpyriphos at 40 DAT recorded the BPH population/ hill varying from 1.18 to 4.0 numbers compared to 3.23 to 6.6 numbers of BPH/hill in control plots at 30 DAT. The aforesaid treatments registered 1 to 4 numbers of BPH/hill at 50 DAT as against 5.66 to 8.0 BPH /hill in untreated check plots. Thus it may be stated that one round application of neem derivatives like NSE (5%), NO (5%) and Multineem (0.3%) as foliar spray at 20 DAT and further supplemented with chlorpyriphos spray (0.4 kg a.i. /ha) at 40 DAT was good enough to suppress the BPH population below the ETL. From the result it is highlighted that protection of rice crops by two round spray of neem pesticides (NSE, NO and Multineem) could maintain the BPH population below the ETL point registering 1.86 to 4.3 numbers of BPH/hill at 30 DAT and 2.0 to 4.3 number of BPH/hill at 50 DAT. Thus, it

**Table 1 : Population of brown plant hopper (BPH) in different treatments during *Kharif* seasons (2004, 2005) and *Rabi* season (2004-2005) at 30 days after transplanting (DAT)**

| Treatment No | Details of treatments | Number of BPH/hill at 30 DAT | | | | | |
|---|---|---|---|---|---|---|---|
| | | $V_1$: *Jaya* | | | $V_2$: *Lalat* | | |
| | | *Kharif*, 2004 | *Rabi*, 2004-05 | *Kharif*, 2005 | *Kharif*, 2004 | *Rabi*, 2004-05 | *Kharif*, 2005 |
| $T_1$ | Recommended IPM Practice | 1.00 | 1.00 | 0.66 | 1.16 | 1.6 | 0.33 |
| | | (1.22) | (1.22) | (1.07) | (1.29) | (1.45) | (0.91) |
| $T_2$ | NSE (5%) at 20 and 70 DAT + | 1.18 | 2.60 | 3.00 | 1.70 | 2.30 | 3.00 |
| | Chlorpyriphos (0.4kg a.i./ha) at 40 DAT | (1.50) | (1.76) | (1.87) | (1.48) | (1.67) | (1.87) |
| $T_3$ | NO (5%) at 20 and 70 DAT+ | 1.93 | 3.30 | 3.33 | 2.16 | 2.60 | 4.00 |
| | Chlorpyriphos (0.4kg a.i./ha) at 40 DAT | (1.56) | (1.95) | (1.96) | (1.63) | (1.76) | (2.12) |
| $T_4$ | Multineem(0.3%) at 20 and 0 DAT+ | 2.00 | 3.60 | 3.00 | 2.00 | 2.20 | 3.66 |
| | Chlorpyriphos (0.4kg a.i./ha) at 40 DAT | (1.58) | (2.02) | (1.87) | (1.58) | (1.64) | (2.04) |
| $T_5$ | Halt (1kg/ha) at 20 and 70DAT + | 2.16 | 4.60 | 4.33 | 2.30 | 4.00 | 3.66 |
| | Chlorpyriphos (0.4kg a.i./ha) at 40 DAT | (1.63) | (2.26) | (2.20) | (1.67) | (2.12) | (2.04) |
| $T_6$ | NSE (5%) at 20, 40 and 70 DAT | 2.43 | 3.00 | 3.00 | 1.86 | 2.6 | 3.00 |
| | | (1.71) | (1.870 | (1.87) | (1.54) | (1.76) | (1.87) |
| $T_7$ | NO (5%) at 20, 40 and 70DAT | 2.70 | 4.00 | 3.00 | 2.00 | 4.00 | 4.00 |
| | | (1.79) | (2.12) | (1.87) | (1.58) | (2.12) | (2.12) |
| $T_8$ | Multineem(0.3%) at 20, 40 and 70 DAT | 2.66 | 4.30 | 4.00 | 2.50 | 4.00 | 3.00 |
| | | (1.78) | (2.19) | (2.12) | (1.73) | (2.12) | (1.87) |
| $T_9$ | NSE (5%) at 20 and 70 DAT + Halt | 2.93 | 3.00 | 3.00 | 2.36 | 3.30 | 3.00 |
| | (1kg/ha) at 40 DAT | (1.85) | (1.87) | (1.87) | (1.69) | (1.95) | (1.87) |
| $T_{10}$ | Untreated control | 4.00 | 6.60 | 6.00 | 3.23 | 6.30 | 5.00 |
| | | (2.12) | (2.66) | (2.55) | (1.93) | (2.61) | (2.34) |
| | | S | S | S | S | S | S |
| | $S.E._{(m)}$ ± | 0.010 | 0.038 | 0.051 | 0.010 | 0.038 | 0.051 |
| | C.D. (P=0.01) | 0.02 | 0.11 | 0.15 | 0.02 | 0.11 | 0.15 |

$V_1$: Susceptible rice variety, *Jaya* $V_2$: Moderately resistant rice variety, *Lalat*

**Table 2 : Population of brown plant hopper (BPH) in different treatments during *Kharif* seasons (2004, 2005) and *Rabi* season (2004-2005) at 50 days after transplanting (DAT)**

| Treatments No | Details of treatments | Number of BPH/hill at 50 DAT | | | | | |
|---|---|---|---|---|---|---|---|
| | | $V_1$: *Jaya* | | | $V_2$: *Lalat* | | |
| | | *Kharif*, 2004 | *Rabi*, 2004-05 | *Kharif*, 2005 | *Kharif*, 2004 | *Rabi*, 2004-05 | *Kharif*, 2005 |
| $T_1$ | Recommended IPM Practice | 2.00 | 1.00 | 0.33 | 2.33 | 1.00 | 0.33 |
| | | (1.58) | (1.22) | (0.91) | (1.68) | (1.22) | (0.91) |
| $T_2$ | NSE (5%) at 20 and 70 DAT + | 2.66 | 3.60 | 2.00 | 2.66 | 3.30 | 1.00 |
| | Chlorpyriphos (0.4kg a.i./ha) at 40 DAT | (1.78) | (2.02) | (1.58) | (1.78) | (1.95) | (1.22) |
| $T_3$ | NO (5%) at 20 and 70 DAT+ | 3.00 | 3.00 | 2.66 | 3.33 | 3.30 | 2.00 |
| | Chlorpyriphos (0.4kg a.i./ha) at 40 DAT | (1.87) | (1.87) | (1.78) | (1.96) | (1.95) | (1.58) |
| $T_4$ | Multineem(0.3%) at 20 and 0 DAT+ | 3.33 | 3.60 | 3.00 | 3.66 | 4.00 | 3.66 |
| | Chlorpyriphos (0.4kg a.i./ha) at 40 DAT | (1.96) | (2.02) | (1.87) | (2.04) | (2.12) | (2.04) |
| $T_5$ | Halt (1kg/ha) at 20 and 70DAT + | 4.00 | 5.60 | 4.00 | 3.33 | 6.00 | 3.00 |
| | Chlorpyriphos (0.4kg a.i./ha) at 40 DAT | (2.12) | (2.47) | (2.12) | (1.96) | (2.48) | (1.87) |
| $T_6$ | NSE (5%) at 20, 40 and 70 DAT | 3.00 | 3.00 | 4.00 | 2.66 | 3.00 | 2.00 |
| | | (1.87) | (1.87) | (2.12) | (1.78) | (1.87) | (1.58) |
| $T_7$ | NO (5%) at 20, 40 and 70DAT | 3.66 | 3.00 | 4.30 | 3.00 | 3.60 | 2.00 |
| | | (2.04) | (1.87) | (2.19) | (1.87) | (2.02) | (1.58) |
| $T_8$ | Multineem(0.3%) at 20, 40 and 70 DAT | 3.66 | 3.30 | 3.00 | 3.00 | 3.60 | 3.00 |
| | | (2.04) | (1.95) | (1.87) | (1.87) | (2.02) | (1.87) |
| $T_9$ | NSE (5%) at 20 and 70 DAT + Halt | 4.00 | 3.00 | 4.66 | 3.66 | 3.30 | 3.33 |
| | (1kg/ha) at 40 DAT | (2.12) | (1.87) | (2.27) | (2.04) | (1.95) | (1.96) |
| $T_{10}$ | Untreated control | 6.33 | 7.00 | 8.00 | 5.66 | 6.00 | 6.33 |
| | | (2.61) | (2.74) | (2.92) | (2.48) | (2.48) | (2.61) |
| | | S | S | S | S | S | S |
| | $S.E._{(m)}$ ± | 0.003 | 0.036 | 0.043 | 0.003 | 0.036 | 0.043 |
| | C.D (P=0.01) | 0.01 | 0.10 | 0.12 | 0.01 | 0.10 | 0.12 |

$V_1$: Susceptible rice variety, *Jaya* $V_2$: Moderately resistant rice variety, *Lalat*

can be concluded that neem based pesticides is quite effective against the BPH in low to moderate population density. Halt (Bt. formulation) application @ 1kg/ha at 20 DAT plus chlorpyriphos spray @ 0.4 kg a.i./ha at 40 DAT were found relatively less effective in comparison to the aforesaid treatments.

Saxena and Khan (1985), Krishnaiah and Kalode (1990), Jena and Dani (1994, 1997) and Pradhan (2002) reported the antifeedant action of neem oil against the BPH and further they indicated that neem oil is quite effective in suppressing the BPH population in field conditions. Nanda *et al.* (1996) and Pradhan (2002) reported that neem derivatives like neem cake, neem oil and neem seed extract as well as commercial formulation of neem were found very effective against the rice BPH when applied in combination with monocrotophos or as alternate application. Scientists of All India Coordinated Rice Improvement Project, Hyderabad (AICRIP, 1996) reported that commercial formulation of Bt. is low to moderately effective against the rice BPH in field conditions. Results of the present investigations are almost similar with the statements made by the scientists mentioned in this paragraph.

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