ROLE OF SOME ECOFRIENDLY BIOPESTICIDES TO CONTROL THE PEST

_Heliothis armigera_ ON TOMATO

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**ABSTRACT**

**Purpose**

Botanical pesticides are now emerging as a valuable component of IPM strategies in all crops due to their efficacy to insect pests and safety to their natural enemies. The prime purpose of the study is to check the efficiency of plant extracts against the _Heliothis armigera_ on tomato.

**Methodology**

The trial test was performed in randomised block design with six treatments and three replications. The infestation was evaluated and subjected to analysis of variance with LSD. Field experiments were performed to check the efficacy of chemical and botanical formulations against fruit borer, _Heliothis armigera_ infesting tomato. The insecticides Steward, Tracer, and Proclaim (Sahito 2013), were applied four times at the interval of 15 days of second, third and fourth spray, respectively.

**Social Implications**

Plants derived chemicals act as an environmentally safe alternative to chemical pesticides. Secondary metabolites from plants play a keydefensive role against the pests and act as antifeedants, oviposition deterrents and growth inhibitors. Plant extracts pose less threat to the animals, human and society.

**Findings**

The results showed that all three insecticides performed well in reducing the infestation in fruits by the _H. armigera_ however, Proclaim gave best results. It shows 1.22% of infestation after the 4th spray and 95.72% mortality. Simultaneously three plants extract _Nigella sativa_, _Aristolochia_ leaf extract, _Jatropha curcas_ (Ratnadass 2012) also applied to check their efficacy against fruit borer. Among these plants extract _Nigella sativa_ extract perform well against _H.armigera_. After the application of _Nigella sativa_ 4th spray, the percent infestation was 3.83 and 72.99% mortality while _Aristolochia_ leaf extract and _Jatropha curcas_ were comparatively less potent with 48.5% and 62.64% mortality respectively.

**Originality**

The study was performed at Zoology Department, A.N.D. College, Kanpur. Data collected through the randomised block design method.

**Key Words: Heliothis armigera, Botanical extracts, Biodegradable, Tomato**

**INTRODUCTION**

_Heliothis armigera_ (Hubner) (Lepidoptera: Noctuidae) creates a problem for agricultural production around the world (Carneiro2014). It feeds on a wide range of economically important crops, among them more than 60 species of cultivated and non-cultivated plants belonging to more than 47 families. It includes soybeans, cotton, sorghum, corn, sunflower, peanuts, tomatoes, and peppers, pigeon pea, chickpea, sorghum and cowpea. Other hosts include diosanthus, rosa, pelargonium, chrysanthemum, groundnut, okra, peas, field beans, soybeans, lucerne, other Leguminosae, tobacco, potatoes, maize, flax, citrusfruits, forest trees and a range of vegetable crops (CAB, 2006; Multani and Sohi, 2002; Chandra and Rai, 1974; Gahukar, 2002; Kakimoto et al, 2003). Polyphagia, high mobility, high fecundity and facultative diapaus are the main characteristics of _Heliothis_ life history that permit it to survive in adverse environments and to adapt to the most abrupt seasonal changes. The proposed management strategies for _H. armigera_ are, use of biological control; pest monitoring; reduction of the seeding window for corn, soybeans, and cotton; and adoption of refuge areas of conventional plants near transgenic cultivars. However, chemical control is still mostly used by producers. Use of synthetic pesticides causes
environmental pollution and affect the nontarget organisms (Chauhan, M.S. et al, 2013) The recommended dosages of the insecticides should be observed, avoiding super- and sub-dosages, since the effectiveness of control can be reduced, as well as contributing to selection for population resistant to the insecticides applied. Multiple applications of an average dosage are more potent than a single application in overdose. Rotation of insecticides with different modes of action is also recommended to avoid selection for resistant populations. The synthetic insecticides currently used for control purposes in countries that suffer from damage caused by H. armigera are indoxacarb, methoxyenoide, abamectin benzoate, novaluron, chlorfenapyr, imidacloprid, fluvinate, endosulfan, spinosad, abamectin, deltamethrin, cypermethrin, lambda-cyhalothrin, carbaryl, methomyl, profenofos, thiodicarb, and chlorpyrifos. Many plant extracts, semi-purified and purified compounds have been studied for insect control properties by many researchers all over the world. Secondary metabolites from plants play a key defensive role against the insects and act as antifeedants, oviposition deterrents, and growth inhibitors (Isman 2002). Biopesticides or biological pesticides based on plant extracts specific to a target pest offer an ecologically sound solution to pest problems. They pose less threat to the environment and human health.

MATERIALS AND METHOD

The experiment was laid in randomised block design with six treatments and three replications (Shah, J.A. et al, 2013). Plant to plant distance was 0.50m, and row to row distance was 0.60 m. The size of the unit plot was 3.6m×3m.

Rearing of test organism

To start the culture larvae were collected from plots and reared in a Petri dish containing fresh food. The food was changed daily, and at maturation, the larvae were separated according to their sexes. They were allowed to mate. The pair of Heliothis carefully transferred to the new plate for egg laying after 24 hours. As soon as hatching starts, the newly hatched larvae were relocated to Petri dish and the food was kept on moist filter paper.

Treatments

T1-Nigella sativa extract(5%)
T2-Aristolochia leaf extracts(5%)
T3-Jatropha curcas(5%)
T4-Steward(25cc/tank)
T5-Tracer(25 cc/tank)
T6-Proclaim(25cc/tank)
T7-Untreated

The Procedure of Treatment Application

Treatment wise botanicals and insecticide were sprayed when the first symptom of infestation observed at the time of flower initiation stage and then treatments were repeated after 15 days interval, till fruiting. On the date of spray, the target plot was surrounded by temporary plastic sheet to avoid drifting to the adjacent plots.

Data Collection

Plants from each treatment were randomly examined, and pest population was recorded on damaged fruits percent. Both the safe and infested (damaged) fruits were counted per plant from each plot (treatment). Finally, the infestation / damaged percent (%) was evaluated and subjected to analysis of variance with LSD (A.K.M.Z. Rahman 2014).

Percent fruit damage by number = Number of infested fruit ×100
Total number of fruits

Percent fruit damaged by weight= Weight of infested fruits×100
Weight of total fruits

Statistical Analysis:

For statistical analysis of efficacy of botanical extracts to H. armigera mortality was analysed by Statistical Package SPSS .8
RESULTS AND DISCUSSION

During the study period, the different insecticides such as; Steward, Tracer, Proclaim and natural protectants such as Nigella sativa, Aristolochia leaf extract, and Jatropha curcas was used to control the tomato fruit borer, H. armigera in the tomato crop. The results of the present study indicated that the tomato fruit borer was one of the serious pests in tomato crop. Its damage was found more severe at fruiting stage. The screening of best insecticide was determined by comparing treated plots with untreated plots.

The results further indicated that the overall mean infestation percent of minimum infestation of fruits were recorded 1.59% per plant after the first spray. Among all pesticides, the Proclaim insecticide was found the best in the first spray. In the second spray, the overall mean percent of less damaged fruits observed were 1.08% per plant by the H. armigera from Proclaim pesticide among these insecticides, as compared to control plot (14.05% per plant). In the third spray, the overall mean percent of less damaged fruits per plant observed was 0.65% as compared to control (16.78% per plant) by the Proclaim insecticide. In the last spray, the overall mean percent of less damaged fruits per plant was observed 1.22%.

While after the application of botanical extracts best result given by Nigella sativa extract with mean percentage 3.80% in the first spray followed by 3.98%, 3.72%, and 3.83%. It shows 72.99% mortality. Other botanical extracts were not able to demonstrate a significant effect against H.armigera. Aristolochia leaf extract shows infestation mean percentage 7.31% in the first spray followed by 7.46%, 7.26%, and 7.08%. While after the application of Jatropha curcas extract the average percentage infestation in the first spray was 3.71% followed by 3.77%, 3.64%, and 4.81%. Results are presented in Table 1 and figure no 1.

<table>
<thead>
<tr>
<th>TREATMENTS</th>
<th>1 spray</th>
<th>2 spray</th>
<th>3 spray</th>
<th>4 spray</th>
<th>%mortality</th>
</tr>
</thead>
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<tr>
<td>Nigella sativa</td>
<td>3.80</td>
<td>3.98</td>
<td>3.72</td>
<td>3.83</td>
<td>72.99</td>
</tr>
<tr>
<td>Aristolochia</td>
<td>7.31</td>
<td>7.49</td>
<td>7.26</td>
<td>7.08</td>
<td>48</td>
</tr>
<tr>
<td>Jatropha curcas</td>
<td>3.71</td>
<td>3.77</td>
<td>3.64</td>
<td>4.81</td>
<td>62.64</td>
</tr>
<tr>
<td>Steward</td>
<td>2.08</td>
<td>1.91</td>
<td>1.57</td>
<td>2.07</td>
<td>93.78</td>
</tr>
<tr>
<td>Tracer</td>
<td>2.02</td>
<td>2.73</td>
<td>1.97</td>
<td>2.63</td>
<td>87.32</td>
</tr>
<tr>
<td>Proclaim</td>
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<td>1.08</td>
<td>0.65</td>
<td>1.22</td>
<td>95.72</td>
</tr>
<tr>
<td>untreated</td>
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<td>14.05</td>
<td>16.78</td>
<td>19.73</td>
<td>10</td>
</tr>
</tbody>
</table>

Figure no 1: Damaged % by H. armigera after application of treatments
CONCLUSION

*H. armigera* is best controlled by Proclaim chemical pesticide while out of four botanical extracts *Nigella sativa* extract shows the significant effect against the pest. At starting chemical protectants perform better against *Heliothis* but in the long term, chemicals affect the growth of plants and pests adversely also develop resistance against them. Biopesticides play a crucial role in that case. Biopesticides based on plant extracts specific to a target pest offer an ecologically sound and effective solution to pest problems. They pose less threat to the environment and human health.

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REFERENCES