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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 *Jatrophacurcas* 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 than60 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 dianthus, 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 diapauses are the main characteristics of *Heliothis* life history that permit it to survive in adverse environments and to adapt to the mostabrupt 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 ofrefuge areas of conventional plants near transgenic cultivars. However, chemical control is stillmost 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- andsub-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,fluvalinate, 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 plantextracts specific to a target pest offer an ecologically sound solution to pest problems. They pose lessthreat to the environment andhuman 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).

$$\text{Percent fruit damage by number} = \frac{\text{Number of infested fruit} \times 100}{\text{Total number of fruits}}$$

$$\text{Percent fruit damaged by weight} = \frac{\text{Weight of infested fruits} \times 100}{\text{Weight of total fruits}}$$

Statistical Analysis:

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

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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 was0.65% 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%, and7.08%.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 no 1: Damaged % by *H. armigera* after application of treatments

TREATMENTS	1 spray	2 spray	3 spray	4 spray	%mortality
Nigella sativa	3.80	3.98	3.72	3.83	72.99
Aristolochia leaf	7.31	7.49	7.26	7.08	48
Jatropha curcas	3.71	3.77	3.64	4.81	62.64
Steward	2.08	1.91	1.57	2.07	93.78
Tracer	2.02	2.73	1.97	2.63	87.32
Proclaim	1.59	1.08	.65	1.22	95.72
untreated	9.05	14.05	16.78	19.73	10

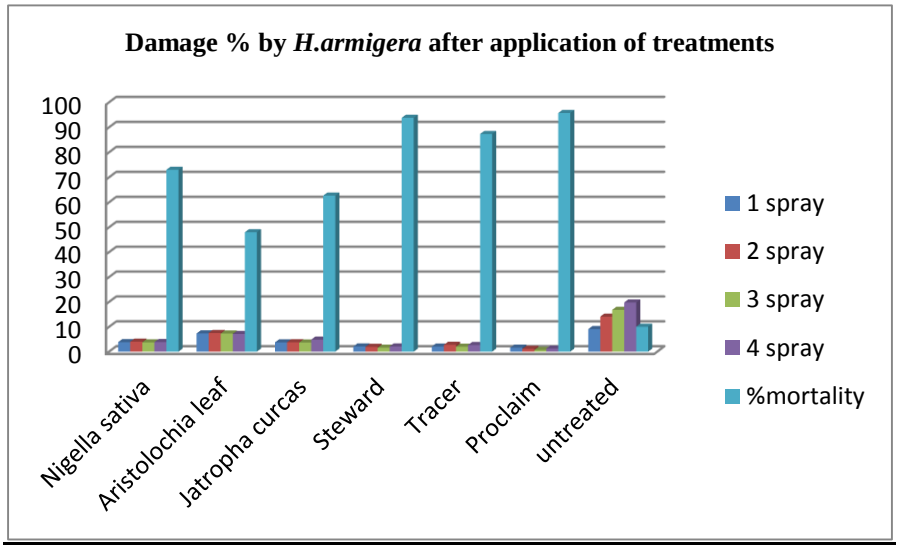

Figure no 1: Damaged % by *H. armigera* after application of treatments

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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