International Journal Of

Recent Scientific Research

ISSN: 0976-3031

Volume: 7(1) January -2016

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THE OFFICIAL PUBLICATION OF
INTERNATIONAL JOURNAL OF RECENT SCIENTIFIC RESEARCH (IJRSR)
http://www.recentscientific.com/ recentscientific@gmail.com

ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 7, Issue, 1, pp. 8384-8387, January, 2016

International Journal of Recent Scientific Research

RESEARCH ARTICLE

EFFICACY OF NEEM SEED OIL, NEEM KERNEL POWDER AND MALATHION ON LARVAL INSTARS OF *HELICOVERPA ARMIGERA*

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ARTICLE INFO

Article History:

Received 05th October, 2015
Received in revised form 08th November, 2015
Accepted 10th December, 2015
Published online 28st January, 2016

Key words:

Helicoverpa armigera

ABSTRACT

The use of synthetic pesticides was careless and indiscriminate, and led to number of well known problems. Eventually we need a movement towards a more environment-oriented, sustainable, health protecting, low toxic pesticides in an attempt to preserve and protect the environment and human health. As a logical conclusion, this led to the test of neem seed oil, neem kernel powder and Malathion. Neem derivatives are readily available, highly economical, dependable bio-insecticides with least poison effect. Since the control of the ***Helicoverpa armigera*** is an essential for the "Agricultural Economy". The present study were evaluated for the control of ***Helicoverpa armigera*** third, fourth, fifth and sixth instar larvae which are distributed in the cotton field. An increase in the concentration of Neem derivatives resulted in an increased the larval mortality rate when compared to malathion.

INTRODUCTION

One of the fundamental reasons for the evolutionary success of insects was their adaptability to different habitats. Insects are necessary for pollination of agricultural crops, for the production of honey and silk, as animal food, and as biocontrol agents.

On the other hand, insects are also pests that cause tremendous economic loss to humans. Certainly, insects and plants are inextricably linked, and the evolution of insect-plant association has been mediated to a large extent by plant chemistry for the majority of insect groups (Schoonhoven *et al.*, 2005). Extracts from the Indian neem tree, *Azadirachta indica* is most extensively investigated in recent years, with reported against >200 species of insects from several orders (Saxena 1989 and Isman and Port 1990).

The diverse biological activities of neem include feeding and oviposition deterrence, repellency, growth disruption, reduced fitness, and sterility (Koul and Isman 1991 and Schmutterer 1990). They act as antifeedant, growth regulators and sterilants. Species of *Helicoverpa* found world-wide, three species, namely *Helicoverpa armigera, Helicoverpa assulta* and *Helicoverpa peltigera* have been recorded on most important crops in India (Singh 2005). *H. armigera* (Lepidoptera, *Noctuidae*) was the most serious pest harboring over 181 plant species belonging to 45 families (Srivastava *et al.*, 2005). Because of its high mobility, survival rate under adverse conditions, capacity to complete several generations in a year and ability to develop resistance against insecticides, its management was very difficult.

Damage potential of this pest was so great that an average infestation of single larva may destroy 30-40 pods per plant in Cotton. In order to develop pest management strategies of *H. armigera*, knowledge on the basic biology of this pest was required, therefore, the present experiment was planned to study the biological characteristics of *H. armigera* on Cotton.

This work proposes to test the effect of Neem Seed Oil, Neem Kernel Powder and Malathion by laboratory bioassay and verify the percentage mortality in *Helicoverpa armigera* larvae. Losses up to 70 % of the yield reduction due to *Helicoverpa armigera* have been reported.

This consideration was behind the present study in evaluating the efficacy of neem seed oil 5.0%, 10.0%, 15.0%, neem kernel powder 5.0%, 10.0%, 15.0% and Malathion 1.0%. In the present study, the bioefficacy of neem seed oil, neem kernel powder were evaluated along with Malathion control cotton

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pest, *Helicoverpa armigera* with the following premise: *To investigate: Biology and Larva Mortality effect.*

MATERIALS AND METHODS

Culturing of Test Insects

Collected larva and adults insects are reared in the plastic box 15 cm x 10 cm. The open end of the box was covered with well ventilated cover. Fresh cotton fruits are provided daily for larvae and adults. The emerged adults are released into sterilized polyester film cage. The cotton fruits and leaves are kept in cages for oviposition.

Preparation of Neem Derivatives

Neem seed oil and teepol are mixed together until the soak completely dissolve in it. Then water was added, stirred well and used for the experiments.

Preparation of Neem kernel powder

The kernel powder was mixed then with sesame oil at rate of 35g oil /50g neem kernel. One liter of water had to be added to the mixture, which had to be stirred and left for at least 5 hours. The spraying was done in the evening using knapsack sprayer, keeping in mind that good coverage of the treated target was important to increase the effect of the applied chemicals. For comparing the effectiveness of different methods of application, local neem was applied additional to the spraying in the form of powder and liquid into the soil.

Observing the Effect of Larvicidal on Helicoverpa Armigera

Bioassay under laboratory conditions was carried out on the nymph of *Helicoverpa armigera.* For larvicidal mortality studies on III, IV, V and VI instar larva of *Helicoverpa armigera* was placed separately at the center of a box 15 cm x 8 cm diameter. Cotton fruits dipped in the test solution of neem seed oil 5.0%, 10.0% and 15.0% and neem kernel powder 5.0%, 10.0% and 15.0% and Malathion 1.0% are air-dried and placed at opposite ends inside the well ventilated box.

A control was also maintained in a similar manner with cotton treated with a mixture of distilled water and teepol. The entire set up was left undistributed for 24 hours, after which the number of larvae feeding on control and treated cotton are recorded separately for different test solutions. Each test was repeated three times using third, fourth, fifth and sixth instar larvae each time. At the end of the experiment, the total number of larvae of *Helicoverpa armigera* was counted.

Statistical Analysis

The data collected in various experiments are statistically analyzed using, Duncan's Multiple Range Text (DMRT) was applied to analyze the data collected in all experiments. used to analyze the data. Statistical significance was assessed by DMRT at 5% significant level (Steel and Torrie 1980).

RESULT AND DISCUSSION

Efficacy of Neem Seed Oil, Neem Kernel Powder And Malathion On III, IV, V and VI Instar Larvae of Helicoverpa armigera

It was the evident from the results that after 24 hours of larvicidal effect treatment, III instar larvae of *Helicoverpa armigera* failed to feed on cotton treated with neem seed oil. The larvicidal effect of 5.0%, 10.0% and 15.0% neem seed oil was 20.66%, 45.66% and 78.66% respectively (Table -III). Lower concentration of neem seed oil has lower percentage of larvicidal effect. After 24 hours of treatment with neem kernel powder 15.0%, the larvicidal effect was 70.00% against III instar larvae of *Helicoverpa armigera*. It was followed by neem kernel powder 10.0%, where the larvicidal mortality effect was about 45.66% and neem kernel powder 5.0% showed 30.00% larvicidal effect (Graph - II). Malathion 1.0% has 40.00% larvicidal effect on III instar larvae of *Helicoverpa armigera.*

It was the evident from the results that after 24 hours of larvicidal effect treatment, IV instar larvae of *Helicoverpa armigera* failed to feed on cotton treated with neem seed oil. The larvicidal effect of 5.0%, 10.0% and 15.0% neem seed oil was 53.33%, 73.33% and 46.60% respectively (Table -IV). Lower concentration of neem seed oil has lower percentage of larvicidal effect. After 24 hours of treatment with neem kernel powder 15.0%, the larvicidal effect was 46.60% against IV instar larvae of *Helicoverpa armigera*. It was followed by neem kernel powder 10.0%, where the larvicidal mortality was about 55.00% and neem kernel powder 5.0% showed 60.00% larvicidal effect (Graph - III). Malathion 1.0% has 56.66% larvicidal effect on IV instar larvae of *Helicoverpa armigera.*

It was the evident from the results that after 24 hours of larvicidal effect treatment, V instar larvae of *Helicoverpa armigera* failed to feed on cotton treated with neem seed oil. The larvicidal effect of 5.0%, 10.0% and 15.0% neem seed oil was 75.00%, 46.66% and 40.00% respectively (Table -V). Lower concentration of neem seed oil has lower percentage of larvicidal effect. After 24 hours of treatment with neem kernel powder 15.0%, the larvicidal effect was 86.66% against V instar larvae of *Helicoverpa armigera*. It was followed by neem kernel powder 10.0%, where the larvicidal mortality was about 73.33% and neem kernel powder 5.0% showed 53.33% larvicidal effect (Graph - IV). Malathion 1.0% has 40.00% larvicidal effect on III instar larvae of *Helicoverpa armigera.*

It was the evident from the results that after 24 hours of larvicidal effect treatment, VI instar larvae of *Helicoverpa armigera* failed to feed on cotton treated with neem seed oil. The larvicidal effect of 5.0%, 10.0% and 15.0% neem seed oil was 85.66%, 73.33% and 53.33% respectively (Table -VI). Lower concentration of neem seed oil has lower percentage of larvicidal effect. After 24 hours of treatment with neem kernel powder 15.0%, the larvicidal effect was 80.77% against VI instar larvae of *Helicoverpa armigera*. It was followed

by neem kernel powder 10.0%, where the larvicidal mortality was about 70.00% and neem kernel powder 5.0% showed 55.00% larvicidal effect (Graph - V). Malathion 1.0% has 40.00% larvicidal effect on III instar larvae of *Helicoverpa armigera.*

In the present study, the larvicidal mortality effect of 5.0%, 10.0% and 15.0% was evaluated along with the 1.0% of Malathion on third, fourth, fifth and sixth instar larva of *Helicoverpa armigera*. *Helicoverpa armigera* represents a significant challenge to cotton cropping systems in many parts of the world and remain the target for concentrated management with synthetic insecticides. Praveen (2000) reported that application of biointensive IPM module is very effective to control the H. armigera. Yazdanpanah *et al.*, (2009) reported the young larvae of *Helicoverpa armigera* attack on squares and flowers of cotton. While mature larvae feed on green mature cotton bolls causing them to drop off from the plant and the holes due to damage of *Helicoverpa armigera* can be seen at the base of cotton bolls. Approximately, 30% yield losses due to damage of *Helicoverpa armigera*. Raja Rajeswari and Uma Maheswari (2013) also stated that the Pupicidal efficacy of AZT and Btk was effective role in control of Chickungunya Mosquito *Aedes aegyptu* (Linn. 1762).

Ravi *et al.*, (2008) reported that HaNPV, Btk, azadirachtin and Spinosad were safe to natural enemies as in case of predatory mirids and spiders, agreeing with our results.Various authors verified that neem extract is suitable to control different insect pests like Cnaphalocrocis medinalis, Maruca vitrata, including *Helicoverpa armigera* in different cropping systems (Boomathi *et al.*, 2006; Rouf and Sardar 2011).

Acknowledgements

The authors are thankful to the Principal, Sri Vasavi College, Erode for providing the facilities and necessary equipments to carry out this project work.

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How to cite this article:

Umamaheswari S., Rajarajeswari A., Prakash S and Mohan Prabu M.2016, Efficacy of Neem Seed Oil, Neem Kernel Powder And Malathion on Larval Instars of Helicoverpa Armigera. *Int J Recent Sci Res.* 7(1), pp. 8384-8387.

TSSN 0976-3031