STUDIES ON INSECTICIDAL PROPERTIES OF NON-LEGUMINOUS PLANTS OF THAR DESERT

Abstract

Papilio demoleus, commonly known as the lime butterfly, poses a significant threat to citrus crops due to the extensive damage caused by its larvae. Traditional insecticides have been employed to control P. demoleus populations, but their adverse effects on human health and the environment have led to the search for alternative, eco-friendly solutions. This research article investigates the insecticidal properties of three plant species—Euphorbia royleana, Lantana camara, and Cascabela thevetia—against P. demoleus. Through laboratory bioassays and analysis of bioactive compounds, this study evaluates the efficacy and mechanisms of action of these plant extracts as potential natural insecticides. The findings contribute to the development of sustainable pest management strategies for the lime butterfly. Based India

Keywords: Papilio demoleus, lime butterfly, Euphorbia royleana, Lantana camara Cascabela thevetia, insecticidal properties, natural insecticides, pest management.

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I. INTRODUCTION

India is basically an agriculture-based country and more than 80% of Indian population depends on it. Insect pest are known to cause significant damage. The Insect selected for the research is Papilio demoleus and Helicoverpa belongs to the order lepidoptera. Papilio demoleus (Linnaeus) the common "Citrus butterfly" (lime butterfly) causing considerable economic loss to many plants. The major one's being citrus, bael, Murraya koenigii (curry tree), Ziziphus mauritiana (Ber) etc. through Asia to Australia.

Papilio demoleus is a well-known pest of citrus in the oriental region and has been responsible for multiple defoliations of seedlings in nurseries and young plantations. (Yunus & Munir, 1972) revealed that Papilio demoleus larvae feed on the leaves of at least 19 different citrus species or kinds. In Andhra Pradesh, Narayanamma has documented a defoliation rate of up to 83 percent on young Grove trees, and Takhre and Borle (1974) claimed that a severe epidemic resulted in the "skeletonization" of the entire citrus orchard.

On the underneath of sensitive leaves as well as on tender twigs, the adult female lay eggs either singly or in clusters of two to five. The average length of each stage was 2.87 days for the egg, 17.53 days for the larva, 1.04 days for the pre-pupal stage, 9.01 days for the pupal stage, 6.75 days for the female adult, and 3.81 days for the male. The enormous and expanding population of India relies heavily on pulses as a source of protein. The chickpea (Cicer arietinum) is one of India's most significant pulse crops. With 75% of the world's area and production of gram, India is the leading producer. With an average yield of 844 kg, India produces 5.3 mt of chickpeas from 6.67 mha of land.

P.demoleus development stages: Egg, Larvae, Chrysalis, Adult

Numerous factors affect the production of chickpeas, according to the periodic survey carried out by several authorities in various regions of the nation. One of the main factors limiting chickpea output is Helicoverpa armigera, a pest bug in particular known as the pod borer. In normal weather, the chickpea yield loss caused by the pod borer ranged from 10% to 60% (Bhatt and Patel, 2001). Due to its regular appearance from the vegetative growth through the pod formation stage, the pod borer [Helicoverpa armigera Hubner (Lepidoptera: Noctuidae)] is to blame for up to 90% of the damage in chickpea.

Growers are tempted to use more pesticides to manage this issue, but this has the unintended consequence of harming beneficial organisms that aren't being targeted as well as the environment and leaving residues in the food chain and causing pests to reappear. Larva feeds initially on green leaves before transitioning to flower buds and pods later on. This odd trait is seen in mature larvae, which are partially inside the fruit and partially outside. Feeding on flower buds and flowers causes a decrease in fruit ripening. A dark spot and a dark patch can be seen on the forewings of medium-sized light brown moths that are around 40 mm broad. The outer end of the hind wings' light-colored outer patch is dark. Females individually lay a number of tiny white eggs. The caterpillars eat briefly on the leaves after hatching in 3–4 days before attacking the pods.

Approximately 34 mm long, with short white hairs strewn here and there, a full-grown caterpillar buries itself in the ground to create an earthen cell, which is where it pupates. The life cycle takes 30 to 45 days to complete. Eight generations of the pest are finished per year. The spread of natural enemy complexes, the emergence of insect resistance, and the escalating contamination caused by the detrimental environmental

applications of synthetic chemicals have made it necessary to look for alternatives.

Due to the existence of over 30,000 secondary metabolites, this resulted in a surge in the production of biologically derived chemicals with antifeedant, repellant, deterrent, chemosterilant, and growth regulator properties (Schoonhaven, 1993).

II. MATERIALS AND METHODS

1. Citrus butterfly (papilio demoleus) collection from Lemon plant, Bael plant and Curry tree plant and Helicoverpa armigera from chick pea plant work in progress from farms near Beawar and Ajmer area.
2. Young leaves of Lantana camara and Cascabela thevetia and branches of Euphorbia royleana will be gathered from the field.

III. OBJECTIVE

The purpose of the proposed investigation is to check the efficacy of **Euphorbia royleana, Lantana camara** and **Cascabela thevetia** plants aqueous and acetone extracts with potential activity, especially pesticidal action against selected citrus pest (lime butterfly) Papilio demoleus and Helicoverpa armigera 4^{th} and 5^{th} instar larvae.

1. EFFECT ON OVIPOSITION
2. EFFECT ON FECUNDITY
3. EFFECT ON MORTALITY

$$\text{PERCENTAGE MORTALITY} = \frac{No\cdot\ of\ dead\ larvae}{No.\ of\ introduced\ larvae} \times 100$$

IV. SPECIFIC OBJECTIVE

1. To prepare plant based biopesticides which have more efficiency in controlling pesticides.
2. Analyse the aptitude of developed bio pesticide products in contrast to specific pest under lab and field condition.
3. Advance technology is used as a product to enhance organic farming by using plant-based bio pesticide.
4. Collection of Data for bio pesticide authorization for registration.
5. In order to increase the Indian economy if the selected plant-based bio pesticide succeed in comparison to it, then it is a commercial product that works to increase agricultural production and generate income by licensing.

V. SEX SPECIFICITY TEST

1. Treated Male× Untreated Female
2. Treated Male× Treated Female
3. Untreated Male × Treated Female

Control: Untreated Male × Untreated Female

VI. SELECTED PLANT PRODUCTS

1. **Euphorbia royleana (Danda thor):** The latex of the plant is a valuable source of ingenol esters. Ingol is a macrocyclic diterpene and is of therapeutic interest due to its antileukemic properties. Danda Thor has been used in Ayurvedic and Yunani medicine.

2. **Lantana camara (Panchfooli):** Antimicrobial, fungicidal, and insecticidal qualities can be found in lantana leaves. Leprosy, skin rashes, leprosy, chicken pox, measles, asthma, and ulcers have all been treated with L. camara in traditional herbal treatments. Rats' development of stomach ulcers was shown to be decreased by L. camara extract. Brazilians have also utilized the plant's extracts to treat respiratory ailments.

3. **Cascabela thevetia (Yellow oleander):** A decoction of the Cascabela leaves is taken to treat jaundice, fever and as a purgative for intestinal worms. The leaf sap is used as eye drops and nose drops to cure violent headaches.

4. **Preparation of aqueous plant extraction:** After collection of fresh leaves, it will be washed thoroughly by distilled water so that it can be cleaned to follow the dirt, mix it with 2-3 days after drying the filter paper at room temperature and then blend it by grinder or crush it by mortar and pestle and the finely pulverized paste to formulate the fine powder. Then the powdered material has been extracted by using the Soxhlet apparatus with acetone solvent. After the completion of the extraction 2gm, 5gm and 10gm of extract will be weighed and dissolved with 100 ml of **acetone** and **water**. These concentrations of stock solutions are used to check the insecticidal properties of plant extracts. Different concentrations of aqueous and acetone solution (1%, 3% and 5%) will be used to check the pesticidal properties of plants. Three different methods will also be used to conclude the results which are as follows:-

5. **Contact Method:** In This Method The Insect Is Kept In The Petridish Which Will Already Have Tissue Paper Bathed With The Prepared Extracts. The Result Will Be Observed.

6. **Feeding Method:** In This Method The Insect Will Be Taken In The Close Vicinity Of The Extract To Help Him Eat The Extract And The Results Will Be Observed.

7. **Topical Method:** In This Method The Insect Will Be Sprayed With Both The Plant Extracts (Water And Acetone) And the results will be observed.

- Students "t" test will be used to compare different variables.
- To inspect the fatal concentration in 50% (LC 50) the toxicity and mortality rate

for individual insect stages vary, standard error will be used.

- Report and structure were also added which would help in demonstrating efficiency and mortality.
- ANOVA test will apply.

VII. DISCUSSION

To proposed research work will be completed in two years. The year plan is as follows: -

1. Collection of literature and research related information about research topics from different universities, libraries and institutions.
2. Examine plant based aqueous extracts effect on crop production eg Data (citrus plant, curry tree, chick pea) and pest of infected plant.
3. To receive information and reaction of proposed concentration of plant aqueous extracts on **Papilio demoleus** and **Helicoverpa armigera**.

1. Insect collection:

- The egg, larvae and adult will be also collected from the citrus, curry tree and chick pea plants of nearby fields of Ajmer district, Rajasthan, India.
- The different larval stages of the butterfly Papilio demoleus and Helicoverpa armigera will be collected and reared in plastic/glass jars with best aeration. To allow air passage, a hole of 2cm in diameter was cut opened in the centre of each jar lid, and sterile cloth will glued to the underline of each lid throughout the experiment
- Wet fresh loose leaves of Indian curry leaf Murraya koinigii and chick pea plant leaf will be provided daily.
- Throughout the experiments insect culture will be maintained as optimum temperature, photoperiod and relative humidity.

2. Work in Progress

- Analysis of Data.
- Comparison of Data information and confirmation through statistical methods.
- Creating graphs, tables and figures for presentation. Preparation, writing and typing thesis.

REFFRENCES

[1] Evans, W.H. (1932). The Identification of Indian Butterflies. (2nd Ed. Revised), Bombay Natural History Society, Mumbai, India. Pp. 454.
[2] Von Euw, J, Reichstein, T.and Rothschild, M. (1968). Aristolochic acid-I in the Swallowtail butterfly Pachliopta aristolochiae (FABR) (Papilionidae), Israel J. Chem. 6. 659- 670.
[3] Singh D. (1969). Citrus industry in India today. Indian J. Hort. 13(2): 16-32.
[4] Butani D.K. and Jotwani M.G. (1975). Trends in the control of insect pests of fruit crops in India. Pesticides. 9(4), 139-149.
[5] Nayar KK, Ananthakrishnan TN and David BV. (1976). General and Applied Entomology. Graw Hill

Publ. Co., New Delhi.
[6] Rembold, H., Sharma, G. K., Czoppelt, Ch. and Schmutterer, H. (1980). Evidence of growth disruption in insects without feeding inhibition by neem seed fractions. Z. PflKrankh. PflSchutz, 87. 290-297.
[7] Butani DK (1982). Insect pests of Tulsi (Ocimum sanctum Linnaeus) and their controls. Pesticides.
[8] Collins, N.M. and Morris, M.G. (1985). Threatened Swallowtail Butterflies of the World. The IUCN Red Data Book, vi:pp. 401.
[9] Thakre, K. R., S. G. Radake, M. N. Borle and H. T. Ghuguskar, (1985). "Two Decades of Research on Citrus Pest Management in Maharashtra". Directorate of Research, Dr.
[10] Panjabrao Krishi Vidyapeeth, Akola. Bull. No. 2 p.12.
[11] Somasundaram P and Chockalingam S (1988). Impact of chitin synthesis inhibitor diflubenzuron on the feeding physiology of Papilio demoleus (Lepidoptera: Papilionidae); Insect Sci. Appl. (in press)
[12] Singh YP and Gangwar SK. (1989). Biology of the lemon butterfly, Papilio demoleus
[13] L. on Citrus reticulata. Indian J. Entomol. 5: 151-153.
[14] Radke SG and Kandalkar HG. (1989). Observation on the biology of lemon butterfly, Papilio demoleus L. (Lepidoptera: Papilionidae). Indian J. Agril. Res. 13: 176-177.
[15] Sharifi S, Zarea N. (1989). Biology of the citrus Butterfly, P. demoleus (Lepidoptera: Papilionidae). Annals of the Entomological Society of America. 1989; 63(5):1211-1213.
[16] Koul O., Tsman M.B. and Ketkar C.M. (1990). Properties and uses of neem- Azadirachta indica. A. Juss. Can. J. Bot, 68(1), 1-11.
[17] Schoonhaven, L.M (1993). Insects and phytochemicals. Nature's economy in: Phytochemistry and agriculture,1-17.
[18] Singh D. (1995). Bionomics of lemon butterfly, Papilio demoleus L. on Citrus reticulata., Pest Management and Economic Zoology in India. 5:37-41.
[19] Rajindar B, Kirpal S, Bhan R and Shing K. (1997). Bionomics of lemon butterfly, Papilio demoleus L. on Citrus reticulata. Pest Management and Economic Zoology in India. 5(1): 37-41.
[20] Shivankar, V.J (1999). Recent trends in insect pest management of citrus. Hi-tech citrus management: Proceedings of International Symposium on citriculture (Nov. 23-27) held at NRC for citrus, Nagpur, pp.773-774.
[21] Mordue (Luntz) AJ and Nisbet AJ. (2000). Azadirachtin from the neem tree Azadirachta indica: Its actions against insects. Ann. Soc. Entomol. Brasil. 29: 615-632.
[22] Keita SM, Vineent C, Schmit JP, Arnason JT and Belangar A (2001). Efficacy of essential oils of Ocimum basilicum L. and O.gratissimum L. applied as an insecticidal fumigant and powder to control Callosobruchus maculatus (Fab.) (Coleoptera: Bruchidae). Journal of Stored Products Research 37(4) 339-349.
[23] hou, C.N (2001). A progress and development foresight of pesticidal microorganisms in China. Pesticides., 40, 8–10.
[24] Ramarethinam S and Loganathan S (2001). Studies on the biology and management of swallow tail butterfly, Papilio demoleus L. (Lepidoptera: Papilionidae) infesting the curry leaf, Murraya koenigii (L.) Sprengel. Pestology, 25 (12): 9-11.
[25] Pathak, M. and Pizvi, P. Q. (2003). Age specific survival and fertility table Papilio demoleus at different set of temperatures and host plants. Ind. J.Entomol. 65(1): 123 – 126.
[26] Pathak M and Rizvi Q. (2003). Effect of different temperatures and host pants on the developmental behaviour of lemon butterfly, Papilio demoleus. Indian J. Entomol. 65(4): 496-499.
[27] Dubey, A. K. and Sundararaj, R. (2004). Evaluation of some neem products against Aleurodicus dispersus Russell (Aleyrodidae: Homoptera) on Bauhinia racemosa and Michelia champaca.). Indian Journal of Plant Protection, 32(2): 126-128.
[28] Poorten GV. (2004). The lime butterfly Papilio demoleus L. www.srilanka insect.net/ butterfly/ Papilionidae/ lime butterfly htm, 2004.

