

Bioefficacy of Plant Extracts Against Larvae of American Bollworm *Helicoverpa Armigera* (Noctuidae: Lepidoptera) Special Reference to The Effect on Peritrophic Membrane)

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Abstract—The pesticide of plant origin is having nontoxic biodegradable and environmental friendly qualities. The frequent spraying of toxic chemicals developing resistance to the pesticide. Leaf powder of the plants like *Argimone maxicana* and *Calotropis procera* is prepared, Different doses of these plant extracts is given to the fourth instar stages of *Helicoverpa armigera* through feeding methods, To find their efficacy the experimental findings will be put under analysis using various parameters. The effect on midgut is also studied.

Keywords—Distillation plant, Acetone, Alcohol, Pipette, Castor leaves, Grams pods, larvae of *Helicoverpa armigera*, plant extract, Vials, Jars, Cotton.

I. INTRODUCTION

THE problem of insect pest is intensified by a large number of insects of nuisance value to man and having a broad spectrum of their harmful effects. The most common example of this category is the Lepidopteran pests that are interfering in maintenance of a hygienic environment for healthy leaving. This moth is the single major pest for global plant agriculture. This moth and its close relatives overcome chemical insecticide to attack over 100 crop plant species at an annual cost of over US \$ five billion. The gram (*Cicer arietinum*) is an important vegetable crop grown in the country, unfortunately this vegetable crop suffers heavily from various insect pest and disease which reduces not only to its yield but also spoils the quality. Among the various pests the gram pod borer has been reported to cause maximum economic damage to the gram crops in India. In agricultural pest management botanical insecticides are best suited for use in organic food production in industrialized countries but can play a much greater role in the production and post harvest protection of food in developing countries. The use of simple formulation of plants such as leaf, flower or seed powder extracts needs to be popularized. Their being safe to non target organism, including human.

II. MATERIAL AND METHODS

The selection of the pest was mainly based on the local pest problem and the rearing possibilities of the selected pest species under laboratory conditions. The gram pod borer *Helicoverpa armigera* belongs to order lepidoptera and family Noctuidae. It's a phytophagous pest. For rearing, adults were collected from the field by light trap method. They were allowed to mate and lay eggs in glass troughs which contain moist soil. The sides of the troughs were provided with paper so that female could rest and lay eggs on them. Water was added to the soil to maintain the humidity. The honey soaked cotton was changed daily. Soon after hatching of the egg, the 1st instar larvae transferred to plastic vials containing fresh castor leaves. After 3rd instar stage the larvae were kept individually in plastic vials to avoid cannibalism. The common weed belonging to the family papaveraceae were collected partly in the morning hours and washed thoroughly with tap water to remove any dust or pest adhering to the plant product. The washed material was chopped into small pieces and dried in shade at room temperature. The fine powder was subjected to solvent extraction. 27 ± 3 °C 75 ± 5 % RH temperature and humidity were provided. 14: 10 (hours) dark light period given.

III. RESULTS AND DISCUSSION

A. *Calotropis procera* (leaf extract)

Mortality increases as the dose level increases. At the dose levels of 10, 25, 50, 75 and 100 ppm, the percent corrected mortality comes to 41.17, 52.17, 69.56, 100 as compared to 8 percent mortality in control. There is a significant increase in the average larval periods. At the dose levels of 10, 25, 50 ppm average larval period comes to 22.2, 19.1 and 20.0 respectively as compared to 6.0, 9.2, 6.0 days respectively. In control the average larval and pupal periods come to 14.0, 7.13 days respectively. There is no adult emergence at the dose level of 75 ppm and higher. The adult emerged out of the treated fourth instar larva show reduced fecundity and fertility. Prolongation in preoviposition period is occurred.

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B. *Argimone maxicana*(leaf extract)

Higher dose levels are very effective at the dose of 10,25,50,75,and 100,the percent corrected mortality comes out to be 17.30,21.74 34.78,41.30,100as compared to 8 percent mortality in control.abnormalities maily observed at a very high dose level which mainly affects the fecundity n fertility.

The selected bio pesticides block the molting process at the level of synthesis of new cuticle and there by death occurs at exuviations. On treatment to larvae the effective doses were determined based on parameters mortality, abnormalities and reproductive potentiality of the emerged adults. In general the effect of the pest includes the fall in natality due to disruption in development and growth and increase in mortality due to toxic action and death during moulting because of inadequate mode of action by the plant extracts. Adverse effects on reproduction which includes the following-

- Occurrence of larvae- pupae and pupae adult intermediate stage in capable of becoming adult.
- Adverse effect of larvae, such as darkening of skin and change in behavior.
- Reduction in fecundity and fertility.
- Suppression of fl generation.

The plant extract mainly affect the egg hatchability.

Behavioural aspect--Treated fourth instar larvae becomes sluggish at higher dose level. The body becomes very dark, they become very lethargic. Food intake capacity become slow down, the average pupal period increases at a higher dose level.

IV. MODE OF ACTION

The prevailing view of mode of action is further supplicated the histopathological studies on midgut of the larvae of *Helicoverpa armigera* treated with the plant extract of *Argimone maxicana* and *Calotropic procera* at the doses level of 25 ppm, 50 ppm, 75 ppm and 100 ppm respectively. The mid gut gets broken, dismantled and intermingled with the totally displaced epithelial cells.

Thus it is concluded that both these biopesticides have enough potentiality to suppress the dangerous pest *Helicoverpa armigera*, a better scope for agriculture and environment.

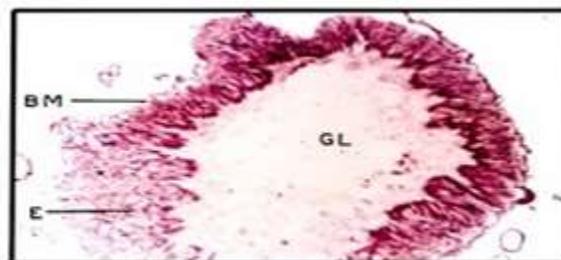


Fig : 1

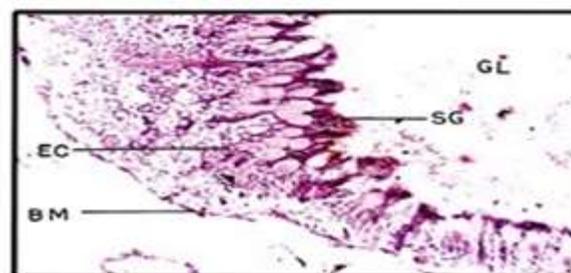


Fig : 2

Histomicrograph of the midgut of a sixth instar larva of *H. armigera* after treatment to early fourth instar larva with the leaf extract of *C. procera* at the dose of 25 ppm. Feeding method showing detachment of the epithelial cells (EC) from the basement membrane (BM) and its intermingling with the disintegrated peritrophic membrane.

TABLE I
EFFECT OF PLANT EXTRACTS ON MORTALITY OF 4TH INSTAR LARVA OF *H. ARMIGERA*

Plant extracts	Dose (ppm)	Average larval period (days)	Percent larval mortality	Average pupal period (days)	Percent pupal emergence	Percent total mortality	Percent corrected mortality	Percent adult emergence
<i>Calotropis procera</i> (Leaf)	10	22.02 ± 0.28a	40	6.02 ± 0.14a	60	44**	41.17	56
	25	19.01 ± 0.06a	48	9.2 ± 0.48a	52	56**	52.17	44
	50	20.02 ± 0.22a	68	6.01 ± 0.15a	32	72	69.56	28
	75 to 100	-	100	-	NIL	100	-	NIL
<i>Argimone maxicana</i> (Leaf)	10	19.6 ± 0.34	16	9.02 ± 0	84	28*	17.39	76
	25	20.01 ± 0.30a	20	9.04 ± 0.02a	80	40*	21.74	72
	50	22.35 ± 0.41a	36	9.02 ± 0.64a	64	46**	34.78	60
	75	21.4 ± 0.21a	40	9.1 ± 0.10a	60	100	41.30	54
	100	-	100	-	NIL	-	-	NIL
Contrtol	-	14.01 ± 0.17	-	7.13 ± 0.07	92	8	-	92

A=Values are significantly different from control (P<0.01)

B=No significance between treated and control values. Number of test larvae Treated =25

*=Individual died after undergoing very little or no morphogenetic change. Control-25

**Died with severe morphogenetic change

TABLE II
 FECUNDITY AND FERTILITY OF 2 PAIRS OF ADULTS EMERGED OUT OF OF 4TH
 INSTAR LARVAE OF *H.ARMIEGRA* TREATED WITH THE PLANT EXTRACT
ARGIMONE MAXICANA AND *CALOTROPIS PROCERA* BY FEEDING METHOD

Plant Extracts	Dose (ppm)	Number of eggs adult		(%) Hatching
		Total	Eggs/female	
<i>Calotropis procera(leaf)</i>	25	180	90.4	22.12
<i>Argimone maxicana(leaf)</i>	25	402	170.0	50.00
	50	304	152.0	40.78
	75	296	148.0	33.78
<i>Control</i>		584	292.0	85.56

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