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EFFECTS OF SELECTED BIOPESTICIDES *CALOTROPIS PROCERA* AND *ARGEMONE MAXICANA* AGAINST SIXTH INSTAR LARVAE OF *HELICOVERPA ARMIGERA* INCLUDING THE BEHAVIOURAL ASPECT

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ABSTRACT

The pesticides of plant origin are biodegradable and therefore, environmental friendly. Leaf and flower extracts of the plant *Calotropis procera* and *Argemone mexicana* were prepared. Their different doses were given to the sixth instar larvae of *Helicoverpa armigera* through feeding and topical methods, and data were collected on developmental abnormalities, reproductive potential and behavioural aspects.

INTRODUCTION

Different development stages including adults of various insect pests damage crops and their products. The extent of loss depends on the intensity of pest attack and in cases of severe infestation, as much as 90-100% losses have been recorded.

The indiscriminate use of toxic chemicals not only increases cost of production unnecessarily but also contaminates badly the produce. The frequent spraying of toxic chemicals develop resistance to the pesticides. The use of simple plant based formulation such as leaf or seed powder or extract needs to be popularized (Amonkar 1973, Bhuyan et al. 1974, Chander and Ahmad 1986, Ahmad and Ahmad 1992, Mahmoud and Shoieb 2008). These being safe to non target organisms including human make them ideal insecticide. The biopesticide help a lot to cope with environment health hazard.

The gram pod borer *Helicoverpa armigera* belonging to order Lepidoptera and family Noctuidae is a phytophagous pest. This pest has acquired status of national agricultural pest. The resistance to pesticide by the pest is an important matter of concern. The effects of leaf and flower extracts of *Calotropis procera* and *Argemone mexicana* on sixth instar larvae of *Helicoverpa armigera* are reported in this communication.

METERIALS AND METHODS

Adults of *Helicoverpa armigera* were collected for rearing in the laboratory from the field by light trap method. They were allowed to mate and lay eggs in glass troughs containing moist soil. The sides of the troughs were provided with paper so that females could rest and lay eggs on them. Water was added to the soil to maintain humidity. The honey soaked cotton was changed daily. Soon after hatching of the eggs, the 1st instar larvae were transferred to plastic vials containing fresh castor leaves. After 3rd instar stage, larvae were kept individually in plastic vials to avoid cannibalism. The common weeds belonging to the family Asclepiadaceae (*Calotropis procera*) and Paparveraceae (*Argemone mexicana*) were collected in the morning hours and washed thoroughly with tap water to remove any dust or pest adhering. The washed materials were chopped into small pieces, dried in shade at room temperature and their fine powders were subjected to solvent extraction.

Treatment to larvae – Feeding, topical

Food – castor leaves, gram pod

1) 10g pods
2) 2 sq. cm area of castor leaf

No of ex. Larvae - 25

Doses – Feeding, 25, 50, 75, 100ppm

Topical, 10, 20, 30, 40, 50ppm

Temp. + Humidity – 27±3° C or 75±5°F

Dark: Light – 14: 10 (hours)

Container – Plastic vials

The effective doses to larvae were determined based on parameters such as mortality, abnormalities and reproductive potentiality of the emerged adults. The data was subjected to statistical analysis.

RESULTS AND DISCUSSION

Highly effective dose was 50 ppm per larva which resulted in 80.4 % mortality (Table 1). At the dose levels of 10, 20, 30 and 40 ppm per larva, % mortality were to 17.4, 26.1, 34.8 and 82.6% respectively as compared to 8 % mortality in control. 6th instar larva was found to be most susceptible at the dose levels of 40 and 50ppm per larva as only 16 and 18 % adult emergence was recorded. The adults emerged out of the treated 6th instar larva showed reduction in both egg laying and egg hatching. The number of eggs laid per female were 40 (40 ppm) and 34 (50 ppm) as compared to 168 number of eggs laid in the control. Only 30.0 % egg hatching was recorded at the dose of 40 ppm per larva as compared to 83.3% in control. The leaf extract of *Argemone mexicana* was less effective even at a dose level of 100 ppm at which 47.8 % mortality was recorded. The plant extract act as molting bio pesticide as they interfered with the synthesis and deposition of epithelial cells in the develop mental stages of insects.

The selected bio pesticides blocked molting process at the level of synthesis of new cuticle and thereby death occured at exuviations. In general the effect of the pest includes the fall in nalality 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 includesd the followings-

a) Occurrence of larvae- Pupae and pupae adult intermediate incapable of becoming adult.
b) Adverse effect on larvae, such as darkening of skin and change in behavior.
c) Reduction in fecundity and fertility.
d) Suppression of F1 generation.

The plant extract mainly affect the egg hatchability.

Behavioural aspects- Treated sixth istar larvae were sluggish at higher dose . Their body were very dark. Food intake decreased while average pupal period increased at higher dose levels

MODE OF ACTION

The histopatholical studies of the larvae of *Helicoverpa armigera* treated with the plant extracts revealed broken

Table 1. Effect of the plant extract on the 6th instar larvae of *H. armigers* applies topicaly on the ventral side of the abdomen.

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
Calotrotis procera	10	6.0 ± 0.21[b]	16	5.01 ± 0.13	84	24	17.39	76
(leaf)	20	8.02 ± 0.28	20	8.02 ± 0.16[b]	80	32	26.09	68
	30	8.11 ± 0.28	32	5.01 ± 0.12	68	40	34.78	60
	40	7.01 ± 0.24	40	7.8 ± 0.17	60	84	85.61	16
	50	6.01 ± 0.21	64	7.01 ± 0.17	36	82	80.43	18
Calotrotis procera	10	7.0 ± 0	16	7.0 ± 0.20	84	26	19.56	74
(flower)	20	8.11 ± 0.26[a]	20	9.1 ± 0.32	80	26	19.56	74
	30	7.12 ± 0.24	20	9.0 ± 0.31	80	28	21.74	72
	40	8.11 ± 0.28[a]	40	9.0 ± 0.22	60	80	78.26	20
	50	8.02 ± 0.33	60	9.0 ± 0.22[a]	40	80	78.26	20
Argemone	10	7.0 ± 0	4	5.0 ± 0.13	96	14	10.40	86
maxicana	20	7.01 ± 0	8	7.8 ± 0.16	92	18	10.87	82
(leaf)	30	8.01 ± 0.26[a]	8	9.0 ± 0	92	18	10.87	82
	40	8.01 ± 0.26	12	8.01 ± 0.22	88	32	26.09	68
	50	7.12 ± 0.22	20	8.01 ± 0.22	80	60	56.52	40
Argemone	10	7.01 ± 0.12	16	6.22 ± 0.22	84	26	16.02	74
maxicana	20	8.01 ± 0.22	20	8.01 ± 0.26	80	32	18.06	68
(flower)	30	8.02 ± 0.32[a]	44	8.01 ± 0.22	56	40	26.09	60
	40	8.01 ± 0.22[a]	56	9.0 ± 0.22	44	48	58.48	52
	50	7.12 ± 0.32[a]	60	8.01 ± 0.20	40	60	68.00	40
control		6.01 ± 0.21	8	8.01 ± 0.22	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
Control = 25

Table 2. Fecundity and fertility of 2 pairs of adults emerged out of 6th instar larvae of *H.armigera* treated with the plant extract of *Argemone mexicana* and *Calotropis procera* by feeding method.

Plant Extracts	Dose (ppm)	Number of eggs laids /females		Percent egg hatching
Calotropis procera (Leaf)	25	184	92	21.73
Calotropis procera (flower)	25	188	94	23.4
	50	112	56	21.42
Argemone mexicana (Leaf)	25	196	114	44.21
	50	180	79	50.38
	75	114	64	20.21
Argemone mexicana (Flower)	25	232	116	67.24
	50	204	102	54.9
	75	116	58	17.24
Control		454	227	88.00

mid gut was dismantled and intermingled with the totally displaced epithelial cells.

Present study thus reealed that both these biopesticides have enough potentiality to suppress the dangerous pest *Helicoverpa armigera,* a better scope for agriculture and environment.

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