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Evaluation of the Morphological Abnormalities in the 4th Instar Larva of *Helicoverpa armigera* (Hub.) On Application of Leaf Extract of *Lantana camara* (L.)

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Abstract: The morphological changes in 4th instar larva of *Helicoverpa armigera* (Hub.) on application of leaf extract of *Lantana camara* (L.) were evaluated. The leaf powder was extracted on ethanol and different doses were applied on the different developmental stages of the larvae and abnormal morphological changes along with mortality was observed. The larval pupal intermediates and abnormal pupae were also observed.

Key words: *Helicoverpa armigera* · Morphological abnormalities · *Lantana camara* · Leaf extract · Late instars

INTRODUCTION

Helicoverpa armigera is a highly polyphagous species. The most important crop hosts of which *H. armigera* is a major pest on tomato, cotton, pigeon pea, chickpea, sorghum and cowpea. In spite of the use of all available means of plant protection, about one-third of the yearly harvest of the world is destroyed by pests [1]. The status of national agricultural pest all over the globe indicates that it is largely a man made problem. Amongst several reasons that gave a big name to this pest-"the big boss". The larva is the only feeding stage in the life cycle and causes maximum damage to chickpea and tomato. Due to heavy infestation, it damages the complete field crop making enormous loss. Thus, it is desirable to suppress the insect population in its early larval stage. Although chemical insecticides have contributed largely in this direction but have also raised a number of ecological and medical problems as they leave undesirable residues and promote faster evaluation of resistant forms of pest, destroy natural enemies and harm other non target species. Therefore, in recent years, there has been a renewal interest in botanical pesticides as they are safe, effective, renewable and affordable by poor farmers. Considerable attention has been directed towards ecofriendly insecticides in the past few years.

In the present investigation one such obnoxious weed i.e., *Lantana camara* (L.) has been tried against 4th larval instar of *H. armigera* (Hub.) and the control of the pest has been achieved by the development of the various morphological abnormalities.

MATERIALS AND METHODS

Culture of *H. armigera* (Hub.) was reared in laboratory in sterilized plastic containers containing crushed artificial diet.The artificial diet was made as suggested by [2]. The plastic containers were pierced for proper aeration and the culture was maintained at 28°C + 2°C temperature and70 +75 percent relative humidity.

Fresh leaves of the weed plant *Lantana camara* (L.) were collected from the fields near the university campus. The collected leaves were washed shade dried and then powered. Extract was prepared by soxhlet apparatus in the ratio of 1:10 that is 10grams of leaf powder and 100ml of solvent (ethanol). After 8hrs. of continuous extraction the final extract was kept as stock solution (100%). The larvae at different developmental stages of experiment were set by applying the leaf extract separately in four different doses of each and along with control using solvent only. 1gm of food was treated with 0.1ml, 0.5ml, 0.75ml and 1ml of extract solvent was allowed to evaporate. Ten fresh larvae at 4th instar with three replications and control were introduced in each replicate and were allowed to develop till pupation. Observations were made from the first day and the different morphological changes were observed in the treated larvae.

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RESULTS

When 4th instars were treated with different formulated doses of leaf extract, the following morphological changes in the developing larvae are observed. General sluggishness and cessation of feeding was observed after two days of treatment that increased significantly as the time enhanced.

Gradually, the body became black particularly towards the posterior portion.The body got paralysed with dark brown to black skin and green colour was observed in the leg region of the mid gut segments.The whole body turned brownish to black leaving a slight faded portion in the posterior part though the legs were all black and paralysed.During the later phase, dry appearance of body,crumpled skin, overall shrinkage of body segments and reduction due to shortening of body segments can be seen (Fig.1and 2).

The death of larva was observed during molting from one stage to another. Larval pupal intermediates were also observed indicating the effect of the plant on chitin synthesis of the insect. Death also occurred at the time of final molting stage of pupae formation with attached larval skin and ruptured abdomen.The pupae that were formed from the treated larvae also revealed various abnormalities like abnormal cephalothorax, reduced abdominal region, sometimes unproportionate pupa body and general darkening of pupa body. (Fig-3,4) Statistical table shows significant mortality rate. (Table-1).

Fig. 1

Fig. 2

Fig. 3:

Fig. 4:

Table 1: Efficacy of Leaf extract of Lantana camara (L.) on IVth Instar larvae Helicoverpa armigera (Hubner)

Concentration	N	Mortality %	SD	CV
0.10 ml	3	43.33	0.942809	21.70
0.50 ml	3	63.33	0.471405	7.42
0.75 ml	3	66.67	0.942809	14.2
1.00 ml	3	80	0.816497	10.2

DISCUSSION

Saxena *et al*. [3] has studied the insecticidal action of aerial parts of *Lantana camara* against *Callosobruchus chinensis* (Coleoptera: Bruchidae) and found 10-43% mortality.Complete feeding deterrent and loss of fecundity was also noticed. J.O. Ogendo, *et al*. [4] has studied the efficiency of *Lantana camara* L. and *Tephrosia Vogelii* Hook against *Sitophilus Zeamais* (Coleptera: Curculionidae) in stored maize grains and it was found that 82.7% to 90.0% of insect mortality was caused by *L.camara* alone. Suryakala *et al.* [5] did topical application for insect growth regulating activity on *Dysdercus koengii*, a pest of cotton plant, with extracts of some plants of botanical origin. It was observed that the freshly moulted fifth instars resulted in various morphological abnormalities in the test insect.Super nymphs,adultoids and abnormal adults resulted after the moult.Nymphal mortality with exuviate attached to the body was a common observation. Mesbah *et al*. [6], reported that, all the efficiently tested essential and/or volatile oils acted principally as Insect Growth Inhibitors (IGIs) rather than

antifeedants causing disruption of the insect development, abnormal larvae, pupae and adults that were lead finally to death. Akhtar [7], Most of the extracts and botanicals tested proved to be strong growth inhibitors, contact toxins and significant feeding deterrents to both lepidopteran species. The quantum of mortality during the molting was highest. It may be due to the fact that malformed weak cuticle of the new instars failed to withstand the internal pressure during molting and thereby fails to give adequate support to the muscle involved in the attachment. This renders the instars unable to cast off the old exuviae and results in their death in their molting process. Some of the phyto chemicals acts as general toxicants which generally kills the different life stages of the insect various other interfere with growth. Similarly the development of the different intermediate stages (Larval-Pupal, Pupal-Adult) and the formation of abnormal pupae and adult are also an indication of the insect growth regulation properties of the plant extracts. Such effects are also indicative of malfunctioning of endocrine system. Formation of the malformed larval-pupal intermediate is also reported to be physiological effect of Neem as reported by Redfern *et al.* [8].

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