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Influence of Vitex Negundo Leaf extract on the Morphogenesis of Uzifly Exorista Bombysis

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ABSTRACT:- Petroleum ether leaf extract of *Vitex negundo* affected moulting, development and metamorphosis of Uzifly and induced various types of morphological abnormalities in Uzifly. The treated resultants of third instar Uzifly maggots, a few of them died during moulting, some of them developed into maggot-pupal and pupal-adult intermediates, abnormal pupae, abnormal adults and remaining treated third instar maggots developed into morphologically normal adults exhibiting reduced fecundity when compared to the controls. Petroleum ether leaf extract of *Vitex negundo* exhibited growth regulating activity on Uzifly. They affected pupal-adult transformation and produced intermediates along with deformed adults and also affected the inhibition of pupation and adult emergence. The leaf extract significantly reduced the number of adults being emerged when compared to the controls.

Key words:- *Vitex negundo, Uzifly, Maggot-pupal, Pupal-adult, Abnormalities.*

I. INTRODUCTION

The plant kingdom is the most efficient producer of chemical compounds (primary and secondary metabolites) synthesizing many products having wide array of functions that are used in defence against insect pests. Phytochemicals with a considerable capacity to reduce adult emergence at low dosage, which reduce the recruitment over time is the desired characteristic of botanical. (Balandrin *et al*., 1985).

The adult emergence is affected by phytochemicals, which often cause acute and chronic toxicity. These compounds exhibit effects on developmental stages of exposed larvae, which can produce morphological abnormalities in different developmental stages such as lack of melanization in larval and pupal stages, dead larvae-pupal intermediate stage with the head of pupa and the abdomen of a larva, dead adults with folded wings in pupal exuvium and emerged adults unable to escape the pupal exoskeleton, half ecdysed adults etc. (Facknath and Kawol, 1996).

Suresh *et al.* (2002) reported that higher concentration of *Hyptis suaveolens* and neem reduced the egg laying capacity of *Spodoptera litura*. Oviposition deterrence may be due to the presence of deterrence compounds present in the plants dissolved in various solvent extracts that may repel the adult moth to lay egg on treated leaves (Raja *et al*., 2003). It was reported that extract of garlic is effective on the Uzifly eggs (Veeranna and Nirmala 2001). Essential oil obtained from *Vitex negundo* was used as repellent against *Aedes aegypti*. Repellent properties of *Lantana camara* (Vervanaceae) flowers against *Aedes* mosquitoes reported (Das *et al*., 2003).

The search for alternative ways of controlling sericultural insect pests has led to the investigation and re-examination of plant sources for naturally occurring compounds. This may have led to utilizing the structures of these natural products as a base for the development of new bio-pest control agents and is one of the most successful applications so far of natural products discovery for crop protection (Rosell *et al*.,2008).

Topical application of plant etracts to the freshly moulted fifth instars of *Dysdercus koengii*, resulted in various morphological abnormalities. Super nymphs, adultoids and abnormal adults resulted after the moult. Nymphal mortality with exuviate attached to the body was a common observation (Suryakala *et al*,.2007).

Therefore, in the present study an attempt has been made to investigate the influence of *Vitex negundo* leaf extract on the morphogenesis of Uzifly, *Exorista bombycis*.

A. Influence of petroleum ether leaf extract of Vitex negundo on the third instar maggots of Uzifly

Sixty third instar maggots of Uzifly were treated topically with petroleum ether petroleum ether leaf extract of *Vitex negundo* and the experiments were replicated six times. Experiments with 0.5µg, 1µg and 1.5 µg of petroleum either leaf extract of *Vitex negundo* /1µl of acetone affected moulting disruption and induced a wide range of morphological abnormalities in Uzifly *Exorista bombycis* when compred to the control (Graph:4.3.2.1)

(i) Control and carrier control

In the control all the sixty third instar maggots of Uzifly emerged as normal adults and in the carrier control adult emergence recorded on an average was 57.17±0.601.

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(ii) Treated

The effect of 0.5 µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone on third instar maggots of Uzifly

Sixty third instar maggots of Uzifly were treated topically with petroleum ether leaf extract of *Vitex negundo* with 0.5µg/1µl of acetone resulted in moulting inhibition and induced various morphogenetic abnormalities in the treated resultants of the Uzifly and the experiments were replicated six times.

(i) In the treated petroleum ether leaf extract of *Vitex negundo* resultants with 0.5 µg /1µl of acetone, 1.50±0.224 developed into maggot- pupal intermediates. These intermediates failed to undergo further development and ultimately died (Plate-7, Fig. A).

(ii) 7.50±0.224 of the treated third instar maggots with 0.5 µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone failed to pupate and ultimately died.

(iii) 2.50±0.224 of petroleum ether leaf extract of *Vitex negundo* treated resultants of third instar maggots of Uzifly with 0.5 µg /1µl of acetone developed into pupal- adult intermediates. These intermediate forms failed to shed their pupal case. These intermediates did not undergo subsequent development and ultimately died.

(iv) On an average 5.67±0.211 of 0.5 µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone treated resultants of the third instar maggots of Uzifly developed into mosaics and failed to develop further.

(v) 11.00±0.258 of 0.5 µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone treated third instar maggots of Uzifly pupated and metamorphosed into malformed adults with deformed wings (Plate-7, Fig. B-F).

(vi) On an average only 34.17±0.401 of treated resultants of the third instar maggots of Uzifly with 0.5 µg of petroleum either leaf extract of *Vitex negundo* /1µl of acetone pupated and emerged as normal adults and they exhibited low fecundity.

The effect of 1µg of petroleum ether leaf extract of *Vitex negundo* / 1µl of acetone on third instar maggots of Uzifly

Sixty third instar maggots of Uzifly were treated topically with 1µg petroleum ether leaf extract of *Vitex negundo* /1µl of acetone resulted in moulting inhibition and induced various morphogenetic abnormalities in the treated resultants of the Uzifly and the experiments were replicated six times.

(i) 2.17±0.167 of 1µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone treated third instar maggots of Uzifly developed into maggot- pupal intermediates. These forms ruled out from further development and ultimately died (Plate: 12: Fig. A).

(ii) 12.33±0.333 of 1µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone treated third instar maggots of Uzifly resultants failed to pupate and did not accomplish the pupal metamorphosis (Plate: 8, Fig. B).

(iii) 2.33±0.333 of 1µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone treated third instar maggots of Uzifly resultants developed into pupal-adult intermediates. These intermediate forms failed to pupate and did not undergo subsequent developmental changes and ultimately died (Plate: 8, Fig. C).

(iv) 1.83±0.477 of 1µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone treated third instar maggots of Uzifly which pupated failed to accomplish adult eclosion.

(v) 15.50±0.224 of 1µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone treated third instar maggots resultants pupated metamorphosed into malformed adults with deformed wings and appendages. These deformities prevented the insects from feeding , flying and mating. Some adults unable to come out from pupal case (Plate: 8, Fig. D).

(vi) Only 25.83±0.307 of treated third instar maggots which pupated emerged as normal adults.

The effect of 1.5µg petroleum either leaf extract of *Vitex negundo* / 1µl of acetone on third instar maggots of Uzifly

Sixty third instar maggots of Uzifly were treated topically with 1.5µg of petroleum ether extract of leaves of *Vitex negundo* /1µl of acetone resulted in moulting inhibition and induced various morphogenetic abnormalities in the treated resultants of the Uzifly and the experiments were replicated six times.

(i) 3.33±0.422 of 1.5µg of petroleum ether extract of leaves of *Vitex negundo* /1µl of acetone treated third instar maggots moulted into maggot- pupal intermediates. Most of the intermediates produced exhibited pupal abdomen with larval head. These intermediates suffered from ecdysial failure.

(ii) 15.67±0.211 of 1.5µg of petroleum ether extract of leaves of *Vitex negundo* /1µl of acetone treated third instar maggots failed to moult and did not accomplish the pupal metamorphosis (Plate: 9: Fig. A&B).

(iii) 3.17±0.307 of 1.5µg of petroleum ether extract of leaves of *Vitex negundo* /1µl of acetone treated third instar maggots developed into pupal- adult intermediates. These intermediate forms were ruled out from further development and reproduction.

(iv) 2.33±0.333 of 1.5µg of petroleum ether extract of leaves of *Vitex negundo* /1µl of acetone treated resultants of third instar maggots of Uzifly gave rise

to morphologically normal adults exhibiting low fecundity.

(v) 12.50±0.224 of 1.5µg of petroleum ether extract of leaves of *Vitex negundo* /1µl of acetone treated third instar maggots pupated normally and abnormal adults eclosed from these pupae. These forms survived only for few hours and therefore were unable to mate or oviposite (Plate: 9, Fig. C - E).

(vi) Only 21.67±0.494 of 1.5µg of petroleum ether extract of leaves of *Vitex negundo* /1µl of acetone treated third instar maggots which pupated emerged as normal adults and these adults exhibited low fecundity when compared to controls.

B. Influence of petroleum ether leaf extract of Vitex negundo on the Zero hour pupae of Uzifly

Sixty zero hour pupae of Uzifly were treated topically with petroleum ether extract of leaves of *Vitex negundo*. The experiments were replicated six times. Experiments with 0.5µg, 1µg and 1.5 µg petroleum either leaf extract of *Vitex negundo* /1µl of acetone affected moulting disruption, development and induced a wide range of morphological abnormalities in Uzifly *Exorista bombycis* when compred to the control (Graph:4.3.2).

C. Influence of petroleum ether leaf extract of Vitex negundo on the zero hour pupae of Uzifly

(i) Control and carrier control

In the control all the sixty zero hour pupae of Uzifly emerged as normal adults and in the carrier control adult emergence recorded on an average was 58.22±0.529.

(ii) <u>Treated</u>

The effect of 0.5 µg of petroleum ether leaf extract of *Vitex negundo* / 1µl of acetone on zero hour pupae of Uzifly

Sixty zero hour pupae of Uzifly were treated topically with petroleum ether leaf extract of *Vitex negundo* with 0.5µg/1µl of acetone resulted in moulting inhibition and induced various morphogenetic abnormalities in the treated resultants of the Uzifly and the experiments were replicated six times.

(i) 8.5±0.342 of treated resultants of zero hour pupae of Uzifly treated with 0.5 µg of *Vitex negundo* leaf extract/1µl of acetone failed to accomplish the adult metamorphosis.

(ii) 0.33±0.211 of treated zero hour pupae of Uzifly with 0.5 µg of *Vitex negundo* leaf extract/1µl of acetone, developed into pupal- adult intermediates. These intermediate forms remained inactive and died after few days.

(iii) Of the treated resultants of zero hour pupae of Uzifly with 0.5 µg of *Vitex negundo* leaf extract/1µl of acetone, 8.5±0.342 metamorphosed into malformed adults. Protruding genital organs from terminal segment, abnormal wings and abnormal appendages were observed in the treated resultants (Plate-10, fig-A-C).

(iv) Only 43.0±0.516 of treated pupae emerged into normal adults and they exhibited low fecundity.

The effect of 1µg of petroleum ether leaf extract of *Vitex negundo* /1 µl of acetone on zero hour pupae of Uzifly

Sixty zero hour pupae of Uzifly were treated topically with 1µg of petroleum ether leaf extract of *Vitex negundo* / 1µl of acetone induced various morphogenetic abnormalities in the treated resultants of the Uzifly and the experiments were replicated six times.

(i) 12.33±0.333 of treated zero hour pupae of Uzifly with 1 µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone, failed to develop into adults and they exhibited serious disturbances during eclosion.

(ii) The treated zero hour pupae with 1 µg petroleum either leaf extract of *Vitex negundo* /1µl of acetone developed into pupal- adult intermediates and was recorded as 0.83±0.167. They developed within the pupal cuticle unable to shed the exuviae. These intermediates were unable to undergo subsequent changes and ultimately died

(iii) 11.16±0.401 of treated zero hour pupae of Uzifly with 1 µg petroleum either leaf extract of *Vitex negundo* /1µl of acetone eclosed into malformed adults. Most of these forms showed elongated antenna, fused transparent forewings and hind wings with no sign of sclerotization. These forms survived only for few hours and therefore were unable to meet or oviposite (Plate: 11, fig. A-C).

(v) 33.66±0.494 of treated zero hour pupae of Uzifly with 1 µg petroleum either leaf extract of *Vitex negundo* /1µl of acetone developed and emerged into morphologically normal adults but these resultant adults exhibited low fecundity.

The effect of 1.5 µg of petroleum ether leaf extract of *Vitex negundo* / 1 µl of acetone on zero hour pupae of Uzifly

Sixty zero hour pupae of Uzifly were treated topically with petroleum ether extract of leaves of *Vitex negundo* with 1.5µg/1µl of acetone induced various morphogenetic abnormalities in the treated resultants of the Uzifly and the experiments were replicated six times.

(i) 17.5±0.342 of treated zero hour pupae of Uzifly with 1.5 µg of *Vitex negundo* leaf extract / 1 µl of acetone failed to emerge as adults and finally died.

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(ii) 2.5±0.224 of treated pupae developed into pupal-adult intermediates. These intermediate forms were ruled out from further development and reproduction.

(iii) 14.83±0.307 of treated pupae eclosed into abnormal adults with deformed wings (Plate: 12, fig. A-B) and a few of the adults were unable to extricate from the pupal case (Plate: 12, fig. C) and these deformities prevented the insects from feeding, flying and mating.

(v) Only 26.83±0.749 of treated zero hour pupae 1.5 µg of *Vitex negundo* leaf extract / 1 µl of acetone emerged into normal adults but exhibited low fecundity when compared to the control.

D. Influence of petroleum ether leaf extract of Vitex negundo on the fecundity of treated resultants of third instar maggots of Uzifly

Resultants of successfully emerged adult Uziflies of treated maggots and pupae with petroleum either leaf extract of *Vitex negundo* were fed with 10% glucose solution soaked in cotton swab (Sriharan *et al.,* 1980). After mating (Datta and Mukharjee, 1978) the gravid female flies were allowed for oviposition on fifth instar silkworms. Control and carrier controls of Uzifly adults were maintained and the total numbers of eggs laid by the single gravid Uzifly were counted and compare with the treated resultant adults.

(i). Control

Female Uzifly was allowed to oviposite on the fifth instar silkworm larvae of the control and carrier control to record the fecundity of Uzifly and on an average fecundity recorded was 63.83±0.447 and 60.12±0.333 respectively.

(ii). Treated

The effect of 0.5 µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone on the fecundity of Uzifly

Some of third instar treated maggots of Uzifly metamorphosed into normal adults. These flies were allowed to lay eggs on the fifth instar silkworm larvae to record the fecundity and the fecundity was reduced to 14.00±0.365 when compared the control and the carrier control.

The effect of 1µg of petroleum either leaf extract of *Vitex negundo* /1µl of acetone on the fecundity of Uzifly

A few of third instar treated maggots of Uzifly metamorphosed into morphologically normal adults and the fecundity of these resultants recorded on an average was 7.33±0.333.

The effect of 1.5µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone on the fecundity of Uzifly

The third instar treated maggots of Uzifly resultants developed into morphologically normal adults and the fecundity of these resultants recorded on an average was 2.83±0.166. Fecundity of these adults was reduced when compared to control adults.

E. Influence of petroleum ether leaf extract of Vitex negundo on the fecundity of zero hourpupae of Uzifly

(i) Control

Successfully emerged Uziflies from zero hour pupae from the control and carrier control were fed with 10% glucose solution soaked in cotton swab (Sriharan *et al.,* 1980). After mating (Datta and Mukharjee, 1978) the gravid female flies were allowed for oviposition on fifth instar silkworms and fecundity was recorded in the control and carrier control was as 65.53±0.547 and 61.32 ±0.333 respectively.

(ii) Treated

Successfully emerged Uziflies from the treated zero hour pupae of Uzifly with petroleum ether leaf extract of *Vitex negundo* were fed with 10% glucose solution soaked in cotton swab (Sriharan *et al.,* 1980). After mating (Datta and Mukharjee, 1978) the gravid female flies were allowed for oviposition on the fifth instar silkworm larvae and fecundity was reduced when compared to the control and carrier control (Graph 4.3.2(c).

The effect of 0.5µg of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone on the fecundity of Uzifly

Some of the zero hour treated pupae of Uzifly metamorphosed into morphologically normal adults and the fecundity of these resultants was reduced to 16.833±0.307 when compared with the controls.

The effect of 1 µg petroleum either leaf extract of *Vitex negundo* /1µl of acetone on the fecundity of Uzifly

Some of zero hour treated pupae of Uzifly metamorphosed into morphologically normal adults and the effect of 1µg of *Vitex negundo* petroleum ether leaf extract /1µl of acetone on the fecundity of these resultants recorded an on an average was 14.66±0.333.

The effect of 1.5µg of *Vitex negundo* petroleum ether leaf extract /1µl of acetone on the fecundity of Uzifly

A few of zero hour treated pupae of Uzifly with 1.5µg petroleum ether leaf extract of *Vitex negundo* /1µl of acetone metamorphosed into morphologically normal adults and the fecundity of these resultants recorded on an average was as 3.67±0.211.

The treated resultants adults of pupae of Uzifly with petroleum ether leaf extract of *Vitex negundo* exhibited low fecundity at all concentrations and was dose dependent.

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II. DISCUSSION

Most of the treated resultants of third instar maggots of Uzifly with different concentrations of petroleum ether leaf extract of *Vitex negundo* /1µl of acetone failed to shed their exuviae. The development of these maggots upto apolytic stage was normal. Death during emergence may be a consequence of insufficient availability of chitin during metamorphosis. Larval mortality with exuviae attached to the body was a common observation in larvae of *Helicoerpa armigera* treated with leaf extract of *Lantana camara* (L) indicating the effect of the extract on chitin synthesis of the insect as also reported by Prasad and Purohit, (2009).

Secondary metabolites present in the plant extracts at any stage generally interrupt normal metamorphosis in insects producing varying types of deformed individuals at any stage of their life. Formation of the deformed characters usually depends on the mode of action of metabolites present in the plants extracts. In the present study the treatment of third instars maggots and zero hour pupae of *Uzifly* with *Vitex negundo* petroleum ether leaf extract resulted in a partial blockage of the adult emergence. Since the eclosion hormone, a blood-born factor arising from the central nervous system may trigger eclosion, the petroleum ether leaf extract of *Vitex negundo* probably prevented this hormone from being released at the appropriate time. Similar results were made by Naqvi *et al*., (2007) *on Musca domestica* with Azadirachtin, Abdel-Ghaffar *et al*., (2008) on *Rhynchophorus ferrugineus* with Azadirachtin and by Jbilou *et al*., (2008) on *Tribolium castaneum* with *Centaurium erythreae* and *Pteridium aquilinum.*

The results showed that the action of petroleum ether leaf extract of *Vitex negundo* cause physiological disturbances leading to growth abnormalities like incomplete metamorphosis and deformed maggots/pupae and adults. All these effects could be due to disturbances in the normal functions of juvenile hormone in the treated insects as also reported by Schmutterer (1990) with *Azadirachta indica*.

In the present study the adult morphogenesis of *Uzifly* was disrupted by *Vitex negundo* petroleum ether leaf extract after the treatment of the third instar maggots and zero hour pupae of Uzifly. The adult deformities varied between a failure to moult or to metamorphose. Similar results were reported by Bakr *et al*., (2008) with topical application of the extract from *Cyprus rotendus* onto the penultimate instar nymphs of *Schistocerca gregaria.*

The inhibition of adult eclosion of Uzifly may be attributed to the effect of *Vitex negundo* petroleum ether leaf extract with the hormonally controlled program of eclosion. This may be due to the modification of the ecdysteroid titer, which in turn leads to changes in lysosomal enzyme activity causing overt morphological abnormalities as also reported by Josephrajkumar *et al.,* (1999) with plumbagin and azadirachtin against *Helicoverpa armigera.*

In the present study resultants of third instar maggots and zero hour pupae of Uzifly tropically treated with different concentrations of petroleum ether leaf extract of *Vitex negundo* interfered with normal development and metamorphosis resulting in moulting abnormalities which resulted in maggot – pupal and pupal-adult intermediates and adult deformities as also reported by Sujatha *et al*., (2010) with medicinal plants on *Spodoptera litura.* Petroleum ether leaf extract of *Vitex negundo* appears to cause disruption of metamorphic processes leading to delayed pupal – adult transformation and structural abnormalities. These results are in agreement with thr reports of Jagajothi and Martin (2010).

During the formation of maggot-pupal and the pupal-adult moult, insects undergo transformations that involve complex neuroendocrine processes that do not occur at the same intensity during larval to larval moults. This may be the reason for the appearance of malformations of various degrees in the adult Uzifly when compared to maggot and pupal stages. Morphological deformities observed in the present study may be result of abnormal metabolism induced by the *Vitex negundo* petroleum ether leaf extract by the maggot/pupae of the Uzifly, *Exorista bombycis* as also reported by Sreelatha *et al.,* (2011*) with Adathoda vasica* (Acanthaceae) and *Glyricidia maculata* (Leguminosae) on the third instar larvae of *Oryctes rhinoceros* L. (Coleoptera: Scarabaeidae) and Nugroho (1999) with derivate compounds from *Aglaia odorata on Spodoptera littoralis*.

Most of the third instar maggots failed to pupate. It is likely that pupation in treated larvae is inhibited by disturbance in ecdysteroid regulation shortly before ecdysis as also observed in *Helicoverpa armigera* (Nabway Elkattan *et al*., 2011).

Fecundity of *Vitex negundo* petroleum ether leaf extract treated resultant adults of third instar maggots and zero hour pupae of Uzifly were reduced compared to the controls. At 1.5µg concentration maximum reduction in fecundity was observed over the control. These findings are in conformity with the reports of Su and Mulla (1998).

Botanicals with Insect Growth Regulating activity (IGRs) have shown pronounced effects on the development period, growth, adult emergence, fecundity, fertility and egg hatching resulting in effective control (Shaalan *et al*., 2005) as also observed in the present study.

In the *Vitex negundo* petroleum ether leaf extract treated resultants of third instar maggots and zero hour pupae of Uzifly resulted in decrease of fecundity as also observed by *Vollinger (1987) working on Plutella xylostella with neem formulation resulted in substantial reduction in female fecundity*.

In the present study treatment of Uzifly maggots/zero hour pupae with different concentrations of *Vitex negundo* petroleum ether leaf extract caused reduction in fecundity in the treated resultant female adults may be due to increasing sterility as also reported by Tripathi *et al.,* (2003).

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In the *Vitex negundo* petroleum ether leaf extract treated resultants of Uzifly the fecundity was reduced when compared to control. The decrease in the fecundity may be due to the suppressing effect on the Uzifly mating-decisive behavior as also reported by Engelmann, (1970) with plant extracts on the insects.

In the *Vitex negundo* petroleum ether leaf extract treated resultants of Uzifly, reduction in fecundity may be due to the partial sterilization of females and/or males, or the inability of the sperms to be transferred to the females during copulation as also observed by Ismail, (1980) working with juvenile hormone analogues upon the cotton leaf worm *Spodoptera littoralis* Boisd (Lep., Noctuidae).

Present study results of decrease fecundity in the treated resultants when compare to the control may be due to the reduction in the number of normal sperms produced by male Uzifly as also reported by El-Meniawi *et al.*, (1999) with neem seed extracts on the reproductive activities of the cotton leafworm, *Spodoptera littoralis*.

There was reduction in the fecundity of *Vitex negundo* petroleum ether leaf extract treated resultant female Uziflies as also reported by Mannan et al. (1993) and Khanam & Talukdar (1993) working on *Tribolium castaneum* and *Tribolium confusum* with botanicals.

The bioactive compounds present in the *Vitex negundo* petroleum ether leaf extract may have caused inhibitory action and it was reflected significantly in the egg output in the treated resultants of Uzifly. The same trend of results was also reported by Shah (1994) working with *Catharanthus roseus* against Gryllodes sigillatus and by Srinivasan and Sundarababu (1998) working on *Leucinodes orbonalis* with neem products.

The average fecundity was decreased in *Vitex negundo* petroleum ether leaf extract treated resultant females of Uzifly as also reported by Ramamurthy *et al.*, (2012) against *Eupterote mollifera.*

The results of present study suggest that the topical treatment of third instar maggots and zero hour pupae of Uzifly with *Vitex negundo* petroleum ether leaf extract prevented normal development of the different developmental stages of Uzifly and able to reduce the adult emergence and decrease their reproductive potential. Thus petroleum ether leaf extract of *Vitex negundo* exhibit great promise in suppressing the Uzifly population in and around the silkworm growing areas.

Plate – 7

Morphological deformities of 0.5 µg petroleum ether leaf extract of *Vitex negundo* treated on third instar maggots of Uzifly resultants

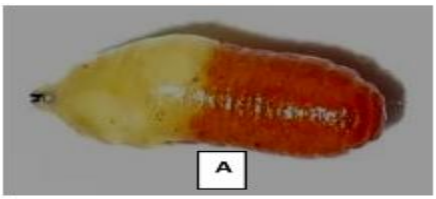

Plate – 7

LEGENDS

Fig – A- Maggot- pupal intermediates

Fig –B, C, D and E – Adults with malformed appendages

Plate: 8

Morphological deformities of 1 µg petroleum ether leaf extract of *Vitex negundo* treated on third instar maggots of Uzifly resultants of Uzifly

Plate: 8

LEGENDS

Third instar Uzifly maggots of treated resultants of Uzifly

Fig –A- Maggot- pupal intermediates

Fig –B - Maggot failed to pupate

Fig –C- Pupal- Adults

Fig –D- Adults with malformed appendages

Plate: 9

Morphological deformities of 1.5 µg petroleum ether leaf extract of *Vitex negundo* treated on third instar maggots of Uzifly resultants of Uzifly

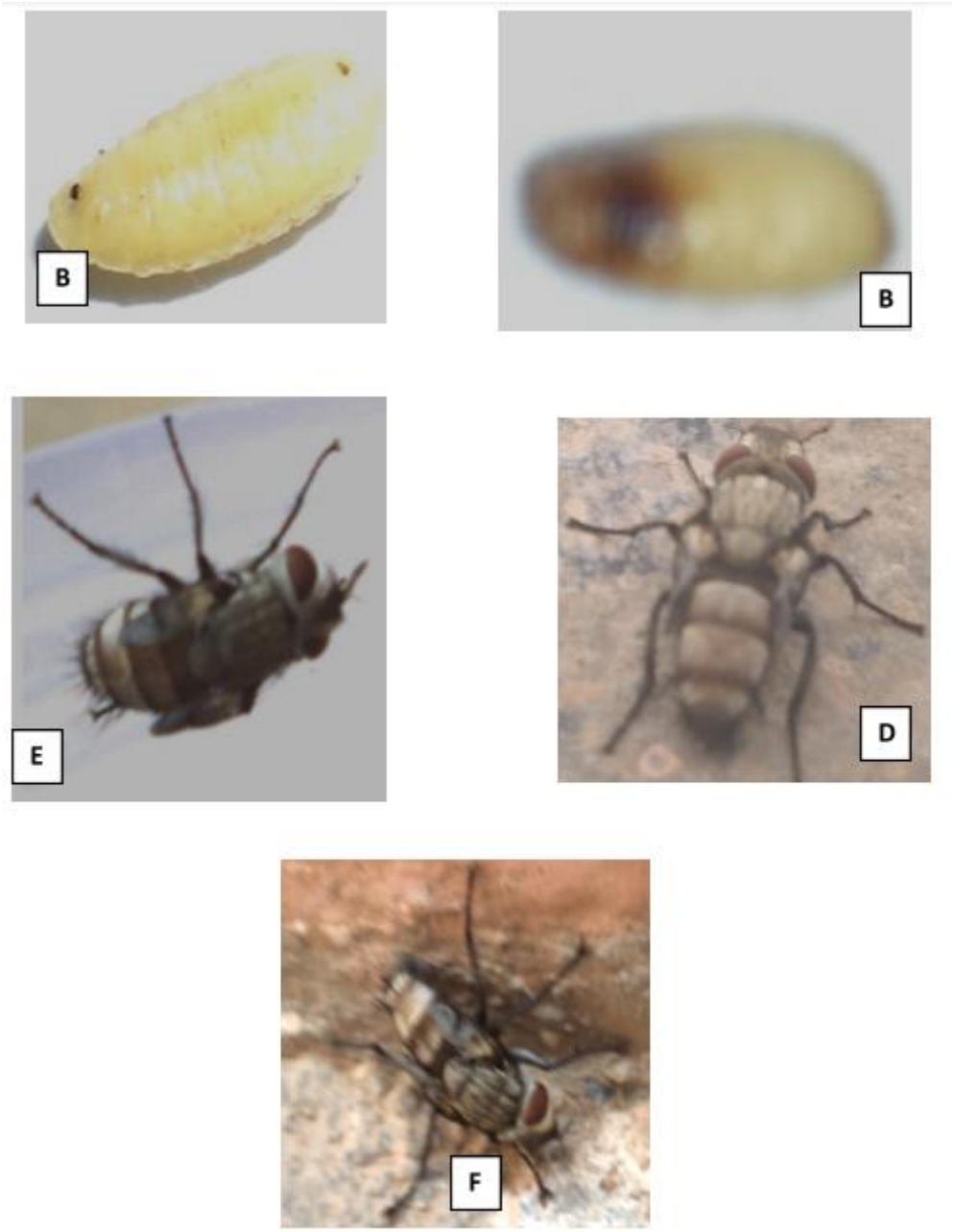

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Plate: 9

LEGENDS

Fig –A & B: Maggot failed to pupate

Fig –C- E: Adults with malformed wings and appendages

Plate – 10

Morphological deformities of 0.5 µg petroleum ether leaf extract of *Vitex negundo* treated on zero hour pupae of Uzifly resultants

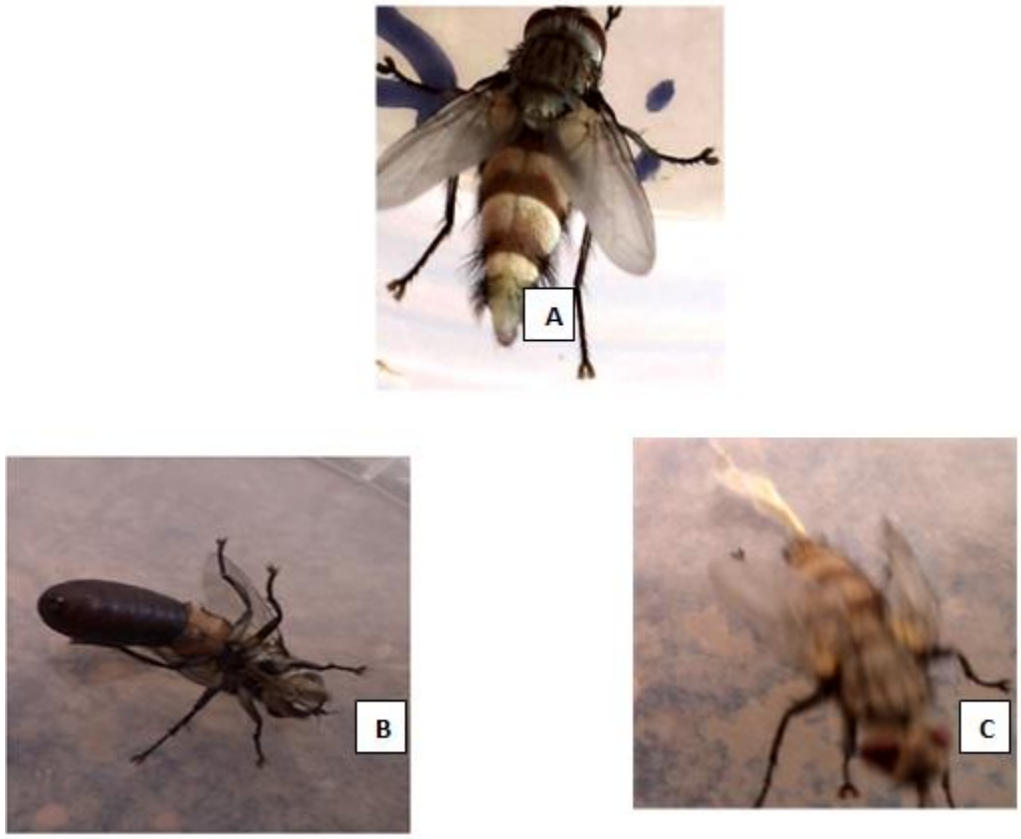

Plate – 10

LEGENDS

Fig –A & C– Abnormal adult with protruding genital organs

Fig –B – Adult unable to extricate from the pupal case

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Plate – 11

Morphological deformities of 1 µg petroleum ether leaf extract of *Vitex negundo* treated resultants of zero hour pupae of Uzifly

Plate – 11

LEGENDS

Fig –A –C – Adult with deformed wings and appendages

Plate – 12

Morphological deformities of 1.5 µg petroleum ether leaf extract of *Vitex negundo* treated zero hour pupae of Uzifly resultants

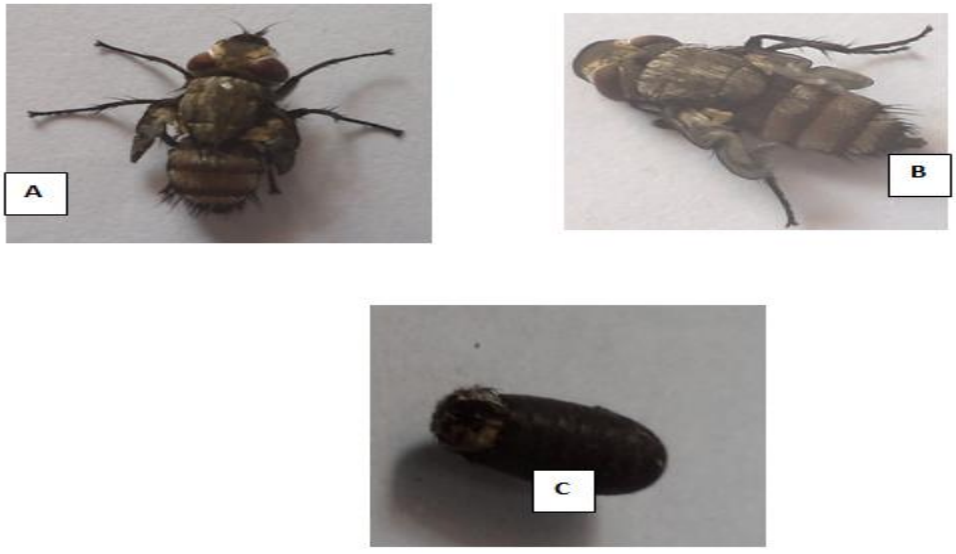

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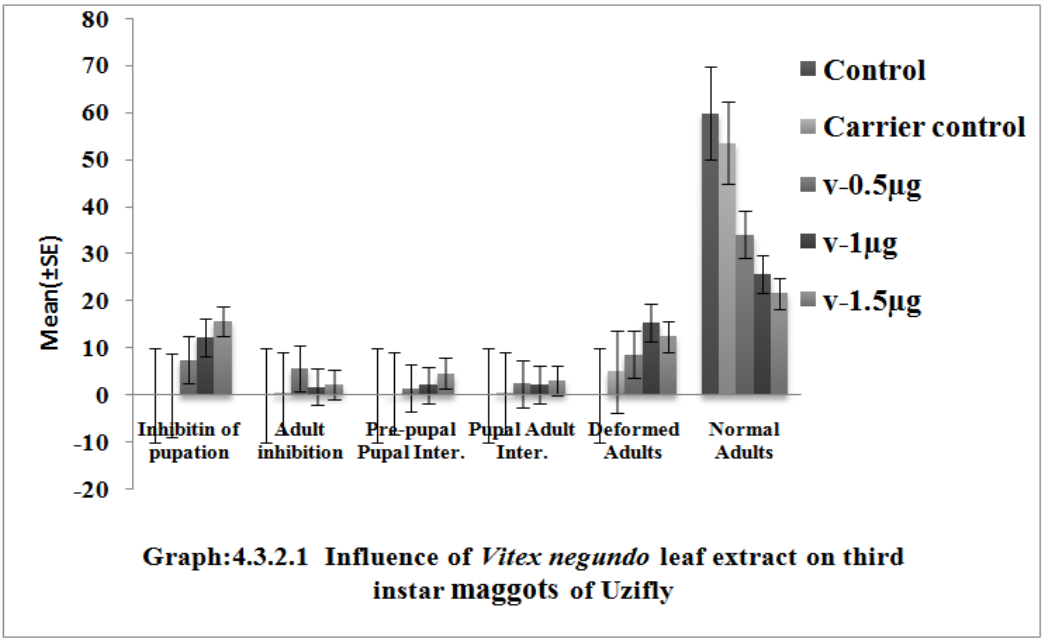
Plate – 12

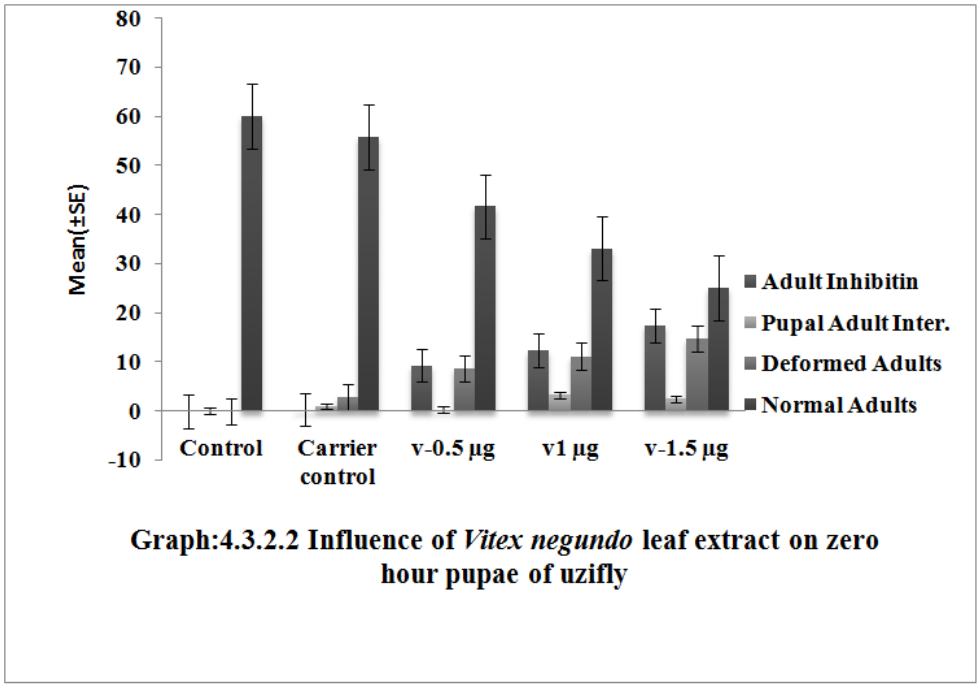
LEGENDS

Fig A, & B– Adults with malformed wings and appendages

Fig –C– Adult unable to extricate from the pupal case



Graph:4.3.2.1 Influence of *Vitex negundo* leaf extract on third instar maggots of Uzifly



Graph:4.3.2.2 Influence of *Vitex negundo* leaf extract on zero hour pupae of uzifly

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