*Research Paper :*

# Laboratory Evaluation of Neem Derivatives for Phagodeterrency Against Shoot and Fruit Borer, *Leucinodes orbonalis* Gue. (Lepidoptera : Pyralidae)

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**SUMMARY**

**The study on the phagodeterrency of neem derivatives along with monocrotophos against third instar larvae of *Leucinodes orbonalis* was carried out in the laboratory. All the test solutions exhibited certain degrees of phagodeterrency. The rate of feeding varied significantly depending upon the concentration of neem derivatives and the effect of neem oil was more significant than neem cake extract.**

**Key words :** *Azadirachta indica, Leucinodes orbonalis, Solanum melongena,* Phagodeterrency

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*Azadirachta indica* A.Juss, the neem tree is considered to be one of the most promising trees of the 21st century. It has great potential in the fields of pest management, environmental protection and medicine. The practical utility of neem as a pest control was first demonstrated by Pradhan *et al*. (1962). After severe setback arising from the use of chemical pesticides on living systems and the environment, the use of eco-friendly insecticides of plant origin is gaining momentum. Botanicals provide ecologically sound, equitable and ethical pest management. They are pest pecific, biodegradable, less prone to pest resistance and resurgence, non toxic to humen and other biota and relatively less expensive. Among various options, neem has been identified as a source of environmentally ?soft? natural pesticide with broad spectrum of bioactivity against harmful pests.

Brinjal – the egg plant (*Solanum melongena*) is much prized by both urban and rural people as an affordable vegetable and it is cultivated more than 500,000 hectares in India (FAOSTAT data, 2006). The crop is attacked by a large number of insect pests, out of which *Leucinodes orbonalis* is most serious one. Larvae bore into shoots during the vegetative growth stage and later in flowers and fruits, rendering fruit unfit for human consumption. It causes yield loss upto 80% and farmers have responded by heavy application of insecticides (Alan Cork, 2009). *L.orbonalis* threatens both the livelihood of the farmers and the health of the consumers. The effect of the synthetic pesticides on the pest is often minimal because it has become highly tolerant to the insecticides but high levels of residues remain on the fruits. To reduce the constraints to production of brinjal, alternative control strategies are needed. The use of plant extracts or botanical pesticides may play a more prominent role in the integrated pest management programmes in the near future (Senthilnathan and Sehoon, 2006 ). Many investigators reported the antifeedent effect of plant extracts, such as, *Azadiracta indica* on *Earias vittella* (Thara and Kingsley, 2001) and *Pericallia ricini* (Revathi and Kingsley, 2004); *Sphaeranthus indicus* on *Spodoptera litura* (Ignacimuthu *et al*., 2006); *Hydnocarpus alpine* on *Helicoverpa* (Ezhil Vendan *et al*., 2009). This consideration is behind this study to evaluate the phagodeterrency or antifeedency of neem derivatives against *L.orbonalis*.

## MATERIALS AND METHODS

The infected fruits of brinjal (*Solanum melongena*) and the pupae of *Leucinodes orbonalis* were collected from the fields at Padapai, Kancheepuram district, Tamilnadu. The emerged adults from the reared larvae were released into sterilized polyester film cage for oviposition. The eggs from the film cage were collected and incubated at room temperature 28 ± 2$^0$C. To find out the antifeedent effect, third instar larvae of *L. orbonalis* were placed at the centre of a

Petridish of 9.8 cm diameter. Brinjal fruit bits dipped in the test solutions of neem oil 1.0, 1.5, 2.0% and neem cake extract 1.0, 1.5, 2.0 % along with monocrotophos 0.05% concentrations, were air dried and placed inside the Petridish. A control was carried out by brinjal fruits dipped in the mixture of water and teepol. The entire setup was left undisturbed for 24 hours, the number of larvae feeding on controlled and treated brinjal were determined. The "antifeedent index" was computed using the formula, as adopted by Abivardi and Benz (1984).

$$\text{Antifeedent index } Z \frac{C - T}{C} \times 100$$

where,

C = Total number of larvae feeding on control

T = Total number of larvae feeding on treated brinjal

## RESULTS AND DISCUSSION

The phagodeterrent effect of neem derivatives at different concentrations against third instar larvae of *L. orbonalis* is given in Table 1. Significant phagodeterrent activity of 66.66% was observed in neem oil at 2.0% concentration, where as in neem cake extract at 2.0% concentration, it was only 63.33%. Same higher phagodeterrent effect of neem oil was also observed earlier by Shanmugapriyan and Kingsley (2001) on *Epilachna vigintioctopunctata*; Thara and Kingsley (2001) on *Earias vittella* and Anam *et al.* (2006) on *Epilachna dodecastigma*.

In the present evaluation, neem oil at 1.0, 1.5, and 2.0 % concentrations exhibited phagodeterrent effect of 44.44, 52.22 and 66.66%, respectively. Likewise, 31.11, 41.10 and 63.33% of phagodeterrent effect was observed in neem cake extract at 1.0, 1.5, and 2.0 % concentrations, respectively. From the results it was inferred, that a clear dose-response relationships was established with the highest dose of 2.0% neem oil evoked 66.66% feeding deterrency. This finding corroborates with the earlier observations of Joseph (2000) who treated *Eligna narcissus indica* with neem seed kernel extract. The dose dependent antifeedent effect of neem oil was also earlier found by Revathi and Kingsley (2004) on *Pericallia ricini*, Anam *et al*. (2006) on *Epilachna dodecastigma* and Uma Maheshwari *et al*.(2008) on *Dysdercus cingulatus*.

Elumalai *et al.* (2008) observed higher antifeedent activity of 56.75% in hexane extract of *Abutilon indicum* at 5.0% concentration against fourth instar larvae of *Helicoverpa armigera*, while they found only lesser antifeedent effect of 19.64% in the same plant extract at 1.0% concentration. Earlier many investigators observed the dose dependent feeding deterrent effect of crude extracts of botanicals, such as *Sphaeranthus indicus* on *Spodoptera litura* (Ignacimuthu *et al*., 2006), *Polygonum hydropiper* and *Pogostemon parviflorus* on *Buzura suppressaria* (Rahman *et al*., 2008) and *Hydnocarpus alpine* on *Spodoptera litura* (Ezhil Vendan *et al*., 2009).

**Table 1 : Evaluation of neem derivatives for phagodeterrency against III instar larvae of *Leucinodes orbonalis***

| Treatment | Concentration | Antifeedent index % |
|---|---|---|
| Neem oil | 1.0 | 44.44 (41.71) [bc] |
| Neem oil | 1.5 | 52.22 (46.29) [ab] |
| Neem oil | 2.0 | 66.66 (54.80) [a] |
| Neem cake extract | 1.0 | 31.11 (33.77) [cd] |
| Neem cake extract | 1.5 | 41.10 (39.84) [bc] |
| Neem cake extract | 2.0 | 63.33 (52.93) [a] |
| Monocrotophos | 0.05 | 21.10 (27.25) [d] |
| Control | | 0.00 ( 0.19) [e] |

Values mean of three replications

Means followed by a common letter are not significantly different at 5% level by DMRT

Monocrotophos (0.05%) exhibited 21.10% of antifeedent activity. Revathi and Kingsley (2004) also reported suppression of feeding by monocrotophos against *Pericallia ricini.*

The rate of feeding varied significantly upon the concentration of plant extracts. This suggests that active principles present in the plants inhibits feeding behaviour or make the food unpalatable or the substances directly act on the chemosensilla of the larva, resulting in feeding deterrency (Pavunraj and Ignacimuthu, 2006 ). The present study indicates that the larvae of *L.orbonalis* showed less appetite to feed on the treated leaf and took rest in the peripheral of the Petridishes. The larvae were unable to digest the treated food and eliminated the consumed food. This corroborates with the findings of Morimoto *et al.* (1992).

These positive findings could pave the way for the development of a safe, potent, and cheaper plant protection component, which could be either alone or in

combination with other methods in the future to make crop production of non-polluting, non- hazardous and at the same time profitable, green pesticide for the management of *L.orbonalis*.

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