

Impact of Neem Derivatives on Egg Hatchability of Okra Fruit Borer, *Earias Vittella* Fab. (Lepidoptera : Noctuidae)

S. THARA, S. KINGSLEY AND N. REVATHI

International Journal of Plant Protection, Vol. 2 No. 1 : 95-97 (April to September, 2009)

See end of the article for authors' affiliations

Correspondence to :
S. KINGSLEY
Entomology Research
Institute, Loyola
College, CHENNAI
(T.N.) INDIA

SUMMARY

Bioefficacy of neem derivatives such as neem oil and neem cake extract at different concentrations along with endosulfan were evaluated for their effect on the egg hatchability of *Earias vittella*, under laboratory conditions. All the test solutions to some extent reduced the hatchability. Maximum suppression of hatchability was observed in neem oil. Hatchability was reduced notably with an increase in the concentration of the test derivatives. The age of treated larvae played a significant role on the hatchability of egg.

Key words :

Earias vittella,
Neem derivatives,
Hatchability.

An alternative eco-friendly strategy for management of noxious insect pests has been searched to reduce harmful effects of synthetic chemical insecticides on humanity. In recent years, crop protection based on botanicals to control pests has been recognized as a valuable tool in pest management. Due to the increased awareness on indiscriminate use of synthetic pesticides and their persistent harmful effects, much interest has been evinced in the use of botanical products to control the agricultural pests. Of the numerous plants investigated, the neem tree *Azadirachta indica* A. Juss., has shown promising results for the control of numerous crop pests (Revathi and Kingsley, 2008). Neem has universally been accepted as a wonder tree because of its diverse utility. It belongs to the family Meliaceae, an attractive evergreen tree, native of Indian subcontinent. Its multidirectional uses as therapeutic have been known in India since vedic times. Besides therapeutic efficacy, neem established its potential as a source of naturally occurring insecticide with various mode of actions. Saxena *et al.* (1981) were the first to observe that neem oil at different concentrations strongly inhibited the hatchability of the eggs of *Cnaphalocrocis medinalis*. Luca (1982) on *Callosobruchus* sp. and Rajendran (1997) on *Henosepilachna vigintioctopunctata*, observed reduced hatchability of eggs, when treated with neem oil. Pest control methods are aimed to combat insect at initial stages, particularly the hatching stage. This factor is one of the key aspects of the present investigation to evaluate the effect

of neem derivatives on the egg hatchability of *Earias vittella*.

The fruit borer, *Earias vittella* Fabricius causes extensive damage to okra (*Abelmoschus esculentus*) fruits, resulting in 69% reduction in yield (Rawat and Sahu, 1973). Farmers rely solely on synthetic chemicals for the management due to the pests perceived efficiency. As the okra fruits are harvested in frequent intervals, the dependence on the chemical pesticides leads to accumulation of residues in the fruits and pose problems to consumers. Realizing the emerging significances of botanical pesticides, the objective of the present work is to evaluate the efficacy of neem extracts for the protection of okra crop from *E.vittella*.

MATERIALS AND METHODS

The larvae of *E.vittella* collected from the infested fruits from the field at Chettipalayam of Erode district, Tamilnadu, were kept in a container (30×25 cm) and fed with fresh okra fruits. Adults emerged from pupae were separated out and kept in adult rearing cages. For oviposition, fresh okra leaves were kept inside. Adults were fed with 5% honey solution soaked in cotton and kept inside the cages. Freshly laid eggs were collected and stock culture was initiated.

Neem oil at 0.5, 1.0 and 2.0%, neem cake extract 1.0, 3.0 and 5.0% concentrations along with endosulfan at 0.05% were evaluated to find out the hatchability effect on the eggs of *E.vittella*. Okra fruits dipped in test solutions and dried were provided to two hours pre-

Accepted :
March, 2009

starved fourth and fifth instar larvae. Left undisturbed for 24 hours, normal food was provided and the larvae were allowed to metamorphosis. Emerged adults from treated larvae, were reared as described earlier and the eggs laid by each pair were collected separately. Observations on the hatchability of eggs were made. Experiment was replicated thrice at room temperature.

RESULTS AND DISCUSSION

It was observed from the results presented in Table 1 that all the test solutions to some extent reduced the egg hatchability on *E.vittella*. The lowest rate of hatchability of 20.95 and 32.08% was found, when the eggs laid by the adults emerged from the fourth and fifth instar larvae treated with neem oil at 2.0%. Mala and Muthalagi (2008) also reported the maximum effect of neem oil extract on the egg hatchability. They observed total suppression of hatchability of eggs on *Pericallia ricini*, when they treated the larvae with neem oil (0.8%).

Table 1: Effect of neem derivatives on the egg hatchability of *earias vittella* fab.

Treatment	Concentr ration	% of eggs hatched	
		larval instars	
		IV	V
Neem oil	0.5	36.96 (37.44) ^{abc}	39.97 (39.21) ^d
Neem oil	1.0	31.87 (34.37) ^{ab}	35.05 (36.30) ^c
Neem oil	2.0	20.95 (27.24) ^a	63.10 (52.59) ^f
Neem cake extract	1.0	57.93 (49.56) ^c	53.99 (47.29) ^e
Neem cake extract	3.0	53.00 (46.73) ^{bc}	45.02 (38.09) ^{abc}
Neem cake extract	5.0	45.03 (42.15) ^{bc}	82.99 (65.64) ^h
Endosulfan	0.05	38.02 (38.06) ^{abc}	
Control		82.99 (65.64) ^h	

Values are mean of four replications

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

In the present investigation, neem oil 0.5, 1.0 and 2.0% exhibited 36.96, 31.87 and 20.95% of egg hatchability, respectively (Table 1). These eggs were laid by adults emerged from treated fourth instar larvae. Likewise, the hatchability of eggs laid by the adults emerged from the fourth instar larvae treated with neem cake extract 1.0, 3.0 and 5.0% was 57.93, 53.00 and 45.03%, respectively. From the results it was observed, when the concentration of the neem derivatives increased, the hatchability of egg was reduced. This dose dependent effect was also observed earlier by Gajmer *et al.* (2002). They found the hatchability of egg was lower at higher concentration than at lower concentration of methanolic extract of neem on *Earias vittella*. Chandrasekaran *et al.* (2003) reported decreased hatchability, while increasing the concentration of neem products on the eggs

of *Earias vittella*. Neem at higher concentration reduced the egg hatchability on *Epilachna dodegastigma* (Mishra, 2007). Samarasinghe *et al.* (2008) also evaluated the dose dependent hatchability effect of methanol extract of garlic on the eggs of *Plutella xylostella* and found a reduced hatchability of 42.74% at 5.0% concentration.

From the results it was inferred that the age of larvae played an vital role to determine the effect of neem derivatives on the egg hatchability of *E.vittella*. Larvae at young age were more susceptible than older ones. The present evaluation clearly shows that an increase in age of treated larvae results in a decreased rate of egg hatchability. Endosulfan (0.05%) also exerted a certain level of effect on the hatchability of eggs. The hatchability of eggs laid by treated fourth and fifth instars was 38.02 and 45.02%, respectively.

Many opined a number of factors for the low hatchability of eggs treated with botanicals. House (1963) observed, that lack of protein caused retardation of many physiological processes in insects. Adult insects require protein to promote ovulation, egg development and hatchability. The inhibition of DNA and RNA synthesis interfered with endomitosis of nerve cells, prevented the yolk production. However, the reduced DNA, RNA, proteins, aminoacids and alkaline phosphatase might be due to the toxicity of botanicals caused mitotic failure during embryogenesis, resulted poor hatchability of eggs. As reported by Shukla *et al.* (1997), the impairment of gonotrophic cycle of adults might have prevented the eggs from hatching in *Earias vittella*. Reduction of egg hatchability might be due to impairment of gonotrophic cycle of adults by the secondary metabolites present in the members of sapindaceae (Subashini *et al.*, 2004).

The reduction of egg hatchability observed in the present investigation would definitely have drastic effect on the population density. If these neem derivatives could retain their effect on the hatchability of eggs in fields, then it would become a eco-friendly, green pesticide for the management of *E.vittella*.

Authors' affiliations:

S. THARA, Department of Zoology, Sri Vasavi College, ERODE (T.N.) INDIA.

N. REVATHI, Department of Advanced Zoology and Biotechnology, Loyola College, CHENNAI (T.N.) INDIA

REFERENCES

Chandrasekaran, M., Balasubramanian, G. and Kuttalam, S. (2003). Ovicidal action and ovipositional deterrence of certain neem products against bhendi fruit borer (*Earias vittella* Fabricius). *Madras Agric.J.*, **90** (4-6): 376-379.

- Gajmer, T., Singh, R., Saini, R.K. and Kalidhar, S.B. (2002).** Effect of methanolic extracts of neem (*Azadirachta indica* A.Juss) and bakain (*Melia azedarach* L.) seeds on oviposition and egg hatching of *Earias vittella* (Fab.) (Lep., Noctuidae). *J. Appl. Entomol.*, **126** (5) : 238-243.
- House, H.L. (1963).** Nutritional diseases In: *Insect Pathology. An Advanced treatise* (E.A.Steinhaus, Ed.) Academic Press, New York, **1** : 133-160.
- Luca Y. De. (1982).** Products of vegetable origin that can be used against bruchids (Coleopteran) (Attractant, antifeedant, deterrent, repellent and lethal). *Frustrula Entomologica*, **2**: 19-29.
- Mala, S. and Muthalagi, S. (2008).** Effect of Neem Oil Extractive (NOE) on repellency, mortality, fecundity, development and biochemical analysis of *Pericallia ricini* (Lepidoptera : Arctidae). *J. Biopesticides*, **1**: 63-66.
- Mishra, Anjali (2007).** Studies on the effect of neem (*Azadirachta indica* A.Juss) on the reproduction and biochemical parameters of *Epilachna dodegastigma* (Weid) (Coleoptera:Coccinellidae). *Uttar Pradesh J. Zool.*, **28**(1) : 11-16.
- Rajendran, B. (1997).** Effect of neem oil and endosulfan on the oviposition and hatchability of *Henosepilachna vigintioctopunctata* (Fab). *Proceedings of the first National Symposium on Pest Management in horticultural crops*, Bangalore. 15-17.
- Rawat, R.R. and Sahu, H.R. (1973).** Estimation of losses in growth and yield of okra due to *Empoasca devastans* and *Earias* species. *Indian J. Ent.*, **17**: 241-243.
- Revathi, N. and Kingsley, S. (2008).** Neem derivatives as a larvicide against countrybean pest, *Pericallia ricini* F. (Lepidoptera:Arctidae). *J. Ent. Res.*, **32** (1) : 27-29.
- Samarasinghe, M.K.S.R.D., Chillar, B.S. and Ram Singh. (2008).** Effect of methanolic extract and fractions of garlic on oviposition and egg hatching of *Plutella xylostella* (Linnaeus). *J. Insect Sci.* **21**(1) : 28-33.
- Saxena, R.C., Waldballer, G.P., Luguido, N.T. and Puma, B.C. (1981).** Effect of neem seed oil on the rice leaf folder, *Cnaphalocrocis medinalis*. In: *Natural pesticides from neem tree (Azadirachta indica* A.Juss). Schmutterer, H., Ascher, K.R.S. and Rembold, H. (Eds.) CTZ, Eschborn FRG : 189-204.
- Shukla, A., Pathak, S.C. and Agarwal, R.K. (1997).** Effect of some plant odours in the breeding environment on fecundity and hatching of okra shoot and fruit borer, *Earias vittella* Fab. under laboratory conditions. *Crop Res. Hisar*, **13** : 157-161.
- Subashini, H.D., Malarvannan, S. and Ranjith R. Pillai. (2004).** *Dodonaea angustifolia* – a potential biopesticide against *Helicoverpa armigera*. *Curr. Sci.*, **86** (1) : 26-28.
