Journal of Entomology

ISSN 1812-5670

Academic Journals Inc.

www.academicjournals.com

Journal of Entomology 4 (3): 243-247, 2007
ISSN 1812-5670

Efficacy of *Dodonaea angustifolia* Crude Extracts against Spotted Bollworm, *Earias vitella* (Fab.) (Lepidoptera: Noctuidae)

S. Malarvannan and H.D. Subashini
M.S. Swaminathan Research Foundation, III Cross Street,
Taramani Institutional Area, Chennai 600 113, India

Abstract: A field experiment was conducted in Sorapet, Pondicherry, Union Territory, India, to evaluate the efficacy of crude extracts of *D. angustifolia* against *Earias vitella* on rainfed cotton. *D. angustifolia* crude extracts drastically reduced the number of larvae similar to a neem product. The percentage of damaged squares and bolls was also reduced after consecutive sprays compared to untreated and endosulfan (controls).

Key words: *Earias vitella*, *Dodonaea angustifolia*, neem, rainfed

INTRODUCTION

The potential yield loss worldwide due to weeds, diseases and pre-and post-harvest pests is estimated at 45% (Gwo-Chen, 1999). In India, on an average, 33% of crop loss occurs due to pests and diseases (Puri *et al*., 1999) and runs to an estimated Rs. 200 billion (Singh, 1999).

Spotted bollworm, *Earias vitella* Fab. is one among the severe pests in cotton crop. Its incidence varies between seasons and the feeding preferences. It is abundant in high rainfall areas. The pest attacks the crop from 35 to 110 days. First and second larval instars prefers for squares, followed by bolls and flowers. They bore into the growing shoots, buds, flowers and bolls. The attacked shoots wither, droop and ultimately die, and flowers and buds drop off. Infested bolls do not shed, open prematurely and the quality of the lint is spoiled. Pupation takes place in the bolls, impairing the development of bolls (Sharma *et al*., 2004; Vennila *et al*., 2005).

The genetic resistance of pest species, toxic residues in food produce, increasing costs of application, hazards from handling etc., (Martin *et al*., 2000) due to the indiscriminate use of chemical pesticides have increased the need for an effective alternative biocontrol method using botanicals with greater selectivity. Biologicals are safe to higher animals and environment, relatively specific in their mode of action and application, easy to access, locally available and cost effective (Karuppuchamy, 1999).

The effects of methanolic extracts of *Azadirachta indica* and *Melia azedarach* seeds affected the oviposition behaviour and egg hatchability of *E. vitella* (Gajmer *et al*., 2002).

Though chemical insecticides as well as biopesticides have been targeted towards the dreadful noctuid, *Dodonaea angustifolia* has not been screened for such pests either in the laboratory or in the field. The initial experiments conducted in the laboratory have proved that this plant is highly potential against controlling *H. armigera* (Subashini *et al*., 2004) and hence the field trials with target pest and non-target pests were carried out under field conditions (Malarvannan, 2004). This article would focus on the bio-efficacy of the crude extracts of *Dodonaea* against *Earias vitella*.

Dodonaea angustifolia, commonly known as hop bush, (Vernacular Tamil: *Viraali* or *Vilaari*) is a perennial shrub belonging to Sapindaceae. In Tamil Nadu, *D. viscosa* dominates at Pacchaimalai foot hills, Kolli hills, Servarayans etc., (Gamble, 1987).

Corresponding Author: S. Malarvannan, M.S. Swaminathan Research Foundation,
III Cross Street, Taramani Institutional Area, Chennai 600 113, India

MATERIALS AND METHODS

Plant Material-source

Leaves of *Dodonaea angustifolia* was collected from different parts of Kolli Hills, Namakkal District, Tamil Nadu.

Extraction of Plant Material

The leaves of *D. angustifolia* were shade dried and powdered. One kilogram each of powdered leaves was extracted successively using non-polar to polar solvents viz., hexane, petroleum ether, chloroform, acetone and water according to the standard procedures (Harborne, 1998). The crude extracts were measured and used in desired concentrations for field trial.

Field Trial

A field experiment of Randomized Block Design (RBD) on rainfed cotton was conducted in a famer's field at Sorapet, a small hamlet near the outskirts of Pondicherry, Union Territory to test the crude extracts of *D. angustifolia* against *Earias vitella*. Individual plots were of 12 m^2 size. Ten percent crude extracts (hexane, petroleum ether, chloroform, acetone and water) of *D. angustifolia* were sprayed during the late hours of the day using a knapsack sprayer. Neem product and endosulfan was used as positive controls. Unsprayed plots were maintained as negative control. Six sprays were given at weekly intervals. The pre treatment count and post treatment count on number of larvae per plant and the damaged squares and bolls per plant were taken (Fig. 1).

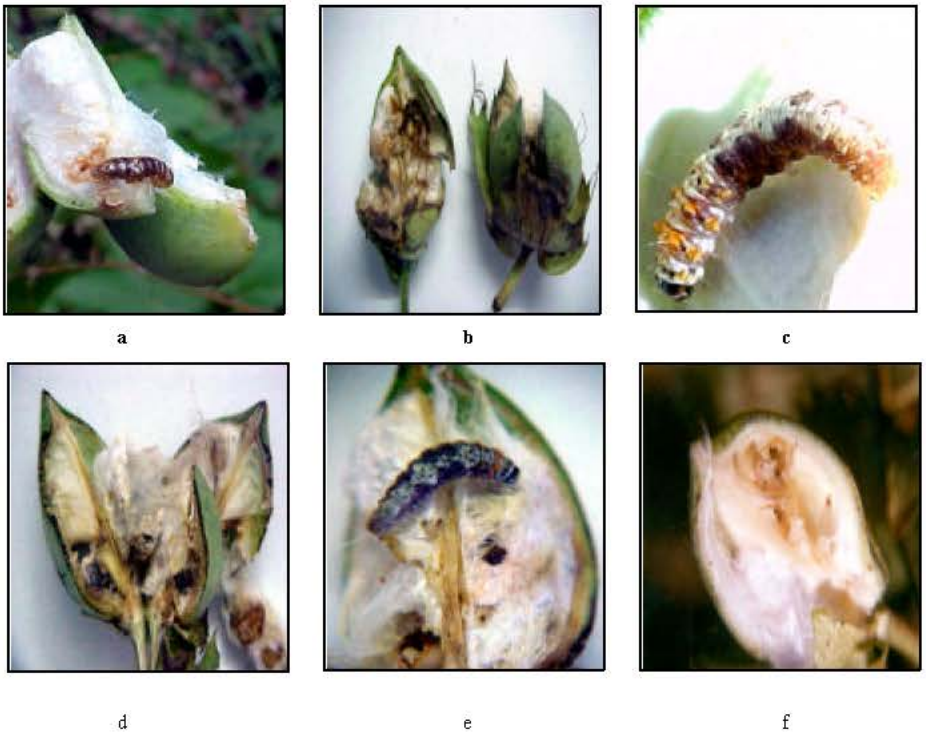

Fig. 1: *Earias vitella* incidence and damage on cotton before spray. a and b: Split squares and damaged bolls; c: *Earias vitella* larva; d: Damaged kapas; e: Larvae feeding and f: Severely damaged boll

RESULTS AND DISCUSSION

Number of Larvae

The number of larvae (Table 1) drastically reduced in all the extract treated plots along with neem product. Most of the treatments resulted in nil larvae after 2nd spray, however larvae were seen in chemical treated and untreated plots until the last spray.

Damaged Squares and Bolls

There was 50% reduction in percent damage squares after 1st spray, compared to before spray and there was no significant difference among the treatments even after 2nd spray. Further, plots treated with *Dodonaea* extracts showed less percent of damaged squares and bolls, which was on par

Table 1: Effect of *D. angustifolia* extracts against *Earias vitella* larva on cotton

	Larvae (numbers)						
		After spray					
Treatments	Before spray	1	2	3	4	5	6
Hexane extract	2.2^{ab}	0.1	0.0^{a}	0.0^{a}	0.1^{a}	0.0^{a}	0.0^{a}
Petroleum ether extract	2.0^{ab}	0.1	0.0^{a}	0.0^{a}	0.1^{a}	0.0^{a}	0.0^{a}
Chloroform extract	2.4^{ab}	0.1	0.0^{a}	0.0^{a}	0.1^{a}	0.0^{a}	0.0^{a}
Acetone extract	1.6^{ab}	0.1	0.2^{b}	0.1^{ab}	0.1^{a}	0.0^{a}	0.0^{a}
Water extract	0.8^{a}	0.1	0.1^{ab}	0.1^{ab}	0.0^{a}	0.0^{a}	0.0^{a}
Neem product	2.8^{b}	0.3	0.0^{a}	0.0^{a}	0.0^{a}	0.0^{a}	0.0^{a}
Endosulfan (chemical)	2.2^{ab}	0.1	0.0^{a}	0.3^{b}	0.5^{b}	0.7^{a}	1.1^{b}
Unsprayed (control)	2.6^{ab}	0.1	0.2^{b}	0.5^{c}	0.9^{c}	1.7^{b}	0.9^{b}
F ($p<0.01$)	1.1	NS	3.6	7.0	11.8	6.2	29.7

Each value mean of triplicate of mean of five plants/plot, NS: Non Significant; Different letter(s) in each column differ significantly (5%) by DMRT

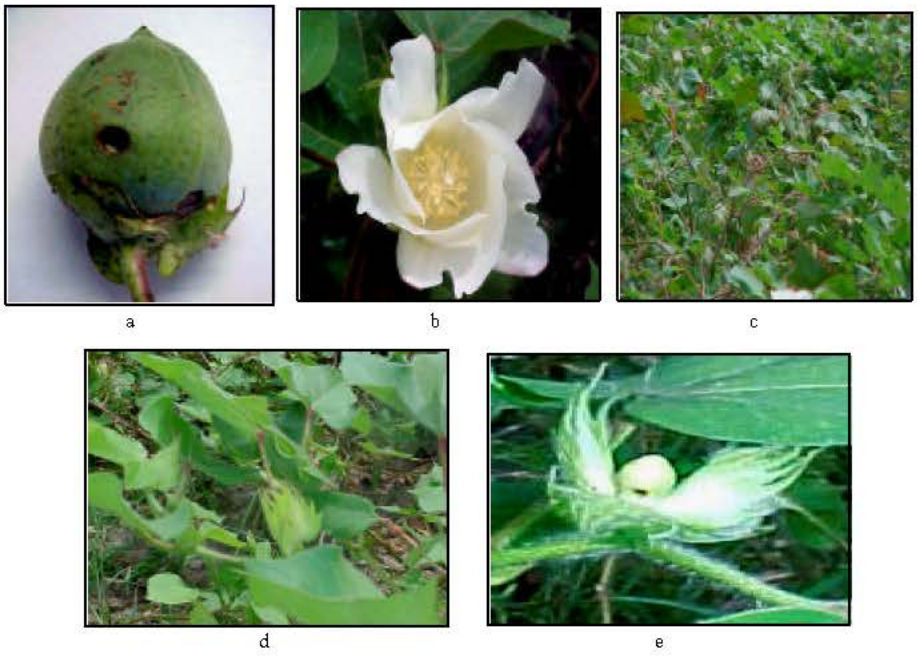

Fig. 2: *Earias vitella* incidence and damage after *Dodonaea* spray. a: Less split squares and bolls; b: Undamaged flower; c: Reduced damage-field view and d and e: Retrieval of affected field-less damaged squares

Table 2: Effect of *D. angustifolia* extracts against *Earias vitella* on cotton field

	Damaged squares and bolls (%)						
		After spray					
Treatments	Before spray	1	2	3	4	5	6
Hexane extract	46.3	24.0	4.7	1.1^{a}	6.7^{b}	0.3^{a}	1.6^{a}
Petroleum ether extract	41.4	17.3	2.5	0.6^{a}	0.6^{ab}	0.3^{a}	0.7^{a}
Chloroform extract	57.1	19.5	2.9	0.8^{a}	0.6^{ab}	0.0^{a}	0.4^{a}
Acetone extract	37.4	22.5	8.0	0.9^{a}	0.3^{a}	0.0^{a}	0.3^{a}
Water extract	48.2	26.0	8.7	0.3^{a}	4.0^{ab}	0.0^{a}	0.0^{a}
Neem product	32.1	18.8	3.7	2.2^{a}	0.3^{a}	0.7^{a}	0.6^{a}
Endosulfan (chemical)	46.7	28.1	2.2	13.3^{b}	25.5^{c}	3.6^{a}	8.7^{b}
Unsprayed (control)	48.6	21.7	6.7	36.2^{c}	32.0^{d}	13.0^{b}	11.9^{b}
F ($p<0.01$)	NS	NS	NS	14.7	45.3	6.2	1.6

Each value mean of triplicate with mean of five plants/plot, NS: Non Significant; Different letter(s) in each column differ significantly (5%) by DMRT

with neem product (Table 2 and Fig. 2). This is in accordance with the findings of Samuthiravelu and David (1991) who found that applications of neem oil and endosulfan, alone and together, reduced damage by *Earias vitella* on lady's finger and by Dhawan *et al*. (1992) in upland cotton.

CONCLUSIONS

The experimental results prove that such less explored plants do have a potential to combat pests in an ecofriendly way and would serve as promising biopesticides, if handled at right combination and dosage at the right time.

ACKNOWLEDGMENTS

The authors acknowledge the Sir Dorabji Tata Trust, Mumbai for the financial support and the farmers of Sorapet who helped us to conduct the experiment without any hindrance. Thanks are due to Mr. S. Anand former staff of MSSRF who helped us in the selection of suitable field and to staff of Kolli hills in the collection of plant material.

REFERENCES

Dhawan, A.K., G.S. Simwat, P. Tauro and S.S. Narwal, 1992. Field evaluation of Neemrich 20EC for management of insect pests on cotton during reproductive phase. In: Proceeding I Natl. Symposium. Allelopathy in Agroecosystems (Agriculture and Forestry), pp: 152-153.

Gajmer, T., R. Singh, R.K. Saini and S.B. Kalidhar, 2002. Effect of methanolic extracts of neem (*Azadirachta indica* A. Juss) and bakain (*Melia azedarach* L.) seeds on oviposition and egg hatching of *Earias vitella* (Fab.) (Lep., Noctuidae). J. Applied Entomol., 126: 238-243.

Gamble, J.S., 1987. Flora of the Presidency of Madras, 1: 253.

Gwochen, L., 1999. Scope of plant protection. A Practical Point of View', http://www.agnet.org/library/article.

Harborne, J.B., 1998. Methods of Plant Analysis. In: Phytochemical Methods-A Guide to Modern Techniques of Plant Analysis. Chapman and Hall (Eds.), London, UK.

Karuppuchamy, P., 1999. Preparation and Assay of Crude Plant Extracts. In: Training Manual on Botanicals in Pest Management. Rabindra, R.J., S. Kuttalam, B. Rajasekaran, K. Gunasekaran and S. Chandrasekaran (Eds.), Coimbatore.

Malarvannan, S., 2004. Studies on biocontrol of *Helicoverpa armigera* using traditional plants. Ph.D Thesis. University of Madras, Chennai, pp: 153.

Martin, T., G.O. Ochou, F. Halan' Klo, J. Vassal and M. Vaissayre, 2000. Pyrethroid resistance in the cotton bollworm, *Helicoverpa armigera* (Hübner), in West Africa. Pest Manage. Sci., 56: 549-554.

Puri, S.N., K.S. Murthy and O.P. Sharma, 1999. Pest Problems in India-Current Status. Indian J. Plant Prot., 27: 20-31.

Samuthiravelu, P. and B.V. David, 1991. Bioefficacy of Neem Oil and Endosulfan Against the Fruit Borer, *Earias vitella* (Fab.) (Noctuidae: Lepidoptera) on Okra. Madras Agric. J., 78: 77-78.

Sharma, O.P. , O.M. Bambawale, R.C. Lavekar and A. Dhandapani, 2004. Integrated Pest Management in Rainfed Cotton. In: Proceedings 11. Integrated Pest Management in Indian Agriculture. New Delhi, India.

Singh, S.P., 1999. Biological Control in India. Ind. J. Plant Prot., 27: 126-38.

Subashini, H.D., S. Malarvannan and Renjith R. Pillai, 2004. *Dodonaea angustifolia.* A potential biopesticide against *Helicoverpa armigera*. Curr. Sci., 86: 26-28.

Vennila, S., V.K, Biradar, P.R., Panchbhai, J.G., Gadpayle, A.Y., Deshmukh, P.W. Nemade and P.P. Karanjkar, 2005. Seasonal dynamics, survival and feeding preference of *Earias vitella* (Fab.) larval instars on cotton. Ann. Plant Prot. Sci., 13: 60-64.