

Evaluation of ovicidal activity of some plant extracts against *Helicoverpa armigera*



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SUMMARY

Studies conducted to see the effects of aqueous and methanol extracts of selected plant species on hatchability of freshly laid eggs of *H. armigera* indicated that all the eight plant species were found to inhibit hatching of the eggs. The mean per cent hatching of the eggs in both the aqueous and methanol extracts of plant species was ranged between 15.00 to 65.00 and 30.00 to 70.00, respectively as against 10.00 per cent in control. Amongst the aqueous extracts of plant species, 10.00 per cent neem fruit extract (NFE), 10 per cent serni whole plant extract (SWPE), 7.5 per cent neem fruit extract (NFE), 7.5 per cent serni whole plant extract (SWPE) and 10 per cent undi fruit extract (UFE) were found equally promising in reducing hatchability of eggs in *H. armigera*. In methanol extracts of plant species, the maximum per cent unhatched eggs were noticed in the treatment with 7.5 per cent neem fruit extract (NFE) with 70.00 per cent unhatched eggs, which was significantly better than rest of the treatments except the treatments with 7.5 per cent undi fruit extract (UFE), 7.5 per cent ritha fruit extract (RFE), 7.5 per cent serni whole plant extract (SWPE) and 5 per cent neem fruit extract (NFE) which were found at par with each other. The hatchability of eggs in both aqueous and methanol extracts of plant species was found to be decreased with increase in the concentration of extracts tried.

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The plants are rich source of bioactive organic chemicals. They are less deleterious to human being, non-phytotoxic and have no residual toxicity to parasites, predators and pollinators. Plants are known to produce a variety of secondary metabolites such as alkaloids, terpenoids, polyacetylenes, flavonoids, usual amino acids, sugars, etc. which has behavioural and physiological effects on the colonization, development, growth, survival and multiplication of insects. In view of their environmental safety, botanicals offer an attractive alternative to synthetic pesticides.

There is a great diversity in the plants species in the country and abroad. It is estimated that there are about 2,50,000 to 5,00,000 different plant species existed in the world (Dhaliwal and Arora, 2004). Only 10 per cent of these have been examined chemically indicating that there is enormous scope for further work (Benner, 1993). As many as 2,121 plants species have been

reported to possess pesticidal properties. The neem, pyrethrum, rotenone, ryania, nicotine, sabadilla and number of other lesser known botanical pesticides are being used from the time much before the advent of synthetic organic pesticides to protect agricultural crops from the ravages of insect and non-insect pests in different parts of the world (Shukla and De, 2000). The presence of biologically active principle in different parts of various plant species viz., seed, flowers, bark, stem, leaves, roots, rhizomes, etc. and their extra ordinary pest management traits have been investigated by many scientists (Pradhan *et al.*, 1962; Gujar and Mehrotra, 1983; Koul, 1985; Pandey *et al.*, 1987; Ayyangar and Rao, 1991; Sarode *et al.*, 1995; Dwivedi and Sharma, 2003; Raja *et al.*, 2005).

The Konkan region of Maharashtra is blessed with greater diversity of plant species. Many of them are known to possess insecticidal and medicinal properties. However, very little information is available

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on the insecticidal activities of these plant species. An attempt has therefore been made during present investigation to study the relative efficacy of eight selected plant species *viz.*, Undi, *Calophyllum inophyllum*; Serini, *Homonoia riparia*; Cassava, *Manihot esculenta*; Shikakai, *Acacia concinna*; Yam bean, *Pachyrrhizus erosus*; Acacia, *Acacia mangium*; Ritha, *Sapindus trifoliatus*; and Neem, *Azadirachta indica* A. Juss growing naturally and abundantly in the region against highly polyphagous and most destructive pest, Tomato fruit borer, *Helicoverpa armigera* Hub. (Lepidoptera; Noctuidae).

MATERIALS AND METHODS

Assessment of ovicidal activity:

Several indigenous plant species are known for their insecticidal properties (Shukla and De, 2000). Some of these plants are abundantly available in the natural habitat of the Konkan region of Maharashtra State and are known for their poisonous properties. Based on their insectistatic activity and natural abundance, eight commonly occurring plant species were selected for testing their ovicidal activity against *H. armigera* (Table 1).

Table 1 : Details of plant species selected for evaluation of ovicidal activity

Sr. No.	Botanical name	Common name	Family	Plant part used
1.	<i>Azadirachta indica</i>	Neem	Meliaceae	Fruits
2.	<i>Calophyllum inophyllum</i>	Undi	Clausiaceae	Fruits
3.	<i>Homonoia riparia</i>	Serni	Euphorbiaceae	Whole plant
4.	<i>Manihot esculenta</i>	Cassava	Euphorbiaceae	Tuber skin
5.	<i>Acacia concinna</i>	Shikakai	Leguminosae	Pods
6.	<i>Pachyrrhizus erosus</i>	Yam bean	Leguminosae	Seeds
7.	<i>Acacia mangium</i>	Acacia	Leguminosae	Pods
8.	<i>Sapindus trifoliatus</i>	Ritha	Euphorbiaceae	Fruits

Twenty freshly laid eggs of *H. armigera* were placed in petridish (10 cm in diameter) and treated with various concentrations of plant extracts as per treatment details. The eggs were observed daily at 9 a.m. for hatchability. Two such sets were maintained simultaneously. Hand

atomizer of 500 ml capacity was used for spraying the eggs with plant extracts. Observations on number of eggs hatched were recorded daily till five days after treatment. The student dissecting microscope was used for recording the observations on hatchability of the eggs. Eggs mortality percentage was worked out on the basis of number of eggs unhatched from the total number of eggs exposed to various concentrations of each treatments and mortality was corrected by Abott's formula.

RESULTS AND DISCUSSION

Results of the studies conducted to see the effects of aqueous and methanol extracts of selected plant species on hatchability of freshly laid eggs of *H. armigera* indicated that all eight plant species were found to inhibit hatching of the eggs. The mean per cent hatching of the eggs in both aqueous and methanol extracts of plant species ranged between 15.00 to 65.00 and 30.00 to 70.00, respectively as against 10.00 per cent in control (Table 2 and 3). Amongst the aqueous extracts of plant species, 10.00 per cent neem fruit extract (NFE), 10 per cent serni whole plant extract (SWPE), 7.5 per cent neem fruit extract (NFE), 7.5 per cent serni whole plant extract (SWPE) and 10 per cent undi fruit extract (UFE) were found equally promising in reducing hatchability of eggs in *H. armigera* (Table 2). In methanol extracts of plant species, the maximum per cent unhatched eggs were noticed in the treatment with 7.5 per cent neem fruit extract (NFE) with 70.00 per cent unhatched eggs, which was significantly better than rest of the treatments except the treatments with 7.5 per cent undi fruit extract (UFE), 7.5 per cent ritha fruit extract (RFE), 7.5 per cent serni whole plant extract (SWPE) and 5 per cent neem fruit extract (NFE) which were found at par with each other (Table 3). The hatchability of eggs in both aqueous and methanol extracts of plant species was found to be decreased with increase in the concentration of extracts tried. Above results clearly indicated that the aqueous and methanol extracts of undi fruit (UFE) and whole plant of serni (SWPE) were found as effective as neem fruit extracts (NFE) in reducing hatchability of freshly laid eggs of *H. armigera*. The ovicidal action of neem against various species of insects was reported long before by earlier workers (Gujar and Mehrotra 1983, Ayyangar and Rao 1991). Patel and Patel (1997) reported ovicidal effect of various commercial neem based pesticide against *H. armigera*. Jeyakumar and Gupta (1999) reported that 10.00 per cent NSKE caused 60.9 per cent reduction in eggs of *H. armigera*. Agrawal (1993) reported that 5.0 per cent seed extract of *Calophyllum inophyllum* L.

Table 2 : Effect of aqueous extracts of selected plant species on hatchability of eggs of *H. armigera*

Treat. No.	Treatments	Mean per cent eggs unhatched
T ₁	7.5 per cent neem fruit extract (NFE)	47.50 (43.56)*
T ₂	10 per cent neem fruit extract (NFE)	65.00 (53.77)
T ₃	7.5 per cent undi fruit extract (UFE)	32.50 (34.74)
T ₄	10 per cent undi fruit extract (UFE)	40.00 (39.23)
T ₅	7.5 per cent serni whole plant extract (SWPE)	42.50 (40.68)
T ₆	10 per cent serni whole plant extract (SWPE)	55.00 (47.88)
T ₇	7.5 per cent cassava tuber skin extract (CTSE)	17.50 (24.67)
T ₈	10 per cent cassava tuber skin extract (CTSE)	25.00 (30.00)
T ₉	7.5 per cent shikakai pods extracts (SPE)	20.00 (26.39)
T ₁₀	10 per cent shikakai pods extracts (SPE)	30.00 (33.13)
T ₁₁	7.5 per cent yam bean seed extract (YBSE)	27.50 (31.60)
T ₁₂	10 per cent yam bean seed extract (YBSE)	35.00 (36.22)
T ₁₃	7.5 per cent acacia pods extract (APE)	15.00 (22.78)
T ₁₄	10 per cent acacia pods extract (APE)	20.00 (26.39)
T ₁₅	7.5 per cent ritha fruits extract (RFE)	22.50 (28.28)
T ₁₆	10 per cent ritha fruits extract (RFE)	37.50 (37.75)
T ₁₇	0.05 per cent endosulfan 35 EC	42.50 (40.68)
T ₁₈	Control (water spray)	10.00 (18.43)
	S. E. ±	2.13
	C. D. (P=0.05)	6.34

*Figures in parenthesis are arcsin values

caused 76.66 per cent mortality in one day old eggs of *Dysderus Koenigii* fabr. Whereas, Patharikar (2005) observed 76.66 and 86.66 per cent mortality in eggs of *S. litura* in methanol extracts of *calophyllum inophyllum* L and *Homonoia riparia* Lour., respectively. The performance of other extracts on egg mortality could not be discussed here due to lack of information in the

Table 3 : Effect of methanol extracts of selected plant species on hatchability of eggs of *H. armigera*.

Treat. No.	Treatments	Mean per cent eggs unhatched
T ₁	5 per cent neem fruit extract (NFE)	55.00 (47.88)*
T ₂	7.5 per cent neem fruit extract (NFE)	70.00 (56.86)
T ₃	5 per cent undi fruit extract (UFE)	50.00 (44.99)
T ₄	7.5 per cent undi fruit extract (UFE)	67.50 (55.38)
T ₅	5 per cent serni whole plant extract (SWPE)	50.00 (44.99)
T ₆	7.5 per cent serni whole plant extract (SWPE)	62.50 (52.32)
T ₇	5 per cent cassava tuber skin extract (CTSE)	32.50 (34.74)
T ₈	7.5 per cent cassava tuber skin extract (CTSE)	47.50 (43.56)
T ₉	5 per cent shikakai pods extracts (SPE)	35.00 (36.22)
T ₁₀	7.5 per cent shikakai pods extracts (SPE)	52.50 (46.44)
T ₁₁	5 per cent yam bean seed extract (YBSE)	32.50 (34.74)
T ₁₂	7.5 per cent yam bean seed extract (YBSE)	40.00 (39.23)
T ₁₃	5 per cent acacia pods extract (APE)	30.00 (33.13)
T ₁₄	7.5 per cent acacia pods extract (APE)	37.50 (37.75)
T ₁₅	5 per cent ritha fruits extract (RFE)	47.50 (43.56)
T ₁₆	7.5 per cent ritha fruits extract (RFE)	65.00 (53.77)
T ₁₇	0.05 per cent endosulfan 35 EC	42.50 (40.68)
T ₁₈	Control (water spray)	10.00 (18.43)
	S. E. ±	2.98
	C. D. (P=0.05)	8.87

*Figures in parenthesis are arcsin values.

literature.

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REFERENCES

- Agrawal, Indu Lekha (1993).** Ovicidal activity of four plant extracts on *Dysdercus koenigii* Fabr. (Heteroptera: Pyrrhocoridae). *Indian J. Ent.*, **55**(4) : 440-443.
- Ayyangar, G.S.G. and Rao, P.J. (1991).** Neem (*Azadirachta indica* A. Juss.) extract as larval repellent and ovipositional deterrent to *Spodoptera litura*. *Indian J. Ent.*, **51**(2) : 121-124.
- Benner (1993).** *Integrated pest management concept and Approaches*. Kalyani Publications, pp. 234-235.
- Dhaliwal, G.S. and Arora, R.(2004).** *Integrated pest Management concepts and Approaches*. Kalyani Publications, pp. 234-259.
- Dwivedi, S.C. and Sharma, Yamini (2003).** Studies on the efficacy of five botanical extracts on eggs of *Trogoderma granarium* Everts (Coleoptera : Dermastidae). *Pestology*, **27**(5) : 5-8.
- Gujar, G.T. and Mehrotra, K.N. (1983).** Juvenilizing effect of azadirachtin on a noctuid moth, *Spodoptera litura* Fabr. *Indian J. Expt. Biol.*, **21**: 292-293.
- Jeyakumar, P. and Gupta, G. P. (1999).** Effect of neem seed kernel extract (NSKE) on *Helicoverpa armigera* *Pestology*, **11**(1) : 32-36.
- Koul, O. (1985).** Azadirachtin interaction with development of *Spodoptera litura* Fab. *Indian J. Exp. Biol.*, **23**(3) : 160-163.
- Pandey, N.D., Singh, Lal, Singh, Y.P. and Tripathi, R.A. (1987).** Effect of certain plant extracts against *Lipaphis erysimi* Kalt. under laboratory conditions. *Indian J. Ent.*, **49**(2) : 238-242.
- Patel, K.B. and Patel, J.R. (1997).** Ovicidal effect of botanicals alone and in combination with synthetic insecticides on eggs of *Helicoverpa armigera*. *Indian J. Ent.*, **59**(3) : 326-328.
- Patharikar, S.V. (2005).** Evaluation of some plant extracts against *Spodoptera litura* (Fab.). An M.Sc. (Ag.) Thesis, Dr. B.S. Konkan Krishi Vidyapeeth, Dapoli, M.S. (India).
- Pradhan, S., Jotwani, M.G. and Rai, B.K. (1962).** The neem seed deterrents to locusts. *Indian Fmg.*, **12** : 7-11.
- Raja, N., Jeyakumar Venkatesan, A. and Ignacimuthu, S. (2005).** Efficacy of *Hyptis suaveolens* against lepidopteran pests. *Curr. Sci.*, **88**(2) : 220-222.
- Sarode, S.V., Deotale, R.O. and Thakare, H.S. (1995).** Evaluation of neem seed kernel extract (NSKE) at different concentrations for the management of *Helicoverpa armigera* (Hb.) on pigeonpea. *Indian J. Ent.*, **57**(4) : 385-388.
- Shukla, M.K. and De, D.K. (2000).** Use of plant materials in insect control. *Plant Prot. Bull.*, **52**(1-2) : 6-8.
