Research Paper :

Effect of plant extracts on larval mortality of *Helicoverpa armigera*

J.H. SABLE, S.A. LANDGE, R.V. KADU AND D.P. BARKADE

International Journal of Plant Protection, **Vol. 4 No. 2 (October, 2011) : 248-251**

See end of the article for authors' affiliations

Correspondence to :
R.V. KADU
Department of Agricultural Entomology, Dr. B.S. Konkan Krishi Vidyapeeth, Dapoli, RATNAGIRI (M.S.) INDIA

SUMMARY

The laboratory studies were conducted to determine efficacy of aqueous and methanol extracts of plant species against 3rd instar larvae of *H. armigera* at one, three and five days after treatment which revealed that all the plant extracts under test were found significantly effective in causing larval mortality except aqueous extract of 7.5 per cent ritha fruit (RFE) which was comparable with control. Considering the cumulative effect on larval mortality after five days of treatments in methanol extract, the treatment with 7.5 per cent undi fruit extract registered 73.33 per cent larval mortality which was maximum amongst the all other treatments. It was followed by the treatments with 5 per cent undi fruit extract (70.59 %), 7.5 per cent neem fruit extract (70.00%) and 7.5 per cent serni whole plant extract (57.14%) in order of efficacy. Whereas, methanol pod extract of acacia and fruit extract of ritha was found least effective which registered only 18.75 and 20.69 per cent larval mortality, respectively.

Sable, J.H., Landge, S.A., Kadu, R.V. and Barkade, D.P. (2011). Effect of plant extracts on larval mortality of *Helicoverpa armigera*. *Internat. J. Plant Protec.,* **4**(2): 248-251.

Key words : Plant extract, *H. armigera*, Larval mortality

Received : *January, 2011*
Revised : *May, 2011*
Accepted : *July, 2011*

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 have 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).

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 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 riperia*), Cassava (*Manihot esculenta*), Shikakai (*Acacia concinna*), Yam bean (*Pachyrrizus erosus*), Acacia (*Acacia mangium*), Ritha (*Sapindus trifoliatus*) and Neem (*Azadirachta indica*) 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 larval mortality:

The uniform size fresh leaves of castor were collected from the field, cleaned with soft cloth and thoroughly sprayed with hand atomizer at desired concentration as per treatment details. The treated leaves were dried for 10 minutes under fan and then placed into Petriplates (9 cm diameter) having blotting paper at the bottom. A uniform size 3rd instar

larva of *H. armigera* was released on treated leaves in each Petriplate and allowed to feed for 24 hrs. For subsequent feeding, the untreated fresh leaves were provided daily till five days. Such 20 Petriplates were maintained for each treatment and replicated twice. The observations on larval mortality were recorded 1, 3 and 5 days after treatment.

Details of plant species selected for evaluation of Ovicidal activity

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

RESULTS AND DISCUSSION

The laboratory studies conducted to determine the efficacy of aqueous and methanol extracts of plant species against 3rd instar larvae of *H. armigera* at one, three and five days after treatments revealed that all the plant extracts under test were found significantly effective in causing larval mortality except aqueous extract of 7.5 per cent ritha fruit (RFE) which was comparable with control. The larval mortality was also found to be increased with increase in the concentration of aqueous and methanol extracts tested. The mean per cent larval mortality in the aqueous extracts of plants recorded at one, three and five days after treatment was in the range of 5.00 to 22.50, 10.53 to 40.62 and 11.76 to 57.89, respectively(Table 1) The efficacy of aqueous extracts of plant species on larval mortality recorded at one day after treatment indicated that the 10.00 per cent cassava tuber skin extract (CTSE) was found most effective with 22.50 per cent larval mortality as compared with other plant species. However, it was statistically at par with 10.00 per cent undi fruit extract (UFE), 7.5 per cent undi fruit extract (UFE), 7.5 per cent cassava tuber skin extract (CTSE) and 10 per cent serni whole plant extract (SWPE). At three days after treatments, 10 per cent undi fruit extract (UFE) was found most effective in causing larval mortality as compared with other plant species. However, it was statistically at par with 7.5 per cent undi fruit extract (UFE). Similarly, at five days after treatment also, 10 per cent undi fruit extract (UFE) proved its superiority over other treatments and was found most effective in causing larval mortality as compared with other plant species. However, it was statistically at part with 10 per cent neem fruit extract (NFE), 10 per cent serni whole plant extract (SWPE) and 7.5 per cent undi fruit extract (UFE). Behera and Satapathy (1996) reported that the aqueous extracts of undi (*Calophyllum inophyllum* L.) and neem (*Azadirachta indica* A. Juss.) were found effective causing 50.00 and 100.00 per cent larval mortality in the larvae of *S. litura,* respectively (Table 1). Sarode *et al.* (1995) reported that two applications of 5 per cent NSKE caused maximum larval reduction of 63.39 and 53.48 per cent at 7 and 16 days after treatment, respectively in *H. armigera*. Nemade (2000) obtained 33.33 per cent larval mortaliy in *S. litura* treated with cold extracts of *A. indica.* Munguskar (2002) reported that 5.0 per cent seed extract of neem registered 40.0 per cent larval mortality in *Earias vittella.* Patharikar (2005) reported that aqueous extracts of neem, serni and undi were found effective causing 53.33, 60.00 and 50.00 per cent larval mortality, respectively in the larvae of *S. litura.* The present findings are more or less in agreement with these findings.

Considering the cumulative effect on larval mortality after five days of treatments in methanol extract, the treatment with 7.5 per cent undi fruit extract registered 73.33 per cent larval mortality which was maximum amongst the all other treatments. It was followed by the treatments with 5 per cent undi fruit extract (70.59 %), 7.5 per cent neem fruit extract (70.00%) and 7.5 per cent serni whole plant extract (57.14%) in order of efficacy. Whereas, methanol pod extract of acacia and fruit extract of ritha was found least effective which registered only 18.75 and 20.69 per cent larval mortality, respectively (Table 2). The results obtained during present investigations in respect of neem are in agreement with Nemade (2000) who reported that the methanolic extract of *A. indica* caused 63.33 per cent larval mortality of *S. litura* after 72 hours treatment. Munguskar (2002) claimed that 5.0 per cent neem seed methanolic extract killed 66.66 per cent larvae of *Earias vittella* three days after treatment. Jaglan (1997) reported insecticidal effect of methanol and chloroform + methanol (9:1) extracts of neem seeds and green leaves against *H. armigera.* During the present investigation, the whole plant extract of serni (*Homonoia riparia*) and undi fruit extract (*Calophyllum inophyllum*) were found promising which

Table 1: Effect of aqueous extracts of selected plant species against 3rd instar larvae of *H. armigera*

Treatment No.	Treatments	Mean per cent larval mortality		
		1 DAT	3 DAT	5 DAT
T_1	7.5 per cent neem fruit extract (NFE)	10 (18.43)*	19.44 (26.11)	37.93 (38.07)
T_2	10 per cent neem fruit extract (NFE)	12.50 (20.61)	25.71 (30.41)	53.85 (47.21)
T_3	7.5 per cent undi fruit extract (UFE)	17.5 (24.67)	33.33 (35.22)	45.45 (42.39)
T_4	10 per cent undi fruit extract (UFE)	20 (26.56)	40.62 (39.58)	57.89 (49.30)
T_5	7.5 per cent serni whole plant extract (SWPE)	10 (18.43)	16.66 (24.09)	36.66 (37.14)
T_6	10 per cent serni whole plant extract (SWPE)	15 (22.79)	23.53 (29.02)	50.00 (45.00)
T_7	7.5 per cent cassava tuber skin extract (CTSE)	17.5 (24.67)	21.21 (27.34)	23.08 (28.71)
T_8	10 per cent cassava tuber skin extract (CTSE)	22.5 (28.28)	29.03 (32.54)	31.82 (34.28)
T_9	7.5 per cent shikakai pods extracts (SPE)	5 (12.92)	18.42 (25.36)	19.35 (26.11)
T_{10}	10 per cent shikakai pods extracts (SPE)	10 (18.43)	19.44 (26.10)	20.69 (27.06)
T_{11}	7.5 per cent yam bean seed extract (YBSE)	7.5 (15.67)	13.51 (21.44)	18.75 (25.66)
T_{12}	10 per cent yam bean seed extract (YBSE)	12.5 (20.61)	22.85 (28.57)	25.92 (30.51)
T_{13}	7.5 per cent acacia pods extract (APE)	10 (17.85)	13.88 (21.73)	22.58 (28.37)
T_{14}	10 per cent acacia pods extract (APE)	12.5 (20.61)	20 (26.48)	32.14 (34.50)
T_{15}	7.5 per cent ritha fruits extract (RFE)	5 (12.92)	10.53 (18.93)	11.76 (19.44)
T_{16}	10 per cent ritha fruits extract (RFE)	5 (12.92)	13.16 (21.17)	15.15 (22.77)
T_{17}	0.05 per cent endosulfan 35 EC	42.5 (40.68)	52.17 (46.30)	63.63 (52.75)
T_{18}	Control (water spray)	0 (0.00)	5 (12.92)	5.26 (12.92)
	S. E.±	2.54	3.01	4.89
	C. D. (P=0.05)	5.35	6.32	10.28

*Figures in parenthesis are arcsin values.

Table 2 : Effect of methanol extracts of selected plant species against 3rd instar larvae of *H. armigera.*

Treatment No.	Treatments	Mean per cent larval mortality		
		1 DAT	3 DAT	5 DAT
T_1	5 per cent neem fruit extract (NFE)	15 (22.79)*	23.53 (32.73)	54.17 (47.40)
T_2	7.5 per cent neem fruit extract (NFE)	20 (26.56)	37.50 (37.70)	70 (67.64)
T_3	5 per cent undi fruit extract (UFE)	22.5 (28.28)	45.16 (42.25)	70.59 (57.36)
T_4	7.5 per cent undi fruit extract (UFE)	25 (29.88)	50 (45.00)	73.33 (60.02)
T_5	5 per cent serni whole plant extract (SWPE)	17.5 (24.67)	39.39 (38.84)	50 (45.00)
T_6	7.5 per cent serni whole plant extract (SWPE)	22.50 (28.28)	45.16 (42.12)	57.14 (49.85)
T_7	5 per cent cassava tuber skin extract (CTSE)	32.50 (34.74)	37.04 (37.29)	41.18 (39.78)
T_8	7.5 per cent cassava tuber skin extract (CTSE)	35.00 (36.27)	38.46 (38.24)	43.75 (42.18)
T_9	5 per cent shikakai pods extracts (SPE)	15.00 (22.79)	23.53 (32.73)	33.33 (35.38)
T_{10}	7.5 per cent shikakai pods extracts (SPE)	22.5 (28.28)	25.80 (30.55)	39.13 (38.64)
T_{11}	5 per cent yam bean seed extract (YBSE)	27.50 (31.60)	41.38 (40.06)	47.05 (42.97)
T_{12}	7.5 per cent yam bean seed extract (YBSE)	30 (33.21)	42.85 (40.89)	50 (45.00)
T_{13}	5 per cent acacia pods extract (APE)	7.5 (15.67)	13.51 (21.44)	18.75 (25.66)
T_{14}	7.5 per cent acacia pods extract (APE)	15 (22.79)	23.53 (28.84)	26.92 (31.15)
T_{15}	5 per cent ritha fruits extract (RFE)	12.5 (20.61)	17.14 (24.46)	20.69 (27.06)
T_{16}	7.5 per cent ritha fruits extract (RFE)	15.00 (22.79)	20.59 (26.93)	25.92 (30.63)
T_{17}	0.05 per cent endosulfan 35 EC	42.5 (40.68)	52.17 (46.30)	63.63 (52.75)
T_{18}	Control (water spray)	0.00 (0.00)	5.00 (12.92)	5.26 (12.92)
	S. E.±	2.18	4.13	5.56
	C. D. (P=0.05)	4.58	8.69	11.69

*Figures in parenthesis are arcsin values.

were also reported effective against 3rd instar larve of *S. litura,* causing 76.66 and 66.66 per cent larvae mortality as reported by Patharikar (2005) and are supporting the present findings.

Authors' affiliations:
J.H. SABLE, S.A. LANDGE AND D.P. BARKADE,
Department of Agricultural Entomology, Dr. B.S. Konkan Krishi Vidyapeeth, Dapoli, RATNAGIRI (M.S.) INDIA

REFERENCES

Behera, U.K. and Satapathy, C.R. (1996). Screening indigenous plants for their insecticidal properties against *Spodoptera litura* Fb. *Insect Environment,* **2**(2) : 43-44.

Benner (1993). *Integrated pest management concept and approaches*. Kalyani Publication, pp. 234-235.

Dhaliwal, G.S. and Arora, R. (2004). *Integrated pest management concepts and approaches*. Kalyani Publications, pp. 234-259.

Jaglan, M.S., Khokhar, K.S., Malik, M.S. and Singh, Ram (1997). Evaluation of neem (*Azadirachta indica* A. Juss) extracts against American bollworm, *Helicoverpa armigera* (Hubner). *J. Agric. & Food Chem.,* **45**(8) : 3262 – 3268.

Munguskar, S.B. (2002). Laboratory evaluation of certain plant extracts against *Earias vittella* Fabricius. M.Sc. (Ag). Thesis, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, AKOLA, M.S. (India).

Nemade, P.W. (2000). Evaluation of promising herbs against *Spodoptera litura* Fabricius. M.Sc. (Ag). Thesis, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, AKOLA, M.S. (India).

Patharikar, S.V. (2005). Evaluation of some plant extracts against *Spodoptera litura* (Fab.). M.Sc. (Ag). Thesis, Dr. B.S. Konkan Krishi Vidyapeeth, DAPOLI, M.S. (India).

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.

****