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Antifeedant Efficacy of Some Medicinal Plant Extracts Against *Leucinodes Orbonalis*

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Abstract
The antifeedant activities to determine the efficacies of hexane, ethyl acetate, chloroform and methanol extracts Pongamia glabra, Annona squamosa, Parthenium hysterophorus, Melia azedarach, Lantana camera, Murraya koenigii, Ipomia cornea, Emblica officinals against brinjal fruit borer, Leucinodes orbonalis were carried out. The maximum larvae mortality was found in the ethyl acetate followed by methanol, chloroform and hexane extract of A. squamosa with LD_{50} values of 1.51, 2.44, 2.68, and 4.86 ppm against L. orbonalis. Our result suggested that the ethyl acetate of A. squmosa leaf extract was an excellent antifeedant potential in controlling pest management programme.

Keywords: Antifeedant activity, Pest management, Leucinodes orbonalis

Introduction

In modern years, repeatedly use of synthetic pesticides in agricultural fields to protect crop from the hazardous pest has resulted resistance in pests, toxic effect on non-target organism loss of soil richness due to pesticide residue on micro-flora, disruption in ecosystem. Harmful pesticides residues enter the food chain and consumers suffer from chemical poisoning (Damalas and Eleftherohorinos, 2011). Therefore, there is solution to search an alternative means which can minimize or replace the uses of synthetic pesticides. In this related botanical pesticides are potential alternative as they possess important properties, such as toxicity to pest only, repellency, antifeedant and inhibitory to growth of insects (Prakash *et al*., 1989). In fact botanical pesticides are is uses in Indian agriculture for over a century to minimize losses caused by pests and disease (Parmer and Devkumar, 1993; Prakash *et al.*, 1990).

Vegetables are a significant source of minerals, vitamins and plant proteins in human being diets. Their agriculture is one of the more important dynamic and major branches. In rural areas, small farmers prefer to cultivate vegetable crops for their livelihood, because they fetch a good booty within a short period of time. Now big farmers are also switching over to vegetable cultivation in their farm houses, as it is becoming an important source of income. Brinjal, Solanum melongena Linnaeus is one of the most significant vegetables in South and South-East Asia (Thapa, 2010) having hot-wet climate (Hanson et al., 2006). India produces about 13.44 Mmt of brinjal from an area of 0.722M ha with an average productivity of 18.6 mt/ha, it's a great nutritional values and it contains large amount of carbohydrate and lower amount of fat (Bajaj et al., 1979). Brinjal infested by many number of insect pest, among these pests the brinjal fruit borer Leucinodes orbonalis Guenee is the key pest of eggplant (Latif et al., 2010; Chakraborti and Sarkar, 2011) an inflicting sizeable damage in almost al1 the eggplant growingareas (Dutta et al., 2011) initial damage by L. orbonalis is confined to petioles, midribs of large leaves, and auxiliary shoots (Banerjee and Basu, 1955) and the damage restricts plant growth (Frempong, 1979). Upon flowering, the larva attack developing fruits (Atwal, 1976).Which may cause 100% damage to brinjal (Rahman, 2007).

Phyto pesticides can reduce the use of chemical insecticides by avoiding unnecessary application of synthetic chemicals. Though more than 3000 plants have been reported to have insecticidal properties and to contain biologically active principles with multiracial effects against insect species, only a few plants have been used in pest management programs

(Arnason *et al*., 1987). There exist some reports about some other plants having such insecticidal properties (Pavunraj *et al.*, 2012). However, deriving pure new biopesticidal substances from plants remains a complex task because it needs chemical screening complimented with biological effects. Developing new natural insecticides such as antifeedants, ovipositional deterrents, ovicidals and insecticidal from some unexplored plant species would definitely be an effective alternative to synthetic chemicals. It has been found that there are many plant species availablethroughout the tropics so far having some kind of pesticidal properties. According to Kiritani (1979), eco-friendly, less costly measures, such as, cropping system approach, botanicals (Prakash *et al.*, 2008) are more advantageous over insecticides, as they fit well in IPM. The safer plant products are useful in developing sound pest management strategies (Gupta and Singh, 2002). In the present study impact of ethnobotanical extracts against brinjal shoot borer *L.* orbonalis.

Material and methods

Collection of plant materials and extraction

Fresh leaves of the selected plants (P. glabra, A. squamosa, P. hysterophorus, M. azedarach, L. camera, M. koenigii, I. cornea and E. officinals) were collected from various parts of Tamil Nadu (Table 1) and washed with distilled water, shade dried, powdered using electric blender. The powdered material will be soaked in five folds of respective solvents. After 48 hours the extract filtered using No 1 Whatmann filter paper and the extract were evaporated with room temperature. The residue was collected, weighed and stored at 4◦C for subsequent bioassay on L. orbonalis.

Collection of L. orbonalis sampling

Matured larvae of brinjal fruit borer, L. orbonalis was collected from infested shoot and fruits of different brinjal growing districts throughout Tamil Nadu, (Table 1). The collected larvae of L. orbonalis brought to the laboratory in a live condition along with infested fruits for establishment of L. orbonalis culture.

Establishment of L. orbonalis culture

Matured larval instar of L. orbonalis was reared on their natural host inside cages in laboratory conditions (28±2ºC and 80±5 RH). The adult moth emerged from the cocoons and immediately transferred into separate oviposition cages. We are frequently provided with multivitamin drops and 10% honey solution for feeding and allowed to oviposit on their host. By this method was adopted and larvae were reared in the laboratory.

Antifeedant bioassay of crude extracts

Antifeedant activity of above mentioned plants crude extracts of evaluated using leaf disc no-choice method described by Pavunraj et al (2008). The antifeedant activity was assessed using brinjal fruit discs for L. orbonalis. Brinjal fruit discs (5mm thickness) was dipped in 0.1, 0.5, 1.0, 3.0 and 5.0%) concentration of crude extracts for about 10 minutes and were shade dried and fruits were weighed and provided for L. orbonalis larval consumption. A set containing 10 were placed separately in a Petri dish for each treatment and control for both the pest. Disc of brinjal was dipped in respective solvents was used as positive and negative control, without larvae were maintained to find out the weight loss in the disc due to desiccation at room temperature. After 24 hrs the discs were weighed and the difference between initial and final weights was calculated. Real consumption was calculated by Bentley et al (1984)

Statistical analysis

The data gathered were transformed into angular or square root values for statistical scrutiny, wherever necessary (Gomez and Gomez, 1984). The experiments were subjected to statistical scrutiny following the method of Panse and Sukhatme (1989), Gomez and Gomez (1984) and the means were compared with Least Significant Difference (L.S.D.).

Result and Discussion

The preliminary screening is a good mode of evaluation of the potential antifeedant activity of plants popularly used for bioassay. Antifeedant activity of different solvent crude extracts of eight plants. The larval percentage mortality showed in hexane, ethyl acetate, chloroform and methanol extracts of A. squamosa at 0.1 to 5 ppm (Fig. 1A). It was evident that all the extracts showed moderate to low antifeedant effects however, the 91 % larval mortality was found in ethyl acetate, methanol, chloroform and hexane extracts of A. squamosa (LD_{50}= 1.51, 2.44, 2.68 and 4.86 ppm) (Table 2). Gogoi et al (2003) has been reported that petroleum ether, chloroform and methanol extracts from the leaves of Pogostemon parviflorus, P. glabra and A. squamosa exhibited antifeedant activity tested with Helopeltis theivora at 0.5-4.0. In the present study, maximum mortality was found in ethyl acetate extract of A. squmosa.

The larval percentage mortality showed in hexane, ethyl acetate, chloroform and methanol extracts of M. azedarach at 0.1 to 5 ppm (Fig. 1B). It was evident that the entire extracts showed moderate to low larvicidal effects however, the 85 % larval mortality was found in ethyl acetate, methanol, chloroform and hexane extracts of M. azedarach (LD_{50}= 0.83, 1.06, 1.56 and 2.01 ppm) (Table 2). Yasodha and Natarajan (2007) reported 63% ovicidal action against L. orbonalis (brinjal root and shoot borer) when eggs were exposed to the extracts of kernels of Azadirachta indica and dried powder of Acorus calamus. Larval percentage mortality showed in hexane, ethyl acetate, chloroform and methanol extracts of L camera at 0.1 to 5 ppm (Fig. 1C). It was evident that all the extracts showed moderate to low larvicidal effects however, the 75 % larval mortality was found in ethyl acetate, methanol, chloroform and hexane extracts of L. camera (LD_{50}= 1.44, 1.86, 3.87 and 4.84 ppm) (Table 2).

Larval percentage mortality showed in hexane, ethyl acetate, chloroform and methanol extracts of P. glabra at 0.1 to 5 ppm (Fig. 1D). It was evident that all the extracts showed moderate to low larvicidal effects however, the 51 % larval mortality was found in ethyl acetate extracts of P. glabra (LD_{50}= 4.59 ppm) and methanol, hexane and chloroform extracts less than 50% was obtained (Table 2). Chloroform and methanol extracts from the leaves of P. glabra against Helopeltis theivora (Gogoi et al., 2003). The larval percentage mortality showed in hexane, ethyl acetate, chloroform and methanol extracts of E. officinals at 0.1 to 5 ppm (Fig. 1E). It was evident that all the extracts showed moderate to low larvicidal effects however, the 75 % larval mortality was found in ethyl acetate, methanol, chloroform and hexane extracts of E. officinals (LD_{50}= 1.51, 2.44, 2.68 and 4.86 ppm) (Table 2).

Larval percentage mortality showed in hexane, ethyl acetate, chloroform and methanol extracts of P. hysterophorus at 0.1 to 5 ppm (Fig. 1F). It was evident that all the extracts showed moderate to low larvicidal effects however, the 71 % larval mortality was found in ethyl acetate, methanol and chloroform extracts of P. hysterophorus (LD_{50}= 1.97, 4.67 and 4.71 ppm); hexane extracts less than 50% was obtained (Table 2). The larval percentage mortality showed in hexane, ethyl acetate, chloroform and methanol extracts of M. koenigii at 0.1 to 5 ppm (Fig. 1G). It was evident that all the extracts showed moderate to low larvicidal effects however, the 67 % larval mortality was found in ethyl acetate, methanol, chloroform and hexane extracts of M. koenigii (LD_{50}= 2.25, 2.99, 3.47 and 4.59 ppm) (Table 2).

The larval percentage mortality showed in hexane, ethyl acetate, chloroform and methanol extracts of I. cornea at 0.1 to 5 ppm (Fig.1H). It was evident that all the extracts showed moderate to low larvicidal effects however, the 60 % larval mortality was found in ethyl acetate and methanol extracts of I. cornea (LD_{50}= 2.73 and 3.94 ppm); hexane and chloroform extracts less than 50% was obtained (Table 2).

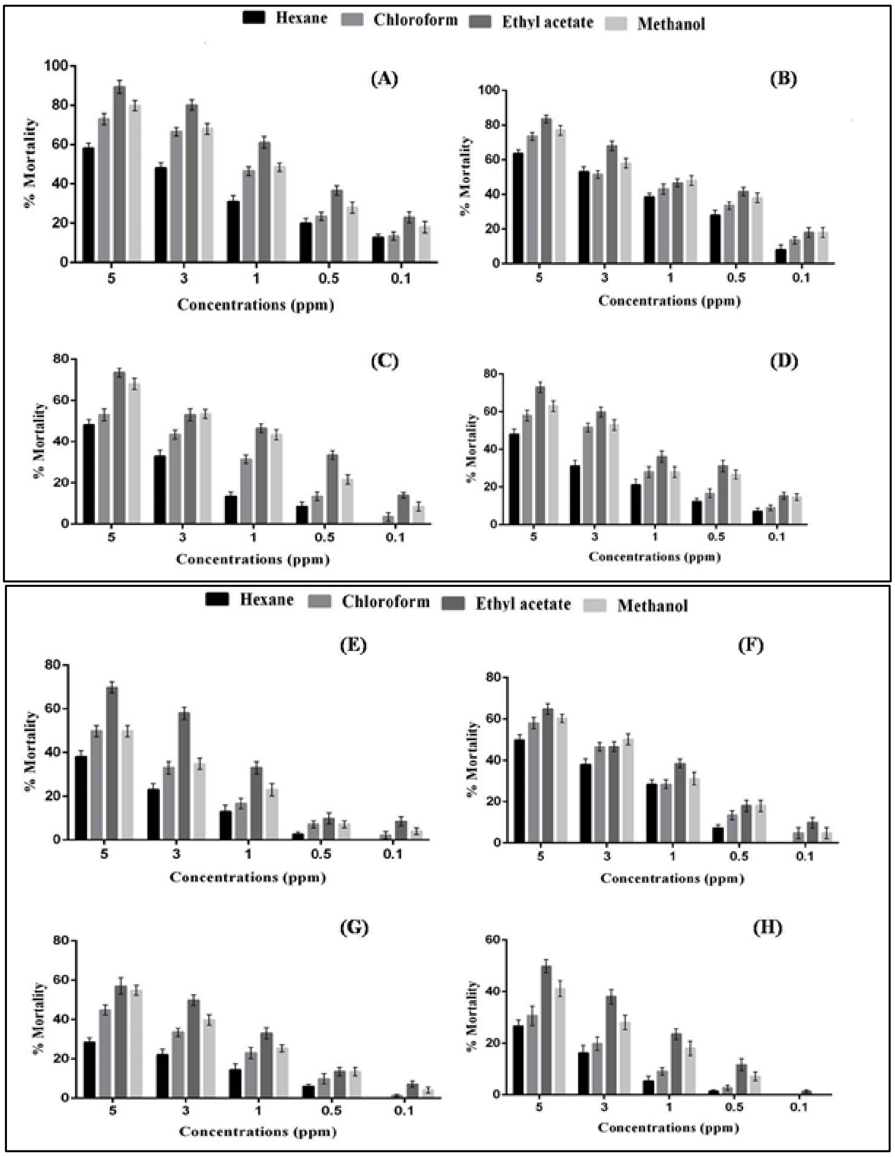

Fig. 1 Antifeedant activity of ethnobotanical extracts (A) A. squamosa, (B) M. azedarach, (C) L. camera, (D) P. glabra, (E) E. officinals, (F) P. hysterophorus,(G) M. koenigii and (H) I. cornea against brinjal fruit borer L. orbonalis.

Table 1: The plant collection and matured brinjal fruit borer, *L.* orbonalis in different regions of Tamil Nadu, India

S. No	District	Abbreviation
1.	Madurai	MDU
2.	Dindugal	DGL
3.	Theni	TNI
4.	Namakkal	NKL
5.	Erode	ERO
6.	Karur	KRR
7.	Salem	SLM
8.	Virudhunagar	VHN

9.	Tirunelveli	TVL
10.	Dharmapuri	DMI
11.	Kanyakumari	KKR
12.	Villupuram	VPM
13.	Trichy	TRY
14.	Pudukottai	PKI
15.	Tanjore	TNJ
16.	Ariyalur	ALR
17.	Perambalur	PMR
18	Kumbakonum	KBM
19	Thenkasi	TKI
20	Manaparai	MAI
21	Kulithalai	KHI
22	Ariyamangalam	AGM
23	Thittakudi	TTI
24	ulunthurpet	UPT
25	Virudhachalam	VDM
26	Kanchipuram	KPM
27	Tirupathur	TPR
28	Tiruvannamalai	TMI
29	Tiruthani	TTI
30	Krishnagiri	KGI
31	Sathyamangalam	SGM
32	Gopichettipalayam	GPM
33	Avinasi	ASI
34	Mettupalayam	MPM

Table 2: Antifeedant activity of different solvent crude extracts against *L. orbonalis*

Plants	Solvents	LD_{50} ppm	LCL ppm	UCL ppm
A. squamosa	Hexane	4.86	3.72	6.36
	Chloroform	2.68	1.66	4.32
	Ethyl acetate	1.51	1.12	2.03
	Methanol	2.44	1.80	3.31
M. azedarach	Hexane	2.01	1.37	2.95
	Chloroform	1.56	1.15	2.11
	Ethyl acetate	0.83	0.62	1.11
	Methanol	1.06	0.76	1.48
L. camera	Hexane	4.84	3.59	6.54
	Chloroform	3.87	2.70	5.55
	Ethyl acetate	1.44	1.06	1.95
	Methanol	1.86	1.38	2.50
E. officinals	Hexane	4.86	3.72	6.36
	Chloroform	2.68	1.66	4.32
	Ethyl acetate	1.51	1.12	2.03
	Methanol	2.44	1.80	3.31
P. hysterophorus	Hexane	-	-	-
	Chloroform	4.71	3.60	6.15
	Ethyl acetate	1.97	1.48	2.62
	Methanol	4.67	3.47	6.29
M. koenigii	Hexane	4.59	3.20	6.59
	Chloroform	3.47	2.03	5.94
	Ethyl acetate	2.25	1.69	3.00
	Methanol	2.99	2.03	4.40
I. cornea	Hexane	-	-	-
	Chloroform	-	-	-
	Ethyl acetate	2.73	1.72	4.35
	Methanol	3.94	3.10	5.00
P. glabra	Hexane	-	-	-
	Chloroform	-	-	-
	Ethyl acetate	4.59	3.20	6.59
	Methanol	-	-	-

Control—nil mortality, LD_{50} lethal dosage that kills 50% of the exposed larvae,LCL lower confidence limit, UCL upper confidence limit, (-) < 50%

Conclusions

The environmentally benign and renewable source of ethyl acetate of A. squmosa extracts were highest mortality and control for pest of L. orbonalis. The results reported in this study open the possibility for further investigations of the efficacy of antifeedant properties of natural product extracts. The isolation and purification of crude extract of leaf ethyl acetate A. squmosa are in progress.

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