International Journal of Science, Environment and Technology, Vol. 5, No 2, 2016, 395 – 400

ISSN 2278-3687 (O)
2277-663X (P)

EVALUATION OF SOME PLANT DERIVATIVES FOR MANAGEMENT OF CABBAGE *BUTTERFLY (PIERIS BRASSICAE)*

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Abstract: Efficacy of different solvent extract of *Lantana camara (L.), Eupatorium adenophorum (Spreng), Artemisia brevifolia (Wall), Melia azedarach (L.) vitex nigundo,* Ageratum conyzoides, *Polygonum* sp. and *Rumex nepalensis,* were studied at 1.25, 2.5 and 5.0% concentrations against cabbage butterfly. Amongst different plant species evaluated, *Eupatorium adenophorum* and *Lantana camara* without differing with each other resulted significantly higher toxicity to the caterpillars of *P. brassicae* followed by *Eupatorium adenophorum* and *Melia azedarach.* Amongst various solvents used for preparing crude extracts, methanol found to be significantly more effective in extracting the toxic constituent than other solvents (chloroform and ethyle acetate). Plant extracts applied at 5.0% concentration resulted in significantly higher toxicity to the third instar caterpillar of *P. brassicae* as compared to 2.5 and 1.25% concentration.
Keywords: Plant extracts, Antifeedant, Mortality.

INTRODUCTION

Himachal Pradesh has emerged as the pioneer vegetable growing state in the country. Amongst various vegetables grown in the state, cabbage is being cultivated on a large area as an off-season as well as main season crop. Himachal Pradesh is exporting quality seed of cabbage to African countries besides, meeting the country's requirement. About two dozen species of insect pests were reported to be associated with cabbage in Himachal Pradesh (Anonymous, 1991). The cabbage butterfly was reported to be one of the serious pests in different regions of the country (Rizvi *et al*., 2009). Usually the management of this pest is insecticide oriented, but the problems associated with synthetic chemicals viz. development of pest resistance (Ali and Rizvi 2007) and objectionable pesticide residues (Hasan, 2008), higher cost etc. has necessitated the development of newer control methods (Jainulabden and Prasad 2004). Plant products have proved to be useful in formulating sound pest management strategies (Kashyap *et al*., 1993). Several plant parts and their products are known to be potent source of insecticides (Parmar, 1993). In the present study different plant extracts were evaluated for their antifeedant activity against cabbage butterfly.

*Received Feb 11, 2016 * Published April 2, 2016 * www.ijset.net*

MATERIALS AND METHODS

Collection of plant material

The aerial parts of eight plant species viz. *Lantana camara (L.), Eupatorium adenophorum (Spreng), Artemisia brevifolia (Wall), Melia azedarach (L), Vitex nigundo, Ageratum conyzoides, Polygonum* sp. and *Rumex nepalensis (L.)* were collected from different agro climatic zones of Himachal Pradesh. The collected samples were air dried in shade for a week and then dried in oven at 40^0 C for 24 hours.

Extraction of plant material

The plant material was extracted in methanol by simple distillation process. The extract was further fractionated with column packed with silica gel G (60 – 120 mesh) and methanol fraction was collected for testing against the test insect.

Rearing of test insect

Mass culture of test insect cabbage butterfly (*Pieris brassicae*) was maintained under laboratory conditions as per techniques described by Verma and Makhmoor (1988).

Antifeedant Activity

Antifeedant properties of all the plant extracts were studied against third instar larvae of *P. brassicae*. Fresh cabbage leaves were cut in small circular discs, washed with water and air dried. These discs were dipped in desired concentrations of the extracts for two minutes and were allowed to dry. The treated discs were placed in Petri dish having moist filter paper at the bottom. Instar larvae (pre starved for 6 hours) were released in each Petri dish (n=10). All the treatments were replicated thrice and one set was also maintained devoid of larvae in order to record the reduction in area due to the shrinkage and loss of moisture. An untreated check was also maintained by releasing larvae on solvent treated leaf discs. After 72 hours, the larvae were removed from Petri dishes and leaf area consumed was measured with the help of systronic leaf area meter.

RESULTS AND DISCUSSION

An examination of data (Table 1) indicated that exposure of third instar caterpillars of *P. brassicae* to solvent extracts of different plant species exhibited moderate to high toxicity. The differences amongst different plant species, solvents as well as their concentrations were significant.

Amongst different plant species evaluated, *Eupatorium adenophorum* and *Lantana camara* without differing with each other resulted significantly higher toxicity to the

caterpillars of *P. brassicae* followed by *Eupatorium adenophorum* and *Melia azedarach. Vitex nigundo* extract proved least effective.

Amongst various solvents used for preparing crude extracts, methanol found to be significantly more effective in extracting the toxic constituent than other solvents (chloroform and ethyle acetate).

Plant extracts applied at 5.0% concentration resulted in significantly higher toxicity to the third instar caterpillar of *P. brassicae* as compared to 2.5 and 1.25% concentration. The later two concentrations also differed significantly.

Irrespective of the concentration of the plant extracts evaluated, methanol extract of *Eupatorium adenophorum* resulted in highest kill (71.9%) which was at par to mortality recorded in chloroform and ethyl acetate extracts of *Lantana camara* (Table 2). Ethyl acetate extract of *Polygonum* sp. proved least effective in bringing about mortality. Similar results were also obtained in methanol and ethyl acetate extact of *lantana Camara* (Pandey et. al.,1993).

A perusal of data pertaining to the effect of plant extracts and their corresponding concentrations revealed that *Eupatorium adenophorum* extract at 5.0% concentration resulted in highest mortality (80.7%) being at par to *Lantana camara* (Table 3). *Polygonum* sp. was least effective and resulted in 40.9% kill only at the highest concentration evaluated. Similar results were also reported by Sood et al. (1994).

ACKNOWLEDGEMENT

The author is grateful to Department of Science and Technology, New Delhi for financial support.

Table 1: Effect of solvent extracts of some plants on mortality of *P. brassicae*

Plant /Concentration	Per cent mortality in solvents		
	Methanol	Ethyl acetate	Chloroform
Melia azedarach			
5.0	70.5 (57.1)	62.8 (52.4)	60.7 (51.2)
2.5	55.6 (48.2)	46.3 (42.9)	44.2 (41.7)
1.25	48.7 (44.3)	22.9 (28.6)	22.0 (28.0)
Ageratum conyzoides			
5.0	74.8 (59.9)	66.6 (54.7)	60.5 (51.1)
2.5	60.3 (50.9)	54.2 (47.4)	51.4 (45.8)
1.25	33.7 (35.5)	24.9 (29.9)	22.7 (28.4)
Vitex nigundo			
5.0	19.2 (25.9)	12.8 (21.0)	14.2 (22.1)
2.5	15.3 (23.0)	7.6 (16.0)	10.4 (18.8)

1.25	10.1 (18.5)	3.4 (10.6)	5.9 (14.1)
Rumex nepalensis			
5.0	29.4 (32.8)	20.6 (27.0)	18.3 (25.3)
2.5	12.6 (20.8)	10.3 (18.7)	8.7 (17.1)
1.25	3.5 (10.8)	3.2 (10.3)	1.3 (6.5)
Artemesia brevifolia			
5.0	60.7 (51.2)	48.6 (44.2)	40.3 (39.4)
2.5	47.6 (43.6)	30.3 (33.4)	18.7 (25.6)
1.25	38.3 (38.2)	20.6 (27.0)	6.9 (15.2)
Eupatorium adenophorum			
5.0	80.3 (63.6)	70.0 (56.8)	64.3 (53.3)
2.5	56.7 (48.8)	50.6 (45.3)	44.4 (41.8)
1.25	36.9 (37.4)	26.8 (31.2)	19.3 (26.1)
Lantana camara			
5.0	82.4 (65.2)	75.4 (60.3)	70.0 (56.8)
2.5	60.8 (51.2)	55.6 (48.2)	50.3 (45.2)
1.25	39.2 (38.8)	28.3 (32.1)	25.8 (30.5)
Polygonum sp.			
5.0	25.6 (30.4)	16.3 (23.8)	20.6 (27.0)
2.5	15.3 (23.0)	10.2 (18.6)	13.4 (21.5)
1.25	8.2 (16.6)	2.6 (9.3)	5.3 (13.3)

Figures in parenthesis are the angular transformed values

CD (P=0.05) Plant = 4.2
Solvent = 3.0
Concentration = 3.0
Plant × Concentration = 8.4
Solvent × Concentration = NS
Plant × Solvent = 8.5
Plant × Solvent × Concentration = 12.7

Table 2: Interaction effect of plants vs solvents

Plant/Solvent	Corrected mortality (%) in solvents			
	Methanol	Ethyle acetate	Chloroform	Mean
M. azedarach	83.4(66.0)	56.0(48.4)	69.0(56.2)	69.5(56.9)
A. conyzoides	84.3(66.7)	62.0(51.9)	74.3(59.5)	73.5(59.4)
V. nigundo	42.3(40.6)	42.1(40.4)	42.8(40.9)	42.4(40.6)
R. nepalensis	81.5(64.5)	75.6(60.4)	80.0(63.4)	79.0(62.8)
A. brevifolia	77.5(61.7)	71.5(57.7)	76.2(60.8)	75.1(60.1)
E. adenophorum	93.9(75.7)	91.6(73.1)	91.0(72.5)	92.2(73.8)
L. camara	90.4(71.9)	87.0(68.9)	87.8(69.6)	88.4(70.1)
Polygonum sp.	41.5(40.1)	30.3(33.4)	37.1(37.5)	36.3(37.0)
Mean	64.5(60.9)	69.8(54.3)	74.3(57.5)	-

Figures in parenthesis are the angular transformed values

Table 3: Interaction effect of plants vs concentrations

Plant	Corrected mortality (%) in solvents			
	5.0	2.5	1.25	Mean
M. azedarach	81.2(64.3)	69.8(56.7)	57.3(49.2)	69.5(56.9)
A. conyzoides	84.0(66.4)	73.8(59.2)	62.9(52.5)	73.6(59.4)
V. nigundo	48.2(44.0)	44.4(41.8)	34.6(36.0)	42.4(40.6)
R. nepalensis	84.9(67.1)	80.3(63.6)	71.9(58.0)	79.0(62.8)
A. brevifolia	83.3(65.9)	75.1(60.1)	66.8(54.8)	75.1(60.1)
E. adenophorum	97.4(80.7)	92.8(74.4)	87.4(69.2)	92.2(73.8)
L. camara	93.0(74.7)	90.2(71.8)	82.1(65.0)	88.4(70.1)
Polygonum sp.	42.9(40.9)	36.6(37.2)	29.3(32.8)	36.3(37.0)
Mean	76.9(63.0)	70.3(58.1)	61.4(52.2)	-

Figures in parenthesis are the angular transformed values

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