International Journal of Science, Environment and Technology, Vol. 9, No 6, 2020, 982 – 987

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

EVALUATION OF PESTICIDAL POTENTIAL OF SOME INDIGENOUS PLANT EXTRACTS AGAINST CABBAGE APHID (*Brevicorne brassicae*)

Suman Sharma
Department of Chemistry and BioChemistry,
College of Basic Sciences, CSKHPKV, Palampur- 176062(H.P.)

Abstract: Cabbage is a versatile vegetable crop grown throughout the world. Cabbage aphid is a sap sucking pest that damages the crop. The aim of the present study was to evaluate the efficacy of different solvent extract of *Lantana camara* (L.), *Eupatorium adenophorum* (Spreng), *Artemisia brevifolia* (Wall), *Melia azedarach* (L.), *Polygonum sp*., *Vitex nigundo* (L.), *Rumex nepalensis*, and *Ageratum conyzoides* at 1.25, 2.5 and 5.0 % concentrations against cabbage aphid. Amongst various plant species evaluated, *Melia azadarach* and *Ageratum conyzoides* resulted in significantly higher toxicity to the fourth instar nymphs, which were followed by *Vitex nigundo* and *Rumex nepalensis*. Methanolic extract resulted in significantly higher mortality than chloroform and ethyl acetate extract. Plant extract when applied at 5.0 % concentration resulted in significantly higher toxicity to the nymphs of cabbage aphid as compared to 2.5 and 1.25 % concentration. Interaction between plant material and solvent used for extraction of the active constituent had significant affect on the mortality of cabbage aphid. Methanolic extract of *Melia azedarach* proved significantly superior to others and was followed by methanolic extract of *Ageratum conyzoides*. Further, it was found that methanolic extract of all the plant material evaluated resulted in significantly higher mortality to the nymphs of cabbage aphid than chloroform and ethyl acetate extracts.

Keywords: Efficacy, Toxicity, Cabbage aphid, Nymphs, Extract and Mortality.

INTRODUCTION

Cabbage is a vital vegetable crop grown thorough out the world even by small scale farmers for their financial support. Amongst various vegetables grown, cabbage is being cultivated as an off-season as well as main season crop (Emana *et al*, 2015). Himachal Pradesh is exporting quality seed of cabbage to African countries along with meeting the country's requirements. The cabbage aphid is reported to be one of the serious pests of cabbage, cauliflower and broccoli in different regions of the country (Rizvi *et al*., 2009). Feeding injury from cabbage aphid results in wrinkled, downward-curling leaves, yellow leaves, reduced growth and contamination with aphid honeydew.

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

*Received Dec 30, 2020 * Published Jan 10, 2021 * www.ijset.net*

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 (Sarwar, 2015). Several plants and their parts are known to be potent source of insecticides (Baidoo and Adam,2012). In the present study different plant extracts were evaluated for their efficacy against cabbage aphid.

MATERIAL 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), Rumex nepalensis (L.), Polygonum sp., Vitex nigundo (L.), and Ageratum conyzoides* 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) using methanol, chloroform and ethyl acetate solvent.

Laboratory rearing of test insect and observations

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

Stock culture was maintained on cabbage grown in plastic pots. Early fourth instar nymphs were collected and put on a filter paper placed in Petri dish. 2.0 mL of desired solvent extract was sprayed on the aphids. 10 aphids per application were released on fresh untreated cabbage leaves contained in a glass vial with their petiole and dipped in water. The glass vial along with leaf was covered with a glass chimney. Nymphal mortality data was recorded after 48 hours. Similarly, toxicity of all plant extracts was studied by replicating all the treatment thrice. In the control treatment, nymphs were sprayed with the solvent used for the extraction.

RESULTS AND DISCUSSION

An examination of data (Table 1) revealed that exposure of fourth instar nymphs of *B. brassicae* to solvent extracts of eight plant species exhibited moderate to high toxicity. Differences amongst plant species, solvents used to prepare the extracts and their concentrations were significant. Amongst various plant species evaluated, *Melia azadarach* (56.1%) and *Ageratum conyzoides* (54.0%) resulted in significantly higher toxicity to the

fourth instar nymphs, which were followed by *Vitex nigundo* (51.3%) and *Rumex nepalensis* (47.6%). *Polygonum* sp. and *Lantana camara* extracts proved significantly least toxic to the fourth instar nymphs.

Among various solvent, methanol extract resulted in significantly higher mortality (57.4 %) than chloroform (48.1%) and ethyl acetate extract (38.7 %). Plant extract applied at 5.0 % concentration resulted in significantly higher toxicity to the nymphs of cabbage aphid as compared to 2.5 and 1.25 per cent concentration. The later two concentrations also differed significantly (Table 2). Though the concentration of the formulation used exerted significant impact on the toxicity of crude extracts to cabbage aphid but the interaction effect with other components remained non significant. Interaction between plant material and solvent used to extract the active constituent had significant affect on the mortality of cabbage aphid.

A perusal of the interaction data (Table 3) between plant extract evaluated and the solvent used to extract the active constituent reveals that methanolic extract of *Melia azedarach* proved significantly superior to others and was followed by methanolic extract of *Ageratum conyzoides*. Further, significantly higher mortality of the nymphs of cabbage aphid was observed in case of methanolic extract of all the plant materials evaluated followed by chloroform and ethyl acetate extracts. Least toxicity was observed in case of Ethyl acetate extract of *Polygonum* sp.

ACKNOWLEDGEMENTS

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

Table 1: Effect of solvent extracts of plants on mortality of Cabbage aphid (*B. brassicae*)

Plant /Concentration	Per cent mortality in solvents		
	Methanol	Chloroform	Ethyl acetate
Melia azedarach			
5.0	95.2 (76.1)	88.4 (68.1)	78.1 (65.4)
2.5	82.4 (61.7)	68.3 (53.4)	54.3 (46.8)
1.25	65.3 (51.2)	50.4 (44.1)	38.2 (38.4)
Ageratum conyzoides			
5.0	91.2 (73.5)	85.4 (65.5)	74.3 (65.0)
2.5	88.0 (58.1)	62.3 (51.3)	50.6 (45.3)
1.25	61.6 (48.4)	45.6 (42.5)	35.4 (36.7)

Vitex nigundo			
5.0	85.3 (68.9)	79.3 (61.8)	68.4 (67.4)
2.5	82.6 (54.1)	55.4 (48.0)	44.8 (42.6)
1.25	56.3 (46.1)	41.6 (40.0)	31.3. (32.4)
Rumex nepalensis			
5.0	73.3 (65.5)	74.3 (56.8)	60.1 (58.9)
2.5	64.6 (55.8)	58.4 (44.5)	38.1 (37.6)
1.25	53.1 (45.3)	40.1 (35.4)	24.2 (28.7)
Artemesia brevifolia			
5.0	80.4 (58.7)	63.4 (53.4)	54.2 (49.1)
2.5	67.3 (49.0)	48.3 (43.3)	36.7 (37.1)
1.25	54.0 (41.8)	34.2. (34.6)	23.0 (26.8)
Eupatorium adenophorum			
5.0	78.2 (57.9)	62.0 (54.9)	56.8 (48.6)
2.5	56.7 (47.1)	43.3 (49.1)	46.7 (43.0)
1.25	42.8 (37.4)	27.2 (39.9)	31.2 (26.7)
Lantana camara			
5.0	53.6 (61.6)	68.2 (50.1)	48.4 (47.0)
2.5	44.2 (57.0)	60.4 (44.0)	37.9 (39.6)
1.25	29.2 (45.4)	40.4 (35.8)	24.8 (23.7)
Polygonum sp.			
5.0	52.8 (56.9)	60.2 (48.0)	44.8 (46.2)
2.5	41.4(51.7)	51.3 (42.1)	34.7 (33.2)
1.25	24.8 (48.9)	46.2 (37.1)	26.7 (26.0)

Figures in parenthesis are the angular transformed values

Table 2: Effect of solvent extract on mortality of *B. brassicae*

Treatments	Per cent mortality
M. azedarach	68.9 (56.1)
A. conyzoides	66.0 (54.0)
V. nigundo	60.5 (51.3)
R. nepalensis	54.0 (47.6)

A. brevifolia	51.3 (43.8)
E. adenophorum	49.4 (45.0)
L .camara	45.2 (44.9)
Polygonum sp.	42.5 (43.3)
CD (P=0.05)	0.57
Concentration (%)	
5.0	69.8 (59.4)
2.5	54.9 (45.7)
1.25	38.8 (38.0)
CD (P=0.05)	0.35
Solvents	
Methanol	63.5 (57.4)
Chloroform	56.4 (48.1)
Ethyl acetate	44.3 (38.7)
CD (P=0.05)	0.35

Figures in parenthesis are the angular transformed values

Table 3: Interaction effect of plant *vs* solvent

Plants/Solvents	Per cent mortality in solvents			
	Methanol	Chloroform	Ethyl acetate	Mean
M. azedarach	81.0 (63.0)	69.0 (55.2)	56.9 (50.2)	69.0 (56.13)
A. conyzoides	80.3 (60.0)	64.4 (53.1)	53.4 (49.0)	66.0 (54.0)
V. nigundo	74.7 (56.4)	58.8 (49.9)	48.2 (47.5)	60.6 (51.3)
R. nepalensis	63.7 (50.2)	57.6 (45.6)	40.8 (41.7)	54.0 (47.6)
A. brevifolia	67.2(50.2)	48.6 (44.6)	38.0 (37.7)	51.3 (44.2)
E. adenophorum	59.2 (47.5)	44.2 (48.0)	44.9 (39.4)	49.4 (45.0)
L. camara	42.3 (54.7)	56.3 (43.3)	37.0 (36.8)	45.2 (45.0)
Polygonium sp.	39.7 (52.5)	52.6 (42.4)	45.3 (35.1)	42.6 (43.3)
Mean	63.5 (62.1)	56.4 (47.8)	44.3 (42.2)	-
CD (P=0.05)		1.00		

Figures in parenthesis are the angular transformed values

REFERENCES

[1] Ali A and Rizvi P Q (2007) Development response of cabbage butterfly, Pieris brassicae L. on different cole crops under laboratory and field conditions. Asian Journal of Plant Sciences 6(8): 1241-1245.

[2] Baidoo P, Adam J (2012) The effects of extracts of Lantana camara (l.) and Azadirachta indica (A. juss) on the population dynamics of Plutella xylostella, Brevicoryne brassicae and Hellula undalis on cabbage. Sustainable Agriculture Research 1(2): 229-234.

[3] Emana B, Afari-Sefa V, Dinssa F, Ayana A, Balemi T, Temesgen M (2015) Characterization and Assessment of Vegetable Production Marketing Systems in the Humid Tropics of Ethiopia. Quarterly Journal of International Agriculture 54(2):163- 87.

[4] Embaby S and Lotfy D (2015) Ecological studies on Cabbage pests. Journal of Agricultural Technology 11(5):1145-1160

[5] Hasan F (2008) Studies on the bionomics of Pieris brassicae (Linn). MSc thesis, AMU, Aligarh, India.

[6] Jainulabden S and Prasad SK (2004) Severe infection of cabbage butterfly Pieris brassicae (Linn) on six species of brassicae and effect of abiotic factor on its population dynamics. Journal of Entomological Research 28(3): 193-197.

[7] Kashyap NP, Sharma DC, Bhagat RM and Suri SM (1993) Bioefficacy of insecticides against potato tuber moth. J. Indian Potato Assoc. 20(2): 179-181.

[8] Rizvi P Q, Ali A and Khalid S (2009) Age and stage specific life tables of cabbage butterfly, Pieris brassicae (Linn) on various cole crops. Journal of Plant Protection Research 49(2): 145-150.

[9] Sarwar M (2015) The Killer Chemicals for Control of Agriculture Insect Pests: The Botanical Insecticides. International Journal of Chemical and Biomolecular Science 1(3):123-128.

[10] Sharma, DC and Singh M (1993) Residual toxicity of insecticides on cabbage C aterpillar (*Pieris brassicae*) and their dissipation on cauliflower (*Brassica oleracea var. botrytis*. Indian Journal of Agricultural Sciences, 63(1), pp. 59-63.

[11] Verma, A K and Makhmoor HD (1988) The intrinsic rate of natural increase of the cabbage aphid. *Brevicoryne brassicae* (Linn.) (Homoptera: Aphididae) on cauliflower. Entomon. 13(1): 51-56.