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ORIGINAL ARTICLE

Insecticidal Activity of Petroleum Ether Extract of Castor Seeds against Mustard Aphid *Lipaphis erysimi* Kaltenbach

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ABSTRACT
An experiment was conducted to examine the insecticidal activity of petroleum ether extract of castor (Ricinus communis) seeds against mustard aphid Lipaphis erysimi Kalt., which is known to cause a serious damage to Brassica oil seed crop of our country. A stock solution of 8% concentration was prepared in distilled water using 0.2% Triton X-100 as emulsifier. The control consisted of 0.2% Triton X-1oo dissolved in water. Three concentrations (0.5, 1.0 and 1.5 percent) of test solution were prepared by its dilution with distilled water and sprayed on parts infested with counted number of 3rd instar nymphs and adults of apterous viviparous females. 1.5% concentration was found to be quite effective as it caused 100% mortality both in nymphs and adults in 24 hours whereas 1.0 and 0.5% solution caused 100% and 75% mortality respectively in 48 hours. The insecticidal activity was quite comparable with known insecticides for the same aphid.
Keywords: Castor, Insecticidal activity, Aphid

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INTRODUCTION

Ricinus communis is a member of family Euphorbiaceae, commonly known as castor. This plant is common and quite wild in forest of India. It is also cultivated in our country, chiefly in Madras, Bengal and Bombay. Seeds contain mixed oil soluble in alcohol. The oil of castor is non irritant, purgative, when it reaches the duodenum it is composed by pancreatic juice in to ricinin and ricinolic acid which irritates the bowl, stimulates the intestinal glands and muscular coat and causes purgation. Ricinin is a powerful poison having a definite effect on the coagulation of blood, it has no purgative effect but produces haemorrhagic inflammation of the gastric intestinal tract even when given subcutaneously [1]. The oil is extracted from castor seeds. The presence of physiologically active groups makes castor seeds and oil non edible, yet it has scores of industrial and agricultural applications [2]. The present investigations were conducted to find out the effectiveness of petroleum extract of castor seeds against the mustard aphid *Lipaphis erysimi* Kalt. (Homoptera: Aphididae) which is known to cause a considerable reduction in the yield of *Brassica* oil seed crop.

MATERIAL AND METHODS

The seeds of castor were collected and washed thoroughly under tap water and dried in shade. After drying the seeds were powdered in an electric grinder and sieved though a fine muslin cloth. The powdered material (approx. 10 g) was extracted serially in a glass soxhlet extractor with 250 ml petroleum ether (b. p. 40-50^{0}C) as a solvent. The extraction was carried out continuously for 29 h. Finally, the extracted materials were separated out in a small beaker after complete evaporation of the solvent. A stock solution of 8% concentration was prepared in distilled water using 0.2% Triton X-100 as emulsifier. The control consisted of 0.2% Triton -100 dissolved in distilled water. The required concentrations (0.5,

1.0 and 1.5%) of the test solution were prepared by diluting the stock solution with distilled water. Each concentration was applied with three replications for every treatment. Observations were made after every 12 h. The corrected percentage of mortality was calculated according to Abbott's formula. The data were subjected to Probit analysis [3] for calculating regression equation and fiducially limits. LT_{50} values were calculated by graphical superimposition method described by Marwaha and Sarup [4].

Experimental Bioassay: The crop was shown in two experimental Plots A and B. Plot 'A' had mature mustard crop infested with enough number of mustard aphids, while plot 'B' contained small 19-12 cm high uninfested young plants. The plot 'B' plants were transferred to small clay pots measuring 12-15 cm in diameter and 15 cm in length. The pots were placed in natural environment (at 20 ± 5^0C; 89 ± 10 RH) away from plot 'A'. The counted number of aphids was transferred to potted plants with the help of a fine camel hair brush from the plot 'A'.

The soil of the small clay pots with one host plant each was covered with a white paper disk. To ensure that the disc fits securely at the top of the pots and around the stem, it was incised along the radius to reach the circular host. The place if any between the stem and hole was filled with cotton and pots were kept in water filled enamel trays to ensure that the apterous insect do not escape out from the potted plants.

Each of the potted plant with 48-52 apterous viviparous third instar nymph or adult apterous viviparous females of *L. erysimi* was sprayed with 5ml of emulsion. Before spraying the plant with a devilbiss atomizer, the insects that had dropped off the plants were removed from the paper disc and water in the enamel trays. Concentration response test with different concentrations of petroleum ether extract castor seeds were conducted in three replicates involving 150 insects. No visible sign of movement by the insect was accepted as a criterion for mortality.

RESULT AND DISCUSSION

Petroleum ether extract of *Ricinus* seeds caused 45, 80, 100 and 43, 79, 100% mortality respectively at 0.5, 1.0 and 1.5% concentration after 24 hour in 3rd instar nymphs (Table. 1) and adult apterous viviparous females (Table. 2). The LT_{50} values indicated that 50% mortality in nymphs and adults was caused in 29.3, 15.6, 9.0 and 30, 14.8, 9.3 hours respectively after a spray of 0.5, 1.0 and 1.5% petroleum ether extract of mustard seeds. Fecundity was also affected significantly. All the apterous viviparous females died after a spray of 0.5% concentration in 96 hours and after 48 and 24 hours respectively at 1.0 and 1.5% concentration of the extract. The number of young ones produced in control after 24, 48, 72 and 96 hours were 24, 43, 74 and 111 respectively (Table. 3).

Table.1 Insecticidal activity of petroleum ether extracts of castor seeds against 3rd instar nymphs of *L. erysimi*

Conc.	Corrected Percentage of Mortality After					LT_{50}*	Fiducial	Regression
(%)	12h	24h	48h	72h	96h	Value	Limit	Equation
Control	0.66	0.66	0.66	0.66	2.00			
0.5	14.78	44.98	75.18	87.92	100.00	29.30	0.556-0.744	0.016X+49.52
1.0	36.92	79.88	100.00	100.00	100.00	15.64	0.756-0.904	0.011X+49.71
1.5	66.44	100.00	100.00	100.00	100.00	9.03	0.880-0.980	0.011X+49.76
*Time required for 50% mortality								

Table.2 Insecticidal activity of petroleum ether extract of castor seeds against adult apterous viviparous females of *L. erysimi*

Conc.	Corrected Percentage of Mortality After					LT_{50}*	Fiducial	Regression
(%)	12h	24h	48h	72h	96h	value	Limit	Equation
Control	0.66	0.66	1.34	1.34	2.66			
0.5	14.09	42.96	75.01	83.78	100.00	29.97	0.535-0.725	0.029X+48.87
1.0	41.62	79.20	100.00	100.00	100.00	14.79	0.766-0.914	0.037X+49.11
1.5	64.43	100.00	100.00	100.00	100.00	9.31	0.880-0.980	0.044X+49.24
*Time required for 50% mortality								

Table. 3 Insecticidal activity of petroleum ether extract of castor seeds on the fecundity of adult apterous viviparous females of *L. erysimi.*

Concentration (%)	Fecundity After Treatment			
	24h	48h	72h	96h
0.5	18.67	33.67	41.33	-*
1.0	10.67	-	-	-
1.5	-	-	-	-
Control	24.33	43.33	73.67	110.67
SE±	2.59	3.10	3.79	3.72
CD at 5%	5.59	6.70	8.19	8.04
*All treated females died				

The perusal of literature revealed a number of findings supporting the present work with the treatment of *R. communis* extract given to different insect species. [2, 5-13]. A significant work of Kwon *et al*., [14] involved the separation of ricinine, a natural toxicant from castor oil plant. Kwon *et al.* (Loc. cit.) also demonstrated insecticidal activity of ricinine against brown plant hopper. Kumar and Dutta [5]; Vasudevan *et al*.,[2]; Stein and Klingauf [6] reported larvicidal properties of castor seed extract, whereas Adhikari *et al*., 1994 and Niber, 1994 examined their insecticidal activity against various insect species. The efficacy of castor seed oil was reported [8] on fecundity and fertility of *Tribolium castaneum*. The insecticidal effect of another constituent electin obtained from *Ricinus communis* oil on the population of *Musca domestica* was evaluated by Alvarez et *al* [11]. Castor seed oil was also reported [10] to affect the oviposition and genotypic cycle of *Anopheles stephensi* and *A. culicifacies*. In the present investigations it exhibited an excellent aphicidal activity against *L. erysimi.* Furthermore seed extract was found to be a stronger aphicidal agent than mustard seeds extract [16], *Azadirachta indica*, *Madhuca indica* seeds [17] and *Lycopersicon* leaves [18] against mustard aphid. The present findings suggest the feasibility of exploiting the potential of castor seed oil and its major constituents for protecting the mustard crop against mustard aphid *L. erysimi*.

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