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# Studies on ovicidal effects of some plant extracts against the diamondback moth, *Plutella xylostella* (L.) infesting cauliflower crop

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**ABSTRACT**

**Studies on ovicidal effects of aqueous and alcoholic extracts of four different plants namely, *Melia azedarach; Lantana camara, Artemisia annua* and *Cannabis sativa* were carried out under laboratory conditions against the diamondback moth, *Plutella xylostella* (L.) which revealed that extracts of all the plants used had significant effect on the mortality of eggs. However, the alcoholic extracts were found to be better than the aqueous extracts. Alcoholic and aqueous extracts of *M. azedarach* (leaf) resulted in mean egg hatch of 24.4 per cent and 59.9 per cent at 10 per cent concentration in comparison to control where 90.0 and 88.3 per cent egg hatch was observed. This was followed by *A. annua* seed extract where the same concentration resulted in 31.1 per cent and 77.7 per cent egg hatch in alcoholic and aqueous extracts respectively. *L. camara* (seed) and *C. sativa* (leaf) extracts were followed by these with 64.4 and 75.5 per cent eggs hatch in case of alcoholic extract and 73.2 and 82.2 per cent egg hatch in case of aqueous extract. There was constant increase in the per cent kill of egg masses with the increase in the extract concentration.**

**Keywords**: Ovicidal effects, plant extracts, *Plutella xylostella* L., cauliflower crop

## INTRODUCTION

The diamondback moth, *Plutella xylostella* (L) (Lepidoptera : Yponomeutidae) is an internationally known insect-pest of cruciferous crops causing extensive damage. The damage is caused by larva which skeletonizes the foliage of host plant and renders it unfit for consumption. In cauliflower, it firstly feeds on leaves and later on enters inside the curd thus causing damage to this crop. A number of insecticides have been recommended in the last decade to control this pest but excessive use of these chemicals resulted in the development of resistant strains of this insect, which ultimately resulted in resistance to many insecticides thus residue problem on the crop (Saxena *et al.*, 1990; Raju, 1996; Sanaveerappanavar and Viraktamath, 1997). Under such conditions, the uses of botanical insecticides are the only alternative, which not only are cost effective but cause adverse effects on the development and reproduction of insect. The present study has therefore been undertaken to study the ovicidal effect of some plant extracts against the diamondback moth, *P. xylostella* under laboratory conditions so that information thus gathered may be utilized for the management of this pest under field conditions.

## MATERIALS AND METHODS

Aqueous and ethanol extract of four plant species namely *Melia azedarach* (leaf), *Lantana camara* (seed), *Artemisia annua* (seed) and *Cannabis sativa* (leaf) were tested for their ovicidal action against the diamondback moth. All the test plant materials except *A. annua* were collected from locally available plants while the seeds of *A. annua* were procured from the department of Forest Products and utilization of the University. The collected material was shade dried for 6-7 days and then grinded in a mixture grinder. The powdered material thus obtained was used for the extraction. The aqueous extract of these plant materials was prepared on per cent basis as per the method of Gahukar (1996) and Sharma *et al*. (1997)

for which a stock solution of 20% concentration was prepared by dissolving 20 gram of each plant material in 80 ml of water and used at different concentrations. The ethanol extract was obtained through Soxhlet apparatus. Further dilutions were made by using the respective solvent by single dilution method. To study the ovicidal effect of different plant extracts the leaf portion with egg masses of the diamondback moth was dipped instantly for 10 seconds into the solution of desired plant extracts, air dried and then placed into Petri dish (9 cm diameter) having moist filter paper at the bottom. The egg masses in control were dipped in distilled water. The observations on egg hatchability were recorded up to 7 days and per cent egg hatching was calculated.

## RESULTS AND DISCUSSION

The studies reveal that the aqueous extract of *M. azedarach* leaf at 10 per cent concentration gave minimum egg hatch of 59.9 per cent whereas at 1 per cent concentration, the egg hatch was maximum (86.3%) and was at par with control (Table 1). However the alcoholic extract of this plant resulted in 24.4 per cent egg hatch at 10 per cent concentration whereas it was 86.6 per cent at 1 per cent and 90 per cent in the untreated control. The aqueous extract of *L. camara* seed resulted in 73.2 and 86.5 per cent egg hatch, respectively at 10 and 1 per cent concentrations in comparison to 90.9 per cent egg hatch in control, whereas the alcoholic extract of this plant gave 64.4 and 91.1 per cent egg hatch at the respective concentrations in comparison to 92.1 per cent in control. The comparison of aqueous and alcoholic extract of *A. annua* seed revealed that at 10 per cent concentration, the egg hatch was 77.7 and 31.1 per cent, respectively however, at 1 per cent the egg hatch was 90.9 and 82.2 per cent in comparison to 91.1 and 84.4 per cent in the untreated control for the respective solvents. The aqueous and alcoholic extracts of *C. sativa* leaf resulted in egg hatch of 82.2 and 75.5 per cent at 10 per cent concentration whereas in the respective solvents at 1 per cent, the egg hatch was 86.5 and 81.1 per cent in comparison to 90.9 and 97.7 per cent egg hatch in control. On comparing different plant extracts, the extract of *M. azedarach* (leaf) was found to be more effective in causing 69.7 per cent egg hatch and was statistically at par with *A. annua* (seed) extract giving 75.5 per cent egg hatch. This was followed by mean per cent egg hatch in seed extract of *L. camara* (81.1%) and leaf extract of *C. sativa* (85.8%) and these were significantly different from each other. When the comparison of aqueous and alcoholic extract was made, the aqueous extract was found to be effective in causing 71.8 per cent egg hatch and was significantly different with the ethanol extract giving 82.8 per cent egg hatch (Table 1).

The studies thus indicated the superiority of *M. azedarach* leaf extract to all other plants extracts tested in the present studies. Mishra (1990) also observed 76.7 and 91.7 per cent egg mortality (infertility) at 5 and 10 per cent concentration of aqueous extract of *M. azedarach* leaf. Deka *et al.*, (1998) also reported the superiority of *M. azedarach* drupe aqueous extract to that of the aqueous extract of *L. camara* seed at 2, 5, 8 and 10 per cent concentrations. The less efficiency of the aqueous extracts in the present study might to be due to poor extraction of active ingredients in water. Singh *et al*. (1978) reported that the extract from plant material has the ability to penetrate the chorion of egg thus causing the death of developing embryo. This fact can also be well supported by the findings of Dilawari *et al*. (1994) who reported the post-ovipositional effects of kernel extract of *M. azedarach* with ethanol where less number of eggs of *P. xylostella* were hatched and subsequently those hatched resulted in mortality in larval and pupal stages and malformed adults. The results on the effectiveness of *M. azedarach* leaves draw considerable supports from the findings of Sandhu *et al.* (1994) who reported 45.1 per cent egg hatch in *P. brassicae* when cabbage leaves were treated with chloroform:methanol fraction of *M. azedarach.* Bhathal *et al.* (1991) also observed 6.7 and 3.3 per cent egg hatch in *Dysdercus koenigii* when eggs were treated with 0.25 and 0.5 per cent extracts of *Ageratum houstonianum.* The results also

corroborate the studies of Sharma *et al*., (1997) who reported the effectiveness of alcoholic extract of *M. azedarach* over the aqueous extract. The alcohol extract of dharek resulted in 10.37 per cent reduction in eggs hatch over the control in comparison to aqueous extract where 6.7 per cent egg hatch was observed.

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Table 1. Effect of different plant extract concentrations of aqueous and alcohol on egg hatch in *P. xylostella*

| Extract (plant part) | Concentration (%) | Per cent egg hatch | | Mean |
|---|---|---|---|---|
| | | Aqueous extract | Alcohol extract | |
| *M. azedarach* (Leaf) | 10.0 | 59.9 (50.7) | 24.4 (29.1) | 69.7[a] |
| | 8.0 | 70.7 (57.2) | 35.5 (36.6) | (57.9) |
| | 5.0 | 77.7 (61.9) | 57.8 (49.5) | |
| | 2.5 | 79.7 (63.4) | 79.8 (63.5) | |
| | 1.0 | 86.3 (68.7) | 86.6 (69.0) | |
| | 0 (Control) | 88.3 (70.2) | 90.0 (77.8) | |
| *L. camara* (Seed) | 10.0 | 73.2 (58.9) | 64.4 (53.4) | 81.1[b] |
| | 8.0 | 75.3 (60.3) | 71.1 (57.5) | (65.3) |
| | 5.0 | 88.8 (70.6) | 77.8 (62.2) | |
| | 2.5 | 84.4 (66.9) | 77.8 (62.2) | |
| | 1.0 | 86.5 (68.9) | 91.1 (72.9) | |
| | 0 (Control) | 90.9 (72.6) | 92.1 (76.9) | |
| *A. annua* (Seed) | 10.0 | 77.7 (61.9) | 31.1 (33.9) | 75.5[a] |
| | 8.0 | 79.9 (63.6) | 42.0 (40.4) | (59.6) |
| | 5.0 | 86.7 (69.0) | 44.4 (41.6) | |
| | 2.5 | 86.4 (68.8) | 73.3 (59.0) | |
| | 1.0 | 90.9 (72.7) | 82.2 (65.1) | |
| | 0 (Control) | 91.1 (72.9) | 84.4 (66.9) | |
| *C. sativa* (Leaf) | 10.0 | 82.2 (65.1) | 75.5 (60.4) | 85.8[c] |
| | 8.0 | 84.4 (66.9) | 77.8 (61.9) | (69.2) |
| | 5.0 | 88.8 (70.6) | 91.1 (72.9) | |
| | 2.5 | 79.9 (63.6) | 93.2 (77.7) | |
| | 1.0 | 86.5 (68.9) | 81.1 (64.5) | |
| | 0 (Control) | 90.9 (72.6) | 97.7 (84.9) | |
| Mean | | 71.8 (59.9)[a] | 82.8 (60.1)[b] | |

Figures in parentheses indicate arc sin transformed values

CD (p=0.05)

| | | | |
|---|---|---|---|
| | Solvent | = | 1.8 |
| | Plant | = | 2.5 |
| | Concentration | = | 3.1 |