Pest Management in Horticultural Ecosystems
Vol. 27, No.1 pp 95-97 (2021)

DOI Number: 10.5958/0974-4541.2021.00018.7

## RESEARCH NOTE

# Evaluation of some leaf and seed extracts for their insecticidal properties against *Aphis gossypii* Glover (hemiptera: Aphididae)

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**ABSTRACT:** The insecticidal properties of leaf extracts of *Carica papaya*, *Leucas aspera* and seed extracts of *Datura stramonium* and *Mucuna pruriens* were evaluated against *Aphis gossypii* Glover (Hemiptera: Aphididae) under laboratory conditions. The mortality of aphids (80.0%) was more from *D. stramonium* seed extract (10ml/l) with $LD_{50}$ of 0.39% followed by *C. papaya* leaf extract which caused mortality of 72.5% (10ml/l) with $LD_{50}$ 0.96%. The mortality of *A. gossypii* in *M. pruriens* seed extract was 70.0% with $LD_{50}$ 0.65% however the mortality was found to be non significant in *L. aspera* extract.

**Keywords:** *Carica papaya, Leucas aspera,* aphids, bioassay

Aphids, *Aphis gossypii* Glover (Hemiptera: Aphididae) are one of the important sucking pests of various vegetable crops like okra, bitter gourd, chilli, capsicum and cucurbits which cause significant and economic damage. Both adults and nymphs feed on plant stems, buds, leaves, flowers and pods of vegetable crops and also act as vectors of many plant viral diseases. In order to protect crops from damage of aphid infestation, farmers apply insecticides indiscriminately that sometimes result in pest outbreaks (Prasannakumar *et al.,* 2020a). Although synthetic insecticides give adequate control however pesticide residues on the crop affect non targeted organisms including human beings (Hussain, 1989; Iqbal *et al.,* 2012). In addition, health hazards, undesirable side effects, development of pest resistant to pesticides and resurgence have been observed owing to continuous use of synthetic chemicals (Bahar *et al.,* 2007). The best alternative to insecticides is plant based botanicals (Prasannakumar *et al.,* 2020b). Extracts from plant origin containing insecticidal properties are indigenously available and considered comparatively safer for environment and public health. It has been reported that over 2000 plant species belonging to 170 natural families are known to have insecticidal properties (Iqbal *et al.,* 2012). Thus the present study was aimed to evaulaute insecticidal properties of botanical extracts such as leaf extract of *Carica papaya*, *Leucas aspera* and seed extract of *Mucuna pruriens* and *Datura stramonium* for the control of *A. gossypii* under laboratory conditions.

The botanical extractions were prepared at the Division of Basic Sciences, ICAR-IIHR, Bengaluru. Leaves of *C. Papaya and L. aspera* were collected from field and washed in distilled water, shade dried and powdered using pestle and mortar. The leaf powder weighing 100g was mixed with 100ml of ethanol and incubated at room temperature over night. After proper mixing, the extraction was separated by using whattman No. 1 filter paper and solvent was evaporated under rotatory vacuum (Prasannakumar *et al.,* 2021). Similarly, preparation of seed *M. pruriens* and *D. stramonium* extract was carried out as per Prasannakumar *et al.,* 2021. For bioassays, the insects were collected from the field and reared on okra plants in protected conditions at vegetable Entomology laboratory, Division of Crop Protection, ICAR-IIHR. Leaf dip bioassay were carried out to all extract with six (0.5ml/l, 2.5ml/l, 5.5ml/l, 10.5ml/l) treatments with four replications. Healthy leaves were collected and washed in tap water to avoid other insect contaminants later the leaves were dipped in different concentrations of extracts (Table 1) for 2-3sec; then dried under shade for 30-40min. The leaves used for control were dipped in distilled water. Once the leaves dried they were placed adaxially on moist tissue paper on petri plates. For each replication, 10 aphids (nymphs) of uniform age were released then all bioassay plates incubated at 25 ± 0.5°C and 65 ± 5% relative humidity. Observation on aphid mortality was recorded after 24h. The mortality of each extract was then corrected using Abbott's formula

**Table 1. Effect of *C. papaya, L. aspera* , *M. pruriens* and *D. stramonium* extracts on *A. gossypii*.**

| | Aphid mortality (%) | | | |
|---|---|---|---|---|
| **Dose** | ***C.papaya* leaf extract** | ***L. aspera* leaf extract** | ***D. stramonium*** | ***M.pruriens*** |
| 0.5ml/l | 0.0 (1.8) | 0.0 (1.8) | 10.0 (14.4) | 0.0 (1.8) |
| 2.5ml/lit | 25 (30.0) | 5.0 (8.0) | 32.5 (34.6) | 25.0 (36.3) |
| 5.0ml/lit | 32.5 (34.3) | 12.5 (18.4) | 55.0 (47.9) | 35.0 (48.7) |
| 7.5ml/lit | 50.0 (44.8) | 15.0 (19.5) | 77.5 (68.8) | 57.5 (59.5) |
| 10ml/lit | 72.5 (58.7) | 22.5 (27.8) | 80.0 (63.9) | 70.0 (57.0) |
| Control | 0.0 (1.8) | 0.0 (1.8) | 0.0 (1.8) | 0.0 (1.8) |
| CD (1%) | 18.4 | NS | 17.0 | 20.1 |
| S. E.± | 6.7 | | 8.5 | 7.4 |

Means between brackets are transformed by Arcsine (× + 0.1)

**Table 2. Toxicity of different botanical extract of *C. Papaya*, *M. pruriens* and *D. stramonium* on *A. gossypii***

| **Extracts** | **$LD_{50}$ LCL-UCL (95% confidence limit)** | **$LD_{90}$ LCL-UCL (95% confidence limit)** | **$\chi^2$** | **df** |
|---|---|---|---|---|
| C. *Papaya* | 0.96 (5.3711-19.75) | 1.54 (10.196-23.013) | 9.44 | 5 |
| *M. pruriens* | 0.65 (0.4221-1.6377) | 1.41 (1.20163-2.5631) | 7.05 | 5 |
| *D. stramonium* | 0.39 (0.1373-0.6802) | 1.10 (0.9810-1.8003) | 4.2 | 5 |

$LD_{50}$ -Lethal dose for 50% killing of the exposure larvae; CL.- Confidence Limit (95%); $n^a$- number of larvae; S.E. - Standard error;$\chi^2$-Chi square; df- degree of freedom

(Nilahyan *et al*., 2013). Probit analysis of the mortality data was conducted using IBM SPSS statistics version 21 to determine the $LD_{50}$ and $LD_{90}$ values

The significant mortality of aphids was observed in all extracts ($P<0.05$) (Table 1). Among the four different botanical extracts, after 24h of treatment, the highest mortality (80.0%) of aphids was recorded from *D. stramonium* seed extract (10ml/l) followed by *C. papaya* leaf (72.5% mortality at10ml/l) and *M. Pruriens* seed extract (70.0% mortality at 10ml/l). The $LD_{50}$ of *M. Pruriens*, was 0.65 %/l with lower confidence limit (LCL) 0.42 % and upper confidence limit (UCL) 1.63%. Similarly, the $LD_{50}$ for C. *papaya* was 0.96% with LCL 0.57 and UCL 1.97 %. Whereas, for *D. stramonium* 0.39% with LCL 0.13 and UCL 0.68 % (Table2). From both lab bioassay and probit analysis, the seed extract of *D. stramonium* has caused a significant mortality of *A. gossypii* than *M. pruriens*.

Highest mortality in *D. stramonium* may be due to the presence daturaolone, secondary metabolites or phytochemicals like alkaloids, phenols, flavonoids, tannis, saponin in the seeds (Cornelius *et al.,* 2019). Rotary evaporated hexane datura seed extract also exhibited good mortality of *Callosobruchus maculatus* (Abbasipour *et al.,* 2011). The mortality of papaya leaf extract was due to presence of some cysteine proteases papain (Konno, 2004). Whereas the phytochemical analysis of the plant extracts reveals the presence of several bioactive secondary metabolites that singly or in combinations may be responsible for the insecticidal activity (Kovendan *et al*., 2012). The 99% mortality were obtained when locusts were fed on wheat seedlings treated with mucuna seed water/ethanol extract indicating high stomach action (Abdalla *et al.,* 2004).

The present study provides evidence that botanical extracts of datura, papaya and macuna could be used for controlling aphids after further confirmation of their efficacy by carrying out field evaluation.

**ACKNOWLEDGEMENT**

Authors are grateful to the Director, ICAR-IIHR, Bengaluru and Heads, Divisions of Crop Protection and Basic Sciences, ICAR-IIHR for supporting and giving valuable suggestions throughout the study.

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*MS Recieved - 13 May 2021*
*MS Accepted - 27 May 2021*