

# THE EFFECT OF BOTANICALS ON APHIDS, APHIS CRACCIVORA ON COWPEA.

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## INTRODUCTION

Aphis craccivora proved to be the most injurious & dominant species, found on cowpea plants (Attia et al., 1986). Young colonies are concentrated on the growing points of the host plants & are regularly attended by ants. The coccinellid beetle has tremendous potential for utilization in the biological pest control (Sathe and Bhosale, 2001). Dimethoate was recommended to control the aphid in Sri Lanka by Department of Agriculture (1990). Botanicals or natural insecticides are used to control the aphids. The potential of these botanicals has not been evaluated adequately in Sri Lanka. Therefore, the attempt will be made as this study, to evaluate the efficacy of Garlic extract, Marigold flower extract, and Lantana leaf extract on cowpea aphid in Laboratory and Plant house.

## MATERIAL AND METHOD

Aphids were collected from the infested Cowpea and Bushitao (vegetable cowpea), grown on the Agriculture farm, Eastern University, Sri Lanka. To ensure the supply of Aphis craccivora for the whole experiment the collected aphids were reared on 'Banker plants'. Ladybird beetles were collected from the Cowpea and Bush cowpea plants those were highly infested by cowpea aphids, on the Agric. Farm, Eastern University. The collected ladybird beetles were identified as *Menochilus sexmaculatus*. The collected predators were reared on plants infected with aphids and in rearing box. Cowpea *Vigna unguiculata*, variety MI-35, was used as host plant of aphids. 20 days old plants were used as host plant for the experiment.

20g garlic bulbs were taken and washed out with distilled water and the retention water was removed by the filter paper. Then ground by using grinder. Ground bulbs were soaked with 40ml of hot water (100°C) and allowed for soaking for three hours (the measuring cylinder with ground bulb and water was covered with a Petri dish as lid to prevent the loss of chemical in the botanical, through the vapour). After that the solution was strained out by the muslin cloth and 20g / 40ml water (50% solution) was prepared. Likewise 40g / 40ml water (100% solution) aqueous extracts and other botanical aqueous extracts were prepared. And Dimethoate (400g/lit EC) was used. During the experimental period in Laboratory, the average temperature range was from 28°C to 32°C and relative humidity was 60 to 65% and in plant house the average temperature range was from 28°C to 32°C and relative humidity was 65 to 70% and adequate sunlight was permitted in to the plant house.

## Laboratory study:

Twenty-four Petri dishes, measuring 9cm diameter (63.64cm<sup>2</sup> cross section area) lined with a layer of blotting paper at bottom were used. Same size of tender shoot with flower, pod and leaf of cowpea plant was kept in each Petri dish and arranged in complete randomized, design. Botanicals (2ml/63.64cm<sup>2</sup>), Dimethoate (0.29ml/63.64cm<sup>2</sup>), and in control, distilled water (2ml) were sprayed. And separate disposable syringes were used for each treatment. Then twenty same size female adult apterous aphids were introduced for every treatment and the Petri dishes were covered by the muslin cloth and rubber band. And feed was maintained through out the experimental period. Survival of aphids was counted at 12 hours interval. And reading was taken for six times (3 days) from the application of treatments.

## Plant house study

24 pot each measuring of 20cm diameter and 30cm height were filled with cow dung, red soil and sandy Regosol in 2: 1: 1 ratio. Basal fertilizers were added at recommended rate. Cowpea plants (MI35) were raised in these pots. The cages made of iron bars (1/4") and mosquito net (mesh 20 1 cm), each measuring 28cm of diameter and 60cm of height were placed on pots in order to cover cowpea plants, thus they were protected from infestation before the treatments were started. Ten adult female apterous (wingless) *Aphis craccivora* were introduced for each pot (two plant), and allowed to five days for further settling and increased the aphid number. The numbers of aphids were recorded daily for a period of four days from the commencement of the experiment. At the fifth day from the introduction of aphids; botanical aqueous extracts (10ml/0.314m<sup>2</sup>), Dimethoate (1.44ml/0.314m<sup>2</sup>) and in control, distilled water (10ml/0.314m<sup>2</sup>) were sprayed on the plants. Separate disposable syringes were used for each treatment. The soil was covered with the white paper to find out the dead aphids. Predators (*Memochilus sexmeculatus*) were introduced into control treatment immediately after the application of Distilled water and introduced the same size of beetles (predator: prey ratio was 1: 50 as reported by Fong, 1987). Survival of *Aphis craccivora* was recorded from 24 hours after treatment up to a period of four days. The results of the plant house experiments were subjected to Analysis of CO-Variance (ANOCOVA) and the means were compared using Duncan's Multiple Range test (DMRT) and the results of laboratory test were subjected to Analysis of Variance (ANOVA) and the means were compared using Duncan's Multiple Range test DMRT (Gomez and Gomez second edition, 1983).

## RESULTS AND DISCUSSION

The mean number of survived Aphids for different treatments is shown in Figure 1. Among these treatments, Dimethoate 400g / lit EC significantly ( $p < 0.05$ ) reduced the aphid population. Control (T8), significantly increase the aphid number during the experimental period, over other treatments. Among the treatments with botanicals, the reduction of aphid number is greater in Marigold 40g /40ml, compared to other botanicals.

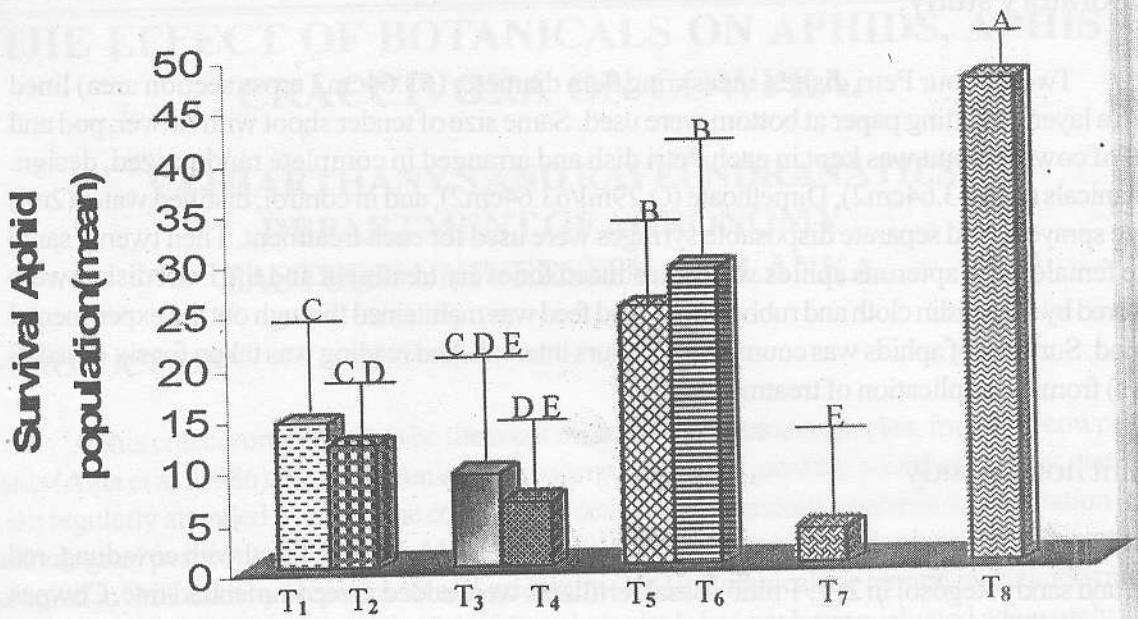


Fig 1: Mean of survived Aphid number of different treatments

Means of the same letter do not differ significantly based on DMRT ( $p < 0.05$ )

- |                                    |                                    |
|------------------------------------|------------------------------------|
| T <sub>1</sub> - Garlic 20g/40ml   | T <sub>2</sub> - Garlic 40g/40ml   |
| T <sub>3</sub> - Marigold 20g/40ml | T <sub>4</sub> - marigold 40g/40ml |
| T <sub>5</sub> - Lantana 20g/40ml  | T <sub>6</sub> - Lantana 40g/40ml  |
| T <sub>7</sub> - Dimethoate        | T <sub>8</sub> - Control           |

In Plant house experiment, all the mean of change in aphid population in different treatments are shown in Figure 2. Here (-) symbol with mean denoted, the reduction in the aphid number, (+) symbol with mean denoted, the increased aphid population and zero mentioned that there is no change in the aphid number.

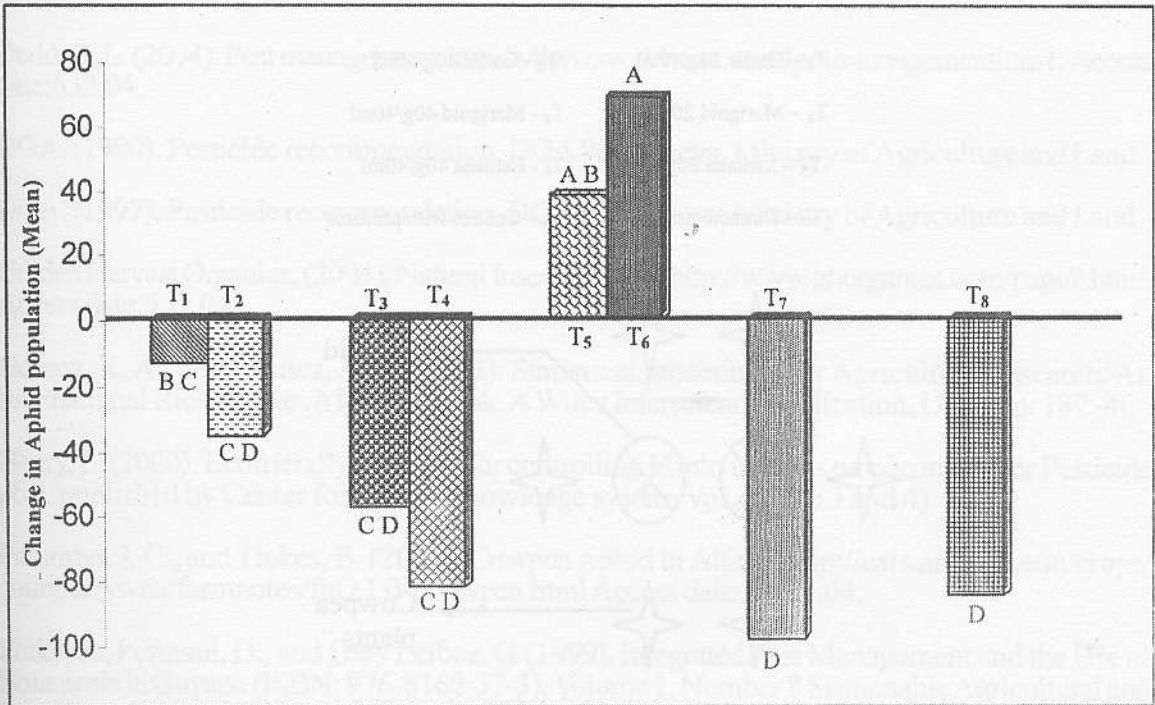
Among these treatments (Dimethoate 400g Ilit EC), significantly reduced the aphid number. Control with predator also reduced the aphid number. The reduction of aphid number is higher in marigold (40g/40ml), compared with other treatments with botanicals.

The change in Aphid population with time is shown in Figure 3. Reduction of aphid number is greater in treatment with Dimethoate than other treatments; all aphids treated with Dimethoate died in first day. And from the first day there were no aphids until 16 days. Pre Harvest Interval of Dimethoate is 14 days (DOA, 1997) and LD50 of Dimethoate is 8 to 14mg/kg (Weeraratne, 1983). So the persistence of this chemical did not allow the further aphid attack at least for 2 weeks. Palumbo and Tickes (1999), Dimethoate suppressed the 80% of aphid in Alfalfa in North America, and the residual effect of Dimethoate was lesser than Furadan. Dimethoate is another organophosphate insecticide used against aphids, thrips, scales, mealybugs and leaf miners and Dimethoate has miticidal activity as well. According from the research findings by Thyalline and Raveendranath (1997), Dimethoate significantly reduced the fecundity of cowpea aphids and its effect was significantly ( $p < 0.01$ ) higher than botanicals (Lakada and Neem) used in their study.

In second day from the application of treatments, the reduction in aphid number is greater in T8 than the other treatments and the aphid number is reduced until fourth day. Adult and larvae of *Menochilus sexmaculatus* prey on the aphids. Baskaran and Subramanian, (1992) showed that of *Menochilus sexmaculatus* as a potential predator on *Aphis craccivora*. In botanical the reduction of aphid number is higher in marigold extract with 40g/40ml third. Root extracts of marigold plants were toxic to Aphids and Rice leafhoppers and extracts of the whole

plants were affected the normal growth of Aphids and Cotton stainer bugs (Pluke et al., 1999). So the marigold plant consist the substances, which are toxic and inhibit the activities of aphid.

In treatments with garlic, there is a reduction in aphid number from initial to third day. Garlic extract is repellent plant to aphid (Golden Harvest Organics, 2004). Balasingam et al (2003), Garlic sap and Neem seed extract (50g/l) was effective in reducing yield loss comparable to prothiofos and could be recommended as low cost environmentally friendly insecticide for the management of Thrips like sucking pest and aphid also belonging to this group.



**Fig 2:** Mean of change in Aphid population in different treatments. Means of the same letter do not differ significantly based on DMRT ( $p < 0.05$ )

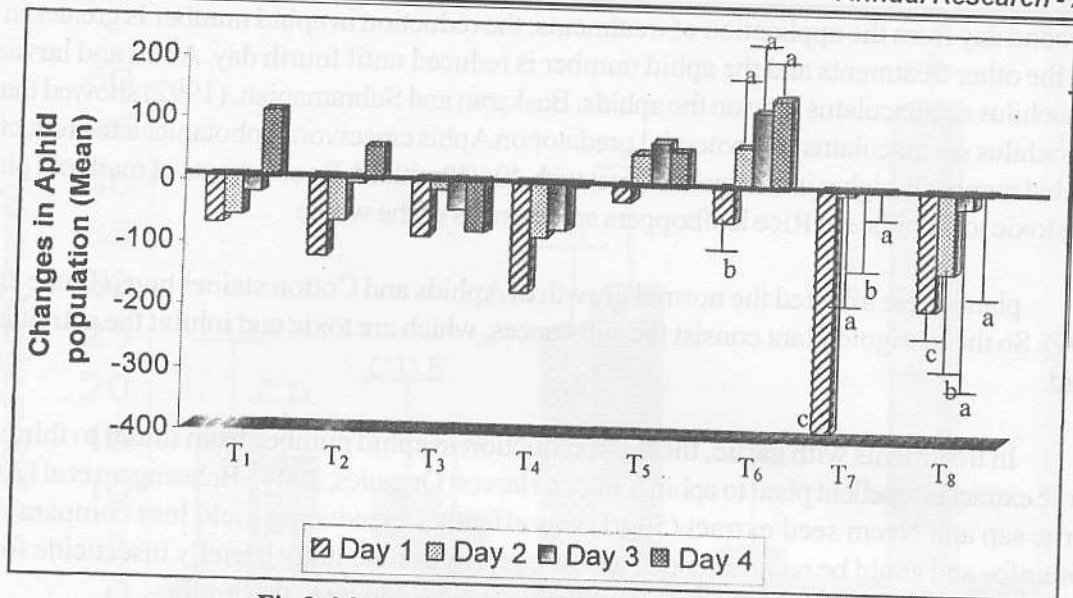


Fig 3: Mean of change in Aphid population Vs Time

Means of the same letter do not differ significantly based on DMRT ( $p < 0.05$ )

- T<sub>1</sub> - Garlic 20g/40ml
- T<sub>2</sub> - Garlic 40g/40ml
- T<sub>3</sub> - Marigold 20g/40ml
- T<sub>4</sub> - Marigold 40g/40ml
- T<sub>5</sub> - Lantana 20g/40ml
- T<sub>6</sub> - Lantana 40g/40ml
- T<sub>7</sub> - Dimethoate
- T<sub>8</sub> - Control with predator

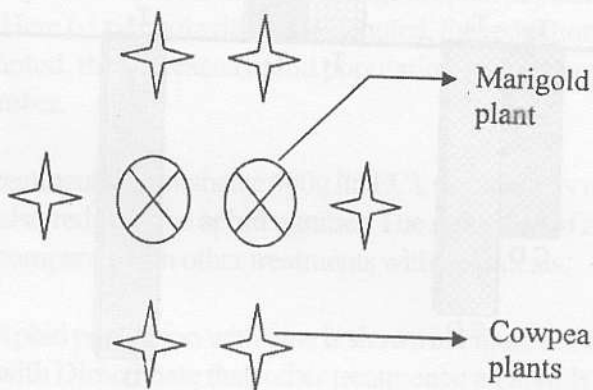


Fig 4: Lay out of Marigold plant with Cowpea plant.

A preliminary study was conducted to find out the performance of *Aphis craccivora* using marigold plants surrounded by cowpea plant as shown in the above diagram.

Same number (50) of aphids was introduced into marigold plants and cowpea plants and observation were made at regular two days interval for ten days. It was found that the aphids on the marigold plants were attracted towards cowpea. This suggests that the presence of some chemical substances in marigold may have acted as repellents to aphids.

It was reported by Dadd (2004) that marigold plants in garden attracted beneficial insects such as Bees and Lady Bugs, which repel aphids and Marigolds, for example, are frequently planted as a friendly border around the garden or among vegetables because they have a natural resistance to insects.

## CONCLUSION

Among the botanicals tested in the study it was found that marigold (40g/40ml) was very effective botanicals to suppress Aphids. The fact that, it has the ability not to interfere with the activities of natural enemies and effectively suppress Aphid population suggests that, it has a potential to be used as a botanical to suppress Aphids.

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