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Potential Effects of Herbal Preparation of *Eucalyptus globulus* and *Anacardium occidentale* on Sustainable control of grubs of *Henosepilachna vigintioctopunctata* (Fab.) on *Solanum melongena* Plant

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Abstract
Insects cause a lot of damage to plants leading to wilting and drying of leaves, and reducing the chlorophyll content thereby leading to death of plants. The present study was focussed on the serious pest of brinjal (eggplant) namely *Henosepilachna vigintioctopunctata*. Solvent extracts from *Eucalyptus globulus* and *Anacardium occidentale* using methanol and hexane were used for the experiment as herbal preparations. The grubs were collected and reared in the laboratory to identify the mortality rate. The extract from *E. globulus* and *A. occidentale* using methanol was found to be more effective in controlling the grubs rather than the extracts with hexane. In comparison it was found that *E. globulus* has a greater role in the eradication of grubs of *H. vigintioctopunctata*.

Keywords: *Henosepilachna vigintioctopunctata, Eucalyptus globulus, Anacardium occidentale,* Eggplant

1. Introduction
Brinjal is heavily infested by a number of pests among which *Henosepilachna vigintioctopunctata* (Coleoptera: Coccinellidae), locally known as hadda beetle, is one of the most destructive pests extensively found all over India and in other countries [1, 2]. Both the grub and adult feed on the epidermal tissues of leaves by scraping surface and damage up to 80% of plants [3]. Thirty five to seventy five percent leaves can be severely damaged by grubs and adults [4]. The grubs confine their attack to the lower surface of the leaves and adults usually feed on the upper surface of the leaves [5]. The incidence of hadda beetle varies from place to place and year to year due to prevailing environment [6]. This ladybird is larger than other ladybird species. They are brown in colour. Carefully counted, there are 13 black spots on each wing cover, two spots on thorax, i.e. 28-spotted in total. There are dense short hairs on its body. It causes considerable damage to a number of solanaceous, cucurbitaceous and leguminous crops [1, 2].
Insecticides seem to be indispensable in maintaining high lives of health, nutrition and quality surroundings. In agriculture, these are regular component as their application has played an important role in the development of modern agriculture. Its application can be very hazardous, and direct contact with a highly toxic insecticide can cause severe illness and even death. In addition, unfortunately, natural enemies of insect pests are more susceptible to insecticides than the insect pests and are easily eliminated from the agro ecosystem. But plant sources are comparatively less harmful to the human health. The plant produces many resources and products of importance. In the present investigation, the morphological changes and the total mortality rate were examined using the solvent extract of plant materials.

2. Materials and Methods
The present study was carried out during the study period of 2014-2015, in the laboratory, Department of Zoology, Madras Christian College, Chennai.

2.1 Collection of Plants
In this experiment, the fresh leaves of *Eucalyptus globulus* and *Anacardium occidentale* were collected from the forest areas near Chengulpattu, Chennai. They were washed with distilled

water and shade dried for 6 days. The dried leaves were uniformly ground by using mechanical grinder. The bioactive components were extracted using the methods with slight modification [7].

2.2 Extraction of Plant Material

5 grams of the powder was poured into a cellulose thimble. Then it was kept in the soxhlet apparatus. The extraction was done by adding 200 ml of solvent (methanol, Hexane) to the sample. The sample was then placed in the extractor at 70 ^{0}C for 10 hrs. When the extraction time was complete, the thimble was removed and content were carefully transferred to the sterilised glass container and allowed to air dry. Then the container was kept in the refrigerator for the study purpose.

2.3 Test Insects

For experiment purpose, newly hatched first and second instars of *H. vigintioctopunctata* were collected in mass amount from the brinjal field in the Madras Christian College farm, Chennai. They were reared carefully under laboratory condition and the experiment was carried out in the research room.

2.4 Bioassay

From the field, 50 healthy I and II instars grubs were taken and separated into the plastic container individually. This plastic container provided the protection and it was closed with small holes containing lid for providing aeration to the developing instars. A blotting paper dipped in water was placed inside the plastic container which kept the leaves fresh and moist for a longer time. For each experiment, ten prestarved instars were introduced individually. Fresh leaves were collected daily and washed with distilled water and air dried. Then the leaves were dipped with solvent extraction of plant material as already prepared. The instars were allowed to feed on the treated leaves in the containers respectively. For the control the leaves were dipped only with distilled water.

After 24 hrs, the instars were carefully transferred to the fresh, uneaten leaves by keeping the leaves in slanting position and allowed it to move from the eaten leaves. The morphological changes, moulting and grub mortality were noted carefully by identifying its exuviae and dead larvae. Percentage of grub mortality was calculated and corrected by Abbott's formula.

$$\text{Corrected Mortality (\%)} = \frac{\%MT - \%MC}{100 - \%MC} \times 100$$

Where,

%MT = % Grub mortality in treatment

%MC = % Grub mortality in control

3. Result

3.1 Efficiency of Herbal Extracts

The data obtained in the present study have been shown in table 1 which revealed that the larval mortality started from 24 hrs, 48 hrs, 72 hrs and 96 hrs data on the first and second instar grubs of *H. Vigintioctopunctata* were estimated to be 100%, 90%, 80% and 50% for methanol extract of *E. globulus*, methanol extract of *A. occidentale*, hexane extract of *E. globulus* and hexane extract of *A. occidentale* respectively.

Among these, both methanol extract of plant species showed the highest significant mortality than hexane extract. Likewise, when compared with *A. occidentale, E. globulus* herbal preparation shows the greater potential effect on the grub mortality.

Table 1: Residual efficiency of different herbal products on control of *H. vigintioctopunctata.*

Plant species	Solvent used	Duration of Grubs mortality (%)				Total mortality (%)
		24hrs	48hrs	72hrs	96hrs	
Eucalyptus globulus	Hexane	10%	10%	20%	40%	80%
	Methanol	10%	50%	40%	0%	100%
Anacardium occidentale	Hexane	20%	10%	10%	10%	50%
	Methanol	10%	40%	40%	0%	90%
Control		0%	0%	0%	0%	0%

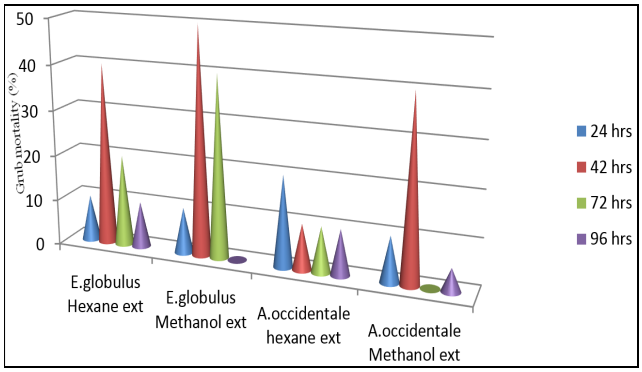

Fig.1: Diagrammatic representation of different herbal products on control of *H. vigintioctopunctata.*

4. Discussion

A number of studies have been conducted in the past to establish the effectiveness of the plant extracts against hadda beetle, *H. vigintioctopunctata*. A comparative study was carried out on insecticidal activity of *N. indicum* leaves extract against first instars of *H. vigintioctopunctata* [8]. Saxena and Sharma reported that 1.0% concentration of *A. arabica* fruit and *E. globulus* flower extract showed highly significant larval mortality against epilachna beetle [9]. Satpathi [10] observed the root extract of *T. nerifolia* showed 90% mortality against *H. vigintioctopunctata.* The authors showed that the extract was larvicidal causing mortality with 1.0% concentration while the study made by Saxena *et al.* using petroleum ether leaves extract of *E. globulus* against the same larval instars revealed 93.3% larval control with similar emergence pattern by feeding on treated leaves of food plant which is in conformity with the present observations using different parts of these plants. Screening plant extracts for deleterious effects on insects is one of the approaches used in the search for novel botanical insecticides [11].

Secondary plant compounds act as insecticides by poisoning or by production of toxic molecules after ingestion. These compounds also deter or possibly repel an insect from feeding [12]. Phytochemical screening of crude methanol extracts of leaves of *E. globulus* revealed that it contained saponins, tannins, flavonoids as reported by Pranay *et al.* [13].

The leaves and seed coat of cashew tree has not been used as extensively as compared to many medicinal herbs or trees. It is not used as live stock feed for cattle also. Since the leaves and seed coat were not used effectively for any economical purposes, this study was undertaken to study its properties and ways to make it an economically important resource.

A. occidentale L. leaves stem and bark extracts are utilized widely for the treatment of diarrhea, dysentery and colonic pain [14].

In this present study, polar solvents like methanol and non-polar solvents like Hexane were used. Polar solvents are hydrophilic. So that, the methanol compounds are easily dissolved in water and shows the greater potency while non-

polar solvents are lipophilic and get less dissolved in water than polar compounds. That is why hexane extract shows lesser potency effect.

5. Conclusion

In comparison, all these tested extracts, except hexane extract of *A. Occidentale* showed a good efficiency against the pest *H. vigintioctopunctata*. Hence, it may be suggested that the leaf extracts of both *E. globulus* and *A. occidentale* can be used for controlling the insect pest, *H. vigintioctopunctata*.

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7. References

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