

Effect of Biopesticide from Custard Apple Seeds on white mealy bugs

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Abstract: Mealy bugs (*Pseudococcus longispinus*) buildup rapidly in numbers which is the common species and produce about 200 young's in 2-3 weeks. These attack wide variety of plants and are widely distributed in tropical, subtropical and temperate regions. To maintain the yield of crops, the pests should be kept away by using pesticide. Excessive use of synthetic pesticides for controlling mealy bugs increases the total cost of operation, in turn adversely affecting the health of human beings and polluting nature. Hence, an eco-friendly bio-pesticide is derived from custard apple seeds. In the present studies, oil from custard apple seeds is extracted using hexane or methanol as a solvent and used as bio-pesticide to control the mealy bugs on the hibiscus plant. Results showed that the number of white mealy bugs decreases day-by-day after spraying the extract solution on affected area of plant due to the presence of fatty acids in the oil. Fatty acid showed the toxicity against the mealy bugs.

Keywords: mealy bugs, custard apple seeds, extraction, fatty acids.

I. INTRODUCTION

Pesticides are mixture of substances, used for preventing, destroying, or mitigating any pest, or for use as a plant growth regulator causing a range of harmful health effects in humans. Hence the safe and best alternative is to use biopesticide. Biopesticides are a cheap and safer alternative for the products, humans and for nature also. The various plant derived products from different plant families have been employed as pesticide. Custard apple (*Annona squamosa*) belongs to the Annonaceae plant family. Oil extracted from it can be used as pesticide against a number of common pests like white mealy bugs, aphid, termite, etc. The oil extracted from custard apple seeds contain acetogenin a group of powerful respiratory inhibiting toxic components, responsible to act as a biopesticide. The pesticide is produced by the extraction of oil from the seeds followed by distillation, using various solvents like hexane, methanol, etc. Studies are focused for the determination of some possible properties of oil. Lastly, testing results for the sample are discussed.

Annonaceae is a large family under the division of Magnoliophyta comprising about 130 genera over 2300 species. *Annona squamosa* commonly known as Custard apple or sugar apple is distributed in tropical and subtropical trees and shrubs. They range from 10 to 20 ft in height with irregular branches and zigzag twigs. The fragrant flowers are borne single or in groups of 2 to 4. The fruit is nearly round, oval or conical which gets separated when the fruit is ripe. The ripe fruit contains creamy white, sweet and delicious flesh. The seeds are scattered throughout the flesh, blackish brown, hard and shiny and are poisonous if chewed.

The use of pesticides in agriculture is dated back to the beginning of agriculture itself and it became more popular with time due to increased pests parallel with decreasing soil fertility. The first important synthetic organic pesticide was dichlorodiphenyltrichloroethane (DDT). DDT was hailed as a miracle because of its broad-spectrum activity, persistence, insolubility, inexpensive and ease to apply. Biopesticides gained lot of importance because of eco-friendly nature, keeping the environment clean and green and also less toxic compared to synthetic

pesticides

Biopesticides are biochemical pesticides that are naturally occurring substances that control pests by nontoxic mechanisms. Biopesticides are living organisms or their products or byproducts which can be used for the management of pests that are injurious to plants. They pose less threat to the environment and to humans. The commonly used biopesticides are living organisms, which are pathogenic for the pest of interest. These include biofungicides, bioherbicides and bioinsecticides. There are few plant products also which can be used a major biopesticide source. Plant incorporated protectants include substances that are produced naturally on genetic modification of plants.

Different biopesticides are prepared from cow urine extracts, fermented curd water, dashparni extract, neem-cow urine extract, mixed leaves extract, chilli-garlic extract, tobacco with other plant extracts in cow urine, seed treatment with rhizome powder and cow's urine, papaya fruit extract, onion bulb extract, etc.

II. MATERIALS & METHODS

A. Materials/Instruments-

Soxhlet extraction unit, Simple distillation unit, Spray gun

B. Extraction Solvents:

n-hexane, Methanol

C. Raw material:

Custard apple seeds.

D. Extraction of Biopesticide:



Fig. 1: Experimental set-up for extraction of oil from custard apple seeds.

Biopesticide is produced from custard apple seeds by using simple grinding and extraction methods. Soxhlet extraction is used when the desired compound has a limited solubility in a solvent, and the impurity is insoluble in that solvent. Custard apple seeds are collected from the ripened custard apples, freed from dirt by washing with water and then sun dried to remove moisture. Custard apple seeds are crushed and grounded to powder with the help of grinder to separate the kernel from the hulls. The kernels are grounded to powder with the help of mixer. Then this powder is mixed with hexane or methanol solvent to extract oil from seed kernels. During extraction solvent is used in the ratio of 15ml/g of seed kernels powder. Temperature was maintained about 65- 70°C during extraction with continuous stirring about 3-4 hours. After extraction, sample is filtered out to remove solid material as residue and filtrate contained the oil extracted with solvent. This filtered sample is proceeded to the simple distillation. After distillation, solvents distilled out while the oil extracted remains in distillation chamber.

E. Preparation and application of biopesticide

The obtained oil is tested for its pesticidal properties by standard methods. After testing the various properties of the oil, it is applied on white mealy bugs on the hibiscus plant surface. Before applying the oil on mealy bugs on hibiscus plant surface pre preparation of the blank solution is done. The blank solution is prepared by mixing 6 parts of labolene soap with 94 parts of water. To 100ml of blank solution 30ml of the custard apple seeds extracted oil is added and sprayed on the pest attacked hibiscus plant surface with a spray gun. The effect of the biopesticide is studied from Day1 to Day5 and the reduction of the white mealy bugs is observed



Fig.2 Observation of number of white mealy bugs left on the affected area of plant from Day1 to Day 5

III. RESULTS AND DISCUSSION

After the extraction and separation of oil by simple distillation oil samples are analyzed for determination of percentage oil, density, acid value and colour appearance. The results interpreted in Table 1 below.

Table 1: TEST RESULTS AT CHEMICAL LAB.

Solvent used	%oil	Density (g/ml)	Colour	Acid value (mg KOH/g sample)
Hexane	19	0.876	Yellowish-light brown	1.683
Methanol	10.5	0.954	Dark-woody brown	Not determined



Fig. 3: Yellowish light sample (Hexane)



Fig. 4: Dark-woody brown oil sample

The extracted oil obtained is tested for its pesticidal properties by Gas Chromatography (GC) at "Anacon Laboratories", Nagpur.

Table 2: TEST RESULTS OF ANACON LAB NAGPUR

Test Result		
Sr. No.	Test Parameters	Test Results (g/100g)
a.	Palmitic Acid	1.38
b.	Stearic Acid	1.49
c.	Lauric Acid	0.26

Test result shows the presence of fatty acids series; palmitic acid, stearic acid, lauric acid in custard apple seeds oil. As concern of pesticide formulation for this product, we can prefer the liquid formulation because here the active ingredient is from oil has a liquid form.

IV.CONCLUSIONS

Recently attacks of white mealy bug on fruit as well as on horticultural crops are very high, which decreases the yield by 40 %. To maintain the crops yield pesticide should be used but not the synthetic pesticide. It should be replaced by bio-pesticide. Following are the conclusions made in the present studies.

1. Recovery of oil by using hexane solvent is 19% while using methanol as solvent is only 10.5%.
2. Presence of fatty acids in the oil lead to the reduction of white mealy bugs on the affected area of the plant.
3. Fatty acid showed the toxicity against mealy bugs.
4. Biopesticide thus formulated is eco-friendly.
5. This biopesticide does not deplete earthworms and maintain the soil fertility.

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