

Extraction and Separation of Custard Apple Seed Oil as a Natural Pesticide

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Abstract

For extraction of oil from the custard apple seed we use Soxhlet extraction equipment. With help of Soxhlet apparatus yield of extraction will be increase. The bio Pesticide from seed oil is effective and ecofriendly. It will help to reduce the pollution air as well as soil. There are various processes are available to produce Pesticide from custard apple seed. Scope of bio Pesticide in India is high. This will beneficial for farmers as well as producer. The % Recovery of biopesticide produce from the custard apple seed powder is more than 80 %. As the ration of feed to solvent increase the % recovery also increase. For 1:5 ration has highest recovery of biopesticide which up to 85%. Above 1:5 ratio increase the cost of solvent and negligible increase in recovery. Hence ratio for feed to solvent will be 1:5 as optimum ratio. Tests of susceptibility for larvae and imaginal stage of mosquitoes were realized to determine mortality and LC50 of mosquitoes. Chemical identifications showed that these extracts contain alkaloids and flavonoids compounds that probably confer their biological Pesticidal proprieties. On adult mosquitoes, significant Pesticidal effects were observed with methanol extracts of seeds of *Annona squamosa*.

Keywords – Methanol, Custard Apple Seed Oil, Natural Pesticide, Different Solvent to Feed Rations, Soxhlet Extraction Apparatus.

INTRODUCTION

The seed extracts of plants may be used as a natural Pesticide. Bio-pesticides are eco-friendly pesticides which are obtained from naturally occurring substances(biochemicals), microbes and plants. Not all natural products are biopesticides. Some are chemical pesticides if they act on nervous system of the pest. Through the use of biopesticides in a wider way, agriculture and health programs can be beneficially affected. Biopesticide reduces the pollution which make earth life safe, protecting the human and animal health. The cost of disposal also replacing by bio pesticide. Quality of corps also clean due to bio or organic pesticides. Pesticides are any substance or mixture of substances intended for preventing, destroying or mitigating any pest, or intended for use as a plant growth regulator. Natural pesticides are a cheap and safer alternative for the products as well as human being who always exposed to pesticides during use. Pesticides include all materials that are used to prevent, destroy, repel, attract or reduce pest organisms. We can say that Pesticides are chemicals that we use to kill undesirable organisms.

Literature Reviews

Chand and McLaughlin (1990) have described squamosin as an extract from the Annona squamosa seed which was described as stereo chemically undefined 15, 24, 28 – trihydroxy-bis-tetrahydrofuran acetogenins. ANOSOM is a biological insecticide based on botanical extract of Annona squamosa (Custard Apple). It contains squamosin (annonin) as active ingredient and is formulated as 1% Emulsifiable Concentrate (10,000 ppm). Anosom is non-phytotoxic and not toxic to higher animals. Registration data Package for Anosom is being submitted to the Indian Pesticides Regulatory Authority - Central Insecticides Board, Govt of India and the same is under process for registration. [1]

Custard apple seed oil is extracted by crushing the seeds of the custard apple. Traditionally seeds are extracted from seed casing and dried in sun. Once the dried seeds are crushed to extract the oil. Oil extracted from custard apple seeds can be used as pesticide against a number of common pests like white mealy bug, aphid, termite, etc. The oil extracted from custard apple seeds contain acetogenin a group of powerful respiratory inhibiting toxic components, which is responsible to act as a bio-pesticide. It may also enjoy application as Insect Repellent, Pesticides and weedicide, Pharmaceutical uses and Biogas production. By-product emanating from the processing could be useful for plant or as animal feed if properly processed. Custard apple seeds were crushed and grounded to the desired size. The crushed and grounded powder then mixed with Butane as a solvent in a two neck round bottom flask, which is connected with a vertical condenser. Heating of this mixture was carried out for around 3-4 hrs. and at temperature of 70oC. Solvent was

used in ratio of 15 ml/g of seeds powder. After distillation, condensate kept for settling for 2 hrs.[5]

Recovery by using Hexane solvent is 19% than the methanol solvent is 10.5%. This pesticide material can be made easily available for every farmer throughout India without taking much more effort. This raw material will be very cheap which minimizes the total cost of processing along with solvent recovery. Many factors like oil extraction efficiency, environmental impacts, and the renewability of solvents must be considered while selecting the ideal solvent. [13]

Annona squamosa seed ethyl acetate and hexane extracts exhibited direct mortality of both neonate larvae and third instar larvae besides producing strong anti-feedant action on surviving larvae resulting in reduction in growth and development. At 1000 ppm concentration, A. squamosa seed ethyl acetate extract caused 64.47 and 80% larval mortality on 10th and 15th day. Solvents hexane, ethyl acetate and methanol use for successive extraction in Soxhlet based on polarity. [15]

Recovery of oil by using hexane solvent is 19 % while using methanol as solvent is only 10.5%. 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. Number of white mealy bugs decreases day-by-day after spraying extract solution on affected area of plant due to presence of fatty acids in the oil. Fatty acid shows toxicity against the mealy bugs. [17]

Targeted Pest

- 1.White Mealybug
2. Adult Beetles
3. Larvae

4. Aphids
5. Head-lice and Fleas
6. Ant's Aphids and Diamond Black Moth Pupae

Raw Materials and Chemicals

1. Custard Apple Seed Powder
2. Methanol/Acetone

Apparatus

1. Simple Distillation Assembly
2. Round Bottom Flask/Beaker with heating mantle for extraction
3. Separating Funnel for separation of two phases
4. Soxhlet Apparatus
5. Digital Thermometer and Measuring Cylinder

Experimental Process Solvent Extraction with Methanol- Extraction with Methanol for 1:3 Feed To Solvent Ratio

1. Take 100 gm custard apple seed dried in oven or sunlight to remove the moisture.
2. Make powder of seed for increase yield of extraction.
3. As per literatures extracted oil act as biopesticide having B. P. range 190-195 °C.
4. Select solvent B.P. up to 100 °C so it can easily separate from seed oil.
5. Take cotton cloth or filter paper and keep seed powder in cloth or filter paper.
6. Gas chromatography or filter paper in Soxhlet apparatus contains seed powder.

7. Take 300 ml of the methanol as solvent in round bottom flask of Soxhlet.
8. The mixture was then heated at 60 °C - 65 °C (B.P. solvent) for 2-4 hrs.
9. After extraction removal of round bottom flask from Soxhlet apparatus.
10. Oil (B.P. 92-95 °C) to be separated from the solvent using simple distillation.
11. Separation of oil and solvent by simple distillation at temperature 60-65 °C.
12. Calculate % yield and % recovery of oil.

Extraction with Methanol for 1:4 Feed To Solvent Ratio

1. Take 100 gm custard apple seed dried in oven or sunlight to remove the moisture.
2. Make powder of seed for increase yield of extraction.
3. As per literatures extracted oil act as biopesticide having B. P. range 190-195 °C.
4. Select solvent B.P. up to 100 °C so it can easily separate from seed oil.
5. Take cotton cloth or filter paper and keep seed powder in cloth or filter paper.
6. Gas chromatography or filter paper in Soxhlet apparatus contains seed powder.
7. Take 400 ml of the methanol as solvent in round bottom flask of Soxhlet.
8. The mixture was then heated at 60 °C - 65 °C (B.P. solvent) for 2-4 hrs.

9. After extraction removal of round bottom flask from Soxhlet apparatus.

10. Oil (B.P. 92-95 °C) to be separated from the solvent using simple distillation.

11. Separation of oil and solvent by simple distillation at temperature 60-65 °C.

12. Calculate % yield and % recovery of oil.

Extraction with Methanol for 1:5 Feed To Solvent Ratio

1. Take 100 gm custard apple seed dried in oven or sunlight to remove the moisture.

2. Make powder of seed for increase yield of extraction.

3. As per literatures extracted oil act as biopesticide having B. P. range 190-195 °C.

4. Select solvent B.P. up to 100 °C so it can easily separate from seed oil.

5. Take cotton cloth or filter paper and keep seed powder in cloth or filter paper.

6. Gas chromatography or filter paper in Soxhlet apparatus contains seed powder.

7. Take 500 ml of the methanol as solvent in round bottom flask of Soxhlet.

8. The mixture was then heated at 60 °C - 65 °C (B.P. solvent) for 2-4 hrs.

9. After extraction removal of round bottom flask from Soxhlet apparatus.

10. Oil (B.P. 92-95 °C) to be separated from the solvent using simple distillation.

11. Separation of oil and solvent by simple distillation at temperature 60-65 °C.

12. Calculate % yield and % recovery of oil.

Characterization of Extracted Oil

1. Color - The color of the extracted lemongrass oil was dark brown.

2. Moisture Content

The moisture content of the extracted oil was determined by heating 5 g of the sample placed in a clean dish which had been previously oven dried at 105 °C for about 24 hr. in a thermosetting oven. The weights of the dish with its content were measured before and after heating and recorded.

$\% \text{ Moisture content} = [\text{Loss in weight} / \text{Weight of sample before drying}] * 100$

3. Viscosity

The viscosity of the oil produced measured using a digital viscometer. To carry out the viscosity measurement 12 mL of desert Oil was poured into a 50 mL beaker and a spindle with a number of 7 was immersed in oil until the level got to the mark on the spindle. It positions such that it would not touch the wall of the beaker.

4. Density of Oil

Density can calculated by taking known volume of oil in 100 ml of cylinder using following formula.

$$\text{Density} = \text{Mass} / \text{Volume}$$

5. Specific Gravity

An improvised specific gravity bottle washed and rinsed with acetone and dried. The bottle was filled

with water and its weight together with the content taken. The water then poured out and the bottle rinsed with acetone and dried. The oil was then poured into it and the weight of the content in addition to the bottle taken.

RESULTS AND DISCUSSION

Observations

We can select the both solvents methanol, Hexane and petroleum ether. All solvents have low B. P. which can easily separate from the oil after extraction process. In the observation we carried out the experiment by using the seed powder to solvent ratios like 1:3, 1: 4 and 1:5. Calculated the extraction yield or recovery of oil or pesticide after separation of solvent from oil by simple distillation process. Solvents to be use for extraction of pesticide from custard apple seed powder petroleum ether, methanol.

For calculation of recovery we consider 28 % of oil in seed which is maximum value as per literatures.

Sr. No.	Feed To Solvent Ratio	ml of Oil Extracted
01	1:3	21
02	1:4	24
03	1:5	25

% Recovery and % Yield of Custard Apple Seed Oil

% Yield of Custard Apple Seed Oil

% Yield = (Oil Extracted/ Seed Feed) * 100

For Feed to Solvent Ratio 1:3,

% Recovery = (Oil Extracted/ Seed Feed) * 100

$$= (21/100) * 100 = 21$$

% Yield with Feed to Solvent Ratio 1:3 = 21

2. For Feed to solvent ratio 1:4,

% Recovery = (Oil Extracted/ Seed Feed) * 100

$$= (23/100) * 100 = 23$$

% Yield with Feed to Solvent Ratio 1:4 = 24

3. For Feed to solvent ratio 1:5,

% Recovery = (Oil Extracted/ Seed Feed) * 100

$$= (25/100) * 100 = 25$$

% Yield with Feed to Solvent Ratio 1:5 = 25

% Recovery of Custard Apple Seed Oil

% Recovery = (Pesticide separated by distillation/ Pesticide in Feed) * 100

Seed contains 28 % Pesticide (OIL) = 100 * 0.28 = 28 gms of Pesticide in feed

1. For Seed Powder and Methanol Ratio 1:3

% Recovery = (Oil Recover by Distillation/ Max. Oil in Seed) * 100

$$= (21/28) * 100 = 75$$

2. For Seed Powder and Methanol Ratio 1:4

% Recovery = (Oil Recover by Distillation/ Max. Oil in Seed) * 100

$$= (23/28) * 100 = 82.31$$

3. For Seed Powder and Methanol Ratio 1:5

% Recovery = (Oil Recover by Distillation/ Max. Oil in Seed) * 100

$$= (25/28) * 100 = 89.28$$

Observation Table of % Recovery of Oil (BIO Pesticide)

Sr. No.	Feed to Solvent Ration	% Yield	% Recovery
01	1:2	21	75
02	1 :4	24	82.31
03	1:6	25	89.28

Table % Recovery and Yield of Bio Pesticide

Observation table shows the % Recovery of biopesticide produce from the custard apple seed powder. As the ration of feed to solvent increase the % recovery also increase. For 1:4 ration has highest recovery of biopesticide. Above 1:4 ratio increase the cost of solvent and negligible increase in recovery. Hence ratio for feed to solvent will be 1:4 as optimum ratio. As per experimental analysis petroleum ether and hexane have higher recovery of oil from the seed.

ECONOMICS OF BIOPESTICIDE

1. The natural pesticide produced from custard apple seed oil proves itself efficient.
2. It advantageous, cheap and safety to handle.
3. We can recover by using various solvent is available and can easily recover from solvent.
4. This pesticide material can make easily available for every former thought the India without taking much more efforts.

5. The raw material will be very cheap which minimizes the total cost of processing along with solvent recovery.
6. The bio Pesticide from seed oil is effective and ecofriendly.
7. It will help to reduce the environmental pollution air as well as soil.
8. Scope of bio Pesticide in India is high.
9. This will beneficial for farmers as well as producer.
10. Cost of production for custard apple biopesticide is low comparing with synthetic pesticide.

FUTURE SCOPE AND OPPORTUNITIES

1. As per report, consumption of bio pesticide in 2017-18 in all India consumption was 6560 tons which increase to 7505 tons in year.
2. India is the second one under agricultural land of 159.7 million of hectares hence there is the opportunities for the bio pesticide.
3. There was the pollution from problem due to the synthetic Pesticide which can be reduce by bio pesticide.
4. There are numbers of diseases for human as well as animal can be avoiding with the biopesticide uses.
5. Biopesticide will protect the earth life.
6. Past from years India was use natural medicines so the raw material can easily available in India for production of bio Pesticide or bio pesticide.
7. Some state like Uttaranchal and Sikkim have declared as an organic so will be wide scope for bio Pesticide.
8. Due to rich diversity for organic farming in India.

CONCLUSION

The natural pesticide produced from custard apple seed oil proves itself efficient which is cheap and less toxic. We can recover the pesticide from the seed by using various solvent is available in market. This biopesticide material can make easily available for every farmer thought the India without taking much more efforts. The raw material will be very cheap which minimizes the total cost of processing along with solvent recovery. This will be for alternative choice of synthetic. The process of mfg. is economical than other bio pesticide.

For extraction of oil from the custard apple seed we use Soxhlet extraction equipment. With help of Soxhlet apparatus yield of extraction will be increase. The bio Pesticide from seed oil is effective and ecofriendly. It will help to reduce the pollution air as well as soil. There are various processes are available to produce Pesticide from custard apple seed. Scope of bio Pesticide in India is high. This will be beneficial for farmers as well as producer. The % Recovery of biopesticide produce from the custard apple seed powder is more than 80 %. As the ratio of feed to solvent increase the % recovery also increase. For 1:5 ratio has highest recovery of biopesticide which up to 85%. Above 1:5 ratio increase the cost of solvent and negligible increase in recovery. Hence ratio for feed to solvent will be 1:5 as optimum ratio.

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