

Sitaphal Seed Oil: A Source of Natural Pesticide

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Abstract - In recent year the demand of food has been increased by increasing population. Our basic need is to be consume food from plants. But our plants are not safe because, lots of bugs and insects damage and destroy our plant. Solution on this problem is natural pesticide. Due to increases in the industrialization use of synthetic product has been increased. But they give adverse health effect and also damage our environment. Now, in this situation we need to use natural pesticide and they obtain from natural resources like as waste leaves, cow urine, and various extracted oil from leaves and seeds. In this paper we use method of extraction of oil from custard apple seeds. After extraction of oil purify and separation of solvent with the help of distillation. And finally, we manufacture the pesticide using purified oil with the help of emulsifier as Labolene soap.

tropical America. It is widely available in various parts of India, including Andhra Pradesh, Assam, Bihar, Karnataka, Maharashtra, Orissa, Tamil Nadu, and West Bengal. Custard apple seeds are toxic, bitter and can be used as pesticides and fish poison. Cancer treatment involve the use of seed pest. Custard apple seed have confirmed that the major active chemical constituents are annonaceous acetogenins and cyclopeptides. Seed have been shown to have strong anti-bacterial, anti-ovulatory, anti-inflammatory, anti-thyroidal and other properties. Due to acetogenins group of powerful respiratory inhibiting toxic component which is responsible for oil act as pesticide.

Custard apple seed oil contain following acids which shows antioxidant properties as shown in following Table (1)

Key Words: Oil Extraction, Distillation, Custard apple seed, Pesticide.

1.INTRODUCTION

Pesticide:

Pesticide as substances that we are applied to kill undesired organisms. In additional to helping to maintain soil fertility and boost agricultural yield, pesticides are essential for protecting crops from insect assault. In other term "Pesticide" refers to any substance used to prevent, eliminate, repel, attract or diminish pest organisms. Pesticide both natural and synthetic, natural pesticides are those pesticide which we use from ancient time. Peoples who are constantly exposed to pesticide during use they can benefit from using natural pesticides, which are less expensive and more secure. It is created from natural ingredients such as cow urine, waste leaves, seed oil and so on. It benefits soil fertility as well as biodegradable. Synthetic pesticide has become more popular in recent years. As agricultural productivity increases, soil fertility decreases. Bio control is the most effective method for dealing with chemical losses. Oil extracted from custard apple seed using various solvent like hexane, benzene, ethyl acetate etc. Further studies focused for the formulation, modification and determination of some possible properties of oil.

Custard Apple Seed:

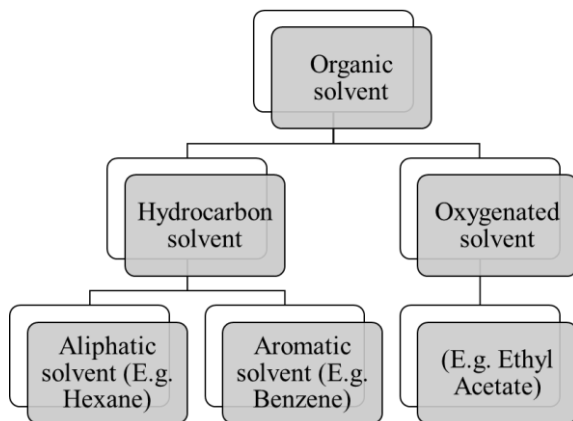
Annona squamosa (Custard apple), also known as "Sitaphal", is one of the most delicious fruits brought to India from

Fatty acid composition	Hexane (%)	Benzene (%)	Ethyl Acetate (%)
Palmitic	13.3	11.3	13.5
Palmitoleic	0.1	0.1	0.1
Stearic	11.1	11.7	11.1
Oleic	48.3	49.1	48.1
Linoleic	25.0	25.4	25.2
Linolenic	1.7	1.8	1.7
Arachidic	0.1	0.1	0.1
Behenic	0.2	0.3	0.2
Arachidonic	0.2	0.2	0.1
Lignoceric	0.1	0.1	0.1

Table (1) Fatty acid composition

Solvent Selection:

It is necessary to select a proper solvent for extraction. In this paper, we have carried out comparatively study of three different solvents. Which is economical for environment.



Cost of solvent:

Cost is one of the important factor while choosing the solvent. We have to choose the solvent which is less expensive and having more efficiency of extraction of oil.

2. Review of various methods of oil extraction

Cold pressing:

Cold pressing is a mechanical extraction process, also called as mechanical separation process. Cold pressing is an extraction method in that method we extracting oils from various sources including olives, fruits, seeds or groundnuts without any external heat and chemical solvents. Cold pressing process is carried out at low temperatures, typically below 120°F. It is also used in the production of fresh juices from fruits and vegetables.

Maceration:

Maceration extraction process is a simple and traditional method used to extract desired compounds from solid material using a liquid solvent. It involves soaking the solid material in the solvent for a certain period, allowing the solvent to desired and extract the components it is relatively straightforward and is commonly for the extraction of food and beverage industries

Percolation:

Percolation extraction process is a method used to extract desired compounds from solid material using a liquid solvent. It involves the flow of the solvent through the solid material. It is commonly used in various industries including pharmaceutical, food production.

Infusion:

Infusion is an extraction process involves extracting desired components from a solid material using a liquid medium. This technique is commonly used to extract flavor, aromas, and other natural ingredients. This process may vary

depending on the materials and components involves as well as the desired outcome of th extraction.

Tincture:

Tincture is an extraction process involves using a solvent, typically alcohol, to extract the active compounds from plant material. Tinctures are concentrated liquid extract that are commonly used in medicine, pharmaceutical and other applications.

Solvent extraction:

Solvent extraction is the process in which a compound transfers from one solvent to another owing to the difference in solubility or distribution coefficient between thus two immiscible (or slightly soluble) solvents.

3. Methods used for extraction

Oil Extraction (Soxhlet apparatus method):

Raw materials and apparatus:

Round bottom flasks, condenser, thermometer, heating mental, beaker (500ml), measuring cylinder, weighing balance, seed crusher, seed powder, filter paper, hexane, benzene, ethyl acetate.



Custard apple seeds Custard seed power



Solvents

Procedure:

- Take the custard apple seeds wash and dry and crushed them.

- Take 40 g of seed powder.
- Take 300 ml solvent in round bottom flask.
- Insert it into Soxhlet Apparatus.
- Set the circular round bottom flask on the heating source.
- Round bottom flask should be connected at the bottom with the Soxhlet apparatus above it and the condenser at the top.
- For the starting extraction process Firstly, heat the round bottom flask according to the boiling point of respective solvents.
- When heating process began, vapours to be generated and moved upward, and finally condensed.
- The condensed solvent is drip in to the Soxhlet apparatus.
- After filling the siphon tube with solution (solvent) coming in to the round bottom flask.
- This extraction process is continuously work for 2 – 3 hrs after that we remove the mixture and filtered.
 - This filtered solution is use for further process.

- Then flask is attached with condenser.
- After that it is heat up to solvent boiling point.
- After solution is heated, vapours are formed and thus vapours pass through the cold-water condenser.
- Condensed vapour is our solvent which is collected in the beaker and remaining solution in the round bottom flask is an oil.



Fig. Experimental setup for simple distillation (Purify oil)

Production of natural pesticide from oil:

Raw material & Apparatus:

Custard apple seeds oil, Labolene soap, water, measuring flask, spray gun.

Procedure:

- Firstly, take an oil sample in various quantity.
- Mix the specific quantity of the water with specific sample of oil and Labolene soap.
- Then well mixed the mixture of oil and water.
- After that mixture is take into the spray gun.
- This mixture is spray on a plant as a pesticide which are harmful for the bugs and insects.
- We observe the pesticide sprayed plant for few days.

.4. Calculations

Analyse the oil properties by using following formulae

$$\text{Density} = \frac{\text{Mass of oil}}{\text{Volume of oil}}$$

$$\text{Yeild of oil in \%} = \frac{\text{Mass of oil}}{\text{Mass of seed}} \times 100$$

$$\% \text{ of solvent recovery} = \frac{\text{Solvent recoverd by distillation}}{\text{Solvent use for extraction}} \times 100$$



Fig. Experimental setup for extraction of oil

Simple distillation

- Firstly, filtered mixture is added in round bottom flask.

5. Result and discussion

Sample	Hexane	Benzene	Ethyl acetate
Colour	Yellow wish light brown	Dark brown	Yellow wish dark brown
Volume	8.2 ml	8.5 ml	9.5 ml
Weight	8 gm	8.5 gm	9.2 gm
Density	0.686 gm/ml	0.929 gm/ml	0.9321 gm/ml
Acid value	14.61 mg/gm	8.98 mg/gm	11.03 mg/gm
pH	7.67	6.78	4.20
Yield of oil (%)	20	21.25	23
Solvent recovery (%)	37	50	56.67

Table (2) Results of oils

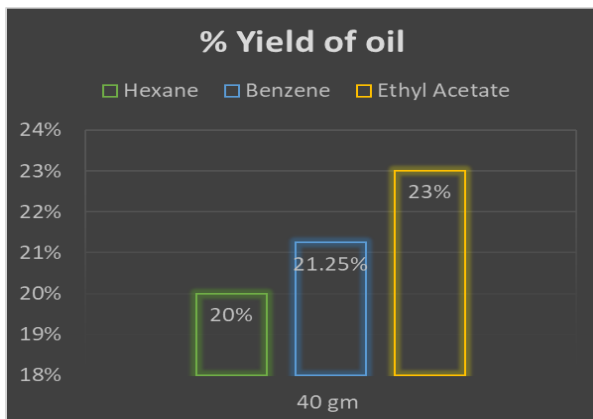


Fig. Graph of % yield of oil

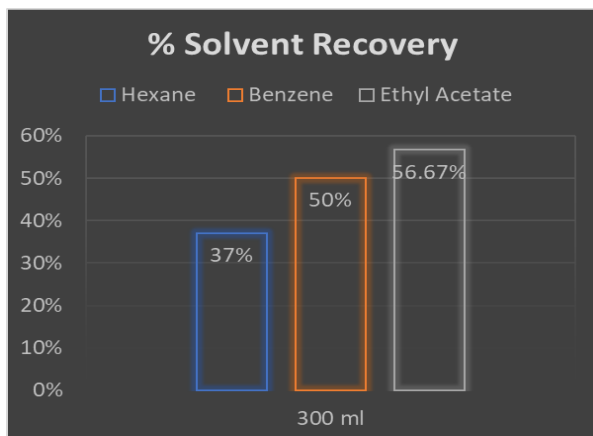


Fig. Graph of % solvent recovery

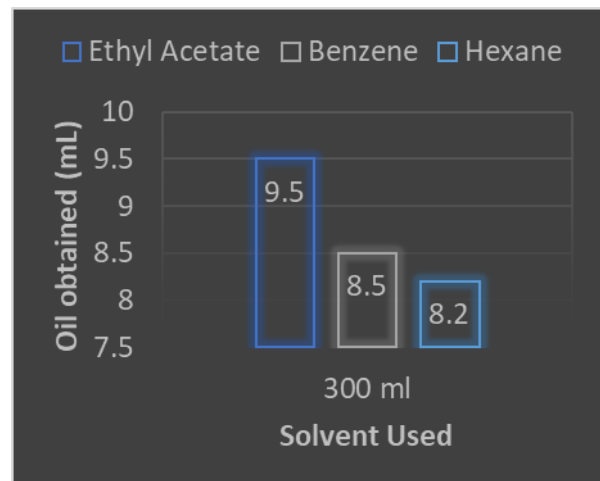


Fig. Extraction of oil from custard apple seed using hexane, benzene & ethyl acetate

Chemical properties of pesticide

Fatty Acid	Density	M.P	B.P	Appearance
Palmitic Acid	0.853	64	351	White semi solid
Palmitoleic Acid	0.894	-0.1	162	White solid
Steric Acid	0.941	69.3	361	Waxy solid
Oleic Acid	0.895	13.4	360	Colourless
Linoleic Acid	0.900	-5	230	Colourless
Linolenic Acid	0.914	-16.5	443	Colourless

Table (3) Fatty acid composition of custard apple seed oil by GLC

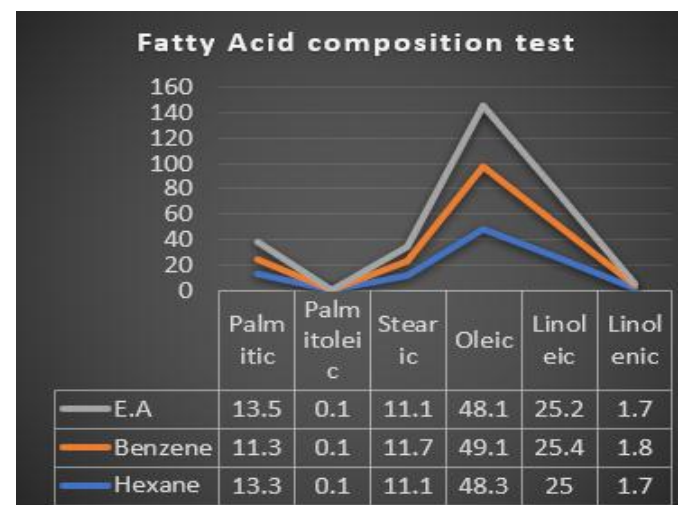


Fig. Graph of Fatty acid composition

After applying pesticide on a plant. We observe the effect of the pesticide on plant for 5 days. In these days we learn that our pesticide is effect on plant is slowly. For destroy the bugs and insects we need 5 days. Those are the result of that 5 days.

Sr. No	No. of Days	No. of white mealy bugs
1	0	45
2	1	38
3	2	24
4	3	18
5	4	8
6	5	5

Table (4) Effect of pesticide on mealy bugs

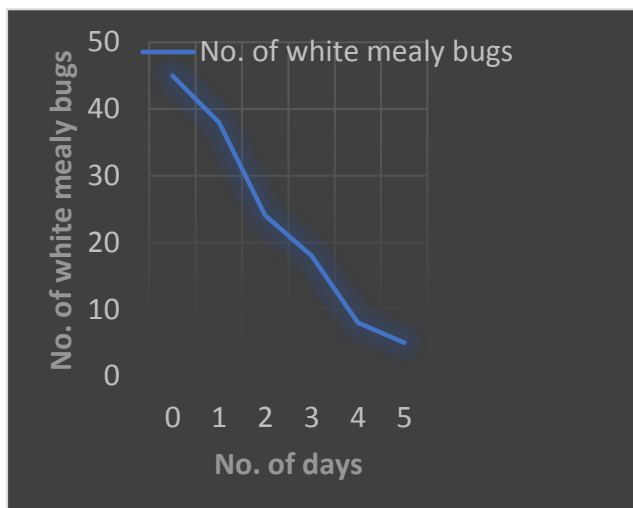


Fig. Graph Effect of pesticides on white mealy bugs

6. Conclusion

Natural pesticide made from custard apple seed oil has shown to be effective, affordable, and non-toxic. By using different solvents that are sold in the market, we are able to recover the pesticide from the seed. Without much additional work, this natural pesticide material can be made easily accessible to all former citizens of India. The cost of the raw material will be extremely low, which will reduce the overall processing and solvent recovery costs. This will be for a different synthetic option. Manufacturing is more affordable than other natural pesticides.

We can conclude that custard apple oil derived from custard apple seed is cost effective and easy to manage. It recovered to about 63 – 65 % while using ethyl acetate as a solvent. Ethyl acetate oil is recovered during extraction is around 25 – 29 %. As well as if we use benzene as a solvent than we get

oil yield is about 20 – 23 % and solvent recovery of benzene is 61 – 64 %. This raw material will be very inexpensive, lowering the overall processing and solvent recovery cost.

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