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### EXTRACTION OF OIL FROM CUSTARD APPLE SEEDS

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#### ABSTRACT

*All over the world, due to growing vegetable oil demand, much interest currently being focused on possibilities on exploring some newer and underutilizes plant resources for the production of oil. For this reason many fruit seeds oils as newer sources have been evaluated for scientific industrial or food uses. 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 .The by-product emanating from the processing could be useful for plant or as animal feed if properly processed.*

**Keywords:** Custard apple seeds; acetogenin; Insect Repellent; Pesticides.

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#### INTRODUCTION

Custard apple (*Annona Squamosa*) is a tropical branched tree or shrub, indigenous to the Amazon rainforest. It grows around 3 meters to 8 meters in length. The conical fruit, with a purple knobby skin, is very sweet and eaten fresh or can be used for milkshakes, ice- creams and even sherbets. The fruit is juicy and creamy-white and looks like a giant raspberry. The plant is native to both America and India. It is popularly known as “Sharifa” in India. Custard apple tree does not require much care and will do well if watered regularly, along with enough light for it to grow. It grows well in hot dry climates and adjusts in any kind of soil, a job that is a little difficult for other plants in its family. If you have sowed the plant’s seeds, it will bear fruits in 2 to 3 years. The fruits are generally conical or round in shape and will take around 3 to 4 months to ripen. The leaves are thin and oblong, while the flowers are greenish –yellow. It is very sweet and eaten fresh or can be used for milkshakes, ice- creams and even sherbets. The plant is native to both America and India. It is popularly known as “Sharifa” in India. The plant does not required too much care with along with enough light it will grow. It grow in hot dry climates and adjust all types of soil which is difficult to some other plants to its family.<sup>(1)</sup>



**Fig1:** Custard Apple Seeds

The seeds are bitter, poisonous, serve as fish poison and insecticides. The custard seed were found to have insecticidal properties against fruit flies and lies. Seed pest is used in cancer treatments. Most of the acetogenins were isolated from the seeds of *Annona Squamosa* (custard apple) and it exhibited remarkable cytotoxic activities and as an abortifacient.<sup>(2)</sup>

Sugar-apple or sweetsop or Custard apple is the fruit of *Annona squamosa*, the most widely grown species of *Annona* and a native of the tropical Americas and West Indies. The Spanish traders of Manila galleons brought it to Asia

where its old Mexican name ate may still be found in Bengali ata, Nepalese aati, Sinhalese mati anoda, Burmese awzar thee, and that is in the Philippines. It is also known as custard apple in India, (mainly *Annona reticulata*) in the Philippines and in Australia.[1] The name is also used in Portuguese as ata.<sup>(3)</sup>

The fruit is spherical through conical, 5–10 cm (2.0–3.9 in) in diameter and 6–10 cm (2.4–3.9 in) long, and weighing 100–240 g (3.5–8.5 oz), with a thick rind composed of knobby segments. The color is typically pale green through blue-green, with a deep pink blush in certain varieties, and typically has a bloom. It is unique among *Annona* fruits in being segmented, and the segments tend to separate when ripe, exposing the interior.<sup>(4)</sup>

The flesh is fragrant and sweet, creamy white through light yellow, and resembles and tastes like custard. It is found adhering to 13-to-16-millimetre-long (0.51 to 0.63 in) seeds forming individual segments arranged in a single layer around a conical core. It is soft, slightly grainy, and slippery. The hard, shiny seeds may number 20–40 or more per fruit and have a brown to black coat, although varieties exist that are almost seedless.<sup>(2)</sup>

There are also new varieties being developed in Taiwan. The atemoya or "pineapple sugar-apple," a hybrid between the sugar-apple and the cherimoya, is popular in Taiwan, although it was first developed in the US in 1908. The fruit is similar in sweetness to the sugar-apple but has a very different taste. As its name suggests, it tastes like pineapple. The arrangement of seeds is in spaced rows, with the fruit's flesh filling most of the fruit and making grooves for the seeds, instead of the flesh's occurring only around seeds.<sup>(3)</sup>

## 1.2 Constituents & Specifications

Custard apple oil has various chemical compounds that include  $\alpha$ - and  $\beta$ -pinene, E-ocimene, germacrene-D, methyl and ethyl butanoate and methyl hexanoate.<sup>(5)</sup>

**Properties:** It is anti-rheumatic, purgative, astrigent, emmenagogue, febrifuge, tonic, cold remedy, digestive or to clarify the urine.<sup>(5)</sup>

## Benefits & Uses

- It is used in flavorings the salad, dishes, ice cream or blended with milk to make a cool beverages.
  - It is used in the manufacture of soap and can be detoxified by an alkali treatment and used for edible purposes.
- It is effective pesticides against head lice, southern army worms and pea aphids.<sup>(5)</sup>

## 1.1 EXTRACTION

It is a technique of removing one component from the solid or liquid by means of a liquid solvent fall into two

categories, the first of is called as leaching or solid extraction and the second as liquid extraction.

### 1.1.1 SOLID PHASE EXTRACTION (SPE)

Solid phase extraction is sample preparation process by which compounds that are dissolved or suspended in a liquid mixture are separated from other compounds in the mixture according to their physical and chemical properties.

### 1.1.2 LIQUID-LIQUID EXTRACTION (LLE)

Liquid-liquid extraction known as solvent extraction and partitioning is a method to separate compounds based on their relative solubility in two different immiscible liquids, usually water and an organic solvent. It is an extraction of a substance from one liquid into another liquid phase.

### 1.1.3 Methods of extraction of oil

- 1) Cold Pressing
- 2) Solvent extraction
- 3) Steam Distillation
- 4) Maceration
- 5) Percolation
- 6) Tincture
- 7) Infusion

#### 1) Cold Pressing

This method is used to extract the oil from citrus rinds such as orange, lemon, grapefruit and bergamot. This method involve the simple pressing of the rind at about 120° F to extract the oil. The rinds are separated from the fruit, are ground or chopped and are then pressed. The result of it is watery mixture of oil and ethanol.

Liquid which we separate given time little alteration from the oil original state occurs this citrus oil retain their bright, fresh, uplifting, aroma like that of smelling wonder cooling ripe fruit. The drawback of this method is oil extracted using has short shelf life.

#### 2) Steam distillation

Steam distillation is a special type of distillation or a separation process for temperature sensitive material like oils, resins, and hydrocarbons etc. which are insoluble in water and may compose at their boiling point. The fundamental nature of steam distillation is that it enables a compound or a mixture of compound to be distilled at a temperature contain substance with substantially below that of the boiling point of the individual constituents. Essential 15 oils contain substance with boiling point up to 200°C. Or higher temperature. in the presence of steam or boiling water, however the substances are volatilizes at a temperature 10°C very close to atmospheric pressure.

A number of factors determine the final quality of a steam distilled essential oil. Apart from plant material, most important are time, temperature and pressure and quality of the distillation equipments. Essential oils are very complex products. Each is made up of many, sometimes hundreds, of distinct molecules which comes together to form the oils aroma and therapeutic properties. So as of these molecules are fairly delicate structures which can be altered or destroyed by

adverse environmental conditions so much like a fine metal is more flavorful that longer distillation times may give more complete oil. It is also possible however, that longer distillation times may lead to the accumulation of more artefacts than normal. This may have a curious effect of appearing to improving the odor, as sometimes when material that have a large number of components are sniffed, the perception is often of slightly increased sophisticated, added fullness and character, and possibly, and extra pleasantness.

### 3) Maceration

The simple widely used procedure involved leaving the pulverized plant to soak in suitable solvents in closed container. Simple maceration is performed at room temperature by mixing the ground grub with the solvents and leaving the mixture several days with occasional shaking or starring. The extract is then repeated from the plant particles by stirring. The process is repeated for once or twice with fresh solvent. Finally the last residue is pressed out of the plant particles using the mechanical press or centrifuge. Kinetic maceration differs from simple one by continuous stirring. The method is suitable for both initial and bulk extraction.

### 4) Percolation

The powdered plant material is soaked initially in a solvent in a percolator. Additional solvent is then poured on the top of the plant material and allow to percolate slowly out of the bottom percolators. Additional filtration of the extract is not required because there is a filter at the percolator.

### 5) Tincture

A tincture is typically and alcoholic extract of plant or animal material or a solution of such or of a low volatility substance. To qualify as an alcoholic tincture the extract, the extract should have ethanol percentage of at least. Sometimes an alcohol concentration higher as 90 is used in tincture. In alcoholic tincture are made with various ethanol concentration the most common.

### 6) Infusion

It is the process of extracting chemical; compound or flavor from plant material in a solvent such as water, oil or alcohol by allowing the material to remain suspended in the solvent our times. An infusion is also the name for the resultant liquid. The process of infusion is distinct from decoction, which involve boiling plant material or percolation, in which the after passes through the material.

### 7) Solvent Extraction

In the solvent extraction method oil recovery and extracting unit is loaded with perforated trays of oil plant material and repeatedly wash with the solvent. A hydrocarbon solvent is used for extraction. All the extractable material from the plant is dissolve in the solvent. This include highly volatile aroma molecule as well as non-aroma waxes and pigment. The extract is distilled to recover the solvent for future used. The waxy mass that remains is known as the concrete. The concentrate concrete is further processed to remove the waxy

material which diluted pure oil. To prepare the absolute from the concrete the waxy concrete is warm and stirred with alcohol (Ethanol). During the heating and stirring process the concrete breaks up into min globules. Since the aroma molecule are more soluble in alcohol than the waxes and efficient separation of two results. This is not consider as the best method to extraction as the solvent can leave small amount of residue behind which cooled cause algae and affect the immune system.

## 1.2 Types of solvents

Extraction process involves the extraction of solute into inert non reacting hydrocarbons and substituted hydrocarbons and is relatively free of complexities. To show the influence of diluents on the extraction, two factors need to be accounted: (a) partial dissociation of the acids in aqueous phase and (b) dimerization in the hydrocarbon phase. Another important parameter particularly in carbon bonded oxygen donor solvents is the water of hydration. Due to the high binding attraction of acid with the water molecules, the requirement of solvent molecules is also high so that they can compete with the water molecules that hydrate the acid at the interface. There are number of ways by which solvents for extraction can be classified. On the basis of molecular structure, they are classified as :<sup>(9)</sup>

#### Polar protic solvents

A polar protic molecule consists of a polar group OH and a non-polar tail.

#### Dipolar aprotic solvents

Dipolar aprotic molecules possess a large bond dipole moment (a measure of polarity of a molecule chemical bond). They do not contain OH group.

#### Non-polar solvents

Electric charge in the molecules of non-polar solvents is evenly distributed; therefore the molecules have low dielectric constant. Non-polar solvents are hydrophobic (immiscible with water). Non-polar solvents are lipophilic as they dissolve non-polar substances such as oils, fats, greases. On the basis of nature, solvents are classified as:

#### Inorganic solvents

The most popular inorganic (not containing carbon) solvents are water (H<sub>2</sub>O) and aqueous solutions containing special additives (surfactants, detergents, pH buffers and inhibitors). Other inorganic solvents are liquid anhydrous ammonia (NH<sub>3</sub>), concentrated sulfuric acid (H<sub>2</sub>SO<sub>4</sub>), sulfuryl chloride fluoride (SO<sub>2</sub>ClF).

#### Organic solvents

These are further subdivided into two types:

#### Oxygenated solvents

Oxygenated solvents are organic solvent, molecules of which contain oxygen. Oxygenated solvents are widely used in paints, inks, pharmaceuticals, fragrance sectors,

adhesives, cosmetics, detergents, food industries. Examples of oxygenated solvents are alcohols, glycol ethers, methyl acetate, ethyl acetate, ketones, esters, and glycol esters.

### Hydrocarbon solvents

Molecules of hydrocarbon solvents consist only of hydrogen and carbon atoms. They are classified as:

#### i) Aliphatic solvents

Aliphatic solvents are having straight chain structure. Examples include hexane, kerosene, heptane etc.

#### ii) Aromatic solvents

Molecules of pure aromatic solvents have benzene ring structure. Examples of pure aromatic solvents are benzene, toluene and xylene.

#### iii) Halogenated solvents

Halogenated solvent is an organic solvent, molecules of which contain halogenic atoms: chlorine (Cl), fluorine (F), bromine (Br) or iodine (I).

#### iv) Natural solvents

There are solvents which are obtained from natural products like sunflower seeds (sunflower oil), coconut (coconut oil) etc.

## MATERIALS AND METHODS

### 3.1 MATERIALS

- A. Two necked round bottom flask ( Verity traders, Amravati)
- B. Condenser (Chemical engg. Dept. Ytl)
- C. Heating mantle (Chemical engg. Dept. Ytl)
- D. Thermometer (Chemical engg. Dept. Ytl)
- E. Beaker 500 ml (Chemical engg. Dept. Ytl)
- F. Measuring cylinder (Chemical engg. Dept. Ytl)
- G. Weighing Balance (Chemical engg. Dept. Ytl)
- H. Seed Crusher (Chemical engg. Dept. Ytl)
- I. Oil Seed Sample ( Obtain from custard apple)
- J. Solvents ( Butanol , Benzene ) ( Verity traders, Amt)

### 3.2 METHOD

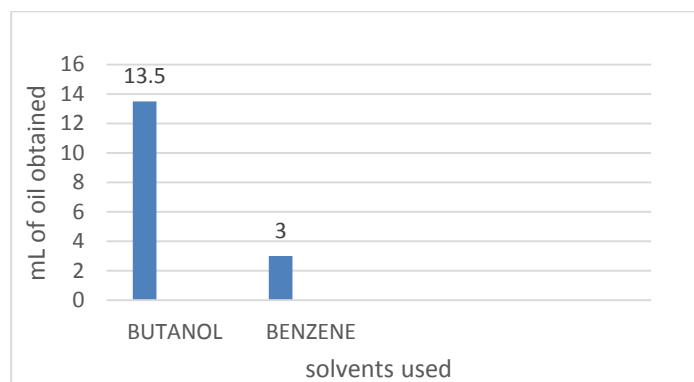
Custard apple seeds were crushed and grounded to the desired size. The crushed and grounded powder was then mixed with the Butane as a solvent in a two neck round bottom flask, which is connected with a vertical condenser. Heating of this mixture was carried out for around 3-4 hrs. and at a temperature of 70°C. The solvent was used in ratio of 15 ml/g of seeds powder. After distillation, condensate was kept for settling for around 2 hrs. The upper layer was taken as the desired product, oil. The similar procedure was repeated for benzene as a solvent.

### EXPERIMENTAL SETUP:

**Fig. 2:** Experimental setup

## RESULT AND DISCUSSION

After the extraction of oil we analyzed the oil sample by the quantity of oil extracted from Butanol and Benzene. The calculations and the result interpreted in table no 1.



**Fig.3:** Extraction of Oil from Custard Apple Seed using Butanol and Benzene

**Table no. 1:**

Solvent	Wt. of Sample (gm.)	Volume of Solution (ml)	Volume of oil Extracted (ml)

Butanol	21	250	13.5
Benzene	21	250	3

From fig. 3 we observe that the Butanol extract the more quantity of oil than the Benzene.

Because Alcohols are protic solvents and hydrogen bond donors which make them good anion solvators because it contain hydrogen atoms bound to Electronegative element O (-O-H). Their relative permittivity ( $\epsilon$ ) and *ET* value are large, indicating them to be strongly polar.

## CONCLUSION

The study on extraction of oil from custard apple seeds using Butanol and benzene was carried out and following conclusion were made:

1. Butanol gives more efficiency than the Benzene.

Our objectives are fulfilled because we manage to extract the oil from the custard apple seeds by used by various solvents. From the experiment we know to use of solvents, there properties function.as well as know about the extraction method. So that we can determine oil content from any sample by ourselves. It may also enjoy application as Insect Repellent, Pesticides and weedicide, Pharmaceutical uses and Bio production. The by-product emanating from the processing could be useful for plant or as animal feed if properly process.

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