

Manufacturing of Natural Pesticide from Custard Apple Seeds

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Abstract— Pesticide is a substance which helps to kill the bugs and insects and helps to maintain the crop yield. There basically two types of pesticides are one is natural and second is synthetic. Due to industrialization and easily availability synthetic pesticides used more often. It affects the soil fertility. There are many options are available for natural pesticides. In this paper we will study about manufacturing of natural pesticide from custard apple seed. Custard apple seeds shows antioxidant properties. The manufacturing process based on distillation in which solvents are used acetone and hexane.

Index Terms: Custard apple seed, hexane, distillation, acetone.

I. INTRODUCTION

Pesticide:

Pesticide plays vital role to protect the crops from bugs attack, maintain the soil fertility as well as helps to increase the yield of crops. Pesticide also some types which is are natural and synthetic. Natural pesticide is those who are made up from natural materials like cow urine, waste leaves, seeds oil etc. It is beneficial to maintain the soil fertility as well as biodegradable and main effect is pesticide is more effective on killing bugs as compare to synthetic pesticide. It is less costly as compared to synthetic pesticide. Synthetic pesticide is more often used in recent years. It decreases soil fertility as crop yield also decreases. Organic agriculture is a rapidly growing sector of the agricultural industry. Modern agriculturists are looking for insecticides and pesticides with less non-target effects and residue concerns. According to WHO research, 80 % of people in poor nations rely only on traditional medicine for their basic health care needs, including the use of plant-based extracts in the majority of cases (WHO, 2000). Bio-control is the most effective method for dealing with chemical losses. Oil is

extracted from custard apple seeds using a different solvent and utilized as a bio pesticide to control pests.

Custard apple seeds:

Custard apple seeds are bitter, poisonous, serve as fish poison and insecticides. The custard apple seed were found to have insecticidal properties against fruit flies and lies. Seed pest is used in cancer treatments. Most of the acerogenins were isolated from the seeds of Annona Squamosa (custard apple) and it exhibited remarkable cytotoxic activities and as an abortifacient. Custard apple seeds is anti-rheumatic, purgative, astringent, emmenagogue, febrifuge, tonic, cold remedy, it is effective pesticides against head lice, southern army worms and pea aphids.

Custard apple seed oil contains three acids which shows antioxidant properties are

1. Palmitic acid
2. Stearic acid
3. Lauric acid

Fatty acid composition	Weight %
Lauric acid	0.08
Palmitic acid	17.79
Stearic acid	4.29
Oleic acid	39.72
Linoleic acid	29.13
Linolenic acid	1.37
Arachidonic acid	1.06
Behenic acid	2.01

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Solvent Selection:

Maximum efficiency of solvent to extract the oil:

It is the very important factor while choosing the solvent for extraction. In above extraction we can use many solvents like NaOH, Pyridine DMA etc. We have to choose the solvent which can give maximum extraction of oil which is desired.

Cost of solvent:

It is also major factor while selecting the solvent. Many Solvents are costly and have maximum efficiency of extraction of oil. But due to high cost we cannot select the solvent. We have to choose the solvent which is less costly and high efficiency of extraction of oil. On the basis of above two parameters, we have chosen 2 solvents:

- a. Acetone
- b. Hexane

II. REVIEW OF DIFFERENT METHODS OF EXTRACTION

Cold Pressing

To extract the oil, simply crush the rind at roughly 120°F for a few minutes. The rinds of the fruit are removed, crushed or diced, and then pressed. It produces a fluid mixture of oil and ethanol as a consequence. Citrus oil retains its bright, fresh, uplifting perfume like that of smelling amazing cooling ripe fruit after being separated for a period of time. The disadvantage of this process is that the oil extracted has a short shelf life.

Steam distillation:

Steam distillation is a separation method that involves distilling water with other volatile and non-volatile substances. The volatiles' vapour is carried to a condenser by steam from boiling water; both are cooled and return to a liquid or solid form, while the non-volatile leftovers stay in the boiling container. If the volatiles are liquids that are not miscible with water, they will form a distinct phase after condensation, allowing them to be separated by decantation or a separatory funnel. While the distillation is taking place, a Clevenger apparatus can be employed to return the condensed water to the

boiling flask. Alternatively, fractional distillation or another separation technique can be used to process the condensed mixture.

Maceration:

The extensively used method required soaking the pulverized plant in appropriate solvents in a closed container.

At room temperature, simple maceration is done by mixing the ground grub with the solvents and allowing the mixture for several days, shaking or stirring occasionally. Stirring is used to extract the extract from the plant particles again. At least two times, the process is repeated with a new batch of solvent. Finally, using a mechanical press or centrifuge, the remaining residue is forced out of the plant component ices. Continuous stirring distinguishes kinetic maceration from simple maceration. Both initial and bulk extraction can be done with this approach.

Percolation:

In a percolator, the powdered plant material is first soaked in a solvent.

After that, more solvent is poured on top of the plant material and allowed to gently percolate out of the bottom percolators. Because the extract is filtered at the percolator, no additional filtration is necessary.

Tincture:

A tincture is an alcoholic extract of plant or animal material, or a solution of such, or a compound with a low volatility. To be classified as an alcoholic tincture, the extract must contain at least 10% ethanol. In tincture, alcohol concentrations as high as 90 percent are sometimes utilised. The most popular type of alcoholic tincture is created with varied ethanol concentrations.

Infusion

Infusion is the technique of extracting a 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 for an extended period of time. The liquid that results is known as an infusion. Infusion differs from decoction, which involves boiling plant material, and percolation, which involves passing the after through the material.

Solvent extraction

It is a method of separating chemicals based on their relative solubilities. This procedure entails the use of a solvent, which is a liquid capable of dissolving another chemical. Solvent extraction is utilized in a variety of sectors, including perfume and vegetable oil production. It's also widely utilized in the refining of petrochemicals. Hazardous pollutants are separated from sludge and sediments via solvent extraction. This is especially advantageous for hazardous waste generators because solvent extraction minimizes the amount of hazardous waste that needs to be treated.

III. METHOD CHOSEN FOR EXTRACTION.

Soxhlet process:

Raw Materials & apparatus:

Two necked round bottom flasks, Condenser, heating mantle, thermometer, Beaker 500 ml, measuring cylinder, Weighing Balance, Seed Crusher, Oil Seed Sample, hexane, acetone.



Custard apple seeds Custard apple seed powder



Hexane

Acetone

Process:

1. Take the custard apple seeds wash them dry them and crushed them.
2. Take 20 g of seed powder.
3. Take 300 ml solvent in round bottom flask.
4. Insert it into Soxhlet Apparatus.
5. Place Round bottom flask on heating mantle

6. Connect Round Bottom Flask at bottom with Soxhlet Apparatus above it and Condenser at the top
7. Heat the round bottom flask using heating mantle according to boiling point of respective solvent.
8. As soon as heating starts the vapours formed move upwards and getting condensed.
9. The solvent is filled inside the apparatus until solution in siphon tube reaches its peak point.
10. After crossing peak point the solution gets emptied and is collected in round bottom flask.
11. Filling of Soxhlet apparatus and getting drained is allowed to happen multiple times (cycles) till the solution in siphon tube gets transparent.
12. The solution is filtered.
13. The collected solution is distilled (using simple distillation) and concentrate is collected.
14. Solvent required 15 ml for each 1 g of powder.



Experimental setup for extraction of oil

Simple distillation:

1. First mixture of oil is added in flask after that it is heated upto solvents boiling point.
2. The flask is attached to condenser
3. After the vapours is formed then passing cold water through condenser the solvent is collected in beaker.

4. The oil is collected in round bottom flask.

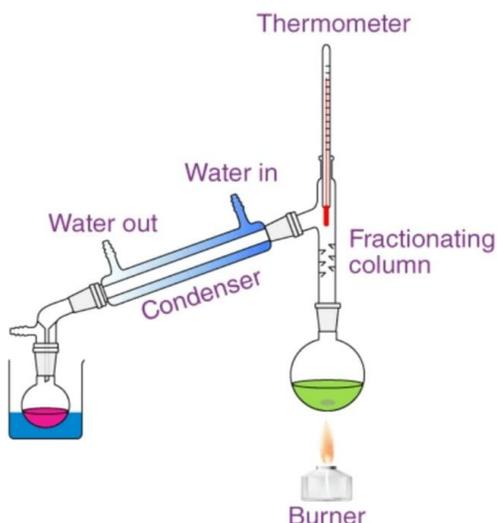


Image taken from <https://byjus.com/chemistry/distillation/>

Manufacturing of natural pesticide from oil:

Raw materials & Apparatus:

Lanoline soap, water, spray gun, custard apple seeds oil, beaker, measuring flask.

Procedure:

1. First, we will take the sample of oil at different concentration.
2. After that we will mix the oil with 6 parts of lanoline soap and 94 parts of water.
3. After that it transfer to spray gun.
4. After that we will spray on plant which are affected by mealy bugs.

Merits and Demerits

Merits:

1. It is Simple to design.
2. It have production process continuity.
3. It is easy to monitor the process.

Demerits:

1. Evaporation temperature plays vital role on the quality of the final product.
2. Solvent ratio is important.

IV.CALCULATIONS:

$$density = \frac{mass\ of\ oil}{volume\ of\ oil}$$

$$Acid\ value = \frac{56 \times V \times N}{W}$$

Where,

V= ml of KOH required

N= Normality of KOH

W= Weight of oil taken

$$\% \text{ yield of oil} = \frac{mass\ of\ oil}{mass\ of\ seed} \times 100$$

$$\% \text{ Solvent recovery} = \frac{volume\ of\ solvent\ recovered}{volume\ of\ solvent\ taken} \times 100$$

IV. RESULT

Sample	1 (Hexane Solvent)	2 (Hexane Solvent)	3 (Acetone Solvent)	4 (Acetone Solvent)
Volume (ml)	3.8	4	2.4	3
Weight (g)	3.7	3.87	2	2.5
Density (g/ml)	0.9669	0.9669	0.835	0.835
Acid value (mg of KOH/ gm of oil)	1.17	1.05	0.85	0.87
pH	6.4	6.6	6.8	6.9
Color	Pale Yellow	Pale Yellow	Pale Yellow	Pale yellow
% Yield of Oil	18.5%	19.35%	12.5%	10%
% Solvent recovery	80%	85%	55%	60%



Oil sample of hexane solvent Oil sample of acetone solvent

V. CONCLUSION

We can conclude that the natural pesticide derived from custard apple seed oil is effective, cost-effective, and easy to manage. It recovers to about 19- 20% while using hexane as a solvent. If we use

acetone as a solvent then we get oil yield is about 12-15 % yield of oil. Hexane recovered during extraction is around 80-85% as well as acetone recovered during extraction is around 55-60%. Without putting forth a lot of work, this pesticide substance may be made easily available to everyone in India. This raw material will be very inexpensive, lowering the overall processing and solvent recovery costs.

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