Determination of Fatty Acid Content of Rambutan (Nephelium lappaceum L.) Seed

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Abstract - *This study was conducted to determine the content of fatty acid in the rambutan seed extract. The fatty acid content of the rambutan seed extract were tested using Saponification Test, Halogenation Test and Von Baeyers Test. Based on the saponification test, there was formation of suds after heating the extract with Sodium Hydroxide (NaOH). Halogenation Test resulted to the decolorization of bromine water when added to the rambutan seed extract, while addition of Von Baeyers reagent cause the Potassium Permanganate (KMnO4) to fade in color. It was concluded from the results that rambutan seed contains triglycerides as revealed by the formation of suds in the saponification test and the presence of unsaturated fatty acids ware revealed in the decolorization of bromine water and fading of KMnO4 in the halogenation test and Von Baeyers test, respectively. Based on the results of this study, it is recommended that further analysis of the components of rambutan seed extract be made to look for other possible potentials of this plant.*

Keywords*: Nephelium lappaceum, Fatty Acid, Saponification, Von Baeyer's Test, Halogenation Test, Lipids*

INTRODUCTION

Rambutan (*Nephelium lappaceum L.*) as an exotic fruit, is one of the seasonal fruits grown in Philippines. It is widely cultivated in most of the tropical countries of Southeast Asia with a plentiful supply of water. The fruit is sensitive to soil and climatic condition. Rambutan is an evergreen, rugged tree, developing to a tallness of 20 meters, with straight limited trunks (to 60 cm, or 2 ft, wide) with a thick, low, round and spreading crown. Leaves are pinnately compound, 15 to 40 centimeters in length, with 3 to 8 pamphlets. The pamphlets are elliptic, 7.5 to 20 centimeters in length, and 3.5 to 8 centimeters wide. Blooms are greenish white, fragrant, little, without petals, and borne on axillary panicles. Organic product is oval, 4 to 5 centimeters since quite a while ago, red to yellow, secured with thick, coarse hairs or delicate spines. Mash is eatable, white, hazy, translucent, succulent and sweet. The single seed is glossy brown, 1–1.3 cm, with a white basal scar. Rambutan seed can also cooked and eaten [1].

There is a growing interest in rambutan (*Nephelium lappaceum L.*) seeds, a waste by-product from fresh consumption to fruit canning industry. Rambutan seed waste is usually discarded in abundance because of its less economic value. Rambutan seeds contain carbohydrates, fats and proteins which can meet the needs of the body‘s nutrients.

The nation's refuse issue has a great deal to do with way of life. Each individual must be in charge of the squanders he creates. Considering that we are among the most populated on the planet, with the measure of waste each of us produces, it is nothing unexpected that our properties have turned into the biggest dumpsite. This investigation can help the earth in limiting the waste item that eventually adds to the waste administration issue of the nation.

As future educators who are specializing in Science subject, this experimental study was conducted to practice on how to use different laboratory techniques necessary to laboratory investigations which can be use in Science instruction. Furthermore, the researchers will conduct this study from the view of the possibility to obtain organic molecules from the rambutan seed particularly lipids and to determine the presence of fatty acids that can make it suitable for human consumption. The Philippines is one of the country that produces a large variety of rambutan and it is a great opportunity to maximize its uses.

Our nation delivers around ten billion tons of strong waste every year and just twelve percent of this was changed over to reusable things. The transcendent issue for strong waste administration (SWM) is the

insufficient transfer offices. By and by, open dumping is as yet the basic waste transfer strategy that utilizations by our legislature as controlled dumpsites and sterile landfills (SLFs).

By means of recycling, rambutan seed that is considered as waste material that would be thrown away as trash can be converted into new products. It can benefit the country and the environment by reducing the amount of waste, conserving natural resources, sustaining the environment for the future generation and helps create new well-paying jobs.

OBJECTIVES OF THE STUDY

This research generally aimed to determine the content of fatty acids in rambutan seed. Specifically, this study determined the type of fatty acids content whether it is saturated or unsaturated and investigated the presence of triglycerides in the rambutan seed.

METHODS

Research Design

This study made use of an experimental method in the extraction and determination of fatty acid content of Nephelium lappaceum L. seeds. This study involved the determination of the presence of the saturated and unsaturated fatty acids of extracted Nephelium lappaceum seed fat.

This research utilized the seeds of rambutan *(Nephelium lappaceum L.)*. Good selection of this subject will ensure the feasibility and quality of the result of the experiment.

The researchers focused on the process of preparations of the sample and on the examination of the fat content of the extract from rambutan seed. In obtaining and examining the extract from the rambutan seed, the researchers will utilize two major methods: (1) mechanical processes of preparing the sample and isolation of extract; (2) chemical processes in determining the fat content.

Extraction of Nephelium lappaceum seed oil

1. Collecting

Rambutan fruit is the major raw material that was used in this research. The rambutan fruit were deskinned and deseeded. The seeds were collected and reserved for the study.

2. Cleaning

The seeds were cleaned manually in water to remove the unwanted particles.

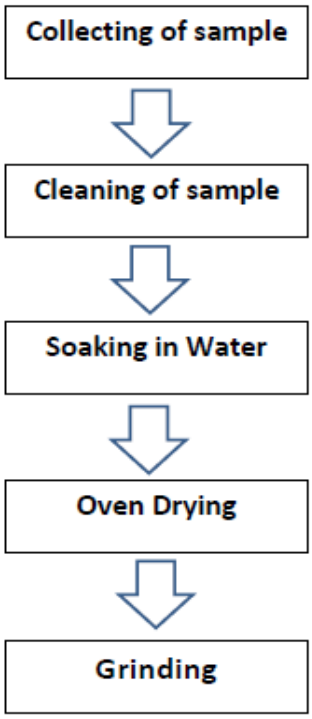
These seeds were cleaned to remove the excess pericarp.

3. Soaking in water

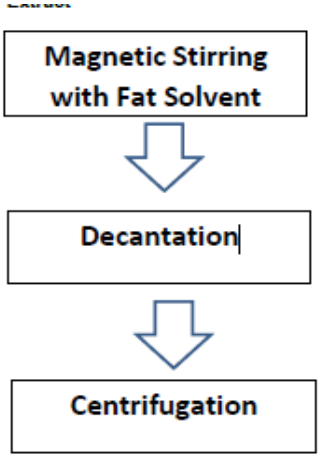
The seeds were soaked in water for twelve hours to make the seed soften and then sundried afterwards.

I. Mechanical Process

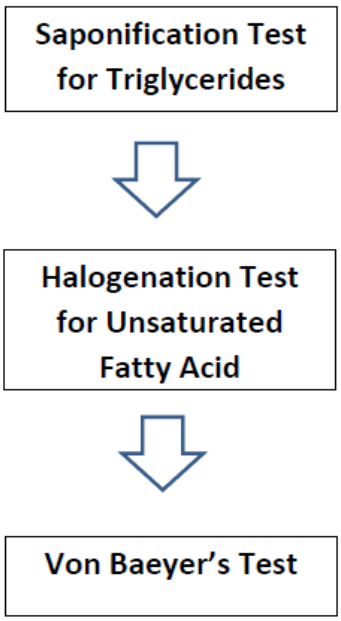
A. Preparation of Sample Seed Extract



B. Isolation of Rambutan



C. Chemical Process for Determination of Fatty Acids



4. Oven Drying

The seeds were oven dried at 60 degrees Celsius for six hours.

5. Grinding

The seeds were grounded using the blender and the resulting powder were preserved in plastic container for the preparation of fat extraction.

Chemical Processes

1. Magnetic Stirring with Extracting Solvent

Weigh 5g of grounded rambutan seed using the electronic balance in 2 separate watch glasses for 2 trials. Place them on 2 separate beakers and add 75 mL of ethanol respectively. Stir the content using magnetic stirrer at the speed of 200 rpm for 1 hour.

2. Decantation

Put the extract mixture in a beaker and allow solid particles to settle. Decant the supernatant liquid into another beaker.

3. Centrifugation

Place 5 mL each of the supernatant liquid in eight separate centrifuge test tubes. Put the test tubes in the centrifuge and let it spin for 10 mins to completely separate solid particles from the liquid extract.

B. Determination of the Presence of Fatty Acid

1. Saponification

Place 5 mL each of the centrifugate from the extracted sample in two separate test tubes for two trials. Add 10 drops of 10M NaOH. Place the test tubes in a boiling water bath for 15-20 minutes. Remove from the water bath and allow to cool to room temperature. Add 5 mL of distilled water to each test tube. Shake each test tube vigorously. Observe if there is any formation of suds/oily globules separating upon standing.

C. Determination of Saturated or Unsaturated Fat

1. Von Baeyer's Test

Place 10 mL of the sample in a test tube. Add 3 mL of dilute potassium permanganate. Observe any change in color of the permanganate solution.

D. Hydrogenation Test for Unsaturated Lipids

Place 5 mL of rambutan seed extract on two separate test tube for two trials. Add a drop of bromine water and shake vigorously. Observe its result.

RESULTS AND DISCUSSION

Chemical Processes

A. Presence of Fatty Acid

1. Saponification

Table 1. Determination of the Presence of Fatty Acid

Trial 1	**Suds formation**
Trial 2	**Suds formation**

Table 1 presents the results in the saponification test for triglycerides using two trials. A positive result as indicated by the formation of suds revealed that the rambutan seed extract contains triglycerides commonly known as fats and oils.

Based on the results, the suds formation is due to the reaction of NaOH and water to the extracted sample after boiling. An ordinary type of substance that is added to NaOH can produce products such as glycerol and crudes soap, which means that fats and oils are present on the given substance. Chemical reaction occurs when a vegetable oil or animal fat is mixed with a strong alkali. One product of the reaction is soap from fat.

Saponification is a based-catalyzed hydrolysis of the ester linkages in fats and oils. One of its items is cleanser, and the word saponification is inferred for the Latin word saponis, signifying "cleanser". Saponification found before 500 B.C., when it was discovered that a curdy material came about when creature fat was warmed with wood cinders. Soluble substances in the fiery debris advance hydrolysis of the ester linkages of the fat. Cleanser is at present made by bubbling creature fat or vegetable oil with arrangement of sodium hydroxide.

Artificially, a cleanser is the sodium or potassium salt of unsaturated fat. The contrarily charged carboxylate assemble is Hydrophilic (pulled in to water), and the long hydrocarbon chain is hydrophobic (repulsed by water) and lipophilic (pulled in to oils). In water, cleanser shapes a shady arrangement micelle: bunch of around 100 to 200 cleanser atoms with their polar "heads" (carboxylate gatherings) on the surface of the group and their hydrophobic "tails" (the hydrocarbon chains) encased inside. Soap are useful cleaning agents because of different affinities of a soap molecules two ends.

B. Determination of Saturated or Unsaturated Fat
1. Von Baeyer's Test

Table 2. Determination of Saturated or Unsaturated Fat

Trial 1	**Decolorization of KMnO4 reagent**
Trial 2	**Decolorization of KMnO4 reagent**

Table 2 shows the results in the Von Baeyers Test for unsaturation using two trials. A positive result as indicated by the decolorization of the KMnO4 reagent revealed that the fats that obtained in rambutan seed extract is unsaturated.

The Baeyer test for unsaturation is for determining the presence of carbon-carbon double bonded compounds called alkenes. The organic compound is treated with an aqueous solution of potassium permanganate (Baeyer 's reagent). The disappearance of the pink color shows the presence of unsaturation.

Fatty acid is a carboxylic acid, with a long aliphatic chain, which is either saturated or unsaturated. Unsaturated fats are typically liquid at room temperature. It contains double bonds, triple bonds or rings which can be determine by two different procedures, Von Baeyer 's test and bromine test.

After conducting the Von Baeyer 's test, where distilled water is used as a control, the decoloration of the dilute potassium permanganate showed that the present fat on the extracted solution is unsaturated fat.

Like the baeyer's test, bromine does not react with an alkane. In Von Baeyer 's test and bromine test, both reagent 's used decolorize in the extracted solution**.**

C. Hydrogenation Test for Unsaturated Lipids
Table 3. Determination of Unsaturated Lipids

Trial 1	**Decolorization of bromine water**
Trial 2	**Decolorization of bromine water**

As gleaned in Table 3, the results in the hydrogenation test for unsaturated lipids using two trials. A positive result as indicated by the decolorization of bromine water revealed that the lipids present in the rambutan seed extract is unsaturated.

Hydrogenation responses can be subdivided in a few courses, for instance, as indicated by the kind of halogen (fluorine, chlorine, bromine, or iodine), sort of material to be halogenated (paraffin, olefin, fragrant, hydrogen, et cetera), and working conditions and strategies for catalyzing or starting the response.

According to study [2], vegetable oils are referred as "polyunsaturated". This only means that there are many double bonds present.

Vegetable oils can be change from liquids to solids by the hydrogenation or halogenation reaction.

CONCLUSIONS AND RECOMMENDATIONS

This study showed that the rambutan seed extract, upon undergoing chemical processes such as saponification and Von Baeyer 's test, contain triglycerides and unsaturated fat present in the sample.

Based on the results of this study, some recommendations were hereby given for further analysis of the components of rambutan seed extract to look for other possible potentials of this plant.

First, the fact that rambutan seed had been positive on the presence of fatty acid, it is good to determine and quantify the exact amount of its oil in a given mass.

Second, since this experiment had proven that lipids that are coming in rambutan seed is unsaturated fatty acid which only means that it is healthy and ideal for the human consumption, the researchers recommend to develop and formulate it as a commercial cooking oil similar to other cooking oil such as canola and the like. As the Philippines is one of those tropical countries that produces tons of rambutan this will be a great alternative oil that not only help the human health but also the nation 's economy.

Aside from that the future researchers are recommended to conduct more experiments and determine other biomolecules that are present in the rambutan seed to know more about the seeds and its other potential.

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