



## Analysis of Potassium (K) and Calcium (Ca) in Durian Seeds (*Durio Zibethinus Murr*)

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### Abstract

*Durian seeds are one of the wastes from durian fruit that has not been optimally utilized due to the community's lack of knowledge and creativity regarding the processing of waste into food that has economic value. This reduces the accumulation of durian seed waste that can pollute the surrounding environment. Durian seeds benefit from being used as food because they are rich in minerals, especially potassium and calcium. This study aims to determine the levels of potassium and calcium contained in durian seeds. Determination of potassium and calcium levels using atomic absorption spectrophotometer (SSA). Potassium levels were analyzed at a wavelength of 766.8 nm, and calcium was investigated at 423 nm. Before the potassium and calcium levels were determined, the moisture content and ash content were first defined in the sample. The results of the analysis of moisture in the sample obtained 2.182 % and ash content of 12.633 %. Further analysis of potassium obtained average results for potassium of 612.605 mg / 100 g and an average for calcium of 15.555 mg / 100 g. The results of this study are expected to be a source of information about potassium and calcium levels in durian seeds. They can be further utilised as an alternative food based on durian seeds, especially in the Parigi Moutong area, Central Sulawesi.*

**Keywords:** Durian seeds, potassium and calcium, atomic absorption spectrophotometer (SSA)

### Introduction

Durian is a fruit plant native to tropical Asia wet Indonesia that is very popular in the community. Durian plants can produce 80 to 100 fruits annually, even in old plants will produce up to 200 fruits. Each fruit cavity has 2 to 6 seeds or more. In general, the part of the durian fruit that can be consumed is only the pulp, which is close to 52 % of the total weight of the durian fruit. This shows that the skin (60 – 75 %) and seeds (5 – 15 %) have not been optimally utilized. Usually, the skin and seeds become waste, only a tiny part of which is used as animal feed, even though most are just thrown away (Wati et al., 2017).

Durian seeds are part of the durian fruit that becomes waste for the community. Raw durian seeds cannot be consumed directly because they contain toxic cyclopropene fatty acids (Kumoro et al., 2020). Durian seeds are ovoid, yellowish-white, or light brown. Durian seeds are rich in carbohydrates, mainly starch, which is quite large at around 42.1 % compared to sweet potatoes at 29.9 % or cassava at 34.7 % (Baraheng & Karrila, 2019). Not only that, durian seeds have a variety of vitamins, mineral sources, and mineral factors. Among others, carbohydrates (30 %), protein (9.79

%), fat (0.2 %), Calcium (0.27 %), and phosphorus (0.9 %) (Sumarlin et al., 2013).

Durian seeds can be used as an alternative source of carbohydrates in the form of flour. Durian seed flour can be used as an alternative functional food ingredient because it has protein (Eliza et al., 2021). Converting durian seeds into flour will facilitate the utilization of durian seeds into flexible semi-finished materials (Zuhri, 2015).

Parigi Moutong is one of the districts in Central Sulawesi that produces a lot of durian fruit every year. According to BPS Parigi Moutong, 2019 durian fruit production was 44.500 kg/year (BPS, 2021). Production is estimated to continue increasing every year. The increasing production of durian fruit will result in more waste. Durian seeds are abandoned waste that has added value (Ho & Bhat, 2015).

Minerals found in durian seeds are one of the nutrients needed by the body (Aziz & Jalil, 2019). Such as potassium, calcium, and so on, which are macro minerals. Consumption of foods with sufficient mineral content is beneficial for our bodies. However, consuming foods with less or excess mineral content will harm the body (Lukiati et al., 2016).

Potassium delivers nerve impulses to muscle fibres, sharing the muscle's ability to contract and

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release energy from proteins, fats, and carbohydrates during metabolism (Constantin-Teodosiu & Constantin, 2021). Potassium helps our body regulate blood pressure and sterilises carbon dioxide. Potassium also protects electrolyte fluid balancers and alkaline acid balancers (Astuti, 2017).

Potassium sends nerve impulses to muscle fibres, sharing the ability of muscles to contract and release energy from proteins, fats, and carbohydrates during metabolism. Potassium is helpful for our body in regulating blood pressure and sterilizing carbon dioxide in the blood. Potassium also protects electrolyte fluid balance and acid-base balance (Terker et al., 2015).

Potassium deficiency will hurt the body because it causes hypokalemia, which causes the heart rate frequency to slow. Excess potassium causes hyperthermia, which causes arrhythmias that can lead to cardiac arrest or cardiac fibrillation (Yaswir & Ferawati, 2012).

Calcium is an important nutrient needed in various body functions. Calcium deficiency can harm the body, causing kidney stones, prostate cancer, difficulty defecation (constipation), and calcium deposition in the blood (Fitriani et al., 2012).

The primary source of calcium is minerals that contain calcium, which can be found in fruits. One such fruit is durian fruit, which has a high mineral content and is also widely found in Indonesia (Gobinathan et al., 2009).

(Sari, 2009) Using atomic absorption spectrophotometry, I researched the determination of durian's potassium, calcium, and sodium levels (Durio Zibethinus Murr). Potassium, calcium, and sodium levels are determined through two stages. The first stage of durian is dried, and the second stage is measured using a Shimadzu AA - 6300 Spectrophotometer. This method was chosen because it is easy, fast, and thorough and does not result in the determination of potassium levels 429.97, 19.51 mg / 100 g, and calcium levels 2.29, 0.22 mg / 100 g.

## Methods

### Research type

This research is a laboratory experiment conducted to analyze durian seeds' potassium and calcium content before analyzing the potassium and calcium content in durian seeds.

### Research samples

The samples used in this study are durian seeds from Parigi Moutong Regency.

### Location of research and research time

This research was conducted in two different locations, namely:

Chemistry Laboratory, Faculty of Teacher Training and Education, Tadulako University for sample preparation, determination of moisture content, ash content, and making sample solutions.

Analytical Chemistry Laboratory, Faculty of Mathematics and Natural Sciences for making standard solutions of potassium (K<sup>+</sup>) and calcium (Ca<sup>2+</sup>) and analyzing potassium and calcium levels using atomic absorption spectrophotometry (SSA).

### Research tools and materials

The tools used in this research are a drip pipette, knife, measuring flask, measuring cup, stirring rod, spatula, porcelain cup, funnel, gauge, digital balance, oven, FB1410M furnace, sample bottle, aluminium foil, atomic absorption Spectrophotometer (SSA), type PG932 for K metal and Ca metal.

This study used durian seeds, distilled water, tissue, filter paper, a 1 M HNO<sub>3</sub> solution, and standard Potassium and Calcium solutions.

### Research tools and materials

Preparing durian seeds involves peeling the skin, washing the seeds using running water and dried air, and cutting them into small sizes. Small durian seeds are then weighed. Tiny durian seeds are brought to the chemical laboratorium FKIP UNTAD Palu to be dried using the oven. Drying is done for ± 3 hours at 105 °C.

### Analysis of moisture

Durian seed flour samples that have been dried and weighed as much as 30 grams using a digital balance sheet were put into 3 cups of evaporation (known weight), each 30 grams. Then, the oven was preheated to 105 °C for ± 3 hours. After being heated, the durian seed flour samples were cooled in a desiccator and weighed until a constant weight was obtained. The moisture content was then determined by using the following equation (Juliasti et al., 2015).

$$\% \text{ Moisture Content} = \frac{\text{Initial weight} - \text{Early end}}{\text{Initial weight}} 100\% \quad (1)$$

### Ash analysis

Durian seed flour samples were weighed 30. Using an analytical balance sheet, 505 grams each was put into three porcelain cups. The cups were left in the furnace at 700 °C for ± 3 hours. Then, the sample of durian seed flour was cooled in the desiccator. The ash obtained was weighed, and the ash content was determined using the following equation (Juliasti et al., 2015).

$$\% \text{ Ash content} = \frac{\text{Ash weight}}{\text{Initial weight}} \times 100\% \quad (2)$$

### Potassium and calcium levels in durian seed samples

#### Destructive process

Weight the dried samples by 30 grams each, add a solution of HNO<sub>3</sub> 1 M to 5 mL, and add 100 mL of aquades to dissolve or destroy the samples' metals. After that, it is filtered using filter paper to separate filtrate and residue. After filtering, put into a measuring flask 100 ml, then add equates to the

measure limit. After that, it is shaken so that the solution can be homogenized. After that, put it in the sample bottle that has been provided.

#### **Manufacture of a standard solution of potassium and calcium 100 ppm**

Fill the parent solution of potassium and calcium 1000 ppm each – 100 mL each, and dilute in a measuring flask 100 mL whose volume is up to the limit mark.

- 1) The calibration curve series from potassium solution 100 ppm was made into standard series: 10 ppm, 20 ppm, 30 ppm, 40 ppm, and 50 ppm. Calcium 100 ppm is made into the standard series: 0.5 ppm, 10 ppm, 15 ppm, 20 ppm, and 25 ppm.
- 2) Analysis of mineral levels using SSA. Potassium levels at wavelengths 766.8 nm are measured, while calcium levels are measured at wavelengths 423 nm. The sample absorption data was analyzed to obtain the potassium and calcium concentration in durian seed samples.

#### **Data analysis techniques**

From the results of the measurement of the series of standard solutions, graphs for potassium and calcium are made. The data obtained were analyzed to obtain the concentration of potassium and calcium in the sample using the equation of regression lines, namely:

$$Y = a + bX \text{ and } Y = a - bX \quad (3)$$

Where: Y = Absorbance value (A)

a = Constants

X = Sample solution concentration (mg / L)

b = Kemiringan garis

Furthermore, the determination of K and Ca levels in the sample based on dry weight used equations as follows:

$$Y = \frac{v \cdot X}{m}$$

Where:

Y = Analyte levels in the sample (mg / g)

V = Assignment volume (L)

X = Sample concentration of the tool (mg/L)

m = Dry sample weight (g)

(Sudarmaji et al., 2010).

## **Results and Discussion**

#### **Analysis of moisture and ash**

Table 1 presents the results of the moisture and ash content analysis of durian seed samples.

**Table 1.** Average moisture content and ash content in durian seed samples

Sample	Content (%)	
	Water	Ash
Durian seeds	2.187	12.633

This research begins with determining the moisture content of durian seeds. The water content analysis aims to determine how much moisture content in durian seeds will be analyzed. Moisture content is an important component in determining the resilience of a foodstuff in its storage. The low amount of water content makes foodstuffs will be stored for a relatively long period. There are several methods of moisture analysis in the sample, including drying or oven methods.

This study analyses moisture using an oven to dry it. The method of drying with the oven is based on calculating the difference in the weight of the sample material before and after drying. The difference in weight is the water that evaporates, which is calculated as the moisture content of the material. The principle of the drying method is that the water contained in an ingredient will evaporate when the material is heated at 105 °C for a specific time (Ahadi & Effendi, 2019).

Durian seeds also have high water-binding power so that they can be used as a potential source of dietary fibre (Amid & Mirhosseini, 2012). Meanwhile, water-soluble polysaccharides found in durian seeds can be used as ice cream stabilizers (Herlina et al., 2015).

The water content obtained in this study was 2.187 %, while the quality requirement of Indonesian National Standard (SNI) flour was 10 %. This indicates that durian seed samples can be used as flour and have a relatively long storage time.

After that, dry destruction or dry foaming continued. This is the usual way of doing this depends on the nature of organic substances in the mineral material to be analyzed. The destruction process breaks the bond between organic compounds and metals, which needs to be analyzed. Ash content can be searched by not the sample to be analyzed, but first, the sample is eliminated, and water is dried in the oven at a temperature of 105 °C. After that, put in the desiccator and weighed. The sample should not be in the furnace at 700 °C. It oxidizes all organic substances at high temperatures and speeds up the destructive process. It has cut down the sample. Ash content is obtained by comparing the weight of ash with the initial weight after it is multiplied by 100 % (AOAC, 1990).

Analysis of the potassium and calcium levels concentration in durian seed samples using SSA tools.

**Table 2.** Data on potassium levels in durian seeds

Treatment	Dry sample weight	Power K	
		Absorbant (A)	mg / 100 g
1	30	1.156	611.833
2	30	1.160	613.983
3	30	1.158	612.900
Average			612.605

**Table 3.** Data on calcium levels in durian seeds

Treatment	Dry sample weight	Power K	
		Absorbant (A)	mg / 100 g

1	30	0.104	15.526
2	30	1.106	15.513
3	30	1.109	15.897
Average			15.555

### ***Analysis of durian seed potassium levels***

Durian seeds were found to have a high mineral content of potassium of 612.605 Mg / 100 g. Meanwhile, the research conducted by Ambarita et al. (2013) obtained potassium levels at 962 mg / 100 g in durian seeds originating from Medan. The study's results are precise in that durian seeds originating from Medan have a higher calcium content than those derived from Parigi Moutong.

The difference in potassium levels of durian seed samples is due to environmental conditions, places of growth, soil conditions, and weather, which affect the content of organic nutrients. If there is much potassium around the place of growth, then much potassium will be produced in the fruit. A lack of potassium ions in the soil will cause the source of potassium that plants need to grow to be increasingly hampered (Fitriani et al., 2012).

Potassium is an intracellular ion and one of the macro minerals that regulate body fluid balance. As much as 95 % of potassium is in intracellular fluid (Kurniawan, 2018).

Potassium increases its concentration in intracellular fluid, attracting fluid in the extracellular space and lowering blood pressure. It can lower blood pressure because it serves as a diuretic, increasing the production of sodium and liquid (Atun et al., 2018).

Potassium deficiency can occur due to most gastrointestinal or kidney loss. Potassium loss through the gastrointestinal tract can occur due to vomiting, chronic diarrhoea, or lacsan use. At the same time, loss through the kidneys can be caused by the use of diuretic drugs primarily for the treatment of hypertension. Potassium deficiency can cause loss of appetite, weakness, lethargy, paralysis, delirium, and constipation. The heart will pound and decrease its ability to pump blood (Almatsier, 2006).

Acute excess potassium can occur when consumption through the gastrointestinal tract (enteral) or not through the gastrointestinal tract (parenteral) exceeds 12 g / m<sup>2</sup> of body surface a day (18 g for adults) without being offset by increased excretion. Acute hyperkalemia can lead to heart failure, which can result in death. Excess potassium can also occur when renal function is impaired (Almatsier, 2006).

### ***Analysis of durian seed calcium levels***

Durian seeds were found to have a high mineral content, namely calcium 15.555 mg / 100 g. In the research by Ambarita et al. (2013) on durian seeds derived from the field, calcium levels were obtained at 17 mg / 100 g. The study's results are precise: Durian seeds derived from the terrain have

a higher calcium content than durian seeds derived from Parigi Moutong.

Differences in calcium levels in durian seeds are explained by environmental conditions, such as where it grows, soil conditions, and weather, which affect its content of organic nutrients (Fitriani et al., 2012).

Calcium is a mineral that is highly needed by the human body. It functions as a mineral in the growth and development of bones and teeth, nerve conduction, muscle speech regulation, blood flow, blood clotting regulation, and minerals that affect the body's growth (Susanti et al., 2016).

In addition to the formation of bones and teeth, calcium plays a role in increasing nerve activity and contraction of the heart muscle. Calcium is a macro mineral for the human body because it is needed in a measure of more than 100 mg. Calcium deficiency can harm the human body, especially in adolescence, because it is in the growth phase (Iksen et al., 2019).

The greatest need for calcium is during growth, and the need for calcium continues even after reaching adulthood. When bones are formed, if new bones are formed, then the old bones are destroyed simultaneously (Padmasuri, 2015).

Sample durian seed ash obtained from the process of dissolving dissolved with HNO<sub>3</sub> 1 M as much as 5 mL, after which diencerka to the pumpkin take 100 mL, so obtained dilution factor as much as 10 times. The HNO<sub>3</sub> 1 M used in the trailer setup aims to dissolve the metals in the sample, as HNO<sub>3</sub> is a standard metal solvent and can stabilize the metals to be analyzed. The addition of HNO<sub>3</sub> in the process of fertilization aims to oxidize all carbon.

The mineral content of a sample is calculated based on its total weight. The study obtained average potassium levels of 612.605 mg / 100g and calcium levels of 15.555 mg / 100g.

A significant mineral content in durian seeds is potassium, 612. 605 mg / 100g, which is much higher than calcium. This study proves that potassium, calcium, minerals, and dietary fibre can protect against hypertension and stroke (Wahyuningrum, 2018).

## **Conclusions**

Based on the research results, durian seeds contain high amounts of minerals. The average potassium content in durian seeds is 612.605 mg / 100 g, and the average calcium content in durian seeds is 15.555 mg / 100

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