

## Pineapple Peel (*Ananas Comosus* L. Merr) Can be Used as Non-Pharmacological Treatment for Hypertension

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**Abstract.** One of the causes of hypertension is reduction of intracellular potassium concentrations in the body. Increased potassium intake could be done by consuming vegetables and fruits that are rich in potassium. Vegetable and fruit consumption is one of the non-pharmacological treatment methods needed for hypertensive patients. Pineapple (*Ananas comosus* (L.) Merr.) is one of the superior fruits in West Kalimantan which expected to have a high content of potassium. The purpose of this study was to determining potassium levels from various parts of pineapple fruit (peel, flesh, and core). Potassium content in pineapple's peel, flesh, and core carried out by means of Atomic Absorption Spectroscopy (AAS) consisting of: sample preparation with dry destruction method (process of furnace sample removal at 550°C) and potassium content analysis. The results showed that potassium levels in pineapple peel were 938.48 mg / kg. The potassium content is greater than flesh and core which are 485.28 mg / kg and 12.98 mg / kg, respectively. The conclusion to this study is that the peel contain more potassium than flesh and core. Pineapple peel has the potential to being used as a non-pharmacological treatment in the form of processed food and instant drinks.

**Keywords:** AAS, Hypertension, Pineapple peel, Potassium

### 1 Introduction

Hypertension is a chronic disease which is the biggest challenge in the province of West Kalimantan, Indonesia. Prevalence of hypertension in West Kalimantan is above the average, reaching 30% [1]. So far, patient's blood pressure treatment are not optimized. This caused by patients just focused on using hypertension drugs. According to the guideline of hypertension treatment that must using antihypertensive drugs and patient's lifestyle changing, known as non-pharmacological treatment [2]. Hypertension treatment with combination pharmacological and non pharmacological treatments, could give much benefits in controlling blood pressure to the lower rate and could be optimized [3,4].

The non-pharmacological treatment of hypertension refer to Dietary Approach to Stop Hypertension (DASH). One of DASH's suggestion for non-pharmacological treatment is consuming vegetables and fruits which rich in potassium. The patient's known has potassium lowest intake (<2000 mg/day) [3,5,6]. The requirements of potassium each day according to WHO recommendation is 90 mmol each day or equal to 3510 mg each day [7]. The fact showed that potassium intake very needed to hypertension patient. Pineapple is a fruits rich in potassium. The content difference of potassium in a pineapple could be seen from the kinds. *Cayeene* pineapple known have higher potassium rather than *Queen* pineapple [8]. One of the superior fruits in West Kalimantan is *Cayeene* pineapple where to analyze potassium levels using the Atomic Absorption Spectroscopy (AAS) method.

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Several studies have determined the level of potassium in pineapple using the AAS method. Determination of potassium levels is done on pineapple's flesh (*Ananas comosus* (L.) Merr.) *Cayenne* dan *Queen* varieties, chayote (*Sechium edule*), and banana (*Musa paradisiaca* L.) [8,9,10]. Determination of potassium levels using AAS is known to have many advantages, namely a fast and simple process, a detection limit of less than 1 ppm, using fewer samples, and specific for each metal without separation [11,12,13]. Based on that, researcher interested on knowing potassium level in the flesh, core, and the peel of Cayeene pineapple that grown in Galang's Village, Sungai Pinyuh District, Mempawah Regency, West Kalimantan Province, Indonesia using AAS method.

## 2 Methodology

The instruments that being used in this study are glassware (Iwaki Pyrex<sup>®</sup>), stirring rod (Iwaki Pyrex<sup>®</sup>), bulb filler, glass funnel (Iwaki Pyrex<sup>®</sup>), cawan porselen, kertas saring, batang pengaduk, *furnace* (Thermolyne 1400<sup>®</sup>), *cruss*, Vacuum Desiccator, measuring glass (Iwaki Pyrex<sup>®</sup>), micropipette 100  $\mu$ l dan 1000  $\mu$ l, oven (Mammert<sup>®</sup>), test tube clamp, volume pipette, measuring pipette, test tube rack, stainless steel spoon, analytical scale (*Ohaus*<sup>®</sup>), dan Atomic Absorption Spectrophotometer (Shimadai AA-7000<sup>®</sup>).

Materials that being used in this study are mature pineapple fruit (flesh, core, and pineapple peel)



Fig 1. Pineapple's Ripe Level [14]

### 2.2 Preparation of Sample Solution

Ash samples from the flesh, core, and pineapple peel were weighed as much as 5 mg. Each sample is put into a 100 mL beaker glass. Each sample were added 10 mL 5 N HCl and distilled water (1: 1). Each sample solution is filtered and the filtrate is stored in a 100 mL measuring flask. Residues left in the filter paper are rinsed with HCl and distilled water solution (1: 1) to dissolves the residue. The sample solution was diluted with distilled water to the limit mark to obtain concentration of 0.5 ppm. The solution were pipetted

*Cayenne* varieties, HCl 5 N, aquabidest, and potassium standard solution (1000 mg/L).

### 2.1 Sample Preparation

The sample used in this study is ripe pineapple *Cayenne* varieties in the village of Galang, Mempawah Regency, West Kalimantan. The pineapple chosen is ripe pineapple with yellowish peel. Mature pineapple is known for rich secondary metabolites than young pineapple. The level of maturity of pineapple fruit used for the research sample is pineapple number 5 (five), as shown in Figure 1. Preparation of samples were done by means of cleaning pineapple fruit with flowing water. Furthermore, the pineapple is peeled and separated from the flesh, core, and peel. Each piece was finely chopped and taken as much as 50 grams. Samples were left at room temperature for 15 minutes. The next process, flesh, core, and peel are dried using an oven at 60°C for 24 hours. The sample were removed from the oven and cooled for 30 minutes. Furthermore, the sample is weighed by the dry weight of each part of pineapple. The next stage, the sample is inserted into the crucible and ignited using outplate at a temperature of 100°C to form carbon. The results of the carbon were put into the furnace at a temperature of up to 550°C until it became white ash. This process is known as the dry destruction process.

as much as 2.5 mL and put into a 250 mL measuring flask. The solution was diluted by adding distilled water to the markings on a 250 mL measuring flask so that the concentration of the sample solution were obtained 0.005 ppm.

### 2.3 Making Potassium Standard Curve

The standard potassium solution (1000 ppm) of 1 mL pipette added into a 100 mL volumetric flask. The standard solution is added with distilled water (10 ppm concentration) to 100 mL volumetric flask. The

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standard solutions are 2.5 mL each; 5 mL; 7.5 mL; 10 mL; 12.5 mL; 17.5 mL and put into a 50 mL volumetric flask and add distilled water to the measuring flask markers. The results of dilution of the solution obtained the concentration of the standard solution from each measuring flask of 0.5 ppm, 1 ppm, 1.5 ppm, 2 ppm, 2.5 ppm, 3 ppm, and 3.5 ppm. Each standard solution was measured using AAS at 766.5 nm wave length with an air-acetylene flame type [15].

#### 2.4 Determination of Potassium Level

Sample solution with a concentration of 0.5 ppm as much as 100 mL were diluted. The sample solution was pipetted as much as 2.5 mL and put into a 250 mL volumetric flask. Furthermore, the solution was diluted by adding distilled water to 250 mL volumetric flask. The measurement of the sample was carried out 2 times repetition using AAS on 766.5 nm wave length. The absorbance value obtained must be within the range of

calibration standard solution calibration curves. Potassium concentration in the sample was determined based on the regression line equation of the calibration curve.

### 3 Results and Discussion

The following steps that must be taken to obtain the content of potassium in flesh, core, and pineapple peel are the first to determine the potassium standard curve. In Figure 2 the equation of the standard potassium curve obtained is  $y = 0.2163x + 0.0038$  with obtained limit detection or limit of detection (LOD) of 0.00001 mg/L and limit of quantification (LOQ) of the limit value 0.000005 mg / L. From the results of the equation, the r value is 0.9992. These results indicate there is a linear correlation between the standard potassium concentration and absorbance.

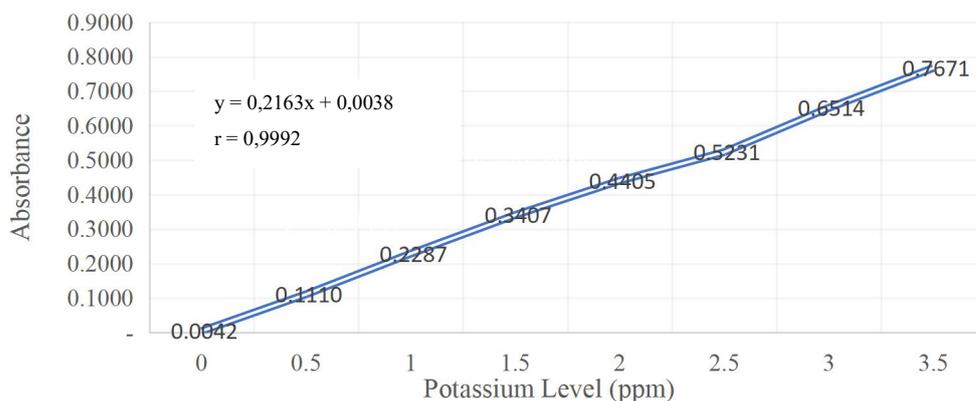


Fig 2. Standard Potassium Curve

The next stage is a quantitative analysis of potassium levels from flesh, core, and pineapple peel. The analysis was carried out based on the results of measurements of flesh, core, and peel of pineapple samples using AAS. The wavelength used to measure the potassium level of each part of the pineapple is 766.5 nm. From the results of these measurements

obtained levels of potassium in pineapple peel 938.48 mg / kg higher than pineapple flesh (485.28 mg / kg), and core (12.98 mg / kg). The difference in potassium content in each part of pineapple is presented in Table 1.

Table 1. Quantitative Analysis of Potassium level of Pineapple

No	Sample	Potassium Level (mg/kg)
1.	Peel	938.48
2.	Flesh	485.28
3.	Core	12.98

High potassium content in pineapple peel shows that pineapple peel has the potential as a non-pharmacological treatment for hypertensive patients. Hypertension occur due to the increased concentration of sodium in extracellular fluid and the depletion of

intracellular potassium concentration. With a high intake of potassium can regulate the balance of body fluid volume which will have an impact on blood pressure reduction settings. The mechanism of potassium intake in controlling blood pressure can

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work by: First, when the intake of potassium enters the arteries, blood flow increases, causing vasodilation. The entry of high potassium intake can cause the concentration of sodium ions in intracellular to decrease through activation of the  $\text{Na}^+ / \text{K}^+ / \text{ATP-ase}$  pump so as to reduce blood pressure, especially in hypertensive patients with high sodium intake. The  $\text{Na}^+ / \text{K}^+ / \text{ATP-ase}$  pump plays a role in regulating the balance in  $\text{Na}^+$  (3 ions) and exiting  $\text{K}^+$  (2 ions) in the intracellular so that it has an impact on the vascular smooth muscle which affects blood flow and blood pressure. Second, high intake of potassium increases urinary excretion, especially for hypertensive patients with high sodium intake. The mechanism of action is similar to the mechanism of action of diuretic drugs. Third, potassium intake decreases vasoconstriction and norepinephrine (NE) pressure to enter sympathetic nerve centers which can increase vascular smooth muscle relaxation and increase blood flow [16,17,18]. With the knowledge of the high content of potassium there is *Cayeene* pineapple peel type which is expected for subsequent research to be able to process pineapple peel into food or instant drinks that are rich in potassium as a non-pharmacological treatment for hypertensive patients.

## Conclusion

The conclusion of this study has shown the content of potassium was found in pineapple peel was 938.48 mg/kg. High potassium content in pineapple peel has the potential to be used as a non-pharmacological treatment in the form of processed food and instant drinks

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