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## Analysis of vitamin C and mineral content on rambutan peels extract

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**Abstract.** Rambutan (*Nephelium lappaceum* L) is the original Indonesian tropical fruit. Generally people who eat rambutan only eat the flesh. They throw away the rind which is potential to be a waste. On the rambutan's peel contains antioxidant which potentially becomes basic material of herbal medicine. However another compound has been not discovered yet. Except vitamin C, our body needs some other minerals. This study aims to analyze the vitamin C and other minerals content on rambutan's peel extract. This study uses exploration study design. The sample of the study is rambutan's peel on the Sekaran area, Gunungpati. Focus of this study is to test the vitamin C and minerals (Cu, K, Fe, and Zn) on Rambutan's peel extract. The vitamin C test uses HPLC and for minerals (Cu, K, Fe, and Zn) uses AAS. The result shows that value of vitamin C on rambutan's rind extract is 0.0003941mg/100mg, while minerals (Cu, K, Fe, and Zn) are 0.0012996 mg/100mg, 0.0001645 mg/100mg, 0.00384 mg/100mg, and 0.0135065 mg/100mg. These results show that the extract contains vitamin C and minerals (Cu, K, Fe, and Zn).

### 1. Introduction

*Nephelium lappaceum* L. or better known as rambutan is a tropical fruit native to Indonesia and countries spread across Southeast Asia. But now it has spread widely in tropical regions and Latin American countries [1]. Rambutan is one of the plants that is widely cultivated in Indonesia to be used by its fruit [2]. Utilization of rambutan fruit is generally only eaten by the fruit, but it is good to eat rambutan also has a number of benefits for health. The efficacy of rambutan fruit for health can not be separated from the chemical content in it which contains vitamin C in large quantities [3]. The most potent antioxidant in rambutan fruit is the peel. But the rambutan peel has not been widely used and is only used as waste. For this reason, further utilization of rambutan peel is needed as an antioxidant.

Vitamin C is one of the substances that acts as an antioxidant and is effective in dealing with free radicals that can damage cells or tissues [4]. Vitamin C is also called ascorbic acid, which is the simplest, most volatile vitamin due to oxidation, but is very useful for humans. Its chemical structure consists of a 6 atom C chain and its position is unstable ( $C_6H_8O_6$ ), because it easily reacts with  $O_2$  in air to dehydroascorbic acid. Besides vitamin C, the body also needs some minerals. Minerals are part of the body and play an important role in maintaining bodily functions, both at the level of cells, tissues, organs and overall bodily functions [5]. The number of adequacy of each mineral differs depending on age and sex. List of nutritional adequacy recommended in Indonesia results of Food and Nutrition presented



figures for the adequacy of calcium, phosphorus, magnesium and fluorine. Even though it does not meet the criteria, it is expected that with diverse foods, both vegetable and animal, it will be able to meet the body's needs for minerals, although only a little [6]. Both vitamin C and the above minerals are contained in rambutan's peel [7]. However, until now there has been no research on vitamin C and minerals, especially rambutan rind, Sekaran region, Gunungpati. Therefore, this study was conducted to analyze the content of vitamin C and minerals (Cu, K, Fe, Zn) in rambutan fruit peel extract.

Based on the background above, the formulation of the problem in this study is (1) What is the vitamin C content in rambutan fruit peel extract? (2) What is the content of minerals (Cu, K, Fe, Zn) in rambutan fruit peel extract. The objectives of this study were (1) to analyze the vitamin C content of rambutan fruit peel extract, (2) to analyze the mineral content (Cu, K, Fe, Zn) in rambutan fruit peel extract.

## 2. Methods

The design of this study was an exploratory study of the content of vitamin C and minerals (Cu, K, Fe, Zn) in the extracts of rambutan peels Sekaran variety. The focus of this study was to test the content of vitamin C and minerals (Cu, K, Fe, Zn) on the extract of rambutan peels extract from Sekaran variety. The independent variables in this study were rambutan Sekaran variety which grew around the Banana Gang, Sekaran Gunungpati Semarang. The dependent variables were vitamin C and minerals (Cu, K, Fe, Zn) on rambutan peels extract, Sekaran variety. Data obtained after the sample of rambutan bark extract samples were analyzed using HPLC and AAS in the Food Science Laboratory of Soegijapranata Catholic University. The data obtained will be analyzed descriptively. This analysis is intended to describe the content of vitamin C and mineral extract of rambutan peels. This study was conducted to analyze the content of vitamin C and minerals in the extract of rambutan peels extract from Sekaran variety.

## 3. Results and Discussion

The results of the analysis of vitamin C and mineral (Cu, K, Fe & Zn) content of rambutan's peel extract with HPLC and AAS carried out at the Food Science Laboratory of the Faculty of Agriculture, Soegijapranata Catholic University during June to July 2017 obtained the following data:

**Table 1.** Content of Vitamin C and Mineral Rambutan's Peel Extracts

Sample	Section	Vitamin C (ppm)	Mineral (ppm)			
			Cu	K	Fe	Zn
Rambutan's Peel Extracts	I	4.251	13.89	1.465	33.42	135.76
	II	4.571	12.58	1.57	34.12	134.84
	III	2.672	12.73	1.37	34.08	134.56
	IV	4.331	12.59	2.26	34.23	135.025
	V	3.881	13.19	1.56	33.35	135.14
Average of content $\pm$		3.941	12.996	1.645	33.84	135.065
SD (ppm)		$\pm 0.751509$	$\pm 0.558014$	$\pm 0.353235$	$\pm 0.419702$	$\pm 0.446066$

Table 1 shows the vitamin C content of rambutan peels extract tested using HPLC. The HPLC test results can detect the presence of vitamin C in rambutan peels extract. The results showed that rambutan peels extract originating from Sekaran Gunungpati Semarang contained vitamin C of 3.941 ppm. The mineral content (Cu, K, Fe and Zn) of rambutan peels extract tested using AAS. The test results using AAS can detect the presence of minerals, especially Cu (Copper) of 12.996 ppm, K (Potassium) of 1.645 ppm, Fe (Iron) of 33.84 ppm and Zn (Zinc) of 135.065 ppm in rambutan extract. This shows that the rambutan peels extract contains minerals namely Copper, Potassium, Iron, Zinc. The highest mineral content in rambutan peels extract is zinc compared to other minerals and the lowest mineral content is potassium.

**Table 2.** Results of Average Content of Vitamin C and Minerals (Cu, K, Fe, Zn) Rambutan's Peel Extracts (mg /100mg)

Sample	Vitamin C	Cu	K	Fe	Zn
Rambutan's Peel Extracts	0.0003941	0.0012996	0.0001645	0.00384	0.0135065

Table 2 shows the results of the average content of vitamin C and minerals (Cu, K, Fe, Zn) in rambutan fruit peel extract in units of milligrams per 100 milligrams. This study was to determine the content of vitamin C and minerals (Cu, K, Fe, Zn) in rambutan's peel extracts.

The test results using HPLC revealed that vitamin C content in rambutan peels extract which had been dried for 18 months was 0.0003941 mg / 100 mg, while according to [8] vitamin C content in fresh rambutan peels was 0.00743 mg / 100mg. The content of vitamin C in rambutan peels extract that has been dried for 18 months is lower than that of vitamin C in the extract of rambutan peels which is still fresh. This is because in this study using rambutan peels which had been dried for 18 months, therefore the rambutan peels had been damaged by oxidation. Due to the length of storage of rambutan peels which are influenced by several factors including temperature, pH, oxygen, metal catalysts, light, enzymes, initial vitamin C concentrations and the ratio of ascorbic acid and dehydroascorbic acid, while fresh vitamin C does not experience oxidation damage because the skin of the fruit is immediately dried using an oven and tested for vitamin C, while the drying process naturally does not use an oven. [9] states that about half of the vitamin C content is lost due to blanching and dehydration, where the amount of loss depends on the method of blanching and drying. Although blanching can result in vitamin C loss some researchers have proven that blanching itself can prevent the loss of vitamin C during drying and storage, because the enzymes found on the surface of the material become inactive. Therefore, the vitamin C content in the skin of rambutan that is still fresh is greater than that of rambutan peel extract which has been dried for 18 months.

According to [8] study, it was found that vitamin C content in dried rambutan peels was 0.00512 mg /100mg and in fresh rambutan peels was 0.00743 mg/100mg. This is caused by several factors including temperature, pH, oxygen, metal catalyst, light, enzymes, initial concentration of vitamin C and the ratio of ascorbic acid and dehydroascorbic acid. Damage to vitamin C can be minimized by packaging and controlling cooking temperature [10] whereas in this study vitamin C content in rambutan peel extract which had been dried for 18 months was 0.0003941 mg/100 mg, when compared to [8] the dried rambutan peels content of 0.00512 mg/100mg there was a decrease in vitamin C of 0.0047259 mg/100mg because of the long-term storage factor for rambutan peels, in the study of [8] the peel of the rambutan was immediately tested for vitamin C whereas in this study rambutan peels was stored for 18 months but there is still vitamin C content even though vitamin C has been damaged due to oxidation. So rambutan peels with a storage period of 18 months still contains vitamin C of 0.0003941 mg/100 mg. This is caused by the rambutan peels containing phenolics including geraniin, corllagin, which is a class of flavonoids, and elagic acid from the tannin group. The content of phenolic compounds in the rambutan peels can be used as an antioxidant to ward off free radicals contained in the body. Free radicals cause generative diseases such as cancer [11]. Based on phytochemical analysis of rambutan peels, it was reported that rambutan peels contains tannins, alkaloids, saponins, flavonoids and triterpenoids which have antibacterial functions. The highest content of rambutan peels extract is tannin compounds, saponins [12] flavonoids [1]. Mineral content (Copper, Potassium, Iron and Zinc) in rambutan peels extract.

The results of the test using AAS (Atomic Absorption Spectrophotometry) revealed the mineral content (Copper, Potassium, Iron and Zinc) in rambutan peels extract that had been dried for 18 months varied in its contents, namely Copper mineral content of 0.0012996 mg/100mg, Potassium of 0.0001645 mg/100mg, Iron is 0.003384 mg/100mg and Zinc is 0.0135065mg/100mg. The mineral content (Copper, Potassium, Iron and Zinc) in rambutan peels extract that has been dried for 18 months is affected by the

length of storage and drying process on the rambutan peels against the mineral content (Copper, Potassium, Iron and Zinc) not only that but there are several factors that influence mineral content, namely temperature, pH, climate, light and fertilizer [8]. Therefore the mineral content (Copper, Potassium, Iron and Zinc) in rambutan peels extract that has been dried for 18 months is reduced compared to the fresh rambutan peels extract.

According to [7] minerals are classified into macro minerals and micro minerals, in this study which includes macro minerals only potassium minerals while other minerals include micro minerals namely Copper, Iron and Zinc. Macro minerals in this study were Potassium rambutan peels extract which had been dried for 18 months at 0.0001645 mg/100mg. Potassium is one of the electrolytes that plays an important role in the body. Potassium is a positively charged ion and is present in cells. Potassium is absorbed in the small intestine and as much as 80-90% of potassium consumed is excreted through urine, the remainder is excreted through feces, sweat and gastric fluid [5].

The micro minerals in this study are three minerals, namely Copper, Iron and Zinc. Copper content in rambutan peels extract is 0.0012996 mg/100mg. Copper is a transition metal (class I B) that is reddish in color, easily stretched and easily forged [5]. Iron content in rambutan peels extract is 0.00384 mg/100mg. Iron is the most important part of hemoglobin, myoglobin and enzymes, but these nutrients are classified as essential so they must be supplied from food [5], while Zinc content in rambutan peels extract is 0.0135065 mg/100mg. Zinc has a major function that has been highlighted lately as a nutrient that helps the growth of toddlers. Zinc plays a role in skin formation, connective tissue metabolism, wound healing, development of male reproductive functions and sperm formation. The minerals that were analyzed for the highest mineral content were micro minerals namely Zinc (Zn) of 0.0135065 mg/100mg. According to Clydesdale & Fergus, in Trace Minerals in Foods, said that the mineral content of fruits and vegetables varies, this depends on several factors including: genetic, agricultural practices, variations in the mineral content in the soil, fattening soil and pH, as well as environmental factors and maturity of the land [8].

#### 4. Conclusion

Based on the research conducted, it can be concluded that (1) Vitamin C levels in rambutan peel extract is 0.0003941 mg/100mg, (2) Mineral content (Cu, K, Fe and Zn) in rambutan peels extract is 0.0012996 mg/100mg, 0.0001645 mg/100mg, 0.00384 mg/100mg, 0.0135065 mg/100mg. Based on the research conducted it can be suggested that further research is needed using fresh rambutan peel fruit.

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