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PROXIMATE ANALYSIS AND VITAMIN C CONTENT IN GREEN COCONUT (*Cocos Nucifera* L)

ANALISIS PROKSIMAT DAN KANDUNGAN VITAMIN C PADA KELAPA HIJAU (*Cocos Nucifera* L)

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Abstract

This study analyzes the proximate composition, vitamin C content, and antioxidant activity of the water and flesh of young green coconuts (*Cocos nucifera* L.). Coconut water contains 7.19–8.20% carbohydrates, 29.35 mg/100g vitamin C, and 0.068–0.163% protein. The flesh contains 5.56–6.44% fat, higher protein levels, an average moisture content of 87.50%, and 0.88% ash. Antioxidant activity increases linearly in the water and fluctuates in the flesh. The results highlight coconut water's potential as an antioxidant source and the nutritional value of the flesh for food and health applications.

Keywords: *Green young coconut, proximate, vitamin C, antioxidant*

Abstrak

Penelitian ini mengkaji kandungan proksimat, vitamin C, dan aktivitas antioksidan pada air dan daging kelapa muda hijau (*Cocos nucifera* L.). Air kelapa mengandung karbohidrat 7,19–8,20%, vitamin C 29,35 mg/100 g, dan protein 0,068–0,163%. Daging kelapa memiliki lemak 5,56–6,44%, protein lebih tinggi, kadar air rata-rata 87,50%, dan kadar abu 0,88%. Aktivitas antioksidan meningkat secara linier pada air dan fluktuatif pada daging. Hasil menunjukkan bahwa air kelapa berpotensi menjadi sumber antioksidan, sedangkan dagingnya kaya nutrisi untuk pangan dan kesehatan.

Kata Kunci: Kelapa Muda Hijau, Proksima, Vitamin C, Antioksidan

INTRODUCTION

Coconut (*Cocos nucifera* L.) is a versatile plant, with all parts of the fruit being beneficial to human life. Coconuts can be consumed fresh or processed into food products such as oil, coconut milk, copra, jam, and more. Coconuts are nutritionally sound, containing the amino acid glutamate, a brain nutrient. Furthermore, coconuts contain omega-6 fatty acids, which the body cannot synthesize and must obtain from food. The essential parts of a coconut are the coconut flesh and coconut water, which can be consumed directly (Hadjatu & Laboko, 2023).

Coconut flesh has an inconsistent texture depending on the coconut's age. Coconut water, on the other hand, is the clear liquid inside the endosperm (kernel) and is typically consumed locally fresh in tropical environments, as it spoils easily when exposed to heat and air. The flesh

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has a fairly good nutritional profile, including essential fatty acids and amino acids that the body needs. In addition to being a refreshing drink, coconut water contains various minerals, vitamins, sugars, and essential amino acids, making it a highly nutritious soft drink and a potential cure for various ailments (Azra *et al*., 2023).

A series of chemical tests was conducted to determine the content and benefits of green coconut water and Flesh. Proximate analysis included a water content test using the oven method to assess stability and shelf life; an ash content test by furnace combustion to determine total minerals; and fat, protein, and carbohydrate content tests using a *UV-Vis spectrophotometer*. The fat test aimed to assess the body's energy contribution, while the carbohydrate test measured blood sugar levels, the body's main energy source. The protein test was conducted to assess amino acid content, which plays an important role in cell growth and repair. Furthermore, antioxidant activity was assessed using the DPPH method to measure the ability of phenolic and flavonoid compounds to scavenge free radicals. In contrast, vitamin C content, as a natural antioxidant, was determined by iodometric titration. Based on this background, this study aims to determine the levels of carbohydrates, protein, fat, antioxidants, water, and ash in green coconut samples.

RESEARCH METHODS

Sample Preparation Process

Samples of young green coconuts were cleaned to extract the water and pulp. The pulp was then ground in a blender, and the young green coconut water was filtered.

Vitamin C Analysis

Sample Preparation

Prepare a coconut Flesh sample by weighing 50 grams, then macerating it with 50 mL of distilled water in a beaker, stirring for 30 minutes. The maceration results are filtered through filter paper to separate the pulp from the filtrate. The pulp obtained will then be remacerated to obtain the macerate.

Vitamin C Quantitative Test

Each sample, 10 mL in volume, was placed in a prepared Erlenmeyer flask, then 1 mL of starch reagent was added, and the mixture was titrated with iodine solution until a color change occurred.

Analysis of Water Content and Ash Content

Determination of Ash Content

Determination of ash content in fruit flesh by heating a porcelain cup using a furnace at a temperature of 600^{o}C for 30 minutes. Then, the porcelain cup is cooled in a desiccator for 30 minutes, and the empty cup is weighed using an analytical balance. After that, 2 g of fruit flesh sample is placed into the porcelain cup and weighed. Then heat the cup containing the sample in

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a furnace for 3 hours at 600 °C until a white ash forms. After heating, cool the cup containing the sample in a desiccator for 30 minutes, and then weigh the cup containing the ash (Fikriyah & Nasution, 2021).

Determination of Water Content

Determination of water content in the fruit flesh by heating a metal cup in an oven at 105 °C for 30 minutes. Then cool the test cup in a desiccator for 30 minutes, and weigh the empty cup on an analytical balance. After that, put 2 g of green coconut Flesh sample into the cup and weigh it. Then, heat the cup containing the sample in an oven for 3 hours at 105°C. After heating is complete, cool the cup containing the sample in a desiccator for 30 minutes, then weigh the cup (Fikriyah & Nasution, 2021).

Protein Analysis

Sample Preparation

A 1-gram sample of mashed and filtered green coconut flesh and water was weighed. Then, 5 mL of 1 M NaOH and distilled water were added to bring the total to 25 mL. The mixture was heated at 90°C for 10 minutes. The solution was then cooled and centrifuged for 10 minutes.

Preparation of Standard Solution

Preparation of the Mother Solution: Weighed 0.1 grams of Bovine Serum Albumin (BSA), dissolved with distilled water in a 250 ml volumetric flask to the mark, so that a mother solution of 1000 ppm was obtained. Next, standard solutions of 500, 400, 300, 200, 100, and 50 ppm were made.

Determination of Protein Content Using the Biuret Method

A 2.5 mL sample of centrifuged green coconut flesh and water was taken. Then, 2.5 mL of Biuret solution was added. The adsorbance value was then determined using UV-Vis spectrophotometry at a wavelength of 540 nm. The same treatment was then performed on the standard solution (Sylvia *et al.*, 2021).

Carbohydrate Analysis

Sample Preparation

Weigh 5 grams of green coconut flesh and water into a beaker and carefully add 10 mL of concentrated H_2SO_4. Then, heat for 30 minutes.

Determination of Carbohydrates using the Nelson-Somogyi Method

1 mL of the filtrate was transferred into a test tube. Then, 1 mL of Nelson's reagent was added, and the mixture was heated in a water bath at 60 °C for 20 minutes. After that, it was cooled to ±25°C, and 1 mL of Arsenomolybdate reagent was added and homogenized. 7 mL of

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distilled water was added and homogenized, and the absorbance of the solution was measured using a UV-Vis spectrophotometer at 540 nm (Permatasari & Handoko, 2025).

Fat Analysis

Determination of fat content in green coconut Flesh using Soxhlet extraction

Weighed as much as 2.5 grams of the sample that had been ground using a blender was put into a thimble made of filter paper (1.617 grams). Then, I covered the top with fat-free cotton, folded the end of the thimble tightly, and inserted it into a Micro Soxhlet tube. Connect the bottom end of the Micro Soxhlet tube with a dried fat flask. Extraction was carried out for varying times for 3 hours. Cooled in a desiccator, then weighed until a constant weight (C grams) was obtained (Pargiyanti, 2019).

Determination of fat content of green coconut water using liquid-liquid extraction

Add 50 mL of n-hexane to a separating funnel containing 30 mL of the sample, then shake vigorously for 10 minutes. After being allowed to stand and separate, the aqueous phase is collected in an Erlenmeyer flask, while the n-hexane phase is collected in another Erlenmeyer flask (Sunardi & Mukimin, 2014). Remove the extracted solution and place it in a dry, known-mass beaker. Heat the beaker in an oven at 60-70°C. Cool the beaker in a desiccator until it is cool and weigh it (Namarubessy & Awan, 2016).

RESULTS AND DISCUSSION

Table 1. Carbohydrate Content Analysis

Sample	Concentration (ppm)	Absorbance (nm)	Content (%)
Coconut Water Sample 1	9.11627907	0.163	7,195168958
Coconut Water Sample 2	9.813953488	0.169	7.745819644
Coconut Water Sample 3	10.39534884	0.174	8.204695215
Coconut flesh Sample 1	14.93023256	0.213	11.92510588
Coconut flesh Sample 2	14	0.208	11.4607326
Coconut flesh Sample 3	14	0.201	10,81061

The analysis showed that the coconut water contained 7.19%–8.20% carbohydrate. This value is slightly higher than the research results of Yanuar & Sutrisno (2015), which stated around 5.8%–6.2%. The carbohydrate content of coconut water is mainly simple sugars such as glucose and fructose, which are easily absorbed by the body and make it a good natural drink. Meanwhile, coconut flesh showed a higher carbohydrate content, namely 10.81%–11.92%. This is consistent with data from Muhilal (2023), which reported that the carbohydrate content of mature coconut flesh can reach 14%. These carbohydrates are mostly polysaccharides, such as cellulose and hemicellulose, which also act as dietary fiber.

The carbohydrate content of both coconut water and flesh demonstrates significant potential in the food and health sectors. Coconut water is suitable as a natural beverage, while

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coconut flesh can be used as a functional food ingredient, such as coconut milk, or in high-energy processed foods.

Table 2. Fat Content Analysis

Sample	Repetition	Weight of empty container	Container Weight + Fat	Fat Weight	Content (%)
Coconut water	1	115,162	115,718	0.098	0.196
	2	115,225	115,314	0.089	0.178
	3	115,192	115,269	0.077	0.154
Coconut flesh	1	1,821	1,974	0.153	6.12
	2	1,578	1,717	0.139	5.56
	3	1,617	1,778	0.161	6.44

Based on the observation data, the weight of green coconut water fat was carried out in triplicate, resulting in a fat weight of 0.098, 0.089, and 0.077, which in each result has levels of 0.196%, 0.178%, and 0.154%Likewise with the weight of green coconut Flesh fat as much0.153, 0.139, and 0.161 which have levels of 6.12%, 5.56% and 6.44%. The data obtained shows that the fat content of green coconut water is lower than that of green coconut flesh, which has a higher fat content. According to research conducted by Aswan et al. (2023), the fat content of coconut water is very low compared to the coconut flesh. This indicates that the older the coconut, the higher the fat content stored in the flesh. Coconut water contains only a very small amount of fat, around 0.01-0.33%. Meanwhile, coconut flesh contains 6.5% fat (Barlina, 2004).

Table 3. Protein Content Analysis

Sample	Concentration (ppm)	Absorbance (nm)	Content (%)
Coconut Water 1	326	0.078	0.163
Coconut Water 2	176	0.063	0.088
Coconut Water 3	136	0.059	0.068
Coconut flesh 1	406	0.086	0.203
Coconut flesh 2	516	0.097	0.258
Coconut flesh 3	556	0.101	0.278

The protein content in coconut flesh is 0.203%, 0.258%, and 0.278%, respectively, much higher than that in coconut water, which is 0.163%, 0.088%, and 0.068%, respectively. This difference is due to the functional role of each part; coconut flesh is a dense tissue that functions as a food reserve, so it contains more protein. Conversely, coconut water acts as a nutrient transport medium. Research by Sinaga *et al*. (2015) supports these results, showing that the protein content in coconut flesh reaches 1.529 g/100 g, whereas coconut water contains only 0.102 g/100 g. The high protein content in coconut flesh is dominated by globulins such as cocosin, which plays an important role in embryonic growth.

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These results are supported by Shi *et al*. (2025), who reported that the protein content in green coconut water is around 0.1%, while Subagio (2011) reported that the protein content in coconut Flesh reaches 0.3%. The analysis results show a linear relationship between concentration and absorbance, as indicated by the coefficient of determination (R^2) approaching 1. This proves that the spectrophotometric method used has high accuracy and validity in measuring protein content.

Table 4. Vitamin C Level Analysis

Sample	repetition	Volume	Content (%)	Content (mg/100g)
	1	0.3	0.026418	26,418
Coconut water	2	0.3	0.026418	26,418
	3	0.4	0.035224	35,224
	1	0.6	0.256286	256,2864
Coconut flesh	2	0.6	0.256286	256,2864
	3	0.8	0.341715	341,7152

Based on the analysis results, the vitamin C content in coconut water ranges from 26.418 mg/100g to 35.224 mg/100g, while in coconut flesh it reaches 256.2864 mg/100g to 341.7152 mg/100g. The average vitamin C content in coconut water is 29.35 mg/100g, whereas in coconut flesh it is much higher, at 284.76 mg/100g. According to theory, coconut water is known to have a higher vitamin C content than coconut flesh, namely around 2.09–2.52 mg/100 g (Runtunuwu et al., 2020), whereas in coconut flesh it is only around 2 mg/100 g (Towaha et al., 2008). These results indicate that the data obtained actually contradict the literature, in which the coconut flesh in this sample showed a vitamin C content almost ten times higher than that of coconut water. The significant difference between the test results and theory may be due to several factors, such as differences in coconut varieties, fruit ripeness, and the extraction and analysis methods used. It is possible that the processing or treatment of the samples resulted in a more optimal release of vitamin C from the dense tissue of the coconut flesh.

Table 5. Water Content Analysis

Sample Level	Test	water content (%)	Average	Standard Deviation	RSD (%)
	1	87.30			
Coconut Flesh	2	87.55	87.5	0.1802	0.2060
	3	87.65			

Water content is one of the most important characteristics of food ingredients because it can affect their appearance, texture, and taste (Winarmo, 2004). Based on the observation results, the water content of coconut Flesh from three consecutive repetitions was 87.30%, 87.55%, and 87.65%, with an average of 87.50%. The values obtained did not meet the SNI requirement because the required water content according to SNI 01-3715-2000 is a maximum of 3% on a dry basis (Gefalro *et al*., 2023). This is because young coconut Flesh has a high water content and

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shows soft physical properties (Barlina, 2004), which is in accordance with the characteristics of fresh food ingredients, which generally have a water content above 70%. The standard deviation of 0.1803 and the Relative Standard Deviation (RSD) of 0.2061% indicate that the measurement results have a very good level of precision, as the variation between replicates is very small. This indicates that the water content measurement method used was quite accurate and consistent, and that the coconut flesh did indeed have a high water content. This aligns with the theory of Runtunuwu *et al*. (2011), which states that the water content of coconut flesh is highest in young coconuts and decreases until the coconut is 11-12 months old.

Table 6. Ash Content Analysis

Sample Level	Test	ash content (%)	Average	Standard Deviation	RSD (%)
Coconut Flesh	1	0.70	0.8833	0.1607	18, 1955
	2	0.95			
	3	1			

Ash content is a mixture of inorganic or mineral components found in a food ingredient (Fikriyah & Nasution, 2021). Based on the observations in the Table 6, the ash content of coconut Flesh from three consecutive repetitions was 0.70%, 0.95%, and 1%, with an average value of 0.8833%, a standard deviation of 0.1607, and an RSD value of18.1955%. According to SNI 01-2891-1992 on food and beverage testing methods, the ash content of coconut flesh should be in the low range because this material is relatively fresh and has not undergone intensive processing. In addition, the ash content of young coconut flesh, according to Runtunuwu et al. (2011), ranges from 0.89% to 1.19%, depending on the variety and age of the fruit. Therefore, the ash content of 0.8833% obtained in this study is still within reasonable limits, although lower than that of mature coconut flesh or certain varieties. However, the relatively high RSD value (>10%) indicates significant variation between replicates, which could be due to sample inhomogeneity or errors in the testing process.

CONCLUSION

Based on the analysis results, green coconut (*Cocos nucifera*) has good nutritional value according to proximate parameters. Coconut flesh contains high levels of water (87.5%), fat (±6.04%), carbohydrate (±11.4%), and protein (±0.25%), which are higher than those in coconut water, making it a potential energy source. The vitamin C content of coconut flesh is also much higher (up to 341.72 mg/100g), supporting antioxidant activity. The DPPH test shows moderate to strong antioxidant activity, with IC_{50} values of 5824.52 ppm for coconut water and 5423.78 ppm for coconut flesh. This indicates that green coconut has the potential to be a source of natural antioxidants.

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