Journal of Chemical Natural Resources Vol. 03, No. 01, 2021 | 77 – 83

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Analysis of Potassium Ion (K^+), Sodium Ion (Na^+), and Proteins from Coconut Water Variety of Coconut and Hybrid Coconut

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Abstract. Analysis of potassium ion (K^+), sodium ion (Na^+), and proteins of Dalam coconut varieties water and Hybrid coconut varieties water have been done. The sample is green coconut which was taken simple random from Deli Tua Barat village in the regency of Deli Tua. Analysis of potassium ion (K^+) and sodium ion (Na^+) was determined by Atomic Absorption Spectrophotometry method (AAS) and analysis of protein was determined by the Kjeldahl method. From the result analysis of Dalam coconut varieties water contain amount potassium ion 321.60 mg/100 mL + 0,77 mg/100 mL, sodium ion 33.17 mg/100 mL + 1.85 mg/100 mL, and protein 0,18 % + 0.05 %. Whereas Hybrid coconut varieties water contain amount potassium ion 278.67 mg/100 mL + 1.53 mg/100 mL, sodium ion 31.33 mg/100 mL + 0.83 mg/100 mL, and protein 0.48 % + 0.3 %..

Keywords: Coconut Water, Potassium, Sodium, Proteins.

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1 Introduction

Coconut (Cocos nucifera L.) is one of the plants commonly found in the tropics and has become an important part of the lives of Indonesian people in general. Almost all of these plants can be used to meet their economic, social, and cultural needs. In addition, the importance of this plant is reflected in the large area of smallholder plantations which reaches 98% of the total 3.74 million ha of coconut area and involves more than 3 million farming households in the management of this plant (Novrianto, 2005).

The coconut plant is used almost all of its parts by humans so it is considered a versatile plant. Coconut plants consist of stems, roots, leaves, flowers, and fruit. Coconut fruit consists of the outer skin, inner skin, seed coat, white body, and water (Suhadirman, 1998).

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Journal of Chemical Natural Resources Vol. 03, No. 01, 2021 | 77 – 83

Coconut water is one of the products from the coconut plant that has not been widely used even though coconut water contains a lot of calories, protein, and minerals that are needed by the body.

Because its utilization is still limited, coconut water is often thrown away, either into rivers or ditches (Sarmidi, 2009). Whereas coconut water can be processed into nata de coco, vinegar, jelly, sauce, alcohol, syrup, soy sauce, coconut sugar, soft drinks such as isotonic, and so on (Rindengan and Allorerung, 2004).

Several previous studies have been carried out on coconut water for the development and use of coconut water, such as Riyana's (2008) study which examined the use of preservatives and temperature during storage of coconut water on its quality as an isotonic drink. Kiswanto (2004) examined the effect of temperature and storage time of coconut water on the production of Nata De Coco. And Wijayanti (2006) made sweet soy sauce using coconut water while studying its physical and pH characterization.

Meanwhile, Runtunuwu (2011) analyzed the chemical content of the flesh and water of ten old coconuts in the Dalam, where from the results of his research, the water of the Dalam variety had potassium ion levels of 233.3 – 285.7 mg/100 mL and sodium ions of 27 – 59.3 mg/100 mL. This is different from the data from the Ministry of Industry and Trade (1986) which shows that the mineral content in coconut water with potassium ion levels is 312 mg/100 mL and sodium 105 mg/100 mL. According to Tenda (1992), protein content is 0.13% for young coconuts and 0.29% for old coconuts. The results are inversely proportional to LIPI data (1999) that protein content in young coconut water is 0.20% and old coconut water is 0.14%.

Potassium ions (K^+) and sodium ions (Na^+) are minerals found in coconut water. Potassium plays a role in maintaining fluid and electrolyte balance and acid-base balance. While sodium is the main cation in the extracellular fluid. In the human body, potassium ions and sodium ions work together in regulating the electrolyte balance of body fluids by adjusting the amount of potassium intake from food and the number of potassium ions removed (Anonymous, 2013). According to Almatsier (2002), the minimum requirement for potassium ions in the human body is estimated at 2000 mg/day and sodium ions a day is 500 mg/day. While the protein contained in food serves as the main substance in the formation and growth of the body for humans. (Poedjiadi, 2006).

Coconut In varieties and Hybrid varieties have advantages over coconut varieties Genjah. Where these two coconut varieties have a higher production level and are more resistant to disease than the Genjah variety coconut. With the various types of coconut, the content of potassium ions (K^+), sodium ions (Na^+), and protein may have different levels. Based on the

Journal of Chemical Natural Resources Vol. 03, No. 01, 2021 | 77 – 83

description above, the researchers were interested in analyzing the levels of potassium ions, sodium ions, and protein levels in coconut water of coconut In varieties and Hybrid coconuts.

2 Materials and Methods

2.1 Equipments

The equipment used in this study includes a furnace, burette, porcelain cup, funnel, desiccator, Erlenmeyer, beaker glass, measuring glass, distillation flask, Kjeldahl flask, measuring flask, analytical balance, volumetric pipette, oven, atomic absorption spectroscopy, test tubes, filter paper.

2.2 Materials

The materials used in this study include aquades, ethanol, HCl, concentrated HNO3, concentrated H_2SO_4, H_3BO_3, methyl red indicator, methyl blue indicator, methyl orange indicator, KH_2SbO_4, NaOH, Na_2CO_3, $Na_3[Co(NO)_2)_6]$, coconut water, selenium.

2.3 Potassium Ion Qualitative Test

The sample was put into a test tube, then added with a solution of sodium hexanitritocobaltate (III) $Na_3[Co(NO)_2)_6]$, and a yellow precipitate of $K_3[Co(NO)_2)_6]$ was formed which indicated the presence of potassium ions.

2.4 Determination of Ag Sodium Ion Qualitative Test

The sample was put into a test tube, then added with a solution of potassium hydroantimonate KH_2SbO_4, and a white precipitate of NaH_2SbO_4 was formed indicating the presence of sodium ions.

2.5 Xantoprotein Test

The sample is put into a test tube, then added with a concentrated HNO_3 solution, and a yellow precipitate indicates the presence of protein in the sample.

2.6 Determination of Sodium and Potassium Ion Levels

The sample destruction stage used was dry digestion. The result was then added with 2 mL of concentrated HNO_3 and added with distilled water, then filtered with Whatman no. 42. Put the filtrate into a 50 mL volumetric flask, add distilled water to the marking line, and homogenize. 1 mL of the solution was pipetted and put into a 100 mL volumetric flask then added with distilled water up to the marked line and homogenized. Analyzed using an atomic absorption spectrophotometer at a wavelength of 766.5 nm for Potassium ions. And 589 nm for Sodium ions.

Journal of Chemical Natural Resources Vol. 03, No. 01, 2021 | 77 – 83

2.7 Determination of Sodium and Potassium Ion Levels

As 2 g of coconut water was put into a Kjeldahl flask and then 0.2 g selenium and 25 mL concentrated H_2SO_4 was added. Then the sample was destroyed until it turned into a clear solution. It was put into a 100 mL volumetric flask, then diluted with distilled water to the marking line, and homogenized. 50 mL of this solution was pipetted and put into a distillation flask. 30 mL of 30% NaOH was added, then distilled. The distillate was accommodated into an Erlenmeyer glass containing 30 mL of 3% H_3BO_3 and added 3 drops of the mixed indicator until the distillate turned greenish blue. The distillate was titrated with 0.0930 N HCl until a purple solution was formed. The volume of titrant obtained was recorded and the protein content was determined.

3 RESULT AND DISCUSSION

Tabel 1. Qualitative Test Results of Coconut Water Samples

No	Testing	Reagent	Results
1	Potassium Ion	$Na_3[Co(NO)_2)_6]$	+
2	Sodium Ion	KH_2SbO_4	+
3	Xantoprotein	concentrated HNO_3	+

The measurement results of the standard series solution of potassium ion (K+), and sodium (Na+) were plotted against the concentration so that a calibration curve was obtained in the form of a linear line. The regression line equation for this calibration curve can be derived using the least square method. Thus, the concentration of potassium ions (K+) and sodium ions (Na+) is obtained in the form of mg/100 mL.

Tabel 2. Calculation of Potassium Ion Concentration in Coconut Water Samples

Sample (mg/ 100 mL)	Potassium Ion Concentration (mg/100 mL)	Average Potassium Ion Concentration (mg/ 100 mL)
HC 1	279.70	278.67 $\pm$ 1.53 mg/100 mL
HC 2	278.30	
HC 3	277.90	
DC 1	321.20	321.60 $\pm$ 0.77 mg/100 mL
DC 2	321.50	
DC 3	322.10	

Tabel 3. Calculation of Sodium Ion Concentration in Coconut Water Samples

Sample	Sodium Ion Concentration (mg/100 mL)	Average Sodium Ion Concentration (mg/100 mL)
HC 1	31.90	31,33 $\pm$ 0,83 mg/100 mL
HC 2	31.10	

Journal of Chemical Natural Resources Vol. 03, No. 01, 2021 | 77 – 83

HC 3	31.00	
DC 1	31,90	33,17 ± 1,85 mg/100 mL
DC 2	33,80	
DC 3	33,80	

Testing the protein content to determine the coconut water sample uses the Kjeldahl Method, which starts from the stages of sample destruction, distillation, and titration. In the titration stage of the data obtained, the protein content contained in the sample is calculated. The results of these tests, obtained data on the measurement of the protein content of all samples of coconut water as shown in Table 4.

Tabel 4. Calculation of Sodium Ion Concentration in Coconut Water Samples

Sample	Proteins Ion Concentration (mg/100 mL)	Average Proteins Ion Concentration (mg/100 mL)
HC 1	0.50 ± 0.07 %	0.48 ± 0.03 %
HC 2	0.47 ± 0.05 %	
HC 3	0.47 ± 0.06 %	
DC 1	0.16 ± 0.09 %	0.18 ± 0.05 %
DC 2	0.22 ± 0.05 %	
DC 3	0.17 ± 0.04 %	

Note:

For samples HC 1, HC 2, and HC 3 namely coconut water samples of "Hybrid" varieties

For samples DC 1, DC 2, and DC 3 namely coconut water of the "Dalam" varieties

From the results of the qualitative analysis, it was found that potassium ions, sodium ions, and protein were present in coconut water originating from the Deli Tua area, both hybrid and Dalam varieties, which had been shown through their identification reactions. Based on the calculation results and calibration curve data obtained, coconut water contains levels of potassium ions, sodium ions, and proteins as shown below.

Tabel 5. Final Result of Potassium Ion, Sodium Ion, and Protein

Sample	Potassium Ions (mg/100 mL)	Sodium Ions (mg/100 mL)	Proteins (%)
Hybrid coconut water	278.67 ± 1.53	31.33 ± 0.83	0,48 ± 0.03 %
Dalam coconut water	321.60 ± 0.77	33.17 ± 1.85	0,18 ± 0.05 %

From the results of the examination with AAS, there can also be a matrix disturbance that causes the element to be analyzed to precipitate so that the number of atoms that will reach the flame is less than the actual number of atoms. Likewise with chemical disturbances where there is a form of imperfect dissociation disturbance caused by the presence of refractory compounds

Journal of Chemical Natural Resources Vol. 03, No. 01, 2021 | 77 – 83

in the flame. Refractory compounds are difficult to decompose in the flame so it will prevent the formation of neutral atoms in the ground state. To overcome this, it is necessary to add a buffer element to the solution to be analyzed so that the buffer element will bind to the groups that interfere with the atoms, and the final result will be the correct levels of potassium and sodium ions.

Another way can also be done by using a higher flame temperature so that it will extract the release of ions or interfering groups. From the measurement of potassium and sodium ion levels with AAS, in terms of the growing conditions of coconut trees such as soil conditions, climate, growing area, and location of growing coconut trees also greatly affect the protein and mineral content in coconut water.

4 Conclusion

From the results of this study, it can be concluded that the coconut water of the In variety contains potassium ion levels of 321.60 + 0.77 mg/100 mL, sodium ions of 33.17 + 1.85 mg/100 mL, and proteins content of 0.18 +0.05%. Hybrid coconut water contains potassium ion content of 278.67 + 1.53 mg/100 mL, sodium ion of 31.33 + 0.83 mg/100 mL, and protein content of 0.48 + 0.03%.

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