

Nutrition Analysis of Wood Apple (*Limonia acidissima*)

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Abstract

Wood apple or *Limonia acidissima* contains fruit acid, vitamins, and minerals. The dry fiber of the fruit contains 15% citric acid, potassium, calcium, and iron salt. The seed and pulp contain fats and protein. The fats consist of palmitic acid, oleic acid, linoleic acid, and linolenic acid, despite palmitoleic and stearic acid traces. β -sitosterol, β -Amirin, lupeol, and stigmasterol are from the unsaponifiable matter of seed oil. It was descriptive research that employed a laboratory experiment approach to determine the composition of total carbohydrate, total protein, total fats, water, ash content, and the crude fiber of wood apple. The research found that every 100 gram of wood apple contains 72.326% water, 2.144% ash content, 0.00985% crude fats, 4.300% protein, 15.115% fiber, and 5.868% carbohydrate.

Keywords: wood apple, nutrition content

Abstrak

Apel kayu atau *Limonia acidissima* mengandung asam buah, vitamin, dan mineral. Serat kering dari buah ini mengandung 15% asam sitrat, kalium, kalsium, dan garam besi. Biji dan daging buahnya mengandung lemak dan protein. Lemaknya terdiri dari asam palmitat, asam oleat, asam linoleat, dan asam linolenat, dengan sedikit kandungan asam palmitoleat dan stearat. β -sitosterol, β -Amirin, lupeol, dan stigmasterol berasal dari bahan yang tidak dapat disaponifikasi dari minyak biji. Penelitian ini adalah penelitian deskriptif dengan pendekatan eksperimen laboratorium untuk mengetahui komposisi karbohidrat total, protein total, lemak total, air, kadar abu, dan serat kasar kayu apel. Hasil penelitian menemukan bahwa setiap 100 gram kayu apel mengandung air 72,326%, kadar abu 2,144%, lemak kasar 0,00985%, protein 4,300%, serat 15,115%, dan karbohidrat 5,868%.

Kata kunci: apel kayu, kandungan gizi

Introduction

Limonia acidissima (L.) from Rutaceae family (Citrus family) is included in *Limonia* monotype genus, limited in India, Pakistan, Sri Lanka, and South East Asia. *Limonia acidissima* is known as wood apple, elephant apple, monkey fruit, buah dadih, kath bel, and kaitha. This fruit is consumed as a natural remedy for various diseases. *Limonia acidissima* L. is a deciduous slow-growing tree, with tall barks toward the top, divided into the smaller and slimmer spinning branch. The fruit is round with 5 – 12.5 cm diameter (as shown in Figure 1). It has 6 mm thick, greyish white skin, which is more like a hard to open woody though shell. Gavel is needed to crack the hard shell of wood apple. The brown pulp is powdery, aromatic, resin-contained, sweet, and sour, with white seeds. The sticky pulp is usually syrup, beverage, jelly, or jam. All parts of the tree are beneficial as a remedy, including the root, fruit, bark, and leaves (1).



Figure 1. Illustration of Wood Apple (*Limonia acidissima*), its flowers and fruits (source: www.istock.com and valentine.gr)

A region in Central Java that produces wood apple is Rembang Regency District. Rembang is a regency on the extreme northeast coast of Central Java Province. The regency is crossed by the North Coast Road, an inter-province main road on the island. The coordinate for Rembang Regency is Latitude: 6° 30' – 7° 60' S and Longitude: 111° 00' – 111° 30' E. Rembang residents have used the wood apple as syrup or beverage, which benefits from the wood apple's pulp. The drink made of kawista or wood apple, also known as Cola van Java, was primarily produced decades ago. The abundant amount of wood apple production in Rembang encourages the residents to make wood apple syrup as their everyday main business. Wood apple is a tropical plant with reddish-orange, aromatic, round, hard-skinned fruit. The ripe fruit has reddish-brown seeds with a small sprout on them. The pulp can be produced into syrup, nougat, jam, or madumongso (2).

Based on the Ministry of Health Republic of Indonesia, The nutrition content in every 100 grams of wood apple are 71.8 g water; 120 Kcal Energy; 3.5 g Protein; 2.5 g Fats; 20.8 g Carbohydrate; 4.6 g Fiber; 1.4 g Ash; 190 mg Calcium; 230 mg Phosphor; 1.6 mg Iron; 9 mg Sodium; 190 mg Potassium; 308.43 mg Copper; 0.4 mg Zinc; 99 mcg Beta-carotene; 0.07 mg Thiamine; 0.07 mg Riboflavin; 0.4 mg Niacin; 3 mg Vitamin C (3). The chemical compound found in wood apples is flavonoid, saponin, tannin, coumarin, and tyramine. Besides, wood apple also contains alkaloid compounds, saponin, and phytochemicals in the form of phenol. A Flavonoid with pharmacological properties can be used in any medication for a number of diseases, including cardiovascular, neurodegenerative, and other non-

communicable diseases such as diabetes and cancer (4,5). The Flavonoid in wood apple is claimed as an active natural antioxidant passed the diphenylpicrylhydrazyl (DPPH) reflux antioxidant activity testing (6). It was descriptive research that employed a laboratory experiment approach to determine the nutrient content of total carbohydrate, total protein, total fats, water, ash content, and the crude fiber of wood apple.

Methods

It was descriptive research that employed a laboratory experiment approach to determine the composition of total carbohydrate, total protein, total fats, water, ash content, and the crude fiber of wood apple. The research was conducted in the Nutrient Analysis Laboratory of Universitas Muhammadiyah Semarang. The wood apple fruits were cracked open. Then the pulp was taken and mashed by using a blender. After that, the nutrient was analyzed using different methods; carbohydrate by using differences method, protein by using kjeldahl-micro method, fat by using soxhlet method, water content by using the gravimetric method, and ash content by using ash content determination

Results and Discussion

Wood apple (*Limonia acidissima* L.) is beneficial for health as a traditional remedy. The parts of the plant have their benefits, such as the bark, which is helpful for a liver disorder, insect bite, and menstruation. The gum from its stem could be used as the substitute for Arabic gum and the remedy for diarrhea (6). Wood apple also produces a chemical compound called coumarin from its roots, pectin polysaccharide as an anti-tumor property, as antimicrobial property, and as larvicide (2). The

analysis of nutrient value from 100 grams of wood apple is listed as follows:

Table 1. The Analysis of Nutrient Content (%) from 100 grams of Wood Apple

No.	Nutrient analysis	Amount (%)
1	Water	72.326
2	Ash	2.144
3	Crude fat	0.0985
4	Protein	4.300
5	Crude fiber	15.115
6	Carbohydrate	5.868

From the analysis, it was found that the carbohydrate content in wood apples is 5.868%. Carbohydrate is a Polyhydroxy aldehyde or Polyhydroxy ketone that involves the formed polymerase condensate. Those compounds are named after carbohydrates as the empirical formula is $C_nH_{2n}O_n$ which is close to $C_n(H_2O)_n$, the hydrated carbon. Carbohydrate is the primary energy source for everyone in the world. Some groups of carbohydrates produce dietary fiber, which is beneficial for digestion. Carbohydrate is also helpful to prevent ketosis, excessive protein breaking, mineral loss, also the ability to enhance fats and protein metabolism (7,8).

The protein content from 100 grams of wood apple is 4.3%. Protein is one of the macronutrients of which structure contains N beside the C, H, O (just like carbohydrate and fats), S, and sometimes P, Fe, and Cu (as a complex compound with protein). Just like the other polymerase compound (for instance, cellulose, starch) or compounds from the condensation process of some units of the molecule (such as triglyceride), so that it could be concluded that protein could also be hydrolyzed or broken down as the units'

components by a water molecule. The hydrolysis process releases the composing amino acid (9). On the other hand, according to Winarno (2002), protein is an essential nutrient for our body. It acts as fuel to our energy and as a building block and regulating component of body tissue. Protein is the source of amino acids containing C, H, O, and N compounds not contained by fat and carbohydrate. The protein molecule also contains phosphorus, sulfur, and some minerals like iron and copper. The content of fats from 100 grams of wood apple is 0.0985% (7,8).

Fats are an integral part of any foodstuff. Some fats are used in food preparation obtained from animals and plants. Fats and oil are essential compounds to help maintain human health. Besides, fats and oil are more useful energy sources than carbohydrates and protein. Fats and oils are contained in almost all foods in different compositions (7).

The water content in 100 grams of wood apple is 72.36%. Water content is the amount of water in the targeted material, stated in percentage. Water content is also one of the crucial characteristics in foodstuff, as it affects the food's appearance, texture, and taste. Water content could also determine the freshness and the endurance of the food. The higher the water content, the more bacteria, yeast, and mold have to develop so that the food's appearance and content might be changed. The lower the water content, the slower the microorganism development, and the slower process of food decay (7).

From 100 grams of wood apple, 2.144% ash is obtained. Ash is an organic compound as the residue from an organic material burning process. The content of ash and the composition depends on the material and the ashing method. The amount of ash contained in

a material is correlated to the minerals in that material. Mineral in a material could be composed of two kinds of salts: organic and nonorganic salt. The ash level was determined by oxidizing all of the organic matter at a high temperature, around 500-600°C, and then the residue from the burning process was weighed. In the case of the component of ash, which is readily decomposed or evaporated at a high temperature, the ashing process requires different temperatures depending on the element contained in the material (8,10). Winarno (2002) stated that the mineral element is also known as the nonorganic substance or the ash content. In the burning process, the organic matter is burnt, but the nonorganic substance stays so that it is called ash (7).

Conclusion

The research found that every 100 gram of wood apple contains 72.326% water, 2.144% ash, 0.00985% crude fats, 4.300% protein, 15.115% fiber, and 5.868% carbohydrate.

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