PROXIMATE COMPOSITION OF *Reinwardtiodendron humile* (Hassk.) Mabb. FRUIT FROM BOGOR BOTANIC GARDENS COLLECTION

KOMPOSISI PROKSIMAT BUAH *Reinwardtiodendron humile* (Hassk.) Mabb. DARI KOLEKSI KEBUN RAYA BOGOR

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Abstract

Reinwardtiodendron humile (Hassk.) Mabb. is one of the members of the Meliaceae tribe with the potential to be developed and consumed as fresh fruit or processed fruit. This research aims to determine the proximate composition or nutritional values contained in R. humile. Proximate analysis of R. humile included analytical determinations of water, ash, crude fat, protein, crude fibre, and carbohydrates. All tests for each of the parameters or components were carried out two times. Then, the contents determined through proximate tests were calculated using certain formulas. The results of this study indicate that the proximate composition of R. humile consisted of water, ash, fat, protein, crude fibre, and carbohydrates (74.2% - 75.28%; 1.35% - 1.54%; 0.53% - 0.72%; 2.48% - 2.73%; 0.86% - 3, 47%; and 16.7% - 20.14%). These results meant the fruit contents met the quality standards of fruit, except for the protein content. The results of the analysis of the proximate composition also show that the nutritional values of R. humile fruit did not significantly differ from the nutritional values of other fruits of the Meliaceae tribe commonly consumed by humans, such as duku, langsat, and kokosan.

Keywords: fruit, nutritional value, proximate analysis, *Reinwardtiodendron humile*

Abstrak

Reinwardtiodendron humile (Hassk.) Mabb. merupakan salah satu jenis anggota suku Meliaceae yang berpotensi untuk dikembangkan dan dimanfaatkan sebagai buah segar atau buah olahan. Penelitian ini bertujuan untuk dapat mengetahui komposisi proksimat atau nilai gizi yang terkandung pada buah R. humile. Analisis proksimat dari buah R. humile meliputi kadar air, abu, lemak kasar, protein, seratkasar, dan karbohidrat. Semua parameter (komponen uji) dilakukan 2 kali pengulangan. Kemudian setiap uji jenis proksimat dihitung menggunakan rumus tertentu. Hasil penelitianini, menunjukkan bahwa analisis komposisi proksimat buah R. humile terdiri dari air, abu, lemak, protein, serat kasar, dan karbohidrat (74,2% - 75,28%; 1,35% - 1,54%; 0,53% – 0,72%; 2,48% – 2,73%; 0,86% – 3, 47%; dan 16,7% - 20,14%). Hasil ini memenuhi standar mutu buah, tetapi untuk protein tidak memenuhi standar mutu buah. Hasil analisis komposisi proksimat atau kandungan nilai gizi buah R. humile tidak jauh berbeda bahkan hamper sama dengan kandungan nilai gizi buah-buahan anggota suku Meliaceae yang umum dikonsumsi manusia, seperti buah duku, langsat dan kokosan.

Kata kunci: analisis, buah, nilai gizi, proksimat, *Reinwardtiodendron humile.*

Introduction

Reinwardtiodendron humile (Hassk.) Mabb. is a member of the Meliaceae tribe with a fruit potential. Jansen, Jukema, Oyen, & Lingen (1992) reported that *R. humile* tastes sour but is edible. The utilization of *R. humile* as fruit in Indonesia is still relatively rare. *R. humile* is reported to be consumed as fresh fruit when it is ripe in Jambi by the Sungai Tapa community, whereas the wood from its main stem is used for firewood (Rahayu, Susiarti, & Purwanto, 2007). The research results of Astuti & Solihah (2018) explained that the taste of ripe *R. humile* from the collection in the Bogor Botanical Gardens was sweet like *Lansiumparasiticum* (duku), but the flesh was thinner than *duku*. Based on the previous studies, it can be predicted that *R. humile* contains various nutrients needed by the body, just like *duku*.

The proximate contents of *R. humile* have been thought to be similar to those of *duku*. However, to find further about the nutrients mostly contained in *R. humile* requires a proximate analysis. According to Mayanti (2009), the proximate contents of *duku* were 0.7% protein, 0.6% ash, 3.2% fibre, 86% water, and no fat (0). The results were reinforced by data reported by Hesti & Apriyani (2015) who found that *duku* contained 1% of protein, 0.2% of fat, and 88.62% water. Meanwhile, based on the research results of Rohin et al., (2016), *duku* had 1.0 - 1.5% of protein and 0.2 - 0.5% of fat.

The previous studies have mostly focused on *duku*,leaving a research gap in the complete information about the nutritional contents of *R. humile*. Economically, this fruit has the potential to be developed and consumed as either fresh fruit or processed fruit. Therefore, this research aims to determine the proximate composition of *R. humile* for better use and development of the fruit.

Material and methods

Time and Research Location

This study was conducted from April 2016 to April 2018 in the nursery of Bogor Botanical Gardens – LIPI and in the laboratory of Research Center for Biological Resources and Biotechnology – Research and Community Empowerment Institutions, IPB.

Materials and Tools

The material used in this study was fresh *R. humile* obtained from the collection of the Bogor Botanical Gardens. The chemicals used were 150 ml hexane solvent, 0.25 gram selenium, 3 ml concentrated H_2SO_4, 50 ml distilled water, 20 ml 40% NaOH, 10 ml 2% H_3BO_3, 2 drops of Brom Cresol Green-Metyl Red Indicator, 0.1N HCl, 100 ml 1.25% H_2SO_4, 20 – 30 ml boiling water, 1.25% NaOH, 25 ml 1.25% H_2SO_4, and 25 ML alcohol.

The tools used in this study included: porcelain cups, ovens, stopwatches, analytical scales, cotton, filter paper, Soxhlet flasks, Kjeldahl flasks, Erlenmeyer flasks, Buchner funnels, furnaces, Pyrex glass, micropipette (Brand), aluminium foil, vortex, rotary evaporator, electric heater, and desiccator.

Proximate Composition Analysis Procedure

The proximate analysis of *R. humile* was done to determine water, ash, crude fat, crude protein, crude fibre, and carbohydrate contents. The tests of all parameters (components) were repeated twice.

1. **Water content determination**

A total of 1 gram of sample was weighed in a cup, then put in an oven with a temperature of 105°C for 8 hours. Next, it was weighed and calculated using the formula to follow Sudarmadji (1989); Rompas, Runtuwene, & Koleangan (2016) which was modified:

$$Water\ content\ = \frac{Sample\ weight\ (fresh - dry)}{fresh\ sample\ weight}\ x\ 100\%$$

2. **Ash content determination**

1 gram of sample was placed in a porcelain cup and then burned until no more smoke was produced. Subsequently, it was burned in a 600°C furnace for 4 hours, and then weighed and calculated using the formula:

$$Ash\ content = \frac{Ash\ weight}{sample\ weight}\ x\ 100\%$$

3. **Crude fat content determination**

A 2 gram sample was spread over cotton on top of dry paper and rolled into a thimble, then put into a Soxhlet flask. After that, the sample was extracted in 6 hours with 150 ml fat solvent (hexane). The extracted fat was subsequently dried in an oven at a temperature of 100°C for 1 hour (Landeng, Suryanto, & Momuat, 2017) was modified. The formula for calculating the fat content is:

$$Fat\ content = \frac{Extracted\ fat\ weight}{Sample\ weight}\ x\ 100\%$$

4. **Crude protein content determination**

In this research, crude protein was determined by the Kjeldahl method. A sample of 0.25 grams was put in a 100 ml Kjeldahl flask, and 0.25 grams of selenium and 3 ml of concentrated H_2SO_4 were added to it. Destruction (heating in a boiling state) followed for 1 hour, until the solution was clear. Once the solution cooled off, 50 ml of aquadest and 20 ml 40% NaOH were added and then it was distilled. The distilled product was stored in an Erlenmeyer flask containing a mixture of 10 ml of 2% H_3BO_3 and 2 drops of pink Bromine Cresol Green-Methyl Red indicator. Once the volume of the distillate reached 10 ml and bluish green in colour, the distillation was stopped and titrated with 0.1N HCl until it turned pink. The same treatment was also done on the blank. With this method, the total nitrogen obtained was calculated using the formula:

$$\%N\ = \frac{(S - B)X\ NHClx14}{w\ x\ 1000}\ x\ 100\%$$

Notes: S = titrant sample volume (ml); B = blank titrant volume (ml); w = dry sample weight (mg). Protein content was determined by multiplying the nitrogen content by the factors for various foodstuffs in the range of 5.18 – 6.38 (AOAC, 1980).

5. **Crude fibre content determination**

A 1-gram sample was dissolved with 100 ml 1.25% H_2SO_4, heated to boiling level, and destructed for 30 minutes. After that, it was strained with filter paper and with the help of the Buchner funnel. The filter residue was rinsed with 20-30 ml boiling water and 25 ml of water for 3 times. The residue was destructed with 1.25% NaOH for 30

minutes. Then, it was strained in the same manner and rinsed in succession with 25 ml of boiling 1.25% H_2SO_4, 25 ml of water for 3 times, and 25 ml of alcohol. The residue and filter paper were transferred to a porcelain cup and dried in a 130˚C oven for 2 hours. Once cooled off, the residue along with the porcelain cup was weighed (A), and then put into a 600˚C furnace for 30 minutes, cooled and weighed again (B). The crude fibre content was calculated using the formula:

$$\text{Crude fibre content} = \frac{\text{crude fibre weight}}{\text{sample weight}} \ x \ 100\%$$

Notes:
Crude Fibre Weight= W – W^0
W = Residual weight before burning in the furnace
= A - (filter paper weight + cup) : A : residual weight + filter paper + cup
W^0 = Residual weight after burning in the furnace
= B - (cup weight) : B : residual weight + cup

6. Carbohydrate content determination

Total carbohydrate content was determined by the carbohydrate-by-difference method, namely: 100% - (water content + ash + protein + fat). N-free protein content indicates the amount of digestible carbohydrate content of a food ingredient, determined with 100% - (water content + ash + fat + protein + crude fibre).

Results and Discussion

Result

The fruit analysed in this research was *R. humile*. The results of the proximate analysis of fresh *R. humile* are presented in Table 1.

Table 1. Result of The Proximate Analysis of *R. humile* (Hasil Analisis Proksimat *R. humile*)

No.	Type of Proximate	Fruit (seed and aryl) %			Whole fruit (with its skin) %		
		R_1	R_2	Average	R_1	R_2	Average
1.	Water content	73.84	74.56	74.2	74.95	75.61	75.28
2.	Ash	1.52	1.55	1.54	1.33	1.37	1.35
3	Fat	0.50	0.55	0.53	0.70	0.74	0.72
4.	Protein	2.71	2.75	2.73	2.48	2.48	2.48
5.	Crude fibre	0.84	0.88	0.86	3.36	3.58	3.47
6.	Carbohydrate	20.59	19.71	20.14	17.18	16.22	16.7

Notes: R_1= First repeat, R_2= Second repeat

Discussion

Table 1. Shows that the average water contents of *R. humile*, both in the forms of seed and aryl and in whole (with peels), from 2 repetitions were 74.2% and 75.28%. Water content is one of the most important characteristics in food. According to Winarno (1997); , water content can affect several physical properties, such as appearance, texture, and taste in food. It also determines the freshness and

durability of food. High water content causes bacteria, mould, and yeast to easily multiply, resulting in changes in food (Winarno, 1997). The water content of *R. humile* is lower when compared to the water content of *duku*. Mayanti (2009); Badan Litbang Pertanian (2012) reported that *duku* had water content of 82% - 86%. In the same vein, Nur'aini & Apriyani (2015) reported *duku* to have 88.6% of water content. This high content of water is thought to be related to the thickness of the fruit flesh (aryl), where *R. humile* flesh is thinner than the *duku* flesh. *R. humile* water content is also lower than that of *Lansium domesticum* (langsat), which according to Tilaar et al., (2007), had 84% water content. According to Dewi & Dewi (2015), the standard quality of fresh fruit in terms of water content is that it contains 75 – 95% water, and in *R. humile* the water content was 74.2% - 75.28%. Hence, the water content of *R. humile* met the fruit quality standards.

Another element which is classified as micronutrient is the ash content. Ash content in food is related to the content of inorganic minerals. Testing of ash content, according to Sudarmadji, Bambang & Suhardi (1997), is to determine the amount of minerals that cannot be burned in organic materials through the combustion process. The results of the analysis of *R. humile* indicate that the ash content was 1.35% - 1.54%. When compared to *Lansium domesticum* var. *kokosan* (*kokosan*) and *langsat*, the ash contentin *R. humile* is higher because according to Tilaar et al. (2007), the ash content in *kokosan* and *langsat* was only 0.6%. Salim, Sulistyaningrum, Isnawati, Sitorus, Yahya, & Ni'mah(2016), also explained that the water content of *duku* fruit skin extract was 0.17% - 0.27%.

The test results of *R. humile* fat content indicated an amount of 0.53% - 0.72%, while the fat content of *duku* was between 0.2% - 0.5% (Hesti & Apriyani, 2015; Rohin et al., 2016). These results indicate that the fat content of *R. humile* is higher than the fat content of *duku*. When compared to other members of the Meliaceae tribe, such as *kokosan*, the fat content of *R. humile* fruit is also higher. This is so because according to Godam (2013), the fat content in cocoa was only 0.2%. According to Dewi & Dewi (2015), fruit fat content indicates relatively low-quality standards of fruit, except for avocados and olives (olives) which contain up to 20% oil.

Analysis of proteins in food is also important to determine the total protein content of a food ingredient. Based on the test results, *R. humile* contained protein of 2.48% - 2.73%. Some research results show that the protein content of *duku* was only 0.7% (Mayanti, 2009); 1% (Hesti & Apriyani, 2015), and 1.0% - 1.5% (Rohin et al, 2016). These reports demonstrate that the protein content of *R. humile* is higher than that of *duku*. When compared to *kokosan*, the protein content of *R. humile* is higher, because the protein content of *kokosan* was only 1.6% (Godam, 2013; Norhayati, et al.,2016). According to Dewi & Dewi (2015), the amount of protein in fruit is generally relatively small, which is around or less than 1%. However, *R. humile* contained more than 1%. Thus, *R. humile* can be considered a good source of protein.

Besides water, ash, protein, and fat, fibre is also an important micronutrient in fruit. In nutrition science, Kusharto (2006) mentions that vegetable and fruit fibers what we eat is called crude fiber (crude fiber). Poedjiadi & Supriyanti (1994); Salimna, Izzati, & Haryanti (2014) defined fibre as a part of plant cells that cannot be digested by the body's enzymes and consists of cellulose. Praseptiangga, Aviany & Parnanto (2016); Kusharto (2006) added that other compositions, besides cellulose, contained in fibre include pectate, hemicellulose, and several types of glycoproteins. The fibre content in a fruit depends on its type. The results of the analysis of the crude fibre content in *R. humile* fruit showed an amount of 0.86% - 3.47%. Based on the results, the crude fibre content in *R. humile* fruit is significantly different from that in *langsat*, which was equal to 0.80% (Tilaar et al., 2007).

The type of nutrient that is also very important for the body is carbohydrate. Carbohydrates or charcoal hydrates are compounds that are formed from carbon hydrogen and oxygen molecules. The main function of carbohydrates is to produce energy in the body, where each gram produces 4 calories (Hutagalung, 2004). The carbohydrate test on *R. humile* fruit yielded an amount of 16.7% - 20.14%. Compared to the content of its relatives of the same tribe, namely *duku* and *langsat*, the carbohydrate content in *R. humile* is higher. According to an Anonymous source (2010); Darmadi, Pradha, & Setiawan (2018); Anonymous (2013), the carbohydrate content in *duku* and *langsat* was only 7.8% - 16,1%. Likewise, when compared to *kokosan*, the carbohydrate content of *R. humile* is also higher. According to Godam (2013), the carbohydrate content in *kokosan* was only 13%. Dewi & Dewi (2015), explained that the quality standards for carbohydrate content of fruit is high, ranging from 2 - 40%, depending on the type of fruit and its maturity. Thus, that it can be said that the carbohydrate content in *R. humile* met the fruit quality standards.

The proximate contents of *R. humile* revealed in this research, especially for water, ash, fat, protein, crude fibre, and carbohydrate contents, are not significantly different from the proximate contents in the fruit relatives of the tribe, namely *duku*, *langsat*, and *kokosan*, which are commonly consumed by the public. In terms of fruit quality standards, the nutritional values or proximate contents of *R. humile* have met the fruit quality standards. This shows that *R. humile* can be developed as a commodity of fresh fruit for consumption. This argument is supported by Astuti & Solihah (2018) who reported that *R. humile* can be eaten by both humans and animals.

In addition to nutritional contents, the fruit contains vitamins A and C, which are both needed by the body to support eye health, prevent infection, and reduce stress. However, this research did not test *R. humile* for vitamin C content. Given the vitamins in fruit are important nutritional values, it is necessary to do further research on the vitamin contents in *R. humile*. Hence, besides being consumed as fresh fruit, the fruit can also be developed into processed products.

Conclusion

Based on the results of the research, it can be concluded that the proximate composition of *R. humile* consisted of water, ash, fat, protein, crude fibre, and carbohydrates (74.2% - 75.28%; 1.35% - 1.54%; 0.53% - 0.72%; 2.48% - 2.73%; 0.86% - 3.47%; and 16.7% - 20.14%). These contents meet the quality standards of fruit, except for protein content because the protein content in *R. humile* was higher compared to the quality standards of fruit. The results of the proximate composition or nutritional value analysis of *R. humile* are not significantly different from, and even almost the same, as those of the fruit relatives of the Meliaceae tribe that are commonly consumed by humans, such as *duku*, *langsat*, and *kokosan*.

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