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## Proximate Analysis of Dewandaru Fruit (*Eugenia uniflora* L.) Dried Sweets

Mazarina Devi

*Universitas Negeri Malang, Semarang Street, No. 5, Malang 65145, Indonesia, mazarina.devi.ft@um.ac.id*

Soenar Soekopitojo

*Universitas Negeri Malang, Semarang Street, No. 5, Malang 65145, Indonesia, mazarina.devi.ft@um.ac.id*

Laili Hidayati

*Universitas Negeri Malang, Semarang Street, No. 5, Malang 65145, Indonesia, mazarina.devi.ft@um.ac.id*

Issutarti Issutarti

*Universitas Negeri Malang, Semarang Street, No. 5, Malang 65145, Indonesia, mazarina.devi.ft@um.ac.id*

Wiwik Wahyuni

*Universitas Negeri Malang, Semarang Street, No. 5, Malang 65145, Indonesia, mazarina.devi.ft@um.ac.id*

*See next page for additional authors*

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### Authors

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Mazarina Devi<sup>a\*</sup>, Soenar Soekopitojo<sup>a</sup>, Laili Hidayati<sup>a</sup>, Issutarti<sup>a</sup>, Wiwik Wahyuni<sup>a</sup>, Mansoor Abdul Hamid<sup>b</sup>, Naufal Kuku Tata Asri<sup>a</sup>

<sup>a</sup>Universitas Negeri Malang, Semarang Street, No. 5, Malang 65145, Indonesia

<sup>b</sup>Universiti Malaysia Sabah, UMS Street, Kinabalu City, Sabah, 88400, Malaysia

\* corresponding author, email: mazarina.devi.ft@um.ac.id

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### ABSTRACT

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Dried sweet fruit is a diversified food product that is popular in Indonesia. Dewandaru fruit (*Eugenia uniflora* L.) dried sweets are expected to be a preferred and beneficial product for health. This study aimed to analyze the Proximate content of Dewandaru fruit. This experimental study utilized a Completely Randomized Design (CRD) with four different drying time treatments consisting of 4 levels (6 hours, 7 hours, 8 hours, and 9 hours) and 2 replications. Observation data were analyzed using One-way ANOVA followed by the DMRT test. The results showed that Dewandaru dried sweets with a drying time of nine hours had the highest chemical properties based on the parameters of the protein content of 3.56 percent, moisture content of 30.90 percent, ash content of 1.81 percent, carbohydrate content of 63.96 percent, fat content 0.4 percent, flavonoids 5,950.85 mg/kg, saponins 46.70 mg/kg, and tannins 242.56 mg/kg. Thus, the drying time rate affects the chemical properties of Dewandaru fruit. However, drying for 9 hours has a higher fat content than other treatments.

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## I. Introduction

Indonesia is one of the tropical countries abounding in fruit diversity. Unfortunately, Indonesia's abundant diversity of fruit species makes Indonesians not yet understand certain fruit species specifically. This condition causes the development of fruit utilization as a product not to be optimal. Fruit is one of the farming and agriculture products rich in benefits and advantages. One underdeveloped fruit is the Dewandaru fruit (*Eugenia uniflora* L.), which is rich in nutritional content and widely used by the general public and the food industry as a source of phytochemicals for human health (Celli, Pereira-Netto, & Beta, 2011). Dewandaru fruit plants can grow regardless of the season. It can grow up to five meters high, it has a red color, and its shape is rounded (Griffis, Jr, McDonald, Smith, & Manners, 2008).

Proximate analysis of herbs provides valuable information and helps assess these herbs' quality. The proximate analysis provides information on moisture content, ash content, volatile matter content, ash, fixed carbon, etc. The total ash may vary with wide limits for the original medicinal specimen due to natural variables: physiological ash. Ash gives us an idea of the mineral material contained in plants (Saebi10.1007/s12011-020-02171-2). Dietary fiber is an indigestible carbohydrate and lignin complexes that are intrinsic and intact in plants and are resistant to digestion and absorption in the small intestine (Dhingra, Michael, Rajput, & Patil, 2012; Rao & Gan, 2014). Dietary fiber enhances beneficial physiological effects such as relaxation, lowering blood cholesterol, and modulation of postprandial blood glucose (Champ, Langkilde, Brouns, Kettlitz, & Collet, 2003).

*Eugenia uniflora* is widely considered to be one of those herbs with great taste. Most of these are grown to produce edible fruit consumed fresh or made into delicious jams (Moura, Oliveira, Bonome, & Franzener, 2018). Apart from its essential diet, it is also a great source of nutrition. Dewandaru fruit (*Eugenia uniflora* L.) has a high carbohydrate content of around 38% where the main compounds are identified as maltose, lactose, and fructose (Costa, Garcia-Diaz, Jimenez, & Silva, 2013). In addition,

Dewandaru fruit (*Eugenia uniflora* L.) contains high levels of vitamin C, vitamin A, riboflavin (B12), and niacin (B3) (Costa et al., 2013).

A number of product innovations to develop Dewandaru fruit utilization must be done to enrich the diversity of beneficial and healthy light meals. One is by processing Dewandaru fruit into dried sweets. It is generally a sweet light meal made from fruit and added with sugars as a sweetener. Dried sweet is processed by drying the fruit to reduce the water content within the fruit; hence, the fruit can be stored longer (Beuchat, 1978; Doran, 2013). The high-water content in Dewandaru fruit causes microorganisms to grow quickly; accordingly, it can accelerate the rot of the fruit.

## II. Method

This research was an experimental study using a completely randomized design (CRD) with four treatments, specifically six hours of drying (A1), seven hours of drying (A2), eight hours of drying (A3), and nine hours of drying (A4) with each treatment repeated twice. This research was conducted in the Industrial Technology Laboratory, Faculty of Engineering, State University of Malang, and the Chemistry Laboratory, University of Muhammadiyah Malang. The tools used in this study included scales, measuring cups, bowls, knives, stoves, pans, ladles, strainers, trays, and cabinet dryers. In addition, the ingredients used were Dewandaru fruit, granulated sugar, salt, calcium hydroxide, cinnamon, and water.

The research was carried out by selecting the raw material in fresh and red Dewandaru fruit and then washing it. Dewandaru fruit was seeded, weighed as much as 100 grams, and soaked in 0.24 percent of salt solution for five hours. Dewandaru fruit was washed and soaked again in 2 percent solution of calcium hydroxide for 12 hours. After that, the Dewandaru fruit was washed to remove the remaining calcium hydroxide, drained, and then blanched at 90°C for five minutes. The next process was cooking a 40 percent sugar solution, adding 5 percent cinnamon to boil, and it continued soaking in the sugar solution for 12 hours. The Dewandaru fruit was drained and dried in a cabinet dryer with four treatments. Each treatment was tested for chemical properties, including flavonoid levels, saponin levels, tannin content, protein content, fat content, carbohydrate content, moisture content, and ash content.

## III. Results and Discussion

### A. Protein Content

The highest protein content in the Dewandaru dried fruits was obtained in Dewandaru sweets which were dried for nine hours with a value of 3.56 percent, while the lowest value was found in the drying period for six hours with a value of 2.3 percent (Figure 1). The value of protein content in the Dewandaru dried sweets was higher with the longer drying period. It is in line with Marzec, Kowalska, Kowalska, Domian, and Lenart (2020), which report that the longer it takes to dry, the water content will decrease, resulting in a drier texture of sweets. Reduced water content in dry sweets will increase protein levels (Bourdoux, Li, Rajkovic, Devlieghere, & Uyttendaele, 2016). Foodstuffs contain various chemical compounds where if the water content in a material is reduced, then chemical compounds, including protein, carbohydrates, fats, and minerals, will be more dominant (Moreno, Fernández, Rodríguez, Carrillo, & Rochín, 2018).

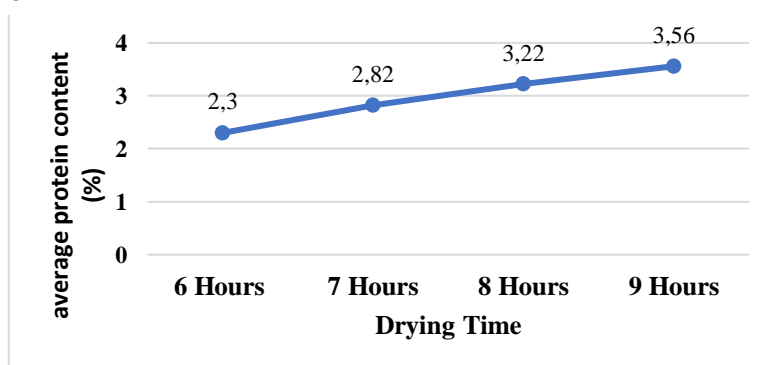


Fig. 1. Protein Content

### B. Water Content

Based on Figure 2, the results of the proximate analysis of moisture content of Dewandaru fruit with a drying period of six hours, seven hours, eight hours, and nine hours had a significant effect ( $P < 0.05$ ). Thus, it obtained a different result in each treatment.

The lowest moisture content was obtained in the drying period treatment for nine hours with a value of 30.9 percent. The longer the drying period is given during drying, the less water content will be obtained (Sinnott, 2000). It is in line with Zambrano, Dutta, Mercer, MacLean, and Touchie (2019) that water movement in a material will be faster when given a longer period. The drying period and temperature are one of the benchmarks in determining the water content of the final product. It is because the water molecules on the material's surface will evaporate. The longer the drying period causes the material to be exposed directly to hot air accordingly the water content will decrease (Carneiro, Nogueira, Martins, Valladão, & Pires, 2018). In addition, the reduced water content of Dewandaru fruit is influenced by soaking with a solution of calcium hydroxide which causes the calcium to penetrate the fruit tissue, consequently, the water from inside the fruit will be discharged, and the material will be stronger (Rodrigues, Cunha, & Hubinger, 2003).

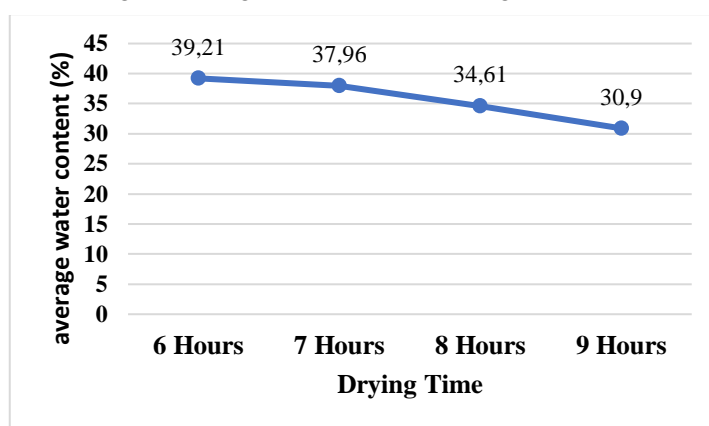


Fig. 2. Water Content

### C. Ash Content

Based on Figure 3, the results of the proximate analysis of ash content of Dewandaru dried sweets with a drying period of six hours, seven hours, eight hours, and nine hours obtained a significant effect ( $P < 0.05$ ). As a result, it obtained a different result in each treatment.

The highest ash content was obtained in the drying period treatment for eight hours and nine hours with the same value of 1.18 percent. The drying period significantly affected the ash content of Dewandaru dried sweets. The increase in the value of ash content during the drying process is related to the lower moisture content in the Dewandaru dried sweets due to the extended drying period (Yunita & Rahmawati, 2015). The higher the value of the components of the ash content in food, the more mineral content, includes calcium, potassium, phosphorus, iron, and others. The increase in ash content in Dewandaru dried sweets occurs due to temperature and drying period factors, where the longer the drying period, the more water content will evaporate (Park & Bell, 2004; Traoré et al., 2017). The type of material, the method of ashing, and the time and temperature used during drying will affect the amount of ash content in the material (Jing et al., 2021).

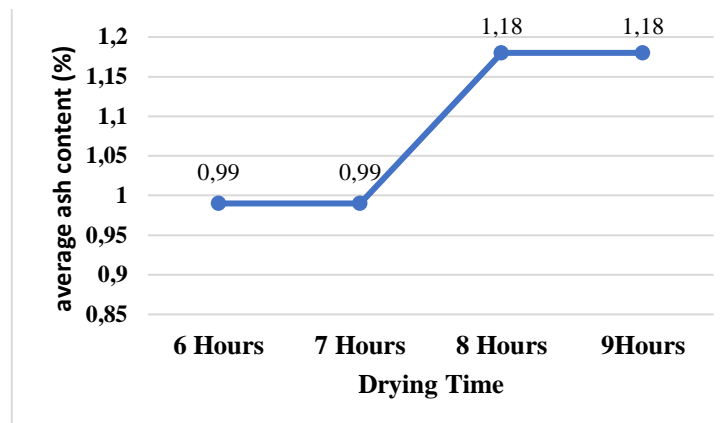


Fig. 3. Ash Content

#### D. Carbohydrate Content

The highest carbohydrate content was obtained in the drying treatment for nine hours, with a value of 63.96 percent (Figure 4). The drying period significantly affected the carbohydrate content of Dewandaru fruit, where the longer it dries, the higher the carbohydrate content obtained. It is in line with Pavel and DeJong (1993) that temperature and drying period will reduce the moisture content in the material. Accordingly, the carbohydrate content will increase. The water content in food influences the number of components of chemical compounds where the water content decreases, so macromolecular compounds such as protein, fat, minerals, carbohydrates, and others will be increasingly dominant 978-1-4051-6807-6. The amount of water content in food ingredients will cause the carbohydrate content to decrease because the concentration of nutrients in the cell will also decrease, thus the decrease or increase in nutrients is called a false decrease or increase (Dhingra et al., 2012; Gibney, Lanham-New, Cassidy, & Vorster, 2013).

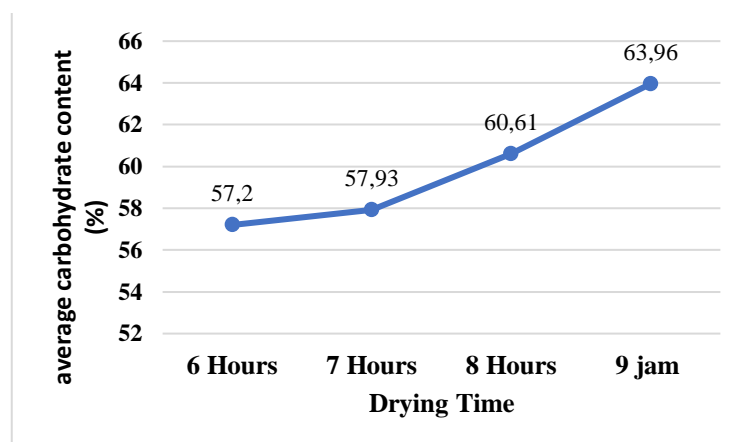


Fig. 4. Carbohydrate Content

#### E. Fat Content

The amount of fat content in Dewandaru dried sweets is influenced by the time it takes in the drying process. The longer the drying period, the higher the fat content obtained. The highest fat content was obtained in the drying period treatment for eight hours and nine hours with a value of 0.4 percent, and the lowest value in the drying period treatment for six hours and seven hours (Figure 5). It is in line with Yunita and Rahmawati's research (2015) that the temperature and drying time used will affect the water content, where the percentage of water content will decrease with the increasing percentage of fat content (Gibney et al., 2013). Meanwhile, based on Yulvianti, Barleany, and Ernayati (2015), drying time has a significant effect on the lipoprotein content associated with the presence of fat, where the reduced water content will fracture the hydrogen bonds with the protein, which is accompanied by fracturing the bonds of water and lipoproteins (Maric et al., 2019). Furthermore, the fracturing will also occur in the bonds between fats and proteins, forming free fatty acids that do not

bind to any molecule. These free fatty acids are detectable whole fatty acids. Thus, the small amount and the percentage of fat content can be measured.

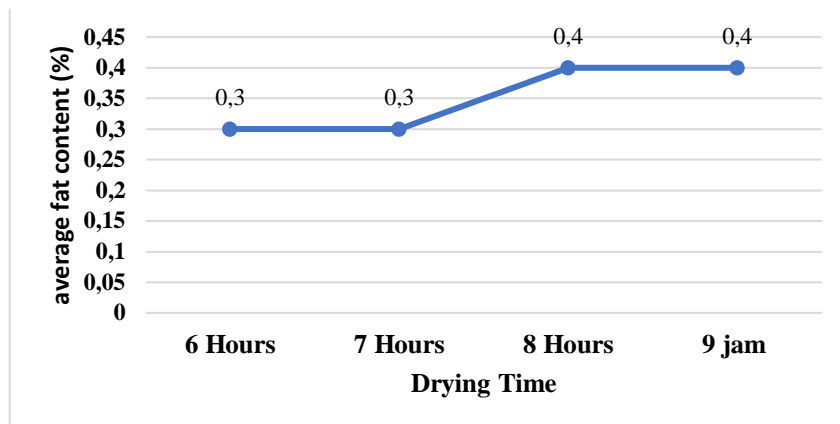


Fig. 5. Fat Content

#### IV. Conclusion

Based on the research and discussion results, the drying period treatment had a significant effect ( $\alpha = 0.05$ ) on chemical parameters, including proximate, flavonoid levels, saponin levels, and tannin levels of Dewandaru dried sweets. Therefore, it can be concluded that the proximate test of Dewandaru dried sweets with a drying time of nine hours produces the best chemical content, which includes a protein content of 3.56 percent, water content of 30.9 percent, ash content of 1.18 percent, carbohydrate content of 63.96 percent, fat content of 0.4 percent, flavonoid levels of 5950.85 mg/kg, saponin levels of 46.7 mg/kg, and tannin levels of 242.56 mg/kg. It is suggested for further research that it is necessary to observe the storage period of Dewandaru dried sweets and the proper packaging technique to maintain the quality of Dewandaru dried sweets.

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