

Utilization of Controlled Oven Drying Method to Produce Export Quality of Coffee Peel and Beans (*Coffea arabica* L.)

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Abstract

Karo regency as supplier of coffee, especially around Jaranguda village. Coffee is one of Indonesia's leading export commodities. A unique approach is required to enhance both the quantity and quality of coffee. Drying is a crucial step to ensure the peel and coffee beans maintain their quality after harvest. This study aims to determine whether drying using a drying oven has an effect on water content and nutritional information. Post-harvest processing methods included wet sorting, separation of peel and coffee beans, washing, drying, analysis of coffee peel characteristics, and analysis of nutrients in coffee beans. The analysis revealed that the water content of Arabica coffee beans was 1.11 %, while the analysis of nutrients and non-nutrients per 100 g of coffee beans revealed the following: total energy 417.34 kcal, fat energy 72.90 kcal, ash content 4.68 %, carbohydrates 72.17 %, total fat content 8.10 %, protein content 13.94 %, saturated fat 3.70 %, and sodium 6.53 mg. The analysis of coffee peel *Simplicia* revealed water content of 6.69 %, water-soluble extract content of 25.57 %, ethanol-soluble extract content of 13.79 %, ash content of 1.90 %, and acid-insoluble ash content of 1.43%. Analysis results of the characteristics of coffee peel meet the requirements of the Indonesian Herbal Pharmacopoeia Edition II in 2017. The food label includes nutritional value information, also known as nutrition facts, which details the nutritional content of the food ingredients. This information is crucial as it provides valuable insights and enhances the overall value of the product

Keywords: *Coffea arabica*; Nutrition fact; Nutrients; Analysis



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INTRODUCTION

Coffee is one of Indonesia's leading export commodities. According to [BPS-Statistics Indonesia \(2023\)](#), Karo regency as the fourth largest plantation crop of Arabica coffee (*Coffea arabica*), after North Tapanuli regency, Dairi regency, and Humbang Hasundutan regency in North Sumatra province with has an plantation area of 9,205 ha and a production of 7,411 tons. Karo regency, especially in Jaranguda village, has a farmer group (KT). KT is a collective of individuals who voluntarily form a group due to shared interests and needs, to increase income and achieve financial independence. One of the businesses involved in KT Anugerah is Dayac Arabica. The Dayac stall sells Arabica coffee in packages. The lack of knowledge among partners regarding coffee drying causes the harvest to be less than optimal.

Coffee plants are plants that have certain characteristics, including growing and developing in highlands with an altitude of 1000 to 2100 meters above sea level ([Wenny, 2019](#)). [Muchtadi & Fitriyono \(2010\)](#) research identifies three classifications that can influence coffee quality: aroma (taste), acidity level, and weight ([Annishia & Setiawan, 2018](#)). Coffee plants (*Coffea* sp.) are included in the genus *Coffea*, which is included in the Rubiaceae family ([Andriyani et al., 2020](#); [Murdiyanti et al., 2022](#)). *Coffea arabica* is a coffee that has a planting altitude of 1000 - 2000 meters above sea level, which is very suitable for the growth of Arabica coffee plants with an environmental temperature of 15-25 °C ([Supriadi & Pranowo, 2015](#)). Arabica coffee beans differ from Robusta coffee in that they are more acidic, have a softer texture, and emit a fragrant aroma ([Herlinawati, 2020](#)). The best characteristics obtained from coffee beans after the drying process will determine the quality of coffee products on the market. For this reason, it is important to dry the peel and coffee beans after harvest to get high-quality coffee that is ready for export ([Purba & Sarah, 2022](#)).

Arabica coffee exports in Indonesia reach 6% ([Fauzi et al., 2020](#)). According to [Kusmiati & Nursamsyah \(2015\)](#), 70% of the world consumes Arabica coffee. You can serve coffee as a beverage product in powder form. Arabica coffee has a viscosity value of 2.40190 ± 3.56 cP, total acid $1.06 \pm 0.13\%$, and total dissolved solids $9.60 \pm 0.56\%$ ([Mahardhika et al., 2022](#)).

Arabica coffee contains caffeine, polyphenols, flavonoids, chlorogenic acid, and trigonelline ([Madi et al., 2018](#)). The acid content in coffee includes propanoic acid, butanoic acid, hexanoic acid, acetic acid, decanoic acid, citric acid, malic acid, chlorogenic acid, and carboxylic acid ([Pamungkas et al., 2021](#)). The acid compounds contained in coffee include propanoic acid, butanoic acid, hexanoic acid, acetic acid, and decanoic acid; citric acid, malic acid, chlorogenic acid, and carboxylic acid ([Esquivel & Jiménez, 2012](#)).

METHOD

We used an experimental research method and collected samples from "Waroeng Dayac," a member of the Anugerah Farmers Group in Jaranguda village, Karo regency. Conducted in September 2024. The samples used in this study were

Arabica coffee (*Coffea arabica* L.) peel and beans, which were dried in a drying cabinet using a drying oven that had been adjusted to a stable temperature of 50 °C.

Making Simple Drugs

We sorted the harvested coffee beans, selecting only the red ones. We then sorted them wet, peeled them, separated the peel from the coffee beans, weighed them, cleaned them with clean running water, and drained them. We then dried the beans in a drying cabinet at a temperature of 50 °C. After drying, we ground the sample into a powder using a blender. Then the sample is sieved using a 60-mesh sieve so that it becomes a simple powder (Pebriati & Diana, 2023).

Characteristics of Simple Drugs in Coffee Peel

The characterization of the simplicia involves several examinations, such as determining the water content, ethanol-soluble extract content, water-soluble extract content, total ash content, and acid-insoluble ash content (Pebriati & Diana, 2023). Near-Infrared Spectroscopy (NIR) The method of analyzing nutritional testing in food uses the Near-Infrared Spectroscopy (NIR) method to determine protein, fat, and moisture in food. The National Accreditation Committee (KAN) has standardized a laboratory at PT. Saraswanti Indo Genetech Surabaya to carry out this analysis.

RESULTS AND DISCUSSION

We examined the characteristics of the herbal medicine to ensure its uniform quality, following the guidelines of the Indonesian Herbal Pharmacopoeia Edition II of 2017 (Pebriati & Diana, 2023). Table 1 presents the results of the analysis of the characteristics of the coffee fruit peel herbal medicine.

Table 1. Results Analysis of Characteristics of the Coffee Fruit Peel Simplex

Parameter	Results (%)	Food & Hospitality Indonesia (FHI) II Requirements (%)
Water content	6,69	< 10
Water Soluble Essence Level	25,57	>21,3
Ethanol Soluble Essence Level	13,79	<9,8
Total Ash Content	1,90	< 7
Acid Insoluble Ash Content	1,43	<2

Nutritional examination of food products has several beneficial benefits, such as quality control, maintaining consumer safety levels, and complying with applicable regulations (Afrika & Purba, 2020). The results of the water content analysis test and nutritional information (Nutrition fact) on ground coffee beans per 100 gr. Table 2 presents nutritional value information on 100 g of Arabica coffee (*Coffea arabica* L.) in the KAN standardized laboratory (PT Saraswanti Indo Genetic Surabaya).

Table 2. Nutritional Value Information on 100 g of Arabica Coffee (*Coffea arabica* L.) in the KAN standardized Laboratory (PT Saraswanti Indo Genetic Surabaya)

Parameter	Unit	Results	Limit of Detection (LOD)	Method
Total energy	Kkal/100 g	417.34	-	11-3-3/MU (calculation)
Energy from Fat	Kkal/100 g	72.90	-	11-3-3/MU (calculation)
Total Sugar	%	Not detected	0.28	11-3-8/MU (<i>luff Schoorl</i>)
Ash content	%	4.68	-	SNI 8964-2021 <i>Apendix A4</i>
Water content	%	1.11	-	SNI2907-2008 poin 7.3
Carbohydrate (<i>By Difference</i>)	%	72.17	-	11-3-3/MU (calculation)
Total fat content	%	8.10	-	11-3-2/MU (<i>weibull</i>)
Protein Content	%	13.94	-	11-3-1/MU (<i>Titrimetri</i>)
Saturated fat	%	3.70	-	11-4-1/MU (GC)
Sodium (Na)	Mg/100 g	6.53	-	11-2-1/MU (ICP-OES)

The plant of Arabica coffee young aged (2 months) is coffee that has dark green fruit peel; the fruit flesh is still hard. Half-old coffee aged 4 months has yellow to orange peel; the fruit flesh is rather soft, and old coffee aged 7 months is bright red to dark red; the fruit flesh is soft and juicy (Srikandi et al., 2019). Drying is an important factor in coffee processing; without proper drying, either mechanical or traditional, the quality of the coffee beans will not meet the required standards (Fauzi et al., 2020).



Figure 2. *Coffea arabica* , The peel of coffee



Figure 3. Conventional Drying Method



Figure 3. Controlled Oven Drying Method (drying chamber 50°C temperature)

The lower the water content of the product, the longer the shelf life of the material; conversely, if the dried material is not too dry, the shelf life will be lower (Agustina et al., 2019). Coffee is known as a drink that has a high caffeine content (Muhibatul, 2014). Caffeine also improves physical performance by increasing endurance and muscle contractions (Ennis, 2014). The analysis reveals that the caffeine content in young Arabica coffee is 1,115% (11.15 mg/g), in medium Arabica it is 1,285% (12.85 mg/g), and in old Arabica it is 1,201% (12.01 mg/g) (Latunra et al., 2021). According to Herawati (2018) that Robusta coffee exhibits varying levels of roasting. This antioxidant activity reflects the benefits of drinking Arabica coffee from different regions for health.

The ideal temperature for coffee drying is between 50 and 55 °C, as this temperature facilitates the transfer of water particles and their evaporation (Abdullah et al., 2010). Temperatures that are too high can cause damage to the surface

of the beans; the transfer of water particles in the beans becomes difficult and results in a decrease in the quality of the dried coffee beans (Widyotomo et al., 2005). Drying of plants is carried out at a temperature of 45° C. We do this to maintain the metabolite compounds in the plants and to maintain the total ash content by Pharmacopoeia standards (Nasution et al., 2022).

Arabica coffee contains 0.4 - 2.4 % caffeine of the total dry weight, while Robusta coffee contains 1 – 2 % caffeine and 10.4 % organic acids. The standard caffeine content in a cup of brewed coffee is 0.9 - 1.6 % in Arabica coffee, 1.4 - 2.9 % in Robusta coffee, and 1.7 % in a mixture of Arabica and Robusta coffee with a ratio of 3:2 (Farida et al., 2013). Low-caffeine coffee not only enhances taste and aroma but also stimulates the nervous system, enhancing mood and extending concentration (Oktadina et al., 2013).

Arabica coffee is usually green when young, slightly yellowish to reddish when half-old, and bright red to dark red when old (Abdullah et al., 2010). While robusta coffee has a higher caffeine content and can grow in environments where arabica cannot, Arabica coffee is considered to have the best taste (Nariswari, 2022). Arabica coffee is a coffee that has a better taste than robusta coffee because robusta coffee tastes more bitter, slightly sour, and contains higher caffeine than arabica coffee (Aditya et al., 2016).

There are three distinct methods for processing coffee: the natural process, the honey process, and the full wash (wet process). Each of these processes will produce waste in different forms (Mangku et al., 2022). According to Juwita et al., (2017), the percentage of pulp from coffee processing reaches 48 % of the total coffee production, consisting of 42 % fruit peel and 6 % seed skin. Orrego et al., (2018) reported that wet coffee processing produces 43.2 % (b/b) peel and pulp. The precursor compounds that form acidity in coffee beans are malic acid, succinic acid, and citric acid for coffee from Gayo regency (Saputri et al., 2020).

CONCLUSION

The water content of Arabica coffee beans was found to be 1.11 %, while the analysis of nutrients and non-nutrients per 100 g of coffee beans yielded the following results: Total energy (417.34 kcal); energy from fat (72.90 kcal); ash content (4.68 %); carbohydrates (72.17 %); total fat content (8.10 %); protein content (13.94 %); saturated fat (3.70 %); sodium (6.53 mg). The results of the analysis of the characteristics of coffee peel simplicia are water content 6.69 %; water-soluble extract content 25.57 %; ethanol-soluble extract content 13.79 %; total ash content 1.9 %; and acid-insoluble ash content 1.43 %. The drying oven used a stable temperature of 50 °C to dry the coffee beans and peel with a water content of 1.11 % and 6.63 % in coffee peel. The Indonesian Herbal Pharmacopoeia Standards, Edition II, 2017 guide the drying process. Compared to conventional drying, which solely depends on sunlight, this method utilizes time more efficiently. Consumers need nutritional value information to make informed food and health choices easier.

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