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The Effect of Variations in the Water-to-Coffee-Powder Ratio on the Water Content and Caffeine Content of Sigarar Utang Instant Arabica Coffee

Ananta Mulia Alfatah Nasution
Institut Pertanian Stiper, Indonesia
Correspondence author, anantamulia190320@gmail.com

Ngatirah
Institut Pertanian Stiper, Indonesia

Herawati Oktavianty
Institut Pertanian Stiper, Indonesia

Nanda Eska Anugrah Nasution
UIN Kiai Haji Achmad Siddiq Jember, Indonesia

Abstract The Sigarar Utang Arabica coffee is a varietal of Arabica coffee that originated from the North Tapanuli region of the North Sumatra province. The purpose of this study is to see how variations in water-to-coffee powder ratios affect water content and caffeine content of Sigarar Utang Arabica instant coffee. This study's research design is a complete block design (CBD). Experiments were carried out at 95°C with three levels of coffee powder-to-water ratio: N1 (1:4)%, N2 (1:6)%, and N3 (1:8)%. Each treatment was repeated twice, for a total of six experimental units. According to the findings of this study, variations in the water-to-coffee powder ratio in Sigarar Utang coffee had a substantial impact on both moisture content and caffeine content.

Keywords: Sigarar utang arabica coffee, Instant coffee, Water content, Caffeine content, Variations in the water-to-coffee-powder ratio

INTRODUCTION

Coffee is an agricultural commodity in Indonesia that is vital to the country's economic activity. Coffee farming, like oil and gas, is a major export commodity in Indonesia, adding considerably to the country's foreign exchange reserves. Despite the promising prospects for coffee exports, there is a sizable domestic coffee market that has the ability to energize coffee producers. The circumstances

and possibilities available to coffee producers in Indonesia provide a platform for innovation, with the goal of increasing Indonesia's coffee production and global recognition. Efforts to increase coffee output will benefit both coffee producers and the nation as a whole (Martauli, 2018).

According to projections from the Ministry of Agriculture, the national coffee consumption rate is expected to climb to 370 tons by 2021. Coffee consumption reached 250 tons in 2016 and increased by 10.54% to 276 tons in 2017 (Databoks, 2018). Smallholder coffee plantation owners supply approximately 94.5% of coffee output in Indonesia. Furthermore, robusta and Arabica varietals account for 81.87% of national coffee output, supplied from coffee hubs in South Sumatra, Lampung, Bengkulu, East Java, and Central Java.

Arabica coffee of the Sigarar Utang kind is one of the coffee varietals distinguished by its distinctiveness. Sigarar Utang coffee has unusual flavor qualities that have allowed it to enter the worldwide market and even become a part of Starbucks' product line known as "Starbucks Black Apron Exclusives." The Sigarar Utang variety was officially certified as superior to other types in terms of flavor and coffee bean yield in Minister of Agriculture Decree No. 205 of 2005 (BBPLM, 2018).

The Arabica coffee of the Sigarar Utang kind is one of the coffee varietals distinguished by its distinctiveness. Sigarar Utang coffee has distinct flavor qualities, allowing it to enter the global market and even become a part of Starbucks' product line known as "Starbucks Black Apron Exclusives." The Minister of Agriculture's Decree No. 205 of 2005 officially certified the Sigarar Utang variety as superior to other types in terms of flavor and coffee bean productivity (BBPLM, 2018).

Arabica coffee is distinguished by the relatively large size of its coffee beans. It can produce up to 1500 kilos per hectare per harvest. The distinctiveness of the Sigarar Utang cultivar is manifested in its pest resistance and ability to grow regardless of whether it is rainy season or dry season. Arabica coffee has a distinct flavor character, especially when cultivated on a variety of plantation soils. The flavor profile produced by the exceptional Arabica coffee variety Sigarar Utang is generally classified as "Good to Excellent," with aromas of cocoa, earthiness, smokiness, tobacco, and woody overtones. It has flowery and maize sweetness, a spicy taste, low acidity, and a beautiful balance when sipped (Kopinikmat.com, 2021).

Variations in the water-to-coffee ratio have an impact on instant coffee. The moisture content, caffeine levels, look, and texture of the resulting instant coffee are all affected by differences in the water-to-coffee ratio. This effect is caused by the dissolving properties of water (Winarno & Wiratmadja, 1993). Given these considerations, the researchers intend to explore the effect of various water-to-coffee powder ratios on the moisture content and caffeine levels in Sigarar Utang Arabica instant coffee.

METHOD

From July 26 to August 17, 2022, this study was carried out at the Laboratory of the Faculty of Agricultural Technology, Stiper Agricultural Institute Yogyakarta. Various instruments and equipment were used in the study, including measuring cups, weighing glasses, stirrers, thermometers, beakers, pans, analytical scales, a Spray Drying (Anhydro) apparatus, a timer, stirring rods, and other relevant tools. Arabica coffee of the Sigarar Utang kind from North Tapanuli, mineral water, Aquadest, and other materials were used in this investigation. At a temperature of 95°C, the coffee powder-to-water ratio was varied in three levels: N1 (1:4)%, N2 (1:6)%, and N3 (1:8)%. Each treatment was repeated twice, for a total of six experimental units.

The following procedures were adhered to to ensure the systematic progress of the research process:

The extraction method in this study was carried out utilizing a coffee extractor (Ferratti Ferro). The weight of the coffee powder to be extracted was measured and then extracted using the following ratios: N1 (1:4)% - 100 grams of coffee and 400 ml of water for the first sequence, N2 (1:6)% - 100 grams of coffee and 600 ml of water for the second sequence, and N3 (1:8)% - 100 grams of coffee and 800 ml of water for the third sequence. To avoid damage and loss of flavor and fragrance components, the extraction water temperature was kept between 85 and 90°C. The extraction took around 15 minutes (until it cooled). The coffee extract was subsequently filtered in stages using a cloth filter.

Following the TLUE treatment, the coffee extract was homogenized and dried using a spray drying (Anhydro) process. The entrance temperature was set at 150°C, while the exit temperature ranged from 70-80°C, resulting in the manufacturing of instant coffee powder. The identical technique was followed for the other treatments, with the only change being the type of extract employed.

FINDINGS AND DISCUSSION

1. Water content

Table 1 displays primary data from an investigation of the water content of Sigarar Utang instant coffee.

Table 1. Water content analysis of Sigarar instant coffee debt (%)

Treatment	Water Content
1	
N1	3,74
N2	4,2
N3	4,64
2	
N1	3,09
N2	3,74
N3	3,84
3	
N1	2,71

N2	3
N3	3,13
Total	32,10

From the primary data in Table 1, a diversity analysis was then carried out to determine the effect of the treatment on the water content of the resulting debt cigarette instant coffee. The results of the variant analysis are seen in Table 2.

Tabel 2. Table of water content variation in Sigarar Utang arabica instant coffee

No	Diversity Source	db	JK	RK	Fh	Ft	
						5%	1%
1.	N	2	1,4843	0,7422	19,263**	4,46	8,56

Table 2 shows that the water-to-Sigarar Utang coffee powder ratio has a highly significant effect on the water content of Sigarar Utang instant coffee. The observed phenomenon is caused by the fact that adding more water to the coffee powder extract results in a larger moisture content. The claim is reinforced further by Fiona Drefin's (2013) comment, which underlines that a greater variety in water used results in lower coffee concentration and, as a result, increased moisture content. This implies that lower moisture content delivers better and more durable instant coffee, with 7% being the maximum allowable moisture content for instant coffee. This is in accordance with Indonesian National Standard (SNI 01-3542-2004).

2. Caffeine Content

Table 3 displays Primary data analysis of caffeine content in Sigarar Utang Arabica Instant Coffee.

Table 3. Primary data analysis of caffeine content of Sigarar Utang arabica instant coffee debt (%)

Treatment	Water Content
1	
N1	2,41
N2	2,28
N3	1,93
2	
N1	2,33
N2	2,09
N3	2,03
3	
N1	2,195
N2	2,25
N3	1,41
Total	18,92

From the primary data in Table 3, a diversity analysis was then carried out to determine the effect of the treatment on the caffeine content value of instant coffee. The results of the diversity analysis can be seen in Table 4.

Table 4. Analysis of diversity of activity tests for caffeine levels in Sigarar Utang arabica instant coffee

No	Diversity Source	db	JK	RK	Fh	Ft	
						5%	1%
1.	N	2	0,9182	0,4591	18,3280**	4,46	8,56

Table 4 shows how different water additions to coffee powder have a significant and tangible effect on caffeine content. Because of caffeine's solubility in water, the difference in water-to-coffee powder ratio has a highly significant effect on caffeine content analysis. As the amount of water utilized increases, so does the caffeine content. This observation is supported by the remark of Muchtadi et al. (2010), who emphasize caffeine's solubility in water, aromatic properties, but also its severe bitterness. As a result, a higher water-to-coffee ratio results in a reduced caffeine level. Caffeine's weakly basic, mono-acidic nature allows it to dissociate during water evaporation, which causes this occurrence. A lower caffeine content in instant coffee is preferred for better consumption, with a maximum allowable caffeine content of 0.3% and a minimum of 2.5% in accordance with Indonesian National Standard (SNI 01-3542:2004).

CONCLUSION

Based on the data and discussion outcomes acquired in this study, the following conclusions can be drawn: The modification in the water-to-coffee powder ratio has a substantial impact on both water content analysis and caffeine content analysis. It is suggested that future research check the quality of the coffee beans to be used, identify the roasting temperature of the coffee beans, and analyze the acidity levels in instant coffee. Furthermore, researching these elements will lead to a more comprehensive understanding of the quality and characteristics of the final instant coffee product.

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