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ORGANOLEPTIC ANTIOXIDANT ACTIVITY, AND VITAMIN C ANALYSIS ON JAMBLANG (SYZYGIUM CUMINI L.) SEEDS COFFEE

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ABSTRACT

One of Indonesia's natural resources, jamblang (*Syzygium cumini L*.) seed, which is a byproduct of jamblang fruit, contains antioxidants and can be used to make jamblang seed coffee. With a fully randomized design, the aim of this study was to evaluate the level of liking, antioxidant activity, and vitamin C in jamblang seed coffee (RAL). Data that has been collected, statistically tested using Duncan's Multiple Range Test (DMRT). The two degrees of treatment in this study are roasting jamblang seeds for either 10 or 20 minutes, with robusta coffee serving as the control. Various roasting times of jamblang coffee beans result in different antioxidant and vitamin C levels jamblang coffee beans cooked for 10 minutes have higher levels of both.

Keywords: Antioxidant, Coffee, Jamblang seed, Vitamin C.

INTRODUCTION

Natural resources that can be used as antioxidants are abundant in Indonesia. By contributing one electron to the free radical molecule in order to stabilize it, antioxidants are able to inhibit the action of free radicals. There are two categories of antioxidants: synthetic antioxidants and natural antioxidants. Fruits are one kind of naturally occurring antioxidants that have less detrimental side effects than synthetic antioxidants(Rahmi, 2017).

Jamblang or also known as juwet is a tropical fruit plant from the Myrtaceae family that can be found in various countries in Asia and Australia, including in Indonesia (Naim & Hisani, 2018). Research on the utilization of jamblang fruit for health has been widely discussed in various journals. Jamblang fruit contains potassium, vitamin C, iron, alkaloids, flavonoids, saponins, polyphenols, tannins, carotene, diterpenes and phytosterols (Elyadi *et al*., 2021). In addition, the purple-black color of jamblang fruit indicates the presence of anthocyanin content. Based on Wati's research (2019), the anthocyanin content in ripe jamblang fruit is 29.39 mg/g. Because the water content of jamblang fruit is quite high and the taste is astringent and sour, the fruit is often processed into candies, jellies, sweets, and drinks to extend the shelf life. Meanwhile, the seeds are not utilized and become waste (Wati *et al*., 2018).

Jamblang seed waste contains various metabolite components that are good for body health, such as polyphenols, alkaloids, jambosine, and jamboline glycosides. In addition, jamblang seeds contain antioxidants IC_{50} 6.70 and Vitamin C in jamblang seeds with IC_{50} 6.98 (Nurhalisa *et al.,* 2021). By removing ferric ions, preventing lipid peroxidation, and snatching up free radicals, jamblang seed extract possesses antioxidant action (Rohadi *et al.*, 2016). Thus, jamblang seeds still have the potential to be developed as a source of natural antioxidants as an effort to ward off free radicals, one of which is by processing it into jamblang seed coffee.

It is crucial to gauge how well-received newly manufactured goods are among consumers. Utilizing an organoleptic test, a different method of evaluating the attraction of consumers to food, involves using a rating scale for the degree of like or disliking. Given this context, the public also prefers jamblang seed coffee, which is thought to have a lot of antioxidants and vitamin C.

MATERIAL AND METHODS

Materials

The components used are jamblang seeds (Syzygium cumini L.) obtained from Situbondo, East Java, coffee, diphenyl-2-picrylhydrazil (DPPH), methanol, distilled water, amylum solution, iodine, ascorbic acid.

Tools

The tools used are knives, gas stoves, pans, spatulas, blenders, spoons, cups, glasses, filters, analytical balances, beakers (Iwaki), measuring cups (Iwaki), erlenmeyers (Iwaki), burettes, measuring pipettes, dropper pipettes, stirring rods, glass funnels, filter paper, volumetric flasks (Iwaki), test tubes (Iwaki), micro pipettes, ovens, spectrophotometry (Shimadzu).

Study Design

This study uses a CRD, or totally randomized design. where each experimental unit receives the treatment in a random manner. In this study, robusta coffee served as the control and two degrees of treatment included roasting Jamblang coffee beans for 10 or 20 minutes. Three copies of each sample were taken. It was carried out between January and March 2022 in the Food Technology and Chemistry labs of the Integrated Laboratory of the Faculty of Health Sciences at the University of Darussalam Gontor, Putri Campus, Mantingan.

Phases of Research

This research begins with the preparation of materials in the form of jamblang fruit seeds and then processed into jamblang seed coffee. After obtaining jamblang seed coffee, the research continued with hedonic testing to determine the level of liking for the product. Then antioxidant activity and vitamin C were tested. The data obtained were tested statistically and interpreted.

Methods

Making Jamblang Bean Coffee (Mariati, 2016 with modifications)

Jamblang seeds are washed thoroughly using running water. After washing, they are dried or aerated, then dried in the sun for 5 days. The jamblang seeds were then roasted at 180℃ and divided into two different roasting time periods. One sample of jamblang seeds was roasted within 10 minutes, and the other sample within 20 minutes. The roasted jamblang seeds were crushed using a blender until they became powder. To create a fine powder, the jamblang seeds were sieved using an 80 mesh sieve after being ground into powder (Mariati, 2016).

Hedonic Test

The samples were brewed using 80℃ warm water and then filtered to separate the samples from the coffee grounds. Then each sample is placed in a testing glass with the same shape and color so that panelists are not fooled by the appearance of the sample container. The samples were then randomly coded. Hedonic testing used 25 semi trained panelists. Panelists were given drinking water to rinse the taste before testing the next sample. Testing was carried out by providing an assessment form for the color, aroma, and taste of the sample. There are six hedonic scales for each assessment, ranging from very dislike to very like.

Antioxidant Activity Test with DPPH (Megananda *et al.,* 2019).

100 cc of methanol were used to dissolve up to 10 milligrams of jamblang seed coffee. In order to obtain a concentration of 0.1% solution, the stock solution was then made to have a concentration of 1000 ppm. The stock solution was then made into a standard solution with a division of 4, 8, 12, 16 and 20 ppm. Then dissolve the DPPH crystal as much as 5 mg using 100 ml methanol and homogenized. Then measure the absorbance of the sample at a wavelength of 516nm. after that measure the DPPH absorption at the wavelength and calculate the percent immersion using the equation.

Calculation of effective concentration values using the formula:

$$\%\ Antioksidan = \frac{Ab - As}{Ab} \times 100\%$$

Keterangan:
Ab = Absorbance of blank = absorbance value of DPPH
As = Absorbance of sample = absorbance value of sample
Utilizing IC_{50}, the value of antioxidant content was calculated from the percent inhibition. The value of the percentage inhibition was entered into a linear regression equation to determine the IC_{50}. A linear regression equation, which can express the relationship between the concentration of the antioxidant fraction, or x-axis, and the percent inhibition, or y-axis, of numerous replicate measurements, was used to determine the IC_{50} value for each sample.

Iodometric Titration Vitamin C Test (Megananda *et al.,* 2019).

A 250 ml Erlenmayer was filled with 10 ml of the jamblang seed coffee solution after it had been dissolved in 100 ml of distilled water, filtered using filter paper, and added 20 ml of distilled water. Three drops of the amylum indicator were then placed into the mixture. Iodine should then be titrated into the Erlenmayer until a blue color shift takes place. Following that, the formula is used to determine the amount of vitamin C in coffee:

$$\text{Vitamin C content (mg/100g)} = \frac{(\text{Vol } I_2 \times 0.88 \times F_p) \times 100}{\text{W sampel (g)}}$$

$V\ I_2$: Volume Iodium (ml)
0.88 : 0.88 mg vitamin C is equivalent to 1 ml of solution I_2 0,01N
F_p : Dilution Factor
W_s : Weight of the sample (g)

Analyisis Procedure

The hypotheses that addressed every area of this study were then subjected to statistical tests based on the outcomes of the experiments that were conducted. The One Way Anova test was used to analyze the data. Duncan's Multiple Range Test (DMRT) was then used to compare the outcomes of each treatment.

RESULTS AND DISCUSSION

1. Hedonic Test

Six hedonic scales were used in the organoleptic testing. The scale for rating the hedonic test had five categories: very dislike (1), dislike (2), slightly dislike (3), somewhat like (4), like (5), and very like (6). 25 panelists were given the 10-minute jamblang bean coffee, 20-minute jamblang coffee, and boiled control coffee to ascertain their level of preference for the samples provided.

An organoleptic test gauges the acceptability of a product by using human senses. The senses of taste, scent, color, and texture are utilised in organoleptics. Determine the degree of product acceptance using the hedonic test is one of the goals of the organoleptic test. The levels of like on the hedonic scale range from very to moderately to dislike to dislike and other levels. The results of a hedonic test can reveal if a product is of good or low quality(Suryono *et al*., 2018).

Table 1. Hedonic Test of Jamblang Bean Coffee

Parameter	Sample		
	S1	S2	K
Colour	3.48[a]	4.08[ab]	4.64[b]
Aroma	3.80[a]	3.64[a]	5.16[b]
Flavor	2.88[a]	2.56 [a]	2.84 [a]

Description: S1: 10-minute roasting jamblang bean coffee sample, S2: 20-minute roasting jamblang bean coffee sample, K: Positive control (coffee). Value 1: Very dislike, 2: Dislike, 3: Somewhat dislike, 4: Somewhat like, 5: Like, 6: Very like. Different letter superscripts indicate significant difference (p < 0.05)

Table 2 displays the results of the hedonic test for the sample that received the majority of votes from the 25 panelists. The color parameter data from the hedonic test performed on samples of jamblang coffee beans revealed negligible results or 0.05, or 0.006, thus the Duncan test was carried out. In the Duncan's test, it can be seen that there is no significant difference between the color of jamblang bean coffee samples roasted for 10 minutes and 20 minutes, but there is a significant difference between the color of control coffee samples and jamblang bean coffee roasted for 10 minutes.

Nawirah et al.,(2021) states that there is an effect of roasting on the organoleptic characteristics of date seed coffee. Roasting date seed coffee for 1 hour will produce coffee with a fragrant aroma and intense color. Meanwhile, roasting date seed coffee for 2 hours will give a thick texture (Nawirah *et al.,* 2021). In salak seed coffee, 60 minutes will produce coffee with a dark brown color, fragrant aroma, soft texture, with very good acceptance (Lokaria & Susanti, 2018). Papaya seed coffee roasted for 30 minutes is preferred compared to papaya seed coffee with 10 and 20 minutes roasting (Hasanah *et al*., 2022). Meanwhile, according to (Megananda et al., 2019), diversification of non-caffeinated coffee from local raw materials such as noni seeds is acceptable to the public.

2. Antioxidant Activity Test

Jamblang seed coffee's antioxidant capacity was examined using the DPPH technique and UV-VIS spectrophotometry at a wavelength of 516 nm. The concentration of the solution in the sample, as determined by the IC_{50} value, is able to block 50% of free radicals in DPPH, indicating the presence of antioxidant activity. The linear regression equation on the relationship curve between sample concentration and percent inhibition in the equation Y = ax + b, where the X axis represents sample concentration and the Y axis represents the percentage value of inhibition, determines the sample's IC_{50} value (Purwanto et al., 2017).

Table 2 displays the IC_{50} value of the sample based on the curve generated from the amount of antioxidants in the sample as well as the percentage of antioxidant content in the three samples as determined by assessing the antioxidant content using the DPPH method through a UV-VIS spectrophotometer. While there was no difference between the control and the 10-minute roasted sample, there was a difference between the 20-minute roasted sample and the other samples.

Based on the test of antioxidant content with DPHH test, the result of antioxidant content of jamblang bean coffee sample with 10 minutes roasting is 9.81 ppm, jamblang bean coffee sample with 20 minutes roasting is 38.45 ppm, and control coffee sample is 10.06 ppm. While the antioxidant levels in the control and 10-minute roasted jamblang bean coffee samples were comparable, they were lower in the 20-minute roasted jamblang bean coffee sample. However, with IC_{50} values below 50, all three samples were identified as being exceptionally potent antioxidants.

Table 2. Antioxidant Activity

Sample	Concentration	%inhibition	IC_{50}	Antioxidant Activity
S1	2	85.68	9.81[a] g/mL	Very Strong (IC_{50} <50 g/mL)
	4	95.78		
	6	93.60		
	8	98.34		
	10	57.80		
S2	2	91.81	38.46[b] g/mL	Very Strong (IC_{50} <50 g/mL)
	4	97.70		
	6	97.70		
	8	99.49		
	10	96.55		
K	2	91.94	10.06[a] g/mL	Very Strong (IC_{50} <50 g/mL)
	4	97.83		
	6	95.52		
	8	87.08		
	10	70.08		

Description: 1: 10-minute roasting jamblang bean coffee sample, 2: 20-minute roastingjamblang bean coffee sample, K: Positive control (coffee).

Numerous classifications are used to determine antioxidant activity. Antioxidants with an IC_{50} value of less than 50 ppm are highly potent; those with an IC_{50} value of 50 to 100 ppm are strong antioxidants; those with an IC_{50} value of 150 to 200 ppm are moderate antioxidants; and those with an IC_{50} value of more than 200 ppm are very weak antioxidants (Bahriul *et al*., 2014). Depending on the technique of processing and the surroundings, antioxidant levels can differ. One of them is cooking at a high temperature for a long period of time since it can weaken the chemical structure of the constituent compounds and diminish antioxidant levels. (Rohadi *et al*., 2019). The longer the roasting and the higher the temperature used will degrade the antioxidant compounds characterized by the loss of the ability to donate electrons to neutralize radical compounds(Najmudin *et al.*, 2021).

Based on previous research, it is known that jamblang seed extract has antioxidant levels with an IC_{50} value of 6.70 ppm (Nurhalisa *et al.,* 2021). So that there is an insignificant difference in antioxidant levels before and after jamblang seeds are processed into coffee for 10 minutes. Meanwhile, in the research of Ajhar & Meilani (2020), antioxidant levels in Arabica coffee showed an IC_{50} value of 12.43 ppm so that there was no significant difference with this study (Ajhar & Meilani, 2020). When compared with salak seed coffee in Karta et al., (2015), the antioxidant content of jamblang seed coffee has the same antioxidant content as the IC_{50} of salak seed coffee of 9.37 ppm (Karta, I. W. et al., 2015).

3. Vitamin C Test

Iodimetric analysis of the vitamin C levels in this study. Amylum is the indicator used in iodine titration. Iodine can cause vitamin C to respond. Vitamin C is a powerful reducer that can be reduced by iodine and is titrated using iodine solution (Purwanto et al., 2017).

Table 3. Vitamin C Content

Sample	Vitamin C Content (mg)
S1	97.90[b]
S2	86.90[b]
K	63.80[a]

Description: S1: 10-minute roasting jamblang bean coffee sample, S2: 20-minute roasting jamblang bean coffee sample, K: Positive control (coffee). Different superscript letters indicate significant differences (p < 0.05).

The advantage of jamblang seed coffee is that it contains vitamin C. According to Table 3, the positive control sample of coffee has the lowest vitamin C level at 63.80 mg, which is because coffee has a lower vitamin C content than the two samples of jamblang seed coffee.

While the sample of Jamblang seed coffee roasted for 10 minutes with 97.90 mg and jamblang seed coffee roasted for 20 minutes with 86.90 mg of vitamin C did not have a significant difference. Vitamin C content of the first sample, namely jamblang bean coffee with roasting for 10 minutes, has a vitamin C content of 97.90 mg, because the cooking or roasting time of the first sample is shorter than the second sample, namely jamblang bean coffee with roasting for 20 minutes, which has a vitamin C content of 86.90 mg. The vitamin C content of jamblang seed coffee is greater when compared to noni seed coffee which has a vitamin C content of 25.30 mg (Megananda et al., 2019).

A water-soluble substance known as ascorbic acid, often known as vitamin C, serves as an antioxidant in the body. Vitamin C can be used to neutralize reactive oxidants and aid in the production of endogenous antioxidant molecules (Fauzana, 2022). Heat will cause the oxidation process to degrade the vitamin C in fruits and nuts (Putri & Setiawati, 2015). As a result, briefly toasting jamblang seeds does not significantly degrade vitamin C.

The Duncan test was used after the ANOVA test results of the vitamin C identification test revealed significant variations in vitamin C levels between the three samples, namely 0.05. In the Duncan's test, there was a significant difference between the control coffee sample and the coffee sample that had been roasted for 10 and 20 minutes, but there was no significant difference between the coffee sample that had been roasted for 10 and 20 minutes.

CONCLUSION

The hedonic test values and hedonic quality of the jamblang seed coffee samples showed no significant differences between the two treatments. However, the antioxidant activity and vitamin C content of the jamblang seed coffee showed a significant difference due to the length of roasting, with jamblang seed coffee roasted for 10 minutes having a higher antioxidant content than jamblang seed coffee roasted for 20 minutes. However, there was no discernible variation in the amount of vitamin C based on the length of time the jamblang bean coffee was roasted.

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