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Characteristics of Instant Arabic Coffee (*Coffea arabica* L.) With Aren Sugar (*Arenga pinnata*) Addition as a Functional Beverage

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ABSTRACT

Indonesia is the largest coffee producer in the world. Kalosi coffee is one of the arabica coffees grown in Enrekang Regency. Fermentation of coffee beans aims to improve the taste of coffee and release the mucus layer attached to the coffee beans. The stages of this research are coffee beans are prepared for the roasting process to produce a medium roast maturity level. Next, grinding is carried out to obtain a fine grind size. Next, ground coffee was extracted, and the brew was filtered using a fine sieve (100 mesh), after which the filtrate was put into a freeze dryer. After drying, instant coffee was weighed for the next process, namely the addition of palm sugar according to the treatment (A1 = 25%, A2 = 35%, and A3 = 45%). Organoleptic and chemical tests were then conducted. The best formulation of Kalosi Arabica instant coffee with added palm sugar is a formulation of 65% instant coffee and 35% added palm sugar. The conclusion is that the best formulation of instant coffee contains antioxidants that are classified as strong at 39 ppm, caffeine at 0.76%, and pH 4.90. The addition of palm sugar affects the chemical content of coffee, such as stronger antioxidants and decreased caffeine.

Keywords: arabica, antioxidants, caffeine, palm sugar.

INTRODUCTION

Indonesia is one of the largest coffee producing countries in the world after Brazil, Vietnam, and Colombia, based on data from the Indonesian Coffee Festival (ICF). Data from the Center for Agricultural Data and Information Systems at the Ministry of Agriculture in 2021 showed that Indonesia was able to produce at least 795 thousand tons. The coffee products produced come from all coffee plantations in Indonesia, which total 1.3 million hectares. The positive trend or increase experienced from 2016 to 2021 shows that coffee is increasingly favored by people in Indonesia (Hartanto, 2012).

Nowadays, processed coffee products have become a social life style. Coffee drinks are not only popular among young people, but also among adults. Coffee consists of many types, but currently many types of coffee are found, namely arabica coffee (Coffea arabica) and robusta coffee (Coffea canephora). According to Farhaty, N., & Muchtaridi, M. (2016), that arabica coffee tastes more sour, contains more oil, contains lower caffeine, and is more expensive. The differences in these types of coffee are related to the chemical components contained therein. Chemical components such as caffeine, chlorogenic acid, trigonelline, carbohydrates, fats, amino acids, organic acids, volatile scents and minerals contained in coffee can have beneficial effects and can also harm the health of coffee lovers (Najiyati and Danarti, 2001).

Kalosi coffee is one of the arabica coffees cultivated at an altitude of around 1500 meters above sea level in Enrekang Regency. Kalosi coffee is famous for its medium body and fresh acidity, the distinctive character of this coffee is the lingering aftertaste (sweetness that stays in the mouth for a very long time). The sweetness contained in Arabica coffee is influenced by the protective plants around the coffee tree. Plants that are generally used by the surrounding community as protectors are palm trees. Ar palm trees are used as protective plants for coffee because in addition to being useful as a regulator of irradiation intensity, palm trees can also affect the quality of the coffee beans produced so as to produce a sweet taste after the coffee is brewed. However, not all people utilize aren palm as a protective coffee plant, there are also those who use lamtoro trees as protective plants so that the quality of the coffee produced also varies. The taste of kalosi arabica coffee will produce a bland taste and unpleasant scent if the processing is done with improper methods or processes (Nugrawati, 2018).

Coffee bean processing can be done in various ways. One of the stages in the coffee processing process is the fermentation stage of coffee beans. The fermentation of coffee beans aims to release the mucilage layer attached to the coffee beans (Hoffmann, 2014). During the

coffee fermentation process, there are volatile and non-volatile compounds that can affect the scent, quality, and characteristics of coffee. These compounds include caffeine compounds which are xanthin alkaloids and chlorogenic acid which belongs to the class of polyphenolic compounds that have antioxidant activity. Chlorogenic acid is chlorogenic acid is one of the contents of coffee that is an antioxidant that can reduce blood pressure and body weight. (Johnston et al., 2003).

Processed coffee products that are often found, for example, instant coffee that is ready to brew. According to Siswoputranto (1993) in Sarah (2019), instant coffee is coffee that is water soluble without leaving coffee grounds and contains lower caffeine. The basic principle of making instant coffee is making coffee using coffee extract which is then dried. In the process of making instant coffee, several additional ingredients such as sugar are added (Darwin, 2013).

Sugar is a carbohydrate compound that can dissolve in water and is also directly absorbed by the body to be converted into energy. The use of sugar in making instant coffee generally uses granulated sugar. According to Sihombing (1995), 100 grams of granulated sugar contains 100% sucrose, 385 calories, and 5.5 grams of water. Granulated sugar has a glycemic index of 58, the value of the glycemic index on granulated sugar is high compared to other types of sugar such as palm sugar which only has a glycemic index value of 35. The use of granulated sugar as a sweetening agent in making instant coffee needs to be considered because it can have negative effects on the body. Palm sugar can be an alternative as a sweetening ingredient in instant coffee products. Palm sugar contains 70% sucrose, 372 calories, and 7 grams of water. In addition, palm sugar also contains other useful compounds such as thiamine, riboflavin, ascorbic acid, protein and also vitamin C. Based on this description, a study was conducted with the title "Influence of Proportional Characteristics of Instant Arabica Coffee (Coffea arabica L.) with the Addition of Aren Sugar (Arenga Pinnata) as a Functional Alternative Drink". This aims to find out the right formulation in making instant coffee by using palm sugar so that it can be beneficial for the body.

MATERIAL AND METHODS

Materials

The materials used in this study are single origin arabica coffee beans (Kalosi coffee), palm sugar, calcium carbonate (CaCO3), maltodextrin, methanol, folin-ciocalteu, 1.1-diphenyl-2-picryl hydrazyl (DPPH), sodium carbonate (Na2CO3) and distilled water.

Research Procedure

This research is divided into two stages, namely:

1. Phase I

Activities carried out at stage I to determine the best formulation through analyzing the sensory properties of kalosi instant coffee using hedonic method organoleptic testing. The formulations in this instant coffee making research are:

A1 : 75% coffee + 25% palm sugar

A2 : 65% coffee + 35% palm sugar

A3 : 55% coffee + 45% palm sugar

2. Phase II

The activities carried out in stage II were analyzing the chemical and physical properties of kalosi instant coffee.

This study used a factorial completely randomized design (CRD), with a single formulation in the form of palm sugar concentration. This study consisted of 3 levels of formulation with 3 repetitions.

Ground Coffee making

Coffee beans that have been wet fermented are previously prepared for roasting at a temperature of around 2100C with a time of 90 minutes to produce a medium roast level of maturity. After the roasting process, the coffee beans are cooled for 10 minutes. Furthermore, grinding is carried out using a grinder machine with a fineness of 80 mesh to obtain fine grind size results (Gafar, P.A, 2018).

Instant Arabica Coffee Making

Ground coffee that has been obtained is then extracted by heating water to boiling with a volume of water as much as 5 times the weight of ground coffee (5: 1). The boiled ground coffee is then stirred for 30 minutes using low heat. Next, precipitation is carried out, then steeping coffee is filtered using a fine sieve (100 mesh). Filtering is done to separate the coffee sediment from the solution. After that, the filtrate is put in a Petri dish and then put in a refrigerator which aims to speed up the evaporation process. After being frozen, the Petri dish was put into a freeze dryer which had previously been set to -40oC. The freeze dryer will suck the solvent that has been frozen into vapor by the vacuum pipe. After drying, instant coffee was weighed for the next process, namely the addition of palm sugar according to the formulation (A1 = 25%, A2 = 35%, and A3 = 45%). Then organoleptic testing was carried out to determine the best formulation. Furthermore, testing of the chemical characteristics of instant coffee

products that have been obtained. After determining the best formulation, it is then put into sachet packaging (Firmansyah, 2011).

Analytical Methods

Sensory Analysis

The sensory analysis used in this instant coffee research is a hedonic test using scent, taste, and color as parameters. The test was conducted by 15 panelists who were then asked to determine their level of preference for the instant coffee product produced using a hedonic scale, namely: (5) Very Like, (4) Like, (3) Neutral, (2) Dislike, (1) Very Dislike.

Antioxidant Activity Test

Preparation of DPPH Solution

DPPH powder as much as 0.002 grams was weighed then dissolved using methanol in a 50 ml volumetric flask until it reached the limit mark.

Preparation of Sample Solution

The sample was weighed as much as 100 mg which was then dissolved using PA methanol in a 100 ml volumetric flask. then the solution was homogenized using a magnetic stirrer using a hotplate for 45 minutes.

Preparation of blank solution

DPPH solution as much as 2 ml was put into a test tube then added 2 ml of methanol then diluted and then homogenized using a vortex. Then the incubation process was carried out in a dark room for 30 minutes and measured the absorption with a wavelength of 520 nm.

Determination of Percent Inhibition

Antioxidant activity can be expressed by percent inhibition which can be calculated using the following formula:

$$\%\ inhibition = \frac{Abs\ blanko - Abs\ sample}{Abs\ blanko} x\ 100\%$$

Determination of IC_{50} Value

Analysis of antioxidant activity testing using the DPPH method is done by looking at the color changes that occur in each sample after incubation with DPPH. The sample will experience a color change from dark purple to bright yellow when all DPPH electrons pair with electrons in the extract sample. Furthermore, the absorbance of the sample was measured using a UV-Vis spectrophotometer at a wavelength of 520 nm. The IC50 value was calculated by linear regression analysis between sample concentration vs percent DPPH radical capture.

Caffeine Quantitative Test

Instant arabica coffee as much as 3 grams was put into a glass beaker then added 150 ml of distilled water, then heated and stirred using a hot plate and magnetic stirrer. Next, it is filtered using filter paper and put into a separating funnel, after which 1 gram of CaCO3 and 25 ml of chloroform solution are added and then the extraction process is carried out 3 times. Then the bottom layer was taken and extracted. After the extraction process, it was then put into a measuring flask and then added 50 ml of distilled water until it reached the limit mark. Next, 25 times dilution was done into a test tube. Caffeine levels were then determined by UV-Vis spectrophotometry at a wavelength of 281 nm.

pH Value Test

Measurement of the pH value of coffee is done after getting the best formulation using a pH meter. Before the tool is used, calibration is carried out with pH 7 buffer and pH 4 buffer. A total of 10 grams of coffee is added with 50 mL of distilled water and stirred until evenly distributed. The pH value is measured by placing the electrode on the sample, and the pH value can be known by looking at the pH meter screen.

Data Analysis

Data processing of the results of this study was analyzed using the One-Way Analysis of Variance (ANOVA) method using Statistical Product and Service Solutions (SPSS) software. Service Solutions (SPSS) software. If the results obtained showed significant differences in each parameter, then further tests were carried out using the Duncan's Multiple Range Test (DMRT) method.

RESULT AND DISCUSSION

Sensory Test

Sensory test is one of the sciences that utilizes human senses to analyze or evaluate sensory properties and then describe the food product. Hedonic method organoleptic testing is one method of sensory testing of food ingredients based on the preferences of panelists (Stone and Joel, 2004). The level of favorability of the panelists in the test is called a hedonic scale, such as strongly dislike, dislike, neutral, like, very like. The hedonic scale is then transformed into a numerical scale using numbers based on the level of preference.

Color

The parameter of brewed coffee is color. The sense of sight is the initial sensor that observes the color quality of brewed coffee. The results of color sensory analysis of Kalosi Arabica instant coffee with added palm sugar are presented in the following figure:

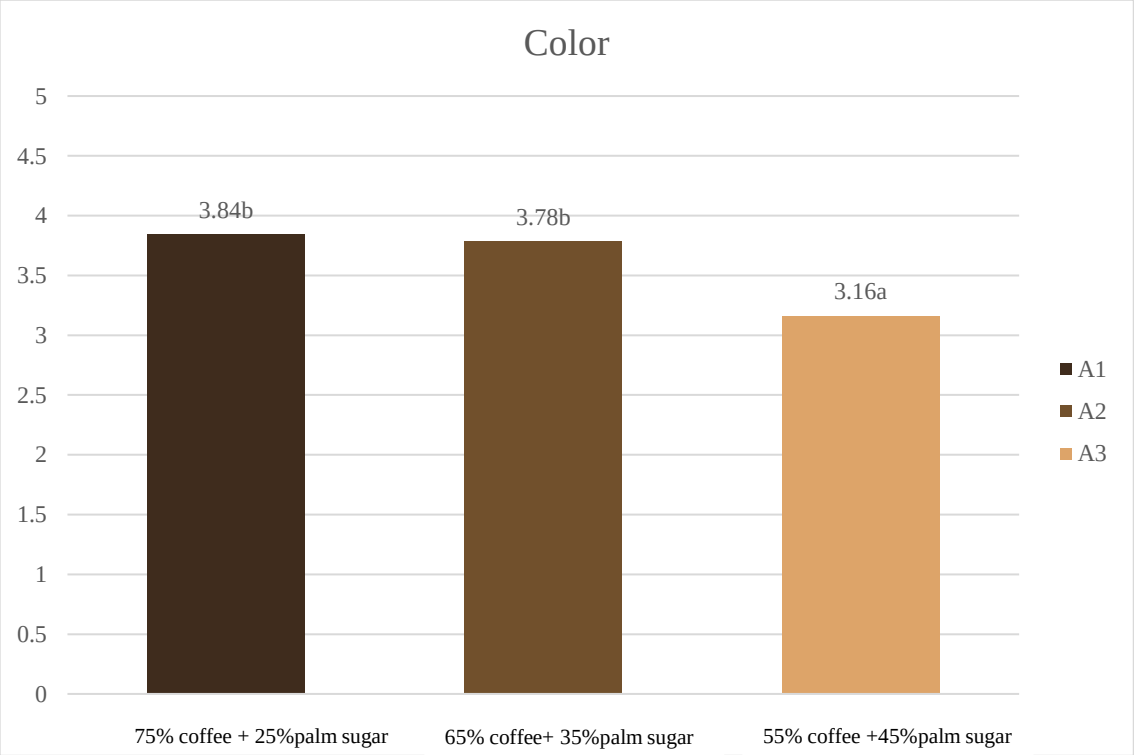

Figure 1: Organoleptic Test Results for Color Parameters

Based on the figure, it can be seen that the average level of panelists' liking for the color of Kalosi Arabica instant coffee with the addition of palm sugar ranges from 3.16 to 3.84. Formulation A3 (55% coffee + 45% palm sugar) obtained the lowest level of liking, namely 3.16 (brownish color). While the formulation that obtained the highest level of liking was A1 (75% coffee + 25% palm sugar) which was 3.84 (brownish black color). The results of analysis

of variance (ANOVA) showed that the formulation with the addition of palm sugar had a significant effect at a significant level of P <0.05 on the color parameters of Kalosi Arabica instant coffee with the addition of palm sugar. Furthermore, Duncan's further test was conducted to test the differences between all pairs of formulations. From the Duncan test results obtained, there are two different formulation groups. The first group is formulation A3 (55% coffee + 45% palm sugar) and the second group is formulation A1 (75% coffee + 25% palm sugar) and formulation A2 (65% coffee + 35% palm sugar).

The color of Kalosi arabica instant coffee obtained is in accordance with Indonesian National Standard (SNI) 2983:2014 which states that the color of instant coffee is brownish black. The color obtained from Kalosi arabica instant coffee is not only determined by the quality of coffee but is also influenced by the quality of palm sugar. Panelists preferred the A1 formulation (75% coffee + 25% palm sugar) because the resulting color is light coffee, which remains the typical color of the coffee despite the addition of palm sugar. The roasting process of coffee beans is a process that greatly affects the color of the coffee powder that will be produced. During the process of making instant coffee, the maillard reaction occurs due to the content of reducing sugars, amine groups and high temperatures (210oC) so that changes in color to brown and darker can occur.

Texture

The viscosity of coffee after the brewing process is one of the sensory attributes that is very important in determining the quality and consumer acceptance of instant coffee products. Assessment of sensory attributes that are generally carried out about texture/viscosity is more focused on the response in the mouth (Matta et al, 2006). The results of texture sensory analysis of Kalosi Arabica instant coffee with added palm sugar are presented in the following figure:

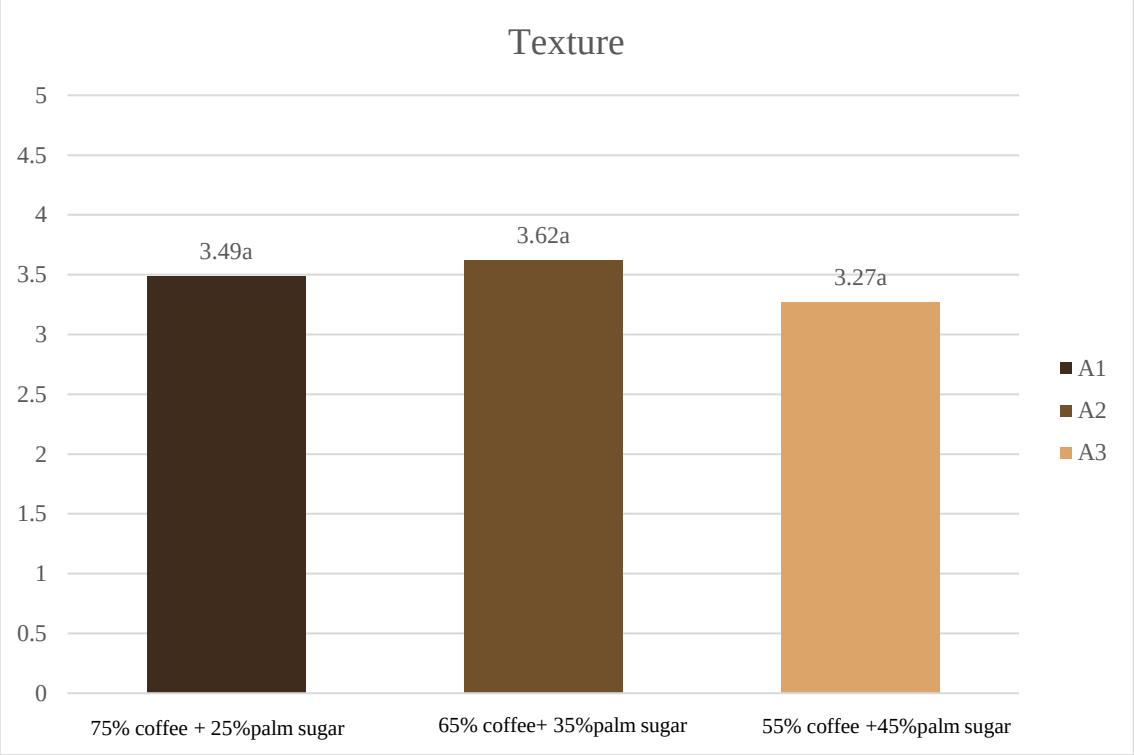

Figure 2: Organoleptic Test Results of Texture Parameters

Based on the figure, it can be seen that the average level of panelists' liking for the texture of Kalosi Arabica instant coffee with added palm sugar ranged from 3.27 to 3.62. Formulation A3 (55% coffee + 45% palm sugar) obtained the lowest level of favorability, namely 3.27. The formulation that obtained the highest level of liking was A2 (65% coffee + 35% palm sugar) which was 3.62. The results of analysis of variance (ANOVA) showed that the formulation with the addition of palm sugar did not have a significant effect at a significant level of P>0.05 on the texture/viscosity parameters of Kalosi Arabica instant coffee with the addition of palm sugar. This is because in the coffee brewing process, the coffee ratio determines the viscosity of the resulting solution. The smaller the coffee ratio, the thicker or more intense it will be, while the higher the amount of palm sugar concentration will produce a thick coffee solution.

Coffee with 35% palm sugar added is the most preferred coffee brew because palm sugar also has a high brix value resulting in an increase in viscosity due to the presence of solids that can bind water, sucrose, and citric acid trap water to create a gel. The viscosity level of instant coffee is thicker when compared to ground coffee. This is due to the installation process so that the brewed coffee does not produce residue (grounds) (Panggabean, 2011).

Scent

Scent is one of the sensory parameters that can affect the taste and level of liking of the panelists. The scent of instant coffee can arise due to the presence of compounds that can easily

evaporate. The group of volatile compounds are acetic acid, propionate, butyrate and volatiles. In the process of making instant coffee, these volatile compounds are dissolved in hot water so that they are extracted to form the scent of the resulting instant coffee. Some of the acetic acid compounds will react with amino acids to produce melancidin compounds that make the coffee color brown. The results of the scent sensory analysis of Kalosi Arabica instant coffee with the addition of palm sugar are presented in the following figure:

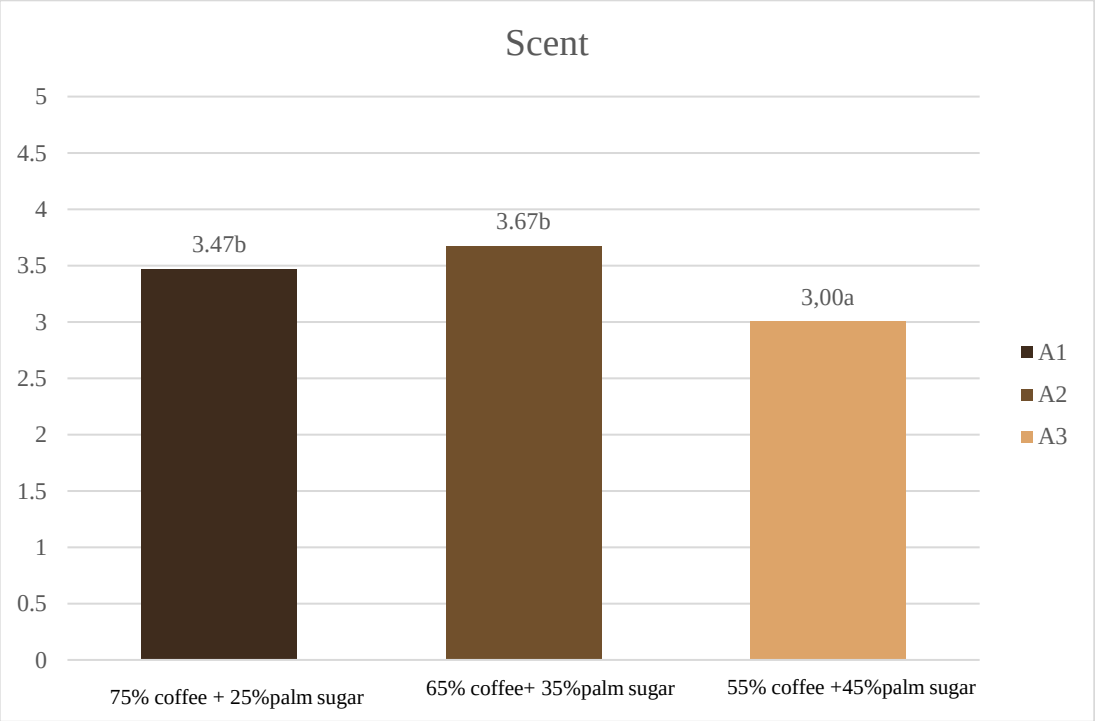

Figure 3: Results of Organoleptic Test for Aroma Parameters

Based on the figure, it can be seen that the average level of panelists' preference for the aroma of Kalosi Arabica instant coffee with the addition of palm sugar ranges from 3.00 to 3.67. Formulation A3 (55% coffee + 45% palm sugar) obtained the lowest favorability level of 3.00. The formulation that obtained the highest level of liking was A2 (65% coffee + 35% palm sugar) which was 3.67. The results of analysis of variance (ANOVA) showed that the formulation with the addition of palm sugar did not have a significant effect at a significant level of $P>0.05$ on the aroma parameter of Kalosi Arabica instant coffee with the addition of palm sugar.

The strongest aroma is obtained in formulation A2 with the addition of 35% palm sugar, this is because the aroma of instant coffee is very strong due to the installation process. The addition of palm sugar to instant coffee makes the aroma of coffee which initially has a distinctive fruity and floral aroma becomes reduced with the distinctive aroma of palm sugar.

Coffee is brewed without producing grounds so that all the volatile components contained in coffee are not wasted. The distinctive aroma of coffee is caused by the organic acids (acetic acid and tannins) contained. Some of the compounds that make up coffee are volatile and susceptible to too much heat, so the more volatile compounds that dissolve in water during the coffee brewing process will produce a strong aroma (Baggenstoss et al, 2008).

Flavor

Taste test is the main factor for panelists in determining the level of acceptance of food products. In this study, the flavor analysis of instant coffee was carried out using the hedonic method of coffee with the addition of palm sugar. The results of the taste sensory test of Kalosi Arabica instant coffee with the addition of palm sugar are presented in the following figure:

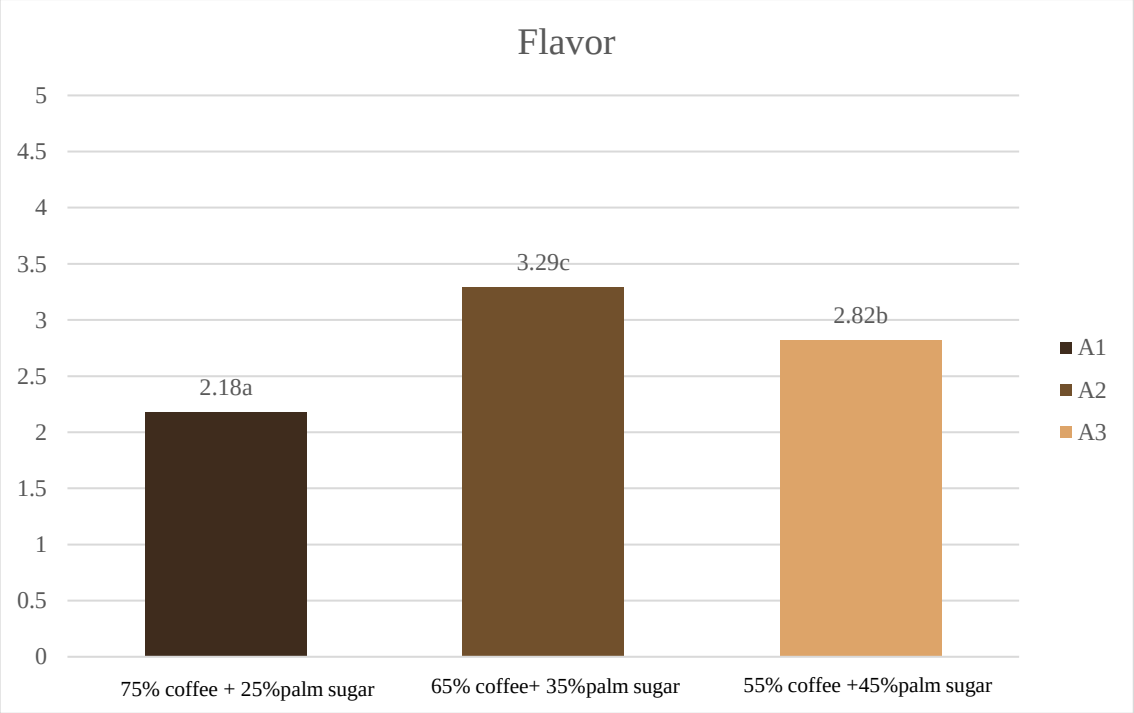

Figure 4: Organoleptic Test Results for Taste Parameters

Based on the figure, it can be seen that the average level of panelists' preference for the taste of Kalosi Arabica instant coffee with added palm sugar ranges from 2.18 to 3.29. Formulation A1 (75% coffee + 25% palm sugar) obtained the lowest level of favorability, namely 2.18. The formulation that obtained the highest level of liking was A2 (65% coffee + 35% palm sugar), which was 3.29. The results of analysis of variance (ANOVA) showed that the formulation with the addition of palm sugar had a significant effect at a significant level of $P < 0.05$ on the flavor parameter of Kalosi Arabica instant coffee with the addition of palm sugar. Furthermore, Duncan's further test was conducted to test the differences between all

pairs of formulations. From the Duncan test results obtained, there are three different formulation groups. The first group is formulation A1 (75% coffee + 25% palm sugar), the second group is formulation A3 (55% coffee + 45% palm sugar) and the third group is formulation A2 (65% coffee + 35% palm sugar).

The 65% coffee formulation with the addition of 35% palm sugar became the coffee most favored by panelists, this is because the ratio between the bitter taste of coffee and the sweetness of palm sugar becomes balanced. The distinctive characteristic of Kalosi coffee is a fruity sour taste and has a sweet lingering aftertaste so that the addition of palm sugar makes the brewed coffee taste less bitter and also contains the sweetness of palm sugar. Apart from adding fragrance to coffee, palm sugar can also prevent the taste of coffee from becoming too sour (Thamrin, et al. 2021). The fruity flavor of Kalosi coffee can be described as orange or dark cherry. Kalosi arabica instant coffee has a high level of acidity, this is due to the arabica type of coffee that is the basic ingredient. The taste of coffee is also influenced by the processing process, as in Kalosi coffee itself which is processed with a natural process. Coffee that is fermented with a natural process produces a sweeter flavor (Bulan, 2021).

Antioxidant Activity

Antioxidants are compounds that can inhibit the oxidation reaction process by binding free radicals. The principle of antioxidant activity testing is quantitative measurement by measuring the inhibition of free radicals (radical scavenging) by a compound containing antioxidant activity using UV-Vis spectrophotometry so that the value of free radical suppression activity expressed by the value of IC50 (inhibitory concentration) is known. Antioxidant compounds play an important role in the human body (Aditya and Ariyanti, 2016). Antioxidants can play a role in maintaining the quality of food products, changes in nutritional value, preventing rancidity and other physical damage to food products. Antioxidants can be produced by the human body itself to fight free radicals, but the amount is still lacking. So that antioxidant intake is needed from outside, such as coffee. The results obtained in making Kalosi Arabica instant coffee with the addition of palm sugar can be seen in the following figure:

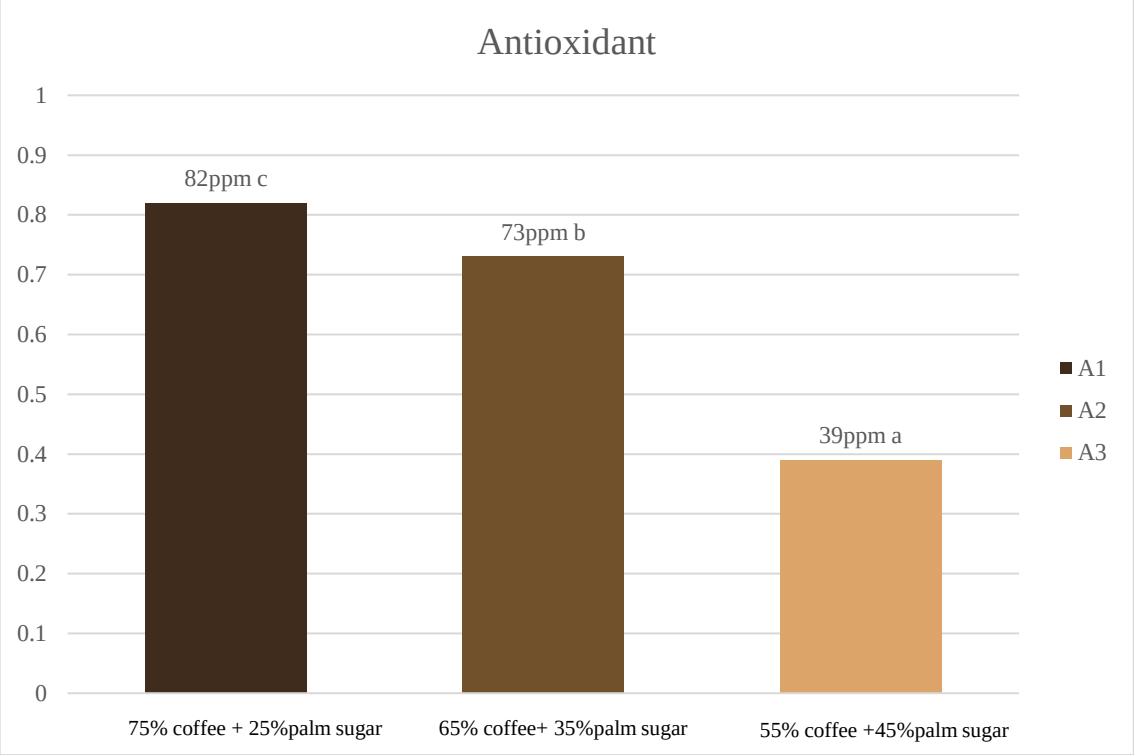

Figure 5: Antioxidant Activity Testing

Based on the figure, it can be seen that the best antioxidant activity value is obtained in the sample formulation A3 (55% coffee + 45% palm sugar) obtained IC50 value of 39 ppm. Formulation A1 (75% coffee + 25% palm sugar) obtained IC50 value of 82 ppm while for formulation A2 (65% coffee + 35% palm sugar) obtained IC50 value of 73 ppm. The results of analysis of variance (ANOVA) showed that the formulation with the addition of palm sugar had a significant effect at a significant level of $P < 0.05$ on the antioxidant content of Kalosi Arabica instant coffee with the addition of palm sugar. Furthermore, Duncan's further test was conducted to test the differences between all pairs of formulations. From the Duncan test results obtained, there are three different formulation groups. The first group is A3 formulation (55% coffee + 45% palm sugar), the second group is A2 formulation (65% coffee + 35% palm sugar) and the third group is A1 formulation (75% coffee + 25% palm sugar).

The antioxidant content of kalosi arabica instant coffee with the addition of palm sugar contains very high antioxidants. Based on Maryani's research (2021), that palm sugar contains an IC50 value of 74.73 ppm. So the addition of palm sugar to instant coffee can increase the antioxidant content. Arabica coffee contains quite high polyphenols, and the main constituents of the phenol component in coffee beans are chlorogenic acid and caffeic acid (Wijayanti and Anggia, 2020). According to Molyneux (2004) in Tristantini et al, (2016) stated that the lower the IC50 value, the stronger the antioxidant activity.

Quantitative Caffeine

Caffeine is an alkalois methylxantine compound (purine base) that is crystalline and tastes bitter. Caffeine is a compound that the body needs to fulfill nutritional needs. The caffeine content contained in coffee has positive effects and negative effects on the body. Caffeine contained in coffee can help speed up the work of the heart muscle and also widen blood vessels, so that after drinking coffee you will feel a sensation of psychic freshness. Caffeine also functions as an element of flavor and aroma in coffee beans (Ciptadi and Nasution, 1985). High caffeine content can cause palpitations, dizziness, and increased blood pressure and make it difficult to sleep. Caffeine becomes harmful to health when consumed at 1000 mg/day or more than 5 cups of coffee per day. The results of caffeine content obtained in the manufacture of Kalosi arabica instant coffee with the addition of palm sugar can be seen in the following figure:

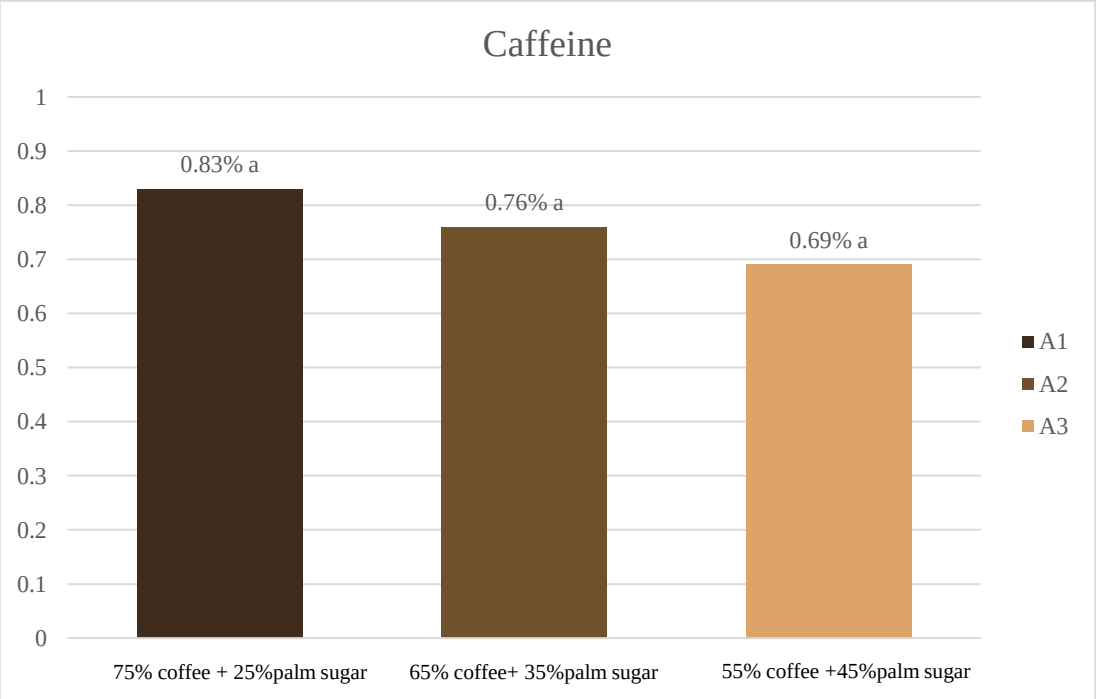

Figure 6. Caffeine Quantitative Testing

The more coffee concentration, the higher the caffeine content. Based on this figure, it can be seen that the highest caffeine content was obtained in the A1 formulation sample (75% coffee + 25% palm sugar) at 0.83%. Meanwhile, the lowest caffeine content was obtained in the A3 formulation (55% coffee + 45% palm sugar) at 0.69%. The results of analysis of variance (ANOVA) showed that the caffeine content was not different at a significant level of P>0.05. Formulation A1 (75% coffee + 25% palm sugar) contains 0.83% caffeine, formulation

A2 (65% coffee + 35% palm sugar) contains 0.76% caffeine while formulation A3 (55% coffee + 45% palm sugar) contains 0.69% caffeine.

Arabica coffee caffeine levels generally range from 0.91-1.09% (Navarra et al, 2017). The presentation of caffeine content contained in kalosi instant arabica coffee ranges from 0.69-0.83%. The caffeine content in the instant arabica coffee obtained is very low because the coffee used is arabica coffee which is then subjected to an instillation process so that it contains lower caffeine.

Degree of Acidity (pH) Value

The degree of acidity or pH is a parameter that indicates the acidity or basicity of a food ingredient. The pH value of a food is often used as an indicator of food damage, this is because controlling the pH value is one way to prevent the growth of spoilage microbes. pH value is one way to prevent the growth of spoilage microbes (Apriani, 2016). Kalosi Arabica Instant Coffee as much as 5 grams was weighed using an analytical balance and then added aquaduct. analytical scales and then added 50 mL of distilled water. The pH value of brewed Kalosi Instant Arabica Coffee can be seen in the following figure:

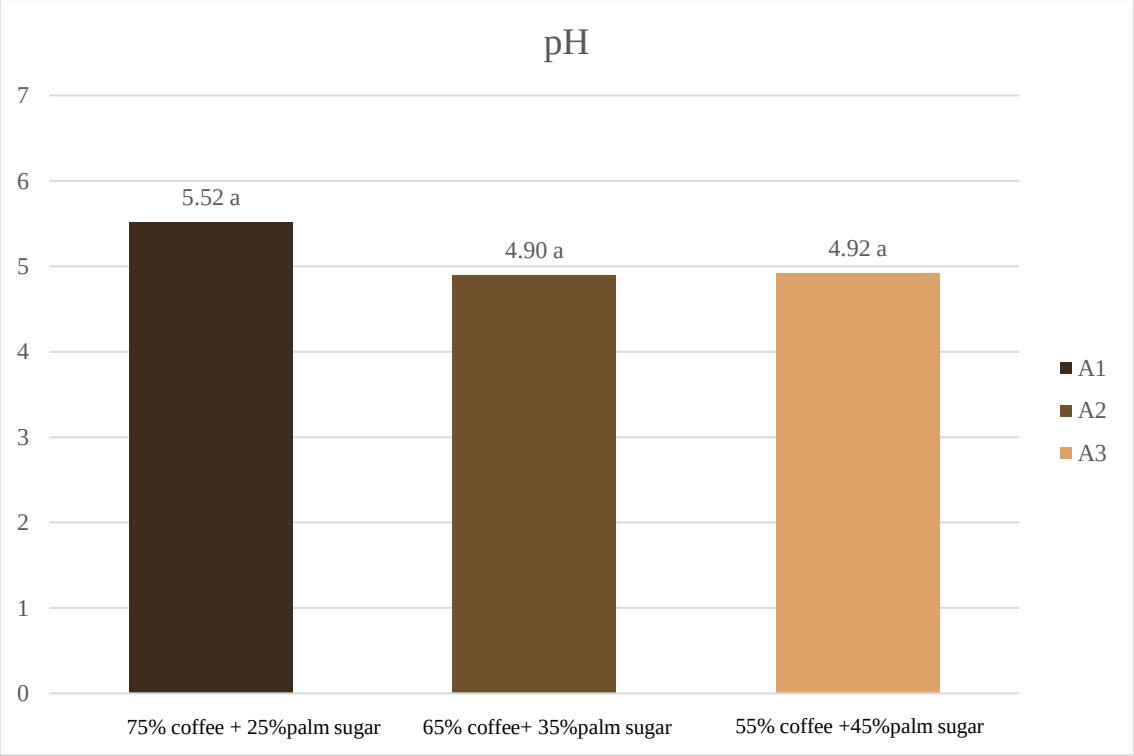

Figure 7. pH value of Kalosi Arabica Instant Coffee

Based on the diagram, it can be seen that the pH value of Kalosi Arabica instant coffee with the addition of palm sugar is the lowest pH value in formulation A2 (65% coffee + 35% palm sugar) of 4.90, while the highest pH value is in sample A1 (55% coffee + 45% palm sugar)

of 5.52. The results of analysis of variance (ANOVA) showed that the pH value of kalosi instant arabica coffee was not different at a significant level of P>0.05. Formulation A1 (75% coffee + 25% palm sugar) has a pH value of 5.52, formulation A2 (65% coffee + 35% palm sugar) has a pH value of 4.90 while formulation A3 (55% coffee + 45% palm sugar) has a pH value of 4.92.

Arabica coffee contains a pH value ranging from 4.8 to 5.8 (Lingle, 2001). Meanwhile, good quality palm sugar has a pH value of 6 to 7 (Saputra, 2015). Increasing the concentration of palm sugar in making Kalosi instant arabica coffee can cause the pH value of the coffee to get lower, indicating that the acid content is increasing. According to Fardiaz (1992), the acidity of a food product is influenced by the acid contained in the food. The pH value of instant coffee is formed from the acid content in coffee, namely volatile and non-volatile acids. Non-volatile acids in coffee consist of chlorogenic acid (CGA), citric, malic, and quinic acids while the volatile acids contained in coffee are formic and acetic acids.

CONCLUSIONS

Based on the results of the study, the best formulation of kalosi instant arabica coffee with the addition of palm sugar is the formulation of 65% instant coffee with the addition of 35% palm sugar based on the hedonic method sensory test. The formulation contains antioxidants that are classified as strong at 73 ppm, caffeine at 0.76%, and pH 4.90. And the addition of palm sugar as much as in the process of making instant coffee affects the sensory characteristics, especially in color and taste parameters.

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CONFLICT OF INTERESTS

The authors declare that they have no conflicts of interest.

ETHICAL CONSIDERATION

The authors have confirmed ethical issues, such as plagiarism, misconduct, fabrication and falsification of information, consent to publish, duplication of publication and submission, and redundancy.

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