SENSORY CHARACTERISTICS AND CHEMICAL PROPERTIES OF COFFEE LEAF TEA (Coffea sp) AS A FUNCTIONAL BEVERAGES

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SENSORY CHARACTERISTICS AND CHEMICAL PROPERTIES OF COFFEE LEAF TEA (*Coffea sp*) AS A FUNCTIONAL BEVERAGES

Karakteristik Sensoris dan Sifat Kimia Teh Daun Kopi (Coffea sp) Sebagai Minuman Fungsional

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Abstract: *Coffee leaves can be processed into functional beverages because they have a fairly high tannin content and a taste that is no less delicious than coffee beans so that they can be used as a substitute for tea leaves in the processing of coffee leaf tea. Red ginger can be added to coffee leaf tea because it is beneficial for health as an antioxidant and can increase endurance. This study aims to: (1) Examine the effect of the concentration of coffee leaf comparison with red ginger on coffee leaf tea processing and (2) Examine the sensory characteristics of coffee leaf tea with the addition of red ginger. The research treatment was coffee leaves with concentrations (100%, 70%, 60%, 50%) and red ginger powder with concentrations (0%, 30%, 40%, 50%). Data analysis using a Complete Randomized Design (RAL), with four treatment levels and three repeats. The results of study obtained the best treatment with a ratio of coffee leaves 50%: red ginger 50% in terms of aroma 3.87 (likes), color 3.31 (likes), flavors without sugar 3.08 (likes), flavors of sugar addition 3.93 (likes), water content 3.46%, and ash content 5.26 %, The water content, ash content and color of coffee leaf tea with the addition of red ginger produced in this study meet SNI 03-3836-2012.*

Keywords: *coffee leaf tea, red ginger, sensory, functional beverages*

Abstrak:*Daun kopi dapat diolah menjadi minuman fungsional karena memiliki kadar tanin yang cukup tinggi dan rasa yang tidak kalah nikmat dari biji kopi sehingga dapat dimanfaatkan sebagai pengganti daun teh dalam pengolahan teh daun kopi. Jahe merah ditambahkan pada teh daun kopi karena bermanfaat bagi kesehatan sebagai antioksidan dan dapat meningkatkan daya tahan tubuh. Penelitian ini bertujuan: (1) Mengkaji pengaruh konsentrasi perbandingan daun kopi dengan jahe merah pada pengolahan teh daun kopi dan (2) Mengkaji karakteristik sensoris teh daun kopi dengan penambahan jahe merah. Perlakuan penelitian yaitu daun kopi dengan konsentrasi (100%, 70%, 60%, 50%) dan bubuk jahe merah dengan konsentrasi (0%, 30%, 40%, 50%). Analisis data menggunakan Rancangan Acak Lengkap (RAL), dengan empat taraf perlakuan dan tiga kali ulangan. Hasil penelitian ini diperoleh perlakuan terbaik dengan perbandingan daun kopi 50%: jahe merah 50% ditinjau dari aroma 3.87 (suka), warna 3.31 (suka), citarasa tanpa gula 3.08 (suka), citarasa penambahan gula 3.93 (suka), kadar air 3.46%, dan kadar abu 5.26%, Kandungan kadar air, kadar abu dan warna teh daun kopi dengan penambahan jahe merah yang dihasilkan dalam penelitian ini memenuhi SNI 03-3836-2012.*

Kata kunci: *teh daun kopi, jahe merah, sensoris, minuman fungsional*

INTRODUCTION

Coffee leaves trimmed from coffee trees that are usually wasted can processed into functional beverages that can fight free radicals in the body with their antioxidant content. Pruning is carried out so as not to complicate it when harvesting and not to inhibit the growth of coffee plants. Coffee leaves contain flavonoids, alkaloids, saponins, caffeine, and polyphenols (Setiawan et al., 2015). Phenolic acids contained in coffee leaves are antioxidant compounds that can function to eliminate free radicals in the body (Suena and Ni Putu, 2020).

According to the results of research by Pristiana et al., (2015), that old coffee leaf has the potential to be used for food fortification because it contains a lot of antioxidants. In addition, coffee has a fairly tannin content and a taste that is no less delicious than coffee beans (Siringoringo et al., 2012).

Coffee leaf tea is processed from coffee leaf raw materials that are no longer used and have a lower caffeine content than coffee and a high antioxidant content (Lazuardina et al., 2022). Coffee leaf tea can be used as one of the choices of health beverages and will be even more efficacious if added with spice plants that have known health benefits. One of the spices that is useful as an antioxidant and can increase endurance is red ginger which belongs to the Zingiberaceae species (Lukita et al., 2021). Red ginger (*Zingiber officinale Roscoe*) is one of the varieties of ginger that is widely circulated in the community (Srikandi et al., 2020). Red ginger can be used as a functional beverage (Ranggawati, 2018) with advantages in the chemical content that is applied at to ginger rhizomes, namely; (1) Gingerol substance that has anticoagulant properties, which can launch blood flow and prevent blood clots, so that it can anticipate heart disease, stroke and other degenerative diseases (Hasanah et al., 2021) and (2) Oleoresin is a ginger content that provides spicy, bitter, and provides antioxidant effects (Ibrahim et al., 2015). Furthermore, red ginger also contains essential oil in the form of a thick liquid and has a green to yellow color that gives a distinctive fragrant aroma to red ginger (Widiyana et al., 2021). Thus, the presence of various ingredients in coffee leaves and red ginger that are beneficial for health, it can be processed into functional beverages.

Functional beverages have the potential to be developed because they can double function in addition to providing nutritional intake can also provide sensory satisfaction and by consuming functional beverages regularly can maintain a healthy body (Fortin et al., 2021; Sharma et al., 2021) . The content of active compounds in functional beverages raw materials can increase the activity of antioxidant compounds so that they can improve the immune system. Comparison formulation or mixing raw materials in the processing of functional beverages is the most important part so that the flavor produced can be accepted by the public and its function for health can be accounted for (Widyantari, 2020). According to the results of the study of Ryadha et al., (2021), that functional beverages from spices have the potential to be a source of antioxidants. Furthermore, according to the results of the study (Dwiyanti et al., 2021), that ginger beverage has an antioxidant activity of DPPH of 82,89% so it has the potential to be developed as a functional beverage.

The tea processing process includes the process of withering, fermentation and drying. These three processes will affect the quality of the coffee leaf tea produced, especially the aroma. The fermentation process of coffee leaf tea will result in an oxidation process where catechins change into various simpler compounds, namely flavonoid polyphenol compounds. The drying process is used to stop the fermentation process. Dismissing the fermentation process too early will result in rudimentary tea quality and a fermentation process that is too long will result in very poor tea quality ((Fibrianto, 2020; Steger et al., 2022). Furthermore, coffee leaf tea produced with the addition of red ginger was analyzed for sensory characteristics by organoleptic testing using hedonic and description tests (Afrianto et al., 2017) and its chemical properties, namely water content and ash content.

Organoleptic testing includes color, aroma, flavor, and texture. Color greatly affects consumer interest in a food product, so color is one of the important variables when consumers assess the quality of a food product (Maligan et al., 2018). Aroma is one of the important factors to determine the level of consumer acceptance of a food product. This is because before consuming usually consumers first smell the aroma of the product to assess whether the product is suitable for consumption. Furthermore, whether the aroma of a food product determines the flavor, so that the aroma is categorized as the flavor of a food product (Winarno, 2004). Flavor plays an important role in determining whether a product is accepted or rejected by consumers (Berenstein, 2020) . Moreover, in the manufacture of a new product, consumers' assessment of flavor largely determines the quality of the product (Tarwendah, 2017). Flavor is an important factor for panelists to accept or reject a food product. Further, although other parameters are of good value, if the flavor is unpleasant or unwelcome, then the product will be rejected or not accepted.

Coffee will be trimmed periodically every year so that it will produce coffee leaf waste that can be further utilized to have functional properties and economic value. One alternative to its use is processed as a functional beverage and to further improve its functional properties, red ginger can be added. Tea and coffee with the addition of red ginger are very beneficial for health. Coffee leaf tea products in packaged form can be more practically consumed by the public so that tea bag products are made. The problem of this study is how the sensory characteristics (color, aroma, and flavor) and the chemical properties of coffee leaf tea with the addition of red ginger. Thus, this study aims to: (1) Assessing the effect of the concentration of the ratio of coffee leaves with red ginger on the processing of coffee leaf tea and (2) Assessing the sensory characteristics and chemical properties of coffee leaf tea with the addition of red ginger.

METHODOLOGY

Time and Place

This research was carried out on April- June 2022 at the Laboratory of Agricultural Sciences, University of Negeri Makassar and the Laboratory of the Center for Standardization of Industrial Services for Plantation Products, Minerals, Metals and Maritime Products.

Tools and Materials

The tools used in this study were basins, stainless steel knives, cutting boards, tampahs, blenders, analytical scales, ovens, and organoleptic test equipment. The ingredients used in this study were young coffee leaves and red ginger.

Research Procedure

Red Ginger Powder Processing

Red ginger is carried out washing, stripping, and cutting. Next, dry in the oven at a temperature of 105°C for three hours. Then grinding is carried out using a blender and sifting; so that red ginger powder is obtained.

Coffee Leaf Tea Processing

The process of processing coffee leaf tea with the addition of red ginger is as follows: coffee leaf picking in the morning at 07.00– 08.00 based on the topmost shoot followed by three strands below. Sorting coffee leaves to remove stems that are included in the picking process. Coffee leaf ploughing to reduce its size. Withering coffee leaves for six hours. Heating using the oven at 90°C for one hour. Roasting coffee leaves for eight minutes at 40°C. Crushing the coffee leaves then crushing them until they are slightly smooth and sifting using a 20-mesh sieve. Next, mixing coffee leaves concentrations of 100%,70%, 60%, and 50% with red ginger powder concentrations of 0%, 30%, 40%, and 50%. Weighing coffee leaf tea contains a net weight of one gram then packaging with osmo-filter paper. Organoleptic testing is carried out by first brewing coffee leaf tea with hot water and then testing the brewing color, aroma, and flavor as well as testing of chemical properties. Coffee leaf tea processing flow chart as presented in Figure 1.

Organoleptic Test

Sensory characteristics were carried out by organoleptic tests using hedonic methods including taste, color, and aroma to test the degree of liking for the coffee leaf tea produced or the feasibility of a product to be accepted by the panelists. In this test, 25 panelists were asked to give an assessment based on liking level. The scores used were 5 (very like), 4 (like), 3 (somewhat like), 2 (dislike), and 1 (very disliked) (Rampengan et al., 1985).

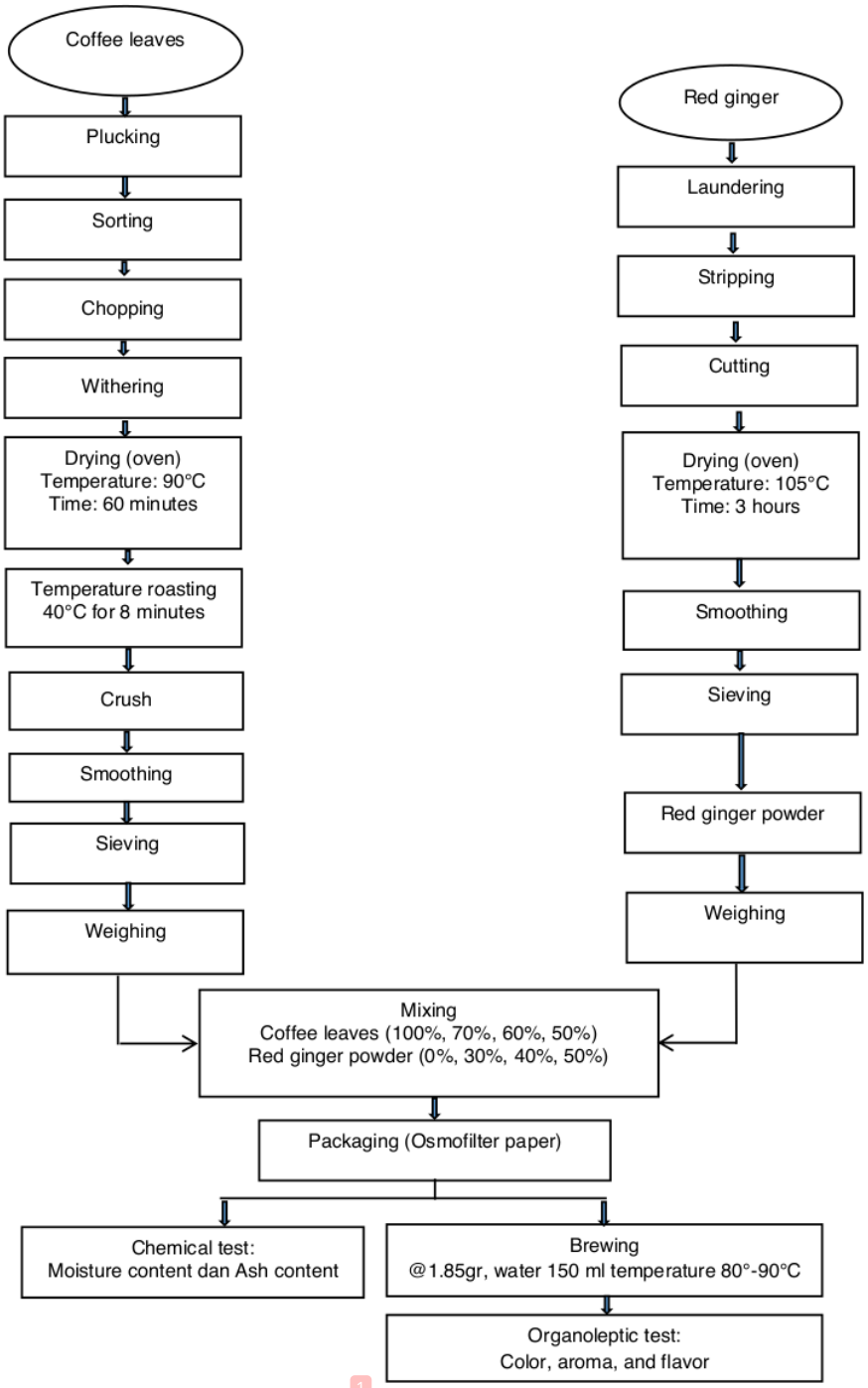

Figure 1. Flow chart of processing coffee leaf tea with the addition of red ginger powder

Moisture Content

The method of analyzing the moisture content uses an oven method. The saucer to be used is first dried in the oven at a temperature of 100 – 105^0 C for 30 minutes until a constant weight is obtained. Next, cooling in the desiccator for 30 minutes and weighing the sample as much as five grams (W_1). Drying of the sample in the oven at a temperature of 100 -105^0 C until a constant weight is reached (8 – 12 hours). Cooling of the sample in a desiccator for 30 min and weighing (W_2). The calculation of moisture content is carried out as follows (Abriana, 2018):

$$\text{Moisture Content (\%)} = \frac{(W1-W2}{W} \text{ x } 100\% \quad (1)$$

Where: w is the sample weight, w_1 is the sample weight plus saucer before drying, and w_2 is the sample weight plus saucer after drying

Ash Content

Drying porcelain clouds at 525°C for 30 minutes. Cooling in desiccator for 15 minutes and weighing the weight of empty containers (W_1). Next, weighing the sample 5 –10 gram in a porcelain dish (W_2). Heating the saucer and samples by oven at 100°C for 30 minutes and continued by rinsing on an electric furnace with a temperature of 525°C for two hours. Cooling in desiccator and weighing (W_3). Calculation of ash content by the formula (Abriana, 2018):

$$\text{Ash Content} = \frac{Incandescent\ residual\ \ weight}{Sample\ weigth} \text{ x } 100\% \quad (2)$$

Where: the incandescent residual weight is w3-w1 and the sample weight is w2-w1

Data Analysis

Coffee leaf tea with the addition of red ginger was carried out in laboratory experiments. The analysis was carried out using ANOVA (Analysis of Variance) to test the influence of each factor and continued with further testing of BNT (Smallest Real Difference) with four levels of treatment, namely coffee leaves with concentrations (100%, 70%, 60%, 50%) and red ginger powder with concentrations (0%, 30%, 40%, 50%) and three repeats. The confidence level used is 95% (α 0.05).

RESULTS AND DISCUSSION

Sensory Characteristics

Functional beverages are an important part of functional processed products due to their health benefits and attractive sensory characteristics, the suitability of consumer tastes and the affordability of people's purchasing power (Males et al. 2022). Sensory testing is carried out organoleptically using a hedonic method against three parameters, namely color, aroma, and flavor. In this test, panelists were asked to express feedback about liking or dislike for the parameters tested on a hedonic scale. The results of the organoleptic test of coffee leaf tea with the addition of red ginger powder as presented in Figure 2.

Color

The color in coffee leaf tea ranges from 3.31 – 4.11 on average. The lowest color score was obtained at the comparison treatment (coffee leaves 50%: red ginger 50%) obtained 3.31; while the highest obtained at the comparison treatment (coffee leaves 100%: red ginger 0%) obtained 4.11. Based on the results of the color organoleptic test, it showed that the best panelists' favorability level was found in the comparison treatment of 100% coffee leaves: 0% red ginger average value of 4.11 with the results of the likes assessment of 20 panelists, while the lowest result of panelists' favorability level towards the comparison treatment of 50% coffee

leaves: 50% red ginger with the results of the likes assessment of 5 panelists as presented in Figure 2 and color coffee leaf tea as presented in Figure 3 .

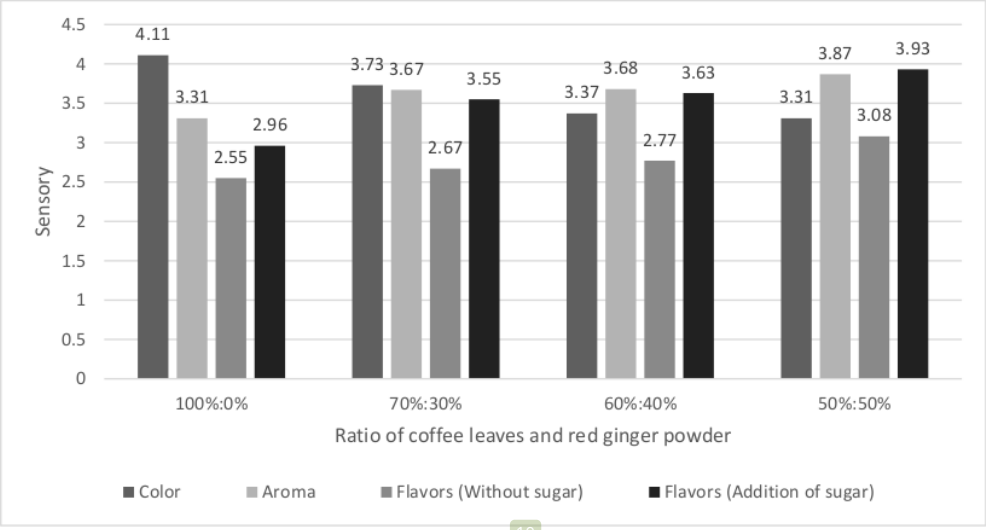

Figure 2. Organoleptic test results of coffee leaf tea with the addition of red ginger powder

Figure 3. The color of the coffee leaf tea

The reddish color of the coffee leaf tea steeping water will be more preferred by the panelists if without adding red ginger. This is because the redder ginger is added, it will reduce the characteristic color of the tea, which is a reddish color. This is in accordance with the results of research by Siringoringo et al., (2012), during the tea processing process, namely in the fermentation process there is a process of changing catechins into simpler compounds, namely flavonoid polyphenol compounds that give a red color to the coffee leaf tea steeping water. Ginger will give a red color which is the typical color of red ginger (Lukita et al., 2021) and if mixed with coffee leaves will produce coffee leaf tea which is very red. Thus, the addition of red ginger will produce tea with a different color from the typical color of tea, which is red.

The results of the fingerprint analysis of various treatment of comparison of coffee leaves and red ginger influenced the color of coffee leaf tea with a real influence on the sig value (0.00<0.05), so that a follow-up test of the smallest real difference (BNT) was carried out. Based on the results of further tests of BNT coffee leaf tea with the addition of red ginger showed that between the treatment (100%: 0%) against (70%: 30%), (60%: 40%), and (50%: 50%) with sig values (0.00<0.05) the results were significantly different ANOVA results as presented in Table 1.

Table 1. ANOVA Test Results Sensory Characteristics and Chemical Properties of Coffee Leaf Tea with the Addition of Red Ginger

Sensory Characteristics	Comparison Coffee Leaves: Red Ginger			
	100:0	70:30	60:40	50:50
Color	4.11 ± 0.1007*	3.73 ± 0.0231*	3.37 ± 0.0231*	3.31 ± 0.0231*
Aroma	3.31 ± 0.0611*	3.67 ± 0.0462*	3.68 ± 0.0400*	3.87 ± 0.0611*
Flavors (Without sugar)	2.55 ± 0.0231*	2.67 ± 0.0231*	2.77 ± 0.0833*	3.08 ± 0.0400*
Flavors (Addition of sugar)	2.96 ± 0.0000*	3.55 ± 0.0611*	3.63 ± 0.0231*	3.93 ± 0.0231*
Moisture Content (%)	1.54 ± 0.0551*	2.76 ± 0.0681*	3.09 ± 0.0608*	3.46 ± 0.7564*
Ash Content (%)	4.50 ± 0.6413*	5.27 ± 0.0639*	5.28 ± 0.0219*	5.26 ± 0.2422*

*ns = non-significant at 5% level of significance, * = Significant at 5% level of significance*

Aroma

The aroma of coffee leaf tea with the addition of red ginger ranges on average from 3.31 – 3.87. The lowest aroma score was obtained at the 100% coffee leaf comparison treatment: 0% red ginger with a value of 3.31; While the highest aroma score was obtained on the coffee leaf treatment of 50%: red ginger 50% with a value of 3.87. The results of measuring the aroma of various treatments on coffee leaf tea with the addition of the resulting red ginger are presented in Figure 2.

Based on the results of the aromatic organoleptic test, it was shown that the best panelists' favorability level was found in the comparison treatment of 50% coffee leaves: 50% red ginger value 3.87 with the results of the likes assessment of 20 panelists, while the lowest result of the panelists' favorability level was found in the comparison treatment of 100% coffee leaves: 0% red ginger with a value of 3.31 by giving the results of the likes assessment of five panelists. The aroma of coffee leaf tea with the addition of red ginger is favored in the same ratio because it produces a fragrant aroma. This is in accordance with the results of the study (Srikandi et al., 2020), that the typical of red ginger is fragrant and has a spicy flavor. According to (Malligan et al., 2018), aroma is one of the key variables, because in general the consumer's flavor of food products is largely determined by aroma. Thus, aroma is related to flavor and can determine the flavor of coffee leaf tea with the addition of red ginger.

The results of the fingerprint analysis of various showed that the comparison of coffee leaves with red ginger in coffee leaf tea had a significant effect on the aroma with a sig value (0.00<0.05), so a further BNT test was carried out. Based on the results of further tests, the smallest real difference (BNT) in coffee leaf tea showed that between the treatment (100%: 0%) against (70%: 30%), (60%: 40%), and (50%: 50%) with sig values (0.00<0.05) the results differed markedly as presented in Table 1.

Flavor

Flavor is a sensory attribute that cannot be separated from the overall taste of food products. Flavor plays an important role in the taste of food. Furthermore, the enjoyment of flavors in processed food products is impossible to obtain without a taste in it. Flavor is a sensation received by taste buds located in the oral cavity and caused by compounds that dissolve in water and interact with receptors on the tongue and taste buds in the oral cavity. Furthermore, there are four basic tastes that can be recognized by the human tongue namely sweet, bitter, sour, and salty (Berenstein, 2020). The results of measuring the flavor of various treatments on coffee leaf tea with the addition of red ginger produced as presented in Figure 2.

The flavor of coffee leaf tea without sugar and the addition of sugar on average ranges from 2.55–3.93. The lowest taste score in the flavor without sugar is at a ratio of 100% coffee leaves: 0% red ginger obtained a value of 2.55; While the lowest flavor with the addition of sugar is the same as the flavor without sugar, namely the ratio of 100% coffee leaves: 0% red ginger obtained a value of 2.96. Furthermore, the highest unsweetened flavor score at the 50% coffee leaf comparison treatment: 50% red ginger obtained a value of 3.08 and the flavor score with the highest addition of sugar as well as the flavor without sugar, namely the comparison treatment of 50% coffee leaves: 50% red ginger obtained a value of 3.93.

Based on the results of the organoleptic test of flavors without sugar, it showed that the best level of panelists' favorability was found in the comparison treatment of 50% coffee leaves: 50% red ginger value 3.08 by giving the results of the like assessment of 18 panelists, while the lowest result of the panelists' favorability level was found in the comparison treatment of 100% coffee leaves: 0% red ginger value 2.55 by providing the results of the likes assessment of seven panelists. Furthermore, the flavor with the addition of sugar showed that the best panelists' favorability level in the comparison treatment of 50% coffee leaves: 50% red ginger value 3.93 by giving the results of the likes assessment of 22 panelists, while the lowest result of the panelists' favorability level was found in the comparison treatment of 100% coffee leaves: 0% red ginger value 2.96 by providing the results of the likes assessment of three panelists. The taste of coffee leaf tea with the addition of red ginger was preferred by the panelists because it was influenced by the combination of red ginger which gave a spicy taste to the product, so the comparison in each assessment treatment increased that the panelists felt. It is appropriate (Lukita et al., 2021), that there is oleoresin consisting of zingerone, shogaol, and gingerol components in ginger and the flavor contained in oleoresin is what causes a spicy and bitter taste. Furthermore, the high oleoresin content makes a spicier taste in ginger extract and provides a higher antioxidant effect (Ibrahim et al., 2015). Based on these antioxidant benefits, coffee leaf tea is used as an herbal tea beverage (Lagawa et al., 2020). Thus, the ratio of the concentration of coffee leaves and red ginger is balanced, so the resulting spicy, bitter, and astringent taste is not so sharp that the panelists liked.

The results of the fingerprint analysis of various comparative treatments had a significant effect on coffee leaf tea with the addition of red ginger. The taste in the addition of sugar and without the addition of sugar that the ratio of coffee leaves with red ginger has a real effect with the sig value (0.000<0.05) as well as the taste without the addition of sugar has a sig value (0.001<0.05), so that further BNT tests are carried out. Based on the results of further tests, the smallest real difference (BNT) to coffee leaf tea with the addition of red ginger with flavor parameters showed that between the treatment (100%:0%) to (70%:30%), (60%:40%), and (50%:50%) with sig values (0.00<0.05) the results were significantly different as presented in Table 1. Based on SNI 03-3836-2012, a good tea flavor is a typical tea that is the taste of astringent. In addition, with the presence of caffeine levels that are high enough in coffee leaves so that coffee leaf tea has a taste that is no less delicious than coffee beans (Dado et al., 2019) . Thus, the flavor of coffee leaf tea is an astringent and spicy taste due to the addition of red ginger.

Chemical properties

Moisture Content

Moisture content is an important parameter to know, especially for dry matter. The moisture content of coffee leaf tea with the addition of red ginger on average ranges from 1.54% - 3.46%. The lowest moisture content was obtained at a 100% coffee leaf comparison treatment: 0% red ginger with a yield of 1.54%; while the highest moisture content was obtained at the coffee leaf ratio treatment of 50%: red ginger 50% with a yield of 3.46%. The higher the concentration of red ginger used, the higher the moisture content of coffee leaf tea. This shows that there is an increase in the value of water content along with the increase in the concentration of ginger added. The results of measuring the moisture content of various treatments on coffee leaf tea with the addition of red ginger as presented in Figure 4.

The results of the fingerprints of the various moisture content of coffee leaf tea showed that the ratio of coffee leaves with red ginger had a very noticeable effect with sig values (0.000<0.05). This is influenced by the addition of red ginger powder which has the largest concentration of the ratio of the others as much as 50% with the drying temperature of red ginger at a temperature of 105^{0}C for three hours, while the drying of coffee leaves at a temperature of 90°C for one hour. This result is in accordance with Sasmita et al., (2018), that the higher the temperature and the longer the drying used, the higher of heat transfer rate and the greater the evaporation of water. Furthermore, according to Mawardi et al., (2016), that the water content of foodstuffs processed into functionary beverages is getting higher along with the increasing concentration of the ratio of added ingredients. Dried red ginger has a high moisture content, resulting in an increase in the moisture content value of the coffee leaf tea functional beverage. Based on the results of the fingerprints, it has a very real influence, so a further test of BNT was carried out. Based on the results of the BNT test, the water content of coffee leaf tea with the addition of red ginger obtained a ratio and treatment (100%:0%) to (70%:30%), (60%: 40%), (50%:50%) the results were very different, as well as the treatment (70%: 30%) against (60%: 40%), (50%: 50%) with sig values (0.000<0.05) as presented in Table 1.

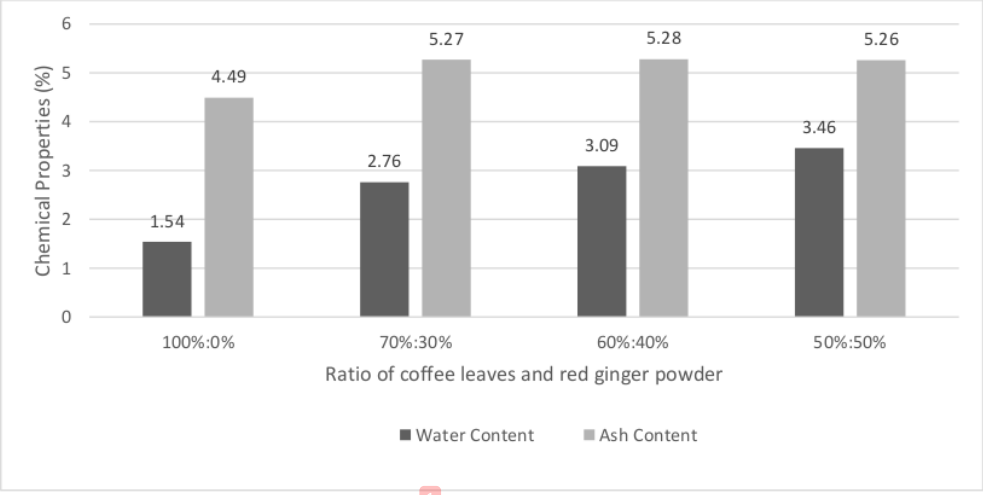

Figure 4. Chemical properties of coffee leaf tea with the addition of red ginger powder

Figure 4 shows that the higher the concentration of red ginger powder, the higher the moisture content of coffee leaf tea. The highest water requirement was in the coffee leaf ratio treatment of 50%: 50% red ginger as much as 3.46%. Based on the SNI tea quality standard 03-3836-2012 shows that the water content of coffee leaf tea with the addition of red ginger produced meets the quality requirements of tea water content around a maximum of 8%.

Ash Content

Ash content indicates the total minerals contained in a food ingredient. Most foodstuffs consist of organic and water ingredients about 96%, the rest consists of mineral elements (Winarno, 2004). Various organic matter in the combustion process will burn but its inorganic components (minerals) will not, thus be producing ash and being expressed as ash content. Conventional dry canning is based on the combustion of samples at high temperatures of 500-600^{0}C (Harris and Marshall, 2017).

The ash content of coffee leaf tea with the addition of red ginger on average ranges from 4.49% – 5.26%. The lowest ash content was obtained at a 100% coffee leaf ratio treatment: 0% red ginger by 4,49%; While the highest moisture content was obtained at the coffee leaf ratio treatment of 50%: red ginger 50% at 5.26%. The results of measuring ash

content from various treatments on coffee leaf tea with the addition of red ginger as served in Figure 4.

The results of the fingerprints of the ash content of coffee leaf tea with the addition of red ginger show that the comparison of coffee leaves and red ginger has a very real effect with the sig value (0.000<0.05) as presented in Table 1. This is influenced by the addition of red ginger which is quite large, which is as much as 50% with the drying temperature of red ginger which is 60^0 C for three hours, while the drying time of coffee leaves is for one hour with a temperature of 90^0C. This is because the greater the concentration of red ginger, the minerals contained in red ginger affect the ash content of the resulting product. This is in accordance with the opinion Agustina et al., (2020) which states that ash content has something to do with the minerals of a material. The increase in ash content is caused by a higher decrease in water content so that inorganic materials that are left behind will increase, one of which is minerals (Lisa et al., 2015).

CONCLUSION

Coffee leaves can be processed into functional beverages with the addition of red ginger to increase their utilization for health. The comparison treatment of coffee leaves with the addition of red ginger has a noticeable effect on the sensory characteristics of color, aroma, and flavor with the addition of sugar and without the addition of sugar as well as on water content and ash content. Coffee leaf tea products are produced in the form of teabags. and meets the Indonesian National Standard SNI 03-3836-2012.

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