Development of Cascara Tisane with The Addition of Dried Pineapple *(Ananas sativus)* and Rosella Flower *(Hibiscus sabdariffa)*

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Abstract

Coffee cherry skin, a form of coffee production waste that accounts for up to 60% of the total yield, contains natural antioxidants that have the potential to become functional foods. Cascara Tisane is a brewed beverage derived from dried coffee cherry skin. Adding other ingredients to this product can help increase consumer acceptance in Indonesia. In this study, the additional ingredients used were dried pineapple and rosella flowers. To determine the effect of adding these ingredients, it is necessary to identify the drying temperature and chemical and organoleptic characteristics to produce Cascara Tisane products according to the Indonesian National Standard (SNI). The research consisted of two stages, namely (1) the identification of the drying temperature of coffee cherry skin and (2) the formulation of the addition of dried pineapple and rosella. The drying temperatures used were 45 °C, 50 °C, 55 °C, and 60 °C. The sample formulation consists of four levels, namely code 126 (75% coffee cherry skin, 15% dried pineapple, 10% rosella): 216 (65% coffee cherry skin, 20% dried pineapple, 15% rosella); and 616 (55% coffee cherry skin, 25% dried pineapple, 20% rosella). Chemical characteristics analysis was conducted on moisture and ash contents, as well as antioxidant activity. Furthermore, a hedonic test was used to evaluate cascara tisane products' organoleptic characteristics (aroma, taste, color, and aftertaste) with a 5-point hedonic scale. The results showed the optimum drying temperature of coffee cherry skin at 45 °C, with the most preferred formula being formula 616.

Keywords: *cascara tisane, coffee cherry skin, drying temperature, dried pineapple, rosella*

1. INTRODUCTION

Coffee is the result of one of the main commodities of plantations in Indonesia (Sitanggang et al., 2013). Based on data from the United States Department of Agriculture (USDA), global coffee production will reach 170 million bags per 60 kg of coffee in 2022/2023. Indonesia is the world's 3rd largest coffee-producing country after Brazil and Vietnam. Indonesia is listed as the 3rd largest coffee-producing country in the world in 2022/2023, having produced 11.85 million bags of coffee. In detail, Indonesia produces 1.3 million bags of Arabica coffee and 10.5 million bags of Robusta coffee. The largest producing and exporting country after Vietnam is Indonesia. As'Ad (2019) said coffee cultivation in Indonesia is suitable for geographical conditions, tropical climates, and favorable temperatures.

According to Ariva et al. (2020), there are two post-harvest coffee processing types: wet and dry. The process commonly used is a wet process to process coffee beans into ground coffee or other products made from coffee beans. Meanwhile, Garis et al. (2019) said there is a by-product in the form of coffee cherry skin, which is still minimally utilized. Hundred kg of coffee is produced from the pulping process, consisting of 56.8 kg of coffee beans and 43.2 kg of coffee skin and flesh. In general, the utilization of coffee cherry skin is limited to processed animal feed and fertilizer, and it is not uncommon to throw it away.

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According to Suloi et al. (2019), the environmental impact that can occur if waste is directly disposed of can cause waste pollution in the form of organic pollution. Pollution occurs when waste is discharged into drainage so water will be polluted. Pollution occurs because the effluent from coffee comes out and is slowly dissolving in wastewater, causing anaerobic conditions. Bad smell is the most uncomplicated impact because the water content of the coffee cherry skin is high, reaching 75-80%, making it easy for pathogenic microbes to grow. Juwita (2017) said coffee cherry skin waste can also pollute the air. Coffee cherry skin can potentially be reprocessed into several products with higher economic value.

Secondary metabolites such as polyphenols have the potential as natural antioxidants contained in coffee skins. According to Etika (2019), some of the active compounds contained in coffee skins include tannins 1.8-8.56%; pectin 6.5%; caffeine 1.3%; chlorogenic acid 2.6%; caffeic acid 1.6%; and total anthocyanin 43%. Coffee cherry skin has been widely used to make a drink rich in antioxidants in the form of cascara tisane, but not many people know about cascara tisane products. The cascara tisane product is environmentally friendly because it comes from coffee production waste, thus opening up new market opportunities for the beverage industry in Indonesia.

Sibuea and Nainggolan (2022) show that as many as 68% of respondents had improved their food consumption. As many as 32% of the 125 respondents had not experienced any improvement in their food consumption during the COVID-19 pandemic. Improving food consumption with functional foods during the COVID-19 pandemic can be an alternative to support increased nutrition and body immunity. As many as 80.6% of respondents make and consume herbal drinks, which are rich in benefits for enhancing the immune system. The interest in making and consuming herbal drinks indicates a change in the consumption patterns of some people who are starting to be aware of healthy living (Sibuea & Nainggolan, 2022).

Tisane has the same serving process as tea drinks, so consumers are more familiar with tisane as tea. Tisane is a drink made from one part or a mixture of plant parts ranging from leaves, seeds, flowers, bark, stems and/or roots from various types of plants. The plant parts are dried and brewed with water. The difference between tisane and tea is that tisane does not always contain parts of the *Camelia sinensis* plant. In contrast, tea generally contains parts of the *Camelia sinensis* plant, such as leaves. Market acceptance of cascara tisane products with tea (*camelia sinensis*) generally lies in consumers' knowledge. Many consumers tend not to know about the existence of cascara tisane products, so sales of cascara tisane are still not optimal. One alternative to increase the product's existence is adding other ingredients to provide new aromas and flavors.

Pineapple in the tisane mixture is intended to obtain its aroma and sour taste with a bit of sweetness in the brew (Somatri, 2022). In addition, adding rosella flowers to tisane can give the brew a sour taste and red color, and rosella is commonly drunk as tisane because it has a high vitamin C content (Haidar, 2016). According to Ariva et al. (2020), it is drying using heating technology as an oven produces better product quality. An oven can reduce the moisture content in a short time and a significant amount. Based on the description above, researchers are encouraged to develop cascara tisane drink products by adding dried pineapple and rosella flowers in pouches with variations in coffee skin drying temperature on the chemical and sensory characteristics of the product.

2. MATERIAL AND METHODS

2.1 Tools and Materials

Plant materials used in producing coffee cascara tisane were robusta coffee skin, honey pineapple, and standard red rosella. The tools needed in the production were knives, buckets, trays, ovens, dehydrators, cutting boards, spoons, winnowing bowls, stories, filters, glasses, and analog scales. The tools used in testing the water content include weighing bottles, analytical balances (Fujitsu FS-AR210), and ovens (Memmert).

The tools used in testing antioxidant activity include measuring cups (Pyrex), beakers (Pyrex), test tubes (Pyrex), measuring pipettes, Erlenmeyer, dropping pipettes, stirrers, pycnometers, UV-Vis

spectrophotometers, and analytical balances (Fujitsu FS-AR210). The materials used in testing the antioxidant activity included the results of steeping the coffee skin tisane formula, methanol, and 100 ppm DPPH solution.

2.2 Identification of Drying Temperature of Coffee Cherry Skin (Stage I)

This study consisted of two stages, namely, the identification of the drying temperature of cascara tisane (Table 1) using an oven based on the results of chemical analysis (conducted at the first stage) and the determination of the product formulation with the addition of dried pineapple fruit and rosella performed at the following stage.

Table 11. Variation of Drying Temperature Cascara Tisane

Treatment	Drying Temperature
A	45 °C
B	50 °C
C	55 °C
D	60 °C

First, the process of washing the coffee cherry skin is carried out. The washed coffee cherry skin was then dried using the artificial heat drying. The process was carried out with the help of an oven with three repetitions at each temperature variation determined, namely 45 °C, 50 °C, 55 °C, and 60 °C. The drying temperature set does not exceed 60 °C because active compounds in plants cannot tolerate heat (Ariva, 2020). The drying process is carried out until it reaches the moisture and ash content according to the Indonesian National Standard (SNI 3836-2013) concerning packaged dry tea, which is a maximum of 8.0%. After that, the samples from stage I will be tested for moisture content, ash content, and antioxidant activity. Cascara, with moisture and ash content according to SNI and the highest antioxidant activity, will proceed to stage II.

2.3 Formulation of Dried Pineapple and Rosella in Making Cascara Tisane (Stage II)

Pineapple fruit is dried using a dehydrator at 50 °C for 18 hours until the moisture content and ash content comply with SNI 3836-2013, which is a maximum of 8%. The rosella used previously had been dried traditionally. However, the water and ash contents still exceeded the maximum provisions in SNI 3836-2013, so further drying was carried out until the water and ash content complied with the SNI. Cascara, pineapple, and rosella, which have been dried, are mixed into tea bags according to the formulation treatment. The tea bags used are made of heat-resistant, non-woven fabric and are equipped with straps to prevent the product inside from spilling out.

Table 12. The formulation for the Production of Cascara Tisane with The Addition of Dried Pineapple and Rosella with Comparative References

Formula	Coffee Skin			Dried Pineapple		Rosella	
	A*	B**	C***	A*	B**	A*	C***
Control	100%	100%	100%	-	-	-	-
126	75%	75%	50%	15%	25%	10%	50%
216	65%	65%	-	20%	35%	15%	-
616	55%	-	-	25%	-	20%	-

Note: (A* = which is conducted), (B** = Rahayu, 2020), (C*** = Felicia, 2022)

The total ingredients in each tea bag are weighed as much as 3 g with the formulation of the ingredients in Table 2. Once all the ingredients are placed in a tea bag, the cascara tisane is ready to be steeped before serving. The cascara tisane is brewed with 100-200 ml of 95 °C hot water and left

for 6-7 minutes before being ready to serve. The color of the brewing results is measured using a color chart. The color measurement used is limited to using the Munsell color chart due to limited equipment.

2.4 Chemical Testing (Stage I and Stage II)

2.4.1 Proximate Analysis

Testing for water content was carried out based on SNI 3836-2013 concerning dry tea, where the tea powder will be heated for 3 hours at 105 °C. The equation for calculating the moisture content is as follows:

$$Water\ Content\ (\%) = \frac{w1 - w2}{w1 - w0} \times 100\% \qquad (1)$$

Note:
w0 : empty cup weight (g)
w1 : weight of cup + material before drying (g)
w2 : weight of cup + material after drying (g)

The ash content test was carried out in accordance with SNI 3836-2013, where the material was weighed first as much as 1-2 g before being put into the ashing cup. The ashing temperature was 525 ± 25 °C until complete ashing took about 3 hours. The equation for calculating the ash content is as follows:

$$Ash\ Content\ (\%) = \frac{w2 - w0}{w1 - w0} \times 100\% \qquad (2)$$

Note:
w0 : empty cup weight (g)
w1 : weight of cup + material before ashing (g)
w2 : weight of cup + material after ashing (g)

2.4.2 Antioxidant Activity Testing

According to Tristantini *et al*. (2016), the antioxidant activity is tested using a solution steeping the product with hot water at 90-95 °C for 6-7 minutes. The test solution was prepared by adding 1 ml of sample solution, 2 ml of 100 ppm DPPH stock solution, and 2 ml of methanol. The test solution was homogenized using a vortex and incubated in a dark room at room temperature for 30 minutes. Absorbance measurement with a spectrometer at a wavelength of 517 nm and activity calculation with the equation as follows:

$$Antioxidant\ activity\ (\%) = \frac{(Abs\ DPPH\ kontrol - abs\ residual\ DPPH)}{Abs\ DPPH\ kontrol} \text{ x } 100\% \qquad (3)$$

2.5 Organoleptic Test

The organoleptic test was carried out using the hedonic test, which aims to determine the panelist's preference level for several samples based on their quality attributes. The panelists used in this study were 39 untrained panelists, most of whom were students who liked tea beverage products and had consumed herbal drinks. The Panelists were asked to assess the quality attributes of the cascara tisane, including taste, aroma, color, and aftertaste, with a rating scale of 1-4 ranging from very dislike to like very much. The sample is brewed with 100 ml of 95°C hot water and left for 6-7 minutes before being ready to serve. Samples are served in glasses with a random three-digit code aimed at avoiding bias. The number of samples tested was four samples.

2.6 Calculation of Added Value (Hayami Method)

The Hayami method is a good method and can be used to determine the amount of added value obtained by supply chain actors, determine output value and productivity. The added value is calculated based on the amount of costs incurred to process an input to obtain income. The several calculation components start from the number of workers, labor wages, electricity costs, material acquisition costs,

raw material prices, finished material prices, and selling prices. Added value can be said to be low if the ratio value is <15%, added value is said to be moderate if the ratio value is 15% - 40%, and added value is said to be high if the ratio value is> 40% (Yosifani, 2021).

2.7 Statistical Analysis

The test data results for water content, ash content, and antioxidant activity were analyzed using one-way ANOVA and followed by the Tukey test at the 0.05 level using IBM SPSS Statistics 25 to determine real differences.

3. RESULTS AND DISCUSSION

3.1 Identification of Drying Temperature and Chemical Testing Results of Dried Coffee Cherry Skin

Cascara tisane is an herbal drink whose main ingredient comes from coffee skin. The skin of the coffee used is a type of Robusta coffee skin obtained from coffee plantations in the highlands of Mount Merapi, Yogyakarta. The skin of red coffee cherries, the by-product of peeling coffee beans, is often not utilized optimally. However, it still contains many benefits for the body, including high antioxidant activity (Ariva, 2020). Based on stage I, the red coffee skin is washed first to remove the slime still attached to the coffee skin. The coffee skin is then subjected to limited drying using only an oven with temperature variations of 45, 50, 55, and 60 °C with a long time to adjust until the water and ash content meet the SNI for dry tea in packs.

Cascara that has been dried is limited to using an oven with varying temperatures starting from 45, 50, 55, and 60 °C; chemical tests are carried out in the form of moisture content, ash, and antioxidant activity. Chemical testing aims to compare the product with SNI 3836-2013 Dried Tea in Packages. In addition, chemical testing aims to determine the effect of variations in drying temperature on the material. So, chemical testing results are carried out to obtain cascara results per SNI 3836-2013.

Table 13. Chemical Test Results (%) Cascara Drying Temperature Variation

Component (%)	Drying Temperature Treatment (°C)				SNI No. 3836 of 2013
	45	50	55	60	
Water Content	6,86 ± 0,74^{c}	6,12 ± 0,17^{bc}	5,14 ± 0,06^{ab}	4,59 ± 0,26^{a}	Max. 8,0%
Ash Content	3,68 ± 0,14^{a}	3,36 ± 0,21^{a}	3,21 ± 0,07^{a}	3,12 ± 0,99^{a}	Max. 8,0%
Antioxidant Activity	52,57 ± 0,70^{c}	45,30 ± 3,61^{bc}	42,70 ± 1,87^{ab}	35,01 ± 0,23^{a}	-

Note: a, b, c, = similar letter notations show no significant difference based on the Tukey test at the 95% level of confidence

Based on Table 3, it can be seen that the higher the temperature, the lower the water content. The drying time used for each variation of uniform drying temperature is 5 hours. Two factors that influence the drying process of a material are the drying air and the material's physical properties. The intended drying air is related to the drying temperature, air humidity, and drying airflow volume. At the same time, the nature of the material that affects the drying process starts from the size of the material and the initial moisture content before the drying process is carried out. Drying using an oven produces water and cascara ash content according to standards, the maximum being 8,0%. The type of material, the method of ashing, and the time and temperature used for drying affect the ash content of a food. The higher the drying temperature used to dry the cascara can reduce the water content of the cascara, which will affect the mineralization process of organic matter in the tea (Ariva, 2020).

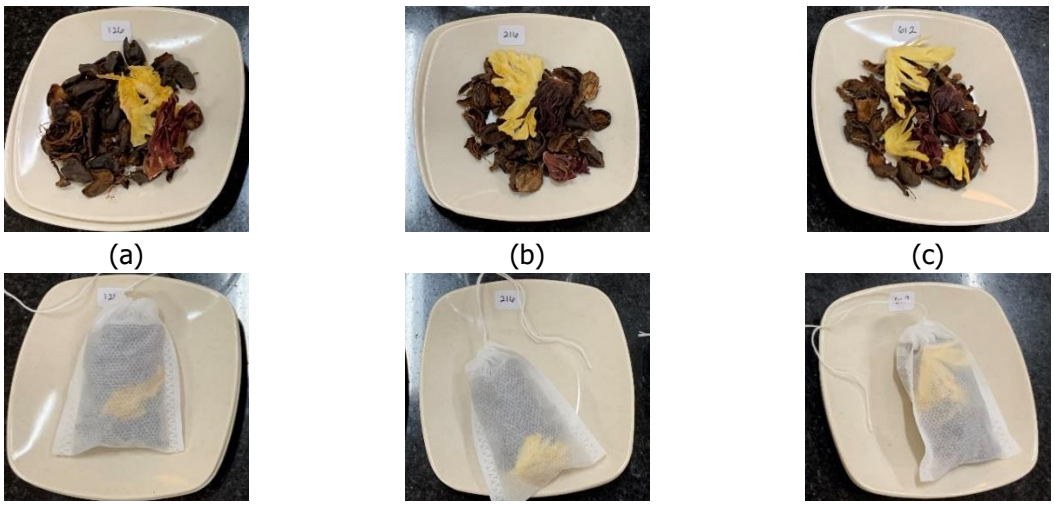
Based on Table 3. the results of testing the antioxidant activity with variations in drying temperature showed that the higher the temperature, the lower the antioxidant activity. Antioxidants are properties that can capture free radicals in the body to prevent various diseases. The method used to test antioxidant activity is the DPPH method. According to research by Hutasoit et al. (2021),

antioxidant levels will also be degraded when it reaches very high temperatures. Heating can damage the cell walls of antioxidant compounds and break chemical bonds.

The higher the temperature and the longer the drying time, the secondary metabolic compounds that act as antioxidants are lost and damaged. Thus, coffee skins with a drying temperature of 45°C were used in the next stage, namely formulations with the addition of dried pineapple and rosella. This is because the coffee skin with a drying temperature of 45 °C produces the highest antioxidant activity compared to other temperatures and is in accordance with the SNI for packaged dry tea for water and ash contents.

3.2 Formulation of Dried Pineapple and Rosella in Making Cascara Tisane

Based on stage II, product formulation with the addition of dried honey pineapple and rosella. Drying of dried honey pineapple and rosella is limited to using only a dehydrator with a temperature of 50 °C for a long time until the moisture and ash content are in accordance with SNI for packaged dry tea. Figure 2 shows the product appearance of the cascara tisane formula with the addition of dried pineapple and rosella.



(a) (b) (c)

(d) (e) (f)

Figure 1. Formula Cascara Tisane with the Addition of Dried Pineapple and Rosella Flower

Notes: (a) Formula 126: 75% cascara, 15% dried pineapple, 10% rosella
(b) Formula 216: 65% cascara, 20% dried pineapple, 15% rosella
(c) Formula 616: 55% cascara, 25% dried pineapple, 20% rosella
(d) Formula 126 in teabag: 3 g
(e) Formula 216 in teabag: 3 g
(f) Formula 616 in teabag: 3 g

Drying using a dehydrator is generally used to dry fresh ingredients such as fruits, flowers, and herbs. Drying using a dehydrator is highly recommended in the manufacture of dried food because it has an ideal temperature and can maintain the appearance and content of the ingredients. Pineapple fruit is dried using a dehydrator at 50 °C for 18 hours until the moisture content and ash content comply with SNI 3836-2013, which is a maximum of 8%. The rosella used previously had been dried traditionally. However, the water and ash contents still exceeded the maximum provisions in SNI 3836-2013, so further drying was carried out until the water and ash content complied with the SNI.

In addition, fruits that are dried in the oven will change their aroma and color due to the unstable heat from the oven. Meanwhile, a freeze dryer can be used, but it is not recommended for tea blends that will be stored for a long time (Somantri, 2022). Adding dried honey pineapple and rosella aims to give the cascara tisane a fruity and sweet-sour taste.

3.3.1 Chemical Test

Based on Table 4, the results show that the more dried pineapple and rosella are added, the more the water content increases. The increase is because the water content in pineapple is relatively high. However, compared with SNI No 3836 of 2013, the moisture and ash contents of all formulas are in accordance with the maximum provisions of 8.0%. Adding more pineapple and rosella fruit to the tisane formula can increase antioxidant activity. Formula 616 has the most dried pineapple and rosella compared to the other two formulas, resulting in the highest antioxidant activity.

Table 14. Chemical Test Results (%) Cascara Tisane Formula with Code

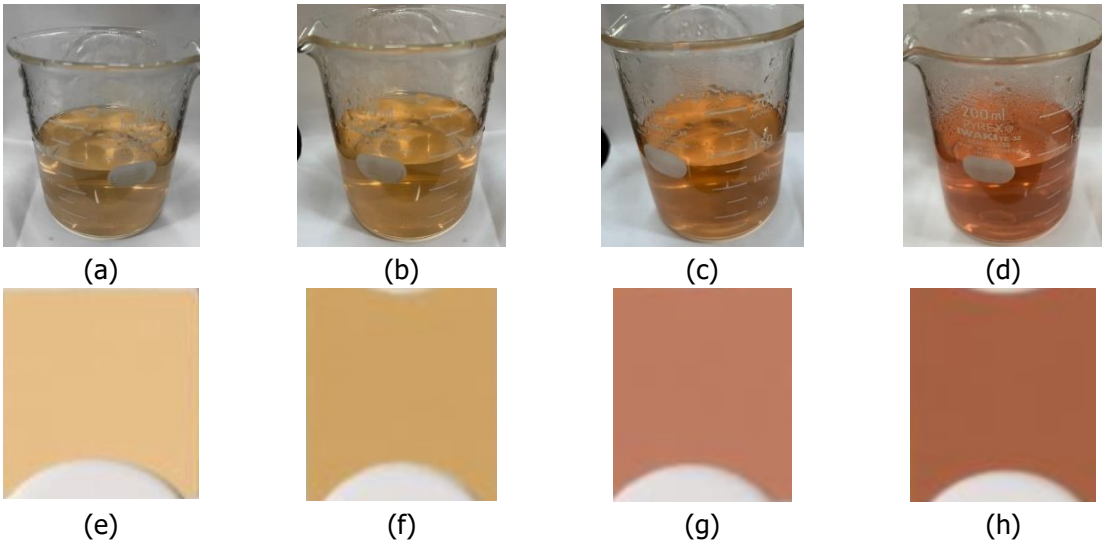
Component (%)	Product Formula				SNI 3836-2013
	Control	126	216	616	
Water Content	6,86 ± 0,74[a]	7,75 ± 0,43[b]	7,82 ± 0,55[b]	8,04 ± 0,39[b]	Max. 8,0%
Ash Content	3,68 ± 0,14[a]	3,33 ± 0,40[a]	3,36 ± 0,64[a]	3,44 ± 0,59[a]	Max. 8.0%
Antioxidant Activity	52,56 ± 0,71[a]	88,28 ± 0,86[b]	89,63 ± 1,83[b]	91,34 ± 0,21[c]	-

Note: a, b, c, = similar letter notations show no significant difference based on the Tukey test at the 95% level of confidence

These results are in line with those cited by Mappa et al. (2021), that Pineapple is a source of antioxidants from various phytochemicals containing phenolics and flavonoids, where antioxidants work by capturing free radicals, so they can inhibit the growth of cancer cells and become anti-cancer agents. In addition, according to Malinda (2020), rosella flowers (Hibiscus Sabdariffa L.) are red due to their anthocyanin content. Anthocyanins function as antioxidants that can be used as a cure for degenerative diseases. The conjugated double-bond system is capable of making anthocyanins act as natural antioxidants with a mechanism for capturing radicals.

3.3.2 Organoleptic Test

Figure 2 shows the color difference in the brewing results of each formula. The cascara tisane is brewed with 100-200 ml of 95°C hot water and left for 6-7 minutes before being ready to serve. The more rosella added, the more red the brew tends to be. Based on the color produced by the control brew or coffee skin without adding dried pineapple and rosella, the overall color is bright yellow. The color measurement used is limited to using the Munsell color chart due to limited equipment. Formula 126 has a color of 10 YR with 7/8, which means it is called bright yellow but not brighter than the control brew. Formula 216 is 2.5 YR with 5/8, which means it is red overall. Formula 616 is 2.5 YR with 4/8, red but darker than Formula 216.



(a) (b) (c) (d)

(e) (f) (g) (h)

Figure 2. The results of steeping cascara tisane in 150 ml of water with Munsell's Color Chart

Notes: (a) Control
(b) Formula 126
(c) Formula 216
(d) Formula 616

The hedonic or preference test is included in one of the organoleptic tests using the affective method. The affective method tests panelists' subjective attitudes toward food products based on their organoleptic properties. Panelists in the hedonic test were asked to rate their likes or dislikes for the product in the form of the rating scale provided. The rating scale used starts from a scale of 1, which is very dislike to 4 likes very much.

The panelists used were untrained panelists of 39 people. According to Setyaningsih et al. (2018), the minimum number of untrained panelists consists of 25 laypeople who are freely chosen based on ethnicity, social level, and education. Untrained panelists cannot carry out discrimination tests, so they can only assess test parameters based on the level of liking panelists themselves. Hedonic tests generally use untrained panelists because they only assess the level of liking for the product. The panelists are considered to be the start of consumer testing in developing cascara tisane products with the addition of dried pineapple and rosella. Four samples of tisane were tested for each panelist with a random three-digit code. The quality parameters tested by panelists were color, taste, aroma, and aftertaste.

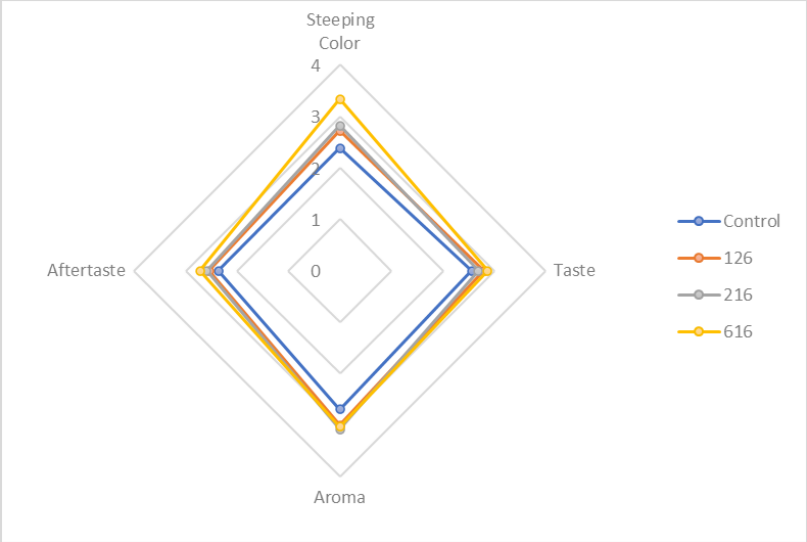


Figure 3. Level of Like of Panelists for Cascara Tisane Products

According to Rahayu (2020), the color parameter is the main parameter used to determine consumer acceptance of a product. Color assessment is subjective, which can affect the results of the product assessment. The more attractive the color seen by the panelist, the higher the assessment of the product color. Figure 4.5 shows the level of preference for the color quality of the cascara tisane formula with the addition of 25% dried pineapple and rosella 205, which has a higher value than other formulas.

According to Wilanda et al. (2021), Taste is the second factor after an assessment based on the visible appearance of a beverage product. If the drink's appearance is attractive, it can arouse the appetite or willingness to taste the drink. The next stage in the assessment is related to the drink's taste, which is determined using the senses of smell and taste. The highest value of 2.87 is found in formula 616, adding dried pineapple 25% and rosella 20% of the total ingredients. Thus, adding dried pineapple and rosella can increase the panelists' preference for cascara tisane products compared to no additions.

Adding dried pineapple makes the tisane product smell sweet, sour, and fresh. Volatile components in ethyl and methyl esters are natural components in pineapple that produce the distinctive aroma of pineapple (Wibowo et al., 2014). The highest value was found in formula 216, where 20% dried pineapple and 15% rosella were added. The highest value shows that adding dried pineapple and rosella has a higher preference level than without the addition. The aftertaste is the remaining taste that remains on the palate even though the product has been swallowed completely. Is there a sticky taste, a little bit in the throat, or is it completely clean (Billah, 2018).

The taste left by the tisane product is slightly sour and fresh, typical of pineapple and rosella. The remaining taste is because pineapple and rosella have slightly sour and sweet tastes (Somatri, 2022). The highest value was found in formula 616 with the addition of 25% dried pineapple and 20% rosella of the total ingredients. Thus, the more dried pineapple and rosella were added, the more panelists' preference for the resulting aftertaste increased. Based on the overall results of the average level of preference on the attributes of color, taste, aroma, and aftertaste, formula 616 has the highest level of preference.

3.4 Calculation of Added Value of Cascara Tisane

Table 15. Calculation of Added Value Cascara Tisane

Direct Processing Fees	Amount (IDR)
Labor	1
Average Wages of Labor	30,000
Electricity	16,052
Oven 800 W	
Dehydrator 347 W	
Amount	46,052
Material Acquisition Costs	10,000
Raw Material Prices	500
Finished Product Prices	15,000
Selling Prices	15,500
Value-added	22%

Table 5 shows an increase in added value of 22%, and the calculation of added value is done using the Hayami Method. The Hayami method is suitable for determining the amount of added value obtained by supply chain actors, output value, and productivity. Value acquisition plus is calculated based on the costs issued to process an input with income generation.

Value added is the difference in product value before and after production to produce products that can increase income. The several calculation components start from the number of workers, labor wages, electricity costs, material acquisition costs, raw material prices, finished material prices, and selling prices (Yosifani, 2021). The workforce is assumed to be one person with a wage of IDR 30,000 per hour.

Then, the electricity costs for using the oven and dehydrator are IDR 46,052, which is based on the price per kWh from the calculation of the watts of the oven and dehydrator. The price of raw materials for making a product is Rp. 25,000 to produce approximately 50 tea bags. As for the price of the finished product, it adjusts to the price range of cascara tisane products that are already on the market. According to Yosifani (2021), added value can be said to be low if the ratio value is <15%, added value is said to be moderate if the ratio value is 15% - 40%, and added value is said to be high if the ratio value is> 40%. Based on the value-added category, according to Ariyanti (2021), the added

value of a cascara tisane product of 22% is still relatively moderate. Hence, an evaluation still needs to be carried out, starting from the acquisition of raw materials and the production process used to the selling price of the product to increase added value.

4. CONCLUSIONS

The coffee cherry skin drying temperature of 45 ^{o}C resulted in the highest antioxidant activity, moisture content, and ash content per SNI No. 3836 of 2013. Adding dried pineapple and rosella to the formula affected the water content and increased antioxidant activity but did not affect the ash levels. The most preferred cascara tisane formula uses the addition of 25% dried pineapple and 20% rosella, with the highest antioxidant activity according to SNI No. 3836 of 2013 for water and ash content.

REFERENCES

Ariva, A. N., Widyasanti, A., Nurjanah, S., 2020. Effect of Drying Temperature on the Quality of Cascara Tea from Arabica Coffee Skin (Coffea arabica) (In bahasa Pengaruh Suhu Pengeringan Terhadap Mutu Teh Cascara dari Kulit Kopi Arabika (Coffea arabica)). Jurnal Teknologi Dan Industri Pertanian Indonesia, 12(1), 21–28. doi: 10.17969/jtipi.v12i1.15744.

As'Ad, M. H., Aji, J. M. M., 2020. Factors Influencing Consumer Preferences for Modern Coffee Shops in Bondowoso (In bahasa Faktor yang Mempengaruhi Preferensi Konsumen Kedai Kopi Modern di Bondowoso). Jurnal Sosial Ekonomi Pertanian, 13(2), 182-199. doi: 10.19184/jsep.v13i2.16441.

Billah, H. M. 2018. Which Coffee (In bahasa Kopi Mana Kopi). Jakarta: Ratna Media Utama

Etika, M., Giyatmi., 2019. Effect of Temperature and Drying Time on the Quality of Ketul Leaf (Bidens pilosa L.) (In bahasa Pengaruh Suhu dan Lama Pengeringan terhadap Mutu The Daun Ketul (Bidens pilosa L.)). Jurnal Teknol. Pangan Kes, 2(1), 13-25. doi: 10.36441/jtepakes.v2i1.496.

Garis, P., Romalasari, A., Purwasih, R., 2019. Utilization of Cascara coffee skin waste into tea bags (In bahasa Pemanfaatan Limbah Kulit Kopi Cascara Menjadi Teh Celup). Prosiding Industrial Research Workshop and National Seminar. 279–285. Bandung.

Hutasoit, G. Y., Susanti, S., Dwiloka, B., 2021. Effect of Drying Time on Chemical and Color Characteristics of Functional Drinks of Coffee Skin Tea (Cascara) in Pouch Packaging (In bahasa Pengaruh Lama Pengeringan Terhadap Karasteristik Kimia dan Warna Minuman Fungsional Teh Kulit Kopi (Cascara) dalam Kemasan Kantung). Jurnal Teknologi Pangan 5(2), 38–43.

Juwita, A. I., Mustafa, A., Tamrin, R., 2017. Study on the Utilization of Arabica Coffee Skin (Coffee arabica L.) as a Local Micro Organism (MOL) (In bahasa Studi Pemanfaatan Kulit Kopi Arabika (Coffee arabica L.) sebagai Mikro Organisme Lokal (MOL)). Agrointek, 11(1). doi: 10.21107/agrointek.v11i1.2937.

Malinda, O., Syakdani, A., 2020. Antioxidant Potential in Rosella Flower Petals (Hibiscus sabdariffa L.) as Anti-aging (In bahasa Potensi Antioksidan dalam Kelopak Bunga Rosella (Hibiscus sabdariffa L.) sebagai Anti-aging). Jurnal Kinetika, 11(3). 60-65.

Mappa, M. R., Kuna, M. R., Akbar, H., 2021. Utilization of Pineapple Fruit (Ananas comosus L.) as an Antioxidant to Improve Body Immunity in the Era of Covid 19 Pandemic (In bahasa Pemanfaatan Buah Nanas (Ananas comosus L.) sebagai Antioksidan untuk Meningkatkan Imunitas Tubuh di Era Pandemi Covid 19). Community Engagement &Emergence Journal, 3(1), 64-48. doi: 10.37385/ceej.v2i3.294.

Rahayu, W. E., Purwasih, R., Hidayat, D., 2020. Effect of pineapple juice addition on chemical and sensory characteristics of cascara tea beverage (In bahasa Pengaruh penambahan sari nanas terhadap karakteristik kimia dan sensori minuman teh cascara). Teknologi Pangan: Media Informasi Dan Komunikasi Ilmiah Teknologi Pertanian, 11(2), 144–151. doi: 10.35891/tp.v11i2.1900.

Setyaningsih, D., Apriyantono, A., Maya, P. S., 2018. Sensory Analysis: for Food and Agro Industry (In bahasa Analisis Sensori: untuk Industri Pangan dan Agro). IPB Press, Bogor.

Sibuea, P., Nainggolan, O. Y., 2022. The Effect of Covid-19 Pandemic on People's Food Consumption Patterns in Medan City (In bahasa Pengaruh Pandemi Covid-19 Terhadap Pola Konsumsi Pangan Masyarakat di Kota Medan). Jurnal Riset Teknologi Pangan dan Hasil Pertanian (RETIPA), 2(2). 145-152. doi: 10.54367/retipa.v2i2.1901.

Sitanggang, J. T. N., Sembiring, S. A., 2013. Development of Coffee Potential as a Leading Commodity of Agropolitan Area of Dairi Regency (In bahasa Pengembangan Potensi Kopi Sebagai Komoditas Unggulan Kawasan Agropolitan Kabupaten Dairi). Jurnal Ekonomi dan Keuangan. 1(6). 33-48.

Somantri, R., 2022. Tea Blending. PT Agromedia Pustaka, Jakarta.

Suloi, A. N. F., 2019. Utilization of Coffee Skin Waste as an Effort to Empower Housewives in Latimojong Village, Enrekang Regency (In bahasa Pemanfaatan Limbah Kulit Kopi sebagai Upaya Pemberdayaan Ibu-ibu Rumah Tangga di Desa Latimojong, Kabupaten Enrekang). Agrokreatif: Jurnal Ilmiah Pengabdian Kepada Masyarakat, 5(3), 246–250. doi: 10.29244/agrokreatif.5.3. 246-250.

Suwadi, P., Fauzan, R. D., Yulianto, A., Usman, A. N., Fauzi, A., 2021. Diversification of Rosella (Hibiscus sadbariffa L.) Plants as an Effort to Improve the Welfare and Economy of the Sumberdem Village Community, Wonosari, Malang (In bahasa Diversivikasi Tanaman Rosella (Hibiscus sadbariffa L.) sebagai Upaya dalam Meningkatkan Kesejahteraan dan Ekonomi Masyarakat Desa Sumberdem, Wonosari, Malang). SEMAR (Jurnal Ilmu Pengetahuan, Teknologi, Dan Seni Bagi Masyarakat), 10(1). doi: 10.20961/semar.v10i1.42056.

Tristantini, D., Ismawati, A., Pradana, B. T., Gabriel, J., 2016. Antioxidant Activity Testing Using DPPH Method on Cape Leaf (Mimusops elengi L) (In bahasa Pengujian Aktivitas Antioksidan Menggunakan Metode DPPH pada Daun Tanjung (Mimusops elengi L)). Universitas Indonesia, 2

Wibowo, R. A., Nurainy, F., Sugiharto, R., 2014. Effect of adding certain fruit juices on the physical, chemical, and sensory characteristics of tomato juice (In bahasa Pengaruh penambahan sari buah tertentu terhadap karakteristik fisik, kimia, dan sensori sari tomat). Jurnal Teknologi & Industri Hasil Pertanian, 19(1), 11-27.

Wilanda, S., Yessirita, N., Budaraga, I. K., 2021. Quality Assessment and Antioxidant Activity of Coffee Skin Tea (Coffea canephora) with Mint Leaf (Mentha piperita L) Addition (In bahasa Kajian Mutu dan Aktivitas Antioksidan Teh Kulit Kopi (Coffea canephora) dengan Penambahan Daun Mint (Mentha piperita L)). JRIP: Jurnal Research Ilmu Pertanian. 1(1). 86-93.