

The Analysis of Dietary Fiber Content and Preference Test on Cookies Substituted with Purple Sweet Potato Flour and Sorghum Flour

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ABSTRACT

Fiber consumption in Indonesia remains critically low, averaging only 10.5 grams per day, far below the recommended 25 grams daily intake. This study aimed to analyze the dietary fiber content and consumer preference of cookies substituted with purple sweet potato flour and sorghum flour to develop functional foods that could address this nutritional deficiency. An experimental design was employed utilizing four formulations: F0 (control) and F1–F3 (varying substitution ratios of purple sweet potato and sorghum flours). Twenty-five trained panelists conducted hedonic evaluation to assess sensory acceptability across color, taste, texture, and aroma parameters. Laboratory analysis determined the fiber content of each formulation. Fiber content increased progressively with higher substitution levels, with F3 containing the highest fiber concentration at 8.4%. Hedonic testing revealed no significant differences in color, taste, or texture preferences ($p > 0.05$); however, aroma showed significant differences ($p < 0.05$), with F0 being most preferred. Overall acceptability analysis identified F2 (containing 7% fiber, equivalent to 0.77g per piece) as the most accepted formulation, successfully balancing sensory appeal with nutritional enhancement. The findings demonstrate that purple sweet potato and sorghum flours can effectively increase dietary fiber in cookies without substantially compromising consumer acceptability, supporting their potential use in functional food development to address Indonesia's fiber deficiency crisis.

Keywords: cookies, dietary fiber, preference test, purple sweet potato flour, sorghum flour

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INTRODUCTION

The fiber consumption of Indonesian people is still far below the recommendation. Data from Riskesdas 2018 and SKMI 2014 show that the average fiber intake is only around 10.5 grams/day, while the Nutritional Adequacy Rate (AKG) recommends a minimum of 25 grams/day. In fact, SKMI 2014 recorded that adult fiber consumption was only 5.7 ± 1.0 grams/day. Jeser's research (2021) also reported that 60.1% of adults aged 20–45 years consume less than 5 servings/day of fiber (Jeser & Santoso, 2021). This shows that the level of fiber consumption of the Indonesian people is still very low and has not met the recommended nutritional recommendations.

Dietary fiber has a variety of health benefits. Hijsak et al. (2022) explain that fiber plays a role in maintaining digestion, preventing constipation, and reducing the risk of obesity, type 2 diabetes, and cardiovascular disease. Thus, fiber is an important component of the diet to support overall health. Although it has a significant positive impact on health, excessive consumption of dietary fiber also has a negative impact and should be avoided (Mujianto et al., 2023). Adequate fiber consumption not only supports digestive health but also provides protection against various metabolic disorders, making it an essential component of a healthy diet. One form of fiber that is easy and often found by Indonesian residents is Sweet Potato.

Sweet potatoes are tubers that can grow in various climates with variations in skin color, one of which is purple sweet potato. Purple sweet potato was chosen because it is a

local food rich in fiber and contains anthocyanins, which are natural antioxidants that play a role in reducing oxidative stress, inflammation, and helping prevent non-communicable diseases such as heart, diabetes, and cancer (Adiningsih et al. 2024). In every 100 grams of sweet potatoes, it contains fiber that helps maintain intestinal health and prevent various digestive related diseases (Pratiwi, 2020). In addition to anthocyanins, purple yam also contains dietary fiber that functions as a prebiotic to support digestive health, and contains β -carotene, vitamin C, iron, and calcium that support the immune system (Pade, 2018). Studies show that sweet potato consumption has an effect on increasing hemoglobin levels, the results show that hemoglobin levels after intervention in the intervention group experienced an increase in Hb levels by 0.58 and in the control group experienced an average increase of 0.18. (Yuliandani, 2017). In addition, the results of Tari (2020's study) show that probiotic yogurt treatment with purple sweet potato extract supplementation is effective on the health of the digestive tract (fecal water content), hematology (number of erythrocytes, leukocytes, hemoglobin and hematocrit) and immune system (antibody titers) due to EPEC (*Enteropathogenic Escherichia coli* infection)) causes of diarrhea. With its high nutritional content and health benefits, purple sweet potato has great potential as a functional food.

Purple sweet potatoes have high dietary fiber content at 12.9 grams, mainly due to compounds such as pectin, hemicellulose, and cellulose that contribute to dietary fiber content. Purple sweet potato flour processing begins with sorting quality tubers, followed by peeling, washing, and thin slicing to 1 mm thickness. Sweet potato slices are then dried at 60°C for 5 hours before being ground finely and sifted using 40-60 mesh sieves. After becoming flour, purple sweet potatoes still contain crude fiber and ash. Purple sweet potato flour has a fiber content of 4.72% per 100 grams. The purple sweet potato flour used in this study contains 100% purple sweet potato, meets food safety standards through Health Service registration with P-IRT certification, and has received *halal* certification from LPPOM MUI.

Fiber content obtained from purple sweet potatoes after processing depends on the processing method and measurements used. In studies by Gionte et al. (2022), crude fiber content from purple sweet potatoes processed into various flakes corresponded to the proportion of purple sweet potato flour (*Tepung Ubi Jalar Ungu*/TUJU) and bran flour (*Tepung Bekatul*/TB) used. When TUJU and TB proportions were 50:50, crude fiber content produced was 7.42%. At 60:40 proportions, crude fiber content obtained was 6.37%. Meanwhile, at 70:30 proportions, crude fiber content decreased to 5.10%. This shows that increasing purple sweet potato flour proportion in mixtures tends to reduce crude fiber content in resulting flakes.

Sorghum (*Sorghum bicolor* (L.) Moench) is a cereal plant type with potential for cultivation and development, especially in marginal and dry areas in Indonesia. Sorghum production in Indonesia remains very limited, and generally sorghum products are not yet available in markets. Sorghum has potential as a food commodity that can be developed in Indonesia. Processing sorghum into flour can replace wheat flour to support local food product diversification. Sorghum ranks 5th as a global food ingredient, after wheat, rice, corn, and barley. Sorghum in Indonesia can be found in several districts in East Nusa Tenggara Province (NTT), such as Sabu Raijua Regency, East Flores, Rote Ndao, Kupang City, and Nagekeo. East Flores Regency is a well-known development area, with Kawalelo Village in Demon

Pagong District as a sorghum processing center. Purchase prices for sorghum in log form from farmers are IDR 8,000 per kilogram.

Cookies are a type of snack that is popular with people. However, most *cookie products* on the market are still high in fat, sugar, and calories, and low in fiber. This encourages innovation in the development of fiber-rich local flour-based cookies such as purple sweet potato and sorghum. In addition, data from the Association (2012) shows an increase in biscuit consumption by up to 55–85%, which illustrates the high public interest in similar products (Muslimin, Fanny and Manjilala, 2018). With a choice of ingredients in the form of purple sweet potatoes, *the resulting cookies* have a good color, a texture that is not too dense, and a balanced sweet potato flavor. *Cookies* are the focus of research because they are widely accepted by consumers, have flexibility in the composition of ingredients, and offer opportunities for improved nutritional value (Pehulisa, Pato and Rossi, 2016).

According to SNI 2973:2022, cookies are a type of biscuit made from flour and fat/butter with a crispy texture and a less dense cross-section, in contrast to nastar, castengel, and soft cookies. SNI sets seven quality requirements for biscuits, namely physical condition, moisture content, insoluble ash, protein (Nx5.7), acid number, heavy metal contamination, and microbial contamination. BPS data (2018) recorded that cookie consumption in Indonesia reached 33,314 kg/year. As consumption increases, many cookie innovations have been carried out by replacing part or all of wheat flour with alternative flour. This aims to reduce the use of wheat flour, utilize agricultural products to have higher economic value, enrich the variety of *types of cookies* and increase the nutritional value of *cookie products* (Elfariyanti, Zarwinda and Jannah, 2023).

The fiber consumption of Indonesian people is still low and far below the recommended level, even though fiber plays an important role in maintaining metabolism, digestive health, and reducing the risk of chronic diseases such as obesity, diabetes, heart, and colon cancer. Efforts to increase fiber intake can be done through the use of nutritious local foods. Sorghum has the potential to be developed as a commodity in marginal and dry land, while purple sweet potato is a source of fiber and anthocyanins with high antioxidant activity. Both can be used as healthy food alternatives while supporting the diversification of local food products.

This study used four cookie formulations, namely F0 (100% wheat), F1 (30% wheat, 30% purple yam, 40% sorghum), F2 (30% wheat, 40% purple yam, 30% sorghum), and F3 (30% wheat, 50% purple yam, 20% sorghum) (Muchtar et al., 2022). The formulation is a development of the best combination of previous research results. Based on this, this study was conducted to produce purple sweet potato flour and sorghum substitution cookies and analyze their nutritional content and acceptability.

METHOD

The type of research used was experimental with a *quasi-experimental* study design. This research was conducted in the Organoleptic Testing Laboratory, Campus 3, Ahmad Dahlan University, on February 15, 2025. Subsequently, laboratory tests were implemented at Unit Laboratory Chem-Mix Pratama Yogyakarta. Panelists in this study were determined using the *purposive sampling* method, namely a sample selection method based on certain criteria or considerations from the population. The panelists used were 25 semi-trained panelists who were students with inclusion criteria such as nutrition students who had received *organoleptic* [A1] material, aged 18-25 years, and were willing to participate and complete the test. Meanwhile, exclusion criteria for panelists included nutrition students who had not learned

organoleptic material, had no sensory experience, had allergies or special health conditions that affect taste perception, were unwilling or unable to complete the test, and had unstable health conditions. This research received approval from the health ethics commission (*Komite Etik Penelitian Kesehatan/KEPK*) of the Faculty of Health Sciences, Aisyiyah University of Yogyakarta with ethical approval number No. 4164/KEP-UNISA/I/2025.

RESULTS AND DISCUSSION

Analysis Fiber Content

This study includes an analysis of the nutritional content of cookies with the addition of purple sweet potato flour and sorghum flour, with a primary focus on dietary fiber. The samples tested were F0 as a control sample, F1 with the addition of 75 grams of purple sweet potato flour and 100 grams of sorghum flour, F2 with the addition of 100 grams of purple sweet potato flour and 75 grams of sorghum flour and F3 with the addition of 125 grams of purple sweet potato flour and 50 grams of sorghum flour. The purple sweet potato flour and sorghum flour used in this study were obtained through *e-commerce* with the brand "Hasil Bumiku." Purple sweet potato flour has a composition of 100% purple sweet potato, while sorghum flour consists of 100% sorghum. The selection of these materials was based on the purity of the composition and the potential content of dietary fiber in accordance with the objectives of the study.

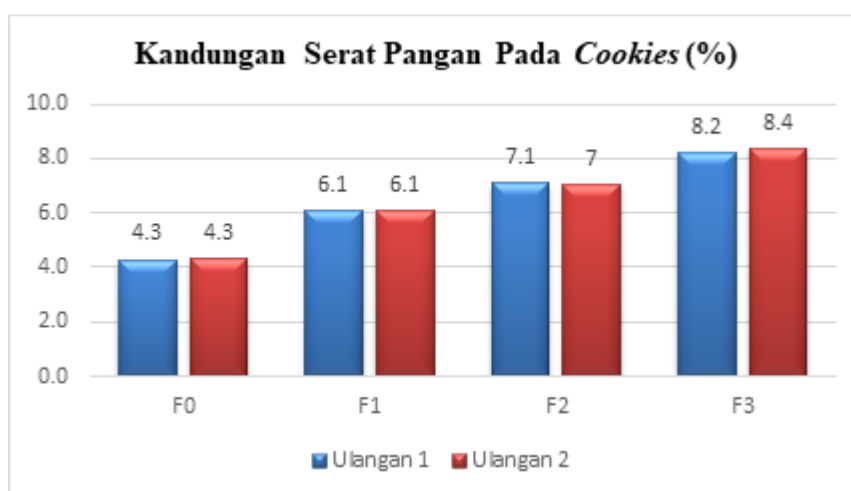


Figure 1 Dietary Fiber Content in Cookies

Figure 1 shows the dietary fiber content of cookies with and without purple sweet potato flour and sorghum flour, measured in two replicates. Sample F0 had the lowest dietary fiber content, at 4.3%. Sample F1's fiber content increased to 6.1% for both replicates. This indicates that with the addition of purple sweet potato flour and sorghum flour, the dietary fiber content increased compared to the control formula. Sample F2's dietary fiber content reached 7.1% in Replication 1 and 7% in Replication 2, an increase compared to F0 and F1, indicating that more substitute flour can increase fiber content. Sample F3 showed the highest fiber content, at 8.2% in Replication 1 and 8.4% in Replication 2. This study supported by Research conducted by (Yusrizza Firmansyah, Pratiwi and Sagitaning Putri, 2021) showed that *cookies* with the addition of 40 grams of purple sweet potato flour in sample P4 had the highest dietary fiber

content, namely 6.36%. Sample P4 in the study was the cookie with the most purple sweet potato flour-based samples among the five samples. Other research done by (Limanto, Julianti and Lubis, 2019) showed that *cookies* made from 75 grams of purple sweet potato flour and 25 grams of purple sweet potato fiber had the highest dietary fiber content, namely 11%. The addition of purple sweet potato flour and sorghum flour successfully increased the fiber content in cookies, with the highest sample reaching 8.4%. This result is higher than cookies made from purple sweet potato flour alone (6.36%) from other studies, there was a fiber content of 11% in cookies with pure purple sweet potato fiber. The combination of these two flours has been proven to be effective in increasing fiber in cookies, although the addition of pure fiber can provide higher results. This indicates that the higher the use of purple sweet potato flour and sorghum flour, the greater the fiber content in cookies.

Table 1 Laboratory Test Results for Dietary Fiber

Formula	Test 1	Test 2	Average	Std. Dev
F0	4,2871	4,3030	4,2950	1.6851
F1	6,1093	6,1051	6,1072	
F2	7,0856	7,0499	7,0677	
F3	8,2157	8,3594	8.2875	
Average	6.4244	6,4543	6,4393	

Table 1 show results laboratory tests level fiber food in *cookies* with substitution purple sweet potato flour and flour sorghum. Average fiber value food from all formulas (F0, F1, F2, and F3) are 6.4393%, with standard deviation of 1.6851. Standard deviation This show that variation level fiber between formulas is sufficient tall. Minimum value level fiber food obtained is 4.2950%, whereas mark maximum reach 8.2875%. This is show that addition purple sweet potato flour and flour sorghum in cookies can increase level fiber food compared to the control formula (F0).

According to the Indonesian Food and Drug Administration (TKPI), the fiber content of purple sweet potato flour is 12.9 grams per 100 grams, and according to *Nutrition Value*, sorghum flour has a fiber content of 6.6 grams per 100 grams. The two types of dietary fiber found in these two flours are soluble and insoluble. These dietary fibers are beneficial in supporting digestion, reducing the risk of colon cancer, and helping control blood sugar and cholesterol levels (Kumalasari and Budiati 2024).

Overall, these results indicate that *cookie formulations* with variations of purple sweet potato flour and sorghum flour produce higher dietary fiber content than formulations without the addition of purple sweet potato flour and sorghum flour.

Each *cookie recipe* yields 43 *cookies*. Therefore, each cookie contains the following nutritional information:

Table 2. Nutritional Value of 1 Cookie

Nutrient content	F0	F1	F2	F3
Energy (kcal)	57.9	55.3	54.9	54.5
Carbohydrates (grams)	7	6.6	6.6	6.5
Protein (grams)	0.70	0.60	0.56	0.53

Nutrient content	F0	F1	F2	F3
Fat (grams)	3	3.1	3	3
Fiber (%)	4.3	6	7	8.3
Fiber (grams)	0.473	0.66	0.77	0.913

The energy, carbohydrate, and protein content of each cookie contributes approximately 1-3% of the daily requirement. Fat content ranges from 4.6% to 4.7% of the daily requirement. Fiber content varies considerably, with sample F3 having the highest fiber content, reaching 2.85% of the daily requirement.

Based on Regulation of the Food and Drug Monitoring Agency (BPOM) Number 1 of 2022 concerning Supervision Claims on Processed Food Labels and Advertisements, a product food can claimed as tall fiber if contain fiber food at least 6 grams per 100 grams Products. According to the Food and Drug Monitoring Agency (BPOM) Regulation No. 26 of 2021 concerning Nutritional Information on Food and Processed Food Labels, the serving size for *cookies* /biscuits ranges from 15 to 50 grams. In this study, one serving of *cookies* was determined to be 3 pieces, adjusted to this serving size range.

Preference Test

Table 3. Kruskal Test Results Wallis Color Parameters

Formula	Mean ($\pm$) Standard Deviation	P-value
F0	4.04 $\pm$ 0.675	0.3438
F1	4.28 $\pm$ 0.678	
F2	4.32 $\pm$ 0.748	
F3	4.32 $\pm$ 0.690	

Based on Table 3, the results of the hedonic test conducted on the color parameters of cookies from various formulas show that F2 and F3 obtained the same average value, also the highest at 4.32, indicating that the panelists overall preferred the color of the cookies in that formula. Meanwhile, F0 obtained the lowest average value at 4.04. This indicates that the panelists did not like the color of the formula.

Color is the first organoleptic parameter assessed in organoleptic testing, as it provides an initial impression through the sense of sight. Attractive colors can stimulate panelists' or consumers' interest in trying the product (Makmur et al., 2022). Addition material food to in something product food can influence color product said. for example, in study this, addition purple sweet potato flour and flour sorghum impact on the color of the cookies changing become dark purple to brown.

Table 4. Differences in Cookie Colors

F0	F1	F2	F3
			

Purple sweet potato (*Ipomoea batatas* L. Poir) has deep purple flesh, which provides a unique visual appeal. This purple color indicates that the sweet potato contains higher levels of anthocyanin pigments than other varieties. This color indicates high levels of antioxidants and anthocyanins. Anthocyanins are water-soluble and safe to consume, so they are often used as natural dyes in food and beverage products (Anugrah & Suryani, 2020) Meanwhile, the color of sorghum white especially originate from the pericarp is thin and transparent, which allows color on the layer The testa and endosperm are visible, and sorghum has a low tannin content. This is what causes its brighter color. Tannin is a polyphenol compound that can give sorghum grains a dark color (Amrinola et al., 2015)

Cookies with the addition of purple sweet potato flour and sorghum flour, F2 and F3, achieved the highest average score of 4.32. This indicates that panelists generally preferred the color of cookies with this formula compared to the other formulas. The color of cookies F2 and F3 was preferred by panelists due to their attractive appearance, richness, and a smooth texture. The resulting color is likely influenced by the balance of purple sweet potato flour and sorghum flour used.

During the baking process, the color of cookies is influenced by the Maillard reaction, which produces a brown color on the surface (Nu'man & Bahar, 2021) Temperature and cooking time also affect the color of cookies. If the temperature is too high and the baking time is too long, the color will be too dark. Meanwhile, if the temperature is too low and the baking time is too short, the cookies will not develop enough brown color and will be undercooked.

Based on table 3, the Kruskal Wallis test results for the color parameter show a probability value of $p > 0.05$. Therefore, it can be concluded that despite the variation in ingredients in each formula, whether with the addition of purple sweet potato flour or sorghum flour, this did not significantly affect the panelists' preference for the color of the resulting cookies. These results indicate that the color of the cookies produced from the various formulas was well received by the panelists, with no significant differences in preference.

Table 5. Kruskal Test Results Wallis Parameters of Taste

Formula	Mean ($\pm$) Standard Deviation	P-value
F0	4.16 $\pm$ 0.624	
F1	4.16 $\pm$ 0.8	0.3257
F2	3.84 $\pm$ 0.898	

Formula	Mean ($\pm$) Standard Deviation	P-value
F3	3.64 $\pm$ 1.254	

Based on Table 5, it can be seen that F0 and F1 obtained the highest ratings for the taste parameter with an average value of 4.16. This indicates that the panelists preferred the taste of cookies from this formula the most. Meanwhile, F3 received the lowest score, namely 3.64, indicating that cookies with this formula were less preferred than the other formulas. Overall, these results indicate that the addition of purple sweet potato flour and sorghum flour, especially in F3, influenced panelists' preference for cookie taste.

The taste of *cookies* in sample F0 tends to be sweet and slightly savory which comes from butter and also the absence of the addition of purple sweet potato flour and sorghum flour, in sample F1 the taste of these *cookies* is sweet, the aroma of purple sweet potato is not too strong and the taste is similar to wheat *cookies* because the content of sorghum flour is more than purple sweet potato flour, then sample F2 has a sweet taste and has a fairly strong purple sweet potato flavor and sample F3 has a sweet taste and has a very strong purple sweet potato flavor.

Purple sweet potato own relatively high natural sugar content high, the glucose content in purple sweet potatoes is 3.27 grams per 100 grams, the fructose content in purple sweet potatoes is 0.56 grams per 100 grams and the starch content is 38.7 grams per 100 grams of purple sweet potatoes, this is what gives the product a natural sweet taste food (Istifadah et al., 2023). When used in manufacturing *cookies* or cake, sugar content in purple sweet potato can add the sweetness of the taste and strengthens the distinctive aroma of purple sweet potato which is increasingly felt with more amount Lots.

Sorghum own higher sugar content low compared to purple sweet potato, and the taste more neutral with A little a touch of natural sweetness. Although No as strong as purple sweet potato, deep sugar content sorghum still can adds a subtle sweetness to the product, however with more intensity light (Ratna Anugrahwati et al., 2024).

Processing material food, especially roasting, giving influence significant to the taste of the product end. During the baking process happen reaction maillard, which is not only give color chocolate on the surface *cookies*, but also creates a unique taste in *cookies*. Reaction Maillard is reaction between amino acids and sugars that occur at temperatures high yielding compound complex that can provide color chocolate and enhance the taste of food (Indah Permata et al., 2023).

Based on Table 5, the results of the *Kruskal-Wallis test*, on the taste parameter where the probability value obtained is $p > 0.05$. This indicates that there is no statistically significant difference between the four samples (F0, F1, F2, and F3) in terms of *cookie taste assessment*. In other words, the variation in the formula used, either with or without the addition of purple sweet potato flour and sorghum flour, does not significantly affect panelists' taste preferences.

Table 6 Kruskal Test Results Wallis Texture Parameters

Formula	Mean ($\pm$) Standard Deviation	P-value
F0	4.12 $\pm$ 0.665	
F1	3.96 $\pm$ 0.789	0.3184
F2	3.68 $\pm$ 0.945	

Formula	Mean ($\pm$) Standard Deviation	P-value
F3	3.84 $\pm$ 0.850	

Based on the hedonic test results in Table 6, it shows respondents' preferences for the textures of the four samples. Sample F0 obtained the highest score with a value of 4.12, indicating that its texture was the most preferred, while sample F2 had the lowest score, namely 3.68, which indicates that texture F3 was the least preferred by respondents.

One factor that influences the texture of *cookies* is the flour composition, specifically the addition of purple sweet potato flour and sorghum flour. Purple sweet potato flour can provide a crispier texture. Research conducted by (Mutiarra et al., 2024) showed that using up to 135 grams of purple sweet potato flour produces cookies with a good texture. Sorghum flour, which does not contain gluten, can also affect the hardness and fragility of *cookies*. The water content in the dough significantly affects the final texture of *cookies*. *Cookies* with a lower water content tend to be crispier, while a higher water content can produce softer cookies (Yusriza Firmansyah et al., 2021).

The baking process also plays a significant role in the texture of cookies. Baking time, mixing of the dough, and oven temperature will all influence the crispiness of *the cookies*. The use of additional ingredients, such as sugar, fat (margarine or butter), and leavening agents, will also affect the texture (Yusriza Firmansyah et al., 2021).

Based on Table 6, the Kruskal-Wallis test results for texture parameters show a probability value of $p > 0.05$. This indicates that there was no statistically significant difference between the four samples in assessing *cookie texture*. Therefore, it can be concluded that despite the variation in ingredients in each formula, whether with the addition of purple sweet potato flour or sorghum flour, this did not significantly affect panelists' preference for the resulting *cookie texture*.

Table 7 Kruskal Wallis Test of Aroma Parameters

Formula	Mean ($\pm$) Standard Deviation	P-value
F0	4.32 $\pm$ 0.556	
F1	3.96 $\pm$ 0.675	0.0495
F2	4 $\pm$ 0.5	
F3	3.72 $\pm$ 0.936	

Based on table 7, the results of the hedonic test for the aroma parameters of *cookies* show that sample F0, which does not use purple sweet potato flour and sorghum flour, has the highest average value of 4.32 indicating that the panelists liked the aroma of this formula the most. Meanwhile, sample F3 has the lowest value of 3.72, indicating that *cookies* with this formula are the least preferred in terms of aroma. This is because some panelists do not like the aroma of purple sweet potato which is too strong. Overall, these results indicate that the addition of purple sweet potato flour and sorghum flour, especially in formula F3, can influence panelists' preferences for the aroma of *cookies*.

The aromatic compounds found in purple sweet potatoes and sorghum give each ingredient its unique characteristics. In purple sweet potatoes, the compound responsible is anthocyanin, which gives purple sweet potatoes their color and has strong antioxidant activity.

Anthocyanin also contributes to the distinctive aroma produced when purple sweet potatoes are cooked or baked (Anugrah & Suryani, 2020). Compounds such as trimethylpyrazine, benzaldehyde, and phenylacetaldehyde can impart a fragrant and distinctive aroma to processed products. Carbohydrate compounds can also produce volatile compounds that contribute to aroma, such as aldehydes and ketones that appear during the baking process (Dewandari et al., 2014)

In sorghum, the compounds that play a role are phenolic acids, including flavonoids and anthocyanins that contribute to aroma and flavor, and tannins, which are polyphenolic compounds that have an aromatic ring with one or two hydroxyl groups. These compounds give sorghum a slightly bitter taste and have high antioxidant properties (Sukmawaty & Afni, 2019). Furthermore, there is the aroma resulting from starch degradation, where during the roasting process, the starch in sorghum degrades into volatile compounds that provide a distinctive aroma. These compounds can include aldehydes and ketones, which increase the complexity of sorghum's aroma when processed into food products (Sukmawaty & Afni, 2019)

Based on Table 7, the *Kruskal-Wallis test results* for the aroma parameter show a probability value of $p < 0.05$. This indicates a statistically significant difference between the four samples in assessing *cookie aroma*. Thus, although the difference is not significant, it indicates that formula variations influence the level of preference for *cookie aroma*.

Based on preference test results, panelists suggested aspects of taste that show that F1 and F3 have a good taste, while F2 tastes rather sweetness. Apart from that, in F2 and F3, the taste of purple sweet potato felt Enough dominant. In terms of overall, the taste of the cookies is assessed delicious and very suitable for consumed. In terms of texture, part panelists consider F1 and F3 texture is less liked although it feels like delicious, while there are also those who like it the texture of the cookies is crunchy. However, it is recommended that the texture of the cookies, especially in F1, F2, and F3, can be made more softer to make it more liked by consumers.

From the aspect color, found that color purple on cookies yet evenly until cookies basis, which is worrying can cause prejudice certain related quality product. Meanwhile that, in matter form, panelists suggest that cookies be made more interesting and varied so as not to monoton as well as looks more good and different One each other. In terms of the manufacturing process, F2 is recommended for balance dose ingredients so that the taste is not too sweet. Besides, the time roasting should No too long for results end of cookies more optimal.

Based on observation, condition physical cookies in research This show difference color between formulas. Cookies F0 (control) has color yellow uniform brown, F1 colored light brown, F2 colored chocolate, while F3 has color chocolate thick. Variation color This influenced by the level addition purple sweet potato flour and flour sorghum, where increasingly tall proportion of purple sweet potato, the color of the cookies becomes more dark, and reactions browning during baking. The aroma of cookies in all formulas is aroma typical cookies without a rancid aroma, and F1, F2 and F3 have the additional aroma of purple sweet potato and a little aroma of sorghum, while the resulting taste is a balanced sweet taste with the distinctive taste of purple sweet potato and sorghum. According to SNI 2973:2022, good cookies must own normal color, smell, and taste. Observation results show that all cookie formulas in study This fulfil criteria condition physique according to the SNI.

CONCLUSION

The addition of purple sweet potato flour and sorghum has been shown to increase the fiber content of cookies. The F3 formula has the highest fiber (8.2%), while F0 has the lowest (4.2%), with a standard deviation of 1.6851 which indicates a considerable variation between the formulas. Organoleptic tests showed no significant differences in color, taste, and texture, except for noticeably different aromas. Panelists liked F2 the most for color and aroma, F1 for flavor and texture, while F3 despite having the highest fiber (8.3%) was less preferred. Overall, the best formula is F2 with a fiber content of 7% or the equivalent of 0.77 grams per piece.

REFERENCES

- Alam, M. K. (2021). A comprehensive review of sweet potato (*Ipomoea batatas* [L.] Lam): Revisiting the associated health benefits. In *Trends in Food Science and Technology* (Vol. 115). <https://doi.org/10.1016/j.tifs.2021.07.001>
- Amrinola, W., Widowati, S., & Hariyadi, P. (2015). *Metode Pembuatan Sorgum Sosoh Rendah Tanin Pada Pembuatan Nasi Sorgum (Sorghum bicolor L.) Instan*. 9, 9–19.
- Anugrah, R. M., & Suryani, E. (2020). *Kandungan Gizi Donat dengan Penambahan Ubi Ungu (Ipomoea Batatas) Sebagai Makanan Jajanan Berbasis Pangan Lokal Bagi Anak Sekolah*. 9(1), 150–158.
- Bednarek, R., David, M., Fuentes, S., Kreuze, J., & Fei, Z. (2021). Transcriptome analysis provides insights into the responses of sweet potato to sweet potato virus disease (SPVD). *Virus Research*, 295. <https://doi.org/10.1016/j.virusres.2020.198293>
- Chen, C. C., Lin, C., Chen, M. H., & Chiang, P. Y. (2019). Stability and quality of anthocyanin in purple sweet potato extracts. *Foods*, 8(9). <https://doi.org/10.3390/foods8090393>
- Dewandari, D., Ir. Basito, M. S., & Ir. Choirul Anam, MP, M. (2014). *Kajian Penggunaan Tepung Ubi Jalar Ungu (Ipomoea batatas L.) Terhadap Karakteristik Sensoris Dan Fisikokimia Pada Pembuatan Kerupuk*. 3(1).
- Istifadah, N. N., Siahaan, N. R., Triana, N. W., & Surabaya, K. (2023). *Pembuatan Pati Rendah Kalori Dari Ubi Jalar Ungu*. 4(01), 37–46.
- Li, A., Xiao, R., He, S., An, X., He, Y., Wang, C., Yin, S., Wang, B., Shi, X., & He, J. (2019). Research advances of purple sweet potato anthocyanins: Extraction, identification, stability, bioactivity, application, and biotransformation. In *Molecules* (Vol. 24, Issue 21). <https://doi.org/10.3390/molecules24213816>
- Limanto, S., Julianti, E., & Lubis, Z. (2019). Karakteristik Kimia Biskuit Dari Tepung Dan Serat Ubi Jalar Ungu (*Ipomea Batatas*). *Teknologo Dan Industri Pertanian Indonesia*, 11(02), 64–68.
- Makmur, T., Wardhana, M. Y., & AR, C. (2022). *Daya Terima Konsumen Terhadap Produk Olahan Minuman Serbul Dari Limbah Biji Nangka*. 5(1), 90–97.
- Mutiara, D., Gusnita, W., Holinesti, R., & Andriani, C. (2024). *Uji Organoleptik Penggunaan Tepung Ubi Jalar Ungu Terhadap Kualitas Cookies*. 5(1), 39–45. <https://doi.org/10.24036/jptbt.v5i1.12258>
- Nu'man, T. M., & Bahar, A. (2021). *Tingkat Kesukaan Dan Nilai Gizi Cookies Dengan Penambahan Tepung Daun Katuk Dan Tepung Kelor Untuk Ibu Menyusui*. 15(02).

- Nurdjanah, S., Nurdin, S. U., Astuti, S., & Manik, V. E. (2022). Chemical Components, Antioxidant Activity, and Glycemic Response Values of Purple Sweet Potato Products. *International Journal of Food Science*, 2022. <https://doi.org/10.1155/2022/7708172>
- Oloniyo, R. O., Omoba, O. S., & Awolu, O. O. (2021). Biochemical and antioxidant properties of cream and orange-fleshed sweet potato. *Heliyon*, 7(3). <https://doi.org/10.1016/j.heliyon.2021.e06533>
- Rahmi, Y., Kurniawati, A. D., Widyanto, R. M., Ariestiningsih, A. D., Aisyi, A. Z. A. F., Ruchaina, A. N., Sihombing, E. V., Istira, F. B., Nafsiyah, I., Permatasari, K. D., Anjani, R. D., Simanjuntak, S. A. Y. M., & Rahma, Y. A. (2021). The sensory, physical and nutritional quality profiles of purple sweet potato and soy-based snack bars for pregnant women. *Journal of Public Health Research*, 10(2). <https://doi.org/10.4081/jphr.2021.2241>
- Ratna Anugrahwati, D., Zubaidi, A., Erna Listiana, B., Malik Yakop, U., Noorma Putri, D., Azira Zikfida, S., Aenum Solihat, N., & Istiayu Lestari, D. (2024). *Kadar Gula Beberapa Varietas Sorghum Pada Berbagai Fase Perkembangan Tanaman*. 6(November 2023), 1–9.
- Sukmawaty, E. K. A., & Afni, N. U. R. (2019). *Kadar Total Fenol Ekstrak Bekatul Sorghum (Sorghum bicolor L .) Varietas Super 2*. 42–47.
- Tang, C., Han, J., Chen, D., Zong, S., Liu, J., Kan, J., Qian, C., & Jin, C. (2023). Recent advances on the biological activities of purple sweet potato anthocyanins. In *Food Bioscience* (Vol. 53). <https://doi.org/10.1016/j.fbio.2023.102670>
- Yusriza Firmansyah, H., Pratiwi, E., & Sagitaning Putri, A. (2021). *Kajian Penambahan Tepung Ubi Ungu Terhadap Sifat Fisikokimia Cookies Ubi Ungu (Ipomoea batatas L.)*. 1–20.