

The Effect of Purple Sweet Potato Flour Substitution (*Ipomoea Potato L. Poir*) On Physical Quality and Sensory Quality of Chiffon Cake

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Abstract

This study aims to analyze the effect of purple sweet potato flour substitution on the physical and sensory quality of chiffon cake. This study was conducted at the Pastry and Bakery Laboratory of the Culinary Arts Education Study Program, Jakarta State University. The study period began in October 2024 and ended in September 2025. The method used in this study was an experimental method. The research sample was a chiffon cake with purple sweet potato flour substitution of 30%, 45%, and 60%. The results of the physical quality test using the ANOVA test showed no significant effect on baked loss. The results of the Duncan test showed that 60% substitution was the product with the best rise power and 45% substitution was the product with the best rise power stability. Sensory quality assessment was carried out on 45 semi-trained panelists who assessed the aspects of crust color, crumb color, aroma, sweetness, purple sweet potato flavor, texture, and pores. The results of the statistical hypothesis of sensory quality with the Kruskal-Wallis test showed that there was no effect of purple sweet potato flour substitution on sensory quality in the aspects of aroma, sweetness, purple sweet potato flavor, texture, and pores. However, there was a significant effect on sensory quality in the aspects of crust and crumb color. The results of the Tuckey's test showed that the 60% substitution chiffon cake product was the best product, so it can be concluded that the chiffon cake with 60% purple sweet potato flour substitution was the product with the best physical quality and sensory quality. Therefore, to optimize the use of purple sweet potato flour, it is recommended that the 60% substitution chiffon cake product can be further developed..

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1. INTRODUCTION

Cake originates from Western culinary traditions and was introduced to Indonesia after being brought by the Dutch during the colonial period. In Europe, almost every country has at least one type of rice cake that is very proud and famous throughout the world. Cakes have many shapes and sizes, from small to large. In addition, cake also has a variety of flavors, whether sweet, savory, or a combination of both. According to Kamilah & Pangesthi (2015), chiffon cake is one type of cake that is included in the group of sponge cakes. Chiffon cake is one of the popular continental cake food products and is loved by many people. This is because chiffon cake has a very light, soft, sweet, porous, and fluffy texture.

Wheat flour is a basic ingredient in many things of cakes, which is used to provide the required structure. The function of wheat flour is to provide the basic structure to the cake which is produced. Wheat flour consumption in Indonesia continues to increase, while its primary raw material, wheat, remains dependent on imports. To maintain national food security and reduce dependence on imported wheat, it is necessary to develop food diversification based on local resources. (Ramadhani & Rahmawati, 2022) With the increasing consumption of wheat flour in

Indonesia, the use of purple sweet potato flour as a substitute has become a potential alternative, especially in the processing of wheat flour products. *cake* and *bakery* (Hardianti & Rinawati, 2022).

Besides yellow, red, and white sweet potatoes, purple sweet potatoes are also commonly found in Indonesia. Purple sweet potatoes have deep purple flesh, making them a superior food with positive health benefits thanks to their various components. Purple sweet potatoes are typically processed by boiling, frying, steaming, or making compote and chips. To increase their appeal, innovations in food processing are needed, one of which is the production of purple sweet potato flour.

Processing purple sweet potatoes into flour offers numerous benefits, both economically and culinary. Purple sweet potato flour has the advantage of a longer shelf life compared to fresh sweet potatoes, thus reducing waste and losses due to spoilage (Widhaswari et al., 2014). Furthermore, purple sweet potato flour also simplifies its use in various food products, such as cakes, bread, and noodles, due to its practicality and ease of long-term storage. Furthermore, by using purple sweet potato flour, Indonesia can reduce its dependence on imported wheat flour, the majority of which is still derived from wheat (Hidayat et al., 2022).

Research has been conducted on the use of purple sweet potato flour, namely in making white bread by (Fadhilah, 2018), stated that the bread formulation with the addition of purple sweet potato flour as much as 10%, 20%, and 30% showed differences in quality characteristics based on color parameters (inside and outside), aroma, taste, and texture, it was known that white bread with 10% purple sweet potato flour substitution was the product most preferred by the panelists. And *thumbprint cookies* by Sulistyarini & Ekawatiningsih (2021) stated that a 70% substitution of purple sweet potato flour was considered more appropriate compared to 50% and 90% substitutions, because it produced an attractive color, a cookie texture that was not too dense, and a balanced sweet potato flavor. Based on the results of the sensory test, it can be concluded that the product of *thumbprint cookies* with 70% substitution of purple sweet potato flour was well received by consumers.

Based on the research presented previously, it is clear that purple sweet potato flour has considerable potential for processing into a local food product in Indonesia. Therefore, the authors are interested in processing purple sweet potato into flour, which can then be substituted into other products, *chiffon cake*. It is hoped that this product can be used as an innovative product in the use of local food ingredients.

2. RESEARCH METHODS

2.1 Research methods

The research method used in this study is an experimental method to determine the effect of purple sweet potato flour substitution on the physical quality and sensory quality of *chiffon cake*. The population in this study is *chiffon cake* with purple sweet potato flour substitution samples consisting of *chiffon cake* with purple sweet potato flour substitution at percentages of 30%, 45%, and 60%. The sampling technique was carried out randomly (*random sampling*), where each sample was given a random code known only to the researcher.

2.2 Data Collection and Analysis Techniques

Data collection in this study was carried out in stages, beginning with product validation by five expert panelists, namely lecturers from the Culinary Arts Education Study Program, Jakarta State University. Next, samples were tested by 45 semi-trained panelists, namely students from the Culinary Arts Education Study Program, Jakarta State University, to assess the sensory quality aspects of crust color, crumb color, aroma, sweetness, taste of purple sweet potato flour, texture, and pores using a scale of liked. Then the samples were tested for physical quality using a ruler for the expansion power and expansion power stability aspects, and using scales for the expansion power aspect of baked loss.

Data obtained from the physical quality test analysis were analyzed using ANOVA to determine the effect of each treatment. If an effect was found, a Duncan test was performed. Physical quality tests were conducted on the expansion power and expansion power stability aspects of baked loss of Sensory quality test data analysis was conducted using the Kruskal-Walli’s test followed by Tukey's test. Sensory quality tests were conducted on the aspects of crust color, crumb color, aroma, sweetness, taste of purple sweet potato flour, texture, and pores.

2.3 Making Purple Sweet Potato Flour

In this study, the manufacture of purple sweet potato flour refers to research conducted by Dhani (2020). The process of making purple sweet potato flour can be seen in the following flow diagram:

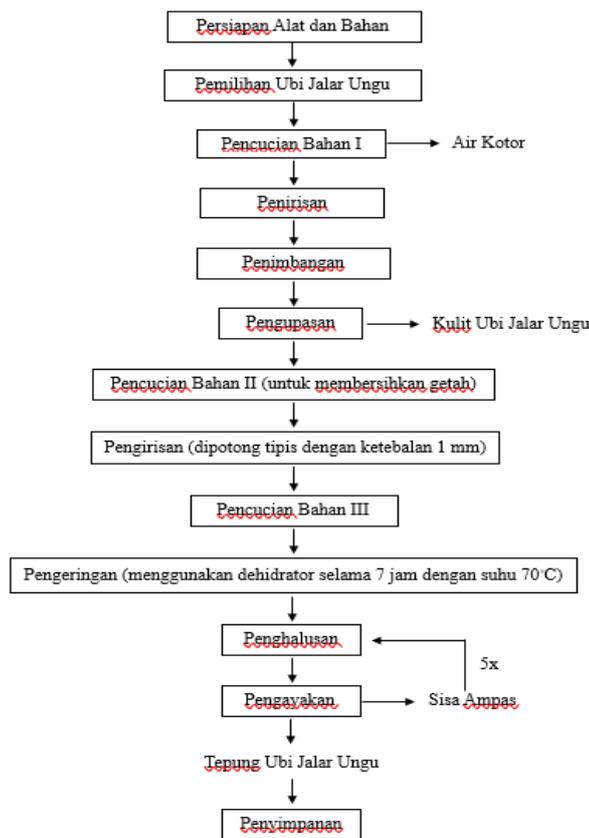


Figure 1 Flowchart of the Purple Sweet Potato Flour Making Process

2.4 Making Chiffon Cake

In this study, the creation of chiffon cake the method uses the chiffon method, with stages that can be seen in the following flow diagram:

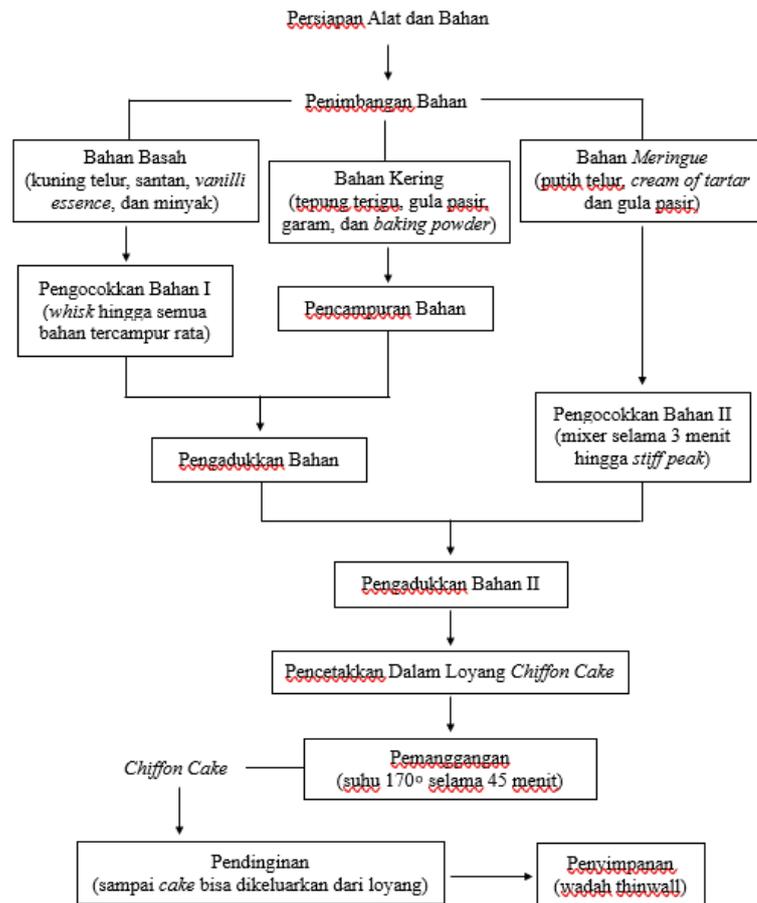


Figure 2 Manufacturing Process of Chiffon Cake

The product manufacturing formula can be seen in the following table:

Table 1 Formula of Chiffon Cake Purple Sweet Potato Flour Substitution

Material	Purple Sweet Potato Flour Substitution					
	30%		45%		60%	
	Gram	%	Gram	%	Gram	%
Flour	105	70	82,5	55	60	40
Purple sweet potato flour	45	30	67,5	45	90	60
Egg yolk	100	66,67	100	66,67	100	66,67
Egg whites	190	126,67	190	126,67	190	126,67
Coconut cream	75	50	75	50	75	50
Granulated sugar	195	130	195	130	195	130
Oil	83	55,33	83	55,33	83	55,33
Vanilla essence	4	2,67	4	2,67	4	2,67
Baking powder	4	2,67	4	2,67	4	2,67
Salt	3	2	3	2	3	2
Cream of tartar	1	0,67	1	0,67	1	0,67

3. RESULTS AND DISCUSSION

1.1. Physical Quality

a. Development Power

In the results of the physical quality test, in terms of expansion power was found that the *chiffon cake*. The substitution of purple sweet potato flour with a percentage of 60%

obtained the highest score. As the percentage of purple sweet potato flour increases, the swelling power of the *chiffon cake* tends to increase.

The results of the Anova test obtained an F_{Count} namely 67.31. So, it is concluded that the substitution of purple sweet potato flour in chiffon cake influences the aspect of developmental capacity. To determine which treatment showed a significant difference, the analysis was continued with the Duncan test.

Table 1: ANOVA Test of Development Power

SK	B	JK	KT	F_{Count}	F_{Tabl}
	D				e
Treatment	2	433,7	207,6	67,31	5,14
Error	6	18,50	3,08		
Total	8	452,2	210,6		
		1	8		

Based on the Duncan test results, it was found that the 30% treatment was significantly different from the 45% and 60% treatments. Meanwhile, the 60% treatment was significantly different from the 30% and 45% treatments. Thus, each treatment showed significant differences from the other.

Table 2 Duncan Test Results

Treatment	Mean	Mean+DMR	Notation
t		T	on
30%	72,64	76,15	a
45%	79,77	83,41	b
60%	89,22		c

In accordance with the statement of Ciagusbandiah & Rindiani (2019) stated that the ratio between purple sweet potato flour and gluten can affect the expansion power of the *cake* in each treatment. Gluten helps loosen the bonds between molecules, allowing water to more easily penetrate the starch. This causes the starch granules to expand during the baking process. Furthermore, gluten is also able to bind water strongly through hydrogen bonds, which can increase the swelling power of the final product. Furthermore, in a study by Krisna Nindyarani et al. (2011), it was stated that the structure of the formation of the dough during the baking process is primarily due to protein coagulation and starch gelatinization. These two processes significantly influence the volume of the dough and the softness of the texture of the *cake*. As is known, the starch content in purple sweet potato flour is quite high, so that the starch in purple sweet potato flour has the characteristics of amylose of 24.79% and amylopectin of 49.78% and the appropriate gelatinization temperature is 65°C, plays an important role in increasing the development of power *chiffon cake through* the formation of dough structure and elasticity that supports volume and texture *cake*.

b. Stability of Development Power

In the results of the physical quality test in terms of the stability of expansion power was found that the chiffon cake substitution of purple sweet potato flour with a percentage of 60% obtained the lowest value. As the percentage of purple sweet potato flour increases, the stability of the swelling power of the chiffon cake tends to decrease.

The results of the Anova test obtained an F_{Count} which is 6.81. So it is concluded that the substitution of purple sweet potato flour in chiffon cake influences the aspect of developmental capacity. To determine which treatment showed a significant difference, the analysis was continued with the Duncan test.

Table 4 ANOVA Test of Development Power Stability

SK	B	JK	KT	F _{Count}	F _{Tabl}
	D				e
Treatment	2	13,5	6,76	6,81	5,14
Error	6	5,95	0,99		
Total	8	19,4	7,75		
		7			

Based on the results of the Duncan test, it was found that the 60% treatment was significantly different from the 30% and 45% treatments. Meanwhile, the 30% treatment was not significantly different from the 45% treatment.

Table 5 Duncan Test Results

Treatment	Mean	Mean+DMR	Notation
t		T	on
60%	97,13	99,12	a
30%	99,33	101,40	b
45%	100		b

In line with the research of Ayu et al. (2014), which stated that gluten is formed from the interaction between glutenin and gliadin proteins in wheat flour when mixed with water. This gluten matrix functions as a support for the dough structure while keeping the gas produced by the developer trapped inside, thus supporting the product volume expansion process and helping to maintain the volume and shape of the final product. Gluten is a protein compound found only in wheat flour and has elastic and chewy properties. Therefore, it can be concluded that increasing the proportion of purple sweet potato flour, accompanied by low gluten content, causes the dough's expansion power to increase, but its stability decreases. This occurs because the dough structure becomes less strong, so it is unable to maintain volume and tends to deflate after the baking process.

c. Baked Loss

In the results of the physical quality test in the aspect of baked loss, it was found that cake substitution of purple sweet potato flour with a percentage of 60% obtained the highest score. As the percentage of purple sweet potato flour increases, the baked loss of chiffon cake tends to increase.

The results of the Anova test obtained an F value_{Count} which is 0.45. So it is concluded that the substitution of purple sweet potato flour in chiffon cakes does not have any influence on any aspect of baked loss.

Table 6 ANOVA Test Baked Loss

SK	B	JK	KT	F _{Count}	F _{Tabl}
	D				e
Treatment	2	6,38	3,19	0,45	5,14
Error	6	42,8	7,13		
Total	8	49,1	10,32		
		8			

Research by Hidayat et al. (2022) stated that the more purple sweet potato flour added, the baked loss will increase because the gluten content in wheat flour acts as a binder that helps retain starch components during the cooking process. Because purple sweet potato flour does not contain gluten, increasing the amount of substitution for wheat flour can cause a decrease in the ability to retain starch. Therefore, the less purple sweet

potato flour used, the lower the rate of starch loss during the cooking process. Furthermore, the high fiber content in purple sweet potato flour can cause baked loss, which is higher in chiffon cake is related to the fiber's ability to absorb water during mixing, but then release it during baking, resulting in greater water evaporation and a decrease in product weight. This is in accordance with the statement by Permata et al. (2023), who stated that purple sweet potato flour contains a higher amount of crude fiber compared to wheat flour.

1.2. Sensory Quality

a. Crust Color

Based on the results of the assessment of the crust color aspect chiffon cake purple sweet potato flour substitution, at a percentage of 30%, got an average value of 3.60 with the chocolate category, at a percentage of 45% got an average value of 3.60 with the chocolate category, and at a percentage of 60% got an average value of 4.60 with the dark chocolate category.

Table 7 Results of the Crust Color Aspect Hypothesis

Testing Criteria	X ² Count	X ² Table
Crust Color	13,65	5,99

Based on the results of the Kruskal-Walli's test, it was shown that the substitution of purple sweet potato flour affected the crust color aspect. This is shown in X²_{Count}= 13.65, which has a result greater than X²_{Table}namely 5.99, so a test will be carried out Tuckey's.

Table 8 Test Results of Tuckey's Crust Color Aspect

No	Difference Between Each Treatment	Comparison of Results	Conclusion
1.	30% - 45% = 3,60-3,60 = 0	0 < 0,26	not significantly different
2.	30% - 60% = 3,60-4,60 = 1	1 > 0,26	significantly different
3.	45% - 60% = 3,60-4,60 = 1	1 > 0,26	significantly different

Based on the test aspect of the crust color, shows that the comparison chiffon cake Substitution of 30% and 45% purple sweet potato flour showed no significant difference in results. The test results showed on the chiffon cake. Substitution of purple sweet potato flour with the use of purple sweet potato flour as much as 30% 60% and 45% with 60% showing significantly different results.

Fadhilah's (2018) research explains that the difference in color on the product's exterior is caused by the relatively high sugar content in purple sweet potato flour. This sugar content influences color due to the Maillard reaction, a chemical reaction between reducing sugars and proteins during the baking process, which results in a golden-brown color change on the product's surface. Therefore, the difference in nutritional composition between purple sweet potato flour and wheat flour plays a significant role in determining the final color of the product (Winarno, 2004). According to Paran (2009), the sugar content in purple sweet potato flour, combined with the sugar in the dough, results in a high total sugar content in the dough. When the dough is baked in the oven, this sugar content undergoes a process of caramelization, which is a reaction where the sugar heats up to produce a brown compound. This caramelization process then triggers the appearance of a reaction-browning, so that the outside of the product shows a characteristic brown color as a result of chemical changes on the surface during baking.

b. Crumb Color

Based on the results of the assessment of the crust color aspect *chiffon cake* purple sweet potato flour substitution, at a percentage of 30%, the average value was 4.73 with a grayish brown category, at a percentage of 45%, the average value was 4.47 with a purplish brown category, and at a percentage of 60%, the average value was 3.47 with a light purplish brown category.

Table 9: Results of the Hypothesis of the Color Aspect of Crumbs

Testing Criteria	X ² Count	X ² Table
Crumb Color	10,62	5,99

Based on the results of the Kruskal-Walli’s test, it was shown that the substitution of purple sweet potato flour affected the crumb color aspect. This is shown in X²_{Count}= 10.62, which has a result greater than X²_{Table}namely 5.99, so a test will be carried out *Tuckey’s*.

Table 10 Test Results Tuckey’s Color Aspect

No	Difference Between Each Treatment	Comparison of Results	Conclusion
1.	$ 30\% - 45\% = 4,73 - 4,47 = 0,26$	$0,26 < 0,36$	not significantly different
2.	$ 30\% - 60\% = 4,73 - 3,47 = 1,26$	$1,26 > 0,36$	significantly different
3.	$ 45\% - 60\% = 4,47 - 3,47 = 1$	$1 > 0,36$	significantly different

Based on the test results of *Tuckey’s* aspect of the crust color, shows that the comparison of *chiffon cake*, Substitution of 30% and 45% purple sweet potato flour showed no significant difference in results. The test results showed that on *chiffon cake* Substitution of purple sweet potato flour with the use of purple sweet potato flour as much as 30% 60% and 45% with 60% showing significantly different results.

Fadhilah's (2018) research explains that the difference in color on the inside of the product is caused by variations in the percentage of wheat flour and purple sweet potato flour used in the dough. The higher the percentage of purple sweet potato flour used, the more pronounced the color of the inside of the product tends to show a more pronounced purple nuance. This is supported by research by Permata et al. (2023), explaining that the distinctive purple color of purple sweet potatoes is caused by the presence of a natural pigment compound called anthocyanin. Flour produced from purple sweet potatoes also has a purple color because it contains a concentration of anthocyanin. Anthocyanin is a water-soluble flavonoid compound and acts as the main pigment that gives red to purple colors to various plants, including purple sweet potatoes. Then, purple sweet potato flour also contains a much higher level of crude fiber than wheat flour. This high fiber content is in the form of water-insoluble cellulose, so it can make the color of the product more concentrated or dark. Therefore, the increase in crude fiber from purple sweet potato flour is thought to contribute to the change in the color of the product to become darker.

c. Aroma

Based on the results of the aroma aspect assessment *chiffon cake* purple sweet potato flour substitution, at a percentage of 30%, the average value is 4.13 with the category of no purple sweet potato aroma, at a percentage of 45%, the average value is 4.00 with the category of no purple sweet potato aroma, and at a percentage of 60%, the average value is 3.87 with the category of no purple sweet potato aroma.

Table 11 Results of Aroma Aspect Hypothesis

Testing Criteria	X ² Count	X ² Table
Aroma	1,86	5,99

Based on the results of the Kruskal-Walli’s test, it was shown that the substitution of purple sweet potato flour did not affect the aroma aspect. This is shown in X2Count= 1.86, which has a smaller result than X2Table which is 5.99.

The fragrant and distinctive aroma of sweet potato flour comes from the starch that undergoes degradation during processing. According to Rodrigues et al. (1988), in the journal Dewandari et al. (2014), the formation of aroma and flavor in purple sweet potatoes is caused by carbohydrate degradation that produces volatile compounds. In products substituted with purple sweet potato flour, the detected aroma comes from the typical volatile compounds found in purple sweet potatoes. However, the volatile aroma tends to be neutral or disappear in all samples after processing. This likely occurs because most of the volatile compounds evaporate due to heat exposure, so that the original aroma of purple sweet potatoes is reduced or no longer detected. This condition indicates that the heating process affects the composition of volatile compounds and has an impact on changing the aroma characteristics in the final product, plus the use of vanilla contained in the dough can also affect the aroma of the product.

d. Sweet Taste

Based on the results of the evaluation of the sweetness aspect *chiffon cake* purple sweet potato flour substitution, at a percentage of 30%, the average value was 4.13 in the sweet category, at a percentage of 45%, the average value was 4.13 in the sweet category, and at a percentage of 60%, the average value was 4.13 in the sweet category.

Table 12 Results of the Sweet Taste Aspect Hypothesis

Testing Criteria	X ² Count	X ² Table
Sweet Taste	0,01	5,99

Based on the results of the Kruskal-Walli’s test, it was shown that the substitution of purple sweet potato flour did not affect the sweetness aspect. This is shown in X2Count= 0.01, which has a smaller result than X2Table which is 5.99.

Taste is the main factor that determines food quality. However, taste is difficult to describe objectively because each individual has different preferences and tastes (Winarno, 2004). Research by Nabilah et al., (2017), states that the sweet taste in chiffon cake comes from the sugar used during the baking process. Sugar not only provides sweetness but also plays a role in improving the overall texture and color of the cake. This was also mentioned in research. Kamilah & Pangesthi (2015), that basic taste chiffon cake sweet potato cakes made from wheat flour are generally only savory and sweet. To create a variety of flavors, flavorings such as essences can be added, which impart distinct aromas and flavors to the final product. Therefore, the use of purple sweet potato flour does not significantly affect the sweetness of the final product of *chiffon cake*, because chiffon cake itself has a sweet taste.

e. Purple Sweet Potato Flavor

Based on the results of the evaluation of the sweetness aspect *chiffon cake* purple sweet potato flour substitution, at a percentage of 30%, the average value was 4.33 with the category of not tasting purple sweet potato, at a percentage of 45%, the average value was 4.20 with the category of not tasting purple sweet potato, and at a percentage of 60%, the average value was 4.13 with the category of not tasting purple sweet potato.

Table 13 Results of the Hypothesis of Purple Sweet Potato Flavor Aspects

Testing Criteria	X ² Count	X ² Table
Purple Sweet Potato Flavor	0,98	5,99

Based on the results of the Kruskal-Walli’s test, it was shown that the substitution of purple sweet potato flour did not affect the taste of purple sweet potatoes. This is shown in X2Count= 0.98, which has a smaller result than X2Tablewhich is 5.99.

Study Rambe & Gusnita (2022), stated that the substitution of purple sweet potato flour did not have a significant effect on the taste quality of the blooming steamed sponge cake. The taste of a food is generally influenced by the ingredients used in the manufacturing process. Therefore, the selection of poor-quality raw materials can hurt food quality, especially on the of taste. Taste is one of the main factors that determines the level of consumer acceptance of a food product. Quality blooming steamed sponge cake generally has a sweet taste, which comes from the use of ingredients such as granulated sugar and soda water. Based on the results of the study, increasing the proportion of purple sweet potato flour substitution did not have a significant effect on the intensity of the sweet taste in the resulting blooming steamed sponge cake, so in this study the purple sweet potato flavor cannot be felt because one of the causes is influenced by the use of other ingredients used such as granulated sugar, eggs, and coconut milk which can affect the taste of chiffon cake which is produced.

f. Texture

Based on the results of the texture aspect assessment of the chiffon *cake* purple sweet potato flour substitution, at a percentage of 30%, the average value was 4.27 in the soft category, at a percentage of 45%, the average value was 4.27 in the soft category, and at a percentage of 60%, the average value was 4.13 in the soft category.

Table 14 Results of the Texture Aspect Hypothesis

Testing Criteria	X ² Count	X ² Table
Texture	0,15	5,99

Based on the results of the Kruskal-Walli’s test, it was shown that the substitution of purple sweet potato flour did not affect the texture aspect. This is shown in X2Count= 0.15 which has a smaller result than X2Tablewhich is 5.99.

According to Permata et al. (2023), purple sweet potato flour also plays a role in forming product texture based on its starch content. Starch with a high amylopectin content contains many hydroxyl groups, so it is able to bind water well. This makes the starch effective in retaining moisture and influencing the texture of the final product. Then, in the manufacture of chiffon cake, not only does flour play a role in forming structure and texture, but eggs also have an important role in the final result of the chiffon cake. Making chiffon cake using the method of beating egg whites until stiff, then mixing them with a back-stirring technique into the egg yolk mixture, which produces a soft and light texture. This technique allows the chiffon cake to have a high volume and a smooth and soft texture. This is also reinforced by the statement Ningsih & Faridah (2020) state that the function of eggs in making *cake* to add volume, add color, maintain moisture, and produce a soft texture. Egg whites that are beaten to form foam act as a leavening agent, while egg yolks provide softness and color of *cake*. In line with what was explained by Faridah et al. (2008), it was stated that the chiffon *cake* is known to have a soft, light, and porous texture like a sponge, as well as an attractive appearance.

g. Pori-Pori

Based on the results of the pore aspect assessment *chiffon cake* purple sweet potato flour substitution, at a percentage of 30%, the average value is 3.67 with a small category, at a percentage of 45%, the average value is 3.60 with a small category, and at a percentage of 60%, the average value is 3.13 with a rather large category.

Table 15 Results of the Pore Aspect Hypothesis

Testing Criteria	X ² Count	X ² Table
Pori-Pori	1,42	5,99

Based on the results of the Kruskal-Wallis's test, it was shown that the substitution of purple sweet potato flour did not affect the pore aspect. This is shown in $X^2_{\text{Count}} = 1.42$, which has a smaller result than X^2_{Table} which is 5.99.

According to Arbowati et al. (2021), the less foam and water bound during shaking will affect the porous crumb when baked. This causes the bonds between egg protein, flour gluten, and other ingredients to weaken, so that the crumb which is produced is unstable, uneven, and rough. Therefore, although the gluten content in purple sweet potato flour is not there, the starch content contained in purple sweet potato flour can help in binding the water in the dough. In line with research conducted by Firdausa (2020), which states that dough that is good at retaining trapped gas will produce pores crumb dense and uniform. This occurs because the formation of a sufficiently large foaming force forms a small, dense gel matrix. During baking, the gel matrix becomes dense and uniform, and the resulting foam forms pores in the dough. In other words, the quality of the foam in the dough greatly influences the size and uniformity of the pores of the crumb after baking, so that the texture cake become better and more stable. The texture of the chiffon cake is good dough is soft with small, evenly distributed pores, resulting in a light and fluffy cake. This characteristic reflects the quality of the dough of chiffon cake, which is produced by the proper shaking and baking process.

4. CONCLUSION

The results of the physical quality test of the swelling power using the ANOVA test showed that there was an effect of purple sweet potato flour substitution on the physical quality of the swelling power and the stability of the swelling power in the manufacture of chiffon cake. Test results of *Duncan* show that 60% substitution is the product with the best expansion power, and 45% substitution is the product with the best expansion power stability. In the aspect of baked loss, it is known that there is no significant influence on each sample.

Results of analysis using the test *Kruskal-Wallis* show that there is no effect of substitution of purple sweet potato flour in the manufacture of chiffon cake on the aspects of aroma, sweetness, taste of purple sweet potatoes, texture, and pores. However, there is an effect of substitution of purple sweet potato flour on the production of chiffon cake on the aspects of crust color and crumb color.

So it can be concluded that there is an effect of purple sweet potato flour substitution on the physical quality and sensory quality of chiffon cake. To optimize the use of purple sweet potato flour, the following products can be recommended chiffon cake 60% substitution to be further developed.

5. ACKNOWLEDGEMENT

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6. BIBLIOGRAPHY

- Arbowati, J. L., Mulyani, S., & Hintono, A. (2021). *Pengaruh Kualitas Telur Terhadap Sifat Fisik Dan Sifat Organoleptik Sponge Cake (The Effect Of Quality Egg On A Physical And Organoleptic Characteristic Of Sponge Cake)*.
- Ayu, K., Rachmawanti, D., & Sigit, B. (2014). Kajian Sifat Sensoris Dan Fungsional Cake Ubi Jalar Ungu (*Ipomoea Batatas L.*) Dengan Berbagai Variasi Bahan Baku. *Jurnal Teknosains Pangan*, 3(1). www.ilmupangan.fp.uns.ac.id

- Ciagusbandiah, & Rindiani. (2019). Cake Tepung Ubi Jalar Ungu Sebagai Makanan Selingan Yang Mengandung Antioksidan. *Prosiding Seminar Nasional Inahco 2019*, 1.
- Dewardari, D., Basito, I., Si, M., Anam, I. C., Teknologi, J., Pertanian, H., & Pertanian, F. (2014). Kajian Penggunaan Tepung Ubi Jalar Ungu (*Ipomoea Batatas L.*) Terhadap Karakteristik Sensoris Dan Fisikokimia Pada Pembuatan Kerupuk Study On The Use Of Purple Sweet Potato Flour (*Ipomoea Batatas L.*) To Characteristics Sensory And Physicochemical Making The Crackers. *Jurnal Teknosains Pangan*, 3(1). www.ilmupangan.fp.uns.ac.id
- Dhani, A. U. (2020). Pembuatan Tepung Ubi Ungu Dalam Upaya Diversifikasi Pangan Pada Industri Rumah Tangga Ukm Griya Ketelaqu Di Kelurahan Plalangan Kecamatan Gunungpati Kota Semarang. *Jurnal Agribisnis Dan Sosial Ekonomi Pertanian Unpad*, 5(1).
- Fadhilah, T. M. (2018). Pembuatan Roti Tawar Subtitusi Tepung Ubi Ungu. *Jurnal Mitra Kesehatan*, 1(1), 32–39. <https://doi.org/10.47522/jmk.v1i1.9>
- Faridah, A., Pada, K. S., Yulastri, A., & Yusuf, L. (2008). *Patiseri Jilid Ii*. Direktorat Pembinaan Sekolah Menengah Kejuruan.
- Firdausa, A. R. (2020). Pengaruh Suhu Dan Lama Pemanggangan Terhadap Kualitas Chiffon Cake. *Prosiding Pendidikan Teknik Boga Busana*, 15(1).
- Hardianti, A. F., & Rinawati, W. (2022). Subtitusi Tepung Ubi Jalar Ungu (*Ipomoea Batatas Var Ayamurasaki*) Pada Pembuatan Biscotti. *Prosiding Pendidikan Teknik Boga Busana*, 17.
- Hidayat, M. N., Pratiwi, E., & Putri, A. S. (2022). *Kajian Tepung Ubi Jalar Ungu (Ipomea Batatas Var Ayamurasaki) Terhadap Fisikokimia Dan Uji Organoleptik Mie Kering*.
- Kamilah, S., & Pangesthi, L. T. (2015). Pengaruh Substitusi Tepung Tiwul Tawar Instan Terhadap Sifat Organoleptik Chiffon Cake. In *Journal Boga* (Vol. 04, Issue 3).
- Krisna Nindyarani, A., Sutardi, & Suparmo. (2011). Karakteristik Kimia, Fisik Dan Inderawi Tepung Ubi Jalar Ungu (*Ipomoea Batatas Poir*) Dan Produk Olahannya Products. *Agritech*, 31(4).
- Nabilah, N., Syarif, W., & Elida. (2017). *Pengaruh Penggunaan Lemak Nabati Terhadap Kualitas Chiffon Cake*. Universitas Negeri Padang.
- Ningsih, Y., & Faridah, A. (2020). Pengaruh Penggunaan Jenis Lemak Terhadap Kualitas Sponge Cake. *Jurnal Kapita Selektu Geografi*, 3(1), 1–9.
- Paran, S. (2009). *100+ Tips Antigagal Bikin Roti, Cake, Pastry, Dan Kue Kering*. Kawan Pustaka.
- Permata, M. I., Pramono, Y. B., & Nurwantoro. (2023). Pengaruh Substitusi Tepung Ubi Jalar Ungu (*Ipomoea Batatas*) Terhadap Sifat Kimia, Fisika, Dan Hedonik Bagelen. *Jurnal Teknologi Pangan*, 7(2). www.ejournal-s1.undip.ac.id/index.php/tekpangan.
- Ramadhani, F. N., & Rahmawati, F. (2022). Pemanfaatan Bahan Pangan Lokal Dalam Inovasi Produk Egg Roll Tepung Garut Dengan Ekstrak Bunga Rosella. *Prosiding Pendidikan Teknik Boga Busana*, 17(1).
- Rambe, S. A., & Gusnita, D. W. (2022). Pengaruh Substitusi Tepung Ubi Jalar Ungu Terhadap Kualitas Bolu Kukus Mekar (The Effect Of Purple Sweet Potato Flour Substitution On The Quality Of Blooming Steamed Sponge). *Jurnal Pendidikan Tata Boga Dan Teknologi*, 3(1). <https://doi.org/10.2403/80sr290.00>
- Sulistiyarini, A. E., & Ekawatiningsih, P. (2021). Pengaruh Substitusi Tepung Ubi Jalar Ungu (*Ipomoea Batatas Blackie*) Pada Pembuatan Thumprint Cookies The Effect Of Purple Sweet (*Ipomoea Batatas Blackie*) Flour Substitution On The Making Of Thumprint Cookies. *Prosiding Pendidikan Teknik Boga Busana*, 16(1).
- Widhaswari, V. A., Dwi, W., & Putri, R. (2014). *The Effect Of Chemical Modifications With Sttp On Characteristics Of Purple Sweet Potato Fluor*. 2(3), 121–128.
- Winarno, F. G. (2004). *Kimia Pangan Dan Gizi*. Pt. Gramedia Pustaka Utama.