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ADVANCES IN SOCIAL HUMANITIES RESEARCH

Effect of Adding *Orange Sweet Potato Puree (*Ipomoea Batatas Linneaus*) on the Physical and Sensory Properties of Steamed Bakpia*

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Abstract:

This study was conducted to analyze the effect of adding orange sweet potato puree with a percentage of 25%, 50%, and 75% in making steamed bakpia on physical properties and sensory quality. The method used in this study was an experimental method with three types of different treatments: steamed bakpia with the addition of 25% puree, 50% puree, and 75% puree. Organoleptic validation tests conducted on five lecturers of the Culinary Arts Education Study Program, Jakarta State University showed that the addition of orange sweet potato puree of 25%, 50%, and 75% was feasible for use in research. Physical quality tests were carried out by measurement, calculation through equations, and Anova tests on the aspects of expansion and stability. The results of the physical quality test showed that there was an effect of the addition of orange sweet potato puree on the stability of the steamed bakpia's expansion power with the results of steamed bakpia with the addition of puree of 50% and 75% being significantly different, while in the expansion power aspect of steamed bakpia there was no effect of the addition of orange sweet potato puree. The results of the Duncan test showed that steamed bakpia with the addition of 75% orange sweet potato puree was the best in terms of stability. The sensory quality test was carried out using the Kruskal-Wallis test with data collection through a hedonic quality test on 45 semi-trained panelists with the results that there was no effect of the addition of 25%, 50%, and 75% orange sweet potato puree on making steamed bakpia in all aspects except for the sponge cake color aspect. The results of the Tuckey's test showed that steamed bakpia with the addition of 75% orange sweet potato puree was the best in terms of sponge cake color. Based on the results of this study, the recommended product is steamed bakpia with the addition of 75% orange sweet potato puree.

Keywords: *Steamed bakpia, orange sweet potato puree, physical quality, sensory quality*

INTRODUCTION

Tubers are a food ingredient that is easy to cultivate and requires only low production costs, making them widely consumed by the underprivileged and significantly contributing to resilience in various developing countries. In Indonesia, tubers are still used in a limited way. Among the abundant and easily found tubers are cassava, sweet potatoes, and potatoes (Bela, 2018; Taufik et al., 2022; Wanita, 2018). Sweet potatoes were chosen because they offer many benefits and balanced nutrition for the health of the body, can be stored longer than other types of tubers—with their taste becoming sweeter over storage time—and have great potential to be developed as part of efforts to diversify food consumption (Widowati, 2011).

Sweet potatoes have a variety of variations. The variety of sweet potatoes is seen from the color of the tubers, namely white, beige, yellow, orange, and purple. The three varieties with the dominant root flesh colors are purple, white, and orange (Harnowo & Utomo, 2020). Among these three dominant flesh colors, orange sweet potato was chosen because it contains high beta-carotene (Rosalia, 2023). Beta-carotene, in addition to functioning as a provitamin A, can also act as a natural dye in food products, giving a bright and natural color to cakes (Holinesti & Isnaini, 2020).

Orange sweet potato tubers are known to have a nutritional content of 32.3 g of carbohydrates, 1.1 g of protein, 0.4 g of fat, 0.7 g of fiber, calcium (57 mg/100 g), phosphorus (52 mg/100 g), vitamin A (900 mg/100 g), vitamin C (35 mg/100 g), and 68.5 ml of water (Harnowo & Utomo, 2020).

Sweet potatoes can be processed into a wide variety of products such as cakes, bread, noodles, and others (Pratiwi, 2020). They can also be processed into semi-finished products such as flour and puree or pasta (Harnowo & Utomo, 2020). Processing sweet potatoes into flour takes a long time and incurs high costs, while processing them into paste/puree is easier, requires less time, and involves lower costs (Hudiah et al., 2019; Mulyadi et al., 2014b, 2014a; Mulyadi, A.F., S. Wijana., 2014; Widyaningtyas & Susanto, 2015). Processing sweet potatoes into puree results in less nutrient loss compared to the swelling process. One of the cakes that can be made using orange sweet potato puree is *steamed bakpia*, a typical Yogyakarta souvenir snack made through a steaming process, resulting in a softer texture than the usual *bakpia* that undergoes baking (Chandra et al., 2021).

Previous research by Widowati (2011) and Harnowo & Utomo (2020) has highlighted the importance of sweet potatoes, especially orange sweet potatoes, as an alternative food ingredient rich in nutrition and with high potential to diversify food consumption in Indonesia. Widowati (2011) emphasized the advantages of sweet potatoes in terms of health benefits and ease of cultivation, while Harnowo & Utomo (2020) reviewed their nutritional content and potential for processing into various products such as flour and puree. However, these studies still focus on general aspects of nutritional content and processing forms without discussing their specific use in regional culinary products such as *steamed bakpia*. In addition, studies by Holinesti & Isnaini (2020) have shown that beta-carotene in orange sweet potatoes can serve as a visually appealing and health-safe natural dye, but few have studied its impact on the sensory and physical characteristics of processed food products.

Based on this description, this study was conducted to analyze the effect of the addition of orange sweet potato puree (*Ipomoea batatas Linneaus*) on the physical properties and sensory quality of *steamed bakpia*. This research is expected to innovate new flavor variants for *steamed bakpia* products, take advantage of the nutritional value of sweet potatoes, and increase the selling value of tubers.

METHOD

The research method used in this study is an experimental method for making *steamed bakpia* products with the addition of orange sweet potato puree. The samples in this study consisted of three types of *steamed bakpia* treatments with the addition of orange sweet potato puree at 25%, 50%, and 75%. This study was divided into two stages, namely the initial stage and the advanced stage. In the initial stage, three repeated trials of the control product were carried out until the best formula was obtained. After that, an advanced stage test was conducted, involving trials of the *steamed bakpia* product formula with the addition of 25%, 50%, and 75% orange sweet potato puree. The research formulas can be seen in Table 1.

The data collection technique for the sensory quality test was carried out randomly (random sampling) by assigning different codes to each sample, then using organoleptic tests (hedonic quality tests) on three groups of slightly trained panelists totaling 15 panelists. These 45 panelists were students of Culinary Arts, Faculty of Engineering, State University of Jakarta, who had previously taken organoleptic courses. The aspects tested on *steamed bakpia* with the addition of orange sweet potato puree for sensory quality included sponge color, orange sweet potato aroma, sweet potato flavor, sweetness of the sponge, level of sweetness of the sponge, softness of the sponge, and smoothness of the outer surface of the sponge. Sensory quality data analysis used the Kruskal-Wallis test; if the results obtained were significantly different, the test was continued with the Tukey test to determine which treatments had real differences.

The collection of physical properties test data in terms of the development aspect was carried out by inserting a skewer in the middle of the cake, then measuring the height before and after baking using a ruler as a mm/cm measure, and then calculating the results using equations. Meanwhile, the stability aspect was measured similarly to the development aspect, by measuring the height at the middle, diameter, and sides after leaving the cake for 30 minutes post-baking and then calculating using an equation.

Analysis of physical trait test data used the ANOVA test; if the results obtained were significantly different, the test was continued with the Duncan test to determine which treatment had a real difference in terms of development and stability.

Table 1. Steamed Bakpia Formula with Orange *Sweet Potato* Puree Addition

Material	***Mash* 25%**		***Mash* 50%**		***Puree* 75%**	
	g	**%**	**g**	**%**	**g**	**%**
Medium Protein Wheat Flour	75	100	75	100	75	100
Orange Sweet Potato Puree	18,7	25	37,5	50	56,2	75
Egg	100	125	100	125	100	125
Sugar	75	100	75	100	75	100
Emulsifier (Ovalet)	2	2,6	2	2,6	2	2,6
UHT Milk	40	53,3	40	53,3	40	53,3
Liquid Margarine	50	66,6	50	66,6	50	66,6
Vanilla	2	2,6	2	2,6	2	2,6

RESULTS AND DISCUSSION

The results of steamed bakpia products with the addition of *orange sweet potato puree* can be seen in Figure 1. The research aspects of the sensory quality test include the color aspect of the sponge, the aspect of the orange sweet potato aroma, the aspect of the sweetness of the sponge, the aspect of the sweetness of the sponge, the aspect of the softness of the sponge, and the aspect of the smoothness of the outer surface of the sponge. The research aspects of the physical trait test are the development aspect and the stability aspect.

Control	***Mash* 25%**	***Mash* 50%**	***Puree* 75%**

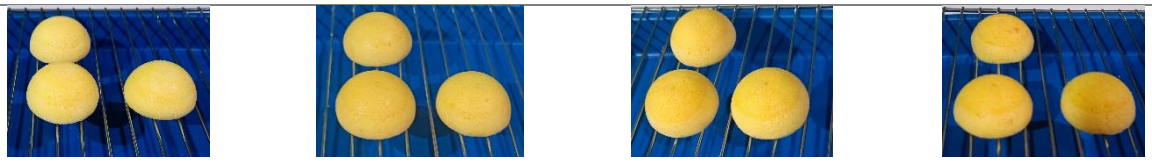

Figure 1. Steamed Bakpia Results

Physical Trait Test

Flowering Power

Based on the results of measurement and calculation of the bloom ability using the equation formula, the results of the average value of steamed bakpia with the addition *of 25% orange sweet potato puree were 0.185%, the average value of steamed bakpia with the addition* of 50% orange sweet potato puree was 0.25%, and steamed bakpia with the addition of *puree* 75% orange sweet potato is 0.23%. The results of Anova's calculation obtained F calculation of 2.095 with a significant degree of α= 0.05; treatment-free degree (dbp) 2; and error-free degree (dbg) 6 obtained F table of 5.143. Therefore, the results of F calculation < F table which means that H0 is accepted and H1 is rejected so that it can be concluded that there is no significant influence on steamed bakpia with the addition of *orange sweet potato puree* on the physical properties of the development aspect.

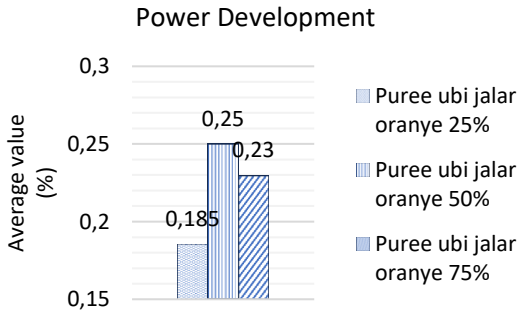

Figure 2. Growth Value Chart

Use *puree* As a substitute ingredient, wheat flour in products can reduce the development power of the product (Haryani, 2023) So this study focuses on adding *puree* Orange sweet potatoes in steamed bakpia in order to maintain the quality of the product's developmental power.

Stability

Based on the results of measurement and stability calculation using the equation formula, the average stability value of steamed bakpia with the addition of *25% orange sweet potato puree was 0.987%, the average value of the stability of steamed bakpia with the addition* of 50% orange sweet potato puree was 0.962%, and steamed bakpia with the addition of *puree* 75% orange sweet potato is 1%. The results of Anova's calculation obtained F calculation of 6.036 with a significant degree α= 0.05; treatment-free degree (dbp) 2; and error-free degree (dbg) 6 obtained F table of 5.143. Therefore, the results of F calculation > F table are obtained, which means

that H1 is accepted and H0 is rejected, so it can be concluded that there is a significant influence on steamed bakpia with the addition of *orange sweet potato puree* on the physical properties of the stability aspect. A follow-up test in the form of *the Duncan* test was carried out to find out the real difference in each treatment.

Based on the results of the *calculation of the Duncan* test, it is known that the treatment with the addition of *orange sweet potato puree by 50% is significantly different from the treatment with the addition* of orange sweet potato *puree* by 75%, while the treatment at 25% percentage is not significantly different. The best orange sweet potato steamed bakpia is steamed bakpia with the addition of 75% *orange sweet potato* puree.

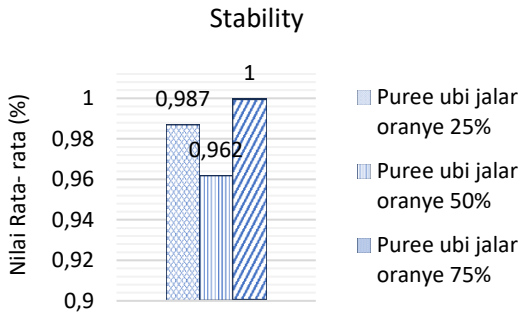

Figure 3. Stability Value Chart

The use of wheat flour containing gluten as a solid structure or skeleton in the dough (Ihromi et al., 2018) may affect the quality of the product's expandability stability.

Sensory Quality Test

Sponge Color

The results of sensory quality tests on the color aspect of sponge on steamed bakpia with the addition *of orange sweet potato puree* can be seen in the following image:

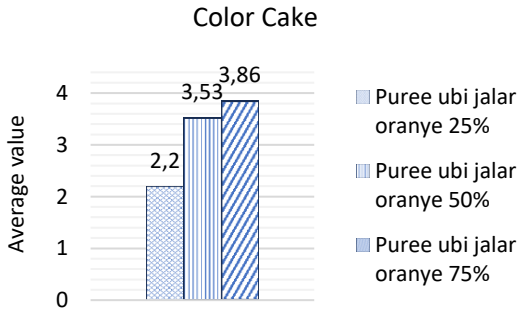

Figure 4. Sponge Color Aspect Value Chart

Based on the results of the calculation, the average calculation of steamed bakpia with the addition of *25% orange sweet potato puree has an average value of 2.2 with the yellowish creamy category, steamed bakpia with the addition* of 50% orange sweet potato puree has an average

value of 3.53 with the bright yellow category, and steamed bakpia with the addition of *puree* 75% orange sweet potato has an average value of 3.86 in the bright yellow category. The results of statistical analysis showed that there was an effect of the addition of *orange sweet potato puree* in the manufacture of steamed bakpia on the sensory quality of the sponge color aspect where X count = 26.49 > X table = 5.991 at a significant level of $\alpha = 0.05$ with the degree of confidence (df) = 3-1 = 2. A follow-up test in the form of *the Tuckey's* test was carried out to find out the real difference in each treatment.

Based on the results of the calculation of *Tuckey's test*, it is known that the treatment of adding orange sweet potato *puree* by 25%, 50%, and 75% is significantly different from one and the other. The best orange sweet potato steamed bakpia is steamed bakpia with the addition of 75% orange sweet potato *puree*. The color of steamed bakpia is influenced by the content of beta-carotene in orange sweet potatoes. The more percentage of sweet potato *puree* added to the cake, the stronger the effect of beta-carotene will be (Nabilah *et al*., 2022).

Orange Sweet Potato Aroma

The results of sensory quality tests on the aspect of orange sweet potato aroma against steamed bakpia with the addition of *orange sweet potato puree* can be seen in the following image:

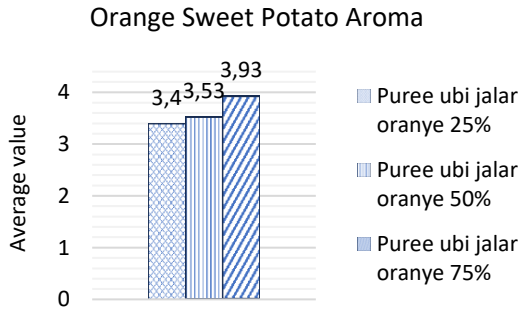

Figure 5. Orange Sweet Potato Aroma Aspect Value Chart

Based on the results of the calculation, the average calculation of steamed bakpia with the addition of *25% orange sweet potato puree has an average value of 3.4 with the category of slightly flavored orange sweet potato, steamed bakpia with the addition* of 50% orange sweet potato puree has an average value of 3.53 with the category of orange sweet potato, and steamed bakpia with the addition of *puree* 75% orange sweet potatoes have an average value of 3.93 in the category of orange sweet potato. The results of statistical analysis showed that there was no effect of the addition of *orange sweet potato puree* in the manufacture of steamed bakpia on the sensory quality of the aspect of orange sweet potato aroma where X count = 2.67 < X table = 5.991 at a significant level $\alpha = 0.05$ with a degree of confidence (df) = 3-1 = 2. The addition *of tuber puree* to cake products does not always make a significant difference in aroma aspects (Ghaffar & Nurhamzah, 2024). In addition, steamed bakpia also uses additional ingredients in the form of vanilla which can affect the aroma of the product.

Sweet Taste of Sponge

The results of sensory quality tests on the sweetness of sponge against steamed bakpia with the addition *of orange sweet potato puree* can be seen in the following image:

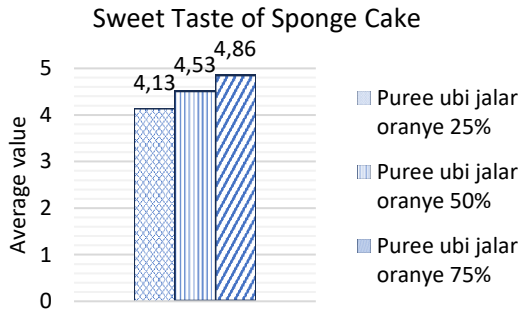

Figure 6. Chart of Value of Sweet Taste Aspects of Sponge

Based on the results of the calculation, the average calculation of steamed bakpia with the addition *of 25% orange sweet potato puree has an average value of 4.13 with the category of quite sweet, steamed bakpia with the addition* of 50% orange sweet potato puree has an average value of 4.53 with the sweet category, and steamed bakpia with the addition of *puree* 75% orange sweet potato has an average value of 4.86 in the sweet category. The results of statistical analysis showed that there was no effect of the addition of *orange sweet potato puree* in the manufacture of steamed bakpia on the sensory quality of the aspect of the sweetness of the sponge where X calculation = 4.10 < X table = 5.991 at a significant level $\alpha = 0.05$ with a degree of confidence (df) = 3-1 = 2. Steamed bakpia is not affected by the addition of *orange sweet potato puree* which has a natural sweetness because of its taste that matches the taste characteristics of steamed bakpia.

Freshness Level of Sponge

The results of sensory quality tests on the aspect of the sweetness level of sponge against steamed bakpia with the addition of *orange sweet potato puree* can be seen in the following image:

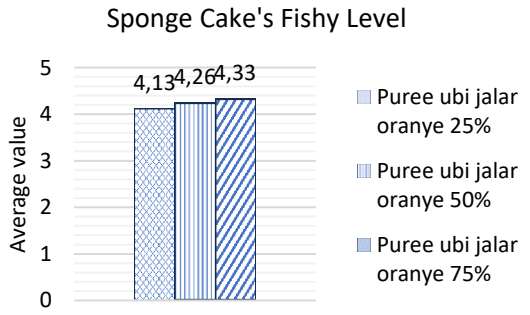

Figure 7. Graph of the Aspect Value of the Sweetness Level of Sponge

Based on the results of the calculation, the average calculation of steamed bakpia with the addition of *25% orange sweet potato puree has an average value of 4.13 with the category of not fishy eggs, steamed bakpia with the addition* of 50% orange sweet potato puree has an average value of 4.26 with the category of not fishy eggs, and steamed bakpia with the addition of *puree* 75% orange sweet potato has an average value of 4.33 in the category of not fishy eggs. The results of statistical analysis showed that there was no effect of the addition of *orange sweet potato puree* in the manufacture of steamed bakpia on the sensory quality of the breadth level of the sponge where X count = 2.52 < X table = 5.991 at a significant level of $\alpha = 0.05$ with a degree of confidence (df) = 3-1 = 2. In making this steamed bakpia uses good quality raw materials and goes through a suitable manufacturing process so that you get results that are in accordance with the standards.

Softness of Sponge

The results of sensory quality tests on the softness of sponge against steamed bakpia with the addition *of orange sweet potato puree* can be seen in the following image:

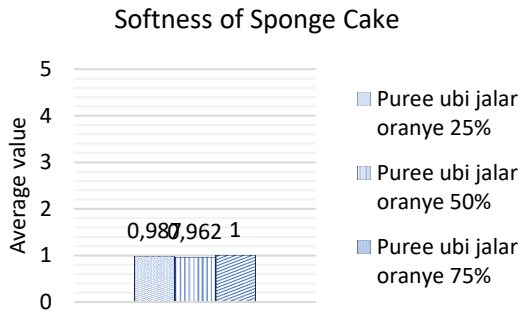

Figure 8. Chart of Bolu Softness Aspect Value Chart

Based on the results of the calculation, the average calculation of steamed bakpia with the addition of 25% orange sweet potato puree has an average value of 4.53 with the very tender category, steamed bakpia with the addition of *50% orange sweet potato puree has an average value of 4.4 with the soft category, and steamed bakpia with the addition of puree* 75% orange sweet potatoes have an average value of 4.73 in the very tender category. The results of statistical analysis showed that there was no effect of the addition of *orange sweet potato puree* in the manufacture of steamed bakpia on the sensory quality of the softness of the sponge where X calculated = 3.34 < X table = 5.991 at a significant level of $\alpha = 0.05$ with the degree of confidence (df) = 3-1 = 2. Orange sweet potatoes have a soft texture and good chewiness, making them suitable for use as an additive to products such as steamed bakpia.

Smoothness of the Outer Surface of the Sponge

The results of sensory quality tests on the smoothness of the outer surface of the sponge against steamed bakpia with the addition *of orange sweet potato puree* can be seen in the following image:

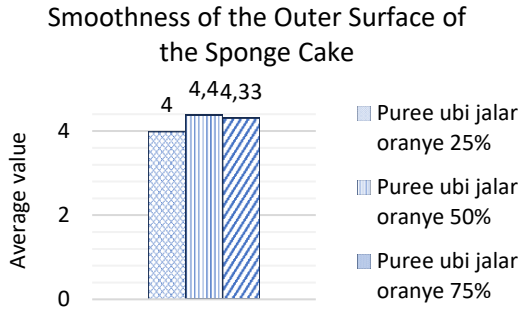

Figure 9. Graph of the Smoothness of the Outer Surface of the Sponge

Based on the calculation results, the average calculation of steamed bakpia with the addition of 25% orange sweet potato puree has an average value of 4 with the category of the outer surface of the smooth sponge, steamed bakpia with the addition of *50% orange sweet potato puree has an average value of 4.4 with the category of the outer surface of the smooth sponge, and steamed bakpia with the addition of puree* 75% orange sweet potato has an average value of 4.33 with the category of smooth sponge outer surface. The results of statistical analysis showed that there was no effect of the addition of *orange sweet potato puree* in the manufacture of steamed bakpia on the sensory quality of the smoothness of the outer surface of the sponge where X calculation = 3.16 < X table = 5.991 at a significant level of $\alpha = 0.05$ with the degree of confidence (df) = 3-1 = 2. In the process of making steamed bakpia, sweet potatoes are mashed into puree and mixed first with liquid ingredients, namely milk, so that it does not affect the smoothness of the outer surface of the bakpia.

CONCLUSION

Based on the results of the study, it can be concluded that the addition of orange sweet potato puree does not have a significant effect on the development of *steamed bakpia*, but it has a real effect on stability, especially at the levels of addition of 50% and 75%, and has a significant influence on sensory quality, particularly in the aspects of color, aroma, sweetness, softness, and smoothness of the sponge. The addition of orange sweet potato puree at 75% resulted in the best sensory characteristics and was most liked by the panelists, so it is recommended as the optimal formulation in the development of *steamed bakpia* products. For further development, it is recommended to conduct additional research related to the shelf life of the products, more comprehensive nutritional analysis, and market tests so that this orange sweet potato-based product can be widely accepted by consumers.

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