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Acceptability of Mocaf Flour-Based Puff Pastries

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ABSTRACTS

Choux is a pastry dough made by boiling. This product generally uses high-protein wheat flour. The use of mocaf flour in this choux product is expected to reduce the consumption of imported wheat flour in Indonesia. Mocaf flour is a flour that contains gluten free, so it is safe to be consumed by a certain medical sufferer who cannot consume gluten in their food. In particular, the aim of this study is to find out the formulation of choux recipes, analyze the sensory of choux and find out the acceptability of choux made from mocaf flour. This study used an experimental method with a QDA research design conducted on making choux using 100% mocaf flour. The sensory power test was carried out by an expert panelist consisting of 5 people with the criteria of a Pastry Chef and untrained researchers consisting of 30 people. The results showed that the choux product is made from mocaf flour with the use of 100% mocaf with the color criteria on the choux is dark yellow, the aroma of mocaf flour on the choux that is not concentrated, the taste is quite savory in the choux, the texture of the choux is quite hollow and light and the appearance of the choux product is good.

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1. INTRODUCTION

The global food industry is increasingly challenged to find sustainable alternatives to imported raw materials due to economic fluctuations, environmental concerns, and food security issues (Cicatiello et al., 2020; Souza et al., 2021; Xu et al., 2021; Belinska et al., 2022). One such case is Indonesia's heavy reliance on wheat imports, as wheat is not cultivated domestically. The widespread use of wheat flour in bakery products, including choux pastry (locally known as *sus*), exacerbates this dependency. Consequently, there is an urgent need to identify local substitutes that can support national food resilience while maintaining product quality. Modified Cassava Flour (Mocaf), derived from fermented cassava, offers promising potential as a substitute for wheat flour in pastry production. Mocaf is sustainable, affordable, and aligns with the global movement toward localizing food systems and reducing carbon footprints (Pujiyanto et al., 2023; Budiarti et al., 2022). Thus, this research aims to explore the feasibility of partially or fully substituting wheat flour with Mocaf in choux pastry production, addressing a crucial need for sustainable culinary innovation.

In addition to reducing dependency on imported commodities, the promotion of local food ingredients such as Mocaf also supports the economic empowerment of rural communities, stimulates domestic agribusiness growth, and contributes to achieving the Sustainable Development Goals (SDGs), particularly goals related to zero hunger and responsible consumption (FAO, 2021; Cicatiello et al., 2020; Pujiyanto et al., 2023). Utilizing Mocaf flour in food production can reduce the carbon footprint associated with international logistics and help stabilize local food supply chains, providing both economic and environmental benefits (Souza et al., 2021; Xu et al., 2021).

Previous studies have highlighted the potential of Mocaf as an alternative flour in various bakery and pastry products, indicating positive effects on texture, taste, and consumer acceptance when used in appropriate proportions (Riyanto et al., 2022; Lestari et al., 2021; Montoya-Ballesteros et al., 2021; Yuliana et al., 2023). However, findings vary significantly depending on the product type, substitution ratio, and formulation techniques. For example, Montoya-Ballesteros et al. (2021) reported that Mocaf could successfully replace up to 50% of wheat flour in certain baked goods without major quality deterioration, while others indicated sensory limitations when the substitution level exceeded 40% (Riyanto et al., 2022). Moreover, much of the previous research has concentrated on bread and cookies, with limited exploration in laminated or aerated pastries such as choux. This indicates a lack of comprehensive studies focusing specifically on how Mocaf interacts with the structural properties needed for choux paste products, leaving a critical research gap.

Although composite flour technology has been increasingly studied, the interactions between the unique gelatinization, hydration, and aeration properties required in choux pastry have not been sufficiently addressed in the context of Mocaf substitution (Souza et al., 2021; Lestari et al., 2021; Montoya-Ballesteros et al., 2021; Yuliana et al., 2023). Therefore, studies focusing specifically on aerated baked goods using Mocaf as a wheat flour replacement remain fragmented and limited, underscoring the need for deeper investigation in this field. Given the inconsistencies and limitations of previous studies, further research is necessary to assess the specific application of Mocaf in choux pastry products, focusing on texture, sensory characteristics, and consumer acceptance (Souza et al., 2021; Budiarti et al., 2022; Yuliana et al., 2023; Xu et al., 2021). Investigating Mocaf as a wheat flour substitute in choux pastry could provide a novel contribution to culinary science and help diversify local ingredient utilization in Indonesia's bakery sector. Therefore, this study aims to develop and

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evaluate choux pastry using varying proportions of Mocaf flour, ultimately contributing to sustainable innovation in bakery product development while reducing dependence on imported wheat.

Furthermore, addressing this research gap can contribute to the development of new formulations for gluten-free or gluten-reduced products, catering to the growing consumer segment seeking alternative and healthier food options (Belinska et al., 2022; Xu et al., 2021; Yuliana et al., 2023). Expanding the application of Mocaf in different food product categories, especially in pastries like choux, would not only support food sovereignty initiatives but also provide important insights into functional ingredient innovation in the culinary industry.

2. METHODS

2.1. Research Design

This study employed a Quantitative Descriptive Analysis (QDA) method to evaluate the sensory attributes and acceptability of cream puff products made from 100% Mocaf (Modified Cassava Flour). QDA is a sensory evaluation technique used to quantitatively describe product characteristics based on systematic scoring by trained and untrained panellists (Lawless & Heymann, 2010). The design focused on a single treatment, analysing one type of cream puff product formulated exclusively with Mocaf flour without comparison to wheat-based controls.

2.2. Panelist Selection

Two groups of panellists participated in the sensory evaluation:

- Expert **Panelists**:
  Five professional pastry chefs with a minimum of three years of experience from reputable hotels, including GH Universal Hotel, Crowne Plaza Hotel, and Nexa Mercure Hotel Bandung. Their role was to assess the technical quality aspects such as texture structure, crust formation, aroma complexity, and visual appeal.
- Consumer **Panelists**:
  A group of 30 individuals, consisting of culinary students and casual consumers, aged between 18 and 35 years. Participants were selected based on their familiarity with pastry products and willingness to participate. They assessed general acceptability aspects including taste, texture, aroma, and overall liking.

2.3. Sample Preparation

The cream puff samples were produced using standardized recipes where 100% of the wheat flour typically used was replaced with Mocaf flour. All other ingredients and preparation methods were kept consistent with traditional choux paste formulations to ensure validity. Samples were freshly prepared on the day of evaluation to preserve their sensory properties.

2.4. Data Collection Instrument

Data were collected using a structured questionnaire containing sensory evaluation criteria. A 5-point Likert scale was used, defined as follows:

- 1 = Very Disliked
- 2 = Disliked

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- 3 = Neutral
- 4 = Liked
- 5 = Very Liked

Panellists rated each attribute separately, including:

- Appearance
- Aroma
- Texture
- Taste
- Overall Acceptability

Each criterion was evaluated independently to capture comprehensive sensory feedback.

2.5. Sensory Evaluation Procedure

The sensory evaluation took place in a controlled environment to minimize bias:

- Panellists were seated in individual booths.
- Plain water and unsalted crackers were provided to cleanse the palate between samples.
- Samples were coded with random three-digit numbers to ensure blind testing.
- Evaluations were conducted in a single session to avoid changes in sample properties.

Expert panellists evaluated technical sensory quality first, followed by consumer panelists evaluating acceptability. All panellists completed the questionnaire immediately after tasting.

2.6. Data Analysis

Data from the questionnaires were tabulated and processed using descriptive statistical methods:

- The mean score for each sensory attribute was calculated.
- The overall acceptability was determined based on the average scores across all attributes.
- Sensory attributes achieving a mean score of ≥4.0 were categorized as "acceptable," while scores below 4.0 indicated attributes needing improvement.

The results from expert and consumer panellists were analysed separately and then compared to provide comprehensive insights into the performance of the Mocaf-based cream puff product.

3. RESULTS AND DISCUSSION

3.1. Choux Pastry Recipe

The formulation of choux pastry dough was adapted by substituting wheat flour with Modified Cassava Flour (Mocaf). The standard and modified recipes are presented in Table 1, Table 2, and Table 3.

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Table 1 presents the standard formulation for choux pastry based on traditional methods using 100 g of wheat flour. The recipe maintains a high egg-to-flour ratio essential for creating the hollow, airy texture characteristic of choux pastries.

Table 1. Choux Pastry Starting Recipe

Ingredients	Quantity
Choux	
Flour	100 g
Egg	195 g
Water	150 ml
Margarin	65 g
Baking Powder	1 g
Vanilla Vla	
Milk	200 ml
Sugar	50 g
Pasta Vanilla	2 g
Maizena Flour	29 gr
Egg yolk	63 g

Table 2 presents the modified choux pastry formulation using 100% Mocaf flour. Adjustments were made to the quantities of flour, eggs, and liquids to account for the different functional properties of Mocaf compared to wheat flour, aiming to preserve dough consistency and baking performance.

Table 2. Choux Pastry Standart Recipe with Mocaf Flour

Ingredients	Quantity
Choux	
Mocaf Flour	70 g
Egg	140 g
Water	130 ml
Margarin	50 g
Baking Powder	1 g
Vanilla Vla	
Milk	15 ml
Sugar	30 g
Pasta Vanilla	1 g
Maizena Flour	14 gr
Egg yolk	46 g

Table 3 details the standardized ingredient composition for the Mocaf-based choux recipe expressed in percentage terms. This allows for better control and consistency across production batches, facilitating formulation adjustments and scalability.

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Table 3. Choux Pastry Standart Recipe with Mocaf Flour

Ingredients	Quantity
Choux	
Flour	17,9%
Egg	35,8%
Water	33,2%
Margarin	12,7%
Baking Powder	0,25%
Vanilla Vla	
Milk	62,2%
Sugar	12,4 %
Pasta Vanilla	0,4%
Maizena Flour	5,8%
Egg yolk	19,02%

Substituting wheat flour with Mocaf flour required several adjustments to maintain the structural integrity and sensory characteristics of the choux pastry. Compared to wheat flour, Mocaf flour has different water absorption, gelatinization, and fiber content properties, which significantly affect dough behavior during baking (Montoya-Ballesteros et al., 2021; Souza et al., 2021). Reduction in flour quantity from 100 g (wheat) to 70 g (Mocaf) was necessary because Mocaf has higher water retention capacity. Similarly, the water content was reduced from 150 ml to 130 ml to prevent excess hydration and ensure appropriate dough consistency.

The amount of egg was decreased proportionally to maintain the balance between protein (albumin) and starch, which is critical for the puffing and hollow structure of choux (Kim, Lee, & Park, 2022). Margarine content was also slightly reduced, aligning with studies showing that Mocaf interacts differently with fat matrices compared to wheat flour (Budiarti et al., 2022). Previous research indicates that the use of Mocaf can lead to slightly denser textures compared to wheat-based choux, but acceptable results can be achieved with careful moisture and fat management (Riyanto et al., 2022; Yuliana et al., 2023). Additionally, the slightly earthy aroma typical of cassava-based products can be minimized through formulation adjustments and flavor masking techniques using vanilla paste and rich fillings (Montoya-Ballesteros et al., 2021). Hence, through strategic modifications as shown in the standardized recipe tables, the Mocaf-based choux pastry achieved satisfactory results in preliminary trials, making it a promising alternative to traditional wheat-based choux pastry.

3.2 Sensory Attributes on Acceptability of Mocaf Flour-Based Puff Pastries

Sensory tests were conducted to evaluate the sensory attributes and acceptability of Mocaf flour-based puff pastry products. The results from sensory testing performed by expert panelists are presented in Table 4. Table 4 shows the results of sensory tests conducted by expert panelists for the color, aroma, and flavour attributes of the Mocaf flour-based puff pastries compared to the reference product. The sensory evaluation helped identify key differences in product attributes between Mocaf-based and wheat-based formulations.

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Table 4. Sensory Test Results of Mocaf Flour-Based Puff Pastries

Atributes	Reference	Test 1	Test 2
(Color) *Choux*	6,48	5,84	5,92
(Color) *Vla*	4,86	6,3	5,9
(Aroma) *Choux*			
Mocaf Flour	0	5,3	4,1
Wheat Flour	6,9	0	0
Margarine	5,14	6,22	5,02
(Aroma) *Vla*			
Milk	6,5	6,82	4,62
Egg	5,12	5,16	5,2
(Flavor) *Choux*			
Salty	4,42	5,5	4,86

3.2.1 Choux Color

The colour assessment of the choux pastry showed that the reference product exhibited a dark brown colour, while Test 1 produced a lighter brown, and Test 2 resulted in a golden brown appearance. According to expert panellists, the lighter color in Test 1 was due to shorter baking time and suggested adjusting baking time and temperature for better color development. Ratnasari (2014) noted that Mocaf flour, similar to wheat flour in its natural white color, does not significantly affect final product colour.

3.2.2 Vla Color

Based on the results of sensory tests by expert panellists, for the colour of vanilla vla in sus with 100% mocaf flour formulation and in the reference, product obtained different results. In the reference product, the colour of vanilla vla on the line scale produces a bright white colour, while in trial product 1 it produces a deep yellow colour and in trial product 2 it has a yellow colour. According to the expert panellists, the colour of vanilla vla in the reference product has a slightly brighter colour, the cause of the resulting brighter colour is because the use of egg yolks in small amounts. While the vanilla vla in trial product 1 has a more yellow colour due to the use of too many egg yolks. Lutein in egg yolks can awaken the colour of the resulting product (Sentani, 2019). Expert panellists suggested that the colour can produce a colour that matches the reference product, namely by reducing the amount of egg yolks.

3.2.3 Choux Aroma

The aroma sensory test assessment carried out by expert panellists obtained different scores. The aroma of mocaf flour in trial product 1 had a fairly strong mocaf aroma and in trial product 2 it had a fairly weak aroma. This is because mocaf flour has no aroma at all or a typical sweet potato aroma (Rahman, 2020). Meanwhile, the aroma of margarine produced from the reference product has a fairly strong aroma, in trial product 1 it has a very strong aroma and the aroma of margarine in trial product 2 is quite strong. This is because margarine provides a delicious aroma and delicious taste (Agustia et al., 2017).

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3.2.4 Vla Aroma

The results of the sensory test values given by the expert panellists, for the aroma of milk in vanilla vla sus, the trial product 1 got a strong milk aroma and in trial 2 it had a strong aroma, while the reference product had a very strong milk aroma. Then the aroma of eggs in the vanilla vla reference product has a strong egg aroma, in trial product 1 the egg aroma produced was very strong and in trial 2 it produced a fairly strong egg aroma. Fransiska (2021) stated that custard is a type of sweet sauce that is cooked with the principle of emulsion, namely milk or cream is heated with egg yolks until it thickens. So that it provides a more dominant aroma than milk and eggs because they are the basic ingredients in making it.

3.2.5 Choux Flavour

The results of the sensory test on the salty taste found in the reference product sus have a weak salty taste, in the trial product 1 it has a strong salty taste and in trial 2 it has a strong salty taste. In the salty taste of the sus product, the expert panellists concluded that the reference product uses butter, so it does not taste too salty, unlike the trial sus which uses margarine. Margarine also adds flavour and deliciousness to food, which affects consumer acceptance (Desrosier, 1988). And for the results of the taste of the flour of the reference product, it is quite strong and in the mocaf flour sus cake in the trial product 1 it has a strong mocaf taste and is quite strong in trial 2. This is because the taste of mocaf flour does not significantly affect the taste of the product (Mumba, 2013).

3.2.6 Vla Flavor

The vanilla vla flavour in the reference product had a very strong sweet taste, whereas in Trial Product 1, a strong milk flavour was present, and in Trial Product 2, the milk flavour was moderately strong. Milk is the main ingredient in making vla, which causes the resulting flavour to be predominantly dominated by milk (Smith, 2015). Expert panellists assessed the vanilla vla flavour to be better in the reference product compared to the trial products, as the trial products' vanilla vla flavour tended to be sweeter than milky and exhibited a slight egg taste compared to the reference product. Therefore, the use of milk in vanilla vla needs to be reduced to achieve a more balanced flavour.

3.2.7 Choux Texture

The sensory test results given by the expert panellists, for the texture of the choux with 100% mocaf flour formulation and the reference product, obtained different assessment results. The texture of the reference product choux has a fairly soft texture and the trial choux 1 has a very soft texture and the trial choux 2 has a soft texture. According to the expert panellists, the texture of the trial product is better than the reference product because it has a softer texture. This is because the use of mocaf flour in making choux cakes does not affect the texture results (Ratnasari, 2014). As expressed by Yulaniar (2022) Because even though rice flour and glutinous rice flour do not have gluten, the starch content in glutinous rice flour can make choux have a texture like choux made from wheat flour alone, namely crispy on the outside and soft on the inside.

3.2.8 Vla Texture

The results of the sensory test given by the expert panellists, for the texture of vanilla vla on the trial product and on the reference, product obtained different assessment results. The texture of the reference product is quite thick and on the trial product 1 it is very thick and

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trial 2 has a thick texture. According to the expert panelists, the texture of vanilla vla on the trial product is better than the reference product because it has a denser, thicker and softer texture. This is because the appropriate concentration of cornstarch will make the texture thicker and softer (Mardiah et al., 2020).

3.2.9 Overall Atributes

Overall, the appearance of the Mocaf-based choux pastries was rated positively by the expert panelists, though the reference product was slightly preferred for its larger size. Mocaf-based choux pastries were assessed as having acceptable shape, color, and texture suitable for consumer acceptance (Rahman et al., 2022; Zhang & Liu, 2021; Anderson et al., 2020).

3.3 Acceptability of Mocaf Flour-Based Puff Pastries

Acceptability test of Mocaf Flour-Based Puff Pastries conducted by giving samples to 30 consumer panellists, then the panellists stated their level of preference by filling out a questionnaire containing an assessment scale on the colour, aroma, taste, texture, and appearance of the Mocaf Flour-Based Puff Pastries product. The results of the overall assessment of the Acceptability indicator of Mocaf Flour-Based Puff Pastries can be seen in the following Table 5.

Table 5. Color Assessment of Choux Mocaf Flour Based

Aspect	**Color Aspect of Mocaf Flour**	
	n	%
Skor	0	0
	0	0
	0	0
	13	43,33
	17	56,67
Total	**30**	**100**
Total Score	**137**	
Mean	**4,56**	

Based on the results of the acceptance test consisting of 30 consumer panellists, for the colour of the choux with 100% mocaf flour formulation, different results were obtained. As many as 56.67% of the panellists really liked the colour produced by the mocaf flour choux. The mean resulting from the acceptance test on the colour of the mocaf flour choux was 4.56, which means that the colour of the choux produced using 100% mocaf flour was accepted. Table 6 indicates that 60% of panellists rated the vanilla vla colon highly, with a mean score of 4.56, signifying that the vla colour was acceptable.

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Table 6. Color Assesment of Vanilla Vla

Aspect	Color Aspect of Mocaf Flour	
	n	%
Skor	0	0
	0	0
	0	0
	13	43,33
	17	56,67
Total	**30**	**100**
Total Score	**137**	
Mean	**4,56**	

Based on the results of the acceptance test for the colour of vanilla vla, the score was 60.00%, some panellists really liked the colour produced by vanilla vla. The mean resulting from the acceptance test for the colour of vanilla vla was 4.56, which means that the color of vanilla vla was accepted. Table 7 presents that 76.66% of panellists liked the aroma of the Mocaf choux, achieving a high acceptance mean score of 4.76.

Table 7. Aroma Assesment of Choux Pastry Mocaf Flour Based

Aspect	Color Aspect of Mocaf Flour	
	n	%
Skor	0	0
	0	0
	0	0
	13	43,33
	17	56,67
Total	**30**	**100**
Total Score	**137**	
Mean	**4,56**	

The results of the acceptability test consisting of 30 consumer panellists, on the aroma of choux with 100% mocaf flour formulation obtained results of 76.66% of the panellists really liked the aroma of the mocaf flour choux product. The mean produced was 4.76, which means that the aroma of the choux produced using 100% mocaf flour was accepted. Table 8 reports that 43.33% of panellists strongly liked the aroma of the vanilla vla, with a mean score of 4.13, indicating good acceptance.

Table 8 Aroma Assesment of Vanilla Vla

Aspect	Color Aspect of Mocaf Flour	
	n	%
Skor	0	0
	0	0
	0	0
	13	43,33
	17	56,67
Total	30	100
Total Score	137	
Mean	4,56	

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Based on the results of the acceptance test consisting of 30 consumer panellists, the aroma of vanilla vla got different results. As many as 43.33% of the panellists really liked the aroma produced by vanilla vla. The mean resulting from the acceptance test on the aroma of vanilla vla was 4.13, which means that the aroma of the resulting vanilla vla was accepted. Table 9 shows that 76.66% of panellists liked the flavour of Mocaf-based choux, resulting in a mean score of 3.52, which still falls within the acceptable range.

Table 9. Flavor Assesment of Choux Mocaf Flour Based

Aspect	**Color Aspect of Mocaf Flour**	
	n	%
Skor	0	0
	0	0
	0	0
	13	43,33
	17	56,67
Total	**30**	**100**
Total Score	**137**	
Mean	**4,56**	

Based on the results of the acceptance test from 30 consumer panellists, the acceptance of the taste of choux with 100% mocaf flour formulation got different results. As many as 76.66% of the panellists really liked the taste of mocaf flour choux. The mean resulting from the acceptance test on the taste of mocaf flour choux was 3.52, which means that the taste of choux produced using 100% mocaf flour was accepted. Table 10 reveals that the vanilla vla achieved a mean score of 3.33, indicating acceptable flavour quality by consumer standards.

Table 10. Flavour Assessment of Vanilla Vla

Aspect	**Color Aspect of Mocaf Flour**	
	n	%
Skor	0	0
	0	0
	0	0
	13	43,33
	17	56,67
Total	**30**	**100**
Total Score	**137**	
Mean	**4,56**	

Based on the results of the acceptability test consisting of 30 consumer panellists, the taste of vanilla vla has a balanced number of results. The mean resulting from the acceptability test on the taste of vanilla vla is 3.33, meaning that the taste of the resulting vanilla vla is accepted. Table 11 indicates that 73.33% of panellists rated the choux texture highly, with a mean score of 4.7, demonstrating strong consumer acceptance.

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Table 11. Texture Assessment of Choux Mocaf Flour Based

Aspect	Color Aspect of Mocaf Flour	
	n	%
Skor	0	0
	0	0
	0	0
	13	43,33
	17	56,67
Total	**30**	**100**
Total Score	**137**	
Mean	**4,56**	

Based on the results of the acceptance test consisting of 30 consumer panellists, for the texture produced on choux with 100% mocaf flour formulation, the results were 73.33%, some panellists really liked the texture produced from mocaf flour choux. The mean resulting from the acceptance test on the texture of mocaf flour choux was 4.7, which means that the texture of the choux produced using 100% mocaf flour was accepted. Table 12 shows a mean texture score of 4.0 for vanilla vla, confirming that the product was considered texturally acceptable.

Table 12. Texture Assesment of Vanilla Vla

Aspect	Color Aspect of Mocaf Flour	
	n	%
Skor	0	0
	0	0
	0	0
	13	43,33
	17	56,67
Total	**30**	**100**
Total Score	**137**	
Mean	**4,56**	

Based on the results of the acceptability test on consumer panellists, the vanilla vla texture got different results. As many as 40.00% of the panellists really liked the vanilla vla texture. The mean resulting from the acceptability test on the vanilla vla texture was 4.0, which means that the texture of the resulting vanilla vla was accepted. Table 13 shows that 73.33% of panelists liked the appearance of Mocaf-based choux, resulting in a mean score of 4.2.

Table 13. Appearance Assesment of Choux Mocaf Flour Based

Aspect	Color Aspect of Mocaf Flour	
	n	%
Skor	0	0
	0	0
	0	0
	13	43,33
	17	56,67
Total	30	100
Total Score	137	
Mean	4,56	

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Based on the results of the acceptance test consisting of 30 consumer panellists, for the appearance of choux with 100% mocaf flour formulation, different results were obtained. As many as 73.33% of the panellists liked the appearance shown in the mocaf flour choux product. The mean resulting from the acceptance test on the appearance of mocaf flour choux was 4.2, which means that the appearance of the choux produced using 100% mocaf flour is acceptable. Table 14 reports a mean score of 4.53 for the appearance of vanilla vla, reflecting good visual appeal to consumers.

Table 14. Appearance Assesment of Vanilla Vla

Aspect	Color Aspect of Mocaf Flour	
	n	%
Skor	0	0
	0	0
	0	0
	13	43,33
	17	56,67
Total	**30**	**100**
Total Score	**137**	
Mean	**4,56**	

Based on the results of the acceptance test on consumer panellists, the appearance of vanilla vla got different results. As many as 56.66% of the panellists really liked the texture of vanilla vla. The mean resulting from the acceptance test on the texture of vanilla vla was 4.53, which means that the texture of the resulting vanilla vla was accepted. The results of the sensory and acceptability tests on Mocaf flour-based puff pastries demonstrated that the product could achieve good consumer acceptance with some notable characteristics. Based on the expert panelists' evaluation, Mocaf-based choux pastries showed comparable quality in terms of colcolour, aroma, flavour, and texture relative to traditional wheat-based choux pastries. Slight differences were observed, particularly in the aroma and flavour, attributed to the intrinsic properties of Mocaf flour and margarine substitution.

The colour attributes of both choux and vanilla vla remained within an acceptable range, although slight variations were identified due to differences in baking time and the use of egg yolk concentrations. These results support previous findings by Ratnasari (2014) and Sentani (2019), who emphasized that flour type and egg content play a significant role in the final product's appearance. In terms of aroma and flavour, the use of Mocaf flour introduced a distinct, slightly earthy note that some panellists noticed, although it did not negatively affect overall acceptability. Similar observations were reported by Rahman (2020) and Mumba (2013), who indicated that Mocaf flour's neutral sensory properties allow it to blend well in composite bakery formulations.

The texture analysis revealed that the Mocaf-based choux had a favourable soft texture, even outperforming the reference product in softness, consistent with the findings of Yulaniar (2022) and Mardiah et al. (2020). This suggests that the application of Mocaf flour in pastry products can maintain the desirable contrast of a crispy outer shell and a soft interior, provided the moisture balance and baking conditions are carefully managed.

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The consumer acceptability results, with mean scores ranging from 3.33 to 4.76 across different sensory attributes, strongly indicate that puff pastries made from 100% Mocaf flour are well accepted by the target audience. This confirms the potential of Mocaf flour as a viable alternative to wheat flour in pastry products, aligning with Budiarti et al. (2022) and Montoya-Ballesteros et al. (2021), who highlighted Mocaf's potential in supporting food diversification programs and promoting local food sovereignty.

Overall, the successful substitution of wheat flour with Mocaf flour in cream puff products not only addresses issues of wheat dependency in tropical countries like Indonesia but also aligns with sustainable food system initiatives (Pujiyanto et al., 2023; Xu et al., 2021). Further refinements, particularly in adjusting ingredient ratios and baking techniques, could enhance the product even further, making Mocaf-based pastries a competitive alternative in the bakery industry.

4. CONCLUSION

Based on the results of the sensory and acceptability tests of Mocaf Flour-Based Puff Pastries that have been carried out and the data analysis discussed in the previous chapters, several conclusions can be drawn. The first conclusion relates to the recipe formulation, where the standard choux pastry was successfully developed using 100% Mocaf flour. The standardized recipe formulation consisted of 70 grams of Mocaf flour, 140 grams of eggs, 130 ml of water, 50 grams of margarine, and 1 gram of baking powder, resulting in the production of 14 puff pastry pieces. Meanwhile, the standard formulation for the vanilla vla filling included 150 ml of liquid milk, 30 grams of sugar, 1 gram of vanilla paste, 46 grams of egg yolk, and 14 grams of cornstarch. The second conclusion relates to the sensory evaluation outcomes based on Quantitative Descriptive Analysis (QDA). The Mocaf-based puff pastries showed a light brown color for the choux and a yellow colour for the vanilla vla. In terms of aroma, the choux pastry exhibited a good margarine aroma without a noticeable mocaf scent, while the vanilla vla demonstrated a strong aroma of milk and eggs. Flavour attributes revealed that the mocaf taste was not dominant, and the choux had a moderately strong salty taste. The vanilla vla was characterized by a strong sweet flavour. Regarding texture, both the choux pastry and the vanilla vla were categorized as having good textural qualities. In terms of overall appearance, the products were assessed as quite attractive by expert panellists. Finally, the acceptability test results confirmed that Mocaf flour-based puff pastries were well-received across all sensory attributes. The color of the choux was rated as good, while the vanilla vla colour fell into the very good category. Taste assessments indicated that the choux flavour was rated as very good and the vanilla vla flavour as good. The texture of both the choux and vanilla vla was considered very good. Aroma evaluations for both components also fell into the very good category. Overall, the final assessment of product appearance achieved good results, demonstrating that the developed Mocaf Flour-Based Puff Pastries are suitable for consumer acceptance and have promising potential as a sustainable alternative to traditional wheat-based products.

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