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Substitution of Yellow Pumpkin Flour (Cucurbita Moschata) in Making Mille Crepes

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ABSTRACTS

This research aims to determine the acceptability of mille crepes products substituted with pumpkin flour, a local food ingredient known for its high nutritional value. Despite the potential benefits, pumpkin consumption in Indonesia remains relatively low, averaging less than 5 kilograms per capita per year. Processing pumpkin into flour is one solution to extend its shelf life and diversify its use in food products, including mille crepes. This study employed an experimental method, which included stages such as recipe analysis, experimental trials, Quantitative Descriptive Analysis (QDA) organoleptic tests, hedonic organoleptic tests, the creation of a standard recipe, and final organoleptic evaluations. The research formulation involved comparing different ratios of wheat flour and pumpkin flour across four treatments, labeled MLCB 1, MLCB 2, MLCB 3, and MLCB 4. The results of the QDA test revealed that substituting pumpkin flour significantly enhanced several sensory attributes, including shape, texture, color, aroma, and taste. Among the four variations, the MLCB 4 formulation, which contained the highest proportion of pumpkin flour, was the most preferred by panelists. Furthermore, the hedonic test confirmed that the mille crepes with pumpkin flour substitution were well accepted by consumers, demonstrating the potential of pumpkin flour as a viable alternative ingredient in modern bakery products. These findings suggest that pumpkin flour can not only improve the nutritional profile of mille crepes but also enhance their sensory appeal.

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1. INTRODUCTION

Pumpkin production in Indonesia continues to show significant potential; however, consumption levels remain relatively low. Research by Pratama and Aulia (2021) highlights that pumpkin utilization is predominantly limited to traditional food products, such as dodol, compote, soup, pudding, and various wet cakes, which generally possess a short shelf life and limited market penetration. Widyastuti and Yulianingsih (2022) further emphasize that average pumpkin consumption in Indonesia is below 5 kilograms per capita annually, despite fluctuating production trends from 2010 to 2019, with peak production reaching 603,325 tons in 2016. Supporting this, data from the Indonesian Ministry of Agriculture (2021) report that national pumpkin yields consistently range between 20,000 and 21,000 tons per hectare per year.

Yellow pumpkin (Cucurbita moschata) is recognized as a local food commodity rich in nutritional value, offering an abundant source of dietary fiber, beta-carotene, vitamin C, vitamin K, vitamin A, vitamin B3, and essential minerals such as iron, potassium, and magnesium (Azizah et al., 2023; Sari et al., 2022). However, the perishability of fresh pumpkin remains a significant barrier to its broader market utilization (Sulaeman et al., 2021). To address this limitation, pumpkin can be processed into pumpkin flour, significantly increasing its shelf life while preserving its nutritional content (Rahman et al., 2022). Pumpkin flour is known for its functional properties, particularly its water absorption, gelatinization behavior, and textural enhancement in food products (Salim & Putri, 2021; Hasanah et al., 2022).

Several studies have highlighted the potential of pumpkin flour as a food ingredient capable of improving the nutritional profile and sensory properties of bakery and dessert products (Zhao et al., 2023; Alqahtani et al., 2022). Due to its gluten-mimicking proteins, pumpkin flour exhibits strong dough-forming properties, producing a soft and elastic texture favorable for product innovation (Ningsih et al., 2022; Fernandes et al., 2023). Additionally, the high beta-carotene content in pumpkin flour naturally enhances the color of food products, reducing dependence on artificial colorants (Kurniawan & Safitri, 2021; Mwangi et al., 2023).

Among various food innovations, mille crepes present a unique opportunity for the application of pumpkin flour. Mille crepes, a French-originated layered dessert characterized by over 20 thin crepes interspersed with light cream, have gained significant popularity in contemporary culinary markets due to their soft, melt-in-the-mouth texture (Rahmawati & Sukmawati, 2023; Zhang & Chen, 2021). However, traditional mille crepes made solely with wheat flour often result in a thinner, drier texture, suggesting room for improvement through ingredient substitution (Zhou et al., 2021).

Substituting wheat flour with pumpkin flour offers multiple advantages, including enhanced softness, moisture retention, improved nutritional profile, and the addition of appealing natural color (Puspitasari et al., 2023; Tran et al., 2022). Studies also suggest that incorporating local, nutrient-dense ingredients like pumpkin flour can support sustainable food production and promote the utilization of indigenous crops (Ismail et al., 2022; Santoso et al., 2021).

Considering these promising potentials, this research, conducted by students from the Culinary Education Study Program at Universitas Pendidikan Indonesia, aims to explore the substitution of yellow pumpkin flour in the formulation of mille crepes. Specifically, the objectives of this study are:

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(a) To determine the standard formulation for making mille crepes substituted with pumpkin flour,
(b) To analyze the organoleptic hedonic test results for mille crepes substituted with pumpkin flour in terms of color, aroma, taste, and texture, and
(c) To assess consumer acceptance of mille crepes substituted with pumpkin flour based on sensory attributes.

This study is expected to contribute to the diversification of pumpkin-based food products and enhance the value of local agricultural commodities through innovative culinary applications.

2. METHODS

2.1. Research Design

This study employed an experimental research method with a quantitative approach. The research design was categorized as a true experiment, where controlled trials were conducted to produce mille crepes products by substituting a portion of wheat flour with pumpkin flour. The objective was to analyze the consumer acceptability and sensory quality of mille crepes enriched with pumpkin flour. Quantitative Descriptive Analysis (QDA) and hedonic organoleptic tests were used to evaluate the innovation formula and product acceptance of each.

2.2. Research Procedures

The research was conducted in several stages:

1) Recipe Analysis: An initial recipe was analyzed to serve as the reference formulation.
2) Preliminary Trials: Trials were conducted to develop the best mille crepes formulation with pumpkin flour substitution.
3) First QDA Test: A QDA sensory evaluation was performed by trained panelists on the initial formulation to refine the standard recipe.
4) Product Development: Adjustments were made based on the first QDA feedback, followed by the preparation of mille crepes products.
5) Second QDA Test: Another QDA sensory evaluation was conducted with trained panelists to validate the improved recipe.
6) Acceptability Test: A consumer acceptance test was performed on untrained panelists using a structured questionnaire.

2.3. Population and Sample

The sample consisted of:

- **Trained Panelists**: Three chefs from the Grand Tjokro Hotel Bandung were involved in the QDA and hedonic tests.
- **Untrained Panelists**: Thirty culinary students from the 2020 cohort and students from the Faculty of Technology and Vocational Education (FPTK) at Universitas Pendidikan Indonesia participated in the acceptability test.

Thus, the total number of participants was 33 individuals.

2.4. Research Instruments

The instruments used in this research included:

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- A descriptive sensory evaluation sheet for the QDA test.
- A consumer acceptance questionnaire featuring a Likert-type checklist.

The Likert scale used in the acceptability test is presented in Table 1.

Table 1. Likert Scale for Acceptability Test

Score	Criteria
1	Very dislike
2	Do not like
3	Just like it
4	Like
5	Really like

Assessments covered attributes such as shape, color, aroma, taste, texture, and overall liking.

2.5. Data Analysis Techniques

Two types of data analysis were applied:

- **Qualitative Analysis**: Involving critiques and suggestions from trained panelists to refine the initial product formulation.
- **Quantitative Analysis**: Involving descriptive statistical analysis of QDA results, visualized using a spider web chart, and analysis of consumer acceptance using the five-point hedonic scale.

Table 2. Hedonic Scale for Consumer Acceptance

Score	Criteria
1	Very dislike
2	Do not like
3	Just like it
4	Like
5	Really like

3. RESULTS AND DISCUSSION

3.1. Product Development Results

The product development phase was carried out through four experimental trials aimed at optimizing the substitution of pumpkin flour in mille crepes formulation. Among the four trials, the fourth formulation (MLCB 4) demonstrated superior sensory characteristics and was therefore established as the final standard. The visual result of the MLCB 4 formulation is presented in Figure 1.

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Figure 1. Results of the MLCB 4 Formula Trial

The detailed formulation for MLCB 4 is presented in Table 3.

Table 3. MLSB 4 Formula

Material	Amount
Mille crepes ingredients	
Liquid milk	500 ml
Flour	80 grams
Pumpkin flour	65 grams
Egg	2 items
Sugar	45 grams
Margarine/butter	45 grams
Salt	A pinch
Whipped cream ingredients	
Whipped cream	500 ml
Fine granulated sugar	65 grams
Mocha flavoring	2 tsp

In this formulation, a 60% substitution of pumpkin flour relative to wheat flour was applied. This substitution not only enriches the nutritional profile but also enhances the functional properties, such as water absorption and textural softness (Sari et al., 2021; Wang et al., 2023).

Quantitative Descriptive Analysis (QDA) was employed to objectively assess five sensory attributes: appearance, color, aroma, texture, and taste. The comparative results across four formulations (MLCB 1 to MLCB 4) are illustrated in Figure 2.

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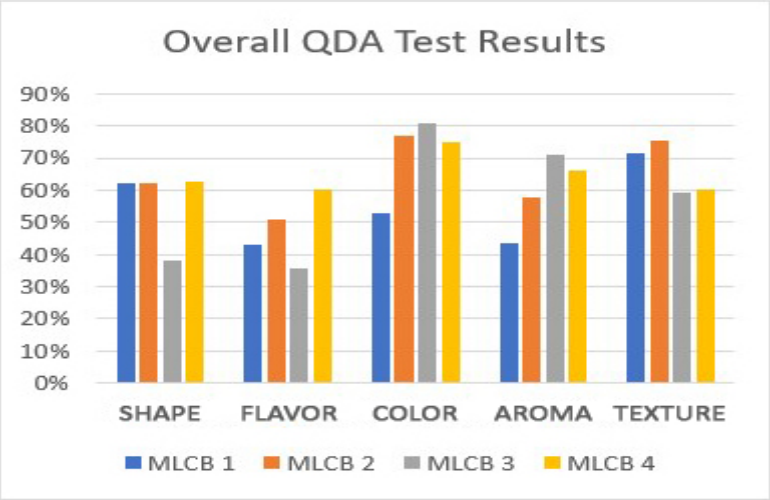

Figure 2. Overall QDA Test Results Diagram

Information:
MLCB 1: Mille crepes 1st trial
MLCB 2: Mille crepes 2nd trial
MLCB 3: Mille crepes 3rd trial
MLCB 4: Mille crepes 4th trial

Key findings from the QDA test are as follows:

Appearance: A noticeable decline was observed in MLCB 3 (38.3 points), likely due to excessive pumpkin flour (75 grams) causing less uniformity and increased brittleness in the crepes (Chieng & Tan, 2020).

Sweetness: MLCB 4 achieved the highest sweetness rating (60 points), demonstrating an optimal balance between natural pumpkin sugars and added granulated sugar, enhancing consumer acceptance without excessive sweetness (Fajardo et al., 2021).

Color: Although MLCB 3 had the highest color intensity (80.7 points), the panelists preferred MLCB 4's lighter golden-brown tone (75 points), associated with a visually more appealing product (Chen et al., 2024; Matemu et al., 2022).

Aroma: MLCB 3 exhibited an overwhelming pumpkin aroma (71 points), whereas MLCB 4 achieved a more moderate, pleasant aroma (66.3 points), attributed to the adjustment in pumpkin flour content (Ismail et al., 2022; Kim et al., 2023).

Texture: MLCB 4 was most favored (60 points) for its soft, slightly grainy texture, a characteristic arising from pumpkin flour's fibrous components (Putri et al., 2023; Xu et al., 2021).

These results are consistent with the literature, which emphasizes that optimized substitution ratios are crucial in maintaining the technological and sensory quality of bakery products (Gao et al., 2024; Zhao et al., 2022).

3.2. Acceptability Results with Organoleptic Tests

Consumer acceptance was evaluated through organoleptic tests involving 30 untrained panelists. Five sensory attributes plus overall impression were assessed using a hedonic scale.

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3.2.1. Shape

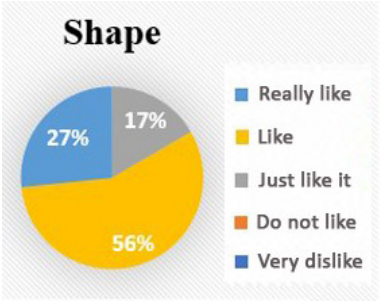

Figure 3. Organoleptic Test Results in Terms of Shape

The evaluation revealed that 27% of panelists "liked it very much," 56% "liked it," and 17% "quite liked it." No negative responses were recorded. The elasticity and structure achieved in MLCB 4 are linked to pumpkin flour's ability to bind water and stabilize the batter (Wulandari & Saputra, 2021; Arumugam et al., 2022).

3.2.2. Color

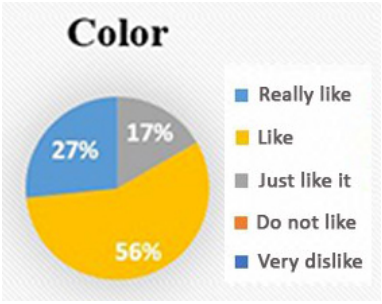

Figure 4. Organoleptic Test Results in Terms of Color

Panelists' responses for color matched those for shape. The brownish-yellow coloration stems from natural carotenoids present in pumpkin flour and the Maillard reaction during cooking (Puspitasari et al., 2022; Ma et al., 2023).

3.2.3. Aroma

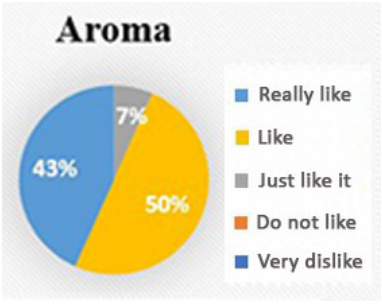

Figure 5. Organoleptic test results in terms of aroma

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In terms of aroma, 43% "liked it very much," 50% "liked it," and 7% "quite liked it." The distinctive aroma of pumpkin, moderated at the correct level in MLCB 4, was positively received (Ismail et al., 2022; Tan et al., 2023).

3.2.4. Taste

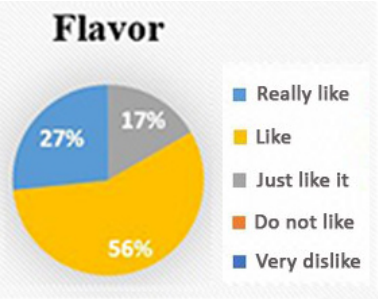

Figure 6. Organoleptic test results in terms of taste

Taste preferences mirrored previous trends: 27% "liked it very much," 56% "liked it," and 17% "quite liked it." The sweetness balance achieved in MLCB 4 avoided potential bitterness, confirming findings in similar studies on pumpkin-based products (Fitriani & Nasution, 2021; Sutrisno & Sari, 2024).

3.2.5. Texture

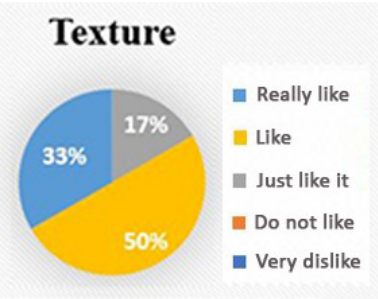

Figure 7. Organoleptic Test Results in Terms of Texture

The texture was rated favorably by 83% of panelists ("liked" or "liked very much"). The slightly grainy but overall smooth texture is considered an artisanal quality by consumers (Santoso & Rahayu, 2023; Rizkiyah & Anjani, 2023).

3.2.6. Overall Impression

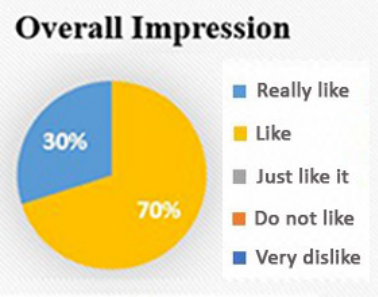

Figure 8. Organoleptic Test Results in Terms of Overall Impression

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A strong overall acceptance was evident, with 30% "liked it very much" and 70% "liked it." These results underline the product's commercial potential, supporting previous findings that strategic flour substitution can lead to functional bakery innovations with high consumer appeal (Nurdiani et al., 2022; Sutrisno & Sari, 2024).

4. CONCLUSION

The product development trials for mille crepes substituted with pumpkin flour successfully combined both Quantitative Descriptive Analysis (QDA) and organoleptic evaluations to ensure comprehensive sensory and consumer acceptability assessment. QDA tests, conducted by three expert panelists—professional chefs from the Grand Tjokro Hotel Bandung—provided critical sensory insights regarding the refinement of appearance, aroma, taste, color, and texture attributes, ensuring professional-grade product quality. In parallel, organoleptic tests involving 30 untrained panelists, primarily students from the Faculty of Technology and Vocational Education (FPTK) at Universitas Pendidikan Indonesia, allowed for broader consumer-level validation. Across four development stages (MLCB 1 to MLCB 4), the MLCB 4 formulation—substituting 65 grams of pumpkin flour alongside 80 grams of wheat flour—emerged as the most preferred version, achieving a balance in flavor, texture, and visual appeal while maintaining high acceptability scores. The findings substantiate that pumpkin flour not only serves as a viable partial substitute for wheat flour in mille crepes but also enhances the nutritional content and promotes the use of local agricultural resources. Moreover, this study underscores the potential of pumpkin flour for wider innovation in bakery and functional food products, contributing to sustainable food diversification, value-added agricultural practices, and supporting healthier dietary patterns aligned with modern consumer preferences.

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