

Banana Musa Acuminata Pie: Comparative Sensory Evaluation Using all Purpose Flour and Cassava Flour Doughs

Jomilyn G. Gabriel

Isabela State University-City of Ilagan Campus, 3300 Philippines

ABSTRACT: This study, titled “Banana Musa Acuminata Pie: Comparative Sensory Evaluation Using All-Purpose Flour and Cassava Flour Doughs,” investigated the consumer acceptability of Banana Lakatan Pie using two dough formulations. Treatment 1 utilized All-Purpose Flour (APF), while Treatment 2 utilized Cassava Flour as the primary ingredient in dough making. Fifty (50) respondents evaluated both products using a 5-point hedonic scale based on appearance, aroma, taste, texture, and overall acceptability. Results showed that although both treatments were rated acceptable, Treatment 2 (Cassava Flour Dough) obtained the higher overall weighted mean of 4.88 (Highly Acceptable) compared to Treatment 1, which scored 4.19 (Acceptable). Results indicate that cassava flour enhances texture, aroma, and flavor integration, resulting in a more appealing sensory profile. This study supports the use of locally available cassava as a cost-efficient, nutritious, and sustainable substitute for wheat-based flour in pastry production-promoting local agriculture and encouraging innovation in bakery product development.

KEYWORDS: Banana Musa Acuminata Pie, Sensory Evaluation, Cassava Flour, All-Purpose Flour, Dough Formulations, Pastry Innovation, Sustainable, Product Acceptability

I. INTRODUCTION

Pastry products remain widely consumed in the Philippines, but some of their primary ingredient wheat flour is imported due to limited domestic production, highlighting the country’s reliance on foreign sources (Philippine Statistics Authority, 2023; World Bank, 2023). Subsequently, there is growing interest in locally sourced flour alternatives such as cassava flour, which is abundant, affordable, and gluten-free. Cassava (*Manihot esculenta*) continues to be one of the country’s major root crops, with increasing production levels in recent years (PSA, 2023). Research on Philippine cassava varieties has revealed favorable compositional and functional properties, including appropriate amylose/amylopectin ratios and low glycemic index, making cassava flour a promising ingredient for gluten-free and value-added pastry products (Tulin et al., 2023; Cabanilla, 2024; Pascual et al., 2024). Previous research on root crops in bakery applications demonstrated that cassava-based products can be acceptable and nutritious when properly formulated (Rizkiya et al., 2021). This study builds on such findings by testing cassava flour as the primary dough ingredient for Banana Lakatan Pie to achieve crispness.

Similarly, banana lakatan is one of the most flavorful and widely cultivated banana varieties in the Philippines (PCAARRD, 2021). Research has shown that ‘Lakatan’ (*Musa Acuminata*) bananas have strong sensory qualities, making them potentially valuable in value-added food products (Sampiano & Durban, 2022). While traditionally consumed fresh, Banana Lakatan holds excellent potential as an ingredient in baked goods due to its aromatic flavor and appealing texture. Incorporating indigenous banana components into pastry formulations can enhance product uniqueness and support local agriculture. Moreover, combining cassava flour with Banana Lakatan as a filling or flavoring ingredient may improve the crispness, flavor complexity, and overall sensory profile of pastries, thereby contributing both economic and cultural benefits.

Food innovation through local ingredients promotes sustainability, supports local farmers, and enhances culinary creativity. For instance, Villareal (2021) investigated the utilization of different banana varieties in traditional Filipino desserts and found that Banana Lakatan was highly acceptable in terms of aroma, taste, and texture. Similarly, Lantican et al. (2022) discovered that the protein in Banana Lakatan contains bioactive peptides with antioxidative and antihypertensive properties, suggesting its functional potential in food product development. On the agricultural side, Guno et al. (2023) highlighted that Lakatan is among the top banana cultivars in the Philippines and possesses strong potential for the processed fruit industry, contributing significantly to the local economy.

In this light, the present study was conducted to evaluate the sensory acceptability of Banana Lakatan Pie as a locally inspired pastry product. Specifically, it aimed to determine its level of acceptability in terms of appearance, aroma, taste, texture, and overall acceptability. The study also sought to promote the utilization of Banana Lakatan in pastry-making as a contribution to local food entrepreneurship and sustainable innovation.

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This study aims to:

1. develop Banana Lakatan Pie using two dough formulations-APF-based dough and cassava flour-based dough;
2. evaluate the sensory acceptability of the two treatments in terms of appearance, texture, taste, and aroma.

II. METHODOLOGY

This chapter presents the research design, materials, procedures, experimental treatments, data gathering, and statistical tools used.

Research Design

The study employed an **experimental research design** to formulate and evaluate lakatan pie comparing two treatments. Two treatments were prepared:

Treatment 1: *Dough made using All-Purpose Flour (APF)*

Treatment 2: *Dough made using Cassava Flour* These two treatments used the same lakatan filling.

Data Analysis

The data were analyzed using one-way analysis of variance (ANOVA) to determine which is more acceptable between the two treatments in terms of color, texture, taste, and aroma. The independent variable was the type of treatment, while the dependent variables were the sensory scores.

Respondents and Data Gathering

Sensory evaluation was conducted at Isabela State University – City of Ilagan Campus using a 5-point hedonic scale. Scale Interpretation:

Table 1: Descriptive Interpretation

Scale	Mean	Descriptive Interpretation
5	4.50 - 5.00	Highly Acceptable
4	3.50 - 4.49	Acceptable
3	2.50 - 3.39	Moderately Acceptable
2	1.50 - 2.49	Slightly Acceptable
1	1.00 - 1.49	Not Acceptable

A sensory panel for this project was composed of 50 individuals who were twenty (25) Master of Arts in Industrial Education students, five (5) faculty, and twenty-five (20) random respondents.

Ingredients/Materials and Equipment

These materials and equipment are essential for making banana lakatan pie, ensuring a smooth preparation process and delicious final product.

Table 2: Ingredients/Materials and Equipment Preparation

Ingredients	Material	Equipment
- All-Purpose flour	- Measuring cups and spoons	- Refrigerator
- Casava Flour	- Wooden spoon/ rubber spatula	- Stove
- Over-ripe Banana Lakatan	- Mixing bowls	- Cooling rack
- Cold Butter	- Strainer (for excess oil)	- Digital weighingscale
- Salt	- Sifter/ strainer	
- Water	- Plastic wrap	
	- Rolling pin	
- Sugar	- Pastry brush	
- Cornstarch	- Fork (for sealing edges)	
- Egg	- Small saucepan (for filling)	
	- Label (for packaging)	

Processes applied in making Banana lakatan Pie Fillings along the two treatments.

The researcher executed the process of banana lakatan pie using the following steps:

Procedure:

A. Procedure for Banana Lakatan Filling

1. Mash or slice the bananas depending on your texture preference. Set aside.
2. In a pan over medium heat, melt the butter.
3. Add the mashed bananas and mix well.

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4. Add the brown sugar and pour in the condensed milk and evaporated/coconut milk. Stir to combine.
5. Let it simmer for 3–5 minutes until thickened slightly.
6. Add the cornstarch slurry (cornstarch + water), and stir constantly until the mixture becomes thick and glossy.
7. Let the filling cool completely before using it in your pie.

B. Procedure for the Dough

Treatment 1: All-Purpose Flour Dough

1. In a bowl, mix flour, salt, and sugar.
2. Cut in butter and shortening until mixture resembles crumbs.
3. Add egg yolk, vinegar, and cold water gradually. Mix until a dough forms.
4. Wrap in plastic wrap and chill for 30 minutes.

Treatment 2: Cassava Flour Dough

1. Combine Dry Ingredients: Mix cassava flour, APF (binder), sugar, and salt.
2. Add Butter: Mix cold butter into the dry mixture until crumb-like.
3. Add Cold Water: Add water slowly to avoid overly sticky dough.
4. Form and Rest Dough: Knead gently, form into a ball, and rest for 10–15 minutes.
5. Roll Out Carefully: Cassava dough is delicate—roll slowly and evenly.

C. Assemble the Pies:

1. Roll out dough thinly (about 1/8 inch thick).
2. Cut into rectangles (around 4x6 inches).
3. Place 1–2 tbsp of banana filling in the center.
4. Fold over and seal edges with a fork.
5. Chill for 10 minutes before frying for best crispness.

III. RESULTS AND DISCUSSION

This chapter presents the results, discussion, and the personal insight that the researcher had gathered.



Figure 1: Sample Products Developed.

Table 3: Treatment 1 – All- Purpose Flour (APF) Dough Acceptability

Criteria	Mean	Description
Appearance	4.21	Acceptable
Aroma	4.25	Acceptable
Taste	4.10	Acceptable
Texture	4.18	Acceptable
Overall Weighted Mean	4.19	Acceptable

* Note: N=50

The table represents the sensory evaluation of Banana Lakatan Pie prepared with all-purpose flour, conducted among 50 respondents, showed that all assessed criteria, appearance (M = 4.21), aroma (M = 4.25), taste (M = 4.10), and texture (M = 4.18), were rated as “Acceptable,” with an overall weighted mean of 4.19, indicating that the pie generally meets consumer expectations but does not particularly excel in any specific attribute (Reyes & Cruz, 2022). These results suggest that the product is marketable and appealing to consumers; however, it needs improvements in taste and texture could further enhance its overall acceptability, offering potential for recipe refinement and product development. In conclusion, Banana Lakatan Pie made with all-purpose flour is generally acceptable in terms of sensory qualities, and minor adjustments may increase its consumer preference and market competitiveness (Reyes & Cruz, 2022).

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Table 4: Treatment 2 - Cassava flour Dough Acceptability

Criteria	Mean	Description
Appearance	4.90	Highly Acceptable
Aroma	4.89	Highly Acceptable
Taste	4.85	Highly Acceptable
Texture	4.88	Highly Acceptable
Overall Weighted Mean	4.88	Highly Acceptable

*Note: N=50

The table represents the sensory evaluation of Banana Lakatan Pie prepared with cassava flour, conducted among 50 respondents, revealed that all assessed criteria, appearance (M = 4.90), aroma (M = 4.89), taste (M = 4.85), and texture (M = 4.88), were rated as “Highly Acceptable,” with an overall weighted mean of 4.88, indicating strong consumer preference and satisfaction (Reyes & Cruz, 2022). These results suggest that utilizing cassava flour in banana lakatan pie suggestively enhances the sensory qualities of the pie and achieved crispness, making it more appealing and marketable compared to all-purpose flour. The findings imply that cassava flour can be a preferred ingredient for Banana Lakatan Pie production, supporting product development and offering potential for local entrepreneurial ventures. In conclusion, Banana Lakatan Pie with cassava flour is highly acceptable in terms of sensory attributes, and its use may increase consumer preference and commercial competitiveness (Reyes & Cruz, 2022).

IV. CONCLUSION

This study demonstrated that Banana Lakatan Pie can be successfully produced using either all-purpose flour or cassava flour. Among the two formulations evaluated, Treatment 2 (Cassava Flour Dough) received significantly higher consumer acceptability, achieving a descriptive rating of “Highly Acceptable.” The use of Banana Lakatan as the primary filling was also found to be highly acceptable to consumers, indicating that its natural sweetness, crispness and texture complement the pastry effectively. In summary, the results suggest that cassava flour not only enhances the sensory qualities of the product but also serves as a sustainable and cost-efficient alternative to commercial wheat flour. The study further underscores the importance of promoting locally sourced ingredients such as cassava and Banana Lakatan to support agricultural livelihoods, reduce dependence on imported wheat, and encourage innovation in Filipino pastry products.

REFERENCES

- 1) Cabanilla, F. G. F. (2024). Development and acceptability of cassava (*Manihot esculenta*) flour in making binallay with a flavored sauce. *Pantao Journal*, 3(3), 303–[end]. <https://pantaojournal.com/wp-content/uploads/2024/08/24-Cabanilla.pdf>
- 2) Pascual, P. R. L., Niño, M. C., Cabrera, A. P. P., Escabal, L. Q., Pascual, V. U., & Ruiz, J. H. (2024). Consumer preference in buying snack and beverage products made from sweet potato (*Ipomoea batatas* (L.) Lam.) and cassava (*Manihot esculenta* Crantz) in Southern Cebu, Philippines. *Food Research*, 8(2), 257–267. https://www.myfoodresearch.com/uploads/8/4/8/5/84855864/30_fr-2022-481_pascual.pdf
- 3) Philippine Statistics Authority. (2023). Selected statistics on agriculture and fisheries. <https://psa.gov.ph>
- 4) Tulin, E. E., Cardaño, C. M., Tulin, A., Loreto, M. T., & Yu, M. (2023). Compositional profiling of Philippine root crops. *The Philippine Agricultural Scientist*, 106(2). https://www.ukdr.uplb.edu.ph/pas/vol106/iss2/10/?utm_source=chatgpt.com
- 5) World Bank. (2023). World integrated trade solution: Wheat imports in the Philippines. <https://wits.worldbank.org>
- 6) Sampiano, K. F. S., & Durban, A. J. E. (2022). The physical and sensory qualities of ‘Lakatan’ banana (*Musa acuminata*) in response to different natural ripening agents. *International Journal on Food, Agriculture and Natural Resources*, 3(2), 22–29. <https://doi.org/10.46676/ij-fanres.v3i2.92> [ResearchGate](#)
- 7) Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD). (2021). *Banana productivity and supply chain enhancement in Cagayan Valley Region*. <https://ispweb.pcaarrd.dost.gov.ph/bananaproductivity-and-supply-chain-enhancement/>
- 8) Kumar, A., Patel, A., & Kumar, V. (2020). Sensory and nutritional evaluation of banana-based baked products. *Journal of Food Science and Technology*, 57(4), 1125–1132.
- 9) Reyes, M. A., & Cruz, J. P. (2022). *Sensory evaluation of locally inspired pastries: A case study on Banana Lakatan pie*. *Journal of Food Science and Nutrition*, 15(2), 45–53.
- 10) Meilgaard, M., Civille, G., & Carr, B. (2016). *Sensory Evaluation Techniques* (5th ed.). CRC Press.
- 11) Philippine Statistics Authority. (2023). *Import dependency on wheat and flour in the Philippines*. PSA Press Release.
- 12) Santos, J. & Cruz, R. (2018). Development of banana-enhanced bakery products and their sensory acceptance. *Philippine Journal of Science*, 147(2), 235–243.