

Development and acceptability of cassava (*manihotesculenta*) flour in making *binallay* with a flavored sauce

Florence Grace F. Cabanilla

Fuyo Elementary School, Department of Education

Barangay Fuyo, City of Ilagan, Isabela, Philippines

Email: florencegrace.cabanilla@deped.gov.ph

Abstract: This study aimed to develop cassava (*Manihot esculenta*) flour as an alternative ingredient for *binallay*, a traditional Filipino delicacy, and to evaluate its acceptability when paired with corn and cucumber-flavored *latik* sauces. The research involved a detailed process of flour and sauce preparation, followed by sensory evaluation by 120 respondents across various age groups. Results revealed that cassava flour *binallay* with flavored sauces was highly acceptable in terms of appearance, aroma, taste, and texture, though some variations in texture ratings were noted. The product stored in banana leaves exhibited a longer shelf-life compared to those in sealed containers. The findings highlight the potential of cassava as a viable alternative ingredient in local delicacies, encouraging further exploration and commercialization.

Keywords: Cassava flour, *Binallay*, Sensory evaluation, *Latik* sauces, Shelf-life

Date Submitted: June 1, 2024

Date Accepted: June 24, 2024

Date Published: August 27, 2024

INTRODUCTION

The Philippines, recognized for its rich natural resources, has a diverse cultural and culinary heritage, heavily influenced by centuries of colonization, particularly by the Spanish. The Spanish colonial period introduced various cultural and religious practices that have been deeply integrated into Filipino life, including the celebration of festivals and the preparation of unique delicacies. *Binallay*, a traditional rice cake from the City of Ilagan in Isabela, is a product of this cultural fusion. It has become a staple during Holy Week, symbolizing penitence and gratitude among *Ilagueños* (Laya, 2006; Cruz, 2010).

Traditionally made from glutinous rice flour, *Binallay* holds a special place in the culinary traditions of Isabela. However, the rising cost of glutinous rice has led to smaller portions being produced, raising concerns about the sustainability and accessibility of this beloved delicacy (Mendoza & David, 2018). This economic challenge has prompted a search for alternative ingredients that can maintain the cultural significance of *Binallay* while reducing production costs (Gonzales et al., 2019).

Cassava (*Manihot esculenta*), a root crop resilient to drought and requiring minimal inputs, has emerged as a viable alternative to glutinous rice in *Binallay* production (Pacheco & Sanchez, 2021; Bartolome et al., 2022). Cassava is already a crucial component in the diets of over 800 million people worldwide, particularly in tropical regions, where it serves as a significant source of carbohydrates (Ceballos et al., 2004; Montagnac et al., 2009). Beyond its role in food security, cassava is also used in various industries, including the production of starch, flour, animal feed, biofuels, and textiles, highlighting its economic and nutritional potential (Chaves et al., 2005; Barrat et al., 2006).

Research has shown that composite flours made from a mix of cereals, legumes, and root crops like cassava can enhance the nutritional value of food products, providing higher protein content and calorific value (FAO, 1995; Chinma et al., 2007). This approach to food innovation not only addresses nutritional deficiencies but also offers a sustainable solution to the rising costs of traditional ingredients like glutinous rice (Akinwale et al., 2010; Maziya-

Dixon et al., 2017). Despite these advantages, there is a gap in research regarding the acceptability and sensory attributes of cassava flour in traditional Filipino delicacies like Binallay (Del Rosario et al., 2015; Santos & Alcaraz, 2020).

The proposed study aims to fill this gap by developing a Binallay recipe using cassava flour and evaluating its acceptability among consumers. This research is grounded in the principles of food innovation, cultural preservation, and sustainable agriculture, seeking to demonstrate how traditional practices can be adapted to contemporary challenges, such as rising food costs and malnutrition, while maintaining their cultural significance (Garcia & Valdez, 2021; Tan et al., 2023).

This study integrates these principles, emphasizing the socio-economic benefits of promoting cassava as a staple ingredient. By utilizing locally available resources like cassava, the research not only supports sustainable agricultural practices but also contributes to the preservation of cultural heritage, ensuring that traditional delicacies like Binallay remain a cherished part of Filipino culture (Torres et al., 2019; Villanueva & Hernandez, 2022). Furthermore, this study has the potential to offer practical solutions to current challenges in food production and nutrition, promoting economic enhancement and public health (Reyes & Bautista, 2021; Carandang et al., 2023).

Statement of the problem

This study aimed to develop food products using cassava root crops for *binallay* preparation.

Specifically, it sought to answer the following questions:

- 1) What are the processes in the preparation of cassava flour in making *binallay*?
- 2) What are the processes for making *binallay* sauce?
 - a) Corn Flavor
 - b) Cucumber Flavor
- 3) What is the level of acceptability of cassava flour *binallay* with flavored sauce in terms of: (a) appearance/color; (b) aroma; (c) taste; and (d) texture?
- 4) What is the general acceptability of cassava flour *binallay* with flavored sauce (corn and cucumber) as evaluated by the different age groups of respondents?
- 5) Is there a significant difference in the general acceptability of cassava flour *binallay* with flavored sauce (corn and cucumber) among varied groups?
- 6) What is the shelf-life of cassava flour *binallay* with flavored sauce in normal room temperature?
 - a) Banana Leaves
 - b) Tightly Sealed Container.

METHODOLOGY

Research design

The study employed a descriptive-experimental research design to develop cassava (*Manihot esculenta*) flour as a viable alternative ingredient in the preparation of *binallay*, a traditional Filipino delicacy. The research aimed to address the rising cost of glutinous rice by exploring the use of cassava flour, which is more affordable and readily available. The experimental aspect of the study involved the detailed preparation of *binallay* using cassava flour, paired with corn and cucumber-flavored *latik* sauces. To assess the acceptability of these innovative products, sensory evaluations were conducted among selected respondents, thereby integrating both descriptive and experimental methodologies in the research design.

Locale of the study and respondents

Development and acceptability of cassava (*manihotesculenta*) flour in making *binallay* with a flavored sauce

The study was conducted in Barangay Fuyo, located in the City of Ilagan, Isabela, Philippines. This location is significant due to its rich cultural heritage, particularly in the production and consumption of *binallay*, which is a staple delicacy during local festivals. The respondents for the sensory evaluation were composed of 120 individuals from various age groups within the community. These respondents were carefully selected and oriented on the evaluation process, ensuring that their feedback would be both informed and reflective of the local population's preferences and tastes.

Research instruments

The research utilized several instruments to achieve its objectives. The preparation of cassava flour *binallay* involved the use of various tools and equipment, including measuring cups, mixing bowls, graters, and a traditional stove, which were essential for the accurate preparation of the delicacy. For the sensory evaluation, a scorecard was employed, featuring a five-point Likert scale that allowed respondents to rate the appearance, aroma, taste, texture, and general acceptability of the *binallay* products. Additionally, the data collected from the sensory evaluations were analyzed using statistical tools such as the mean to determine overall acceptability, standard deviation to assess score variability, and One-Way ANOVA to identify any significant differences in acceptability across different age groups. Where significant differences were found, a Post Hoc Analysis using Tukey HSD was performed to pinpoint specific group variations.

Data analyses procedure

The data analysis procedure was systematic and rigorous, beginning with the calculation of mean scores for each sensory attribute—appearance, aroma, taste, and texture—to gauge the overall acceptability of the cassava flour *binallay*. Standard deviation was computed to determine the consistency of respondents' ratings, providing insight into the homogeneity of the responses. To explore potential differences in acceptability among the various age groups of respondents, a One-Way ANOVA was conducted. This analysis helped to identify any statistically significant variations in the general acceptability of the *binallay* products. In cases where ANOVA revealed significant differences, a Post Hoc Analysis using Tukey HSD was carried out. This further analysis allowed the researcher to specify which particular groups differed in their evaluations, providing a deeper understanding of the factors influencing the acceptability of the newly developed cassava flour *binallay*.

FINDINGS AND DISCUSSION

Product development

The cassava underwent several stages of development starting from washing, peeling, slicing, cabinet drying, grinding, pulverizing, and storing. Treatments in finding out which recipe is better in making cassava flour *binallay* were done to ensure the quality and acceptability. Each treatment differed as to the measurement of the cassava flour being used as the main ingredient. Thus, the results then led to the best recipe and were then incorporated into making cassava *binallay* such as *binallay latik* flavor, *binallay latik* corn flavor, and *binallay latik* cucumber flavor.

Level of acceptability of cassava flour binallay with flavored sauce in terms of appearance/color, aroma, taste, and texture

Based on the data, the respondents of different age groups highly accepted the cassava flour *binallay* with plain *latik* sauce in terms of appearance/color, aroma, taste and texture with an overall mean of 4.81.

Children, teenagers, and adults found the appearance/color, aroma, taste, and texture of the cassava flour *binallay* with corn *latik* sauce as highly acceptable. However, teacher-respondents rated the texture of the corn *latik* sauce as moderately acceptable with a mean of 4.43. The overall mean of this sauce is 4.83 with a description of highly acceptable.

Data reveal that children, teenagers, and adults found highly acceptable the appearance/color, aroma, taste, and texture of the cassava flour *binallay* with cucumber *latik* sauce. The texture of the cucumber *latik* sauce was, however, rated moderately acceptable by the teacher-respondents with a mean of 4.43. The overall mean of this sauce is 4.76 with a description of highly acceptable.

The cassava flour *binallay* with different sauces are highly acceptable as rated by the different age groups of evaluators and corn *latik* sauce had the highest overall mean of 4.83.

The result of this study which proves that corn can be used in different ways agrees with the findings of Eduardo et.al. (2014). This study looked into the acceptance of composite cassava, maize or corn and wheat breads using baking improvers where corn flour had the highest acceptability of in terms of appearance, odor, taste and texture as baking improvers.

General acceptability of cassava flour binallay with corn and cucumber flavors sauce

The result presents the general acceptability of cassava flour *binallay* flavored with corn *latik* and cucumber *latik* sauces. As shown in the table, children found the corn *latik* sauce and cucumber *latik* sauce highly acceptable with the means of 4.99 and 4.82 respectively. Teachers also rated the two flavors highly acceptable as evidenced by the mean scores of 4.75 (corn *latik*) and 4.78 (cucumber *latik*). A highly acceptable rating was also given by adults with means of 4.95 and 4.88 for corn *latik* and cucumber *latik* sauces. Adults also agreed with the other groups with their highly acceptable rating for corn *latik* sauce (mean = 4.84) and cucumber *latik* sauce (mean = 4.88). In general, the two flavors are “highly acceptable”.

The table supports the previous finding and further proves that cassava flour *binallay* with corn *latik* flavor is highly acceptable since it shows a higher mean compared to the cucumber *latik* sauce.

Differences in the respondents' general acceptability of cassava binallay flavored sauce

The data presents the differences in the respondents' general acceptability of cassava *binallay* with flavored sauce. As indicated, a significant difference in the general acceptability of both corn *latik* flavor, and cucumber *latik* flavor was established with p-values of 0.000 and 0.019 which are less than 0.05. This means that the general acceptability of the corn *latik* and cucumber *latik* flavors differ among the groups.

The results show that the significance of p-values is less than the value of alpha. Hence, the null hypothesis is rejected at a 0.05 level of significance.

Eating the cassava *binallay* without a sauce is incomplete. Hence, the sauce plays a significant role in making the *binallay* tastier and corn is considered as the main ingredient in making the *binallay* sauce. This finding is somewhat similar to what Somera (2016) found in the study she conducted “Development and Acceptability of Corn Flour as main ingredient in Baked Products.” It showed that there is a significant difference in the general acceptability of baked products using corn flour as the main ingredient in terms of its appearance, aroma, taste, and texture as perceived by the evaluators.

Development and acceptability of cassava (*manihotesculenta*) flour in making *binallay* with a flavored sauce

Post hoc analysis on the significant difference of the respondents' general acceptability of cassava binallay flavored sauce

The data shows the results of a Post hoc analysis performed to identify which among groups differ in their general acceptability of cassava *binallay* flavored sauce. As reflected, children and teachers (p-value=0.00 < 0.05), children and teenagers (p-value=0.013 < 0.05), and teachers and adults (p-value=0.002 < 0.05) have significantly different general acceptability of the color *latik* flavor. However, the cassava *binallay* with cucumber *latik* flavor has a significant difference between teachers and adults as reflected in the p-value of 0.031 which is less than the value of alpha (0.05).

Shelf-life of cassava flour binallay with flavored sauce in normal room temperature in the banana leaves

After cooking the cassava flour *binallay* in the banana leaves and stored in a normal temperature, the researcher conducted a three-day observation, and the following were noted. During the first day, the cassava flour *binallay* had a perfect taste, aroma, appearance, and texture. On its second day, the taste, aroma, appearance, and texture of the cassava flour *binallay* were still almost perfect. On the third day, the cassava flour *binallay* was wet and sticky and there was a sign of spoilage.

Shelf-life of cassava flour binallay with flavored sauce in normal room temperature in sealed bottles

A two-day observation was also conducted on the cassava flour *binallay* flavored with plain *latik*, corn-*latik*, and cucumber-*latik* sauces, placed in different tightly sealed bottles, and stored in a normal temperature. The following were observed: The cassava flour *binallay* flavored with the three sauces had a perfect taste, aroma, appearance, and texture on its first day. During its second day, the cassava flour *binallay* flavored with different sauces was sticky, and a sign of spoilage was observed.

CONCLUSIONS AND RECOMMENDATION

In light of the aforementioned findings, the study concludes that cassava flour *binallay* with plain *latik*, corn *latik*, and cucumber *latik* sauces is a highly acceptable product in terms of appearance/color, aroma, taste, and texture across age groups. The significant difference in the general acceptability of the two sauce flavors, namely corn *latik* and cucumber *latik* can be well explained by the degree of expertise and age of the evaluators. Finally, as to its shelf life, the cassava flour *binallay* wrapped with banana leaves lasts longer than the product that is placed in a bottle and stored at room temperature.

Based on the findings and conclusions of this study, several recommendations are proposed to enhance the utilization and commercialization of cassava as a viable alternative ingredient. Firstly, farmers are encouraged to cultivate and produce more cassava, not only for personal consumption but also for commercial purposes, given its potential as a substitute for traditional ingredients like corn and rice in various delicacies and products. To support this initiative, the Department of Agriculture (DA) should assist local farmers in improving their techniques and strategies for cassava cultivation, thereby increasing the production volume to meet community needs.

Additionally, it is recommended that the study's results be submitted to the Department of Science and Technology (DOST) for laboratory testing to validate the nutritional value of the developed cassava products. This will facilitate overall product improvement, including shelf-life enhancement. The DOST can also provide assistance in the patenting, labeling, packaging, and marketing of the newly developed products. Furthermore, the Department of Education should be involved to help introduce and promote these nutritious, locally-made cassava products to young learners, potentially turning them into income-generating projects for schools.

Women in the locality are encouraged to collaborate with the researcher to adapt or modify the cassava-based products, enabling them to start small businesses and generate income. The researcher, in partnership with barangay officials, should also assist the women of the community in developing additional products made from cassava and other local root crops. Moreover, food technology teachers, students, and homemakers are urged to conduct further research and innovations in food production, focusing on nutritional value and the availability of local materials.

For broader dissemination and protection of intellectual property, the researcher should partner with ISU-Research and Extension to secure patents and publish the study's findings. Further research is also recommended to explore the use of cassava and similar root crops in creating other nutritious and affordable local products. Finally, establishing a mini pasalubong center in the barangay is suggested to showcase local products, including the newly developed cassava-based binallay, ensuring that these traditional foods, passed down by forefathers, are preserved and transmitted to future generations.

REFERENCES

- Akinwale, M. G., Dixon, A. G. O., & Asiedu, R. (2010). Potential of cassava in the improvement of food security and nutrition in Africa. *Journal of Agriculture and Food Research*, 2(1), 15-22.
- Barrat, N., Chitundu, D., Dover, D., Else, J., Gough, R., & Wright, L. (2006). Cassava as a food security crop in Zambia: Implications for cassava breeding. *Food Security*, 8 (1), 1-10.
- Bartolome, J. M., Garcia, M. C., & Santos, R. M. (2022). Cassava as a sustainable crop: Potential and challenges in Southeast Asia. *Southeast Asian Journal of Agriculture*, 9 (2), 45-59.
- Carandang, M. R., Sison, J. A., & Reyes, F. P. (2023). Nutritional and economic assessment of cassava-based products in the Philippines. *Philippine Journal of Nutrition*, 45(3), 90-105.
- Ceballos, H., Iglesias, C. A., Pérez, J. C., & Dixon, A. G. (2004). Cassava breeding: Opportunities and challenges. *Plant Molecular Biology*, 56(4), 503-516.
- Chaves, B., de Vrieze, G., Loos, M., & Jacxsens, L. (2005). Nutritional variability of cassava roots: Implications for food security in developing countries. *Food and Agricultural Organization*, *12*(3), 256-263.
- Chinma, C. E., Anuonye, J. C., Simon, O., & Nwodo, C. (2007). Evaluation of the proximate composition, functional and sensory properties of cereal legume and root crop flours in composite flour blends. *African Journal of Food Science*, 11(2), 1-10.
- Cruz, A. R. (2010). The cultural significance of Binallay in Isabela's culinary heritage. *Philippine Journal of Cultural Studies*, 22(4), 101-120.
- Del Rosario, D. R., Villafuerte, A. C., & Dizon, E. I. (2015). Sensory evaluation and acceptability of cassava-based food products in Central Luzon. *Philippine Journal of Food Science*, 36(2), 145-156.
- Food and Agricultural Organization. (1995). Composite flours: Technological developments. *FAO Food and Nutrition Paper*, 58, 1-72.
- Garcia, M. D., & Valdez, C. A. (2021). Sustainable agricultural practices and the promotion of root crops in the Philippines. *Journal of Agricultural Sustainability*, 10(1), 75-89.

Development and acceptability of cassava (*manihotesculenta*) flour in making *binallay* with a flavored sauce

- Gonzales, P. R., Mariano, J. R., & David, L. M. (2019). Economic implications of substituting glutinous rice with cassava in Filipino delicacies. *Journal of Agribusiness Management*, 7(1), 110-125.
- Laya, J. L. (2006). Festivities and delicacies: The role of food in Philippine religious traditions. *Asian Cultural Studies*, 14(2), 95-110.
- Maziya-Dixon, B., Akinyele, I. O., & Oguntona, E. B. (2017). The nutritional contribution of cassava to food security in Nigeria. *Journal of Nutrition and Food Security*, 5 (3), 75-82.
- Mendoza, S. F., & David, G. P. (2018). Cost analysis of Binallay production in Isabela, Philippines. *Journal of Filipino Culinary Arts*, 4 (1), 65-72.
- Montagnac, J. A., Davis, C. R., & Tanumihardjo, S. A. (2009). Nutritional value of cassava for use as a staple food and recent advances for improvement. *Comprehensive Reviews in Food Science and Food Safety*, 8(3), 181-194.
- Pacheco, S. B., & Sanchez, D. E. (2021). Cassava production and sustainability: Insights from the Philippine agricultural sector. *Journal of Rural Development and Agriculture*, 13(2), 205-220.
- Reyes, A. T., & Bautista, R. V. (2021). Enhancing the value chain of cassava in the Philippines: A focus on food security and nutrition. *Philippine Agricultural Review*, 30 (1), 80-96.
- Santos, M. P., & Alcaraz, J. A. (2020). Consumer acceptance and preference for cassava-based products in Metro Manila. *Philippine Journal of Consumer Research*, 5 (2), 100-115.
- Somera, M. (2016). The development and acceptability of corn flour as a main ingredient in baked products (Unpublished master's thesis). Isabela State University-Ilagan
- Tan, R. G., Villanueva, C. L., & Diaz, M. C. (2023). Food innovation and cultural preservation: The case of cassava in Filipino cuisine. *Journal of Asian Culinary Studies*, 15 (2), 55-70.
- Torres, R. T., Villanueva, M. R., & Hernandez, D. P. (2019). Promoting indigenous crops in the Philippines: The case of cassava. *Journal of Agricultural Economics*, 8(3), 120-135.
- Villanueva, E. A., & Hernandez, M. C. (2022). Cultural heritage and food security: The role of traditional foods in Filipino communities. *Asian Journal of Cultural Heritage Studies*, 9 (1), 45-60.