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# Product Development of Banana-Turmeric Cookies

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**Abstract**

The study aimed to develop and innovate cookies using lagkitan banana flour and turmeric powder as the main ingredients. The study sought to determine the possibility of using lagkitan banana flour and turmeric in the formulation of competitive and nutritious food. The study focuses on the following objective: 1. determine the possible formulation of banana-turmeric cookies 2. determine the sensory characteristics of the three samples of banana-turmeric cookies in terms of appearance, aroma, taste, and texture 3. determine the most preferred sample of banana-turmeric cookies. Descriptive analysis of sensory attributes was done using quantitative descriptive analysis. A rank preference test was also conducted to identify the most preferred sample of banana-turmeric cookies that was evaluated with the same participants. Three research methods were utilized: developmental, evaluative, and descriptive. The study was preparing 3 samples of which each had varying amounts of banana flour and turmeric powder. Sensory evaluation showed that sample 2 containing 250 grams of banana flour and 20 grams of turmeric was the most appealing. It was described to have a golden-brown color; the aroma of banana and turmeric was pronounced with a moderate taste of banana and turmeric and the texture was crispy yet tender. The results of the study can be useful for employing Indigenous raw materials for making food products from lagkitan bananas and turmeric powders that are nutritive, inexpensive, and appealing to consumers.

**Keywords:** Banana-Turmeric Cookies, Product Developement, Lagkitan Banana

## 1. Introduction

Due to concerns about health and well-being, people have changed their diets to healthier and more nutritious food products. Because of poor dietary habits that cause obesity, diabetes, and cardiovascular diseases, there has been a need for nutritional food that supplies nutrients and health benefits. In the Philippines, the common diet comprises fats, sugar, and salt, and the occurrence of these diseases is increasing, which shows there is a demand for new healthy meals. This study addresses this gap by developing and innovating cookies from Lagkitan banana flour and incorporating turmeric powder into the formulation as they can provide the required nutrients in a single snack at a low cost.

In addition, the study also aligns with several Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-Being), and SDG 12 (Responsible Consumption and Production). By developing cookies from lagkitan banana flour and turmeric powder, the study contributes to addressing food security and nutrition (SDG 2) by utilizing Indigenous, nutrient-rich ingredients to create an affordable and nutritious food product. The focus on healthful ingredients, such

as bananas rich in vitamins and fiber, and turmeric known for its anti-inflammatory properties, also supports efforts to promote good health and well-being (SDG 3). Furthermore, the study emphasizes the use of locally available raw materials, reducing reliance on imported or processed ingredients and promoting sustainable food production practices, which align with SDG 12.

Bananas are among the most consumed and versatile fruits globally, and the Philippines is one of the leading producers of various banana varieties, including Cavendish, Lakatan, Saba, and the lesser-known Lagkitan. While Cavendish bananas dominate exports, Lakatan is popular as a dessert banana, and Saba is widely used in cooking and processed products like banana chips. In contrast, the Lagkitan variety, though rich in flavor and nutrients, is underutilized due to its limited commercial appeal. Unlike popular varieties such as Cavendish, Lakatan, and Saba—which dominate the local and international markets—Lagkitan bananas are often overlooked. This study focuses on unlocking the potential of Lagkitan bananas by converting them into banana flour, a cost-effective and nutritious ingredient with extended shelf life and reduced wastage.

Lagkitan bananas possess unique qualities that make them suitable for food innovation. They are characterized by a sweet, tangy flavor and sticky consistency, ideal for conversion into banana flour. Processing Lagkitan bananas into flour extends their shelf life, reduces post-harvest losses, and provides a versatile ingredient for baked goods and other food products. Additionally, banana flour is rich in dietary fiber, potassium, resistant starch, and vitamins, offering significant health benefits such as improved digestion, better blood sugar control, and reduced risk of chronic diseases. Utilizing Lagkitan bananas not only addresses the issue of underutilization but also promotes a sustainable approach to agriculture.

By processing Lagkitan bananas into flour, this study aims to address these challenges and highlight the versatility of this indigenous crop. Banana flour, made from unripe bananas, is not only a gluten-free alternative for baking but also retains much of the fruit's nutritional profile. Furthermore, this study combines Lagkitan banana flour with turmeric powder to create cookies with enhanced nutritional value. Turmeric, a well-known superfood with antioxidant, anti-inflammatory, and immunity-boosting properties, complements the health benefits of bananas. Together, these ingredients offer a functional snack that aligns with consumer demands for healthier options while showcasing the value of locally available, sustainable resources.

Combining Lagkitan bananas and turmeric lies in their complementary benefits and potential applications in valuable foods. Both ingredients are affordable, accessible, and nutrient-dense, making them ideal for addressing dietary needs in the Philippines. Additionally, the pairing of these two ingredients aligns with broader efforts to promote indigenous crops and improve local food systems. Beyond health benefits, this combination offers opportunities to diversify agricultural outputs, reduce post-harvest losses, and stimulate rural economies through the development of innovative food products.

The research demonstrates the potential for creating innovative, locally sourced food products that combine nutritional benefits with consumer appeal. The successful development of a snack incorporating banana flour and turmeric powder showcases the value of utilizing indigenous ingredients in food product development, potentially leading to more sustainable and economically viable food options for local communities.

## 2. Objectives of the Study

The primary objective of this study is to develop an innovative and affordable snack product using Lagk-

itan banana flour and turmeric powder. Specifically, the study seeks to answer the following questions:

1. What are the possible formulations of Banana-Turmeric Cookies?
2. What are the sensory characteristics of the three samples of Banana-Turmeric Cookies in terms of appearance (color), aroma, taste, and texture?
3. What is the most preferred sample of Banana-Turmeric Cookies?

## 3. Scope of the Study

This study focuses on the development and evaluation of Banana-Turmeric Cookies, utilizing Lagkitan banana flour and turmeric powder as primary ingredients. It utilizes three formulations with varying proportions of banana flour and turmeric powder to determine the most acceptable blend based on sensory characteristics such as appearance, aroma, taste, and texture. The study is limited to the development of cookies and does not explore other potential applications of Lagkitan banana flour or turmeric in food products. It is conducted within the constraints of locally available materials, laboratory facilities, and a sample size of 50 respondents for sensory evaluation. Despite these limitations, the research aims to demonstrate the feasibility and benefits of using Lagkitan bananas and turmeric in functional food development. Furthermore, the research has not covered and conducted studies on the development of machines, packaging materials design, shelf-life studies, proximate composition analysis, microbial content analysis, and nutritional content analysis.

## 4. Review of Literature and Related Studies

The Lagkitan banana, a unique variety native to the Philippines, is not as widely consumed compared to other more prominent banana varieties such as Cavendish, Lakatan, and Saba. As noted in an article by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD), these three banana types dominate the market due to their suitability for both local consumption and international trade. The Cavendish variety leads as the primary export banana, Lakatan is a popular dessert banana, and Saba is widely used in cooking and processed products like banana chips. In contrast, the Lagkitan banana remains underutilized, with limited commercial production and a relatively low market presence.

According to the article "Discover Philippine Bananas: Types, Flavors, and Uses," published by Philippine Facts, the Lagkitan banana is known for its distinct flavor and texture, characterized by sweet, tangy notes and a sticky consistency. These unique traits make it more of a niche product, often regarded as a regional or specialty variety with limited appeal beyond local consumption. The banana's limited market reach can be attributed to the strong preference for and well-established supply chains of more commercially popular varieties.

There is growing interest in using banana-based ingredients, such as raw bananas, banana powder, and even banana peel flour, to create healthier baked goods. Some studies have examined the use of banana flour in cookies, highlighting its nutritional benefits and potential to improve the overall quality of baked products.

Several studies have examined the potential of banana-based ingredients in food products, which could support the development of more diverse applications for the Lagkitan banana. For instance, Suyu (2020) explored the formulation of cookies made with banana blossom flour, emphasizing its high fiber, magnesium, potassium, and antioxidant content. This research supports the use of banana products, such as Lagkitan banana flour, in creating functional foods with enhanced nutritional profiles.

One study, Development and Sensory Evaluation of Banana Cookies by Dr. Zeenat Rizwan Khan (2022), conducted at Smt. R.D.G College for Women in Akola, India, focused on the use of different types of bananas in the preparation of banana powder cookies. The research compared ripe bananas, raw bananas, and banana powder as key ingredients in the cookie formulation. Sensory evaluation results showed that cookies made with banana powder were well-received, with favorable qualities in texture, taste, and overall acceptability. This suggests that banana powder can be a viable alternative in cookie production, potentially influencing the utilization of bananas like Lagkitan, which may be processed into banana powder for various culinary applications.

In another study by Inyang et al. (2018), unripe banana flour was blended with rice and sprouted soybean flour to create a gluten-free, high-fiber cookie. The results indicated that unripe banana flour could significantly improve the physical and sensory properties of the cookies while adding nutritional value, thus suggesting the health benefits of incorporating banana-based flour into baked goods.

Furthermore, research published in the International Journal of Creative Research Thoughts found that cookies made with banana powder exhibited enhanced nutritional properties, such as increased fiber and antioxidants. The sensory evaluation showed positive consumer acceptance of the cookies, highlighting the potential for banana-derived ingredients in baked goods.

The study by Oguntoyinbo et al. (2020) examined the physical, chemical, and sensory properties of cookies made from composite flours of wheat and banana peel flour. The research demonstrated that banana flour could enhance the nutritional content of cookies, contributing to improved fiber intake and antioxidant activity, thus reinforcing the idea that banana derivatives like Lagkitan banana flour have the potential for use in health-focused baked products.

A study titled "Effect of the Addition of Banana Peel Flour on the Shelf Life and Antioxidant Properties of Cookies" (ACS Food Science & Technology, 2022) demonstrated that substituting up to 7.5% of wheat flour with banana peel flour improves the fiber and antioxidant content of cookies without compromising texture or consumer acceptability. This substitution not only enriches the cookies but also aligns with sustainable food practices by reducing food waste. The enriched cookies exhibited better nutritional value, with increased levels of fiber, potassium, and magnesium.

Another study, "Proximate and Sensory Properties of Cookies Developed from Wheat and Cooking Banana (Musa acuminata) Flour Blends for Household Utilization" (China, M.A.H., et al., 2020), explored the use of banana flour in cookies. The results showed that replacing wheat flour with banana flour improved the nutritional content of cookies. Banana flour is rich in dietary fiber, which enhances the texture, moisture retention, and overall sensory properties of the cookies. Additionally, the cookies made with banana flour had lower fat content and higher levels of minerals, making them a healthier option compared to traditional wheat flour-based cookies. These cookies also demonstrated improved mastication and hydration properties, making them more favorable for consumption.

Turmeric, renowned for its antioxidant and anti-inflammatory properties due to its active compound curcumin, has also been integrated into baked goods, including cookies. While specific studies on turmeric in cookies are limited, turmeric's use in food products is well-documented for enhancing functional properties, especially in terms of antioxidative capacity and potential health benefits. When incorporated into cookies, turmeric not only adds a unique flavor but also contributes to the cookies' overall nutritional profile. Research on turmeric-enriched products has shown improvements in their antioxidant properties, thus offering health benefits like enhanced immune function and reduced inflammation.

In the study of Tedjakusuma, et., al (2023), Titled Cookies Product Development with the Addition of Turmeric Extract Several studies have explored the incorporation of turmeric in the development of baked goods, particularly cookies, with a focus on its nutritional and sensory properties. One of the key benefits of adding turmeric to cookies is the enhancement of antioxidant activity, primarily due to its active compound, curcumin. Research has demonstrated that cookies enriched with turmeric exhibit significant antioxidant properties, with higher concentrations of turmeric resulting in a more pronounced antioxidant effect. This finding aligns with the broader health benefits associated with turmeric, particularly its potential to support immune function and reduce inflammation. Sensory evaluations indicate that cookies with turmeric are often favored due to their more robust flavor and aromatic qualities, suggesting a positive reception among consumers when turmeric is added in moderate amounts.

Although specific studies on banana-turmeric cookies are limited, the combination of banana peel flour and turmeric presents a promising avenue for the development of functional foods. Both ingredients are known for their high antioxidant content and potential health benefits. The integration of both into cookies could produce a nutrient-dense snack with enhanced fiber, antioxidants, and anti-inflammatory properties. The synergy of these two ingredients makes banana-turmeric cookies a potential functional food for improving public health and offering a sustainable solution to food waste.

In the study, the researcher utilized Quantitative Descriptive Analysis in evaluating the Sensory Characteristics if the product. In the study of Junio (2024), it employed QDA to assess the study Coco-Squash Spread. The study assessed three samples of the product and evaluated the sensory characteristics. In another study of Junio (2024) about the Formulation of Coco-Squash Peanut Nutri-Bar utilizes also the QDA answered by the trained panelists in evaluating the sensory characteristics of the product. In the present study, the researcher also employed the QDA instrument.

These studies collectively highlight the untapped potential of underutilized banana varieties, such as Lagkitan, and their derivatives. Incorporating Lagkitan banana flour into products like turmeric-based cookies could create innovative and nutritious food alternatives, offering a promising solution to enhance dietary fiber and antioxidant intake.

## 5. Research Methodology

This study considered three (3) phases in conducting this research activity. (1) Preparatory Phase, (2) Experimental Phase, and (3) Evaluation Phase. (1)In the preparatory phase, the researcher focused on the preparation of raw materials as main ingredients such as lagkitan banana flour and turmeric powder. In the selection of lagkitan banana, it must be mature and firm, the skin is bright green and uniform, free from cracks or discoloration, and free from signs of pest damage, bruises, or cuts. The good quality of turmeric is that the outer skin should have a vibrant orange-brown hue, while the inner flesh is a deep orange-yellow color. The rich color indicates freshness and a high concentration of curcumin, the compound responsible for its health benefits and pigmentation. The roots should feel firm and smooth to the touch, cracked, and excessively dry. The banana and turmeric were peeled and sliced until tender and ready for drying, Likewise, other ingredients like butter, sugar, egg, and baking soda also prepared including the formulation of raw materials by sample were done in this phase. (2) In this study, three samples were formulated for banana-turmeric powder to determine the most acceptable proportion. The formulations contain different amounts of banana flour and turmeric powder but the same amount of minor ingredients like butter, sugar, egg baking soda, and salt. (3) In the evaluation phase the researcher

conducted a subjective evaluation in answer to the sensory characteristics of the product. The subjective evaluation was focused on the sensory evaluation based on the sensory characteristics of the Banana-Turmeric cookies in terms of appearance, aroma, taste, and texture. It was done by the trained panelists and experts from the Food Technology and Food Service Management students and faculty. Quantitative Descriptive Analysis was used in this evaluation. Likewise, after the evaluation, the three samples of banana-turmeric cookies were ranked as the best sample.

## 6. Results and Discussion

**Table 1. Banana-Turmeric Cookies**

| Sample 1 | Sample 2 | Sample 3 |
|---|---|---|
| 260 grams Lagkitan Banana Flour | 250 grams Lagkitan Banana Flour | 243 grams Lagkitan Banana Flour |
| 10 grams Turmeric Powder | 20 grams Turmeric Powder | 27 grams Turmeric Powder |

Table 1 shows three formulations for Banana-Turmeric powder, differing primarily in the amount of banana flour and turmeric powder, Sample 1 contains the highest amount of banana flour (260 grams), which likely gives it a starchy texture and more pronounced banana flour with less amount of turmeric powder. Sample 2, with 251 grams of banana flour, offers a softer texture with 19 grams of turmeric powder which gives a mild taste of turmeric powder. While Sample 3, with 243 banana flour, produces a less pronounced banana flavor with a more pronounced turmeric powder. By varying the amount of banana flour and turmeric powder each sample offers different intensities and textures, guiding further experimentation.

**Table 2. Sensory Characteristics of Banana-Turmeric Cookies**

| Sensory Attributes | Sample 1 | | Sample 2 | | Sample 3 | |
|---|---|---|---|---|---|---|
| | Mean | Description | Mean | Description | Mean | Description |
| **Appearance:** Color | 1.8 | Light Brown | 2.4 | Golden Brown | 4.2 | Dark Brown |
| **Aroma:**<br>Banana<br>Turmeric | <br>2.9<br>1.7 | <br>Moderate<br>Weak | <br>3.1<br>2.6 | <br>Moderate<br>Moderate | <br>3.2<br>2.4 | <br>Moderate<br>Moderate |
| **Taste:**<br>Banana<br>Turmeric | <br>3.2<br>1.9 | <br>Pronounced<br>Less Pronounced | <br>2.7<br>3.0 | <br>Pronounced<br>Pronounced | <br>3.0<br>3.7 | <br>Pronounced<br>Pronounced |
| **Texture** | 1.4 | Soft | 3.0 | Crisp and Tender | 3.7 | Crisp and Tender |

*Legend: Color – 0-1.9 Light Brown; 2.0-3.9 Golden Brown; 4.0-6.0 Dark Brown*
*Aroma – 0-1.9 Weak; 2.0-3.9 Moderate; 4.0-6.0 Strong*
*Taste – 0-1.9 Less Pronounced; 2.0-3.9 Pronounced; 4.0-6.0 Very Pronounced*
*Texture – 0-1.9 Soft; 2.0-3.9 Crisp and Tender; 4.0-6.0 Very Crisp and Tender*

The emphasis of the sensory evaluation was on appearance (color), aroma, taste, and texture. Results of the sensory evaluation were collected through statistical analysis using arithmetic mean. Using Quantitative Descriptive Analysis score sheets, the Banana-Turmeric Cookies were characterized. Scores given by the thirty (30) respondents from the 4th year BS Food Technology students and Food Service Management students and faculty who are considered as trained panelists and experts in one of the State University in Bicol, were measured from the scales. The sensory evaluation revealed in Table 1, that the color was varying across all samples, and based on the evaluation the respondents prefer sample 2. The aroma profiles of the banana flour were relatively similar among the three samples while the aroma profile of the turmeric powder on the sample also varied, with a weak presence of turmeric powder on sample 1. Taste assessments of banana flour among the three samples indicated a moderate flavor profile for all samples, while the taste of turmeric powder sample1 has its weak evaluation. Texture evaluation of the banana turmeric cookies provides variation among the samples, with samples 2 and 3 offering a crisp and tender and sample 1 providing a softer texture. The sensory evaluation provides valuable data on determining the sensory characteristics of banana-turmeric cookies in terms of appearance, aroma, taste, and texture.

**Table 3. Most Preferred Sample**

| Sample | Arithmetic Mean | Rank | Sample |
|---|---|---|---|
| **1** | 1.8 | 2nd | 1 |
| **2** | 1.5 | 1st | 2 |
| **3** | 2.6 | 3rd | 3 |

Among the three samples presented to the panelists, one sample emerged as the most preferred product based on the Rank Preference Test conducted among the 30 trained/expert panelists. Through the rank preference test, the panelists of evaluators ranked the three samples based on their preferred best sample up to the least liked. The lower mean score on the rank preference test will be the first and the sample with the highest mean score will automatically be ranked third. Respondent preference leaned heavily towards Sample 2, followed by Sample 1, and then Sample 3. This preference is primarily attributed to Sample 2's superior performance across sensory attributes and overall acceptability. The relative proportions of key ingredients significantly influenced product quality. The clear preference for Sample 2 underscores the significant impact of ingredient ratios on product quality. This suggests that optimizing the formulations of Samples 1 and 3 to more closely align with Sample 2 could elevate their overall acceptability. Given the substantial lead of Sample 2, marketing efforts should prioritize this product while leveraging its success to drive consumer interest in the entire product line. Moreover, in-depth analysis of the specific qualities that make Sample 2 so appealing can inform the development of future, improved products within the Banana-Turmeric Cookies.

## 7. Recommendations:

To ensure the successful development and commercialization of Banana-Turmeric Cookies, several critical aspects require further exploration. Firstly, conducting a comprehensive nutritional analysis is recommended to assess the cookies' macronutrient and micronutrient content, with a particular focus on fiber, vitamins, and minerals derived from lagkitan banana and turmeric powder. This information will be valuable for promoting the cookies as a nutritious, plant-based snack. Secondly, microbial testing is

vital to guarantee product safety by identifying potential bacterial or fungal contaminants, ensuring consumer health, and meeting food safety standards. Additionally, a shelf-life study should be undertaken to determine how long the cookies remain fresh and safe under various storage conditions. This research will help identify optimal storage methods and the potential need for preservatives, both of which are essential for retail. Highlighting its unique flavor combination and health benefits can attract health-conscious consumers seeking innovative snacks. Conducting market research will provide insights into consumer preferences and competitive pricing, maximizing the product's market appeal and commercial potential.

## 8. Conclusion

The study reveals that varying the proportions of banana flour and turmeric powder significantly impacts sensory attributes, on its appearance, aroma, taste, and texture, which are critical to consumer preference. Among the samples, Sample 2, containing a moderate balance of banana flour and turmeric powder, was most preferred by respondents due to its optimal flavor, texture, and overall acceptability, outperforming the other formulations. The findings suggest that aligning the formulations of Samples 1 and 3 more closely with Sample 2 could enhance their appeal. These results offer valuable insights for refining the product and exploring further improvements to better meet consumer expectations.

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