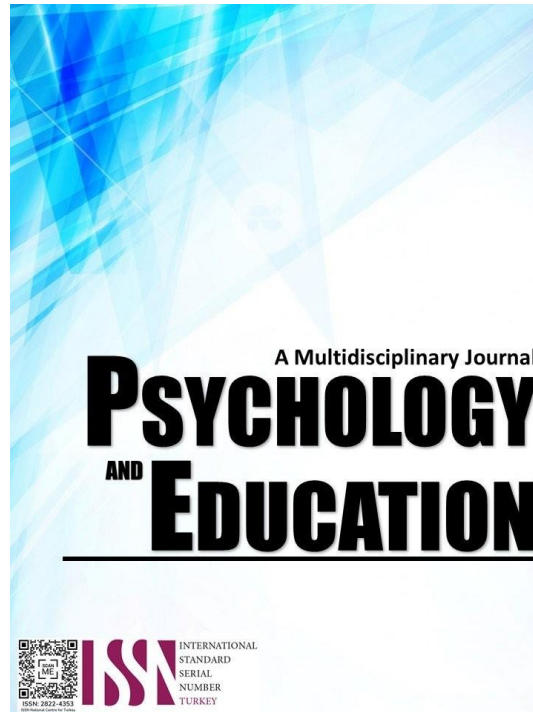


DEVELOPMENT OF SWEET POTATO (IPOMOEA BATATAS) AND BANANA (MUSA ACUMINATA) MUFFINS: TECHNO-GUIDE



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Development of Sweet Potato (*Ipomoea Batatas*) and Banana (*Musa Acuminata*) Muffins: Techno-Guide

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Abstract

This study developed sweet potato (*Ipomoea batatas*) and banana (*Musa acuminata*) muffins a gastronomic delight and nutritional perspective in Minolos, Barili, Cebu during the school year 2024-2025 as basis for techno-guide. This study used the combination of two research designs, namely experimental and descriptive methods. The respondents were categorized into trained panelists and untrained panelist. The trained panelists were the instructors ages 31-40 and most were females, while the untrained panelists were the college and high school students which most of them were females and below 20 years old. The findings revealed that the ingredient formulations of four treatments were different amounts of sweet potato and banana. The overall acceptability of the sensory revealed descriptive evaluation like extremely satisfied. The test of significance on the sensory quality found out all were reject hypothesis which were interpreted as significantly difference. The most preferred and acceptable production cost was the treatment 2 with the ratio of 10g smash sweet potato and 40g smash banana. The researcher concluded that the development of sweet potato (*Ipomoea batatas*) and banana (*Musa acuminata*) muffins represents a promising innovation in the realm of nutritious baked goods. By capitalizing on the health advantages and inherent sweetness of sweet potatoes and bananas, the muffins meet the increasing need for healthier snack choices of the people. In general, this study offers important information on creating healthy baked goods, opening opportunities for further research and business prospects in the future.

Keywords: *sweet potato (ipomoea batatas), banana (musa acuminata) muffins, techno-guide, experimental and descriptive methods*

Introduction

Agriculture has long been a source of pride in the Philippines, with farmers playing a key role in producing crops and vegetables for local markets. However, not all farmers experience consistent economic success, especially when there is an oversupply of out-of-season crops like sweet potatoes and bananas. Despite these challenges, agriculture remains a vital part of the nation's economy, supporting its prosperity and helping uphold core Filipino values (Napkil, 2023).

Farmers, especially in the mountainous area of Barangay Nasipit, Barili, Cebu, frequently encounter economic challenges when there is an excess of off-season product such as sweet potatoes and bananas. As not all harvested vegetables are sold and many decay, these farmers face considerable income losses from this excess.

Muffin entrepreneurs in Barangay Nasipit, Barili, Cebu have come up with creative solutions to address the problem of surplus crops like sweet potatoes and bananas. By adding these ingredients to muffin recipes, they can minimize food waste and establish a new market for locally sourced products.

Sweet potato and banana muffins preparation can be revived by investigating the nutritional and functional potential of sweet potato (*Ipomoea batatas*) and banana herbs (*Musa acuminata*). To discover more nutrient-dense food sources, new food items and manufacturing techniques are being developed through the process of food exploration and innovation (Mytle, 2021).

The idea of muffin preparation and innovation can be enhanced by describing particular methods employed to convert excess produce such as sweet potatoes and bananas into muffins. As an example, farmers and business owners can add mashed sweet potatoes or banana to muffin mixtures to produce moist, tasty baked treats. Furthermore, employing food processing methods such as dehydrators or blenders can assist in preserving these crops and integrating them effectively into the recipes. These techniques not only minimize food waste but also generate a product that satisfies consumer needs, illustrating an effective response to the surplus crop problem in Barangay Nasipit, Barili, Cebu.

Furthermore, it will also provide the vendors of Barili a new market for sweet potato and banana, thus avoiding wastage and increase income and profitability. Excessive production of sweet potatoes and bananas in Barili can lead to several issues such as market saturation when there's too much supply, it can surpass demand, leading to lower prices. Muffin entrepreneurs can experiment with different combinations of these ingredients, adding flavor and nutrition to the muffins while reducing food waste. This approach not only helps manage surplus crops but also opens new market opportunities, benefiting both farmers and local communities by providing a steady income stream and promoting sustainable agricultural practices.

Literature Review

According to Bessiere (2018), claims that the origins of the Muffins may be found in the pre-colonial era, when our forefathers offered

kakanin as a sacrifice to the gods and guests. On important events like fiestas, anniversaries, marriages, and birthdays, kakanin are typically present. Without these kakanin being placed on the table, no celebration is full. They are particularly well-liked during the holidays and since Christmas and New Year's Day are rapidly approaching. In the Philippines, muffin is an individually portioned baked product; however, the term can refer to one of two distinct items: a part-raised flatbread that is baked and then cooked on a griddle, or a quickbread that is chemically leavened and then baked in a mold.

As mentioned by Camillo and Karım, (2018) in their study, Muffin or cupcake is just one of the various types of cupcakes that are available in the Philippines. Flour and rice are used to make Muffins. It is often consumed on all occasions. It goes well with coffee and is served hot as well. Benefits of Muffins include antibacterial properties of its fatty acids, which assist to destroy bacteria that cause illness. By raising good cholesterol and decreasing the ratio of bad to good cholesterol, muffins from sweet potato and banana can also prevent heart disease. Additionally, it guards against strokes, and it helps strengthen immune system.

According to Hall and Sharples (2021), culinary fusion is creating a new product, new food, new tastes, and new presentations, by synthesizing different senses of food belonging to world cuisines. It is the combining of different styles, techniques, ingredients and tastes from all around the world by creative cooks, often on one plate. According to De Castro and Arenillo (2019) culinary fusion is the gathering of at least two different culinary cultures on the same plate, as a result of a conscious effort to find different and unique tastes, provided that none of the combined culinary cultures dominates the other one. Hoppu, Puputti, & Sandell, (2020) defined fusion cuisine as the synthesizing and combining of culinary ingredients, processing and cooking techniques of different countries, and finally, presentation of the obtained food as a very different food from the one available in nutritional perspective.

Horwood, (2019) affirmed that sweet potato has an anti-hyperglycemic effect, protects from cardiovascular diseases, and decreases the level of cholesterol and intestinal glucose absorption. The chemical characterization of potato peel powders showed a high fiber and protein content. The inclusion at different concentrations of potato peel flour from the market improved the nutritional, technological, and stability of formulated foodstuffs. After potato peel flour addition, the hardness of muffins was significantly decreased compared to the control muffin, the crumb color became darker were observed.

Methodology

This study used the combination of two research designs, namely experimental and descriptive methods that assessed the sensory analysis of muffins utilizing sweet potato and banana as a main ingredient from T1 to T4 in terms of flavor, scent, color, and texture. The pre-trial formulation process was observed for creating and innovating muffins must incorporate particular details, including the standards for choosing ingredients, such as the freshness and ripeness of surplus produce like sweet potatoes and bananas, to guarantee quality. The ratios of ingredients, like the balance of fruit puree to flour, need to be experimented with to attain the preferred texture and taste. The composition of the panel includes 92 members, comprising 80 untrained panelists who are students and 12 trained panelists who are educators in Technology and Livelihood Education (TLE). The untrained panelists offer a wider, more general view on the product's attractiveness and acceptance by consumers, whereas the trained panelists provide insights rooted in their expertise in food preparation and assessment. This blend enables a thorough evaluation of the product from both a beginner user and a specialist perspective, guaranteeing a balanced appraisal of the muffin innovation.

To regulate external influences during sensory assessments, consistent baking conditions like temperature and baking duration were upheld to guarantee uniformity in muffin quality. Furthermore, panelist exhaustion was reduced by capping the sample evaluations per session and incorporating breaks, while ingredient quality was ensured by procuring fresh, high-grade surplus produce for each trial to guarantee dependable and valid outcomes.

The sensory information obtained from the Hedonic and Likert scales were analyzed statistically through Analysis of Variance (ANOVA) to ascertain if there were considerable differences in the sensory ratings (e.g., taste, texture, and overall acceptability) among various muffin formulations. ANOVA determined whether the differences in ratings are attributed to the formulation rather than random fluctuations. This procedure increased scientific validity by offering objective, measurable evidence that corroborates or contradicts hypotheses, guaranteeing that the conclusions reached rely on trustworthy statistical assessment instead of personal beliefs or randomness.

Results and Discussion

The findings of the study showed that the respondents were categorized into trained panelists and untrained panelist. The trained panelists were the instructors ages 31-40 and most were females, while the untrained panelists were college and high school students which most of them were females below 20 years old. They consumed muffins once a week and they paid less than 20 pesos.

By securing a diverse panel, the outcomes were more applicable and representative of a wider consumer demographic. The size of the sample was another crucial factor to take into account. A sufficiently large panel size aids in minimizing individual bias and confirms that the outcomes were statistically valid. A sample size that was inadequate might not yield dependable data or could miss representing a range of consumer preferences. For the sensory evaluation, a well-rounded panel including both trained Teachers in TLE and untrained which were student panelists guarantees an extensive evaluation of the product's attractiveness, considering insights from both experts and average consumers.

The process of selecting panelists should likewise be impartial. Panelists who are trained and knowledgeable in food preparation and assessment are selected for their expertise in sensory analysis, while those who are untrained are chosen to reflect typical consumers. Panelists ought to be chosen randomly or based on certain criteria to eliminate any potential bias stemming from personal preferences or previous knowledge of the product under evaluation. Furthermore, elements such as panelist fatigue ought to be managed by restricting the quantity of samples assessed in each session, guaranteeing that the evaluations stay precise and uniform during the procedure. Collectively, these measures guarantee that the sensory assessments produce dependable, impartial outcomes, and that the deductions made represent the tastes of a varied, representative group of consumers.

The findings revealed that the ingredient formulations of four treatments were different amounts of sweet potato and banana.

Table 1. Analytical Results on Color Attributes of the Muffins Preparation

Categories	Scale	Treatment			
		T1	T2	T3	T4
Yellowish brown	5	31	32	46	39
Light Brown	4	26	33	22	30
Moderately Brown	3	17	15	15	10
Dark Brown	2	13	7	3	8
Chocolate Brown	1	5	5	6	5
Mean		4.34	4.18	4.54	4.39
Description		Extremely Satisfied	Very Satisfied	Extremely Satisfied	Extremely Satisfied

As to the sensory evaluation of the four treatments, it was found out that in color, Treatment 1, Treatment 3 and Treatment 4 were extremely satisfied while Treatment 2 was every satisfied.

Table 2. Analytical Results on Aroma Attributes of the Muffins Preparation

Categories	Scale	Treatment			
		T1	T2	T3	T4
Extremely Pleasant	5	50	44	34	45
Very Pleasant	4	22	34	38	30
Moderately Pleasant	3	10	11	12	12
Slightly Pleasant	2	7	2	4	3
Unpleasant	1	3	1	4	2
Mean		4.53	4.49	4.18	4.47
Description		Extremely Satisfied	Extremely Satisfied	Very Satisfied	Extremely Satisfied

As to the aroma, Treatment 1, 3 and 4 were extremely satisfied while Treatment 2 was very satisfied.

Table 3. Analytical Results on Taste Attributes of the Muffins Preparation

Categories	Scale	Treatment			
		T1	T2	T3	T4
Desirable	5	43	41	46	43
Slightly Desirable	4	20	35	36	31
Neither Desirable or Undesirable	3	21	13	10	3
Slightly Undesirable	2	6	2	0	0
Undesirable	1	2	1	0	5
Mean		4.34	4.23	4.51	4.38
Description		Extremely Satisfied	Extremely Satisfied	Extremely Satisfied	Extremely Satisfied

As to the taste evaluation, Treatment 1, 2, 3 and 4 were extremely satisfied.

Table 4. Analytical Results on Flavor Attributes of the Muffins Preparation

Categories	Scale	Treatment			
		T1	T2	T3	T4
Desirable	5	40	42	40	41
Slightly Desirable	4	34	31	33	34
Neither Desirable or Undesirable	3	8	4	6	3
Slightly Undesirable	2	8	2	3	1
Undesirable	1	2	3	0	3
Mean		4.39	4.44	4.31	4.34
Description		Extremely Satisfied	Extremely Satisfied	Extremely Satisfied	Extremely Satisfied

On the flavor, Treatment 1, 2, 3 and were also extremely satisfied.

Table 5. Mean Sensory Score for the Preference Test Analysis on the Over-all Acceptability of

the Muffins

Categories	Scale	Treatment			
		T1	T2	T3	T4
Like Extremely	9	35	34	37	34
Like Very Much	8	40	41	38	41
Like Moderately	7	15	14	15	13
Like Slightly	6	2	3	2	4
Neither Like nor Dislike	5	0	0	1	0
Dislike Slightly	4	0	0	0	0
Dislike Moderately	3	0	0	0	0
Dislike Very Much	2	0	0	0	0
Dislike Extremely	1	0	0	0	0
Mean		8.28	8.30	8.29	8.20
Description		Like Extremely	Like Extremely	Like Extremely	Like Extremely

The overall acceptability of the sensory revealed descriptive evaluation like extremely satisfied.

Test Of Significant Difference on The Sensory Quality from T1- T4 On The Formulation Of Muffins

Table 6. *Analysis of Variance (ANOVA) on the Color Attribute of the Four Treatment*

Treatment	Mean	f	f- critical value	Decision	Interpretation
1	4.34a	3.19	2.24	Reject Ho	Significant
2	4.18b				
3	4.54a				
4	4.39a				

Table 7. *Analysis of Variance (ANOVA) on the Aroma Attribute of the Four Treatment*

Treatment	Mean	f	f- critical value	Decision	Interpretation
1	4.53a	2.63	2.45	Reject Ho	Significant
2	4.49b				
3	4.18a				
4	4.47a				

Table 8. *Analysis of Variance (ANOVA) on the Taste Attribute of the Four Treatment*

Treatment	Mean	f	f- critical value	Decision	Interpretation
1	4.34a	5.23	2.39	Reject Ho	Significant
2	4.23b				
3	4.51a				
4	4.38a				

Table 9. *Analysis of Variance (ANOVA) on the Flavor Attribute of the Four Treatment*

Treatment	Mean	f	f- critical value	Decision	Interpretation
1	4.39a	2.89	2.58	Reject Ho	Significant
2	4.44b				
3	4.31a				
4	4.34a				

The test of significance on the sensory quality found out all null hypotheses were rejected which were interpreted as significantly difference.

Table 10. *Mean Sensory Score for the Preference Test Analysis on the Over-all Acceptability of the Muffins*

Categories	Scale	Treatment			
		T1	T2	T3	T4
Like Extremely	9	35	34	37	34
Like Very Much	8	40	41	38	41
Like Moderately	7	15	14	15	13
Like Slightly	6	2	3	2	4
Neither Like nor Dislike	5	0	0	1	0

Dislike Slightly	4	0	0	0	0
Dislike Moderately	3	0	0	0	0
Dislike Very Much	2	0	0	0	0
Dislike Extremely	1	0	0	0	0
Mean	8.28	8.30	8.29	8.20	
Description	Like Extremely	Like Extremely	Like Extremely	Like Extremely	

As shown in table 10, the most acceptability of muffins was treatment 2.

Table 11. *Ingredient Formulation of Muffins*

<i>Ingredients for Muffins</i>	<i>T1</i>	<i>T2</i>	<i>T3</i>	<i>T4</i>
Smash sweet potato	80g	60g	40g	20g
Smash banana	20g	40g	60g	80g
All Purpose Flour	1 1/2 cups	1 1/2 cups	1 1/2 cups	1 1/2 cups
Granulated Sugar	3/4 cups	3/4 cups	3/4 cups	3/4 cups
Brown Sugar	¼ cup of brown sugar	¼ cup of brown sugar	¼ cup of brown sugar	¼ cup of brown sugar
Baking Powder	1 ½ teaspoon	1 ½ teaspoon	1 ½ teaspoon	1 ½ teaspoon
Salt	½ tsp salt	½ tsp salt	½ tsp salt	½ tsp salt
Egg	2 pcs large	2 pcs large	2 pcs large	2 pcs large
Milk	1/4 cup	1/4 cup	1/4 cup	1/4 cup
Vanilla	1 teaspoon	1 teaspoon	1 teaspoon	1 teaspoon
Water	2 cups of water	2 cups of water	2 cups of water	2 cups of water

The most preferred and acceptable production cost was the treatment 2 with the ratio of 10g smash sweet potato and 40g smash banana.

Conclusions

The researcher concluded that the development of sweet potato (*Ipomoea batatas*) and banana (*Musa acuminata*) muffins represents a promising innovation in the realm of nutritious baked goods. From the research, especially the recognition of the favored formula, Treatment 2. This formulation received the highest preference from panelists because of its outstanding sensory qualities, including its moist texture, harmonious sweetness, and overall flavor profile, rendering it the most preferred choice among the different treatments evaluated. These results highlighted the possibility of using excess crops, such as sweet potatoes and bananas, in creative methods to decrease food waste while producing a product that satisfies consumer demands. This research enhanced the comprehension of how food innovation can aid local farming while offering sustainable and marketable solutions. Besides the muffins' possible market success, a broader conclusion must take into account aspects like target demographics, competitive benefits, and scalability. Utilizing surplus crops has provided a competitive edge, positioning the product as both sustainable and innovative. Moreover, the capacity to scale muffin production through the use of local ingredients allows small-scale entrepreneurs in the community to grow, thus fostering economic development and minimizing food waste on a broader level. The research showed that these components not just boost the nutritional value of the muffins by offering important vitamins, minerals, and fiber, but also enhance sensory qualities like taste, consistency, and odor which results in strong customer approval. By capitalizing on the health advantages and inherent sweetness of sweet potatoes and bananas, the muffins meet the increasing demand for healthier snack options," would enhance readability. Additionally, the cost evaluation shows a practical manufacturing structure, indicating that these muffins have potential to be a successful product in the market. In general, this study offers important information on creating healthy baked goods, opening opportunities for further research and business prospects in the future.

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