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Determinants and Warning Signs of Inpatient Falls a Innovative Cupcake Using Giant Swamp Taro Flour (Cyrtosperma merkusii) and Carrot Frosting (Daucus carota subsp. sativus)

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Abstract: *The increasing rate of unhealthy eating patterns and food insecurity has intensified the demand for healthier snack options. This study examines the viability of Giant Swamp Taro (Cyrtosperma merkusii) flour as a substitute for wheat flour in cupcakes and carrot (Daucus carota subsp. sativus) frosting as a nutrient-dense icing alternative. This research advances food innovation and the utilization of indigenous crops by evaluating sensory attributes, nutritional advantages, and consumer acceptance. A developmental study approach was utilized, concentrating on product formulation and sensory evaluation. Seventy (70) randomly selected students and teachers evaluated the cupcake's flavor, texture, appearance, and aroma with a 9-point hedonic scale. The data analysis encompassed frequency distribution, percentage analysis, and computations of the weighted mean. The taro-based cupcake with carrot icing achieved elevated ratings in all sensory aspects, signifying robust consumer approval. The addition of Giant Swamp Taro flour improved dietary fiber, vital minerals, and resistant starch, whereas carrot frosting contributed additional vitamins and antioxidants. The findings underscore the product's potential as a healthful and sustainable snack alternative. This study highlights the significance of incorporating indigenous crops into contemporary food production to enhance nutrition and promote sustainable agriculture. This novel cupcake leverages locally available yet underutilized resources, addressing the demand for healthier food options while enhancing food security, dietary diversity, and economic prospects.*

Keywords: Sustainable Agriculture; Giant Swamp Taro Flour; Carrot Frosting; Nutritional Enhancement; Food Product Development

I. INTRODUCTION

The increasing prevalence of unhealthy dietary habits and reliance on processed, high-calorie foods has become a global public health concern. These poor eating patterns are strongly linked to a surge in chronic diseases such as obesity, diabetes, and cardiovascular disorders (Baranggan & Adlaon, 2024). While efforts have been made to promote better nutrition, many popular snack foods remain nutritionally deficient. In the Philippines, culturally significant yet calorie-dense treats like cupcakes continue to dominate celebrations and daily consumption due to their convenience, affordability, and appeal (McMahon, 2024). However, conventional cupcakes often lack essential nutrients, contributing little to a healthy diet (Velasco et al., 2023). There is a growing need to reformulate such widely consumed products to enhance their nutritional value without compromising taste or cultural relevance.

Recent developments in food innovation emphasize the incorporation of indigenous and nutrient-dense ingredients into familiar food items as a promising approach to improving public nutrition. One such underutilized resource is **Giant**

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Swamp Taro (*Cyrtosperma merkusii*), a traditional root crop prevalent in the Pacific Islands and parts of the Philippines. This crop is rich in dietary fiber, β-carotene, thiamine, vitamin C, and essential minerals such as calcium, iron, and zinc (Pobar et al., 2014; Rao et al., 2014; Müller & Guzzon, 2023). It also contains resistant starch and amylose, making it a viable option for managing blood sugar and enhancing satiety. Despite its nutritional promise and role in traditional cuisine, Giant Swamp Taro remains largely absent from modern food products, highlighting a missed opportunity for both health improvement and agricultural sustainability (Santonia et al., 2023; Sjögersten et al., 2023).

Complementing this is the **carrot** (*Daucus carota subsp. sativus*), a globally recognized root vegetable known for its abundance of carotenoids, antioxidants, and polyphenols. Carrots are associated with a range of health benefits, including improved immune response, better vision, and reduced cancer risk (Ikram et al., 2024; Paparella et al., 2024; Dias, 2012a; Dias, 2012b). Available in multiple varieties, carrots contain bioactive compounds such as flavonoids and polyacetylenes, along with essential vitamins and minerals (Varshney & Mishra, 2022; Bystrica et al., 2015). Due to their versatility, they are widely incorporated into various processed foods, including juices, powders, and baked goods, making them suitable for innovations in icing and toppings (Turturică & Bahrim, 2021).

This study explores the development of a nutrient-enriched cupcake by substituting wheat flour with Giant Swamp Taro flour and enhancing the frosting with carrot extract. By doing so, it aims to create a healthier version of a familiar treat that aligns with the growing consumer demand for nutritious food options. According to Villanueva (2021), 75% of Filipino consumers prefer healthier food alternatives, and 60% are willing to pay more for improved nutritional quality—indicating a favorable market for this product. Furthermore, this innovation supports sustainable agriculture by promoting the use of locally grown, underutilized crops such as taro and carrots.

Despite previous studies on the nutritional properties of taro and carrots, little research has explored their synergistic application in mainstream baked goods. This study fills that gap by evaluating the sensory appeal, nutritional advantages, shelf life, and consumer acceptability of cupcakes made with Giant Swamp Taro flour and carrot icing. The findings aim to inform future food innovation efforts that integrate traditional ingredients into modern diets, thereby addressing both public health and local agricultural development.

Materials and Methods

This study utilized a developmental research design aimed at product creation and assessing the nutritional benefits of integrating Giant Swamp Taro flour and carrot icing. The concept was suitable as it entailed developing and evaluating the impacts of Giant Swamp Taro flour and carrot icing as primary components in cupcake creation. The main goal was to improve the nutritional value of the cupcake while assessing its market potential.

Research Environment

The research was performed at Union National High School located in Barangay Union, Dapa, Surigao del Norte, Philippines. The school is situated roughly 7 kilometers from the municipality of Dapa, offering an appropriate environment for product testing and assessment.

Research Respondents

The respondents of the study were students and teachers of Union National High School. A stratified random sampling technique was used to select the respondents. The distribution of respondents was as follows: Grade 7 (10 respondents, 14.3%), Grade 8 (10 respondents, 14.3%), Grade 9 (10 respondents, 14.3%), Grade 10 (10 respondents, 14.3%), Grade 11 (10 respondents, 14.3%), Grade 12 (10 respondents, 14.3%), and teachers (10 respondents, 14.3%). In total, there were 70 respondents, with each group representing 14.3% of the total sample.

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Table 1. Distribution of respondents in the study.

Respondents Level	No. Of Respondents	% of Total Responses
Grade 7	10	14.3%
Grade 8	10	14.3%
Grade 9	10	14.3%
Grade 10	10	14.3%
Grade 11	10	14.3%
Grade 12	10	14.3%
Teachers	10	14.3%
Total	**70**	**100%**

Research instrument

The research instrument was designed to evaluate the acceptability of the giant swamp taro flour and carrot frosting in terms of its odor, taste, appearance, and texture. The evaluation focused on four key attributes of the product. Respondents rated each attribute using a 9-point scale: Like Extremely (9), Like Very Much (8), Like Moderately (7), Like Slightly (6), Neither Like nor Dislike (5), Dislike Slightly (4), Dislike Moderately (3), Dislike Very Much (2), and Dislike Extremely (1) (Baranggan & Adlaon, 2024).

Procurement of Ingredients

The components for cupcake preparation were giant swamp taro (*Cyrtosperma merkusii*), carrot (*Daucus carota subsp. sativus*), eggs, whole milk, vanilla extract, salt, baking powder, granulated sugar, and lemon juice.

Utensils and Equipment

The following utensils and equipment were utilized in the preparation process:

- **Measuring tools**: Measuring cups and spoons
- **Mixing and processing equipment**: Electric mixer, mixing bowls, food processor, sifter
- **Baking equipment**: Microwave oven, cupcake molds
- **Preparation tools**: Chopping board, knife, fork, lemon squeezer, mortar and pestle

Ingredient Measurements

The specified measurements for preparing the taro-based cupcake and carrot frosting were as follows:

Taro Cupcake:

- 1 cup giant swamp taro flour
- 1 cup granulated sugar
- 1 teaspoon baking powder
- ½ teaspoon salt
- ½ teaspoon vanilla extract
- 1 cup whole milk
- 1 large egg

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Carrot Frosting:

- 2 large egg whites
- ½ cup granulated sugar
- 1 teaspoon salt
- 1 teaspoon vanilla extract
- 1 teaspoon lemon juice
- 1 whole carrot (for frosting)

Procedures

Preparation of Giant Swamp Taro Flour

1. Select fresh giant swamp taro corms.
2. Wash the corms thoroughly to remove dirt and impurities.
3. Peel the corms manually, ensuring complete removal of the outer layer.
4. Slice the corms into uniform medium-sized pieces.
5. Soak the sliced corms in water overnight to eliminate any potential irritation from oxalate crystals.
6. Drain and air-dry the corms for 10 minutes.
7. Using a crash technique to make it fine and easy to dry.
8. Oven-dry the corms on an aluminum tray at **70°C for two hours** to achieve optimal moisture reduction.
9. Grind the dried corms into fine flour using a mortar and pestle.

Preparation of Taro Cupcake Batter

1. **Mix Dry Ingredients**: In a mixing bowl, combine giant swamp taro flour, granulated sugar, baking powder, and salt. Set aside.
2. **Mix Wet Ingredients**: In a separate bowl, whisk together eggs, vanilla extract, and whole milk until well blended.
3. **Combine Ingredients**: Gradually add the dry ingredients to the wet ingredients, mixing continuously until a smooth batter is formed.
4. **Prepare Cupcake Molds**: Grease the cupcake molds lightly with oil to prevent sticking.
5. **Fill the Molds**: Pour the batter into lined cupcake molds, filling them up to two-thirds full.
6. **Baking Process**: Preheat the oven to **180°C** and bake the cupcakes for approximately **18-20 minutes** or until a toothpick inserted in the center comes out clean.
7. **Cooling**: Remove the cupcakes from the oven and allow them to cool completely before frosting.
8. Here is the flowchart for the preparation of taro cupcake batter. It shows the step-by-step process from start to finish.

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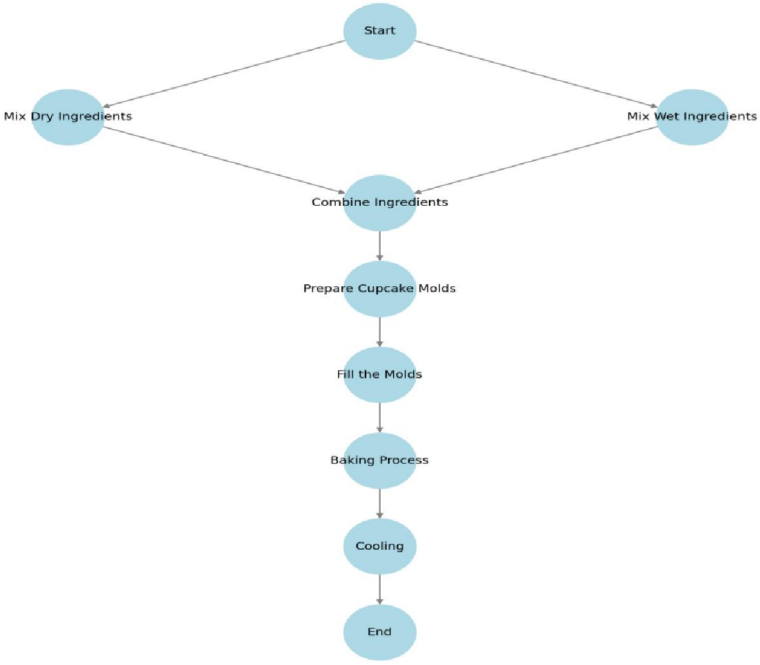
Flow Chart 1: Preparation of Taro Cupcake Batter.

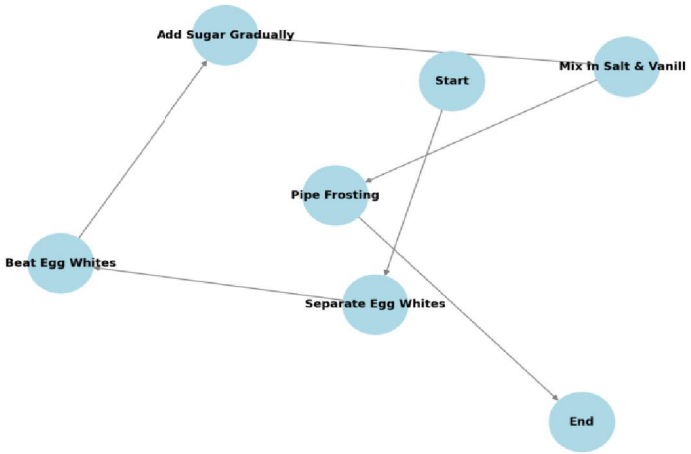


Preparation of Carrot Frosting

1. Separate the egg whites from the yolks.
2. Using an electric mixer, beat the egg whites in a large bowl until soft peaks form.
3. Gradually add sugar while continuing to beat until stiff and glossy peaks form.
4. Incorporate salt and vanilla extract, mixing thoroughly.
5. Pipe the frosting onto the cooled cupcakes using a piping bag.

Here is the flowchart for the preparation of carrot frosting. It shows the step-by-step process from start to finish.

Flow Chart 2: Preparation of Carrot Frosting.



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Data Gathering Procedure

The researchers formally submitted a request to the principal of Union National High School, seeking approval to conduct a survey involving selected students and teachers to assess the acceptability of the innovative cupcake made with giant swamp taro flour and carrot frosting. Upon obtaining authorization, the researchers secured informed consent from the parents or guardians, allowing their children to participate in a complimentary product tasting. Following the approval process, scorecards were distributed to participants to evaluate the cupcake based on predetermined criteria.

Data Analysis

The analysis and interpretation of data were conducted using the following statistical methods:

Frequency Count and Percentage – This method was used to present the distribution of responses, indicating the percentage of participants' perceptions of the innovative cupcake made with giant swamp taro flour and carrot frosting. Specifically, it measured respondents' evaluation of the product's taste, odor, appearance, and texture.

Weighted Mean – This statistical tool was utilized to determine the overall acceptability of the cupcake, including its taste, odor, texture, appearance, and perceived nutritional value.

Compute the Weighted Mean

The **weighted mean** is calculated using the formula:

$$WM = \frac{\sum(f \times w)}{N}$$

where:

f = frequency count for each response category

w = corresponding weight

N = total number of responses

Return on Investment (ROI) – ROI was employed as a profitability measure to assess the financial feasibility of producing the cupcake. It was calculated by analyzing net profit, gross sales, and production costs to evaluate the potential return on investment for the innovative product.

II. RESULTS AND DISCUSSIONS

A sensory evaluation of the Innovative Cupcake utilizing Giant Swamp Taro Flour (Cyrtosperma merkusii) and Carrot Frosting (Daucus carota subsp. sativus) was performed to evaluate customer acceptability regarding appearance, aroma, texture, flavor, and overall preference. The assessment employed a 9-Point Hedonic Scale, with 70 participants evaluating the product according to their preference levels. The frequency count and weighted mean were calculated to assess the product's overall acceptance.

Frequency Count of Sensory Evaluation

Table 2 presents the frequency count of responses for each sensory attribute, ranging from Like Extremely (9) to Dislike Extremely (1).

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Table 2: Frequency Count of Responses

Attributes	LE (9)	LVM (8)	LM (7)	LS (6)	NLK (5)	DS (4)	DM (3)	DVM (2)	DE (1)	TR
Appearance	25	19	10	7	6	2	1	0	0	70
Odor	26	17	12	8	4	2	1	1	0	70
Texture	26	16	15	6	5	1	1	0	0	70
Taste	29	16	12	6	3	2	1	1	0	70

Legend:
LE: Like Extremely (9), **LVM**: Like Very Much (8), **LM**: Like Moderately (7), **LS:** Like Slightly (6), **NLK:** Neither Like nor Dislike (5), **DS:** Dislike Slightly (4), **DM:** Dislike Moderately (3), **DVM:** Dislike Very Much (2) , **DE:** Dislike Extremely (1), **TR:** Total Responses.
Table 2 illustrates the distribution of ratings, with 9 (Like Extremely) being the highest preference and 1 (Dislike Extremely) denoting the lowest. The neutral grade (5 - Neither Like nor Dislike) represents the midpoint, whilst scores from 8 to 2 indicate differing levels of preference or aversion.

Each row represents a sensory attribute—Appearance, Odor, Texture, and Taste—with the figures indicating the number of respondents who chose each rating. The data, comprising 70 responses per feature, offers a thorough assessment of the product's sensory characteristics.
The findings reveal that the majority of respondents evaluated the cupcake favorably, with most ratings falling between "Like Extremely" (9) and "Like Slightly" (6). This indicates a pronounced overall liking for the product across all sensory characteristics.

Interpretation of Sensory Scores
Table 3 summarizes the computed weighted mean scores for each sensory attribute and their corresponding interpretation based on the 9-Point Hedonic Scale.

Table 3: Interpretation Based on the 9-Point Hedonic Scale

Attribute	Weighted Mean	Interpretation
Appearance	7.57	Like Moderately
Odor	7.64	Like Very Much
Texture	7.64	Like Very Much
Taste	7.67	Like Very Much
Overall Acceptability	7.63	Like Very Much

The cupcake's appearance garnered a score of 7.57, signifying a moderate favor among respondents. Although its color and presentation were generally well-received, this quality garnered the lowest grade among all sensory attributes. This indicates that while the cupcake's look was satisfactory, additional enhancements could improve its aesthetic appeal. Enhancing its form, icing design, or ornamental features may render it more appealing to buyers. Hathout (2021) asserts that sensory evaluations highlight the essential importance of appearance in consumer approval of baked products. A study on cupcakes infused with different quantities of Samwah herb revealed notable discrepancies in appearance ratings among samples, highlighting the significance of visual appeal in product development.

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The aroma of the cupcake garnered an impressive grade of 7.64, signifying strong approval from respondents. This indicates that the agreeable and welcoming fragrance enhanced the product's overall sensory allure. The inherent aroma of components like swamp taro flour and carrot icing may have augmented the olfactory experience. To sustain this elevated level of popularity, it will be imperative to ensure ingredient freshness and optimize the baking process for future product development. Basnig (2019) indicates that a study on the acceptability of okra cupcakes reveals that scent significantly influences consumer acceptance, with elevated aroma evaluations associated with enhanced total product acceptability.

The cupcake's texture garnered a rating of 7.64, signifying that respondents greatly appreciated its consistency. This grade indicates that the cupcake's mouthfeel was pleasurable, while some respondents may have anticipated a softer or more moist texture. To further improve this aspect, modifications in baking duration, ingredient proportions, or moisture retention methods may be contemplated to get a more sophisticated and gratifying texture. A recent study on squash (Cucurbita maxima) cupcakes revealed that participants assigned a high rating to the texture, achieving an overall mean score of 4.77 out of 5, signifying that they "liked it very much." The research highlighted that attaining an optimal cupcake texture—defined as moist, spongy, soft, or smooth—necessitates meticulous compliance with preparation protocols.To improve the texture of the cupcakes, consider modifying the baking duration, component proportions, or moisture retention methods. These alterations can result in a more sophisticated and gratifying texture, according with consumer preferences (Mercadal et al., 2022).

The taste of the cupcake, a crucial determinant of product approval, had a rating of 7.67, rendering it the highest-rated feature among all sensory elements. This signifies that the flavor was highly favored by respondents. The equilibrium of sweetness, the earthiness of swamp taro flour, and the inherent flavor of carrot frosting enhanced its positive reception. Although the flavor was positively regarded, slight adjustments in sweetness or ingredient ratios could further elevate the overall taste experience. A study on the sensory acceptability of squash (Cucurbita maxima) cupcakes revealed that flavor is essential to customer acceptance. The study indicated that the flavor of the squash cupcake received a high rating, with an overall mean score of 4.77 out of 5, signifying that respondents "liked it very much." This emphasizes the significance of attaining a harmonious and attractive flavor in cupcake compositions (Mercadal et al., 2022).

The overall acceptability of the cupcake was assessed at 7.63, indicating that respondents highly appreciated the product across all sensory aspects. This outcome indicates that the respondents predominantly favored the cupcake, with flavor, aroma, and texture identified as its most prominent qualities. Enhancing its visual attractiveness could further augment consumer contentment.

The results demonstrate that the Innovative Cupcake Utilizing Giant Swamp Taro Flour and Carrot Frosting received strong approval from respondents, with favorable evaluations across all sensory characteristics. Although the product currently exhibits significant market appeal, certain improvements in aesthetics and texture could further boost its popularity. These insights offer essential direction for product enhancement, prospective commercialization, and broader market appeal.

Shelf-Life Assessment and Nutritional Value of Giant Swamp Taro Flour

This study assessed the shelf-life and nutritional value of Giant Swamp Taro Flour (Cyrtosperma merkusii) to evaluate its storage stability and nutrient retention over time. To preserve the flour's purity and freshness, we put it in sealed cellophane bags, safeguarding it from moisture, insects, and contamination. Appropriate storage in a dry environment, free from humidity and pests, was crucial for maintaining its sensory and nutritional attributes. To improve safety, the flour may also be stored in sealed plastic jars or glass containers.

These findings correspond with Santonia's (2023) study, which examined the storage stability of flour obtained from both cultivated and wild species of gigantic swamp taro. Santonia's research demonstrated that the wild type possessed elevated concentrations of important minerals, including iron, zinc, and calcium, in contrast to the farmed form. Moreover, both kinds demonstrated significant antioxidant activity, surpassing 75%, suggesting that gigantic swamp

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taro flour preserves its nutritional and phytochemical attributes after storage. The findings underscore the promise of huge swamp taro flour as a nutritious and shelf-stable substitute for traditional flours.

Assessment of Nutritional Contribution of Carrot Juice mixing into Cupcake Frosting

Carrot juice is a substantial source of vital vitamins and minerals. Based on the available nutritional data, the nutrient composition of carrot juice per 100 grams is as follows (FatSecret, 2024).

Table 4: Nutritional Content of Carrot Juice (per 100g and per cupcake with 10g of carrot juice)

Nutrient	Per 100g of Carrot Juice	Per Cupcake (10g Carrot Juice)	% Daily Value per Cupcake
Vitamin A	956 µg (106% DV)	95.6 µg	10.6%
Vitamin C	8.5 mg (9% DV)	0.85 mg	0.9%
Calcium	24 mg (2% DV)	2.4 mg	0.2%
Iron	0.46 mg (3% DV)	0.046 mg	0.3%
Potassium	292 mg (6% DV)	29.2 mg	0.6%

Each cupcake includes 10 grams of carrot juice, and the estimated nutritious contribution per cupcake is detailed in Table 4. The calcium, iron, and potassium levels in carrot juice are rather small, although its vitamin A content is significant, offering over 10% of the Daily Value per cupcake. This indicates that a minimal quantity of carrot juice can substantially increase the vitamin A concentration in the frosting. The nutritional composition of the frosting is contingent upon the other components included in the recipe. Incorporating carrot juice into the frosting can enhance its nutritional value by serving as a natural vitamin A supplement (USDA FoodData Central, 2023).

Return on Investment (ROI) and Market Potential

Assessing the economics and market viability of an innovative product is essential for effective commercialization. This study assesses the return on investment (ROI) for cupcake manufacture utilizing Giant Swamp Taro Flour and Carrot Frosting, evaluating its financial viability. The ROI calculation assesses the cost-effectiveness and profitability of the product, offering insights into its potential for further market acceptance.

Table 5: Return On Investment (ROI) Calculation

Item	Value (in pesos)
Total Expenses (Production Cost)	80 pesos
Selling Price per Cupcake	8 pesos
Number of Cupcakes Produced	16 pesos
Total Sales Revenue	128 pesos
Net Profit	48 pesos
Return on Investment (ROI)	**60%**

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The return on investment for cupcake production is 60%, signifying a lucrative enterprise. This indicates that for each peso invested in production, there is a return of 0.60 pesos in profit. The elevated ROI indicates that the enterprise is economically sustainable and possesses significant expansion potential.

The research underscores the market viability of the novel cupcake incorporating Giant Swamp Taro Flour and Carrot Frosting. Sensory assessments reveal favorable customer responses, especially on aroma, flavor, and general acceptability. Although the product possesses significant appeal, slight improvements in aesthetics and feel could augment its marketability.

Utilizing swamp taro flour as an alternate component enhances nutritional value and establishes a distinctive marketing proposition, differentiating it from conventional cupcakes. This method facilitates economical production, sustainable procurement, and financial advantages for local farmers, bakers, and businesspeople.

This revolutionary cupcake, via product development and effective marketing methods, has the potential to achieve broader public acceptance, generate income, and secure its position as a novel contribution to the food industry. The report by Melesse & Orru (2025) indicates that investors are increasingly acknowledging the opportunities within the specialty bakery business, propelled by a transition towards healthier and sustainable products. The continuous evolution in the bakery industry, driven by digitalization and Industry 4.0 technologies, is improving production efficiency and product innovation, hence bolstering the market potential for new bakery products.

III. CONCLUSION

This study demonstrates that incorporating Giant Swamp Taro (*Cyrtosperma merkusii*) flour and carrot (*Daucus carota subsp. sativus*) frosting into cupcake production results in a nutritionally enhanced and well-accepted product. Sensory evaluations revealed positive consumer responses across all attributes, particularly in taste, aroma, and texture, confirming the product's market appeal. While appearance received slightly lower scores, it remained within acceptable standards and suggests potential for refinement through improved presentation.

Beyond sensory appeal, the product offers notable nutritional benefits. The use of indigenous crops—rich in essential vitamins, minerals, and antioxidants—presents a healthier alternative to traditional baked goods. These findings affirm the feasibility of using underutilized, locally available ingredients to improve both the nutritional profile and sustainability of food products.

Importantly, the integration of Giant Swamp Taro and carrots supports sustainable agriculture, food security, and local economic development. These crops are resilient, nutrient-dense, and accessible, making them ideal candidates for food innovation in regions vulnerable to climate change and economic instability.

Overall, this research contributes to the growing field of sustainable food product development by offering a model that aligns health, consumer preference, and ecological responsibility. Future studies may explore broader applications of these ingredients in other baked or processed foods, further advancing the goals of nutrition, sustainability, and inclusive agri-food systems.

Declarations

Ethical Approval: Before the researchers conducted any tasting of the product, they secured written consent from the principal, students, parents, and teachers involved in the study. The researchers ensured that all participants were fully informed and gave their voluntary approval. Additionally, the necessary authority was obtained to ensure compliance with ethical standards throughout the study.

Author Contribution Statement

The corresponding author, Jhondel P. Baranggan , served as the supervising mentor and primary advisor for this research. He provided critical insights, guided the conceptual development, and ensured the entire manuscript was edited to meet academic standards and publication requirements.

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The second corresponding author, Aaron V. Lopez, acted as the lead researcher and team leader. From initiation to completion, they were hands-on in every stage of the process—organizing tasks, maintaining balance, and ensuring all elements were harmonized to achieve a well-rounded and impactful study.

The third author,Chinlee C. Piolin, was in charge of documenting and mixing all the essential components of the research, ensuring that each detail was accurately recorded and thoughtfully integrated into the study.

The fourth author, Ben Gregory M. Monter, took charge of setting up the necessary materials and equipment, ensuring that every resource was properly prepared and available for the research procedures.

The fifth and Sixth authors, Kate N. Villar and Ritchie A. Montilla, played a vital supporting role as the timekeeper and runner, coordinating logistics, managing schedules, and gathering the key ingredients to keep the process smooth and timely.

Together, each contributor brought unique strengths to the table, making this collaborative research a successful and enriching endeavor.

Conflict of Interest **:**The authors confirm that they have no conflicts of interest to disclose.

Acknowledgment

First and foremost, we offer our deepest gratitude to God, whose divine guidance, strength, and wisdom have been our constant source of inspiration throughout the journey of completing this research. Without His grace, none of this would have been possible.

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Our sincere appreciation goes to our dedicated school principal, Mrs. Giovanette D. Espejon, for her support and for fostering an environment that encourages research and academic growth.

We are also truly grateful to the student respondents who willingly participated in this study. Your cooperation and honesty provided the foundation for the success of this research.

Lastly, we would like to express our profound thanks to our statistician, Mrs. Sheilla D. Yamba, for her invaluable guidance and expertise in analyzing the data. Your contributions were essential in shaping the outcomes of this study.

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