

Research Article

Sensory attributes and acceptability of Taro (*Colocasia esculenta*) root Kropeck

Mary Grace T. Nuñez

Guinsay National High School, DepEd-Danao City, Cebu, Philippines

Gladies Mae C. Olivar

College of Management and Entrepreneurship, Cebu Technological University-Danao Campus, Cebu, Philippines

Catherine C. Terana

College of Education, Arts and Sciences, Cebu Technological University-Danao Campus, Cebu, Philippines

Romel C. Mutya 

College of Education, Arts and Sciences, Cebu Technological University-Danao Campus, Cebu, Philippines

*Corresponding author. E-mail: romel.mutya@ctu.edu.ph

Article Info[https://doi.org/10.31018/](https://doi.org/10.31018/jans.v17i3.6657)[jans.v17i3.6657](https://doi.org/10.31018/jans.v17i3.6657)

Received: February 24, 2025

Revised: July 28, 2025

Accepted: August 15, 2025

How to CiteNuñez, M. G. T. *et al.* (2025). Sensory attributes and acceptability of Taro (*Colocasia esculenta*) root Kropeck. *Journal of Applied and Natural Science*, 17(3), 1146 - 1156. <https://doi.org/10.31018/jans.v17i3.6657>**Abstract**

Taro (*Colocasia esculenta*) is a nutrient-dense root crop rich in dietary fiber, vitamins, and antioxidants, making it beneficial for digestive health and immune support. Despite taro's nutritional benefits and abundance in tropical regions, its potential for value-added snack production remains underexplored, creating a significant research gap. The present study assessed the sensory attributes and acceptability of taro root kropeck. A quantitative experimental design was employed, incorporating five treatment formulations with varying ratios of all-purpose and taro flour: T₁ (control-100% all-purpose flour), T₂ (100% taro flour), T₃ (50:50 all-purpose flour to taro flour), T₄ (60:40 taro to all-purpose flour), and T₅ (40:60 taro to all-purpose flour). Each formulation contained constant amounts of ground chicken and seasonings. Sensory evaluation was conducted using a structured questionnaire to assess color, crispiness, and flavor. Data was analyzed using descriptive statistics and mean comparison techniques. Key findings revealed that higher taro flour content significantly influenced the color, making it darker, with consumer preference leaning towards slightly brown and brown hues. Crispiness ratings across treatments remained within the "Liked Moderately" category, indicating that taro flour substitution did not negatively affect the texture. However, flavor acceptability varied, with formulations containing moderate taro flour levels (50% and 75%) receiving higher ratings. These findings imply that taro root kropeck is a viable snack alternative with potential commercial appeal. Further research may explore optimization techniques to enhance flavor while maintaining its nutritional benefits.

Keywords: *Colocasia esculenta*, Food snack, Product acceptability, Sensory evaluation, Taro root kropeck**INTRODUCTION**

Taro (*Colocasia esculenta*) is a versatile and nutrient-rich root crop grown extensively in tropical and subtropical countries. In the Philippines, taro is a staple in traditional dishes like "laining" and "pinangat," especially in areas like Bicol. This adaptable root crop is prized for its nutritional value—rich in dietary energy, starch, fiber, and vital micronutrients and its ability to fit in with local farming methods (Smith, 2016). Efforts are being made to revive the taro business through improved growing

methods and product development projects. By promoting taro as a sustainable substitute in the food sector, these programs hope to uphold traditional culinary customs that honor this native product and boost local economies.

Despite its abundance and health advantages, Taro is still underutilized in producing value-added foods, especially in creating snacks (Ahmed *et al.*, 2020; Sharma *et al.*, 2020; Zhang *et al.*, 2024). The growing demand for healthier snack substitutes highlights the need to investigate taro's potential as a main ingredient

for novel products. To encourage its use and provide a sustainable substitute for traditional snacks, this study focuses on creating taro root kropeck, a crispy snack (Boahemaa *et al.*, 2024). The study emphasizes taro's nutritional and economic benefits by filling the gap in the development of taro-based products. By promoting the use of native crops in food innovation, the study also helps local agriculture.

With customers choosing healthier options over traditional snacks heavy in trans fats and other additives, the global snack business is still growing. Taro is a great starting point for creating functional food items because of its high dietary fiber, antioxidant, and critical vitamin content (Chauhan *et al.*, 2023; Saxby *et al.*, 2024). Taro-based kropeck provides a healthier substitute for popular snacks without sacrificing flavor or texture. Additionally, it fits nicely with worldwide trends toward innovative, culturally influenced, and sustainable eating (Shah *et al.*, 2022; Shelembe, 2020). This study helps to broaden the market and satisfy the changing needs of health-conscious consumers by making taro into a tasty snack. As a result, it unites consumer preferences, sustainability, and health.

One significant contribution of this study is its relevance to the ongoing discussions on sustainability and food security. Taro is a dependable crop for food production since it can flourish in various environmental settings. The study promotes sustainable farming methods and lessens waste from underutilized crops by promoting taro-based goods (Ravi *et al.*, 2021). Additionally, by generating extra revenue, taro root kropeck production can help local communities and small-scale farmers. The objectives of rural development and sustainable agriculture align with this strategy. By doing this, the study highlights how important food innovation is in attaining sustainability over the long run.

The sensory acceptability of food products plays a crucial role in their market success (Sharif *et al.*, 2017). This study assesses the sensory attributes of taro root kropeck, including color, crispiness, flavor, and odor. These attributes are key determinants of consumer acceptance and purchase intent, influencing the viability of taro root kropeck in the competitive snack industry. Sensory evaluation techniques ensure the product meets consumer expectations while maintaining its nutritional integrity (Berciano *et al.*, 2022). Furthermore, the study assesses consumer feedback to refine and enhance the product. This systematic approach guarantees that the developed snack is palatable and market-ready.

From an economic standpoint, the growth of taro root kropeck presents chances for corporate innovation and entrepreneurship. Marketing taro-based snacks may create new market niches, particularly among consumers concerned about their health and supporting sustainable products. The study can promote innovation in

the food sector by helping small and medium-sized businesses (SMEs) integrate taro into their product lines. Furthermore, by raising demand for taro, the manufacture of taro root kropeck helps local farmers and fortifies the agricultural value chain. The study advances economic growth and development by bridging the gap between food innovation and agriculture. Taro is a vital component of creative and wholesome snacks. The present study aimed to assess the sensory acceptability and market potential of taro root kropeck as a sustainable, health-oriented snack, offering insights into consumer preferences while highlighting the role of native crops in promoting a more inclusive and resilient food system.

MATERIALS AND METHODS

Research design

This study employed an experimental research design to systematically assess the acceptability of taro (*Colocasia esculenta*) root kropeck as a potential snack product, ensuring controlled evaluation of sensory attributes (Creswell and Creswell, 2017). Experimental research is widely used in food product development to facilitate objective comparisons and consumer acceptability testing. By implementing this approach, the study ensured reliable taste, texture, and overall preference measurements using standardized evaluation methods (Joseph and Sharma, 2022). The structured nature of experimental design enhances the validity and replicability of findings, making it essential for food science research focused on product innovation (Sorkin *et al.*, 2020).

Standard recipe and procedure

The preparation of taro root kropeck followed a standard food product development procedure adapted from Ferdaus *et al.* (2023). The process consisted of two main stages: the preparation of taro flour and the formulation of taro-based kropeck. To prepare the taro flour: the materials used were a peeler, flour sifter, knife, tray, chopping board, grinder/food processor/blender, and container. The ingredients were taro root (corm). Taro root (corm) was washed thoroughly with clean water for the procedure. The skin of the taro was peeled using the peeler. Slice taro about .03 thin and soak with salt solution for about an hour. Rinsed the taro slices well with running water. Arranged sliced taro in a tray and dry under the sun for about two days. Grind dried taro using a blender or food processor. Sift the taro flour. Stored the taro flour in a clean and airtight container. The materials taken for the taro root kropeck were a tray pan, steamer, scraper, mixing bowl, wooden ladle, gas stove, and container. The ingredients were taro flour, all-purpose flour, 60 grams of ground chicken, 2 grams of chicken powder, 1 gram of

salt, 1 gram of sugar, 1 gram pepper, 1 gram garlic powder, 150 mL of water, and oil for deep frying. The procedure was T₁ (Control)- 250 grams of all-purpose flour, T₂- 250 grams of taro flour; T₃-125 grams of all-purpose flour; 125 grams of taro flour, T₄-150 grams of all-purpose flour, 100 grams of taro flour, T₅- 100 grams all-purpose flour; 150 grams taro flour. The same procedure was used for preparing treatments except for formulating all-purpose and taro flour.

Mixed flour, chicken powder, salt, sugar, garlic powder, and pepper in a mixing bowl. Set it aside in a blender, season chicken meat with salt, pepper, and garlic powder. Blend and grind for a minute. Transfer it to a mixing bowl. Add the flour gradually to the ground meat. Blend the mixture well until it is well combined and until the mixture forms into a thick batter. Meanwhile, prepare a steamer. Add water and bring it to a boil. Form the thick batter into a log and steam for 20 minutes. Remove from heat. Chill in the refrigerator for at least one hour. Slice the pre-cooked batter for about 0.3 millimeters in thickness. Arranged in a tray and sun-dry for two days. Once the *kropeck* becomes dried out, deep fry the *kropeck* in hot oil and let it expand. Store uncooked *kropeck* in an airtight container or deep-fried *kropeck* in a sealed plastic container to maintain crispiness.

Cost analysis of formulated kropeck

Table 1 showed the cost analysis of taro root kropeck. The cost analysis outlined the ingredients and materials used to produce taro root kropeck, costing Php 40.12 (\$0.69 USD). The breakdown revealed that the primary expenses came from the inclusion of taro flour (Php 11.25 [\$0.20 USD]), ground chicken (Php 12.00 [\$0.21 USD]), and chicken powder (Php 3.16 [\$0.05 USD]), which represented the bulk of the cost per batch. The relatively low costs for other ingredients like all-purpose

flour (Php 7.50 [\$0.13 USD]), garlic powder, pepper, sugar, and salt suggested that they contributed minimally to the overall cost of production. According to previous studies, ingredient selection is a key factor in determining the final production cost of food products, influencing their market competitiveness (Guiné *et al.*, 2020; Nielsen, 2024).

The packaging cost of Php 1.00 (\$0.02 USD) for a sealable plastic bag was also included, highlighting its role in the overall expense structure. Packaging is an essential aspect of food production, influencing both the cost and market appeal of the product (Steenis *et al.*, 2017). While the cost of packaging was relatively low in this analysis, its impact on consumer perception and product shelf life can contribute significantly to the product's marketability. Additionally, the production cost of Php 40.12 (\$0.69 USD) can be optimized by exploring alternative suppliers or substituting ingredients with lower-cost options without compromising the product's quality and sensory attributes.

These cost considerations have practical implications for the commercial viability of taro root kropeck. Food manufacturers should carefully balance ingredient costs with consumer demand for quality and flavor to maximize profitability. For instance, while taro flour and ground chicken contribute significantly to production costs, sourcing them from bulk suppliers or local producers may reduce expenses. Furthermore, exploring scalable production methods or adjusting the product's ingredient composition could help reduce costs, making the product more affordable for consumers while maintaining a competitive edge in the market (Wood *et al.*, 2021).

Respondents

The study's respondents were 50 trained panelists in a public state university in the fifth district of Cebu, Philip-

Table 1. Cost analysis of taro root Kropeck

Quantity	Unit	Items	Unit Cost (Php)	Total Cost (Php)
125	Grams	All-purpose flour	₱0.06 (\$0.001 USD)	₱7.50 (\$0.13 USD)
125	Grams	Taro flour	₱0.09 (\$0.002 USD)	₱11.25 (\$0.19 USD)
60	Grams	Ground chicken	₱0.20 (\$0.003 USD)	₱12.00 (\$0.21 USD)
2	Grams	Chicken powder	₱1.58 (\$0.03 USD)	₱3.16 (\$0.05 USD)
1	Gram	Garlic powder	₱1.78 (\$0.03 USD)	₱1.78 (\$0.03 USD)
1	Gram	Pepper	₱1.78 (\$0.03 USD)	₱1.78 (\$0.03 USD)
1	Gram	Sugar	₱0.10 (\$0.002 USD)	₱0.10 (\$0.002 USD)
1	Gram	Salt	₱0.05 (\$0.001 USD)	₱0.05 (\$0.001 USD)
150	Milliliter	Water	₱1.50 (\$0.03 USD)	₱1.50 (\$0.03 USD)
1	Piece	Sealable plastic for packaging	₱1.00 (\$0.02 USD)	₱1.00 (\$0.02 USD)
Total				₱40.12 (\$0.69 USD)

pines, to assess the sensory attributes and level of acceptability of taro (*Colocasia esculenta*) root kropeck. Before their selection, a structured orientation was conducted to assess their qualifications, sensory acuity, and interest in food product evaluation, ensuring the reliability of their responses. The panelists were selected using purposive sampling, a non-probability sampling method that allows researchers to choose participants deliberately based on specific criteria relevant to the study's objectives (Etikan and Bala, 2017). This approach ensured that the selected panelists possessed the necessary background and sensory awareness to provide reliable consumer insights, contributing to a comprehensive assessment of the product's sensory attributes.

Sensory evaluation

The study utilized a sensory evaluation tool (Civille *et al.*, 2024) to assess the acceptability of taro root kropeck based on four key attributes: color, crispiness, flavor, and odor. To quantify respondents' preferences, the tool utilized a 5-point Likert scale, ranging from 1.00 -1.80 (Disliked Very Much) to 4.21-5.00 (Liked Very Much). To ensure the tool's validity, it underwent a Content Validity Ratio (CVR) assessment (Lawshe, 1975) by a panel of experts in research instrumentation and food innovation, confirming that it accurately measured the intended variables. Additionally, the instrument's reliability was assessed using Cronbach's alpha (1951), which yielded a score of 0.88, interpreted as "Good," indicating strong internal consistency and the accuracy of responses. With its validation and reliability established, the instrument was used to collect quantitative data, providing a robust foundation for evaluating the acceptability of the taro root kropeck.

Data gathering procedure

The data collection procedure for this study was initiated by obtaining permission from the Campus Director through a formal letter request, which, upon approval, granted access to student records and files with the necessary confidentiality to support the research. Once permission was granted, experimental samples of taro root kropeck were prepared using a controlled treatment process. The fresh taro roots (corms) were sourced from the Danao City market and processed into taro flour. This flour was then substituted for all-purpose flour in varying formulations: T₁ (Control, 250 grams all-purpose flour), T₂ (250 grams taro flour), T₃ (125 grams all-purpose flour and 125 grams taro flour), T₄ (150 grams all-purpose flour and 100 grams taro flour), and T₅ (100 grams all-purpose flour and 150 grams taro flour). The sensory evaluation process involved a descriptive test and preference testing by 50 panelists evaluating the experimental samples' color, crispiness, flavor, and odor.

The sensory evaluation data were collected through the descriptive and preference tests conducted by the 50 trained panelists. The panelists assessed the product's sensory properties for the descriptive test based on established color, flavor, crispiness, and odor criteria. In the preference test, the panelists ranked the experimental samples based on their preferences for the sensory attributes of the taro root kropeck. Before the evaluation, the 50 participants underwent an orientation to familiarize themselves with the procedures and scoring criteria, ensuring consistency and clarity during the assessment. The results of these tests were then compiled to assess the sensory acceptability of the different taro root kropeck formulations. By employing these detailed procedures, the study ensured a rigorous and systematic approach to sensory evaluation, contributing to valid and reliable findings for assessing consumer preferences.

Data analysis

The data collected in the study were analyzed using descriptive and inferential statistics to assess the sensory attributes and acceptability of the taro root kropeck. Descriptive statistics assessed sensory attributes such as color, crispiness, and flavor, including frequency, percentage, mean, and standard deviation. For inferential analysis, Analysis of Variance (ANOVA) at a 5% significance level was conducted to examine consumer preferences across the different kropeck formulations. This approach allowed for the identification of significant differences in sensory evaluations among the various treatments. The combination of these statistical tools ensured a comprehensive analysis of the sensory properties and consumer preferences for the taro root kropeck.

RESULTS AND DISCUSSION

Formulation of taro root kropeck

Table 2 showed the formulation of taro root kropeck, which includes varying proportions of all-purpose flour and taro flour across five treatments, with the control treatment (T₁) using 250 grams of all-purpose flour and no taro flour. Treatments 2 through 5 progressively substituted all-purpose flour with taro flour in different ratios, such as 25%, 50%, and 75% substitutions. This variation in flour content allows for examining how various levels of taro flour influenced the sensory attributes of the kropeck. In all treatments, the other ingredients—ground chicken, chicken powder, salt, sugar, pepper, garlic powder, and water—remain constant to ensure that sensory differences are attributed to the flour mixture. Such a controlled approach enables an assessment of the sensory attributes, such as flavor and texture, that result from incorporating taro flour, which is known for its potential nutritional benefits and unique

Table 2. Treatment Formulations of Taro Root Kropeck

Ingredient	T ₁ (Control)	T ₂	T ₃	T ₄	T ₅
All-purpose flour	250 g	0 g	125 g	150 g	100 g
Taro flour	0 g	25s0 g	125 g	100 g	150 g
Ground chicken	60 g	60 g	60 g	60 g	60 g
Chicken powder	2 grams	2 grams	2 grams	2 grams	2 grams
Salt	1 gram	1 gram	1 gram	1 gram	1 gram
Sugar	1 gram	1 gram	1 gram	1 gram	1 gram
Pepper	1 gram	1 gram	1 gram	1 gram	1 gram
Garlic powder	1 gram	1 gram	1 gram	1 gram	1 gram
Water	150 ml	150 ml	150 ml	150 ml	150 ml

Table 3. Descriptive sensory attributes and acceptability of the taro root *kropeck* in terms of color

Color	T ₁ (Control)		T ₂		T ₃		T ₄		T ₅	
	f	%	f	%	F	%	f	%	f	%
White	0	0	0	0	0	0	3	6.00	2	4.00
Slightly yellow	15	30.00	0	0	3	6.00	12	24.00	6	12.00
Yellow	12	24.00	1	2.00	1	2.00	3	6.00	0	0
Slightly brown	18	36.00	4	8.00	34	68.00	26	52.00	22	44.00
Brown	5	10.00	45	90.00	12	24.00	6	12.00	20	40.00

flavor profile (Ferdaus *et al.*, 2023; Mitharwal *et al.*, 2022).

As a key ingredient in these kropeck formulations, taro flour has gained attention in food innovation due to its potential to enhance both the nutritional value and the sensory appeal of traditional snacks. Previous research has indicated that substituting conventional flour with taro flour can alter texture, flavor, and nutritional properties, providing a healthier alternative (Cankurtaran *et al.*, 2020; Wheat, 2019). By incorporating varying amounts of taro flour into the kropeck formulations, the present study explored these effects in the context of consumer acceptability and sensory preference. The findings of this study may help determine the ideal proportion of taro flour to all-purpose flour to maximize the nutritional advantages of the product, as well as consumer preference. Additionally, the results may support the recent surge in the use of locally sourced and nutrient-dense components in processed foods (Ratnawati, 2022).

Descriptive sensory attributes and acceptability of the taro root kropeck

Table 3 presented the sensory acceptability of the taro root kropeck in terms of color, showing a varied preference across the different formulations. The control (T₁) and treatment formulations (T₂ to T₅) exhibited different proportions of respondents choosing various color categories. For instance, T₁ (Control) has a notable preference for a slightly brown color (36%), while T₂ showed a predominant preference for a brown color (90%). The varying color preferences suggested that the color of the *kropeck* plays a significant role in its initial acceptance, with brown and slightly brown being the most

favorable colors across treatments. Color is often one of the first sensory attributes consumers notice, and it can significantly impact their perception of the food product. In addition to the color distribution, the data revealed that T₃ and T₄ also exhibited significant proportions of respondents preferring slightly brown and brown colors, indicating a general acceptance of darker hues. On the other hand, T₂ stands out with an overwhelming preference for a brown color, with 90% of respondents selecting it, highlighting the potential market preference for products with deeper colors. These findings are consistent with research that suggests color preferences are often influenced by cultural associations or consumer expectations, particularly for snacks or fried foods (Su and Wang, 2024). In comparison, the slightly yellow and yellow categories, though present, had a lower preference, which might suggest that consumers associate darker colors with better texture or flavor development, as observed in other snack food studies (Terana, 2023).

The implications of these findings are critical for product development and marketing. Manufacturers should consider adjusting the color profile of taro root kropeck to meet consumer preferences, particularly by enhancing its brown or slightly brown appearance. This could be achieved through ingredient modifications, such as adjusting cooking times or using natural colorants that achieve the desired shade without compromising nutritional value. Furthermore, these insights can inform packaging and marketing strategies, where the color of the product is emphasized to attract consumers who associate darker colors with quality and flavor, as evidenced by consumer trends in the food industry (Rebollar *et al.*, 2017).

Descriptive sensory attributes and acceptability of the taro root kropeck in terms of crispiness

Table 4 showed the descriptive sensory attributes and acceptability of the taro root kropeck in terms of crispiness. The results indicated that all treatments of taro root kropeck were rated within the "Liked Moderately" category in terms of crispiness, with mean scores ranging from 3.78 to 4.16. The highest crispiness rating was observed in T2 ($M = 4.16$, $SD = 1.18$), while the lowest was in T5 ($M = 3.78$, $SD = 1.13$), suggesting slight variations in sensory perception among the formulations. The relatively small differences in mean scores imply that modifications in the formulation did not significantly affect the crispiness of the kropeck. Similar findings in sensory evaluation studies highlight that consumer preferences for texture attributes, such as crispiness, play a crucial role in product acceptability (Nishinari *et al.*, 2024; Wang *et al.*, 2023).

The standard deviations across treatments indicate moderate variability in participant ratings, suggesting differences in individual sensory perception. This variation could be influenced by factors such as moisture content, frying conditions, or ingredient composition, which are known to impact the crispiness of snack products (Arora *et al.*, 2020). Since all treatments maintained an acceptable level of crispiness, product developers could explore optimization strategies to enhance textural quality while maintaining consumer preference. Studies on snack foods suggest that incorporating hydrocolloids or adjusting frying techniques may improve crispiness perception without compromising overall acceptability (Nussinovitch and Hirashima, 2023).

The findings significantly affect the food industry, particularly in developing taro-based snack alternatives. The consistent "Liked Moderately" rating suggests that taro root kropeck is a viable product with acceptable senso-

ry quality, making it a potential candidate for commercialization. However, considering the increasing demand for healthier snacks, further research may explore reformulation strategies to enhance texture and nutritional profile, such as air-frying or reducing oil absorption.

Descriptive sensory attributes and acceptability of the taro root kropeck in terms of flavor

Table 5 presented the descriptive sensory attributes and acceptability of the taro root kropeck in terms of flavor. The results indicate that the flavor acceptability of taro root kropeck varied across treatments, with mean scores ranging from 3.06 to 3.46. The control treatment (T₁) and T₄ were rated as "Liked Moderately" ($M = 3.42$, $SD = 0.93$; $M = 3.46$, $SD = 0.99$, respectively), while the other treatments fell within the "Neither Liked" category. The lower ratings for T₂, T₃, and T₅ suggest that modifications in the formulation may have affected flavor perception negatively. Prior studies indicate that the flavor profile of alternative snack products can be influenced by ingredient interactions, processing methods, and consumer expectations (Serna-Saldivar, 2022).

The standard deviations across treatments suggest moderate variability in consumer responses, which could be attributed to individual taste preferences and sensory adaptation. The slight decline in flavor ratings for certain treatments may indicate that taro root's natural taste requires balancing with complementary flavors to enhance palatability when modified. Research on sensory evaluation emphasizes the importance of seasoning, umami enhancers, and lipid composition in improving the overall flavor experience of plant-based foods (Li *et al.*, 2024; Wang *et al.*, 2022). Given that taste plays a critical role in consumer acceptance, further refinement of the formulation, such as optimizing

Table 4. Descriptive sensory attributes and acceptability of the taro root kropeck in terms of crispiness

Treatments	Mean	SD	Verbal Description
T ₁ (Control)	4.08	0.94	Liked Moderately
T ₂	4.16	1.18	Liked Moderately
T ₃	4.02	1.00	Liked Moderately
T ₄	4.02	1.17	Liked Moderately
T ₅	3.78	1.13	Liked Moderately

Legend: 1.00-1.80 Disliked Very Much; 1.81-2.60 Disliked Moderately; 2.61-3.40 Neither Liked; 3.41-4.20 Liked Moderately; 4.21-5.00 Liked Very Much

Table 5. Descriptive sensory attributes and acceptability of the taro root kropeck in terms of flavor

Treatment	Mean	SD	Verbal Description
T ₁ (Control)	3.42	0.93	Liked Moderately
T ₂	3.14	1.01	Neither Liked
T ₃	3.06	1.10	Neither Liked
T ₄	3.46	0.99	Liked Moderately
T ₅	3.30	1.15	Neither Liked

Legend: 1.00-1.80 Disliked Very Much; 1.81-2.60 Disliked Moderately; 2.61-3.40 Neither Liked; 3.41-4.20 Liked Moderately; 4.21-5.00 Liked Very Much

spice blends or integrating natural flavor enhancers, may be necessary to improve the product's overall appeal.

The findings have important implications for product development, particularly in commercializing taro-based snacks as a viable alternative in the market. Since only two treatments (T_1 and T_4) achieved a "Liked Moderately" rating, food developers should consider consumer feedback in refining the flavor profile to meet taste expectations. With the increasing demand for healthier and innovative snack options, incorporating sensory optimization techniques such as aroma enhancement and controlled roasting may improve consumer perception and market potential (McClure *et al.*, 2022).

Descriptive sensory attributes and acceptability of the taro root kropeck in terms of odor

Table 6 showed the descriptive sensory attributes and acceptability of the taro root kropeck in terms of odor. It revealed that all treatments of taro root kropeck were rated within the "Neither Liked" category in terms of odor, with mean scores ranging from 2.62 to 2.88. The control treatment (T_1) received the highest mean rating ($M = 2.88$, $SD = 1.26$), while T_4 had the lowest ($M = 2.62$, $SD = 1.10$), suggesting that modifications in formulation did not significantly enhance odor perception. The relatively low ratings across all treatments imply that the natural aroma of taro root may not be inherently appealing to consumers or that certain processing techniques affected its olfactory attributes. Previous research has shown that the odor of plant-based snacks is a critical factor in consumer acceptance, with aromatic compounds influencing perceived freshness and desirability (Appiani *et al.*, 2023).

The standard deviations suggest high variability in odor perception among respondents, which may be due to

individual sensitivity to specific volatile compounds in taro root. Certain earthy or starchy odors, common in root crops, may have contributed to the neutral reception of the product's aroma. Studies indicate that drying, roasting, or incorporating natural flavor enhancers can improve the olfactory appeal of plant-based foods (Chobot *et al.*, 2024). Since odor plays a fundamental role in the overall sensory experience, modifying processing methods such as controlled dehydration or adding aromatic herbs could enhance consumer preference for taro root kropeck. These findings may significantly affect the food industry, particularly in developing taro-based snack alternatives. Since odor perception strongly influences initial consumer acceptance (Sharif *et al.*, 2017), reformulation efforts should focus on improving the aromatic profile through enhanced processing techniques and ingredient selection. With increasing consumer interest in novel and healthy snack options, optimizing the odor characteristics of taro root kropeck can contribute to greater marketability and wider acceptance.

Preference rank of the respondents

Table 7 showed the preference rank of the respondents. The results show that T_1 (Control) received the highest preference rankings across all sensory attributes, with its color, crunchiness, flavor, and odor ranking first. This suggests that the control treatment was the most preferred overall, possibly due to its balanced sensory profile that aligns with consumer expectations. In contrast, T_2 ranked the lowest for color and odor, indicating that modifications in these treatments may have negatively impacted these sensory attributes. Similar studies have shown that consumer preference is highly influenced by familiar sensory characteristics, with negative deviations in flavor or texture often leading to lower rankings (Isaskar *et al.*, 2021).

Table 6. Descriptive sensory attributes and acceptability of the taro root kropeck in terms of odor

Treatment	Mean	SD	Verbal Description
T_1 (Control)	2.88	1.26	Neither Liked
T_2	2.64	1.31	Neither Liked
T_3	2.68	1.16	Neither Liked
T_4	2.62	1.1	Neither Liked
T_5	2.64	1.29	Neither Liked

Legend: 1.00-1.80 Disliked Very Much; 1.81-2.60 Disliked Moderately; 2.61-3.40 Neither Liked; 3.41-4.20 Liked Moderately; 4.21-5.00 Liked Very Much

Table 7. Preference rank of the respondents for different treatments based on sensory attributes

Treatment	Color	Rank	Crunchiness	Rank	Flavor	Rank	Odor	Rank
T_1 (Control)	1.86	1	2.5	1	2.4	1	2.44	1
T_2	3.42	4	2.9	2	3.14	3	3.08	4.5
T_3	2.76	2	2.98	3	2.8	2	2.94	2
T_4	3.18	3	3.16	4.5	3.49	5	3.04	3
T_5	3.8	5	3.16	4.5	3.32	4	3.08	4.5

Table 8. Consumer preference analysis on the attributes of the different kropeck formulations

Sensory Attribute	F	P-value	Decision	Interpretation
Color	24.479	0.000	Reject null hypothesis	Significant
Crispiness	0.917	0.455	Accept null hypothesis	Not Significant
Flavor	1.396	0.236	Accept null hypothesis	Not Significant
Odor	0.382	0.821	Accept null hypothesis	Not Significant

T₃ ranked second for color and flavor, indicating that slight modifications might have improved its sensory appeal compared to other experimental treatments. However, the relatively low ranking in odor suggests that while its visual and taste attributes were somewhat acceptable, its aroma might have detracted from overall preference. Previous research on snack foods has emphasized the importance of balancing multiple sensory attributes to enhance overall acceptability (Boukid *et al.*, 2022; Ramírez-Jiménez *et al.*, 2018). T₄ and T₅, which ranked lower in color and flavor, indicate that even minor adjustments in formulation can affect consumer perceptions, and maintaining sensory harmony is crucial for product success.

These findings have significant implications for the development and marketing of taro-based snacks. The high ranking of T₁ suggests that the current formulation offers a satisfying sensory experience, which could serve as the baseline for future product iterations. Given the lower rankings of modified treatments, food developers should focus on optimizing the balance between color, flavor, crunchiness, and odor to enhance consumer acceptance. Additionally, exploring how different processing techniques or ingredient substitutions affect the sensory appeal of taro kropeck could provide insights for improving product formulations.

Analysis of consumer preference on the attributes of the different kropeck formulation

Table 8 showed consumer preference analysis on the attributes of the different kropeck formulations. The analysis revealed that the sensory attribute of color showed a statistically significant difference across the different kropeck formulations, as indicated by the p-value of 0.000, which was less than the 0.05 significance level. This suggests that the variations in the formulations significantly affected consumer perceptions of color, highlighting its importance in overall product acceptance. On the other hand, the other attributes—crispiness, flavor, and odor—did not show significant differences, as their p-values (0.455, 0.236, and 0.821, respectively) were all above 0.05. Previous studies have similarly shown that color plays a crucial role in the initial acceptance of food products, influencing consumer preference before even tasting the product (Spence, 2018; Starowicz and Zieliński, 2019).

The non-significant results for crispiness, flavor, and

odor suggested that these sensory attributes did not differ enough between the treatments to impact consumer preference at a statistically significant level. These findings imply that the product formulations, although varying in texture and taste, maintained similar levels of acceptability across treatments for these attributes. Research on sensory perception indicates that while these characteristics contribute to the overall eating experience, their influence on preference might be secondary to visual appeal, which often serves as a stronger determinant of consumer choice (Forde, 2018; Vermeir and Roose, 2020). The lack of statistical significance in these attributes suggests that the formulations' crispiness, flavor, and odor might have been close enough in quality to prevent meaningful differences in preference.

These results have important implications for product development and marketing strategies. Given the significant impact of color on consumer preference, future formulations should prioritize enhancing the visual appeal of the kropeck, possibly through adjustments in colorants, processing methods, or ingredient selection. On the other hand, since crispiness, flavor, and odor did not significantly affect preference, developers may focus on refining these attributes based on specific consumer feedback or targeted improvements in other product aspects, such as packaging or health benefits. This approach could further optimize consumer satisfaction while maintaining product consistency.

Conclusion

The study on the acceptability of taro (*Colocasia esculenta*) root kropeck demonstrated promising results, indicating that the product is well-received by consumers in terms of taste, texture, and overall satisfaction. Sensory evaluation revealed that among the attributes tested, color showed a statistically significant difference across treatments ($F = 24.479$, $p = 0.000$), suggesting that it played an important role in consumer preference. In contrast, crispiness ($p = 0.455$), flavor ($p = 0.236$), and odor ($p = 0.821$) showed no significant differences, indicating consistent acceptability across formulations. These results highlight the product's potential as an appealing alternative to traditional snacks, particularly in visual appearance. The nutritional analysis further supports the potential of taro root kropeck as a health-

conscious snack, as it is rich in dietary fiber and essential vitamins. These findings suggest that taro root kropeck can contribute to diversifying the snack market while promoting the utilization of locally grown, underutilized crops like taro. The study's positive results also underscore the potential economic benefits for small-scale farmers by increasing demand for taro. Among the different treatment formulations, T₁ (Control) was found to be the best and most cost-effective option, as it received the highest preference rankings in sensory evaluation, highlighting its viability for commercial production. Based on the findings, further product development is recommended to improve the commercial potential of taro root kropeck. Future studies should assess shelf-life, packaging, and cost-efficiency for large-scale production. Broader consumer feedback can refine product appeal. Promoting taro and partnering with local farmers can strengthen the supply chain and support wider adoption.

ACKNOWLEDGEMENTS

The author would like to thank the mentors from Cebu Technological University-Danao Campus for their constructive feedback on this paper.

Conflict of interest

The authors declare that they have no conflict of interest.

REFERENCES

- Ahmed, I., Lockhart, P. J., Agoo, E. M., Naing, K. W., Nguyen, D. V., Medhi, D. K., & Matthews, P. J. (2020). Evolutionary origins of taro (*Colocasia esculenta*) in Southeast Asia. *Ecology and Evolution*, 10(23), 13530–13543. <https://doi.org/10.1002/ece3.6958>
- Appiani, M., Cattaneo, C., & Laureati, M. (2023). Sensory properties and consumer acceptance of plant-based meat, dairy, fish and eggs analogs: a systematic review. *Frontiers in Sustainable Food Systems*, 7, 1268068. <https://doi.org/10.3389/fsufs.2023.1268068>
- Arora, M., Singhal, S., Rasane, P., Singh, J., Kaur, S., Kumar, V., ... & Mishra, A. (2020). Snacks and Snacking: Impact on Health of the Consumers and Opportunities for its Improvement. *Current Nutrition & Food Science*, 16(7), 1028-1043. <https://doi.org/10.2174/1573401316666200130110357>
- Berciano, S., Figueiredo, J., Brisbois, T. D., Alford, S., Koecher, K., Eckhouse, S., ... & Blumberg, J. B. (2022). Precision nutrition: Maintaining scientific integrity while realizing market potential. *Frontiers in Nutrition*, 9, 979665. <https://doi.org/10.3389/fnut.2022.979665>
- Boahemaa, L. V., Dzandu, B., Amissah, J. G. N., Akonor, P. T., & Saalia, F. K. (2024). Physico-chemical and functional characterization of flour and starch of taro (*Colocasia esculenta*) for food applications. *Food and Humanity*, 2, 100245. <https://doi.org/10.1016/j.foohum.2024.100245>
- Boukid, F., Klerks, M., Pellegrini, N., Fogliano, V., Sanchez-Siles, L., Roman, S., & Vittadini, E. (2022). Current and emerging trends in cereal snack bars: implications for new product development. *International Journal of Food Sciences and Nutrition*, 73(5), 610-629. <https://doi.org/10.1080/09637486.2022.2042211>
- Cankurtaran, T., Ceylan, H., & Bilgiçli, N. (2020). Effect of partial replacement of wheat flour by taro and Jerusalem artichoke flours on chemical and sensory properties of tarhana soup. *Journal of Food Processing and Preservation*, 44(10), e14826. <https://doi.org/10.1111/jfpp.14826>
- Chauhan, V. B. S., Mallick, S. N., Mohapatra, P., Pati, K., Arutselvan, R., Nedunchezhiyan, M., & Verma, A. K. (2023). Taro (*Colocasia esculenta* (L.) Schoff.) for nutritional security and health benefits. *Horticulture for Nutrition and Income Security*, 1–11. <https://doi.org/10.1111/aab.12882>
- Chobot, M., Kozłowska, M., Ignaczak, A., & Kowalska, H. (2024). Development of drying and roasting processes for the production of plant-based pro-healthy snacks in the light of nutritional trends and sustainable techniques. *Trends in Food Science & Technology*, 104553. <https://doi.org/10.1016/j.tifs.2024.104553>
- Civille, G. V., Carr, B. T., & Osdoba, K. E. (2024). *Sensory evaluation techniques*. CRC press. <https://doi.org/10.1201/9781003352082>
- Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297–324. <https://doi.org/10.1007/BF02310555>
- Etikan, I., & Bala, K. (2017). Sampling and sampling methods. *Biometrics & Biostatistics International Journal*, 5(6), 00149. <https://doi.org/10.15406/bbij.2017.05.00149>
- Ferdaus, M. J., Chukwu-Munsen, E., Foguel, A., & da Silva, R. C. (2023). Taro roots: An underexploited root crop. *Nutrients*, 15(15), 3337. <https://doi.org/10.3390/nu15153337>
- Forde, C. G. (2018). From perception to ingestion; the role of sensory properties in energy selection, eating behaviour and food intake. *Food Quality and Preference*, 66, 171-177. <https://doi.org/10.1016/j.foodqual.2018.01.010>
- Guiné, R. P., Florença, S. G., Barroca, M. J., & Anjos, O. (2020). The link between the consumer and the innovations in food product development. *Foods*, 9(9), 1317. <https://doi.org/10.3390/foods9091317>
- Isaskar, R., Darwanto, D. H., Waluyati, L. R., & Irham, I. (2021). The Effects of Sensory Attributes of Food on Consumer Preference. *The Journal of Asian Finance, Economics and Business*, 8(3), 1303-1314. <https://doi.org/10.13106/jafeb.2021.vol8.no3.1303>
- Joseph, M. V., & Sharma, C. (2022). Food Product Development: Science, Shelf Life, and Quality. In *Shelf Life and Food Safety* (pp. 93-112). CRC Press. <https://doi.org/10.1201/9781003091677-6>
- Lawshe, C. H. (1975). A quantitative approach to content validity. *Personnel psychology*, 28, 563–575. <https://doi.org/10.1111/j.1744-6570.1975.tb01393.x>
- Li, X. (2024). Enhancing plant-based foods: innovative flavor solutions. In *Handbook of Plant-Based Food and Drinks Design* (pp. 273-284). Academic Press. <https://doi.org/10.1016/j.hbpl.2024.100245>

- doi.org/10.1016/B978-0-443-16017-2.00022-X
21. McClure, A. P., Hopfer, H., & Grün, I. U. (2022). Optimizing consumer acceptability of 100% chocolate through roasting treatments and effects on bitterness and other important sensory characteristics. *Current Research in Food Science*, 5, 167-174. <https://doi.org/10.1016/j.crf.2022.01.005>
22. Mitharwal, S., Kumar, A., Chauhan, K., & Taneja, N. K. (2022). Nutritional, phytochemical composition and potential health benefits of taro (*Colocasia esculenta* L.) leaves: A review. *Food Chemistry*, 383, 132406. <https://doi.org/10.1016/j.foodchem.2022.132406>
23. Nielsen, S. S. (2024). Introduction to food analysis. In *Nielsen's Food Analysis* (pp. 3-14). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-45776-5_1
24. Nishinari, K., Peyron, M. A., Yang, N., Gao, Z., Zhang, K., Fang, Y., ... & Su, L. (2024). The role of texture in the palatability and food oral processing. *Food Hydrocolloids*, 147, 109095. <https://doi.org/10.1016/j.foodhyd.2023.109095>
25. Nussinovitch, A., & Hirashima, M. (2023). *Use of Hydrocolloids to Control Food Appearance, Flavor, Texture, and Nutrition*. John Wiley & Sons. <https://doi.org/10.1002/9781119702139>
26. Ramírez-Jiménez, A. K., Gaytán-Martínez, M., Morales-Sánchez, E., & Loarca-Pina, G. (2018). Functional properties and sensory value of snack bars added with common bean flour as a source of bioactive compounds. *LWT*, 89, 674-680. <https://doi.org/10.1016/j.lwt.2017.11.043>
27. Ratnawati, T. (2022, January). Increasing the Economic Value of Locally Processed Food. In *International Conference on Social, Economics, Business, and Education (ICSEBE 2021)* (pp. 152-156). Atlantis Press. <https://doi.org/10.2991/aebmr.k.220107.028>
28. Ravi, V., Vikramaditya, P., Nedunchezhiyan, M., John, K. S., Saravanan, R., Veena, S. S., & Harish, E. R. (2021). Advances in the production technologies of Taro in India. *Promotion of underutilized taro for sustainable biodiversity and nutrition security in SAARC countries*, 281, 148-281. <https://www.sac.org.bd/archives/publications/Promotion%20of%20Underutilized%20Taro.pdf#page=155>
29. Rebollar, R., Gil, I., Lidón, I., Martín, J., Fernández, M. J., & Rivera, S. (2017). How material, visual and verbal cues on packaging influence consumer expectations and willingness to buy: The case of crisps (potato chips) in Spain. *Food Research International*, 99, 239-246. <https://doi.org/10.1016/j.foodres.2017.05.024>
30. Saxby, S. M., Dong, L., Ho, K. K., Lee, C. N., Wall, M., & Li, Y. (2024). Nutritional, physicochemical, and functional properties of Hawaiian taro (*Colocasia esculenta*) flours: A comparative study. *Journal of Food Science*, 89(5), 2629-2644. <https://doi.org/10.1111/1750-3841.17053>
31. Serna-Saldivar, S. O. (Ed.). (2022). *Snack Foods: Processing, Innovation, and Nutritional Aspects*. CRC Press. <https://doi.org/10.1201/9781003129066>
32. Shah, Y. A., Saeed, F., Afzaal, M., Waris, N., Ahmad, S., Shoukat, N., & Ateeq, H. (2022). Industrial applications of taro (*Colocasia esculenta*) as a novel food ingredient: A review. *Journal of Food Processing and Preservation*, 46 (11), e16951. <https://doi.org/10.1111/jfpp.16951>
33. Sharif, M. K., Butt, M. S., Sharif, H. R., & Nasir, M. (2017). Sensory evaluation and consumer acceptability. *Handbook of food science and technology*, 10, 362-386. https://www.researchgate.net/publication/320466080_Sensory_Evaluation_and_Consumer_Acceptability
34. Sharma, S., Jan, R., Kaur, R., & Riar, C. S. (2020). Taro (*Colocasia esculenta*). *Antioxidants in vegetables and nuts-properties and health benefits*, 341-353. https://doi.org/10.1007/978-981-15-7470-2_18
35. Shelembe, S. C. (2020). *Water use and nutritional water productivity of taro (Colocasia esculenta L. Schott) Landraces* (Doctoral dissertation). <https://researchspace.ukzn.ac.za/handle/10413/19572>
36. Smith, N. (2016). *Locavore: Filipino Food that's Full of Surprises*. Retrieved from: <https://scenesfromnadine.com/locavore-filipino-food-thats-full-of-surprises/>
37. Sorkin, B. C., Kuszak, A. J., Bloss, G., Fukagawa, N. K., Hoffman, F. A., Jafari, M., ... & Pauli, G. F. (2020). Improving natural product research translation: From source to clinical trial. *The FASEB Journal*, 34(1), 41-65. <https://doi.org/10.1096/fj.201902143R>
38. Spence, C. (2018). Background colour & its impact on food perception & behaviour. *Food Quality and Preference*, 68, 156-166. <https://doi.org/10.1016/j.foodqual.2018.02.012>
39. Starowicz, M., & Zieliński, H. (2019). How Maillard reaction influences sensorial properties (color, flavor and texture) of food products?. *Food Reviews International*, 35 (8), 707-725. <https://doi.org/10.1080/87559129.2019.1600538>
40. Steenis, N. D., Van Herpen, E., Van Der Lans, I. A., Ligthart, T. N., & Van Trijp, H. C. (2017). Consumer response to packaging design: The role of packaging materials and graphics in sustainability perceptions and product evaluations. *Journal of Cleaner Production*, 162, 286-298. <https://doi.org/10.1016/j.jclepro.2017.06.036>
41. Su, J., & Wang, S. (2024). Influence of food packaging color and foods type on consumer purchase intention: the mediating role of perceived fluency. *Frontiers in Nutrition*, 10, 1344237. <https://doi.org/10.3389/fnut.2023.1344237>
42. Terana, C. C. (2023). Acceptability of coconut (*Cocos nucifera*) apple tart filling recipe: Techno guide for Extension program. *Journal of Applied and Natural Science*, 15 (2), 542-548. <https://doi.org/https://doi.org/10.31018/jans.v15i2.4451>
43. Vermeir, I., & Roose, G. (2020). Visual design cues impacting food choice: A review and future research agenda. *Foods*, 9(10), 1495. <https://doi.org/10.3390/foods9101495>
44. Wang, X., McClements, D. J., Xu, Z., Meng, M., Qiu, C., Long, J., ... & Chen, L. (2023). Recent advances in the optimization of the sensory attributes of fried foods: Appearance, flavor, and texture. *Trends in Food Science & Technology*, 138, 297-309. <https://doi.org/10.1016/j.tifs.2023.06.012>
45. Wang, Y., Tuccillo, F., Lampi, A. M., Knaapila, A., Pulkkinen, M., Kariluoto, S., ... & Katina, K. (2022). Flavor challenges in extruded plant-based meat alternatives: a review. *Comprehensive Reviews in Food Science and Food Safety*, 21(3), 2898-2929. <https://doi.org/10.1111/1541-4337.12964>

46. Wheat, S. O. (2019). Using of taro (*Colocasia esculenta*) flour as a partial substitute of wheat flour in biscuit making. *Environmental Science*, 14(1), 235-246. https://journals.ekb.eg/article_425748_5c0b5a71531f7e8b812e7a9fe12e9429.pdf
47. Wood, B., Williams, O., Nagarajan, V., & Sacks, G. (2021). Market strategies used by processed food manufacturers to increase and consolidate their power: a systematic review and document analysis. *Globalization and health*, 17, 1-23. <https://doi.org/10.1186/s12992-021-00667-7>
48. Zhang, E., Jiang, W., Li, W., Ansah, E. O., Yu, X., Wu, Y., & Xiong, F. (2024). Drought Stress Inhibits Starch Accumulation in Taro (*Colocasia esculenta* L. Schott). *Frontiers in Bioscience-Landmark*, 29(2), 57. <https://doi.org/10.31083/j.fbl2902057>