ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 10| October 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

ACCEPTABILITY OF CLASSIC MACAROONS ENHANCED WITH LIME, PEANUTS, AND PILI NUTS

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Article DOI: https://doi.org/10.36713/epra24636
DOI No: 10.36713/epra24636

ABSTRACT

This study evaluated the acceptability of classic macaroons enhanced with lime, peanuts, and pili nuts based on sensory attributes: appearance, aroma, taste, and texture. In response to the growing demand for healthier, culturally inspired snacks, the research aimed to assess how the integration of locally sourced ingredients affects consumer perception of traditional coconut-based confections. A quantitative experimental design was employed, involving 60 purposively selected evaluators composed of BSHM students, faculty, and local bakery representatives. A standardized recipe and a sensory evaluation instrument adapted from the 9-point Hedonic Scale were used. Results indicated high levels of acceptability across all sensory attributes, with appearance receiving the highest mean score (M = 8.38), followed by texture (M = 8.23), and both aroma and taste (M = 8.18). The overall mean acceptability score was 8.25. Statistical analysis using the Kruskal-Wallis H-test revealed no significant differences among the evaluated attributes ($p > .05$), indicating consistent favorable responses. The study concludes that the incorporation of lime, peanuts, and pili nuts enhances the sensory appeal of classic macaroons without compromising quality. These findings support the product's potential for commercialization, integration into culinary education, and promotion of culturally rooted, health-conscious baked goods.

INTRODUCTION

Classic macaroons are traditional baked confections made primarily from shredded coconut, egg whites, and sugar. Characterized by their chewy texture and sweet flavor, macaroons have long been favored for their simplicity and richness. Coconut (Cocos nucifera) is a crucial crop cultivated in tropical regions, praised for its versatility in culinary and nutritional applications. Virgin coconut oil (VCO), extracted from fresh coconut meat without the application of heat, has gained popularity as a healthy cooking alternative due to its high smoke point and potential heart-health benefits. Recent studies indicate that VCO possesses antioxidant properties that may prevent oxidative stress affecting cardiovascular health, although studies in this sector are limited (Sekhar et al., 2022).

To enhance the sensory and nutritional qualities of macaroons, innovative adaptations have incorporated locally available ingredients such as lime, peanuts, and pili nuts. Lime juice adds a bright acidity that enhances the overall flavor profile of desserts, providing a refreshing contrast to the sweetness of coconut and sugar, and is also an excellent source of vitamin C which supports immune function and promotes healthy skin (Morales-Brown, 2023). Peanuts (Arachis hypogaea) are widely recognized for their protein content and heart-healthy fats and provide essential nutrients such as fiber, vitamin E, magnesium, and potassium. Regular consumption of peanuts has been linked to improved cardiovascular health and reduced inflammation (Çiftçi & Suna, 2022). Pili nuts (Canarium ovatum) are increasingly recognized for their rich nutrient profile, encompassing healthy fats, essential minerals, and antioxidants, supporting muscle function and heart health due to their high magnesium content (Millena et al., 2023).

This research aimed to evaluate the acceptability of coconut macaroons enhanced with peanuts, lime, and pili nuts by assessing sensory attributes such as appearance, aroma, taste, texture, and overall acceptability. Understanding consumer preferences for these enhanced macaroons provided valuable insights into their market potential and contributed to the development of innovative coconut-based products that met the growing demand for healthier snack options.

METHODOLOGY

Research Design

This study used a quantitative research design to determine the acceptability of classic macaroons enhanced with lime, peanuts, and pili nuts. The design was appropriate because the study did not attempt to manipulate variables but rather focused on observing and evaluating the outcomes of the product under controlled conditions and assessing its sensory qualities based on the responses of the evaluators (Bhandari, 2020; Zellner et al., 2020).

Specifically, this design allowed the researchers to gather accurate and systematic data on appearance, aroma, taste, and texture through a structured sensory evaluation tool based on the 9-Point Hedonic Scale developed by Peryam and Pilgrim (1957).

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Purposive sampling was employed to include 60 respondents consisting of 42 BSHM students, 8 faculty members, and 10 bakery representatives who were knowledgeable in food preparation and sensory evaluation (Campbell et al., 2020). Their collective feedback ensured informed and reliable results.

The preparation of the product involved gathering the ingredients and following the standardized recipe and procedures for cooking, mixing, baking, cooling, labeling, and presentation. The necessary materials, tools, and equipment such as mixing bowls, whisk or electric mixer, oven, kitchen utensils, and mini muffin cups were used in preparing the macaroons. Evaluators were given clear instructions on how to rate the product and were encouraged to drink water after tasting to cleanse their palate.

By organizing and presenting the data in a structured manner, the quantitative approach ensured that the assessment of acceptability was comprehensive and descriptive. The mean and standard deviation were used to evaluate each sensory attribute, and inferential analysis was employed to determine whether significant differences existed in terms of appearance, aroma, taste, and texture.

Furthermore, ethical considerations were observed, as participants were informed that involvement was voluntary, and their privacy and confidentiality were respected throughout the study.

Participants and Inclusion Criteria

The participants of this study were sixty (60) purposively selected respondents consisting of Bachelor of Science in Hospitality Management (BSHM) students, BSHM faculty members from West Visayas State University–Himamaylan City Campus, and local bakery representatives from Himamaylan City. Purposive sampling was used to include only individuals who were knowledgeable and capable of evaluating food products, ensuring that the responses were reliable and relevant to the study.

Thus, respondents of the study were specifically identified based on their familiarity and involvement in food preparation and sensory evaluation. Forty-two (42) BSHM students and eight (8) faculty members were included because of their background in hospitality management and culinary skills. Ten (10) bakery representatives were also selected due to their professional experience in baking and consumer food preferences. Their evaluation ensured informed feedback on the acceptability of the macaroons in terms of appearance, aroma, taste, and texture.

The inclusion criteria required that the respondents:
(1) were currently enrolled as BSHM students, employed as BSHM faculty, or working as bakery representatives in Himamaylan City;
(2) had experience and knowledge in food tasting and evaluation; and
(3) were willing to participate voluntarily in the sensory evaluation.
Respondents were guided during tasting and were encouraged to cleanse their palate after each sample to provide accurate ratings. All information was kept confidential, and participation was voluntary.

Sampling Technique and Sample Size

To gather the necessary data for this study, the researchers used purposive sampling. Purposive sampling was employed to include only qualified individuals who were knowledgeable and capable of evaluating food products, thereby enhancing the reliability of the results (Campbell et al., 2020). The total number of participants was sixty (60) respondents consisting of forty-two (42) Bachelor of Science in Hospitality Management (BSHM) students, eight (8) BSHM faculty members from West Visayas State University–Himamaylan City Campus, and ten (10) bakery representatives from Himamaylan City. Their familiarity with food preparation and sensory evaluation ensured informed feedback related to the acceptability of the enhanced macaroons in terms of appearance, aroma, taste, and texture. Respondents were selected based on their background in food tasting and product evaluation. Those who met the inclusion criteria were given questionnaires to accomplish after the tasting procedure. This sampling approach ensured that the respondents' evaluation was relevant to the objectives of the study and supported the accurate assessment of consumer preferences for the enhanced macaroons.

Data Collection Instrument

The researchers utilized an adapted sensory evaluation tool based on the 9-Point Hedonic Scale developed by Peryam and Pilgrim (1957), which was used to collect the data on the acceptability of the classic macaroons enhanced with lime, peanuts, and pili nuts. A modified score sheet was provided to the respondents where they rated each sample in terms of appearance, aroma, taste, and texture.

The instrument was designed to obtain accurate and systematic feedback from individuals who were knowledgeable in food preparation and sensory evaluation. The responses were gathered after the tasting procedure and were tabulated for analysis. This tool ensured reliable data that supported the assessment of consumer preferences and the overall acceptability of the macaroons.

Validity and Reliability of the Data

The sensory evaluation tool used in this study was an adapted score sheet based on the 9-Point Hedonic Scale developed by Peryam and Pilgrim (1957). The instrument was reviewed by experts to ensure clarity, appropriateness, and alignment with the objectives of evaluating the acceptability of the macaroons in terms of appearance, aroma, taste, and texture. Since the hedonic scale is a standardized and widely recognized method in sensory evaluation, the reliability of the instrument was considered established.

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Data Analysis Procedure

After completing the data collection process, the researchers organized and analyzed the gathered information to determine the acceptability of the classic macaroons enhanced with lime, peanuts, and pili nuts. The collected data were reviewed and tabulated to ensure that all responses were complete and valid. Each set of data was grouped according to the sensory attributes evaluated—appearance, aroma, taste, and texture. Descriptive statistics, specifically the mean and standard deviation, were used to determine the level of acceptability of the product. The results were interpreted based on the verbal descriptors indicated in the 9-Point Hedonic Scale. Inferential analysis was also employed to determine whether a significant difference existed among the sensory attributes evaluated by the respondents.

Ethical Considerations

The principles of ethical considerations below were strictly observed in the conduct of the study.

Voluntary participation.The respondents were informed that participation was voluntary, and they were willing to participate in the sensory evaluation

Anonymity and confidentiality.The researchers respected the anonymity of participants, and all information was kept confidential throughout the study.

Informed consent. The researchers asked participants for informed consent before the data gathering procedure was conducted..

Proper communication. Respondents were given clear instructions on how to rate the product and were encouraged to cleanse their palate after each tasting to provide accurate responses.

RESULTS AND DISCUSSIONS

The results of the study determined the acceptability of classic macaroons enhanced with lime, peanuts, and pili nuts based on their sensory attributes. Table 3 shows that appearance obtained a mean score of 8.38, aroma 8.18, taste 8.18, and texture 8.23, with a general mean of 8.25, all verbally interpreted as "Very Acceptable." This indicated that the enhanced macaroons were highly liked by the respondents in all evaluated qualities. The standard deviation values also showed that appearance (.85) had the lowest variability among responses while aroma (1.14) had the highest. These results implied that the product achieved desirable characteristics that met the level of acceptability required in sensory evaluation.

Equally important, the test for significant differences among the sensory attributes (Table 4) using the Kruskal–Wallis H test revealed that appearance, aroma, taste, and texture had p-values of .772, indicating that there was no significant difference in the respondents' level of acceptability toward the sensory qualities of the product. This suggested that the enhancements did not negatively affect any specific attribute, showing that the product was consistently accepted by the evaluators. The uniform acceptability supported the high quality and balanced sensory contribution of lime, peanuts, and pili nuts in the development of the product.

Overall, the results confirmed that the enhanced macaroons met consumer expectations and demonstrated strong acceptability in appearance, aroma, taste, and texture. The product was found favorable by the respondents and showed potential as an innovative snack utilizing locally sourced ingredients. The findings indicated that lime, peanuts, and pili nuts contributed positively to the overall product acceptability, and the enhanced macaroons can be recommended for wider consumer evaluation.

Table 1

Level of Acceptability of Classic Macaroons Enhanced with Lime, Peanuts and Pili Nuts in Terms of Appearance, Aroma, Taste, and Texture.

Sensory Attributes	*n*	Mean		*SD*
Appearance	60	8.38	Very Acceptable	.85
Aroma	60	8.18	Very Acceptable	1.14
Taste	60	8.18	Very Acceptable	1.05
Texture	60	8.23	Very Acceptable	1.01
General	60	8.25	Very Acceptable	.80

Note: 8.51-9.00 Highly Acceptable; 7.51-8.50 Very Acceptable; 6.51-7.50 Moderately Acceptable; 5.51-6.50 Slightly Acceptable; 4.51-5.50 Neither Acceptable/Unacceptable; 3.51-4.50 Slightly Unacceptable; 2.51-3.50 Moderately Unacceptable; 1.51-2.50 Very Unacceptable; 1.00-1.50 Highly Unacceptable

Table 1 shows the sensory evaluation results of classic macaroons enhanced with lime, peanuts, and pili nuts, showing consistently high levels of acceptability across all sensory attributes. The appearance received the highest mean score (M = 8.38, SD =

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0.85), followed by texture (M = 8.23, SD = 1.01), aroma (M = 8.18, SD = 1.14), and taste (M = 8.18, SD = 1.05). The overall mean (M = 8.25, SD = 0.80) falls within the "Very Acceptable" range (7.51–8.50), indicating that the product was well-received by the evaluators. The high rating for appearance suggests that the visual appeal of the macaroons—possibly due to the inclusion of natural ingredients like lime zest or nut pieces—contributed positively to consumer perception. The consistency in ratings across all attributes implies that the enhancements complemented rather than overwhelmed the traditional flavor and texture of the macaroons.

According to Sirangelo (2019),emphasized that sensory descriptive evaluation plays a crucial role in understanding consumer preferences by assessing the fundamental attributes of food such as appearance, aroma, taste, and texture. The study suggests that incorporating such analysis helps guide product development toward consumer satisfaction and market viability. In this case, the use of local and natural ingredients like lime, peanuts, and pili nuts not only enriched the sensory qualities of the product but also aligned with growing consumer interest in unique, regionally inspired food innovations.

Table 2
Significant difference in the Level of Acceptability of Classic Macaroons Enhanced with Lime, Peanuts, and Pili nuts in terms of Appearance, Aroma, Taste and Texture.

	n	Mean Rank	Kruskal-Wallis H	p-value
Appearance	60	127.73		
Aroma	60	116.68		
			1.122	.772
Taste	60	117.81		
Texture	60	119.78		

*p < .05, significant

Table 2 shows p-value of 0.772 which indicates that there is no statistically significant difference between the acceptability levels of classic macaroons enhanced with lime, peanuts, and pili nuts across the attributes of appearance, aroma, taste, and texture. This means that the observed variations in acceptability ratings are likely due to random chance rather than any inherent differences caused by the enhancements.In the context of this study, the null hypothesis posits that the enhancements (lime, peanuts, and pili nuts) do not affect the acceptability of the macaroons. A p-value greater than 0.05 supports the retention of the null hypothesis.

A study by Tamundong and Aliguyon (2022) explored the acceptability of macaroons enriched with coconut curd (latik). Their findings revealed that while the enriched macaroons were generally well-received, significant differences were noted in the texture of specific treatments, suggesting that specific enhancements can influence particular sensory attributes. However, overall acceptability remained high across variations, indicating that such enhancements do not drastically alter consumer perception of the product's quality.

Similarly, a study by Gonzales (2023) assessed the acceptability of KaPiliNgka bar cookies, which incorporated kamias, pili, and langka. The research found that while there were significant differences in acceptability for certain proportions (30g and 60g), the 90g proportion did not exhibit significant differences, suggesting that the quantity of enhancement plays a role in consumer perception. This underscores the importance of optimizing ingredient proportions to maintain product acceptability.

The current study's findings, indicating no significant differences in acceptability across various enhancements, are consistent with existing literature. These results suggest that the incorporation of lime, peanuts, and pili nuts into classic macaroons does not adversely affect consumer perception of key sensory attributes. This insight is valuable for product developers aiming to innovate while maintaining product quality and consumer satisfaction.

CONCLUSIONS

Based on the findings, the study concluded that the classic macaroons enhanced with lime, peanuts, and pili nuts were very acceptable in terms of appearance, aroma, taste, and texture. The overall acceptability showed that the product met the sensory preferences of the respondents and achieved the desired qualities of a baked confection. The results indicated that incorporating lime, peanuts, and pili nuts contributed positively to the improved characteristics of the macaroons, making them highly liked by the evaluators.

Furthermore, the findings revealed that there was no significant difference in the level of acceptability when grouped according to the four sensory attributes, which suggested that the product maintained consistency in its sensory qualities. The enhancements did not affect any specific attribute negatively, proving that all ingredients worked well together in the formulation.

Overall, the study concluded that the enhanced macaroons have potential for consumer acceptance and may be recommended for wider production and market introduction. The product

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demonstrated strong acceptability and can be considered as an innovative snack option utilizing locally available ingredients.

Recommendations

Based on the findings of the study, it is recommended that the product development of classic macaroons enhanced with lime, peanuts, and pili nuts be continued, since the product was rated Very Acceptable in all sensory attributes. The results indicated that the enhanced macaroons have strong consumer acceptance, and therefore, the product may be introduced to a wider market for commercialization and consumer testing.

It is further recommended that future researchers conduct further studies on improving and enhancing the product formulation to strengthen its sensory characteristics even more. Additional testing with a larger number of respondents is encouraged to validate the findings and ensure broader market acceptability. Future studies may also explore other locally available ingredients that can improve the aroma and reduce variations in responses noted in the evaluation.

Moreover, it is recommended that future research assess shelf life, nutritional content, and market potential of the enhanced macaroons so that the product can be developed not only for sensory quality but also for commercial and economic viability. Packaging design and preservation techniques may also be studied to maintain product quality during distribution.

Overall, the researchers recommend that the enhanced macaroons using lime, peanuts, and pili nuts be adopted and further improved, as this product demonstrated high acceptance and potential for consumer preference as a locally inspired innovative snack.

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