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ACCEPTABILITY OF PIZZA WITH SHORT MACKEREL (HASA-HASA) LAMAYO TOPPINGS AS MAIN INGREDIENT

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ABSTRACT

This study evaluated the sensory acceptability of pizza topped with short mackerel (hasa-hasa) lamayo as the main ingredient. Using a quantitative experimental design, fifty (50) respondents composed of students, faculty, and residents assessed the product in terms of appearance, aroma, taste, and texture through a 9-point hedonic scale. Results showed that the pizza was generally rated as acceptable to highly acceptable across all sensory attributes. Taste emerged as the most favorable attribute, while aroma received more varied responses. Overall, the findings demonstrate that short mackerel (hasa-hasa) lamayo can be successfully adapted as a pizza topping, offering both an innovation and culturally rooted food product with potential for consumer acceptance. Based on the findings, it is recommended that local food businesses and pizzerias consider incorporating short mackerel lamayo as a topping to diversify menu options and promote sustainable use of local fish. Further, future studies may explore variations in preparation techniques to improve aroma acceptability.

KEYWORDS: *Lamayo Pizza, Sensory Acceptability, Appearance, Aroma, Taste, Texture, Hasa-Hasa, Hedonic Scale, Experimental Research.*

INTRODUCTION

1.1 Background of the study

Pizza, cherished by people around the world, is known for its adaptability as a dish that can reflect various culinary heritages. Although it originated in Italy, it has evolved into a universal food that accommodates local ingredients and flavor profiles. Recently, the food industry has seen a pronounced trend toward integrating indigenous and sustainable ingredients into modern dishes (Javier-Pisco, Escriche, Igual, García-Segovia, & Pagan, 2024).

The addition of new or unusual pizza toppings is primarily shaped by sensory experiences, which include taste, aroma, texture, and visual appeal. Consumers are becoming increasingly open to seafood toppings as long as these components enhance the dish's sensory qualities (Reinhard, Schmidt, Potter, & Bond, 2023). This increased acceptance paves the way for introducing Filipino-inspired toppings such as lamayo, a local dish made from short mackerel (hasa-hasa), into modern pizza recipes.

Short mackerel, referred to as hasa-hasa in the Philippines, is often prepared as lamayo, a semi-dried and marinated fish known for its rich umami flavor. This method of preparation amplifies its savory profile, making it a suitable ingredient for fusion dishes like pizza. Research by Palma et al. (2023) indicates that methods like marination greatly enhance the sensory attributes of fish products when used in innovative food items, underscoring the need for further exploration into lamayo's acceptability in culinary applications. The success of innovative offerings like seafood pizza heavily relies on ongoing consumer feedback and iterative refinement during the development phase (Williams, Peterson, & Lee, 2020). Thus, this study aims to evaluate the sensory acceptance of pizza topped with short mackerel lamayo concerning its appearance, aroma, taste, and texture. The results will further encourage the use of sustainable local ingredients and the establishment of culturally relevant Filipino fusion cuisine.

2. THEORETICAL FRAMEWORK

This research is based on the New Product Development Theory, which offers a framework for designing and launching new products that fulfill consumer needs while aligning with business objectives. The NPD process includes several critical stages, such as identifying market needs, generating product ideas, refining and testing developments, and ultimately launching the product to the market.

New product development (NPD) pertains to the process of conceptualizing, producing, and marketing a new offering. It utilizes specific methodologies and frameworks and depends on effective tools. This approach provides considerable advantages regarding production costs, product quality, and supply chain efficiency. These elements are essential for achieving success and fostering business growth (Azanedo, Garcia-Garcia, Stone, and Rahimifard, 2020).

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Moreover, Wiścicka-Fernando, Misiak-Kwit, & Fernando (2019) emphasize that engaging younger generations during the development phase can generate more innovative product ideas, especially when they are actively involved in the process. This concept illustrates the collaborative aspect of contemporary NPD practices, where consumers act not only as end users but also as essential contributors in product development.

In this study, the creation of a pizza topped with short mackerel lamayo acts as a case study for this theory. It examines a unique product by combining a traditional ingredient with a modern food item. The objective is to assess its potential acceptance among consumers by applying established sensory evaluation criteria.

3. METHODOLOGY

3.1 Research Design

This investigation will adopt an experimental approach. Experimental research utilizes the scientific method to evaluate whether a specific treatment affects a particular outcome. This design necessitates the random allocation of treatment conditions, while the quasi-experimental and single-subject designs rely on non-random treatment assignments (Bloomfield & Fisher, 2019). The design was employed to statistically analyze and identify the degree of acceptability for pizza topped primarily with short mackerel based on appearance, aroma, taste, and texture. Additionally, the primary aim of this research is to assess the level of acceptability for pizza featuring short mackerel lamayo as a topping.

3.2 Participants and Inclusion Criteria

Fifty (50) respondents participated in the study, including students, faculty members, and residents of Barangay Caradio-an, Himamaylan City. Participants were purposively selected based on availability and willingness to participate in the sensory evaluation.

3.3 Data Collection Instrument

This study will employ a 9-point hedonic scale, which is the most commonly used scale for evaluating food acceptability. The food industry has rapidly adopted this scale, which is now utilized not only for assessing foods and beverages but also for personal care products, household items, and cosmetics. Evaluators will utilize the questionnaire to evaluate the completed pizza with short mackerel lamayo toppings according to specific sensory criteria. The questionnaire will contain the title of the study, along with clear and straightforward instructions to assist evaluators in rating the pizza based on appearance, aroma, taste, texture, and overall acceptability.

3.4 Product Preparation

The lamayo pizza was prepared following a standardized recipe that included 35 g short mackerel lamayo, 30 g bell pepper, 25 g cheese, 25 g mushroom, 25 g white onion, and pizza sauce. The lamayo was marinated, semi-dried, and lightly fried before being placed on the pizza crust.

3.5 Data Analysis Procedure

Upon collection, the accomplished questionnaires will be carefully reviewed, tabulated, and analyzed using appropriate statistical tools. Mean and standard deviation where use in the descriptive analysis to evaluate the acceptability of pizza with short mackerel lamayo toppings using the adapted instrument as assessed by the respondents. To answer objective number 1, What is the level of acceptability of pizza with short mackerel lamayo toppings as main ingredient in terms of aroma, appearance, taste, and texture?

Kruskal-Wallis H test will be employed to assess whether there are statistically significant differences. To answer objective number 2, Is there a significant difference in the level of acceptability of short mackerel lamayo as a main ingredient in pizza toppings in terms of aroma, appearance, taste, and texture? Further, if significant different exist, then post hoc analysis will be performed.

3.6 Ethical Considerations

The study strictly adhered to ethical research standards to protect the rights and welfare of the participants. The following principles were observed:

- Informed Consent: All participants were provided with a consent form detailing the purpose of the study, voluntary participation, anonymity, and the right to withdraw at any time without consequence.
- Confidentiality: No personally identifiable information was collected. Data were handled confidentially and used only for research purposes.
- Data Protection: All data were securely stored and only accessible to the researcher.
- Approval: Prior to data collection, the study received approval from the Campus Administrator and Barangay Captain.

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4. RESULTS AND DISCUSSION

Table 1. ***Level of Sensory Acceptability of Pizza with Short Mackerel (Hasa-Hasa) Lamayo Toppings in Terms of Appearance, Aroma, Taste, and Texture***

Respondents		Appearance	Aroma	Taste	Texture	Overall
Students	*n*	15	15	15	15	15
	Mean	8.67	8.27	8.87	8.60	8.60
	Verbal Description	Highly Acceptable	Acceptable .458	Highly Acceptable	Highly Acceptable	Highly Acceptable
	sd	.49		.35	.51	.25
Faculty	*N*	15	15	15	15	15
	Mean	8.33	8.07	8.60	8.40	8.35
	Verbal Description	Acceptable .72	Acceptable .59	Highly Acceptable .57	Acceptable .57	Acceptable .44
	sd					
Residents	*n*	20	20	20	20	20
	Mean	8.65	8.70	8.75	8.65	8.69
	Verbal Description	Highly Acceptable	Highly Acceptable	Highly Acceptable	Highly Acceptable	Highly Acceptable
	sd	.49	.47	.44	.49	.33
Total	*n*	50	50	50	50	50
	Mean	8.56	8.38	8.74	8.56	8.56
	Verbal Description	Highly Acceptable	Acceptable . 57	Highly Acceptable	Highly Acceptable	Highly Acceptable
	sd	.58		.44	.50	.37

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 Unacceptable; 1.00-1.51 Highly Unacceptable

Table 1 shows the acceptability level of short mackerel lamayo-covered pizza according to four sensory characteristics appearance, aroma, flavor, and texture, as rated by students, teachers, and residents.

The appearance of pizza covered with short mackerel lamayo toppings was scored highly positive as a whole. Students gave the appearance of the pizza very high (M = 8.67), a visually appealing, appetizing, and well-presented-looking pizza. Locals also gave a high satisfaction rating (M = 8.65), testifying to their love of familiar local ingredients being presented in a contemporary form. Faculty members, provided a rating (M = 8.33), and qualify as being within the "Acceptable" category. This implies that certain faculty members might have had expectations about refinement or uniformity in appearance. Aroma was the feature for which the groups gave most heterogeneous answers.

Residents rated highest (M = 8.70, Highly Acceptable), which means that they felt at ease with and even attracted to the familiar odor of lamayo, which is commonly found in traditional Filipino homes. Students provided a rating of (M = 8.27), while the faculty members also score the food (M = 8.07) and both are within the "Acceptable" category. The student and faculty finding can be explained by the strong and unique smell of marinated and half-dried fish, which may be new when paired with pizza. In spite of the lower ratings by a few groups, the scent was still within the acceptable range, which is to say that it did not have a major impact to diminish the overall acceptability of the product. Taste was the most dominant characteristic and contributed a lot in making the product generally successful. The highest rating by students (M = 8.87) was closely matched by residents (M = 8.75), with faculty members also having a positive rating (M = 8.60). All of these fall under the "Highly Acceptable" category.

The fact that the scores were high throughout groups indicates that the lamayo topping effectively augmented the flavor profile of the pizza. The savory richness and umami taste from the fish combined with cheese, tomato sauce, and vegetables gave a new but fulfilling spin on the classic pizza. As taste is the most powerful force behind consumer food purchases, this finding implies that lamayo-based pizza has a great potential to attract large segments of consumers, particularly those looking for innovative yet delicious foods. Texture also garnered highly positive ratings. Students gave it a (M= 8.60), residents a (M= 8.65), and faculty a (M= 8.40). This indicates that the cooking process of the lamayo enabled it to integrate well with the other elements of the pizza, keeping taste pleasant along with a chewy texture.

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Overall, the texture positively affected acceptance of the product. The general acceptability of the pizza with short mackerel lamayo toppings was generally highly positive, as seen from the consistent positive ratings by all three respondent groups. While minor differences occurred in some of the attributes, the product was generally within the range of "Acceptable" to "Highly Acceptable" overall. Texture and appearance were favorably met, demonstrating that the lamayo could be incorporated into the pizza crust, cheese, and vegetables to form a dish that was both pleasing to the eye and agreeable to eat. Aroma garnered the most diverse feedback, with residents liking it the most because they are used to the smell of lamayo, and students and faculty were a little more conservative but still in the acceptable range. Taste, however, proved to be the strongest characteristic and the most influential reason for the product's popularity, with all groups rating it as "Highly Acceptable."

Table 2. ***Differences in Sensory Acceptability Among Respondent Groups***

Respondents	Mean Rank	Kruskal-Wallis H	df	p-value
Students	25.77			
Faculty & Staff	18.57	6.04	2	0.49
Residents	30.50			

p<.05, significant

Kruskal Wallis H test reveals a statistically significant difference in the acceptability of pizza with short mackerel lamayo toppings as main ingredient, H=6.04, p-value = .049.

Although the Kruskal-Wallis test indicates significant differences among the three types of respondents, it does not specify which particular pairs differ. Therefore, Dunn's post-hoc test with Bonferroni adjustment was employed to identify the specific group comparisons contributing to these differences.

Table 3. ***Post Hoc Test of the Sensory Acceptability of Pizza with Short Mackerel Lamayo Toppings as Main Ingredient in Terms of Appearance, Aroma, Taste, and Texture***

Pairwise Comparisons of Respondents					
Sample 1- Sample 2	**Test Statistic**	**Std. Error**	**Std. Test Statistic**	**Sig.**	**Adj. Sig.**
Students and Faculty	7.200	5.193	1.387	.106	.497
Faculty and Residents	-11.933	4.857	-2.457	.014	.042
Students and Residents	-4.733	4.857	9.74	.330	.989

The post hoc analysis revealed a significant difference between faculty and residents (Adj. Sig. = 0.042), indicating that these groups varied in their level of acceptability, with residents providing higher ratings. No significant differences were observed between students and faculty (Adj. Sig. = 0.497) or between students and residents (Adj. Sig. = 0.989).

These findings imply that while most groups evaluated the product similarly, residents showed greater appreciation for the lamayo pizza, possibly due to cultural familiarity with the ingredient. As highlighted by Huang et al. (2021), consumer response to mackerel-based products is influenced by prior exposure and sensory expectations, particularly regarding aroma and texture attributes that residents rated most favorably.

The results underscore that sensory acceptability can differ across demographic groups and that cultural alignment should be considered in developing and marketing innovative, locally inspired dishes such as lamayo pizza.

5. CONCLUSIONS

Based on the findings, the study concludes that pizza with short mackerel (*hasa-hasa*) lamayo toppings is highly acceptable among respondents in terms of appearance, aroma, taste, and texture. The product demonstrated strong sensory appeal, with taste emerging as the most favorable attribute, confirming that lamayo blends harmoniously with the pizza's ingredients. Respondents described the product as appetizing, flavorful, and visually appealing. The overall evaluation affirms that short mackerel lamayo can be successfully adapted into a modern culinary product like pizza while maintaining its traditional Filipino essence.

The results also reveal that cultural familiarity played a role in sensory evaluation. Residents, who are more accustomed to lamayo, provided higher ratings compared to faculty members, suggesting that consumer exposure to traditional food influences acceptance. This highlights the significance of cultural and contextual factors in food innovation and sensory perception.

Theoretically, the study supports the New Product Development (NPD) Theory, which underscores the importance of consumer-centered innovation. The successful incorporation of lamayo demonstrates how indigenous ingredients can be effectively used to create new food products that are both appealing and sustainable. The findings further validate the relevance of Sensory Evaluation Theory, emphasizing that consumer

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preferences extend beyond measurable sensory characteristics to include cultural experience and emotional connection to food.

From a practical perspective, the integration of lamayo as a pizza topping promotes menu diversification, culinary innovation, and sustainability. It encourages local food entrepreneurs and pizzerias to utilize available marine resources, thereby supporting local fisheries and reducing dependency on imported ingredients. Additionally, the study demonstrates that consumers are open to novel food products combining tradition and modernity, offering both nutritional and cultural value.

Lastly, the results have implications for education, policy, and research. Culinary educators and students are encouraged to explore similar innovations that integrate local ingredients into mainstream recipes. Policymakers and institutions may consider supporting initiatives promoting local food sustainability. Future studies may extend this research by analyzing the nutritional content, shelf life, and market feasibility of lamayo pizza, thus advancing its commercial potential. Overall, the study concludes that lamayo pizza represents an innovative, culturally relevant, and environmentally responsible product capable of enriching Filipino gastronomy and promoting sustainable food development.

6. RECOMMENDATIONS

Based on the conclusions of the study, the following recommendations are presented:

For Food Businesses and Pizzerias adopt short mackerel lamayo as a topping to diversify menus, reduce reliance on imported ingredients, and offer customers an affordable, sustainable, and distinctly Filipino flavor.

For Pizza Makers address aroma, the least-rated attribute, by experimenting with culinary techniques such as pairing lamayo with citrus, herbs, or spices to balance its strong scent while preserving its authentic flavor.

For Culinary Educators and Students integrate lamayo-based pizza into lessons on product development, sensory evaluation, and food innovation to encourage creativity and the use of indigenous resources in modern gastronomy.

For Hospitality Management Programs encourage students to conduct similar innovation projects with other local ingredients, strengthening their skills in menu engineering and research-based product development.

For Consumers be open to innovative food products that merge tradition and modernity, as lamayo pizza offers both cultural familiarity and nutritional benefits compared to conventional meat toppings.

For Sustainability Advocates promote lamayo and other underutilized fish species as eco-friendly alternatives to overfished varieties like tuna and salmon, supporting local fisheries and reducing environmental impact.

For Future Researchers expand studies to include nutritional analysis, shelf-life testing, or large-scale market feasibility to further validate lamayo's potential in the commercial food industry.

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