Sensory Acceptability and Characterization of Pijanga Nuggets

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Abstract: *This study focused on the development and evaluation of Pijanga nuggets using Glossogobiusgiuris as the primary ingredient. It aimed to assess the sensory acceptability, nutritional content, and physico-chemical properties of three different nugget formulations. A total of 120 participants, including food experts and general consumers, evaluated the products using a 9-point hedonic scale. The research employed a descriptive-developmental design with a mixed methods approach, incorporating laboratory-based analyses and statistical evaluation. Results revealed that Formulation C was the most preferred, receiving the highest ratings across all sensory attributes—appearance, aroma, taste, texture, and overall appeal. Statistical analysis confirmed significant differences in acceptability among the formulations. Nutritional analysis of the preferred formulation showed it is low in fat, moderate in calories, and high in protein. Its physico-chemical profile also indicated high moisture and protein content with minimal fat and sodium levels. These findings support the potential of Pijanga nuggets as a nutritious, consumer-accepted food product and offer insights for food innovation using underutilized fish species.*

Keywords: *Pijanga nuggets, Glossogobiusgiuris, sensory evaluation, product development, nutritional analysis, physico-chemical properties, underutilized fish, food innovation*

I. INTRODUCTION

The rising global demand for sustainable and nutritious food sources has intensified research into alternative protein sources, particularly in response to challenges such as food security, malnutrition, and environmental sustainability. The development of protein-enriched foods from underutilized aquatic species presents a promising solution to these challenges. This study focuses on the development and acceptability of Pijanga (Glossogobiusgiuris) nuggets, a fish species abundant in Lake Mainit of Surigao del Norte but underexplored as a food source. The primary aim of this research is to assess the feasibility of using Pijanga as a protein-rich ingredient in frozen food products and to determine the consumer acceptability of such innovations. This study is significant in several ways. First, it contributes to the expanding body of knowledge on alternative protein sources by exploring the potential of Pijanga, a species known for its high nutritional value yet underutilized in the food industry (Lee et al., 2019). Second, it addresses the growing need for functional foods that meet the nutritional demands of various populations, including those facing dietary protein deficiencies. As the demand for healthy, convenient, and sustainable food options increases, innovations such as protein-enriched frozen foods could provide a cost-effective and nutritious solution, contributing to both food security and sustainable agricultural practices (Zhang & Chen, 2021). Third, the research aligns with global efforts to reduce food waste by promoting the use of local and lesser-known species that are often discarded in conventional food systems (Shao et al., 2020).

This study fills the gap by developing Pijanga nuggets and evaluating their sensory qualities, nutritional value, and consumer acceptability. Current literature on alternative protein sources often overlooks underutilized aquatic species, leaving a significant gap in the exploration of their potential in mainstream food products. As frozen foods represent a large segment of the global food market, this research aims to provide a viable model for incorporating Pijanga into mass-produced food products while maintaining high levels of nutritional integrity. By combining sensory evaluations and nutritional analyses, the study aims to ensure that Pijanga (Glossogobiusgiuris) nuggets not only enhance the traditional frozen taste and aroma but also contribute to their nutritional value.The acceptability of this innovative

culinary solution will be gauged through feedback from a diverse participant pool, shedding light on its potential integration into both traditional and contemporary culinary practices. The researcher embarks on this investigation, offering a tantalizing glimpse into the future of preserving and enhancing cultural culinary treasures while contributing to global sustainability efforts. This aligns with the Sustainable Development Goals (SDG) Ambition for 2040, promoting sustainable food production, responsible consumption, and the conservation of aquatic resources.

II. LITERATURE REVIEW

Fish Proteins: Nutritional Benefits and Functional Properties

Alemán et al. (2023) emphasized the exceptional nutritional profile of fish proteins, which are abundant in essential amino acids, peptides, and omega-3 fatty acids that contribute to health benefits such as improved cardiovascular health, muscle maintenance, and immune function. They also highlighted the unique functional properties of fish proteins, including gelling, emulsifying, and water-holding capacities, which enhance the texture and structural integrity of processed food products. These attributes are critical in ensuring the cohesiveness, juiciness, and mouthfeel of Pijanga nuggets, making them appealing to consumers. Alemán et al. further explored the role of fish proteins in creating low-fat and high-protein products, supporting the concept of Pijanga nuggets as a healthier and more innovative food option.

Sensory Evaluation in Food Innovation

Mihaela (2023) underscored the pivotal role of sensory evaluation in determining consumer acceptability of novel food products. Sensory attributes such as flavor, texture, appearance, and aroma are critical to the success of food innovations. The study detailed methodologies like quantitative descriptive analysis, hedonic tests, and focus groups, which help capture consumer perceptions and preferences comprehensively. These techniques ensure that sensory attributes of Pijanga nuggets, including their fish-derived flavor and crispy exterior, meet consumer expectations. Mihaela's research also emphasized that sensory appeal often determines the market success of innovative food products, underscoring its relevance to this study.

Effect of Freezing and Storage on Fish Products

Gökoğlu and Yerlikaya (2015) explored the critical influence of freezing techniques on maintaining the quality of fish products. Their research showed that rapid freezing preserves the textural and nutritional integrity of fish by minimizing ice crystal formation, which can damage muscle fibers. They highlighted the importance of temperature control during storage to prevent protein denaturation and lipid oxidation. Qixing et al. (2020) similarly demonstrated that freezing methods directly affect the sensory and nutritional quality of fish products. Rapid freezing was found to maintain the natural flavor and texture of grass carp, making it a relevant approach for Pijanga nuggets to ensure extended shelf life without compromising quality. These findings stress the importance of adopting optimal freezing techniques in the production and storage of Pijanga nuggets to preserve their quality and marketability.

Bioactive Compounds from Fish Byproducts

Atef and Ojagh (2017) highlighted the potential of bioactive compounds derived from fish byproducts, such as peptides and polyunsaturated fatty acids, to offer health-promoting benefits, including antioxidant, antimicrobial, and anti-inflammatory effects. These compounds contribute to functional food development by addressing chronic health issues like cardiovascular diseases and oxidative stress. Their study emphasized sustainable utilization of fish byproducts, aligning with the goal of developing nutritionally enhanced Pijanga nuggets. By incorporating bioactive compounds, Pijanga nuggets could cater to health-conscious consumers seeking functional foods with added health benefits.

Consumer Acceptance of Fish-Based Products

Bonfim et al. (2019) investigated consumer acceptance of fish nuggets formulated with innovative ingredients, such as fish waste flour. Their findings demonstrated that partial substitution of traditional ingredients with alternative protein

sources enhanced nutritional value while maintaining sensory appeal. The study emphasized that consumers prioritize flavor, texture, and overall satisfaction when evaluating fish-based products. These insights are directly applicable to Pijanga nuggets, highlighting the need to balance health benefits with sensory qualities to meet consumer preferences effectively.

Sensory Properties and Acceptance of Alternative Protein Products

Marta et al. (2023) conducted an extensive review of sensory properties and consumer acceptance of plant-based and alternative protein products, emphasizing the critical role of taste and texture in driving consumer choices. Their research revealed that while consumers are increasingly open to alternative protein products for environmental and health reasons, sensory characteristics often dictate repeat purchases. This underscores the importance of optimizing the sensory attributes of Pijanga nuggets, ensuring they can compete with both traditional and alternative protein products in the market.

Nutritional Value of Fish for Human Health

Balami et al. (2019) highlighted the nutritional importance of fish as a high-quality protein source rich in omega-3 fatty acids, vitamins, and minerals. These nutrients are essential for cognitive development, cardiovascular health, and overall well-being. The study also pointed out the role of fish in addressing global nutritional deficiencies. By utilizing Pijanga, a nutrient-dense and underutilized fish species, this research aims to develop a food product that combines nutritional benefits with innovative processing techniques, catering to health-conscious consumers and addressing food security.

Impact of Cryoprotectants in Fish Processing

Tian et al. (2021) explored the application of cryoprotectants, such as sugars and polyols, in preserving the quality of frozen fish products. Their study demonstrated that cryoprotectants prevent protein denaturation, moisture loss, and textural degradation during frozen storage, ensuring that products retain their sensory and nutritional properties. For Pijanga nuggets, incorporating cryoprotectants could significantly enhance shelf stability and maintain product quality over time, making them more appealing to both manufacturers and consumers.

Quality of Fish Nuggets with Innovative Ingredients

Canti et al. (2024) evaluated the effects of innovative ingredients, such as dumbo catfish protein isolates, on the physicochemical and sensory properties of fish balls. Their findings highlighted that alternative protein binders improved texture, moisture retention, and overall sensory appeal. These results are directly relevant to Pijanga nuggets, supporting the use of innovative techniques to enhance the quality and acceptability of the product. The study also emphasized the importance of ingredient functionality in achieving desired product characteristics.

Nutritional Improvement Through Innovation

Hunter et al. (2019) emphasized the potential of neglected and underutilized species (NUS) in improving diets and nutrition. Glossogobiusgiuris (Pijanga) is one such species, offering a rich source of protein, essential fatty acids, and micronutrients. The study advocated for the sustainable use of NUS to address food security challenges and enhance dietary diversity. By developing Pijanga nuggets, this research aims to promote the utilization of underexploited fish species, contributing to both nutritional improvement and sustainability.

Sustainability and New Opportunities in Fish Processing

Hall (2010) explored innovative approaches to fish processing, emphasizing the importance of sustainability and resource efficiency. He discussed how utilizing underutilized species, byproducts, and sustainable processing techniques can reduce waste and environmental impact. These strategies align with global efforts to promote

sustainable development in the food industry. The use of Pijanga in nugget production represents a practical application of these principles, demonstrating how innovative processing can create value from underutilized resources.

III. METHODOLOGY

The study utilized the descriptive- developmental research design methods of research since this study develop a food product of protein-enrich frozen food using pijanga. Mixed methods research design is determining the sensory attributes of the protein-enrich frozen food using pijanga and analyzed for analytical and chemical analysis, which includes moisture content, fiber, and fat. While the sensory acceptability of the food products that utilize pijanga for making nuggets will be measured in terms of appearance, texture, aroma.The developmental research study on protein-enrich frozen food using pijanga was conducted at the Food Technology Innovation Center within Surigao del Norte State University (SNSU) is a prominent academic institution located in Surigao del Norte, Philippines.To assess the level of acceptability of the developed products, an adaptive questionnaire was utilized. The potential products will be evaluated using a Score Card and a Hedonic Scale to determine their acceptability in terms of appearance, texture, and odor. A panel of experts, selected through purposive random sampling, will conduct the evaluation. Multiple trials will be carried out to refine the product and achieve the desired quality.Additionally, allergen information will be carefully considered throughout the product development process. Potential allergens in the ingredients used will be identified, and their presence will be clearly indicated to ensure consumer safety. This will help in addressing health concerns and ensuring compliance with food safety regulations. The evaluation will also include an assessment of how the product may affect individuals with specific food sensitivities, ensuring the final product is both safe and acceptable to a wide range of consumers.A researcher-made questionnaire was used as a gathering tool in determining the level of acceptability of the product in terms of appearance, aroma, flavor, and texture.Data were analyzed using mean and standard deviation for the acceptability of the sensory attributes of the Pijanga Nuggets in three formulations and Multivariate Analysis of Variance (MANOVA) using Wilk's Lambda for the difference between the three formulations on the sensory attributes of the Pijanga Nuggets.

IV. RESULTS AND DISCUSSION

Table 1 illustrates the level of acceptability of the appearance of the Pijanga Nuggets across three formulations based on a set of descriptive statements evaluated by the participants.

TABLE 1: ACCEPTABILITY OF APPEARANCE OF PIJANGA NUGGETS

Statement	Formulation A			Formulation B			Formulation C		
	M	SD	D	M	SD	D	M	SD	D
1. The color of the product looks appealing.	8.19	0.47	LVM	7.82	0.45	LVM	8.53	0.53	LE
2. The color is vibrant and fresh.	8.17	0.49	LVM	7.75	0.58	LVM	8.49	0.53	LVM
3. The product's color is consistent and uniform.	8.22	0.51	LVM	7.82	0.50	LVM	8.45	0.53	LVM
4. The color of the product is suitable for its type.	8.19	0.51	LVM	7.87	0.47	LVM	8.50	0.53	LVM
5. The product's color matches my expectations for this type of product.	8.00	0.74	LVM	7.93	0.41	LVM	8.63	0.52	LE
Average	**8.15**	**0.40**	**LVM**	**7.84**	**0.41**	**LVM**	**8.52**	**0.44**	**LE**

For Formulation A, the average mean score was 8.15, described as "Like Very Much." The highest-rated statement was Statement 3, "The product's color is consistent and uniform," with a mean of 8.22, indicating strong agreement with the visual uniformity of the product. On the other hand, Statement 5, "The product's color matches my expectations for this type of product," received the lowest mean score of 8.00, although still falling under the same descriptive rating. This suggests a slightly lower, yet generally favorable perception regarding color expectation alignment.In the case of

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Formulation B, the appearance was also rated as "Like Very Much," with an average mean of 7.84. Statement 5, "The product's color matches my expectations for this type of product," garnered the highest mean score of 7.93, indicating that among all attributes, alignment with expectation was most positively perceived. Meanwhile, Statement 2, "The color is vibrant and fresh," had the lowest mean score of 7.75, suggesting a slightly more moderate perception of visual freshness compared to other appearance-related criteria. Formulation C received the highest overall average score for appearance among the three, with a mean of 8.52, interpreted as "Like Extremely." The statement rated highest was Statement 5, "The product's color matches my expectations for this type of product," with a mean of 8.63, showing a strong match between the product's appearance and consumer expectation. Statement 3, "The product's color is consistent and uniform," registered the lowest mean score within this formulation at 8.45, still a highly favorable rating—indicating a very positive perception overall across all criteria.

Table 2 presents the acceptability of the aroma of Pijanga Nuggets across three different formulations, as assessed through five specific descriptors.

For Formulation A, respondents rated the overall aroma favorably with an average mean of 8.24, described as "Like Very Much." The statements "The product has an appealing odor," "The product's odor is pleasant and not overpowering," and "The odor of the product is pleasant enough to encourage consumption" all shared the highest mean rating of 8.28, highlighting strong appreciation for the product's olfactory appeal. Conversely, Statement 5, "The product's odor is consistent with its intended flavor," received the lowest mean score of 8.08—still within the very positive range, indicating minimal variance in aroma consistency perception. Meanwhile, Formulation B was also generally well-received with an average mean score of 7.79, interpreted as "Like Very Much," albeit slightly lower than Formulation A. The highest rating was given to Statement 5, "The product's odor is consistent with its intended flavor," with a mean of 7.89, suggesting alignment between the scent and expected taste. Statement 3, "The product has a natural odor," was rated the lowest at 7.73, indicating that although still positively perceived, this formulation was considered marginally less natural-smelling than others. Formulation C stood out as the most aromatic formulation, garnering the highest average mean of 8.72, classified under "Like Extremely." Statement 5, "The product's odor is consistent with its intended flavor," earned the top rating of 8.82, reflecting the strongest agreement among respondents regarding flavor-odor coherence. The lowest, though still highly favorable, was Statement 2, "The product's odor is pleasant and not overpowering," with a mean of 8.57. This reinforces the exceptional acceptability of Formulation C's aroma across all criteria.

TABLE 2: ACCEPTABILITY OF AROMA OF PIJANGA NUGGETS

Statement	Formulation A			Formulation B			Formulation C		
	M	**SD**	*D*	**M**	**SD**	*D*	**M**	**SD**	*D*
1. The product has an appealing odor.	8.28	0.45	*LVM*	7.81	0.40	*LVM*	8.68	0.47	*LE*
2. The product's odor is pleasant and not overpowering.	8.28	0.48	*LVM*	7.76	0.43	*LVM*	8.57	0.92	*LE*
3. The product has a natural odor.	8.26	0.49	*LVM*	7.73	0.45	*LVM*	8.68	0.47	*LE*
4. The odor of the product is pleasant enough to encourage consumption.	8.28	0.48	*LVM*	7.77	0.42	*LVM*	8.79	0.43	*LE*
5. The product's odor is consistent with its intended flavor.	8.08	0.67	*LVM*	7.89	0.36	*LVM*	8.82	0.39	*LE*
Average	**8.24**	**0.42**	*LVM*	**7.79**	**0.33**	*LVM*	**8.72**	**0.38**	*LE*

Table 3 shows the evaluation of the taste acceptability of three Pijanga Nuggets formulations, using five sensory statements to determine the participants' preferences.

TABLE 3: THE ACCEPTABILITY OF TASTEOF PIJANGA NUGGETS

Statement	Formulation A			Formulation B			Formulation C		
	M	SD	D	M	SD	D	M	SD	D
1. The taste is delicious and well-balanced, enhancing the overall dish.	8.21	0.41	LVM	7.70	0.48	LVM	8.74	0.44	LE
2. The taste is neutral and does not stand out in the dish.	8.16	0.48	LVM	7.64	0.50	LVM	8.61	0.49	LE
3. The taste of the product is unique and refreshing.	8.16	0.47	LVM	7.66	0.48	LVM	8.64	0.48	LE
4. The product has the right level of sweetness or saltiness.	8.20	0.46	LVM	7.71	0.46	LVM	8.78	0.42	LE
5. The aftertaste of the product is pleasant.	8.15	0.56	LVM	7.78	0.42	LVM	8.83	0.37	LE
Average	**8.18**	**0.39**	**LVM**	**7.70**	**0.42**	**LVM**	**8.72**	**0.37**	**LE**

Formulation A was rated favorably with an average mean of 8.18, described as "Like Very Much." The highest score among the statements was given to "The taste is delicious and well-balanced, enhancing the overall dish" with a mean of 8.21, which indicates that the overall flavor profile was well-received and complemented the dish. On the other hand, the lowest-rated statement was "The aftertaste of the product is pleasant" with a mean of 8.15, though still within the same favorable category, suggesting consistent satisfaction across taste indicators.Formulation B, while also positively evaluated, had the lowest overall average mean of 7.70 among the three, though still within the "Like Very Much" range. Among its statements, "The aftertaste of the product is pleasant" garnered the highest score at 7.78, reflecting that despite its overall slightly lower rating, the lingering flavor was appreciated. The lowest was "The taste is neutral and does not stand out in the dish," with a mean of 7.64, possibly indicating a need for enhancement in flavor distinctiveness.Formulation C received the highest ratings in terms of taste, achieving an overall average mean of 8.72, corresponding to "Like Extremely." The highest-rated statement was "The aftertaste of the product is pleasant," which achieved an impressive mean score of 8.83, reinforcing the idea that this formulation leaves a strong, favorable impression after consumption. The lowest-rated, though still remarkably high, was "The taste is neutral and does not stand out in the dish" with a mean of 8.61, showing that even the least highlighted aspect of taste still garnered enthusiastic approval from respondents.

Table 4 presents the sensory evaluation of the texture acceptability of Pijanga Nuggets across three formulations, assessed through five descriptive statements.

TABLE 4: ACCEPTABILITY OF TEXTURE OF PIJANGA NUGGETS

Statement	Formulation A			Formulation B			Formulation C		
	M	SD	D	M	SD	D	M	SD	D
1. The texture is slightly chunky, adding a pleasant bite to the paste.	8.22	0.41	LVM	7.81	0.40	LVM	8.81	0.40	LE
2. The texture is smooth and creamy, making it easy to incorporate into dishes.	8.21	0.41	LVM	7.73	0.44	LVM	8.63	0.48	LE
3. The texture is consistent throughout the product.	8.20	0.46	LVM	7.75	0.43	LVM	8.60	0.49	LE

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4. The texture makes the product enjoyable to eat.	8.23	0.48	*LVM*	7.81	0.40	*LVM*	8.72	0.45	*LE*
5. The texture is suitable for the type of product.	8.35	0.50	*LVM*	7.91	0.32	*LVM*	8.81	0.40	*LE*
Average	**8.24**	**0.42**	***LVM***	**7.80**	**0.33**	***LVM***	**8.71**	**0.39**	***LE***

Formulation A garnered an average mean of 8.24, interpreted as "Like Very Much," showing consistent satisfaction among the panelists. The highest-rated statement was "The texture is suitable for the type of product," which received a mean of 8.35, suggesting that this formulation met the expected texture quality for nuggets. The lowest score was for "The texture is consistent throughout the product" at 8.20, still within a high rating range, reflecting only slight variation in preference.Formulation B, though still rated positively, had the lowest average mean of 7.80. The highest-rated statement in this group was "The texture is suitable for the type of product" with a mean of 7.91, indicating that the texture met the basic expectations of the raters. Meanwhile, the lowest mean was recorded for "The texture is smooth and creamy, making it easy to incorporate into dishes," at 7.73, possibly highlighting a need for refinement in consistency or mouthfeel.Formulation C stood out with the highest overall texture acceptability rating at an average mean of 8.71, corresponding to "Like Extremely." It received its highest marks on two statements: "The texture is slightly chunky, adding a pleasant bite to the paste," and "The texture is suitable for the type of product," both scoring a high 8.81. This demonstrates the appeal of both its structural consistency and suitability for nugget-style food. The lowest-rated statement was "The texture is consistent throughout the product" at 8.60, which, while comparatively lower, still reflects an excellent sensory performance.

Table 5 shows the outcome of the MANOVA using Wilks' Lambda, followed by univariate tests for each sensory attribute, while Table 6 presents the results of Bonferroni pairwise comparisons between formulations to pinpoint where the significant differences occurred.

The overall MANOVA using Wilks' Lambda shows that the three Pijanga Nuggets formulations differed significantly when their four sensory dimensions were considered together ($\Lambda = 0.325$, $F = 44.34$, $p < 0.01$). Follow-up univariate tests confirmed this multivariate finding: appearance ($F = 80.80$), aroma ($F = 149.42$), taste ($F = 178.34$) and texture ($F = 145.33$) all had p-values below 0.01, demonstrating that no single attribute escaped the influence of formulation changes.

TABLE 5: SIGNIFICANT DIFFERENCE ON THE ACCEPTABILITY OF PIJANGA NUGGETS

Attribute	F	p	Decision on Ho	Interpretation
Appearance	80.80	<0.01	Rejected	Significant
Aroma	149.42	<0.01	Rejected	Significant
Taste	178.34	<0.01	Rejected	Significant
Texture	145.33	<0.01	Rejected	Significant

Wilks' Lambda $\Lambda = 0.325$, $F = 44.34$, $p < 0.01$

Table 6 reveals that all pairwise comparisons among the three formulations showed statistically significant differences ($p < 0.01$) for each of the four sensory attributes. For appearance, Formulation C had the highest mean ($M = 8.52$), followed by Formulation A ($M = 8.15$), and the lowest was Formulation B ($M = 7.84$). This indicates that raters found Formulation C to be the most visually appealing among the three.In terms of aroma, Formulation C again received the highest mean rating ($M = 8.72$), demonstrating a strong consumer preference, while Formulation A followed with a mean of 8.24. Formulation B received the lowest aroma score ($M = 7.79$), although it still fell within the "Like Very Much" range.When evaluating taste, the results were consistent with the other attributes: Formulation C led with the highest mean ($M = 8.72$),Formulation A followed with $M = 8.18$, and Formulation B again trailed with $M = 7.70$. This suggests that Formulation C offered the most favorableflavor experience according to the raters.

For texture, Formulation C once more emerged as the most preferred with a mean of 8.71. It was followed by Formulation A ($M = 8.24$), while Formulation B was rated lowest ($M = 7.80$). These findings confirm a consistent trend

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across all sensory attributes, strongly favoring Formulation C as the most acceptable variant of Pijanga Nuggets in terms of appearance, aroma, taste, and texture.

TABLE 6: PAIRWISE COMPARISON ON THE ACCEPTABILITY OF SENSORY ATTRIBUTES OF PIJANGA NUGGETS IN THREE FORMULATIONS

Attribute	Formulation (Mean)		p	Decision on Ho	Interpretation
Appearance	A (M=8.15)	B (M=7.84)	<0.01	Rejected	Significant
	A (M=8.15)	C (M=8.52)	<0.01	Rejected	Significant
	B (M=7.84)	C (M=8.52)	<0.01	Rejected	Significant
Aroma	A (M=8.24)	B (M=7.79)	<0.01	Rejected	Significant
	A (M=8.24)	C (M=8.72)	<0.01	Rejected	Significant
	B (M=7.79)	C (M=8.72)	<0.01	Rejected	Significant
Taste	A (M=8.18)	B (M=7.7)	<0.01	Rejected	Significant
	A (M=8.18)	C (M=8.72)	<0.01	Rejected	Significant
	B (M=7.7)	C (M=8.72)	<0.01	Rejected	Significant
Texture	A (M=8.24)	B (M=7.8)	<0.01	Rejected	Significant
	A (M=8.24)	C (M=8.71)	<0.01	Rejected	Significant
	B (M=7.8)	C (M=8.71)	<0.01	Rejected	Significant

Table 7 outlines the nutritional components of the most preferred formulation of Pijanga nuggets, detailing the results of chemical analysis per 100 grams, the estimated nutrient content per serving size, and their corresponding percentage contributions to the daily value and Recommended Energy and Nutrient Intake (RENI) for adult males aged 19–29.

Each 100-gram serving of the nuggets contains 115.61 calories, with a serving size contributing approximately 80 calories, which accounts for about 3% of the daily caloric intake based on a 2000-calorie diet. Calories from fat are minimal at only 1.17 per 100 grams, effectively rounding down to zero per serving. Total fat content is also negligible, recorded at 0.13 grams per 100 grams, contributing 0% to both daily value and RENI.Sodium content is relatively moderate at 250.62 milligrams per 100 grams, translating to about 170 milligrams per serving, which is 7% of the recommended daily intake. Total carbohydrates are measured at 17.82 grams per 100 grams, with a serving providing roughly 12 grams, contributing 4% to the daily value. Protein content is notably significant, with 10.79 grams per 100 grams and about 7 grams per serving, representing 14% of the daily value and 10% of the RENI for the target demographic. These nutritional findings suggest that the Pijanga nuggets are a protein-rich, low-fat food option with moderate carbohydrate content and manageable sodium levels, making them a potentially healthful addition to the diet of young adult males.

TABLE 7: NUTRITIONAL CONTENTS OF FORMULATION "C"OF PIJANGA NUGGETS

Food Nutrient	Result of Chemical Analysis (per 100g)	Amount of Food Nutrient per Serving Size (Rounded Value)	% Daily Value (based on 2000 Calorie Diet, Rounded Value)	% RENI (based on FNRI reference adult requirement of males 19–29 years old)
Calories	115.61	80		3
Calories from Fat	1.17	0		
Total Fat (g)	0.13	0	0	
Sodium (mg)	250.62	170	7	
Total Carbohydrates (g)	17.82	12	4	
Protein (g)	10.79	7	14	10

*Based on the Report of Chemical Analysis

% Daily Value is based on the New Nutrition Facts Label finalized May 20, 2016

Table 8 presents the physico-chemical profile of Pijanga Nuggets Formulation C, highlighting key parameters that describe its nutritional and compositional characteristics.

TABLE 8: PHYSICO-CHEMICAL PROPERTIES OF FORMULATION "C"OF PIJANGA NUGGETS

Parameter	Result
Moisture	69.29 g/100g
Ash Content	1.97 g/100g
Crude Protein	10.79 g/100g
Total Fat	0.13 g/100g
Sodium	250.62 mg/100g

The moisture content is relatively high at 69.29 grams per 100 grams, indicating that the product retains a significant amount of water, which contributes to its texture and shelf life. The ash content, which represents the total mineral content, is measured at 1.97 grams per 100 grams, suggesting a moderate level of mineral presence in the formulation.Crude protein content is recorded at 10.79 grams per 100 grams, reinforcing the product's nutritional value as a good source of protein. The total fat content is remarkably low at only 0.13 grams per 100 grams, aligning with the earlier nutritional analysis and confirming the product as a low-fat food item. Sodium is present at 250.62 milligrams per 100 grams, which is moderate and falls within acceptable dietary levels for processed foods. Overall, the physico-chemical profile demonstrates that the most preferred Pijanga nugget formulation is high in moisture and protein, low in fat, and contains a moderate amount of minerals and sodium, making it a relatively health-conscious food option.

V. CONCLUSION

Formulation C was the most acceptable among the three, receiving the highest ratings across all sensory attributes, indicating strong consumer preference.Formulation C was the most preferred product by the participants.The nutritional content of the preferred Pijanga nuggets demonstrates that it is a low-fat, moderate-calorie food with a good amount of protein.The physico-chemical profile confirms that the nuggets are high in moisture and protein while remaining low in fat, making them a nutritious and health-conscious food option

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