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FORMULATION, ANALYSES AND ACCEPTABILITY OF PAPAYA MEATY BITES

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Abstract: Food innovation plays an important role in enhancing nutritional value, promoting health conscious eating, and creating sustainable alternatives to conventional food products. It focused on evaluating the sensory qualities such as appearance, aroma, taste, and texture as well as the overall acceptability, and nutritional content of the developed products. Using an experimental developmental research design, the study followed a Completely Randomized Design (CRD) with three treatments and replications. Sensory data were gathered from 110 evaluators using the 9-Point Hedonic Scale, with results analyzed through arithmetic mean and ANOVA. Findings revealed that all three papaya meaty bite variants papaya balls, papaya loaf, and papaya nuggets received favorable sensory evaluations. Papaya loaf scored highest in taste and texture, while papaya nuggets led in appearance and aroma. Although slightly lower in some aspects, papaya balls still met the acceptable range across all sensory qualities. In consumer acceptability, papaya nuggets emerged as the most preferred product, followed by papaya loaf and papaya balls. Statistical analysis revealed significant differences in appearance and aroma, while taste and texture showed no significant differences, indicating consistent quality in those attributes. In terms of overall acceptability, appearance was the only quality with a statistically significant difference, emphasizing the impact of visual appeal on consumer preference. Papaya nuggets were selected for microbial and proximate analysis, which confirmed their safety, nutritional value, and extended shelf life. These findings support the product's potential for commercialization and its value in sustainable food product development.

Keywords: Sensory Qualities, Microbial and Proximate Analysis, Papaya Meaty Bites

I. INTRODUCTION

Consumers are seeking meat products that are meat items that are high-quality, inventive, safe, nourishing, and handy. The growing demand is propelling the creation of cooked meat products using novel methods and compositions, with decreased additives such as nitrites, salt, and phosphates, as well as the incorporation of natural ingredients all of this may result in possible health benefits. Additionally, advancements in handling, preserving, and processing meat have expanded the variety of foods available to consumers. As a result, product quality is now a more important consideration in the marketing of meat products since consumers are pickier and more discriminating about what they buy.

As stated in the study of Clayton et al. (2019), plant-based meat alternatives (PBMAs), often referred to as meat analogs, are innovative products derived from plants to effectively substitute for animal meat such as beef, pork, chicken, fish, and seafood. These alternatives are designed by simulating their sensory and nutritional properties using plant-derived ingredients such as soy and pea protein isolates, wheat, and mushrooms. Common examples of commercially available PBMAs include burgers, sausages, luncheon meat, ground meat, and nuggets. As a result of its local availability, some Filipino consumers have started incorporating PBMAs into their diets. A survey conducted by Statista in 2021 revealed that 65% of respondents in the Philippines consume PBMAs, primarily because of the perceived health benefits it offers (Statista 2022a, b). Therefore, it is important to study and address the challenges associated with PBMAs. The global demand for sustainable food is increasing due to concerns about animal products and their environmental impact. As a result, industries are focusing more on developing meat alternatives. There are several health benefits associated with consuming meat analogs as reduced consumption of meat which can lower cholesterol levels and potentially prevent heart related issues. Additionally, regular red meat intake has been connected to a higher risk of colorectal cancer.

(Hu et al., 2019). Consequently, plant-based meat alternatives are gaining significant interest among researchers, driven by high consumer demand stemming from health issues related to meat consumption, as well as the desire to adhere to a vegetarian diet.

Due to its health benefits, papaya fruits (Carica L.) are consumed all over the world. In the Philippines, papaya is a favorite fruit all year round. There are plenty of vitamins A, C, E, K, folate, and pantothenic acid. includes calcium, potassium, and magnesium. Originating in Central America, the Carica papaya is a big herbaceous plant that belongs to the Caricaceae (papaya) family. Tropical regions around the world are home to its enormous, delicious, melon-like fruits.



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Papaya is well-known for its therapeutic and nutritional qualities. According to Kumar and Sreeja (2017), papaya fruits, leaves, seeds, roots, bark, juice, and latex are used for both medical and nutritional purposes. People pay more for good food because they understand how important it is to eat and live a healthy lifestyle.

Scientifically known as Carica papaya L., papaya is extensively grown in Central and South America as well as other tropical and subtropical climates across the world, Southeast Asia, Africa, and the Pacific Islands. It is primarily grown in countries such as India, the Philippines, Indonesia, Malaysia, and Sri Lanka, where favorable climates support its year-round production (FAO, 2021). In the Philippines, papaya is a commonly used ingredient in everyday cooking ranging from savory dishes like tinola and atchara to sweet products such as jams, juices, and desserts highlighting its culinary versatility and cultural relevance (Rehman et al., 2022).

Papaya is valued not only for its affordability and widespread availability but also for its impressive nutritional profile. Along with vital minerals like potassium, calcium, and magnesium, it is abundant in vitamins A, C, and E. Moreover, it contains powerful enzymes such as papain, renowned for their anti-inflammatory and digestive qualities (Kumar & Sreeja, 2017). Due to these health-promoting compounds, papaya is increasingly recognized as a functional food with both nutritional and medicinal applications (Yadav et al., 2023).

In Filipino culture, papaya has earned the reputation of being a "people's fruit" because of its accessibility and economic value to both rural households and local food producers. As dietary preferences shift toward healthier and more sustainable alternatives, papaya's potential as a core ingredient in plant-based food innovations is gaining attention (García-Segovia et al., 2021).

Highlighting papaya as the primary ingredient in this study is significant due to its exceptional nutritional value and diverse flavor profiles. While papaya plays a crucial role as a major fruit crop and a staple in Filipino food, and despite the extensive information available on its nutritional benefits and market potential, there have been no studies conducted specifically exploring the creation, consumer preferences, and market dynamics of plant based papaya meaty bites in the Philippines. This gap is particularly important to address, especially given the global trend of consumers seeking unique and health-conscious food options.

One popular processed chicken meat product is the chicken nugget. Chicken nuggets are made from seasoned ground chicken meat, which is coated in flour and breadcrumbs. The mixture is then partially fried and frozen to preserve its quality during storage (Permadi et al., 2012; Wahidah, 2019). In contrast, Meatballs have long been a staple in various cuisines worldwide, known for their rich flavor and high protein content. However, due to growing health concerns and environmental sustainability, vegetable-based alternatives have gained popularity.

Meatballs, typically made from beef, pork, or chicken, provide essential amino acids, iron, and vitamin B12. However, they also contain saturated fats and cholesterol, which are associated with cardiovascular diseases (Smith & Jones, 2021). In contrast, vegetable balls, made from legumes, grains, and vegetables, offer a high-fiber, low-fat alternative. Research by Brown et al. (2020) found that plant-based proteins, such as lentils and chickpeas, provide adequate protein while reducing the risks of chronic diseases. Additionally, vegetable balls contain antioxidants and dietary fiber, promoting digestive health (Garcia & Lee, 2019). Additionally, Meat loaf has been a staple dish worldwide, traditionally made with ground meat, seasonings, and binders such as eggs and breadcrumbs. It is widely consumed due to its rich flavor and high protein content. However, concerns over health risks associated with red meat consumption, including heart disease, obesity, and high cholesterol levels, have encouraged the exploration of plant-based alternatives (Smith & Jones, 2021). Plant based of papaya meaty bites in the Philippines could provide valuable insights for local producers and the broader food industry. Additionally, given the lack of detailed studies on papaya related food innovations in specific regions, addressing this gap presents an opportunity to enhance the existing body of knowledge by analyzing the potential economic and cultural impacts. Moreover, it is essential to investigate the potential demand, consumer preferences, and market feasibility of introducing plant based Breakfast Food as alternatives to traditional meat in the Filipino market. This study's primary goal is to develop these new plant based products and evaluate consumer preferences and market potential. Therefore, this study aimed to fill the existing gap by formulating, analyzing, and assessing the acceptability of papaya based breakfast food among consumers. By systematically assessing sensory attributes and consumer preferences, the research seeks to provide valuable insights into the market viability and consumer appeal of these products.

II. METHODOLOGY

The experimental-developmental technique of research was used in this study. Coleman and Steele (2018) claim that when the variables of the investigation are carefully controlled or changed, the experimental approach concentrates the study on the future (what will be). The ideal amount of papaya to utilize for preparing balls, loaves, and nuggets was examined using an experimental approach. Conversely, developmental research is the systematic study of the creation, development, and assessment of processes and products for instructional programs that need to satisfy informal consistency and efficacy standards (Richey and Klein, 2014).



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The researcher concentrated on important sensory qualities like look, taste, texture, and scent in this design. They can be sure that outside influences don't affect the results by using controlled testing circumstances. This method is particularly effective for determining the optimal formulation that enhances flavor while maintaining the desirable qualities of the papaya meaty bites. By gathering detailed feedback from a panel of expert evaluators and consumers, the study aims to provide valuable insights into the potential of papaya fruit as an innovative ingredient in nuggets and luncheon meat production.

III. RESEARCH DESIGN

The research utilizes a Completely Randomized Design (CRD) for the experimental setup, as outlined by Stone et al. (2012). This design facilitates the random assignment of papaya nuggets and luncheon meat samples featuring various formulations of papaya and other ingredients. By employing CRD, the study ensures that each formulation is evaluated in a manner that minimizes bias, allowing for a more reliable comparison of sensory attributes across different samples.

Sensory evaluations are conducted by a panel of experts who assess the formulation, analysis, and acceptability of papaya meaty bites based on key sensory attributes such as appearance, aroma, taste, and texture (Montgomery, 2017). The use of a randomized design enhances the validity of the findings, as it controls for extraneous variables that could influence the sensory evaluations. This method provides a structured approach to gathering data, enabling the researchers to draw meaningful conclusions regarding the impact of papaya fruit on the overall quality and consumer formulation, analysis, and acceptability of papaya balls, loaf and nuggets

IV.MATERIALS, TOOLS AND EQUIPMENT

The tools and equipment used in the study were the following: one (1) unit 4x8 meters stainless working table; one (1) unit burner top stove; one (1) food processor; three (3) pieces medium- sized stainless mixing bowls; one (1) blender; one (1) set of stainless measuring spoons; one (1) stainless knife; one (1) piece of chopping board; three (3) piece small bowls; one (1) piece rubber scrapper; one (1) unit digital weighing scale; three (3) piece frying pan; and, one (1) piece food tong; three (3) baking pan molder

V. TREATMENTS USED IN THE STUDY

The experimental treatments consist of three distinct formulations of papaya meaty bites, each designed to explore the effects of different measurements of papaya fruit. Treatment A features 150 grams of papaya, which results in a lighter texture and less pronounced papaya flavor. Treatment B uses 200 grams of papaya, providing a richer, more intense flavor and a denser texture. Treatment C also uses 250 grams of papaya, but with slight adjustments to the seasoning, offering a unique flavor profile and texture compared to Treatment B. Each formulation is replicated three times to ensure the reliability and validity of the results.

The proportions of the ingredients used in each papaya balls, loaf and nuggets formulation are meticulously detailed in Tables 1 and 2, which serve as references for the specific quantities of papaya fruit and other ingredients in the recipes. This precise formulation is essential for maintaining consistency across every batch of papaya meaty bites.

Ingredients	Treatment A	Treatment B	Treatment C
Papaya	150g	200g	250g
White pepper	2g	2g	2g
Salt	3g	3g	3g
Garlic	7g	7g	7g
Onion	20g	20g	20g
Carrots	35g	35g	35g
Baking Powder	3g	3g	3g
Flour	60g	60g	60g
Cornstarch	13g	13g	13g

Table 1. Proportion of Ingredients for Papaya Balls



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Ingredients	Treatment A	Treatment B	Treatment C
Papaya	150g	200g	250g
White pepper	2.00g	2g	2g
Salt	3g	3g	3g
Sugar	6g	6g	6g
Fish Sauce	бg	6g	6g
Mushroom	29g	29g	29g
Cornstarch	43g	43g	43g
Paprika	3g	3g	3g
Garlic Powder	3g	3g	3g
Tofu	60g	60g	60g

Table 2. Proportion of Ingredients for Papaya Loaf

Table 3. Proportion of Ingredients for Papaya Nuggets.

Ingredients	Treatment A	Treatment B	Treatment C
Papaya	150g	200g	250g
Onion	29g	29g	29g
Bell pepper	20g	20g	20g
Cornstarch	65g	65g	65g
Salt	3g	3g	3g
White Pepper	2g	2g	2g
Bread Crumbs	60g	60g	60g
Cheese	45g	45g	45g

VI.EXPERIMENTAL PROCEDURE

The procedure for this study involves several key steps to prepare the papaya meaty bites:

Step 1. Papaya Balls (Treatment A) The ground papaya was mixed with flour, cornstarch, chopped garlic, onion, and seasonings in a mixing bowl. The mixture was shaped into uniform balls using clean hands and a spoon. These were deep-fried until golden brown. The balls were drained on paper towels to remove excess oil.

Step 2. Papaya Loaf (Treatment B) For the loaf, the papaya puree was blended with flour, tofu, seasonings, and other dry ingredients. The mixture was poured into greased loaf molds and steamed for a specific time. After steaming, the loaf was allowed to cool, then air-fried lightly to enhance the texture before packaging.

Step 3. Papaya Nuggets (Treatment C) The nuggets were prepared by combining ground papaya with cornstarch, bell pepper, onion, breadcrumbs, and cheese. The dough like mixture was shaped into nugget-sized pieces and coated with additional breadcrumbs before being fried until crisp and golden.

VII. COLLECTION OF DATA

The instrument used in this study was a researcher-made evaluation sheet. It addressed the quality attributes of the product, as evaluated by experts based on the sensory qualities of the papaya meaty bites in terms of appearance, aroma, and texture. The study began with the formulation of papaya meaty bites. In the first trial, the researcher prepared a batch using papaya as the primary ingredient. Once the initial papaya meaty bites were created, they were presented to a panel of 10 food technology experts, composed of professors and teachers from Capiz State University Main Campus. This panel was essential in offering input on the meaty papaya bites' sensory qualities. Based on particular quality parameters, the evaluators evaluated the product using a Nine-Point Hedonic Rating Scale. Based on the evaluations from the first trial, the researcher refined the papaya meaty bites recipe and proceeded to the second trial. The same panel of evaluators tasted the revised formulation and provided their assessments using the same evaluation sheet. The feedback gathered during this phase proved invaluable, highlighting areas for improvement and adjustments needed to enhance the product's sensory characteristics. Following the second trial, the researcher prepared a final formulation for the papaya meaty bites,



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incorporating all the suggestions received from the expert panel. In the third trial, the final batch was once again presented to the same group of experts. Their evaluations of each treatment, which differed in papaya content, were carefully documented along with any further recommendations for refinement.

After completing the expert evaluations, the researcher conducted consumer acceptance testing. A total of one hundred (100) consumer participants were selected from various backgrounds to provide a comprehensive perspective on the acceptability of the papaya meaty bites. This group included thirty-five (35) Food Technology Senior High School (SHS) and Junior High School (JHS) pupils at Roxas City School for Philippine Craftsmen; twenty-five (25) teachers from the same school; fifteen (15) teachers from Guinbilan Integrated School; twenty (20) parents; and ten (10) individuals identified as frequent consumers of balls, loaf, and nugget products. Each consumer received coded samples of the papaya meaty bites and evaluated each treatment using the Nine-Point Hedonic Scale. The evaluation sheet included qualitative descriptors to help assess the sensory characteristics of the product. The data gathered from both expert and consumer evaluations were instrumental in determining the overall formulation, analyses, and acceptability of the papaya meaty bites. This comprehensive evaluation process provided valuable insights that guided further development and refinement of the product.

VIII. STATISTICAL TOOLS AND ANALYSIS

To determine their overall acceptability, the product and treatment with the highest mean score were evaluated by consumers. The collected data was arranged and statistically analyzed using the Analysis of Variance (ANOVA) and Arithmetic Mean. The Statistical Package for the Social Sciences (SPSS) program was used to handle the data and perform a thorough review for this investigation.

The mean served as the key statistical tool for determining the level of sensory and general acceptability of appearance, aroma, and texture.

The Analysis of Variance (ANOVA) served as the key statistical tool for determining significant differences among the three products. The ANOVA was applied with an alpha level set at 0.01 to discern notable differences concerning its appearance, aroma, sourness, and texture.

IX. RESULTS AND DISCUSSION

Sensory Qualities of Papaya Meaty Bites

Table 2 presents an evaluation of the sensory qualities of papaya meaty bites. The sensory qualities evaluated are appearance, aroma, taste and texture. The evaluations were made by a panel of experts and are represented by means of scores.

The results revealed varying levels of experts preference supported by statistical evidence. In terms of appearance, all treatments were found "Very Much Appealing". The papaya balls (Treatment C), papaya loaf (Treatment C), and papaya nuggets (Treatment B), got all the same mean score of 8.0.

In terms of aroma, papaya balls (Treatment C), was rated as "Very Much Pleasant" across all treatments, with scores of 8.10, while the papaya loaf (Treatment C), got the mean score of 8.0 with the adjectival description of "Very Much Pleasant" and the papaya nuggets (Treatment A), rated as "Very Much Pleasant" scoring the lowest mean of 7.90. This suggests that all the Papaya based breakfast have the most pleasant across all treatments. This could potentially indicate a preference of Papaya balls based on its aroma.

With regard to taste, papaya loaf (Treatment C), was consistently rated as "Very Much Delicious" across all treatment, with scores of 8.0, for the papaya nuggets (Treatment B), and papaya balls (Treatment C), they both rated as "Very Much Delicious", with the mean of 7.80.

In terms of texture, papaya balls (Treatment B), has an adjectival description of "Extremely Firm" with a mean of 8.50, characterized by a crispy outer layer and soft interior. Papaya loaf (Treatment C), and papaya nuggets (Treatment B), rated as "Very Much Firm" with a score of 8.0.



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TREATMENTS		Papaya Balls (150g)		Papaya Loaf (200g)		Papay (2	Papaya Nuggets (250g)	
Product		Quality Attributes	Mean	AD	Mean	AD	Mean	AD
		Appearance	7.70	VMA	7.90	VMA	8.00	VMA
D		Aroma	7.80	VMP	7.90	VMP	8.10	VMP
Papaya	Balls	Taste	7.30	VMD	7.70	VMD	7.80	VMD
		Texture	7.90	VMF	8.50	EF	8.40	EF
Papaya Loaf		Appearance Aroma	7.90 7.90	VMA VMP	7.70 7.80	VMA VMP	8.00 8.00	VMA VMP
		Taste	7.40	VMD	7.50	VMD	8.00	VMD
		Texture	7.90	VMF	7.70	VMF	8.10	VMF
Papaya		Appearance Aroma	7.90 7.90	VMA VMP	8.00 7.80	VMA VMP	7.60 7.60	VMA VMP
Nuggets		Taste	7.70	VMD	7.80	VMD	7.40	VMD
		Texture	7.90	VMF	8.10	VMF	7.70	VMF
Legend: Adjectival Description Appearance Score 8.12 – 9.00 7.23 – 8.11 Very Much Appealing (EA) 6.34 – 7.22 Moderately Appealing (MA) 5.45 – 6.33 Slightly Appealing (SA)		(AD) Aroma		Taste		Texture	2	
		Extremely P Very Much I Moderately Slightly Plea	leasant (EP) Pleasant (VMP) Pleasant (MP) usant (SP)	Extremely Very Much Moderatel Slightly Do	Delicious (ED) 1 Delicious(VM) y Delicious (MI elicious (SD)	Extrema D) Very M D) Modera Slightly	ely Firm (EF) uch Firm (VMF) tely Firm (MF) Firm (SF)	

Table 2. Sensory Qualities of Papaya Meaty Bites.

The overall mean scored of the sensory qualities of papaya meaty bites show consistent high ratings. Papaya nuggets had an overall score of 8.56, while the Papaya balls had an overall score of 8.18 and for the Papaya nuggets loaf had an overall score of 7.57. These results indicate that all three types of papaya meaty bites, were perceived positively in terms of sensory qualities such as appearance, aroma, taste and texture.

General Acceptability of Papaya Meaty Bites

The findings presented in the table shed light on the overall acceptability of papaya meaty bites as perceived by a group of consumers, focusing on key sensory qualities such as appearance, aroma, taste, texture, and general acceptability. Treatment C, which refers to papaya nuggets, emerged as the most favored option across all evaluated sensory attributes, garnering impressive mean scores of 8.64 for appearance, 8.45 for aroma, 8.52 for taste, and 8.63 for texture. These high ratings collectively led to Treatment C being described as "liked extremely" across all four sensory dimensions, indicating a strong level of general acceptability among the consumers.

The results revealed varying levels of consumers preference supported by statistical evidence. In terms of appearance, all treatments were found "Extremely Appealing". The papaya nuggets receiving the highest mean score of 8.64, followed by papaya balls (8.30), and papaya loaf (8.07).

In terms of aroma, papaya nuggets was rated as "Extremely Pleasant" across all treatments, with scores of 8.45, while the papaya balls got the mean score of 8.33 and the papaya loaf rated as "Very Much Pleasant" scoring the lowest mean of 7.76. This suggests that Papaya nuggets have the most pleasant across all treatments. This could potentially indicate a preference of Papaya nuggets based on its aroma.



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With regard to taste, papaya nuggets, was consistently rated as "Extremely Delicious" across all treatment, with scores of 8.52, for the papaya balls, it was rated as "Very Much Delicious" with the mean of 7.86 and papaya loaf was rated as Moderately Delicious with the score of 6.65.

In terms of texture, papaya nuggets has an adjectival description of "Extremely Firm" with a mean of 8.63, characterized by a crispy outer layer and soft interior. Papaya balls also rated as "Extremely Firm" with a score of 8.23, and papaya loaf had the lowest texture and rated as "Very Much Firm" with a score 7.79.

The overall mean scored of the sensory qualities of papaya meaty bites show consistent high ratings. Papaya nuggets had an overall score of 8.56, while the Papaya balls had an overall score of 8.18 and for the Papaya nuggets loaf had an overall score of 7.57. These results indicate that all three types of papaya meaty bites, were perceived positively in terms of sensory qualities such as appearance, aroma, taste and texture.

TREATMENTS	A (Balls)		B (Loaf)		C (Nuggets)	
Quality Attributes	Mean	AD	Mean	AD	Mean	AD
Appearance	8.30	EA	8.07	EA	8.63	EA
Aroma	8.33	EP	7.76	VMP	8.45	EP
Taste	7.86	VMD	6.65	MD	8.52	ED
Texture	8.23	EF	7.79	VMF	8.63	EF
General Acceptability	8.18		7.57		8.56	

Table 3. General acceptability of papaya balls, loaf and nuggets.

Legend: Adjectival Description (AD)

Score	Appearance	Aroma	Taste	Texture
8.12 - 9.00	Extremely Appealing (EA)	Extremely Pleasant (EP)	Extremely Delicious (ED)	Extremely Firm (EF)
7.23 - 8.11	Very Much Appealing (VMA)	Very Much Pleasant (VMP)	Very Much Delicious (VMD)	Very Much Firm (VMF)
6.34 – 7.22	Moderately Appealing (MA)	Moderately Pleasant (MP)	Moderately Delicious (MD)	Moderately Firm (MF)
5.45 - 6.33	Slightly Appealing (SA)	Slightly Pleasant (SP)	Slightly Delicious (SD)	Slightly Firm (SF)

Difference in the Sensory Qualities of Papaya Meaty Bites among Three (3) Treatments

The findings shown in Table 4 provide insightful information on the sensory characteristics of Papaya Meaty Bites.

The results showed that the appearance of the three treatments of Papaya Meaty Bites did not significantly differ. For the Papaya Balls, the F statistic was 0.499 with a p-value of 0.779, suggesting no significant difference. Similarly, for Papaya Loaf, the F statistic was 0.996 with a p-value of 0.608, again indicating no significant difference. Lastly, for papaya nuggets, the F statistic was 1.242 with a p-value of 0.537, reinforcing the finding of no significant difference. Thus, these results suggest that the treatments applied did not significantly affect the appearance of any of the papaya meaty bites, likely remained consistent despite the different treatments.

The results showed that the aroma of the three varieties of papaya did not significantly differ from one another. For Papaya Balls, the F statistic was 0.766 with a p-value of 0.682, suggesting no significant difference. Similarly, for Papaya Loaf, the F statistic was 0.478 with a p-value of 0.787, again indicating no significant difference. Moreover, for Papaya nuggets, the F statistic was 0.743 with a p-value of 0.690, which is higher than 0.01, indicating a no significant difference. Thus, these results suggest that the treatments applied among papaya meaty bites, did not significantly differ in its aroma.

In terms of taste, the three treatments did not significantly differ from one another. For papaya balls, the F statistic was 2.166 with a p-value of 0.339, suggesting no significant difference. Similarly, for papaya loaf, the F statistic was 2.626 with a p-value of 0.269, again indicating no significant difference. Moreover, for papaya nuggets, the F statistic was 0.493 with a p-value of 0.782, which is higher than 0.01, indicating no significant difference.

The results of the study revealed that the texture of the three treatments did not significantly differ. For papaya balls, the F statistic was 2.948 with a p-value of 0.229. Similarly, for papaya loaf, the F statistic was 1.242 with a p-value of 0.537. For papaya nuggets, the F statistic was 0.896 with a p-value of 0.639. Since all these p-values are greater than



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the set significance level of 0.01, the researcher fails to reject the null hypothesis, suggesting no significant difference in texture across the treatments

Table 4. Differences in the sensory qualities of Papay Meaty Bites among three treatments.

Se	ensory Qualities	f	p value	Remarks
	Appearance	0.499	.779	ns
Domosto Dollo	Aroma	0.766	.682	ns
Papaya Dalis	Taste	2.166	.339	ns
	Texture	2.948	.229	ns
	Appearance	0.996	.608	ns
Depays Loof	Aroma	0.478	.787	ns
rapaya Loai	Taste	2.626	.269	ns
	Texture	1.242	.537	ns
	Appearance	1.242	.537	ns
Papaya Nuggets	Aroma	0.743	.690	ns
	Taste	0.493	.782	ns
	Texture	0.896	.639	ns

Legend: P-value -2.410 > 0.01, ns = not significant; level of significance = 0.01 alpha

Difference in the General Acceptability

The data on the differences in the acceptability of papaya meaty bites were shown in Table 5.

Results showed that there was a significant difference in the appearance of papaya balls, loaf and nuggets among treatments. F-value (299) = 10.877, p value = 0.000. This implies that the appearance had dissimilarity in all treatment that suggests that the visual appeal of the papaya meaty bites which could include factors such as color, and shape, varied significantly across the treatments. This variation in appearance could be due to the unique characteristics of each papaya meaty bites and how these characteristics are expressed under different treatment conditions.

Findings from the test of differences between treatments in terms of aroma showed a significant difference, F (299) = 17.931, p-value = .000. This indicates that there was a distinct variation in aroma among the treatments, which might be attributed to the different ingredients used. This further implies that the aroma of the papaya meaty bites, which can be influenced by the specific compounds present in each formulation, varied significantly across treatments. The distinct aroma could be a result of the interaction between these compounds and the ingredients unique to each treatment.

The outcomes of the test for significant difference between treatment in terms of taste rejected the null hypothesis f (299) = 85.688, p value =. 000). The unevenness of the treatments in terms of taste may be due to the composition of the variants, and the unique flavor profiles of each ingredient and how these flavors are altered or enhanced by the different treatments.

Likewise, result of the test for significant difference between treatments of papaya meaty bites in terms of texture rejected the null hypothesis f (299) = 23.447, p value = .000). The variation of the product in terms of texture may be due to the physical structure of each product and how this structure is affected by the different treatments.

X. CONCLUSION

Based on the established findings, the following conclusions are formulated.

Papaya shows strong potential as a value-added ingredient for developing nutritious and appealing breakfast food products, particularly in the form of papaya balls, loaf, and nuggets. These products received high approval ratings from both expert panelists and consumer participants, indicating broad acceptance and favorable sensory appeal across all variants.

A significant difference was observed among the three treatments in terms of certain sensory attributes, including appearance and aroma, while no significant difference was found in taste and texture. Among the three, the papaya



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nuggets demonstrated superior overall sensory qualities and were the most preferred by both experts and consumers. Furthermore, microbiological analysis confirmed that the papaya nuggets were safe for consumption, with aerobic plate count and Escherichia coli levels falling within acceptable standards set by the Department of Science and Technology (DOST) and food safety guidelines for ready-to-eat snack foods.

Overall, incorporating papaya as the main ingredient in balls, loaf, and nuggets enhances nutritional value, sensory quality, and consumer satisfaction. With further research, refinement, and product development, these papaya meaty bites food items show strong potential for commercial production and market acceptance as healthy and innovative snack or breakfast alternatives.

XI. RECOMMENDATIONS

Based on the established generalizations, the following recommendations are made:

Entrepreneurs are encouraged to explore the development and marketing of papaya meaty bites products, especially papaya nuggets, as a viable food business venture. These products are not only organic and nutritious but also present a healthier alternative to many commercial snack items. Producing and selling these items can provide both a health benefit to consumers and a source of income for businesses.

Researchers and food developers should conduct further experimentation using different formulations and papaya concentrations to refine flavor profiles while maintaining product integrity. Adjusting the form and amount of papaya used can help diversify product offerings and cater to a broader range of taste preferences.

Product developers are advised to explore alternative cooking methods or ingredient combinations to enhance the overall sensory quality of the papaya meaty bites products. This may involve steaming, air frying, or incorporating additional herbs, spices, or natural enhancers to elevate taste and texture.

Parents should consider serving papaya balls, loaf, and nuggets as healthier frozen food alternatives for children. These products offer improved nutritional value compared to typical commercial frozen snacks and can be a tasty, wholesome addition to daily meals.

Food manufacturers must implement strict quality control protocols throughout the production process. This includes ensuring consistency in appearance, aroma, taste, and texture. Regular sensory evaluations and consumer feedback surveys should be conducted to monitor product performance and identify areas for refinement.

Educators, especially in the area of Technology and Livelihood Education (TLE), should incorporate this study as a resource in teaching Food Processing. The papaya-based recipes and procedures can be used in practical performance tasks, particularly those related to food preservation and local product development.

Future researchers are advised to focus on a specific papaya variety to ensure consistency in evaluating sensory qualities. They may also explore other underutilized but locally available fruits as alternative ingredients to expand flavor options. Additionally, research into streamlining the preparation process is recommended to reduce time and improve production efficiency.

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