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# FORMULATION, ANALYSES AND ACCEPTABILITY OF PAPAYA (*Carica papaya Linn*) DESSERTS

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Abstract: Papaya as the primary ingredient in this study was not only significant for its exceptional nutritional value but also for its diverse flavor profiles. The study formulated the Papaya Desserts (papaya candy, balls and macaroons), specifically to evaluate its sensory qualities and acceptability in terms of appearance, aroma, taste and texture. Significant differences in the sensory qualities and acceptability were also determined. Finally, the best product which was Papaya Candy was submitted for microbial and proximate analysis. The method used in this study was developmentalexperimental method of research. This used the Completely Randomized Design (CRD), three products with different treatments were subjected to three trials: one (1) was tested by 10 semi-trained panelist and second (2) for final processes for consumer's preference evaluation by the 100 consumers. Score cards with the Nine (9) Points Hedonic Scale was used to obtain the data. The mean and Analysis of Variance (ANOVA) were used to analyze the data into alpha level set at 0.01 alpha. Findings on the sensory qualities of the papaya desserts showed papaya candy, balls and macaroons were "Liked Extremely" and were potential for products development and among three products papaya candy got the highest mean. When the general acceptability was considered in terms of appearance, aroma, taste, and texture, papaya candy, balls and macaroons were "Liked Extremely" and among three products papaya candy and macaroons both got the highest mean. For the general acceptability, in terms of appearance, papaya candy, balls and macaroons were "Liked Extremely" and among three products papaya macaroons got the highest mean. For the aroma, papaya candy, balls and macaroons were "Liked Extremely" and among three products papaya candy got the highest mean. In terms of taste, papaya candy, balls and macaroons were "Liked Extremely" and among three products papaya candy got the highest mean. In terms of texture, papaya candy, balls and macaroons were "Liked Extremely" and among three products papaya balls got the highest mean. There was no significant difference in terms of appearance, aroma, taste and texture among the three products.

Keywords: Papaya Desserts (Candy, Balls and Macaroons)

#### I. INTRODUCTION

Fruits are a crucial component of the human diet, providing essential nutrients such as vitamins, carbohydrates, and proteins. However, some fruits, like papaya, are often undervalued compared to other tropical fruits due to their high abundance. As a result, fruit preservation plays a significant role in ensuring that consumers can enjoy fruits even when they are out of season. The nutritional benefits of fruits are universally recognized. They serve not only as a convenient and flavorful food source but also supply vital vitamins and minerals necessary for maintaining health and preventing diseases. However, many fruits have a limited shelf life and are seasonally abundant, leading to price drops and substantial wastage. Converting these perishable fruits into shelf-stable products can significantly reduce such losses.

Papaya (Carica Papaya Linn) is a large, oval-shaped fruit with bright yellow skin and sweet, orange flesh. Recognized as both a tropical delicacy and a nutritional powerhouse (Cambridge, 2024), it belongs to the Caricaceae family and is native to Central America. This herbaceous plant produces fruits that are widely consumed globally due to their health benefits. Scientifically known as Carica Papaya Linn, papaya is extensively cultivated across the globe, spanning Central and South America, Asia, Africa, the Caribbean Islands, and the Pacific Islands. Originating from countries like India, Malaysia, Indonesia, the Philippines, Sri Lanka, and Oman. Locals in tropical areas, including the Philippines, incorporated papaya into myriad of dishes. From appetizers to desserts, showcasing its versatility.

Papaya is a widely consumed fruit in the Philippines, available year-round due to the country's tropical climate. It is particularly valued for its rich nutritional composition, including high levels of vitamins A, C, E, K, folate, and pantothenic acid (Mahendra & Amnerkar, 2016). Its affordability and dense nutrient profile make it an excellent dietary staple, providing essential vitamins (A, B1, B2, C) and minerals such as magnesium, potassium, calcium, and iron.

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Beyond basic nutrition, papaya contains bioactive compounds like the proteolytic enzyme papain, carotenoids, flavonoids, alkaloids, and monoterpenoids, which contribute to its medicinal properties (Mahendra & Amnerkar, 2016). The fruit's natural sweetness comes from reducing sugars (glucose, fructose) and sucrose, offering a healthful energy source. Additionally, phytonutrients such as lycopene a potent antioxidant enhance its functional food value, supporting disease prevention and overall wellness (Diversity, 2022)

Papaya is renowned for its dual nutritional and medicinal properties, with multiple plant parts including fruits, leaves, seeds, roots, bark, juice, and latex being utilized for both dietary and therapeutic applications (Kumar & Sreeja, 2017). Research has demonstrated that various papaya tissues - including roots, stems, leaves, seeds, and both ripe and unripe fruits - possess significant pharmacological activities (Pandey et al., 2016; Pinnamameni, 2017; Vij & Prashar, 2015; Yogiraj et al., 2014). These health benefits are attributed to the presence of numerous bioactive compounds such as alkaloids, latex, saponins, benzyl isothiocyanate (BITC), benzyl glucosinolate, tannins, anthraquinones, carotenoids, phenolic compounds, and flavonoids (Roshan et al., 2014). The wide spectrum of biological activities and phytochemical constituents' underscores papaya's importance as both a nutritional food source and a valuable medicinal plant.

With growing awareness of healthy living, consumers increasingly prioritize nutritious food options, demonstrating willingness to pay premium prices for health-promoting products. In the Philippines, papaya serves as an ideal dietary staple due to its widespread cultivation, year-round availability, and exceptional affordability coupled with high nutritional density. Particularly in provinces like Biliran, Philippines this tropical fruit remains consistently accessible in local markets and backyard gardens throughout all seasons. Scientific investigation of papaya holds substantial importance for multiple dimensions: establishing its complete nutritional profile, validating therapeutic potentials, and optimizing cultivation techniques. Such research facilitates yield improvement, development of resilient cultivars, and exploration of pharmaceutical/industrial applications, ultimately contributing to sustainable agriculture and national food security initiatives. Despite these advantages, papaya remains underutilized, with significant post-harvest losses occurring due to low consumer demand. A concerning trend shows many children exhibiting low familiarity with and preference for this fruit. To address these challenges, strategic product development presents a viable solution. Incorporating papaya into dessert formulations offers dual benefits: enhancing dietary intake of essential nutrients while reducing food waste through value-added processing. This approach aligns with current trends in functional food innovation and nutrition education programs targeting younger demographics.

This research focuses on developing papaya-based desserts, building upon the fruit's long history in the Philippines since its introduction during Spanish colonization. Having become one of the country's primary fruit crops, papaya has established itself as a dietary staple consumed both unripe in savory preparations and ripe as a sweet treat. The fruit's culinary versatility extends to various dishes where its natural sweetness enhances flavor profiles, particularly in fresh applications like salads and salsas.

This study, researcher identified papaya as a cost-effective and flavorful alternative ingredient. By substituting coconut with papaya, the research team developed innovative dessert variations that maintain the region's characteristic sweet profiles while offering distinct tropical flavors. This culinary innovation resulted in the creation of novel papaya-based confections including candies, balls, and macaroons. The selection of papaya as the principal ingredient was strategically motivated by its affordability and widespread availability, making the final products economically accessible to consumers. The study successfully combined the tropical essence of papaya with traditional dessert formats, creating unique flavor profiles while preserving the sweet characteristics that appeal to local preferences. These papaya-derived desserts demonstrate significant market potential, particularly appealing to health-conscious consumers who seek nutritious alternatives to conventional sweets. The products represent a successful fusion of traditional dessert concepts with innovative ingredient substitution, offering both sensory satisfaction and nutritional value.

The purpose of this study was to develop and evaluate papaya-based desserts specifically candy, balls, and macaroons to capitalize on the fruit's exceptional nutritional value and versatile flavor profiles. Despite papaya's prominence as a major fruit crop and dietary staple in the Philippines, as well as its well-documented health benefits and economic potential, no prior research has explored its application in these dessert forms, consumer preferences toward them, or their market viability within the local context. Addressing this gap is critical, as it aligns with growing global demand for unique, health-conscious food alternatives. Transforming papaya into accessible, appealing, and nutritious sweets, this study aims to enhance the fruit's commercial value, reduce post-harvest waste, and contribute to the diversification of functional desserts in the Philippine market.





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#### II. METHODOLOGY

This chapter presents the research tools, equipment, ingredients, procedures, experimental design, treatment proportions and statistical analysis of the study.

#### **Methods of Research**

The method used in this study was the experimental-developmental method of research. Experimental-developmental method of research is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes (Frascati Manual, 2015). Experimental method focuses the study in the future (what will be) when the variables or the study are carefully controlled or manipulated (Calmorin, 2010). Experimental method was used to investigate the maturity of papaya in making papaya candy, papaya balls and papaya macaroons using three treatments. Experimental-developmental research methods were crucial for studying how variables influence development and establishing causal relationships. By manipulating variables, controlling extraneous influences, and testing hypotheses, these methods were used because it allowed researchers to gain a deeper understanding of developmental processes and informed practices that can improve outcomes.

#### **Experimental Design**

The experimental design utilized in this study was a Completely Randomized Design (CRD), which aimed to evaluate the acceptability of papaya desserts through successive replications to determine the cause of changes in sensory attributes. To ensure objectivity, samples for evaluation were encoded, and a scorecard was employed for randomization during sensory testing. The experiment involved three product formulations papaya candy, papaya balls, and papaya macaroons each subjected to three treatments and three replications. This systematic approach allowed for the careful assessment of how variations in papaya maturity influenced the sensory characteristics of the desserts.

Experimental design is a structured set of procedures used to systematically test a hypothesis. A well-designed experiment requires a deep understanding of the system being studied to ensure reliable and valid results (Bevans 2018). In this study, the researcher focused on examining whether the maturity of papaya would affect the sensory attributes of the dessert products, specifically in terms of appearance, aroma, taste, and texture.

#### **Tools, Equipment and Treatments**

#### A. Tools and Equipment

The tools and equipment use in the study were: one (1) unit 4x8 meters stainless working table, one (1) unit digital weighing scale, one (1) rimmed baking sheet, one (1), one (1) piece stainless pot one (1) piece wooden spoon, one (1) piece stainless shredder, one (1) piece medium-sized stainless mixing bowl, one (1) piece electric mixer, one (1) piece strainer, one (3) dozen of macaroon molders, one (1) unit oven temperature, one (1) unit timer, one (1) unit refrigerator and one (1) unit La Germania gas range.

#### **B.** Treatments

The experiment was carried out in three products with three treatments:

Papaya Candy: Treatment A 100 grams Tinge Papaya, 100 grams Coconut Sugar, 230 ml Coconut Milk, 5 grams Sesame Seeds and 1 gram of Salt. Treatment B 100 grams ¼ Ripe Papaya, 100 grams Coconut Sugar, 230 ml Coconut Milk, 5 grams Sesame Seeds and 1 gram Salt. Treatment C 50 grams Tinge Papaya and 50 grams ¼ Ripe Papaya, 100 grams Coconut Sugar, 230 ml Coconut Milk, 5 grams Sesame Seeds and 1 gram Salt.

Papaya Balls: Treatment A 100 grams Tinge Papaya, 100 grams Coconut Sugar,

230 ml Coconut Milk, 110 grams Skimmed Milk and 1 gram of Salt. Treatment B 100 grams <sup>1</sup>/<sub>4</sub> Ripe Papaya, 100 grams Coconut Sugar, 230 ml Coconut Milk, 110 grams Skimmed Milk and 1 gram Salt. Treatment C 50 grams Tinge Papaya and 50 grams <sup>1</sup>/<sub>4</sub> Ripe Papaya, 100 grams Coconut Sugar, 230 ml Coconut Milk, 110 grams Skimmed Milk and 1 gram of Salt.

Papaya Macaroons: Treatment A 100 grams Tinge Papaya, 35 grams Butter, 50 grams Egg, 50 grams Condensed Milk, 1 gram Vanilla Extract, 35 grams All Purpose Flour, 35 grams Desiccated Coconut and 40 grams Refined Sugar.



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Treatment B 100 grams <sup>1</sup>/<sub>4</sub> Ripe Papaya, 35 grams Butter, 50 grams Egg, 50 grams Condensed Milk, 1 gram Vanilla Extract, 35 grams All Purpose Flour, 35 grams Desiccated Coconut and 40 grams Refined Sugar. Treatment C 50 grams Tinge Papaya and 50 grams <sup>1</sup>/<sub>4</sub> Ripe Papaya, 35 grams Butter, 50 grams Egg, 50 grams Condensed Milk, 1 gram Vanilla Extract, 35 grams All Purpose Flour, 35 grams Desiccated Coconut and 40 grams Refined Sugar. In this study, the process was developmental, in order to obtain the desired result of the products. In all treatments, all ingredients were of the same quantity and volume, only the maturity of papaya differed.

## Table 1. Product formulation, ingredients and proportions of the papaya candy per trial for sensory evaluation.

	Treatment A		Treatment C
	(100g Tinge Papaya)	Treatment B	(50g Tinge and 50 g $\frac{1}{4}$
Ingredients		(100g ¼ Ripe Papaya)	Ripe Papaya)
Papaya	100 grams	100 grams	100 grams
Coconut Sugar	100 grams	100 grams	100 grams
Coconut Milk	230 grams	230 grams	230 grams
Sesame Seeds	5 grams	5 grams	5 grams
Salt	1 gram	1 gram	1 gram

## Table 2. Product formulation, ingredients and proportions of the papaya balls per trial for sensory evaluation.

	Treatment A		Treatment C
	(100g Tinge Papaya)	(100g Tinge Papaya) Treatment B	
Ingredients		(100g ¼ Ripe Papaya)	Ripe Papaya)
Papaya	100 grams	100 grams	100 grams
Coconut Sugar	100 grams	100 grams	100 grams
Coconut Milk	230 grams	230 grams	230 grams
Skimmed Milk	110 grams	110 grams	110 grams
Salt	1 gram	1 gram	1 gram

## Table 3. Product formulation, ingredients and proportions of the papaya macaroons per trial for sensory evaluation.

	Treatment A		Treatment C
	(100g Tinge Papaya)	Treatment B	(50g Tinge and 50 g $\frac{1}{4}$
Ingredients		(100g ¼ Ripe Papaya)	Ripe Papaya)
Papaya	100 grams	100 grams	100 grams
Butter	35 grams	35 grams	35 grams
Eggs	50 grams	50 grams	50 grams
Condensed Milk	50 grams	50 grams	50 grams
Vanilla Extract	1 gram	1 gram	1 gram
All-purpose flour	35 grams	35 grams	35 grams
Desiccated Coconut	35 grams	35 grams	35 grams
Refined Sugar	40 grams	40 grams	40 grams

#### III. EXPERIMENTAL PROCEDURE

#### Steps in Preparation of Papaya Candy, Papaya Balls and Papaya Macaroons

The materials needed for the development of Papaya Desserts were gathered and inspected to ensure that it was in a good quality



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#### A. Preparation of Papaya Candy

The tools, equipment and ingredients needed were prepared. All ingredients were weighed using a digital weighing scale. Washed the tinge and ¼ ripe papaya, sliced in halves and shredded. Soaked in the water with lime to remove the latex. Drained the lime solution, washed the shredded tinge and ¼ ripe papaya and squeezed then set aside. In a medium saucepan over medium heat, stirred together coconut milk and coconut sugar and salt until smooth and added the papaya. Removed from heat and added sesame seeds. Let cooled slightly. Dropped by rounded spoonful onto waxed paper lined sheets, rolled and formed like a candy.



Figure 1. Process flow chart in the preparation of papaya candy

#### **B.** Preparation of Papaya Balls

The tools, equipment and ingredients needed were prepared. All ingredients were weighed using a digital weighing scale. Washed the tinge and <sup>1</sup>/<sub>4</sub> ripe papaya, sliced in halves and shredded. Soaked in the water with lime to remove the latex. Drained the lime solution, washed the shredded tinge and <sup>1</sup>/<sub>4</sub> ripe papaya and squeezed then set aside. In a medium saucepan over medium heat, stirred together coconut milk and coconut sugar and salt until smooth and added the papaya. Let it cooled, added and mixed skimmed milk, formed into balls and rolled into skimmed milk to coat. Wrapped in colored cellophane.



Figure 2. Process flow chart in the preparation of papaya balls



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#### C. Preparation of Papaya Macaroons

The tools, equipment and ingredients needed were prepared. All ingredients were weighed using a digital weighing scale. Washed the tinge and ¼ ripe papaya, sliced in halves and shredded. Soaked in the water with lime to remove the latex. Drained the lime solution, washed the shredded tinge and ¼ ripe papaya and squeezed then set aside. Preheated the oven in 350 °F. Whisked the eggs, vanilla extract, sweetened condensed milk, butter and refined sugar in a large mixing bowl until the mixture is frothy. Added all-purpose flour and desiccated coconut and tinge and ¼ ripe papaya to the mixture. Shaped the macaroons in mini muffin cups before putting on baking sheet. Lastly, baked the macaroons for 15-20 minutes.



Figure 3. Process flow chart in the preparation of papaya macaroons

#### **Research Instrument**

The experimental design utilized in this study was a Completely Randomized Design (CRD), which aimed to evaluate the acceptability of papaya desserts through successive replications to determine the cause of changes in sensory attributes. To ensure objectivity, samples for evaluation were encoded, and a scorecard was employed for randomization during sensory testing. The experiment involved three product formulations papaya candy, papaya balls, and papaya macaroons each subjected to three treatments and three replications. This systematic approach allowed for the careful assessment of how variations in papaya maturity influenced the sensory characteristics of the desserts.

Experimental design is a structured set of procedures used to systematically test a hypothesis. A well-designed experiment requires a deep understanding of the system being studied to ensure reliable and valid results (Bevans 2018). In this study, the researcher focused on examining whether the maturity of papaya would affect the sensory attributes of the dessert products, specifically in terms of appearance, aroma, taste, and texture.

#### **Collection of Data**

For sensory evaluation, the instrument used was a score card. It looks into the quality attributes of the product such as appearance, aroma, taste and texture. These four(4) include in determining the general acceptability of Papaya Desserts.

The study conducted at Capiz State University, Main Campus, Roxas City and a total of 10 evaluators were chosen in the study. The researcher, who was currently enrolled in the same university, significantly contributed to the streamlined



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process of gathering essential information for the study, enhanced convenience. The study justified selected 10 semitrained panelists with the necessary background on food technology or other related courses because they represented professionals with experienced in this line of industry, particularly in areas related to food technology and testing. Thus, involved them in this study especially in terms of sensory evaluation not only provided valuable insights into the market potential of papaya desserts but also offered them hands-on experience in conducted market research and analyzed consumer trends. The 10 semi-trained panelists of food technology rated the three products of papaya desserts (candy, balls and macaroons) in three trials in terms of its sensory qualities such as appearance, aroma, taste and texture. Suggestions and recommendations of the 10 semi-trained panelists improved the study of the three products.

After the sensory evaluation, the three products were prepared for consumers evaluation, the evaluators were invited and were given an instruction on how to evaluate the product. The evaluation sheet was given to the participants: teachers, students and outside consumers with their honest opinions were solicited. The evaluators were instructed to evaluate the product using a Nine (9) Point Hedonic Scale as to appearance, aroma, taste, and texture. The one hundred (100) consumer evaluators were comprised of 20 teachers, 10 outsiders and 70 students at East Villaflores National High School evaluated the acceptability of the product prepared in three treatments.

After the evaluation of the product, the evaluation sheets were gathered, tallied and submitted to the statistician for analysis and interpreted using an SPSS software. The mean was used to determine the sensory qualities of papaya desserts in terms of appearance, aroma, taste, and texture and its general acceptability as a whole. ANOVA was also used to analyzed and interpret the significant difference among three treatments of the product set at 0.01 level of significance. Variance (ANOVA) was used to analyze and interpret the significant difference among three treatments of the product set at 0.01 level of significance.

#### **Scoring of Variables**

In scoring the variables, the researcher used the Hedonic Nine Point Rating Scale to rate the product. To have a better understanding of the result, the researcher gave the equivalent interpretation of each step in the Nine-point Hedonic Scale.

In determining the level of acceptability of the product, the following scoring guide was use. The categorizations of each variation are as follows:

#### **1. Appearance of the Product**

Score	Mean Score	Adjectival Description
9	8.12-9.00	Extremely Appealing
8	7.238.11	Very Much Appealing
7	6.34-7.22	Moderately Appealing
6	5.45-6.33	Slightly Appealing
5	4.56-5.44	Neither Appealing Nor Unappealing
4	3.67-4.55	Slightly Unappealing
3	2.78-3.66	Not Moderately Unappealing
2	1.89-2.77	Not Very Much Unappealing
1	1.00-1.88	Not Extremely Appealing

#### 2. Aroma of the Product

Score	Mean Score	Adjectival Description
9	8.12-9.00	Extremely Pleasant
8	7.23-8.11	Very Much Pleasant
7	6.34-7.22	Moderately Pleasant
6	5.45-6.33	Slightly Pleasant
5	4.56-5.44	Neither pleasant Nor Unpleasant
4	3.67-4.55	Slightly Unpleasant
3	2.78-3.66	Not Moderately Unpleasant
2	1.89-2.77	Not Very Much Unpleasant
1	1.00-1.88	Not Extremely Pleasant



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#### 3. Taste of the Product

Score	Mean Score	Adjectival Description
9	8.12-9.00	Extremely Delicious
8	7.238.11	Very Much Delicious
7	6.34-7.22	Moderately Delicious
6	5.45-6.33	Slightly Delicious
5	4.56-5.44	Neither Delicious Nor Delicious
4	3.67-4.55	Slightly Delicious
3	2.78-3.66	Not Moderately Delicious
2	1.89-2.77	Not Very Much Delicious
1	1.00-1,88	Not Extremely Delicious

#### 4. Consistency of the Product

Score	Mean Score	Adjectival Description
9	8.12-9.00	Extremely Chewy
8	7.238.11	Very Much Chewy
7	6.34-7.22.	Moderately Chewy
6	5.45-6.33	Slightly Chewy
5	4.565.44	Neither Chewy Nor Chewy
4	3.67-4.55	Slightly Chewy
3	2.78-3.66	Not Moderately Chewy
2	1.89-2.77	Not Very Much Chewy
1	1.00-1.88	Not Extremely Chewy

To determine the general acceptability of papaya desserts in terms of appearance, aroma, taste and texture the following score intervals with their corresponding qualitative description were used.

#### **Consumer Summary of Acceptability**

Score		Mean Score	Adjectival Description
9		8.12 - 9.00	Liked Extremely
8		7.238.11	Liked Very Much
7		6.34-7.22	Liked Moderately
6		5.45-6.33	Liked Slightly
5		4.56 - 5.44	Liked or Disliked
4		3.67-4.55	Disliked Slightly
	3	2.783.66	Disliked Moderately
2		1.89-2.77	Disliked Very Much
1		1.00-1.88	Disliked Extremely

#### **Statistical Tools and Analysis**

The data were tabulated and statistically analyze by SPSS software using the Arithmetic Mean and the Analysis of Variance (ANOVA). The mean was used to determine the sensory qualities of papaya desserts in terms of appearance, aroma, taste, and texture and its general acceptability as a whole.

The Analysis of Variance (ANOVA) was used to determine the significant difference in the sensory qualities of the product in terms of appearance, aroma, taste and texture as well as on the differences among the three treatments (Larson, 2008). Level of significance was set .01 alpha.

#### IV. RESULTS AND DISCUSSION

This chapter presents the analysis and interpretation of the data gathered. Textual discussion precedes the tabular data on the acceptability of the papaya desserts product of the study..



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#### Sensory Qualities of Papaya Desserts

The sensory qualities of the papaya desserts were evaluated by the semi-trained panelists among three products with three treatments in terms of appearance, aroma, taste, and texture was presented in Table 4.

For papaya candy, the highest obtained mean in terms of appearance was Treatment A which is 8.50 which reflects as "Extremely Appealing". This was followed by Treatment B and C with mean of 8.30 which reflects also as "Extremely Appealing". All were extremely appealing, but Treatment A got the highest score. In terms of aroma, Treatment A got a highest mean score of 8.70 which described as "Extremely Pleasant". This was followed by Treatment B and C with mean of 8.60 which described also as "Extremely Pleasant". The highest obtained mean in terms of taste was Treatment A which is 8.80 which reflects as "Extremely Delicious". This was followed by Treatment C with mean of 8.60 which reflects as "Extremely Delicious". This was followed by Treatment C with mean of 8.60 which reflects as "Extremely Delicious". The lowest obtained mean was Treatment B which is 8.50 which reflects as "Extremely delicious, but Treatment A got the highest score. In terms of texture, Treatment A got a highest mean score of 8.50 which described as "Extremely Chewy". This was followed by Treatment B with a mean score of 8.30 which described as "Extremely Chewy" and Treatment C got the lowest mean score of 8.20 which described as "Extremely Chewy".

For papaya balls, the highest obtained mean in terms of appearance was Treatment A and B which is 8.40 which both reflects as "Extremely Appealing". The lowest obtained mean was Treatment C which is 8.30 which reflects as "Extremely Appealing". All were extremely appealing, but Treatment A and B both got the highest score. In terms of aroma, Treatment A, B and C got the mean score of 8.50 which described as "Extremely Pleasant". The highest obtained mean in terms of taste was Treatment C which is 8.70 which reflects as "Extremely Delicious". This was followed by Treatment A and B with both mean score of 8.30 which reflects also as "Extremely Delicious". All were extremely delicious, but Treatment C got the highest score. In terms of texture, Treatment C got a highest mean score of 8.10 which described as "Very Much Chewy". This was followed by Treatment B with a mean score of 8.00 which described also as "Very Much Chewy" and Treatment A got the lowest mean score of 7.70 which described as "Very Much Chewy". All were very much delicious, but Treatment C got the highest score.

For papaya macaroons, the highest obtained mean in terms of appearance was Treatment B which is 8.70 which reflects as "Extremely Appealing". This was followed by Treatment A with mean of 8.50 which reflects also as "Extremely Appealing". The lowest obtained mean was Treatment C which is 8.40 which reflects as "Extremely Appealing". All were extremely appealing, but Treatment B got the highest score. In terms of aroma, Treatment A and B both got a highest mean score of 8.30 which described as "Extremely Pleasant". The lowest obtained mean was Treatment C which is 8.20 which reflects as "Extremely Pleasant". The highest obtained mean in terms of taste was Treatment B which is 8.50 which reflects as "Extremely Delicious". This was followed by Treatment A with mean of 8.40 which reflects as "Extremely Delicious". This was followed by Treatment C which is 8.00 which reflects as "Extremely Chewy". This was followed by Treatment B got a highest mean score of 8.40 which described as "Extremely Chewy" and Treatment C got the lowest mean score of 7.70 which described as "Very Much Chewy".

Treatments		Α		В		С	
Product Quality Attributes		Mean	AD	Mean	AD	Mean	AD
	Appearance	8.50	EA	8.30	EA	8.30	EA
	Aroma	8.70	EP	8.60	EP	8.60	EP
Candy	Taste	8.80	ED	8.50	ED	8.60	ED
	Texture	8.50	EC	8.30	EC	8.20	VMC
	Appearance	8.40	EA	8.40	EA	8.30	EA
	Aroma	8.50	EP	8.50	EP	8.50	EP
Balls	Taste	8.30	ED	8.30	ED	8.70	ED
	Texture	7.70	VMC	8.00	VMC	8.10	VMC
M	Appearance	8.50	EA	8.70	EA	8.40	EA
	Aroma	8.30	EP	8.30	EP	8.20	VMP
wiacaroons	Taste	8.40	ED	8.50	ED	8.00	VMD
	Texture	8.20	VMC	8.40	EC	7.70	VMC

Table 2. Table 4. Sensory qualities of papaya desserts.



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#### **General Acceptability of Papaya Desserts**

Table 5 shows the preferences of the 100 consumers (teachers, vendors, outsiders and students) on the acceptability of papaya desserts in terms of its appearance, aroma, taste and texture.

Generally, papaya candy, papaya balls and papaya macaroons were "Liked Extremely" and are potential products for development as shown by the grand mean ratings of 8.78 and 8.72. However, the consumers have generally preferred the papaya candy and macaroons among other treatments when preparing the papaya desserts.

The result implies that these findings are significant for product development. Papaya candy and macaroons superior sensory attributes can be used as a model for refining and improving other formulations. Focusing on the characteristics that consumers liked extremely such as appearance, aroma, taste and texture—could guide future innovations and marketing strategies for this product, making it more competitive in the functional dessert market. Moreover, since appearance, aroma, taste and texture were four key differentiators, emphasis should be placed on improving these qualities in formulations papaya balls to match papaya candy and macaroons level of consumer appeal.

#### Table 5. General acceptability of papaya desserts.

Treatments	A (Candy)		B (Balls)		C (Macaroons)	
Quality Attributes	Mean	AD	Mean	AD	Mean	AD
Appearance	8.74	LE	8.84	LE	8.92	LE
Aroma	8.83	LE	8.54	LE	8.76	LE
Taste	8.82	LE	8.69	LE	8.72	LE
Texture	8.71	LE	8.80	LE	8.73	LE
General Acceptability	8.78	LE	8.72	LE	8.78	LE

#### Legend: Qualitative Description (QD)

Score	General Acceptability
8.21 – 9.00	Liked Extremely
7.41 – 8.20	Liked Very Much
6.61 – 7.40	Liked Moderately
5.81 – 6.60	Liked Slightly

## Difference in the Sensory Qualities of Papaya Desserts Among Treatments

Table 6 reveals that there is no significant difference in sensory qualities of papaya candy in varying treatments as rated by semi-trained panelist. There is no significant difference in the appearance of papaya candy in varying treatments as rated by semi-trained panelist (F –ratio=1.110, p-value=0.574 > .01). This implies that regardless of the proportion per treatments, the appearance of the papaya candy appeared almost the same. The papaya candy prepared in different treatments did not differ in their aroma (F-ratio=0.278, p-value=0.870 > .01).

This indicates that regardless of the proportion per treatments used in preparing papaya candy, the aromatic quality of the three treatments appeared to be similar. As to its taste, the different preparations of papaya candy did not vary. F-ratio=1.943, p-value=0.379>.01). Hence, the taste qualities of the three treatments of papaya candy are not significantly different from each other. This explains the idea that the three treatments when preparing papaya desserts could be similarly tasteful among the semi-trained panelists. The texture of the three treatments of papaya candy product is not significantly different (F-ratio=1.666, p-value=0.435>.01). Therefore, the non-existence This implies that regardless of the treatments used in making papaya candy, the chewy texture of the products seemed to be the same for the three treatments.



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Table 6 revealed that there is no significant difference in the appearance of papaya balls in varying treatments as rated by semi-trained panelist (F –ratio =0.412, p-value=0.814 > .01). This implies that regardless of the product treatments, the appearance of the papaya balls remained the same. The papaya balls prepared in different treatments did not differ in their aroma (F-ratio=0.000, p-value=1.000 > .01). This indicates that regardless of the proportion per treatments used in preparing papaya balls, the aromatic quality of the three treatments appeared to be similar. As to its taste, the different preparations of papaya balls did not vary. (F-ratio=2.654, p-value=0.265 > .01). Hence, the taste qualities of the three treatments of papaya balls are not significantly different from each other. This explains the idea that the three treatments when preparing papaya balls could be similarly tasteful among the semi-trained panelists. The texture of the three treatments of papaya balls products was not significantly different (F-ratio=0.628, p-value=0.730 > .01). This implies that regardless of the treatments used in making papaya balls, the chewy texture of the products seemed to be the same for the three treatments.

Table 6 revealed that there is no significant difference in the appearance of papaya macaroons in varying treatments as rated by semi-trained panelist (F – ratio=1.221, p-value=0.543 > .01). This implies that regardless of the product treatments, the appearance of the papaya macaroons remained the same. The papaya macaroons prepared in different treatments did not differ in their aroma (F-ratio=0.140, p-value=0.932>. This indicates that regardless of the proportion per treatments used in preparing papaya macaroons, the aromatic quality of the three treatments appeared to be similar. As to its taste, the different preparations of papaya macaroons are not significantly different from each other. This explains the idea that the three treatments of papaya macaroons could be similarly tasteful among the semi-trained panelists. The texture of the three treatments of papaya macaroons products was not significantly different (F-ratio=3.718, p-value=0.156>.01). This implies that regardless of the treatments used in making papaya candy, the chewy texture of the products seemed to be the same for the three treatments. Therefore, the null hypothesis of the study that no significant difference in the results of the sensory qualities of papaya candy, balls and macaroons in terms of its appearance, aroma, taste and texture was accepted.

Given these results, the lack of statistically significant differences among treatments implies that all formulations of papaya desserts are similarly acceptable to the panelists in terms of sensory quality. While there may be slight variations in sensory ratings, they are not large enough to influence the overall perception of the product.

This finding suggests that any of the formulations could be viable for commercialization since no one treatment stands out dramatically in consumer perception. However, it also implies that further optimization may be required to create a more distinct sensory profile for a particular treatment if differentiation is desired in the market.

Quality Attributes		Z	p value	Remarks
	Appearance	1.110	0.574	ns
Condu	Aroma	0.278	0.870	ns
Calidy	Taste	1.943	0.379	ns
	Texture	1.666	0.435	ns
	Appearance	0.412	0.814	ns
Dalla	Aroma	0.000	1.000	ns
Balls	Taste	2.654	0.265	ns
	Texture	0.628	0.730	ns
	Appearance	1.221	0.543	ns
Maganaana	Aroma	0.140	0.932	ns
Macaroons	Taste	0.783	0.676	ns
	Texture	3.718	0.156	ns

Table 6. Difference in the sensory	qualities of papaya	desserts among treatments.
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*Legend: p*-value>0.01 = ns = not significant; 0.01 = *level of significance* 

The results aligned with the work of Stone et al. (2012), who emphasized that non-significant sensory differences in ANOVA suggest that products are perceived similarly by consumers. This concept was also supported by Drake and Civille (2013), who noted that the lack of significant variation in sensory attributes across treatments may point to an overall uniformity in product quality, a desirable characteristic in standardized food products.



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By ensuring that sensory differences are minimal across formulations, manufacturers can focus on optimizing other factors such as production costs, shelf life, or nutritional content to enhance the product's competitiveness in the market.

## Difference in the General Acceptability of Papaya Desserts Among Treatments

Table 7 reveals that there is no significant difference in the general acceptability of papaya desserts in varying treatments as rated by consumers. There is no significant difference in appearance of papaya desserts in varying treatments as rated by consumers (F-ratio=3.263, p-value=0.040>0.01). Therefore, the appearance of the three treatments of papaya desserts, the three treatments are accepted. This implies that regardless of the product treatments, the appearance of the papaya desserts remained the same. The papaya desserts prepared in different treatment did differ in their aroma (F-ratio=4.817, p-value=0.009<0.01). Result therefore, accepts the significant difference among treatments of the papaya desserts products. This indicates that the treatments used in preparing papaya desserts, the aromatic quality of the three treatments appeared to be not similar because each treatment used different ingredients. As to its taste, the result shows that there is no significant difference in preparations of papaya desserts. (F-ratio=1.491, p-value=0.227>0.01). The texture of the three treatments shows not significantly different (F-ratio=0.751, p-value=0.437>0.01). Therefore, the non-existence of a significant difference in the texture of the three treatments of papaya desserts products was accepted. This implies that regardless of the treatments used in making papaya desserts the chewy texture of the products seemed to be the same for the three treatments. Furthermore, based on the consumer's acceptability as a whole, there is no significant difference among the three treatments of papaya desserts with the results shown (F-ratio=0.548, p-value=0.584>0.01.) considering the four sensory qualities. This implies that the proportion of papaya candy, balls and macaroons preferred by consumers as papaya desserts.

The results highlight the importance of focusing on attribute like aroma which is identified as key differentiators in consumer perception. These findings imply that improvements or modifications in could significantly enhance the overall acceptability of papaya desserts. Appearance and texture, though still important, may not require as much refinement since the differences are not significant in consumer evaluations. Emphasizing sensory qualities like taste and aroma during formulation could lead to a product that stands out in the market. The findings also suggest that general acceptability is significantly influenced by how well the individual sensory attributes are balanced, meaning that future product optimization efforts should consider the sensory profile as a whole. The results aligned with Meilgaard, et al. (2006), who stated that significant differences in consumer sensory evaluation, particularly for attributes like taste and aroma, often determine a product's market success. In addition, Moskowitz et al. (2012) emphasized that understanding consumer preferences through sensory testing is critical for developing products that meet consumer expectations.

Attributes	Sources of Variance	Sum of Square	df	Mean Square	F- Value	P- Value	Remarks
	Between Groups	1.627	2	0.813	3.263	0.040	ns
Appearance	Within Groups	74.040	297	0.249			
	Total	75.667	299				
	Between Groups	4.580	2	2.290	4.817	0.009	S
Aroma	Within Groups	141.190	297	0.475			
	Total	145.770	299				
	Between Groups	0.927	2	0.463	1.491	0.227	ns
Taste	Within Groups	92.310	297	0.311			
	Total	93.237	299				
	Between Groups	0.447	2	0.223	0.751	0.437	ns
Texture	Within Groups	88.300	297	0.297			
	Total	88.747	299				
	Between Groups	0.117	2	0.058	0.548	0.584	ns
General Acceptability	Within Groups	2.875	27	0.106			
	Total	2.992	29				

Table 7.	<b>Difference in</b>	the general	acceptability	of the papaya	desserts among trea	tments.
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Legend: Ns = Not Significant; S = SignificantF-value - 2.410 > .01, ns @ .01 alpha

#### Shelf life of Papaya Desserts

Table 8.1 and 8.2 reveals the shelf life of the sealed papaya desserts when stored at room/normal temperature. Storage was made for the period of sixty days. The product was checked daily to record reactions on the storage conditions. On the second day, change occurred on the surface of the product of papaya macaroons only and molds started to develop on the surface of the product and giving off an unpleasant smell. Storage was made for the period of 60 days. The product was checked daily to record reactions on the storage conditions. On the 61 days, change occurred on the surface of the product of papaya macaroons were molds starts to develop on the surface of the product and giving off an unpleasant smell. The product also lost its chewiness.

The findings imply that Papaya Desserts like candy and balls can be safely stored at room temperature for up to 60 days without significant quality degradation. Beyond this period, spoilage becomes evident, which could lead to reduced consumer acceptance. For commercialization, it is important to highlight the two-month shelf life on the product label and recommend appropriate storage conditions.

Improving shelf life stability beyond 60 days may require exploring additional preservation techniques, such as improved packaging methods (e.g., vacuum sealing or nitrogen flushing) or the use of natural preservatives to inhibit mold growth and retain product chewiness for longer periods. This is especially important for products targeted at markets where extended shelf life is a key factor for consumer preference.

The results are consistent with Labuza and Dugan (2011), who emphasized that moisture content and exposure to air are primary factors that contribute to spoilage, especially for products like snacks and flakes. Ensuring proper packaging and moisture control can significantly extend the shelf life of crispy food products.

Additionally, Farber (2011) suggested that microbial spoilage, particularly mold growth, is often the first indicator of product degradation in shelf-stable foods. This supports the observation that molds began forming after 60 days in the papaya desserts. Strategies such as incorporating antifungal agents or adjusting the product's water activity may help prolong shelf life..

Variant	One day (Mold Formation, unpleasant odor)	Thirty days (Mold Formation unpleasant odor)	Sixty days (Mold Formation unpleasant odor)	Sixty-one days and above (Mold Formation unpleasant odor)
Candy	0	0	0	0
Balls	0	0	0	+
Macaroons	0	+	+	+
	0 1 C	11		C 11

Fable 8.1	. Shelf life o	f the papaya	desserts at	room te	mperature.
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0-absence of molds

+ - presence of molds

Daily checking of the product was also conducted on the product on a chilling condition. On the first day until one hundred twenty days there were no changes recorded in papaya candy product only but on the one hundred twenty-one days, similar reaction was recorded where molds started to develop on the surface of the product papaya candy and giving off an unpleasant smell.



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Table 8.2. Shelf life of the papaya desserts at chilling temperature.

Variant	One day (Mold Formation, unpleasant odor)	Thirty days (Mold Formation, unpleasant odor)	One hundred twenty days (4 mos.) (Mold Formation unpleasant odor)	One hundred twenty-one and above (5 mos.) (Mold Formation (unpleasant odor)
Candy	0	0	0	+
Balls	0	0	+	+
Macaroons	0	+	+	+

0 - absence of molds

+- presence of molds

#### Microbial Analysis of Papaya Candy

Table 9 shows the microbial report analysis of papaya desserts samples conducted by the DOST Regional Standard and Testing Laboratory, Iloilo City. Test service request number R6-032025-MIC-0121-0184 was submitted dated March 5, 2025 and was analyzed from March 5, 2025-March 7, 2025.

The papaya candy with one (1) pack at 250grams per pack manufactured dated March 4, 2025 was subjected to Aerobic Plate Count. Pour plate method at 35°C for 48 hours, PCA, USFDA BAM online (2001) and Rapid E. coli/ Coliform Count, AOAC Official Methods of Analysis (2021). (AOAC Official Method 2018.13 Enumeration of Escherichia coli and Coliform in Broad Range of Foods and Select Environmental Surfaces, Final ACTION 2021). As shown in the result, papaya candy obtained the Aerobic Plate Count of 380 cfu/g sample. For Rapid E. coli/ Coliform Count obtained the result of <10 cfu/g sample (estimated). The result given in this report was those obtained at the time of examination and referred only to the particular sample submitted.

#### Table 9. Microbial analysis of papaya candy.

Sample Description	Parameter	Result
Papaya Candy, 250g	Aerobic Plate Count	380 cfu/g sample
(1 pack @ 250g/pk MFD: 03/05/2025	E. Coli.	<10 cfu/g sample* (estimated)

Normal range of APC =25-250 CFU for a single plate *E. coli* acceptable level= between 20 and 100 cfu/g

#### **Proximate Analysis of Papaya Candy**

Table 10 shows the report of proximate analysis of Papaya Candy conducted by the Negros Prawn Producers Cooperative Analytical and Analysis Laboratory, Bacolod City. Reference No. 25-85781 was submitted April 21, 2025 and was analyzed from April 21, 2025 to April 30, 2025.

The papaya candy 250g per sample in a plastic container were subjected to fat, carbohydrate, moisture, protein and calories. Fat, by Soxhlet Extraction Method. For Carbohydrate, by Phenol Sulfuric Acid Method. For Moisture by Gravimetric Oven Drying at 105 °C. Protein, by Kjeldahl Method. For Calories, by SS: 40g.

The papaya candy test results were as follows: Fat has 2.1g/250g, Total Carbohydrate of 93.9g/250g, Moisture Content of 0.7g/250g, Protein of 1.3g/250g and Calories of 160kcal/250g.





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 Table 10. Proximate analysis of papaya candy.

TEST	<b>4414</b> Papaya Candy
% Fat	
Soxhlet Extraction Method	2.1
(% Carbohydrate Phenol Sulfuric Acid Method	93.9
<b>% Moisture</b> Gravimetric Oven Drying at 105 ℃	0.7
% Protein Kjeldahl Method	1.3
<b>Calories</b> SS:40g	160

#### V. CONCLUSIONS

Based on the objectives and findings of the study, the following conclusions were formulated.

Based on the findings and objectives of the study, the following conclusions were formulated.

Among the three treatments of papaya desserts, papaya candy has the best quality attributes. Papaya candy was very liked by the evaluators, in terms of its appearance, aroma, taste and texture.

The acceptability of papaya desserts level is high in all sensory qualities including appearance, aroma, taste and texture as well as in its overall rating. This implies that the product is highly acceptable.

The result on the general acceptability of papaya desserts imply that the products are very appreciated by the consumer evaluators, the reason to conclude that there is no significant difference in the general acceptability of papaya desserts among the three treatments.

The papaya desserts still maintain its good quality and safe to consume sealable desserts within sixty (60) days at room temperature and while it can last up to one hundred and twenty (120) days at chilling temperature.

Based on the FDA Standards for Microbial Analysis, the Papaya Candy results are within the acceptable levels and is safe for consumption.

Based on the result, papaya desserts are the best to consumed, aside from lesser price, it was made in all-natural ingredients that are safe to consumers. Papaya desserts that can be called a "healthy sweet".

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