

Papaya Tart: Its Acceptability and Marketability

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Abstract

Food innovation is important in preserving cultural identity while adopting modern consumer preferences and environmentally safe concerns. This study developed and evaluated a unique Filipino dessert the papaya tart using unripe papaya as its filling. The innovation aimed to reduce fruit waste, focuses nutritional benefits, and create chances for entrepreneurship. A developmental research design was employed. Sixty (60) Grade 11 Technical-Vocational-Livelihood (TVL) students in Sta. Clara Integrated National High School were purposively selected as respondents due to their background in cookery and pastry production. Data were collected through validated self-made questionnaire evaluating sensory qualities such as color, aroma, taste and texture packaging and marketability was analyzed using frequency, percentage, mean, standard deviation, ranking and one-way ANOVA. Results showed that papaya tarts were highly acceptable across sensory qualities, packaging and marketability indicators. Sample 1 constantly obtained the highest ratings, particularly in taste and packaging, making it the most suggesting for large-scale production. Overall, the results emphasize that papaya tarts can serve as acceptable food innovation, cultural fusion, consumer appeal and business instinct. The test of difference shown no significant differences among the three samples in terms of sensory qualities, packaging and marketability, showing that all formulations were statistically equivalent in general acceptability and equally viable for consumer preference.

Keywords: *Papaya tart, Acceptability, Packaging, Marketability, Nutritional Value*

1. Introduction

Food innovation is critical for preserving cultural legacy while also catering to new tastes, health trends, and global culinary influences. In the Philippines, this innovation is most visible in the evolution of classic sweets, where local ingredients and time-honored techniques are reinvented to create new gourmet experiences. One such example is the Filipino fruit tart, a treat that combines Western pastry techniques with native fruits and Filipino flavor preferences.

Fruit tarts are traditionally linked with European patisserie, with buttery crusts, custard interiors, and fresh fruit tops. However, Filipino bakers have localized this concept by using indigenous ingredients like mangoes, calamansi, and santol, resulting in a distinct mix that displays both cultural identity and culinary ingenuity (Kanell, 2020). These developments not only adapt to changing customer preferences but also encourage the use of seasonal and sustainable produce, in line with worldwide trends in food sustainability and artisanal workmanship (Philippine Daily Inquirer, 2023).

Among the many tropical fruits in the Philippines, *Carica papaya L.* commonly known as papaya—is one of the most economically significant. Although papayas are native to tropical America, their seeds originate from the Caribbean to Malacca, the Philippines, and eventually to India. In the tropics, papaya is a significant fruit crop that is grown for human consumption, both raw and processed, as well as for usage in the leather, textile, and pharmaceutical industries. The fruit is low in calories, lipids, and salt and high in vitamins and minerals. However, identifying the ideal harvest maturity to guarantee good fruit ripening and high eating quality is one of the main issues in the papaya fruit marketing sector (Hewajulige & Dhekney, 2016).

The limited shelf life of the goods is one of the main issues facing the Philippine fruit and vegetable sector. Fruit food waste caused by overripening, rotting, dents, bruising, and other issues is crucial (up to 40% or nearly Php26M lost annually). In the Philippines, where food is the population's first priority, this corresponds to millions of pesos (Pciard innovations, n.d.). However, food waste is an environmental issue as well as a social and humanitarian one. It is only if we have more food that we can have a better and energy required to cultivate

harvest, transport, and package it. Furthermore, food waste that rots in a landfill releases methane, an even more potent greenhouse gas than carbon dioxide. (Fight climate change by preventing food waste, n.d.). Methane, a gas more than 20 times stronger than carbon pollution from cars, is released into the atmosphere by rotting fruit, which contributes to greenhouse gas emissions. Fruit and vegetable waste must first be composted; otherwise, it is poisonous and cannot be used as soil fertilizer (The Rotten Fruit Box, n.d.).

Everyone can enjoy fruits, vegetables, and their products during the off-season by preserving them. It enhances worker employment. In terms of breadth, there will be a significant growth in fruit and vegetable production. So, they can be processed, conserved, and consumed during the off-season to prevent an excess of them on the market. Fruits and vegetables can be used to prepare a variety of by-products (Agriinfo, 2023). Because papaya fruits contain a high concentration of vitamins, minerals, proteolytic enzymes, and other biologically active components, they are both sweet and healthful. In addition to being eaten raw in fruit salads, they can also be processed into jam, jelly, or sweets, mixed into juice, fried as chips, or dried into fruit slabs, bars, or powder. Processing papaya fruit produces a lot of trash, which can be recovered and blended to create goods with additional value (Sharma et al., 2020; Dotto & Abihudi, 2021; Li et al., 2021; Mesquita et al., 2023).

Nurserylive, (2023) states that Papaya is immensely loaded with healthy components that are good for the body, it is an inexpensive fruit that is available to the common man and is useful in many ways. Papaya has been shown to prevent cancer and other chronic diseases; however, it is not good for beautiful skin. Ripe papayas are consumed as a dessert, added to fruit salads, and processed into a range of goods such ice cream, canned and dried fruit, jam, and jelly.

It simply indicates the fact that there are numerous uses for papaya; the significance of those uses will depend on individuals. This study aimed to develop a new variety of tart a Filipino dessert featuring unripe papaya as its filling. Through this innovation, the researchers sought to introduce a novel product: the papaya tart. The initiative not only highlights the potential health and environmental benefits of utilizing unripe papaya but also opens opportunities for entrepreneurship and sustainable food practices.

1.1 Background of the Study

Papaya is an important member of the Caricaceae family that is grown for industrial, medicinal, and nutritional purposes throughout the world's tropical and subtropical regions (Pesqueira & Farfán, 2017). The papaya is highly economical for most Filipino households and offers excellent nutritional content, as well as high quantities of antioxidants including vitamins A, C, and E. Though the papaya yields a lot of fruit each season, most of it begins to rot. In tropical nations, papayas are one of the most valuable and profitable fruits. However, an immense quantity of unripe papaya trash and by-products are produced by the fruit processing businesses (Garcia, 2021).

The limited shelf life of the goods is one of the main issues facing the Philippine fruit and vegetable sector. There is a high postharvest loss (up to 40% or almost PhP26M loss per year) and food wastage of fruits due to over-ripening, rotting, bruises, dents, etc. In the Philippines, where food is the population's primary concern, this amounts to millions of pesos. Preserving as well as enhancing fresh produce's quality and extending its shelf life from harvest to the end user are problems facing the industry (Hernandez, 2020). However, the by-products that are produced by the food processing sector are one of the biggest issues, as they cause issues with the economy and the environment. The majority of these byproducts offer a number of dietary and health advantages (Fierascu et al., 2020).

Moreover, everyone can enjoy fruits, vegetables, and their products during the off-season by preserving them. It enhances worker employment. In terms of breadth, there will be significant growth in fruit and vegetable production. So, they can be processed, conserved, and consumed during the off-season to prevent an excess of them on the market. Fruits and vegetables can be used to prepare a variety of by-products (Agriinfo, 2023).

Unripe papaya is most typically used as a vegetable in Filipino cuisine, particularly in tinola, where its mild flavor and firm texture complement chicken broth and leafy greens (Pineda, 2025). While ripe papaya is commonly consumed raw or in sweet dishes, its unripe counterpart is neglected in dessert applications. This gap provides potential for culinary innovation, notably the transformation of unripe papaya into unique sweet shapes that showcase its nutritional and functional features.

Pastry tarts are well-known for their versatility, combining a crisp, buttery crust with a variety of sweet and savory fillings. Tarts are traditionally made with fruits like apples, berries, or custards, but recent innovations have explored the use of tropical ingredients to represent local flavors and avoid food waste. This study focuses on the creation of a pastry dessert with unripe papaya as a primary filling, with the goal of evaluating its culinary potential, nutritional value, and consumer appeal.

Papaya (*Carica papaya*) is widely cultivated in tropical countries like the Philippines, yet unripe fruits

are often underutilized or discarded due to limited market demand. According to Jackson (2023), green papaya can be converted into a sweet and tangy filling by combining it with lime juice, cinnamon, and nutmeg, making it appropriate for baked goods such as tarts. Its firm structure and mild flavor allow it to absorb spices and sugars well, making it a novel alternative to traditional fruit fillings.

Tarts, which are described as shallow pastry with only a bottom crust, originated in ancient Rome and medieval Europe, where they evolved from savory meat pies to sweet fruit-based treats (Gillingham, 2022). Tarts are praised in modern pastry creation for their aesthetic appeal and versatility, making them perfect for introducing new ingredients such as papaya. Unripe papaya contains dietary fiber, vitamin C, and digestive enzymes including papain, which promote gut health and immunological function. Its use in pastry not only improves the nutritional profile of the dessert, but it also encourages sustainable food practices by reusing surplus or unsold products.

Unripe papaya, often underutilized or discarded, holds significant potential in terms of nutritional value, affordability, and versatility. By incorporating it into a tart, the study aimed to introduce a fresh take on traditional Filipino desserts while promoting resourcefulness in food preparation. This also aligns with broader goals of reducing food waste and supporting local agriculture. Motivated by a desire to innovate and promote sustainable food practices, the researcher aimed to develop a papaya tart using unripe papaya as its main filling. This study sought to assess the product's acceptability and marketability among consumers. The research was expected to benefit a wide range of stakeholders including local farmers by creating demand for unripe papaya, small-scale entrepreneurs through new business opportunities, and health-conscious individuals by offering a nutritious alternative dessert. Additionally, it was expected to inspire culinary innovation within Filipino cuisine and support environmental efforts by reducing food waste.

Methodology

This chapter presented the research design and the methodology used in the conduct of this study. It incorporated the sampling technique, sources of data, research subjects, population of the study, the instrument to be utilized to gather data, as well as the statistical tools to be employed in processing the data.

1.2 Research Design

The researcher employed a descriptive quantitative research design with a product development and evaluation approach, appropriate for assessing consumer responses to newly formulated food products, hence its main approach is experimental design. Descriptive research is used to systematically describe characteristics of a population or phenomenon, while quantitative methods allow for objective measurement of variables such as sensory acceptability and marketability.

According to Calmorin and Calmorin (2007), descriptive research is ideal for studies that aim to gather information about present conditions, attitudes and behaviors through surveys and evaluations. This design is particularly suited for food product testing; wherein structured instruments are used to collect data from a defined group of respondents.

1.3 Respondents of the Study

Sixty (60) Grade 11 students enrolled in the Technical-Vocational-Livelihood (TVL) strand served as the respondents of this study at Sta. Clara Integrated National High School, located in Brgy. Sta. Clara, Sto. Tomas City, Batangas. These students were chosen because of their background in food-related competencies such as cookery and bread and pastry production, which made them suitable evaluators for a product development study focused on sensory and marketability assessment.

1.4 Population and Sampling Technique

This study employed purposive sampling, a non-probability sampling method in the selection of participants based on specific characteristics relevant to the research objectives. According to Calmorin and Calmorin (2007), purposive sampling is appropriate when the researcher intentionally chooses individuals who are knowledgeable or experienced in the subject matter. In this case, sixty (60) Grade 11 TVL students are selected as respondents due to their practical exposure to food preparation and evaluation, ensuring that their feedback on the papaya tart samples is informed and meaningful.

1.5 Data Gathering Procedures

Prior to the actual conduct of the study, the researcher secured formal approval through written requests addressed to the Division Office of Sto. Tomas City, and to the Principal of Sta. Clara Integrated National High School. These letters explained the purpose of the research, the nature of student involvement, and the ethical considerations to ensure transparency, voluntary participation, and informed consent. Once permission was granted, data gathering proceeded in four phases. First, the researcher prepared three papaya tart samples using unripe papaya as the main filling. Each sample featured a distinct topping: oats for Sample 1, peanuts for Sample 2, and sesame seeds for Sample 3. All samples were prepared under standardized conditions to ensure consistency in crust, filling, and topping application. Next, the selected 60 Grade 11 TVL students were oriented on the objectives of the study and the proper use of the evaluation tools. The researcher explained the procedures for tasting, rating, and answering the survey, emphasizing that participation is voluntary and that all responses will be treated with confidentiality.

During the evaluation phase, each respondent received all three tart samples in identical portions and packaging. They first completed the sensory evaluation sheet, rating each sample based on taste, texture, aroma, and appearance. Afterwards, they answered the marketability survey questionnaire, which included Likert-scale items to assess perceived value. To ensure accurate sensory judgment, students were advised to cleanse their palate between samples.

Finally, the completed instruments were collected, checked for completeness, and encoded for analysis. The researcher utilized statistical tools such as weighted mean, frequency, percentage, and ranking to interpret the data and determine which papaya tart variation was most acceptable and marketable among the respondents.

1.6 Research Instrument

To gather relevant data for this study, the researcher utilized self-made questionnaire designed to assess both the sensory acceptability and marketability of the papaya tart samples. The researcher sought the expertise of the panel members for suggestions and revisions of the questionnaires to come up for a valid instrument.

The questionnaire consists of three (3) parts:

Part 1. This section consisted of the personal data of the respondents which is age and sex.

Part 2. This section consisted of the perception scale on the sensory qualities such as color, aroma, taste and texture of each papaya tart samples. Each attribute was evaluated using a five-point scale, ranging from 1 (Not Acceptable) to 5 (Highly Acceptable). This tool provided a quantitative measure of the product's sensory qualities and helped identify which variation was most preferred by the respondents.

Part 3. This section consisted of the packaging survey questionnaire, designed to assess consumers' perceived in terms of its appeal, quality, and overall consumer benefit. Respondents rate each item using a five-point likert scale, from 1 (Strongly disagree) to 5 (Strongly agree).

Part 4. This section consisted of the marketability survey questionnaire, which aimed to capture consumer perceived value of papaya tart. Respondents rate each item using a five-point likert scale, from 1 (Strongly disagree) to 5 (Strongly agree).

The instruments were pilot testing for clarity and reliability before being administered to the selected Grade 11 TVL students. Their responses served as the basis for analyzing the acceptability and marketability of the papaya tart samples, with appropriate statistical tools employed to interpret the result.

1.7 Statistical Treatment of Data

To analyze the data collected from the perception scale and marketability survey, the researcher employed appropriate descriptive statistical tools to interpret the responses of the selected Grade 11 TVL students. These tools provided a clear and objective basis for determining which papaya tart variation was most acceptable and marketable.

Frequency and percentage were used to summarize categorical data, such as the number of respondents who liked a specific sample and expressed willingness to purchase the product. These techniques helped determine respondent characteristics and provide insight into consumer patterns, allowing the researcher to assess the level of interest in each tart variety. Meanwhile, the mean and standard deviation were employed to analyze the average rating of each tart sample across various sensory attributes and marketability indicators. These measures enabled the researcher to identify which sample received the highest overall evaluation from the respondents.

To further interpret the results, ranking was applied to the computed weighted means. This helped to

establish the order of preference among the three tart samples, highlighting which variation was most favored by the respondents.

One-Way Analysis of Variance (ANOVA) was used to determine whether there was a significant difference among the perceived levels of acceptability of the three (3) papaya tart samples in terms of sensory qualities and marketability at 0.05 level of significant.

2. Results and Discussion

This chapter presents the data gathered through the research instruments. The following analysis and interpretations are organized according to the sequence of questions outlined in the questionnaires.

Profile of the Respondents

Table 1

Distribution of Respondents as to Age

Age	f	%
16	28	46.7
17	20	33.3
18	9	15.0
19	3	5.0
TOTAL	60	100.0

Table 1 shows that almost half of the respondents (46.7%) were 16 years old, followed by those aged 17 (33.3%), 18 (15.0%), and 19 years old (5.0%). The highest proportion of respondents came from the 16 year old group, while the lowest proportion was from the 19 year old group. This distribution indicates that the majority of respondents were teenagers, a group recognized for their openness to trying new foods and their influence on household purchasing decisions.

This result aligns with Antenor et al. (2022) who emphasized that generation Z, aged 18-24, showed a strong preference for familiar, flavorful, and affordable snacks, including pastries and desserts.

Since younger consumers often shape trends in snack and dessert consumption, their insights are particularly valuable for this study. The strong representation of 16 and 17 year olds suggests that the evaluation reflects the preferences of the age group most likely to drive food innovation and market demand. Meanwhile, the smaller number of older respondents (18–19 years old) shows limited influence but still contributes to the diversity of perspectives in assessing the papaya tart.

Table 2

Distribution of Respondents as to Sex

Sex	f	%
Male	29	48.3
Female	31	51.7
TOTAL	60	100.0

Table 2 shows that the respondents were almost evenly distributed by sex, with 31 females (51.7%) and 29 males (48.3%). The highest proportion came from the female group, while the lowest proportion was from the male group, though the difference is minimal.

These findings are consistent with Pleno et al, (2025) both male and female respondents valued taste and convenience, female participants were more likely to consider health and nutrition when choosing snacks. This suggests that fruit-based tarts especially those with added fiber or natural ingredients may appeal more strongly to female consumers who prioritize wellness.

By ensuring that a range of perspectives are taken into consideration in the evaluation, this balance reduces gender bias in the evaluation of sensory qualities and marketability of the papaya tart samples.

Respondent's Perceived Level of Acceptability of Papaya Tart Sample 1,2 and 3 in terms of Sensory Qualities, Packaging and Marketability

Table 3

Perceived Level of Acceptability of Papaya Tart as to color

Indicators	Sample 1			Sample 2			Sample 3		
	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI
1. Possesses golden brown crust.	4.75	0.54	HA	4.80	0.51	HA	4.70	0.70	HA
2. Has consistency in color.	4.63	0.61	HA	4.78	0.49	HA	4.78	0.58	HA
3. Shows a natural, fresh papaya hue that's soft and inviting.	4.83	0.38	HA	4.78	0.42	HA	4.72	0.56	HA
4. Is appealing to the eye of the respondents.	4.60	0.53	HA	4.65	0.73	HA	4.73	0.55	HA
5. Suggests freshness and good quality.	4.82	0.43	HA	4.87	0.34	HA	4.80	0.51	HA
6. Visually attractive and inviting.	4.63	0.55	HA	4.68	0.62	HA	4.62	0.74	HA
7. Reflects natural ingredients.	4.75	0.54	HA	4.72	0.61	HA	4.77	0.53	HA
Over-all	4.72	0.32	HA	4.75	0.37	HA	4.73	0.49	HA

Legend: 4.50 – 5 = Highly acceptable (HA)

3.50 – 4.49 = Acceptable (A)

1.50 – 3.49 = Moderately acceptable (MA)

1.50 – 2.49 = Slightly acceptable (SA)

1 – 1.49 = Not acceptable (NA)

Sample 1 – Papaya Tart with Oats Toppings

Sample 2 – Papaya Tart with Peanuts Topping

Sample 3 – Papaya Tart with Sesame Seeds Topping

Table 3 presents the respondents' evaluation of the papaya tart samples in terms of color. All three samples were rated Highly Acceptable (HA), showing that the products were visually appealing and met consumer expectations for appearance. Sample 1 recorded its highest mean score (4.83) for the statement "Shows a natural, fresh papaya hue that's soft and inviting", while its lowest mean score (4.60) was for "Is appealing to the eye of the respondents." Sample 2 achieved its highest mean score (4.87) for "Suggests freshness and good quality", while its lowest mean score (4.65) was for "Is appealing to the eye of the respondents." Sample 3 received its highest mean score (4.80) for "Suggests freshness and good quality", while its lowest mean score (4.62) was for "Visually attractive and inviting." Overall, Sample 2 obtained the highest overall mean (4.75), making it the most visually preferred among the three. Meanwhile, Sample 1 had the lowest overall mean (4.72), though still within the "Highly Acceptable" range. These results confirm that all papaya tart samples were visually appealing, with Sample 2 standing out slightly more in terms of color consistency and freshness. The relatively narrower distribution curve of Sample 2 further suggests that its formulation may have enhanced its visual appeal, making it appear brighter and more appetizing.

These findings reinforce the importance of color as a critical sensory cue in food evaluation, supporting Genschow et al. (2012), who emphasized that food color plays a crucial role on consumers' food selection, serving as one of the most important cues perceived before tasting. Thus, the results highlight that careful attention to color formulation can significantly elevate product desirability and consumer acceptance.

Table 4
Perceived Level of Acceptability of Papaya Tart as to Aroma

Indicators	Sample 1			Sample 2			Sample 3		
	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI
1. Is enticing.	4.50	0.65	HA	4.58	0.81	HA	4.75	0.57	HA
2. Has a pleasant smell.	4.78	0.56	HA	4.57	0.87	HA	4.67	0.60	HA
3. Has a distinct smell of papaya.	4.27	0.95	HA	4.33	0.97	HA	4.53	0.75	HA
4. Can arouse the appetite of the consumers.	4.73	0.48	HA	4.60	0.72	HA	4.67	0.63	HA
5. Suggests the tart is newly baked and not spoiled.	4.43	0.85	HA	4.63	0.66	HA	4.67	0.63	HA
6. Consistent across different tart samples.	4.60	0.62	HA	4.68	0.60	HA	4.67	0.57	HA
7. Contributes positively to its overall presentation.	4.77	0.50	HA	4.63	0.64	HA	4.80	0.44	HA
Over-all	4.58	0.41	HA	4.58	0.59	HA	4.68	0.48	HA

Legend: 4.50 – 5 = Highly acceptable (HA)

3.50 – 4.49 = Acceptable (A)

1.50 – 3.49 = Moderately acceptable (MA)

1.50 – 2.49 = Slightly acceptable (SA)

1 – 1.49 = Not acceptable (NA)

Sample 1 – Papaya Tart with Oats Toppings

Sample 2 – Papaya Tart with Peanuts Topping

Sample 3 – Papaya Tart with Sesame Seeds Topping

Table 4 shows the respondents' evaluation of the papaya tart samples in terms of aroma. All three samples were rated Highly Acceptable (HA), indicating that the products were enticing, pleasant-smelling, and contributed positively to overall presentation. Sample 1 received its highest mean score (4.78) for "Has a pleasant smell", while its lowest mean score (4.27) was for "Has a distinct smell of papaya." This suggests that while the tart's general aroma was appreciated, the papaya scent was less noticeable. Sample 2 achieved its highest mean score (4.68) for "Consistent across different tart samples", while its lowest mean score (4.35) was for "Has a distinct smell of papaya." This indicates that respondents valued its consistency but found the papaya aroma slightly less distinct. Sample 3 recorded its highest mean score (4.80) for "Contributes positively to its overall presentation", while its lowest mean score (4.53) was for "Has a distinct smell of papaya." This shows that Sample 3 was most appreciated for enhancing presentation, though the papaya scent was again rated lowest. Overall, Sample 3 obtained the highest overall mean (4.68), making it the most preferred in terms of aroma, while Samples 1 and 2 both had the lowest overall mean (4.58). These results confirm that all papaya tart samples were well-received for aroma, with Sample 3 standing out slightly more for its pleasant and appetizing scent.

These highlight the importance of aroma as a sensory attribute that reinforces consumer acceptance and product desirability. Moreover, they align with Brand (2006) who emphasized that smell is the second most used sense in marketing strategies in the food industry. Therefore, aromas play an important role in marketing strategies. The memory of smell is the most intense of all the senses, and only about 20% of olfactory sensations are forgotten. Human beings even maintain very old memories and feelings related to smell. Thus, the results suggest that optimizing aroma, especially the distinctiveness of papaya scent can further strengthen consumer preference and enhance the marketability of the product.

Table 5

Perceived Level of Acceptability of Papaya Tart as to Taste

Indicators	Sample 1			Sample 2			Sample 3		
	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI
1. Is well-balanced, with a moderate amount of papaya and sweetness.	4.87	0.43	HA	4.73	0.55	HA	4.67	0.68	HA
2. Is as sweet as the commercial tart.	4.70	0.53	HA	4.53	0.75	HA	4.73	0.55	HA
3. Retained the natural taste of the papaya.	4.38	0.88	HA	4.57	0.81	HA	4.50	0.85	HA
4. Is pleasing to the palate.	4.52	0.62	HA	4.62	0.64	HA	4.63	0.61	HA
5. Is match well with the filling.	4.78	0.49	HA	4.73	0.63	HA	4.60	0.67	HA
6. Is suitable for both children and adults.	4.92	0.28	HA	4.78	0.64	HA	4.78	0.52	HA
7. Is consistent throughout the sample.	4.90	0.30	HA	4.75	0.57	HA	4.62	0.76	HA
Over-all	4.72	0.31	HA	4.67	0.56	HA	4.65	0.54	HA

Legend: 4.50 – 5 = Highly acceptable (HA)

3.50 – 4.49 = Acceptable (A)

1.50 – 3.49 = Moderately acceptable (MA)

1.50 – 2.49 = Slightly acceptable (SA)

1 – 1.49 = Not acceptable (NA)

Sample 1 – Papaya Tart with Oats Toppings

Sample 2 – Papaya Tart with Peanuts Topping

Sample 3 – Papaya Tart with Sesame Seeds Topping

Table 5 presents the respondents' evaluation of the papaya tart samples in terms of taste. All three samples were rated Highly Acceptable (HA), confirming that the products were well-received and met consumer expectations for flavor. Sample 1 recorded its highest mean score (4.92) for "Is suitable for both children and adults", followed closely by "Is consistent throughout the sample" (4.90). Its lowest mean score (4.38) was for "Retained the natural taste of the papaya." This suggests that Sample 1 was most appreciated for its universal appeal and consistency, though the natural papaya flavor was perceived less strongly. Sample 2 achieved its highest mean score (4.78) for "Is suitable for both children and adults", while its lowest mean score (4.05) was for "Retained the natural taste of the papaya." This indicates that Sample 2 was valued for its broad suitability but, like Sample 1, the papaya taste was less distinct. Sample 3 received its highest mean score (4.78) for "Is suitable for both children and adults", while its lowest mean score (4.05) was also for "Retained the natural taste of the papaya." This shows that Sample 3 shared similar strengths and weaknesses with Sample 2. Overall, Sample 1 obtained the highest overall mean (4.72), making it the most preferred in terms of taste, while Sample 3 had the lowest overall mean (4.65). These findings suggest that sample 1 is the strongest candidate for large scale production, as it balances consumer expectations for consistency and broad acceptance.

Moreover, the results align with Menella and Bobowski (2015), who emphasized that younger consumers tend to prefer sweeter flavors and are more sensitive to bitterness than adults. This supports the conclusion that formulations appealing to both children and adults such as sample 1 are particularly advantageous for marketability and consumer acceptance.

Table 6

Perceived Level of Acceptability of Papaya Tart as to Texture

Indicators	Sample 1			Sample 2			Sample 3		
	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI
1. Has a smooth and creamy filling.	4.70	0.56	HA	4.62	0.64	HA	4.43	1.08	HA
2. Is easy to bite.	4.90	0.30	HA	4.78	0.49	HA	4.60	0.91	HA
3. Is comparable to usual tart offered in stores.	4.58	0.72	HA	4.60	0.72	HA	4.70	0.65	HA
4. Could pick with ease by hand.	4.73	0.55	HA	4.67	0.57	HA	4.83	0.46	HA
5. Adds a nice crunch contrast.	4.53	0.77	HA	4.67	0.60	HA	4.60	0.72	HA
6. Is neither too dry nor too moist.	4.23	1.16	A	4.53	0.95	HA	4.47	0.96	HA
7. Is complements its flavor.	4.87	0.34	HA	4.70	0.65	HA	4.77	0.53	HA
Over-all	4.65	0.42	HA	4.65	0.45	HA	4.63	0.62	HA

Legend: 4.50 – 5 = Highly acceptable (HA)

3.50 – 4.49 = Acceptable (A)

1.50 – 3.49 = Moderately acceptable (MA)

1.50 – 2.49 = Slightly acceptable (SA)

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Sample 1 – Papaya Tart with Oats Toppings

Sample 2 – Papaya Tart with Peanuts Topping

Sample 3 – Papaya Tart with Sesame Seeds Topping

In Table 6, presents the respondents' evaluation of the papaya tart samples in terms of texture. All three samples were rated Highly Acceptable (HA) overall, confirming that the products were well-received in terms of mouthfeel, consistency, and ease of consumption. Sample 1 recorded its highest mean score (4.90) for "Is easy to bite", showing that respondents found it most convenient to consume. Its lowest mean score (4.23) was for "Is neither too dry nor too moist", which was rated only Acceptable (A). This suggests that while Sample 1 was generally pleasing, some respondents perceived slight imbalance in moisture. Sample 2 achieved its highest mean score (4.78) for "Is easy to bite", while its lowest mean score (4.53) was for "Is neither too dry nor too moist." This indicates that Sample 2 was also appreciated for ease of consumption but had minor concerns regarding moisture balance. Sample 3 received its highest mean score (4.83) for "Could pick with ease by hand", highlighting its convenience and handling appeal. Its lowest mean score (4.43) was for "Has a smooth and creamy filling." Although still rated Highly Acceptable, this suggests that respondents found its filling slightly less smooth compared to the other samples. Overall, Sample 1 and Sample 2 both obtained the highest overall mean (4.65), while Sample 3 had the lowest overall mean (4.63). Despite these slight differences, all samples were consistently rated Highly Acceptable, confirming that the papaya tart innovation successfully met consumer expectations for texture.

These findings highlight that texture is critical sensory attribute contributing to product acceptance, aligning with Salgado et al. (2019), who emphasized that flavor textural properties modulate flavor perception and overall sensory enjoyment of food. Thus, the results suggest that optimizing moisture balance and filling smoothness could further enhance consumer preference, while maintaining ease of consumption ensures broad acceptability and market potential.

Table 7

Perceived Level of Acceptability of Papaya Tart as to Packaging

Indicators	Sample 1			Sample 2			Sample 3		
	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI
1. Keeps the tart fresh and maintains its quality.	4.90	0.30	SA	4.77	0.56	SA	4.87	0.50	SA
2. Material feels clean and food safe.	4.92	0.28	SA	4.78	0.45	SA	4.88	0.42	SA
3. Is visually appealing and well-designed.	4.78	0.45	SA	4.73	0.55	SA	4.78	0.52	SA
4. Includes important information such as ingredients and expiration date.	4.80	0.40	SA	4.83	0.38	SA	4.80	0.63	SA
5. Suitable for school canteens or local markets.	4.92	0.28	SA	4.75	0.51	SA	4.72	0.52	SA
6. Contributes to the tart's overall marketability.	4.78	0.42	SA	4.75	0.51	SA	4.68	0.72	SA
7. Would influence my decision to purchase it.	4.83	0.46	SA	4.75	0.44	SA	4.77	0.50	SA
Over-all	4.85	0.24	SA	4.77	0.35	SA	4.79	0.45	SA

Legend: 4.50 – 5 = Strongly Agree (SA)

3.50 – 4.49 = Agree (A)

1.50 – 3.49 = Neutral (N)

1.50 – 2.49 = Disagree (D)

1 – 1.49 = Strongly Disagree (SD)

Sample 1 – Papaya Tart with Oats Toppings

Sample 2 – Papaya Tart with Peanuts Topping

Sample 3 – Papaya Tart with Sesame Seeds Topping

Table 7 shows the respondents' evaluation of the papaya tart samples in terms of packaging. All three samples were rated Highly Acceptable (HA), confirming that the packaging was perceived as clean, safe, visually appealing, and supportive of marketability. Sample 1 received its highest mean score (4.92) for both "Material feels clean and food safe" and "Suitable for school canteens or local markets." Its lowest mean score (4.78) was for "Contributes to the tart's overall marketability." This shows that Sample 1 was most valued for safety and suitability, though slightly less for its direct impact on marketability. Sample 2 achieved its highest mean score (4.83) for "Includes important information such as ingredients and expiration date," while its lowest mean score (4.75) was shared across several statements ("Is visually appealing and well-designed," "Suitable for school canteens or local markets," "Contributes to the tart's overall marketability," and "Would influence my decision to purchase it"). This indicates consistent but slightly lower ratings compared to other samples. Sample 3 recorded its highest mean score (4.88) for "Material feels clean and food safe," while its lowest mean score (4.68) was for "Contributes to the tart's overall marketability." This suggests that Sample 3 was strongly appreciated for safety but perceived as less influential in purchase decisions compared to other attributes. Overall, Sample 1 obtained the highest overall mean (4.85), making it the most preferred in terms of packaging, while Sample 2 had the lowest overall mean (4.77). These findings highlight that packaging across all samples was highly acceptable, with Sample 1 standing out for its strong appeal in safety and suitability, reinforcing its potential for market success.

This result aligns with Sahu et al. (2024), who emphasized that packaging plays a vital role in preserving the quality, safety and shelf life of food products, especially those with semi moist textures. Thus, the results suggest that prioritizing clean, safe and well suited packaging can significantly enhance product marketability and consumer trust.

Table 8
 Perceived Level of Acceptability of Papaya Tart as to Marketability

Indicators	Sample 1			Sample 2			Sample 3		
	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI
1. I would buy this product.	4.88	0.37	HA	4.75	0.51	HA	4.73	0.55	HA
2. Offers good value for its portion size	4.85	0.36	HA	4.75	0.54	HA	4.75	0.60	HA
3. I would recommend this product to others.	4.93	0.25	HA	4.73	0.55	HA	4.77	0.67	HA
4. I would recommend this product to others.	4.90	0.30	HA	4.77	0.53	HA	4.75	0.57	HA
5. worth buying based on its taste and appearance.	4.90	0.40	HA	4.78	0.45	HA	4.73	0.58	HA
6. feels reasonably priced for its quality and ingredients.	4.83	0.42	HA	4.82	0.47	HA	4.75	0.57	HA
7. I would be willing to pay ₱10.00 each for this tart.	4.72	0.69	HA	4.73	0.52	HA	4.75	0.54	HA
Over-all	4.86	0.25	HA	4.76	0.40	HA	4.75	0.52	HA

Legend: 4.50 – 5 = Strongly Agree (SA)

3.50 – 4.49 = Agree (A)

1.50 – 3.49 = Neutral (N)

1.50 – 2.49 = Disagree (D)

1 – 1.49 = Strongly Disagree (SD)

Sample 1 – Papaya Tart with Oats Toppings

Sample 2 – Papaya Tart with Peanuts Topping

Sample 3 – Papaya Tart with Sesame Seeds Topping

Table 8 presents the respondents' evaluation of the papaya tart samples in terms of marketability. All three samples were rated Highly Acceptable (HA), confirming that the products were perceived as valuable, appealing, and worth purchasing. Sample 1 recorded its highest mean score (4.93) for "I would recommend this product to others", showing strong consumer willingness to endorse the product. Its lowest mean score (4.72) was for "I would be willing to pay ₱10.00 each for this tart." Although still highly acceptable, this indicates slightly less enthusiasm when price was considered. Sample 2 achieved its highest mean score (4.82) for "Feels reasonably priced for its quality and ingredients", while its lowest mean score (4.73) was for "I would be willing to pay ₱10.00 each for this tart." This suggests that respondents valued its affordability but were slightly less decisive about actual purchase intent at the given price. Sample 3 received its highest mean score (4.77) for both "I would recommend this product to others" and "Feels reasonably priced for its quality and ingredients." Its lowest mean score (4.73) was for "I would buy this product" and "Worth buying based on its taste and appearance." This shows that while Sample 3 was generally marketable, it was rated slightly lower in direct purchase intent compared to the other samples.

Collectively, Sample 1 obtained the highest overall mean (4.86), making it the most marketable among the three, while Sample 3 had the lowest overall mean (4.75). These findings highlight that all papaya tart samples were perceived as highly acceptable in terms of marketability, with Sample 1 standing out as the strongest candidate for consumer endorsement and large-scale production.

These aligns with Halls (2019) who emphasized that effective marketing is critical to the profitability in fruit and vegetable enterprises. Particularly when direct farmer to consumer channels is utilized. Thus, the results suggest that strategic marketing efforts, coupled with strong product endorsement, can significantly enhance the commercial success of papaya tart innovations.

Nutritional Content of Papaya Tart Sample 1, 2 and 3

Table 9

Nutritional Analysis of the Three Papaya Tart Samples

Sample Code	Lab No.	% Moisture (w/w)	% Ash (w/w)	% Crude Fat (w/w)	% Crude Protein (w/w)
Sample 1	2025-1080	22.60	0.60	10.48	4.78
		22.20	0.58	10.32	4.70
Sample 2	2025-1081	21.83	0.71	10.28	5.25
		22.08	0.72	10.35	5.39
Sample 3	2025-1082	23.06	0.60	8.98	5.46
		23.06	0.63	8.96	5.32

Sample 1 - Papaya Tart with Oats Toppings

Sample 2 - Papaya Tart with Peanuts Topping

Sample 3 - Papaya Tart with Sesame Seeds Topping

Table 9 presents the proximate composition results of the three papaya tart samples, based on the Certificate of Analysis issued by the National Institute of Molecular Biology and Biotechnology (BIOTECH), University of the Philippines Los Baños. The analysis covered moisture, ash, crude fat, and crude protein content, using AOAC standardized methods. The moisture content of the papaya tart samples ranged from 21.83% (Sample 2) to 23.06% (Sample 3), placing all within the moderate range typical for soft baked products. This level is acceptable, ensuring a balanced texture and freshness, though careful packaging is needed to maintain shelf life (Delgado and Sun, 2002). The ash content, representing mineral composition, varied slightly from 0.58% (Sample 1) to 0.72% (Sample 2). These values are low but appropriate for fruit-based pastries, confirming product cleanliness and safe formulation (Analysis of Ash and Minerals, n.d.). For crude fat, Sample 1 had the highest value at 10.48%, while Sample 3 had the lowest at 8.96%. These moderate fat levels are ideal for baked goods, contributing richness and creaminess without being excessive; the lower fat in Sample 3 explains its slightly less smooth filling noted in sensory evaluation (Srl, 2025). Finally, crude protein ranged from 4.70% (Sample 1) to 5.46% (Sample 3), falling within the expected low-to-moderate range for pastries. Protein supports structure and firmness, with Sample 3's higher protein contributing to its handling convenience, while Sample 1's lower protein gave a softer texture (Kumar, 2026).

In conclusion, all samples show balanced composition, with values falling within acceptable ranges for baked goods. Sample 1 stands out for higher fat but lower protein. Sample 2 shows balanced moisture and ash, supporting consistency and mineral contribution. Sample 3 has the highest moisture and protein, giving softness and firmness in handling, though slightly less creamy due to lower fat. The laboratory results confirm that the papaya tart innovation is nutritionally sound and consistent with sensory evaluations. Moisture, fat, and protein levels explain the differences in texture, creaminess, and handling noted by respondents, while ash values confirm product safety and cleanliness.

Test of Difference in Acceptability of Papaya Tart Sample 1, 2 and 3 in Terms of Sensory Qualities, Packaging, Marketability

Table 10

Significant Difference in the Level of Acceptability of Papaya Tart

		Sum of Squares	df	Mean Square	F	Sig.
Color	Between Groups	.045	2	.022	.140	.870
	Within Groups	28.435	177	.161		
	Total	28.480	179			
Aroma	Between Groups	.396	2	.198	.805	.449
	Within Groups	43.600	177	.246		
	Total	43.996	179			
Taste	Between Groups	.174	2	.087	.372	.690
	Within Groups	41.313	177	.233		
	Total	41.487	179			
Texture	Between Groups	.021	2	.010	.041	.960
	Within Groups	44.649	177	.252		
	Total	44.670	179			
Packaging	Between Groups	.215	2	.107	.849	.430
	Within Groups	22.380	177	.126		
	Total	22.595	179			
Marketability	Between Groups	.447	2	.223	1.366	.258
	Within Groups	28.948	177	.164		
	Total	29.395	179			

Legend: $p < 0.05 = \text{Significant}$

$p \geq 0.05 = \text{Not Significant}$

Table 10 presents the results of the Analysis of Variance (ANOVA) conducted to determine whether there are statistically significant differences in the acceptability of the three papaya tart samples across six attributes: color, aroma, taste, texture, packaging, and marketability. The data show that all significance values (p-values) are greater than 0.05, indicating that there are no statistically significant differences among the samples in any of the evaluated attributes. Specifically: Color: $p = 0.870$, Aroma: $p = 0.449$, Taste: $p = 0.690$, Texture: $p = 0.960$, Packaging: $p = 0.430$, Marketability: $p = 0.258$. These results suggest that while each sample may have received slightly different ratings, the variations are not statistically meaningful. Therefore, all three papaya tart formulations are equally acceptable to the respondents in terms of sensory qualities and marketability.

Conclusion and Recommendations

This section includes the conclusions and recommendations based on the given problems and objectives of this study. The absence of significant differences among the samples led to the acceptance of the tested hypothesis; hence suggests that product developers have flexibility to select any formulations, as all are equally acceptable to consumers.

Considering the findings and conclusions, the following recommendations are proposed: 1. For commercialization, focus on Sample 1 for initial market introduction since it consistently received the highest ratings in taste, packaging, and marketability. 2. For product development, the tart itself should also incorporate the toppings, ensuring that the added flavors and texture are not only present as external garnishes but are embedded within the product to enhance overall sensory appeal and explore variations in packaging design to enhance shelf appeal and create differentiation in competitive markets. 3. For market strategy, position papaya tarts as both a novelty and a culturally relevant product that highlights Filipino pride in local ingredients. 4. For future research, expand the study to include a wider demographic such as adults and health-conscious consumers to validate broader market potential.

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