Acceptability of Banisil (Faunus Ater) Crackers with Malunggay

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INTRODUCTION

Background of the Study

The production of crackers, popular snack foods characterized by their crisp texture, appealing appearance, and versatile flavoring, is constantly evolving. The food industry is increasingly focused on enhancing both the nutritional content and sustainability of its products (Singh & Sharma, 2020). This trend includes the exploration of locally sourced and sustainable ingredients to improve the nutritional value of snack foods while minimizing environmental impact. Shellfish by-products, rich in minerals like calcium, are gaining attention as a potential source for fortifying food products, offering a sustainable alternative to traditional methods (Chen & Li, 2021). Green mussel shells (Perna viridis), in particular, offer a valuable resource due to their high calcium carbonate content and potential for improving bone health. The incorporation of shell waste into cracker production not only boosts nutrition but also promotes environmentally responsible food processing (Yamamoto et al., 2022).

Research on the impact of shell-based ingredients on cracker properties and sensory acceptability is ongoing. Studies prior to 2022 have shown the effects of shell flour on texture and color, highlighting the need for optimization of formulation and processing methods. The use of cockleshell waste as a humidity adsorbent in *keropok* (fish crackers) has shown promise in extending shelf life by effectively reducing water activity and maintaining desirable sensory qualities (Hidayati & Fitria, 2016; Tabo et al., 2018). These findings suggested the potential for enhancing cracker quality and stability using sustainable and readily available resources. Traditional cracker production methods, such as those employed in the Indonesian *susuh* scallop cracker industry (Junianto et al., 2023), often rely on manual processes that may limit consistency and scalability. Modern food science can provide valuable tools for optimizing traditional methods and unlocking the full potential of both established and novel approaches to cracker production.

This study focuses on the acceptability of *Banisil* crackers, a traditional Filipino snack, potentially fortified with green mussel shell flour, and further examines the role of cockleshell waste in controlling moisture content. The research aimed to advance sustainable food development practices, enhancing the nutritional and sensory profiles of a traditional product. By combining traditional food production techniques with modern food science principles, this research can contribute to innovations in the food industry while supporting local resources and environmentally sustainable practices. The results will inform product optimization, marketing strategies, and future research in this area.

THEORETICAL FRAMEWORK

The acceptability of *Banisil* crackers with *Malunggay* can be understood through several key theories that highlight the importance of sensory attributes in food products, specifically focusing on texture, appearance, taste, and aroma. Sensory evaluation theory posits that these sensory characteristics significantly influence consumer enjoyment and preference (Stone & Sidel, 2004). For *Banisil* crackers, achieving the right balance of crispiness and crunchiness is essential for a satisfying eating experience, as noted by Meilgaard, Civille, and Carr (2007), whom emphasized the importance of texture in food products.

Consumer preference theory further explains that individual experiences, cultural backgrounds, and marketing influences shape consumer choices (Schiffman & Kanuk, 2007). As a traditional Filipino snack, *Banisil* crackers

benefit from cultural familiarity, enhancing their acceptability. Incorporating local spices and flavors allows manufacturers to align the product with consumer tastes, making it more appealing.

Aroma and flavor perception also play a crucial role in the overall enjoyment of food. Research by Auvray and Spence (2008) indicated that aroma significantly impacts flavor perception, and the scent of *Banisil* crackers can evoke positive memories, enhancing the eating experience. Innovations that focus on enhancing the natural fragrances of the ingredients can further improve consumer acceptability.

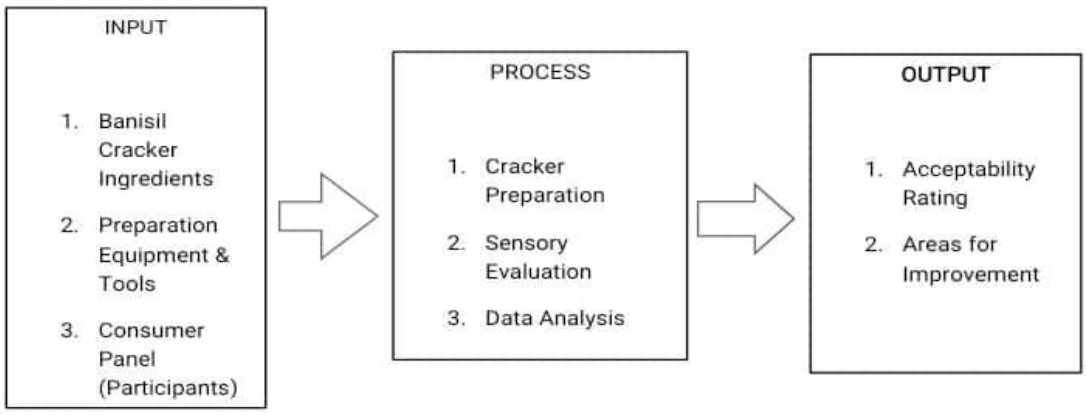
Additionally, visual appeal and packaging are vital in attracting consumers. Underwood and Klein (2002) highlight that the visual presentation of food products, including color and packaging design, greatly influences consumer choice. A well-designed package that showcases the quality and freshness of *Banisil* crackers can draw more attention, while vibrant colors and unique shapes can enhance the product's visual appeal in a competitive market.

Finally, the concept of innovation in food products emphasizes the need to adapt to changing consumer preferences and market trends (Grunert, 2006). By exploring new ingredients, flavors, and packaging options, manufacturers can create exciting products that resonate with consumers. This focus on innovation not only enhances the overall consumer experience but also helps maintain the cherished qualities of traditional snacks like *Banisil* crackers.

Conceptual Framework

This framework illustrates the direct relationship between the sensory attributes of *Banisil* crackers (appearance, texture, taste, aroma) and their overall acceptability.

Figure 1: Conceptual Framework



Conceptual framework consisting of three main components: Input, Process, and Output. The inputs comprised the ingredients, preparation equipment, and tools, as well as the consumer panel participants who evaluated the *Bansil* crackers with *Malunggay*. The process involved preparing the crackers, conducting sensory evaluations to assess taste, texture, and appearance, and analyzing the collected data. The outputs included the acceptability rating, indicating the product's reception, and identifying areas for improvement. This framework outlined the research's progression from resource gathering to product refinement through consumer feedback.

Statement of the Problem

This study aims to find out the acceptability of *Banisil* crackers.

1. Demographic profile of the respondents:

    1.1 Age

1.2 Gender

1.3 Classification

2. What is the level of acceptability of *Banisil* Crackers in terms of the following:

1.1 Appearance

1.2 Aroma or Odor

1.3 Taste

1.4 Texture

Objectives:

- To assess how acceptable *Banisil* crackers are based on their appearance, aroma, taste, and texture.
- To suggest ways to improve *Banisil* crackers to make them more appealing to buyers.

Significance of the Study

The researchers believe the findings of this study on the "Acceptability of *Banisil* Crackers with *Malunggay*" will be beneficial to the following:

BSHM Instructors: The study provides insights to enhance curriculum content on consumer preferences in the snack industry.

Students: Students will gain practical knowledge about factors influencing food acceptability, essential for their future careers.

For Entrepreneurs: Provides insights into consumer preferences, helping them develop and improve *Banisil* crackers to meet market demands and increase sales.

For Future Researchers: It serves as a foundation for further studies on snack acceptability, consumer preferences, and product development in different contexts.

Scope and Delimitations

The study was focused on understanding the acceptance of *Banisil* crackers with *Malunggay* in Tanauan Municipality, specifically originating from *Bario* Santa Cruz. The survey conducted at Eastern Visayas State University Tanauan Campus. It examined factors such as taste, texture, appearance, and aroma. The researcher gathered data through surveys conducted with consumers, including students and others.

Definition of Terms:

In order to understand the terms used in the research study, the following were conceptually and operationally defined:

Acceptability: Acceptability refers to the extent to which consumers perceive *Banisil* crackers with *Malunggay* as satisfactory or favorable, based on sensory properties such as appearance, aroma, taste, and texture, which influence their overall preference and willingness to purchase.

Crackers: A type of dry, crisp biscuit, often eaten as a snack or with spreads.

Malunggay: The Filipino name for moringa oleifera, a leafy green vegetable rich in vitamins and minerals.

Banisil: A cracker with *Malunggay* is a traditional Filipino snack characterized by their distinctive flavor and crispy texture, widely enjoyed by the local community. It was originated from Bario Santa Cruz with scientific

name "*Faunus ater*". It is a species of aquatic gastropod mollusk, also known as the black devil snail or black spike snail.

Texture: This pertains to the physical structure and mouthfeel of *Banisil* crackers with *Malunggay*, including qualities such as crispiness and crunchiness, which contribute to consumer satisfaction and overall acceptability.

Appearance: It refers to the outward visual aspect of the crackers, including attributes like color, shape, and presentation, which play a significant role in attracting consumer interest.

Aroma: The scent or smell of the *Banisil* crackers with *Malunggay*, which significantly influences flavor perception and overall enjoyment by consumers.

Taste: This relates to the flavor experience perceived in the mouth, including sensations like sweetness and saltiness, that are assessed based on consumer preferences.

Consumer Preferences: These are individual choices or inclinations regarding food products, shaping the acceptability of *Banisil* crackers with *Malunggay* based on sensory attributes and personal tastes.

Sensory Attributes: The characteristics perceived through the senses—appearance, aroma, taste, and texture—that impact consumer acceptance and preference for the product.

Survey: It is a method of systematically gathering information by querying respondents to assess their perceptions, preferences, and evaluations of *Banisil* crackers with *Malunggay*.

Innovation: This involves the introduction of new ideas, methods, or products—such as the integration of green mussel shell flour into crackers—to improve nutritional value, sensory qualities, and market appeal.

REVIEW OF RELATED LITERATURE AND STUDIES

Related Literature

Thai fried fish crackers research investigated the use of cockleshell waste as a humidity adsorbent in the production of Thai fried fish crackers, known as *Keropok*. The study highlights that cockleshells, which are rich in calcium compounds, can be transformed into a humidity adsorbent through a heat treatment process at 1,000°C. This transformation enhances the nutritional value of the *Keropok* by potentially prolonging its shelf life and maintaining its quality. The findings suggested that the incorporation of this natural adsorbent can help control moisture levels, thereby preserving the nutritional integrity of the fried fish crackers over time.

The study also examined the impact of the humidity adsorbent on the appearance and texture of *Keropok*. The humidity adsorbent was shown to effectively reduce water activity in the crackers, which is crucial for maintaining their crispness. The texture analysis indicated that the crispness of the fried fish crackers decreased gradually over time, particularly within the first 30 days. The use of the cockleshell-derived adsorbent helped to mitigate the effects of humidity, thus preserving the desirable crunchy texture that is characteristic of high-quality *Keropok*. The visual appeal of the crackers remained intact, contributing to their marketability.

Aroma plays a significant role in the overall sensory experience of food products, and the study addresses how the humidity adsorbent affects this aspect of *Keropok*. The research indicated that the use of cockleshell waste not only helps in maintaining the texture and nutritional value, but also contributes to the retention of the crackers' aroma over time. The thiobarbituric acid-reactive substances (TBARS) analysis showed that the adsorbent controlled the oxidation process, which can lead to off-flavors and undesirable aromas. Overall, the findings suggested that the incorporation of cockleshell waste as a humidity adsorbent can enhance the sensory qualities of Keropok, making it a more appealing product for consumers.

Related Studies

***Susuh* Scallop Crackers,** the study of Junianto et al., (2023) examined the *susuh* scallop cracker home industry in Bojong Salawe, Indonesia, highlighting the intersection of local resource utilization, traditional food

production, and commercial potential. The research was focused on the entire production process, from raw material sourcing (*susuh* scallops, a locally abundant seafood) to processing and marketing. A key finding is the industry's reliance on conventional, manual processing methods, showcasing the preservation of traditional techniques. Despite this, the study suggests potential for commercial expansion, emphasizing the need for understanding the seasonal availability of raw materials and optimizing the cracker's formulation to maintain consistent quality and appeal. The research underscored the importance of supporting local industries that leverage readily available resources while maintaining cultural heritage within food production. Furthermore, it suggested that integrating modern business strategies could significantly enhance the economic viability of this traditional food enterprise. Further investigation into sustainable harvesting practices and market diversification strategies could unlock the full potential of this home industry.

Making Crackers from Green Mussel (Perma Viridis) Shell, explored the potential of utilizing seaweed as a key ingredient in the development of nutritious snacks. Seaweed is recognized for its rich nutritional profile, including high levels of vitamins, minerals, and dietary fiber, which can contribute to a healthier diet. The study emphasized that incorporating seaweed into snack formulations not only enhances the nutritional value, but also provides essential nutrients such as iodine, calcium, and antioxidants. The findings suggested that seaweed-based snacks can serve as a functional food option, appealing to health-conscious consumers seeking alternative sources of nutrition.

The research also investigated the impact of seaweed on the appearance and texture of the snacks. The addition of seaweed was found to influence the color and visual appeal of the final product, with variations depending on the type and amount of seaweed used. Texture analysis indicated that the incorporation of seaweed contributed to a desirable crunchiness, which is a critical factor for consumer acceptance in snack foods. The study highlighted the importance of achieving an optimal balance between the seaweed content and the overall texture to ensure that the snacks remain appealing and enjoyable to eat.

Aroma is a significant aspect of the sensory experience of food, and the study addresses how the inclusion of seaweed affects this characteristic in snacks. The sensory evaluation revealed that the aroma of seaweed-based snacks was generally well-received, with many participants appreciating the unique flavor profile that seaweed brings. However, the study also noted that the intensity of the seaweed aroma could vary based on the formulation, which may influence consumer preferences. Overall, the findings indicated that seaweed not only enhances the nutritional value of snacks, but also contributes positively to their sensory attributes, making them a viable option in the snack market.

The findings of the study underscore the potential of seaweed as a valuable ingredient in snack production. The incorporation of seaweed significantly improved the nutritional content of the snacks, providing essential vitamins and minerals. Additionally, the research demonstrated that seaweed positively influenced the appearance, texture, and aroma of the snacks, contributing to their overall sensory appeal. The study concluded that seaweed-based snacks can be a nutritious and attractive option for consumers, promoting healthier snacking habits while leveraging the unique properties of seaweed.

Crackers from fresh water snail (Pila ampullacea), emphasized the high nutritional potential of using Pila ampullacea waste, particularly its rich mineral content such as calcium, which is essential for bone health. Incorporating freshwater snail waste into crackers enhances their nutritional profile by providing a valuable source of protein and minerals. The research suggested that these crackers can serve as a functional and nutritious food option, especially for populations seeking alternative sources of essential nutrients. Their fortified nature makes them not only a tasty snack, but also a health-promoting food product that can address nutritional deficiencies.

The appearance of crackers made from snail waste is a critical factor influencing consumer acceptance. The study detailed that the color and visual appeal are affected by the incorporation of snail waste, with variations depending on formulations. Proper processing techniques can lead to an appealing, golden-brown color that indicates crispness and freshness. Attractive visual presentation, including uniformity in size and color, plays a vital role in attracting consumers and conveying the product's quality and health benefits.

Texture analysis revealed that the inclusion of snail waste contributes to a desirable crunchiness, aligning with the texture expectations of crackers. Achieving the right balance in texture is crucial for consumer satisfaction, and the study indicated that the processed crackers exhibit a crisp texture that is appealing to consumers. Regarding aroma, the crackers emit a pleasant smell characteristic of freshly baked snacks, with minimal off-odors even when snail waste is used. A well-developed aroma enhanced overall acceptability by evoking freshness and flavor, making the product more enticing and enjoyable for consumers.

Green Clam Crackers, a study by Sari et al., (2021) highlighted the significant nutritional value of green clam crackers, emphasizing their high protein, omega-3 fatty acid, vitamin, and mineral content, positioning them as healthy and functional food option rich in bioactive compounds that may offer various health benefits. The incorporation of green clams enhanced the nutritional profile beyond that of traditional crackers, potentially contributing to improve cardiovascular health and immune function, thus appealing to health-conscious consumers seeking nutrient-dense snacks. This nutritional richness makes green clam crackers stand out as a functional food choice.

Also, Pratiwi et al., (2020) described the attractive appearance and texture of green clam crackers, noting that the incorporation of green clam meat creates a visually distinctive greenish hue. The texture is frequently characterized as crispy and crunchy, a desirable characteristic in snack foods. Achieving the optimal balance of clam content and other ingredients is crucial for controlling the final texture and ensuring a palatable and enjoyable eating experience, thus influencing consumer acceptance. This balance between nutritional enhancement and textural appeal is a key factor in product development.

Hidayati et al., (2022) was focused on the sensory appeal of green clam crackers, specifically highlighting the role of aroma. The natural seafood aroma from the green clams enhances the overall eating experience, contributing to perceptions of freshness and quality. This savory aroma, combined with other ingredients, creates a unique and appealing flavor profile, influencing consumer preference alongside texture and taste. Sensory evaluations emphasize the importance of aroma in shaping consumer perception and acceptance, underscoring the need for producers to carefully control this aspect during processing for optimal product appeal.

Shrimp shell crackers *'kerupuk'*, according to Sri Anggraeni et al., (2020), the study analyzed the impact of different types of flour on the mechanical properties of shrimp shell crackers (SSC), also known as *kerupuk*, using an experimental demonstration teaching method supported by a learning video. The researchers examined how variations in flour—maize, tapioca, sago, and wheat—affected properties such as hardness, puncture strength, expansion, retrogradation, pore structure, crispness, and color of the crackers. The process involved mixing boiled-crushed shrimp shells with seasonings and the selected flour, shaping, steaming, cooling, slicing, sun-drying, and frying the dough. The mechanical properties were measured through hardness and puncture strength tests, and microscopic observations were conducted to analyze the cracker's structure. The findings revealed that SSC with sago flour was the crispest, whereas other flour types produced varying textural outcomes. Additionally, the study found that the use of a learning video increased the students' understanding of how different flours influence the physical characteristics of SSC, highlighting the effectiveness of visual aids in food science education.

Small Crab Shell (Portunus pelagicus) where according to Azizah, Fatnah, and Cahyani, crab shells from Portunus pelagicus possessed considerable nutritional value, containing substantial levels of protein (32.95%), crude fiber (10.89%), calcium (22.93%), and phosphorus (0.78%). This composition makes them a suitable ingredient for various applications. The high calcium content is particularly beneficial for animal feed, improving egg quality in laying ducks, as evidenced by increased eggshell thickness and enhanced yolk color. The protein content further enhances the nutritional profile of such feeds.

Besides, Azizah, Fatnah, and Cahyani's research on the use of crab shell flour in natural food flavorings involved sensory evaluations. The resulting flavoring exhibited a white-brownish color, partly due to Maillard reactions. Both aroma and taste were assessed, with and without added dextrin, and the results indicated that the addition of dextrin did not significantly impact either attribute. Panelists generally accepted the aroma and taste of the crab shell-based flavoring [10], suggesting its potential as a food ingredient.

In summary, Azizah, Fatnah, and Cahyani concluded that crab shell waste can be effectively transformed into economically valuable products, thereby addressing environmental concerns. The successful application of crab shell flour in animal feed resulted in improvements in egg quality, while the creation of acceptable natural food flavorings demonstrated a further avenue for utilization. Additionally, the synthesis of chitosan from crab shells is highlighted as another viable and commercially relevant outcome. The authors stressed the importance of proper marketing strategies to ensure the economic viability and success of these products within the community.

METHODOLOGY

This chapter describes the research method and procedures, techniques and sources of data that helped the researcher for further data gatherings. It includes the research design, respondents of the study, research instrument and data analysis procedure, and ethical considerations.

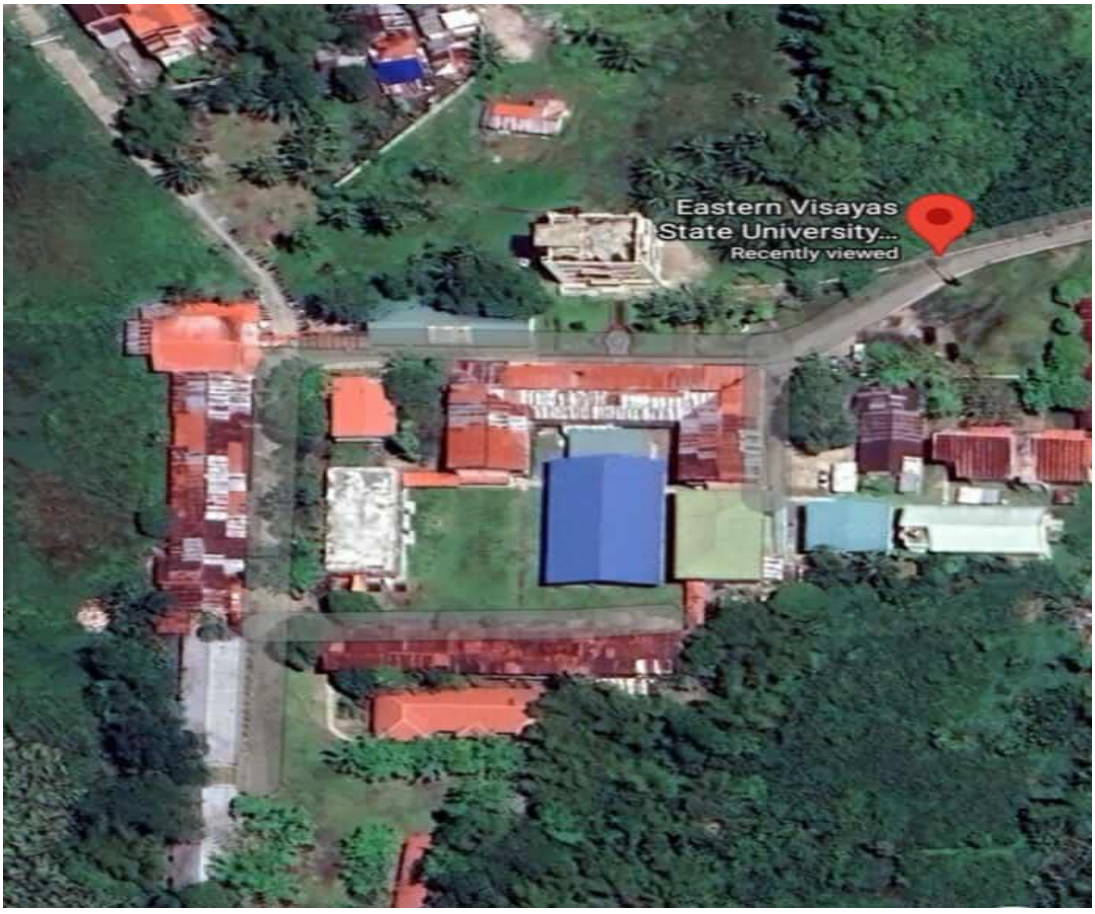
Research Design

This study used a descriptive-experimental design to assess the acceptability of *Banisil* crackers with *Malunggay*. This design is most appropriate and useful way in ensuring that the experimental has a strong level of internal validity.

Research Locale

The research was conducted at Eastern Visayas State University -Tanauan Campus. The respondents were Bachelor of Science in Hospitality Management students and others.

Figure 2: Map of EVSU Tanauan Campus, Tanauan Leyte Philippines



Respondents of the Study

The respondents of the study were Bachelor of Science in Hospitality Management students and others for a total of 100 respondents who were involved in the study.

Research Procedure

The study was conducted with experimental method together with the Sensory Evaluation Sheet wherein 5-point Liker Scale was used which served as the main tool used in gathering data

Table 1: Materials Used in Banisil Crackers with Maluggay

Materials used in making the *Banisil* Crackers, were the following;

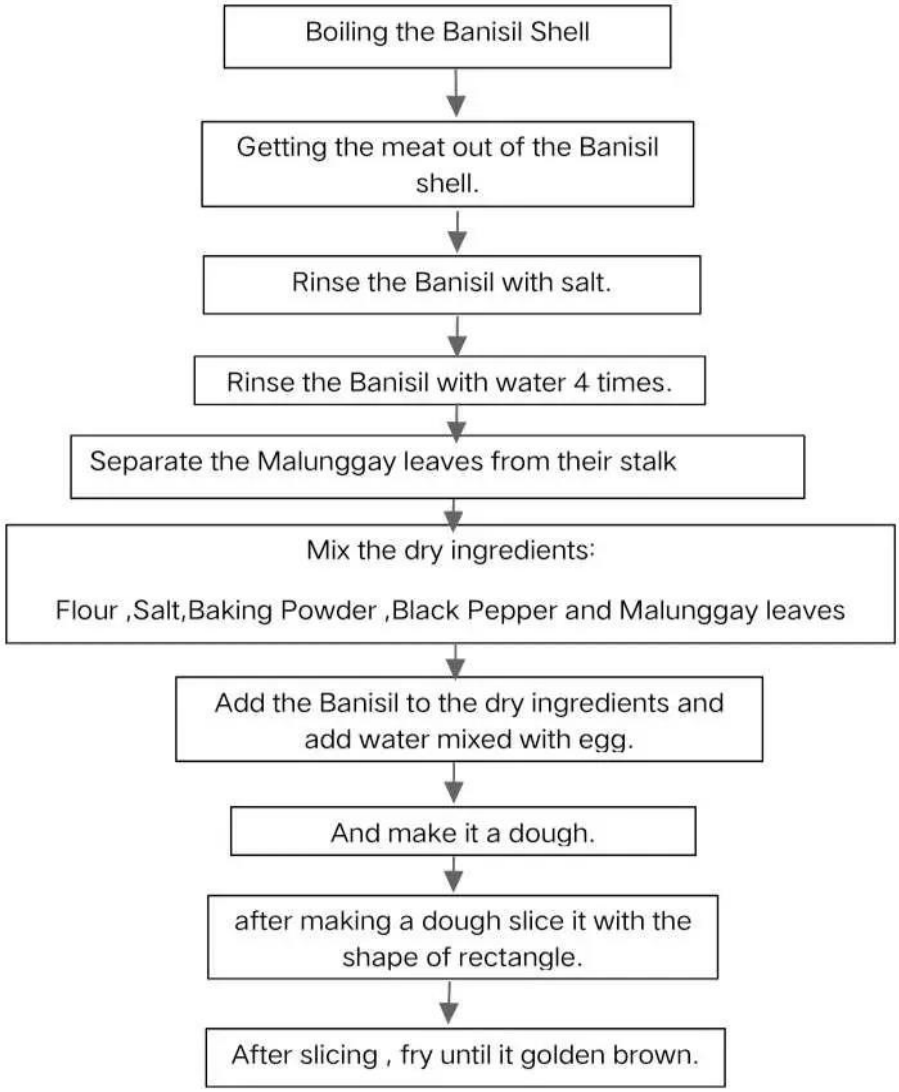
NAME	USE	PICTURE
Strainer	used to strain the flour and baking powder	
Measuring Spoons/Cups	used to measure the dry ingredients (salt, pepper, flour, baking powder and *malunggay* leaves).	
Blender	used to blend the *Banisil* meat	

Cold Water	Used to mix and bind the ingredients to form the dough for *Banisil* crackers.	
Stove	to cook the *Banisil* crackers	
Rolling Pin	use to flatten the dough	
Pan	use to fry the *Banisil* crackers	

Bowl	use for mixing the dry ingredients	

A. The procedure of making the banisil crackers with Malunggay as follows:

Figure 3: Procedure of Banisil Crackers with Malunggay



The preparation of the *Banisil* crackers with *Malunggay* involved several key steps. First, the *Banisil* shell meat was extracted through boiling and then thoroughly cleaned through a series of rinses with salt and water. The *Malunggay* leaves were separated from their stalks and combined with dry ingredients, including flour, salt, baking powder, and black pepper. The *Banisil* meat was then incorporated into the mixture, along with a blended egg and water mixture, forming a dough. The dough was shaped into rectangular forms and deep-fried until golden brown, yielding a crispy and flavorful product.

The Ingredients used in the study were the following:

Table 2: Ingredients of Banisil Crackers with Malunggay

INGREDIENTS	QUANTITY
Banisil	1 cup
Malunggay	1 cup
Flour	1 cup
Oil	500 ml
Salt	½ tablespoon
Egg	1
Water	½ cup or 8 tablespoon
Black Pepper	½ teaspoon
Baking Powder	2 tablespoon

Research Instrument

The researchers employed a Sensory Evaluation Sheet using a 5-point Likert Scale where 5 means very much acceptable to 1 which means not acceptable. These were all employed through weighted mean to evaluate the acceptability of the product and serves as a tool in gathering the information needed in the answering the specific problem in the study. The tool included the respondents background as to age, gender, classification and evaluation and entails the statements which evaluates the characteristics of the *Banisil* shell cracker in terms of appearance, odor, taste and texture.

Data Analysis

The data gathered were statistically analyzed and presented in textual and tabular form. The researchers used a frequency and percentage statistics to answer the demographic profile of the respondents.

The formula are as follows: $P = F \times N$

Where:

P = Percentage

f = Number of respondents per rating

N = Total number of respondents

In this study, the weighted mean was used to determine the average value of the data towards the level of acceptability of the respondents on the *Banisil* Crackers with *Malunggay*. The formula is as follow: $WM = f \times N$

Where:

WM = weighted mean

="sum of"

F = Number of respondents per rating

X = weighted based on the point scale used in the questionnaire

N = Total number of respondents

In this study, the Standard Deviation measured the dispersion values in a data set. A low standard deviation means the values are closer to the mean. A higher standard deviation means the values are farther from the mean. Standard deviation is typically denoted with the Greek letter sigma (σ) or the letter s.

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

Where;

N=total amount of values in the data set

xi=a value in the data set

$\bar{x}$=the mean

Note: ∑ is just math speak for "sum of"

Data Gathering Procedure

The researchers wrote a letter asking permission from the campus Director Sheldon Ives G. Agaton Ph.D. of EVSU - Tanauan Campus noted by the Head of Technology Department Egbert G. Del Pilar, Ed. D. to conduct the experiment inside the campus to the respondents.

The Sensory Evaluation Test using the 5-point Likert Scale together with the sample products experiment in this study were distributed to the respondents. The result was retrieved by the researchers immediately after completion of the evaluation sheet by the respondents in order to observe confidentiality.

Method of Scoring

After the experiment, the data were gathered by the researchers immediately and tabulated the score and interpreted. In order to determine the general acceptability of the quality attributes of the *Banisil* Crackers with *Malunggay*.

The following criteria of interpretation were used.

Table 3: Criteria of Interpretation of the Acceptability

SCALE	RANGE	DESCRIPTION
5	4.51-5	Very much Acceptable
4	3.51-4.5	Acceptable
3	2.51-3.5	Moderately Acceptable
2	1.51-2.5	Less Acceptable
1	1.0-1.5	Not Acceptable

Ethical Considerations

The studies referenced, including the development and assessment of food products such as crackers made from shrimp shells, green mussel shells, and other ingredients, typically adhere to ethical considerations related to ensuring participant safety, informed consent, confidentiality, and proper use of resources. Specifically, the study involving human sensory evaluation would have required obtaining informed consent from participants, ensuring

their voluntary participation, and maintaining confidentiality of their responses. Researchers also ensured that the products tested did not pose health risks, adhering to food safety standards. Additionally, the use of local resources and waste materials, such as shells, aligns with ethical practices of sustainable and responsible resource utilization, promoting environmental conservation and community benefits.

Presentation, Analysis and Interpretation of Data

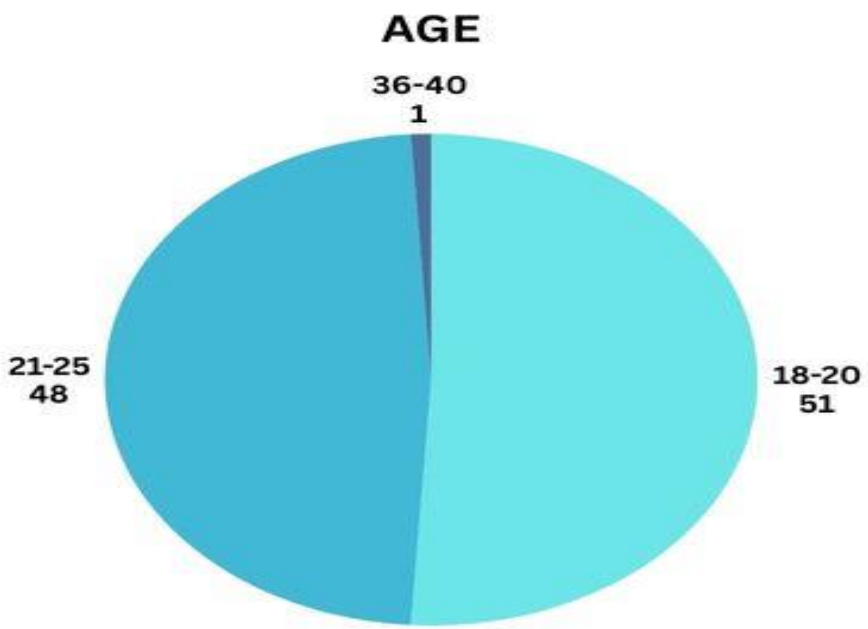
This chapter presents the results, the statistical analysis, and the interpretation of findings based on the data gathered. These are presented in graphs following the sequence of the specific research problem regarding the level of acceptability of the *Banisil* Crackers with *Malunggay* in terms of appearance seasoning.

A. Demographic Profile of the Respondents

Table 4: Frequency Distribution of the Respondent's Profile in terms of Age

Age	F(100)	%
18-20	51	51%
21-25	48	48%
26-35	0	0%
36-40	1	1%

Figure 4: Age Distribution of Respondents

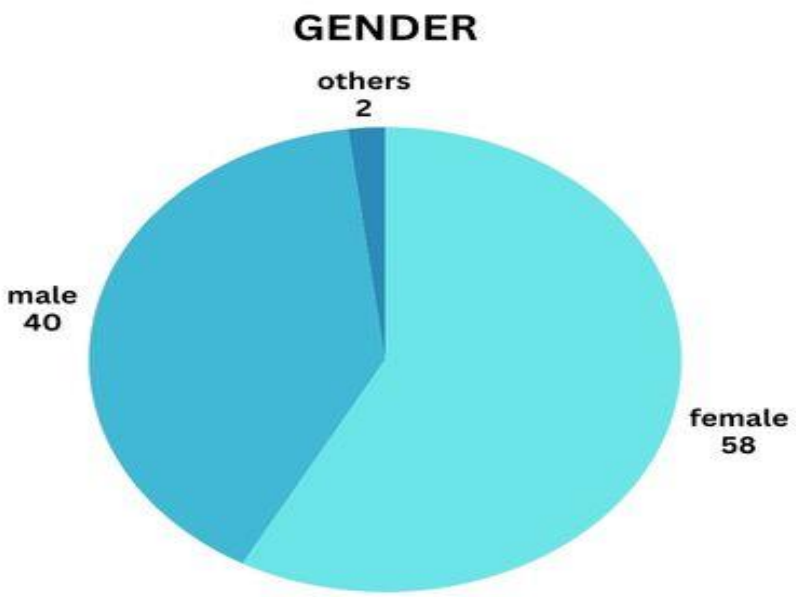


The table and pie chart illustrate the age distribution of respondents. The chart reveals that the majority were 18–20 years old (51 respondents), followed closely by those aged 21–25 years old (48 respondents). Only 1 respondent belonged to the 36–40 age group, while no participants were recorded in the 26–35 age range. This data indicates that most of the respondents were young adults, particularly college-aged individuals, which reflects that the study's feedback primarily came from a younger demographic.

Table 5: Frequency Distribution of the Respondent's Profile in terms of Gender

Gender	F(100)	%
Female	58	58%
Male	40	40%
Others	2	2%

Figure 5: Gender Distribution of Respondents

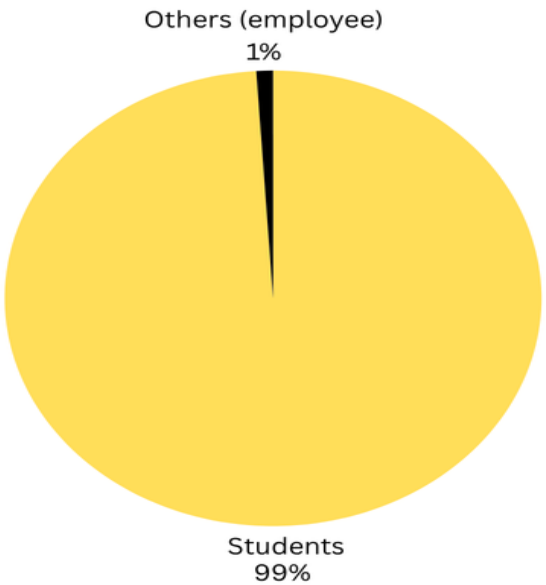


The table and a pie chart show the distribution of respondents according to gender. The table indicates that out of 100 respondents, 58% were female, 40% were male, and 2% belonged to other gender classifications. The pie chart visually illustrates this distribution, where the largest portion represents females, followed by a smaller section for males, and a very thin slice for others. This data shows that the majority of the respondents were women, with men forming the second largest group, while only a few respondents identified under other gender categories.

Table 6: Profile of the Respondents in terms of Classification

Classification	**F(100)**	**%**
Students	**99**	**99%**
Instructor	**0**	**0%**
Others (Employee)	**1**	**1%**

Figure 6: Classification Distribution of Respondents



The table and a pie chart present the profile of respondents in terms of classification. The table reveals that out of 100 respondents, 99% were students, while only 1% came from other employees, and there were no instructors who participated. The pie chart visually supports this distribution, with almost the entire circle shaded for students, and only a very small slice representing employees. This means that the respondents were overwhelmingly students, making them the main source of feedback in the study, while the participation of employees was very minimal.

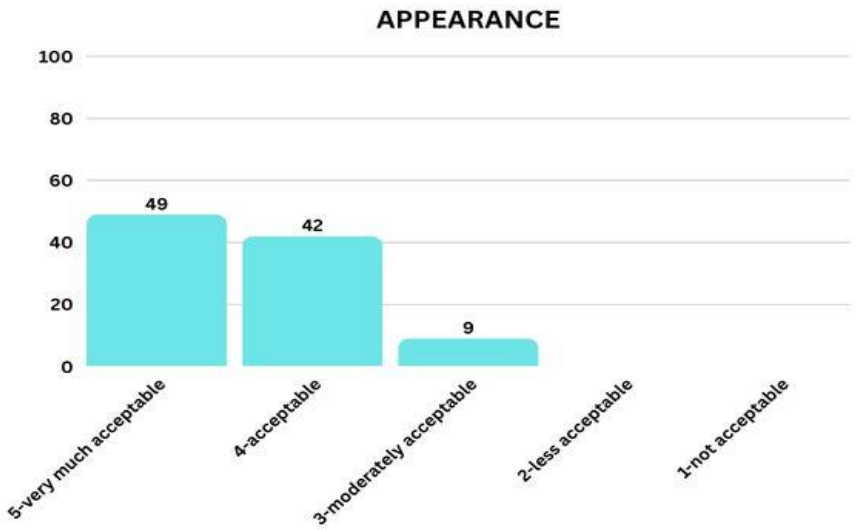
B. Level of acceptability of Banisil Crackers with Malunggay in terms of

Taste, Appearance, Aroma, and Texture

Table 7: Acceptability of Banisil Crackers (Faunus ater) with Malunggay in terms of Appearance

Statement	Weighted Mean	Standard Deviation (SD)	Description
Appearance (The visual look, color, and shape of Banisil crackers are appealing)	4.40	0.651	**ACCEPTABLE**

Figure 7: Acceptability of Banisil Crackers (Faunus ater) with Malunggay in terms of Appearance



The table shows that the crackers' visual appeal—including their color, shape, and overall look—was generally well-received. It has a weighted mean of 4.40 with a standard deviation of 0.651, and the description is "Acceptable." This means that most respondents were satisfied with how the product looks.

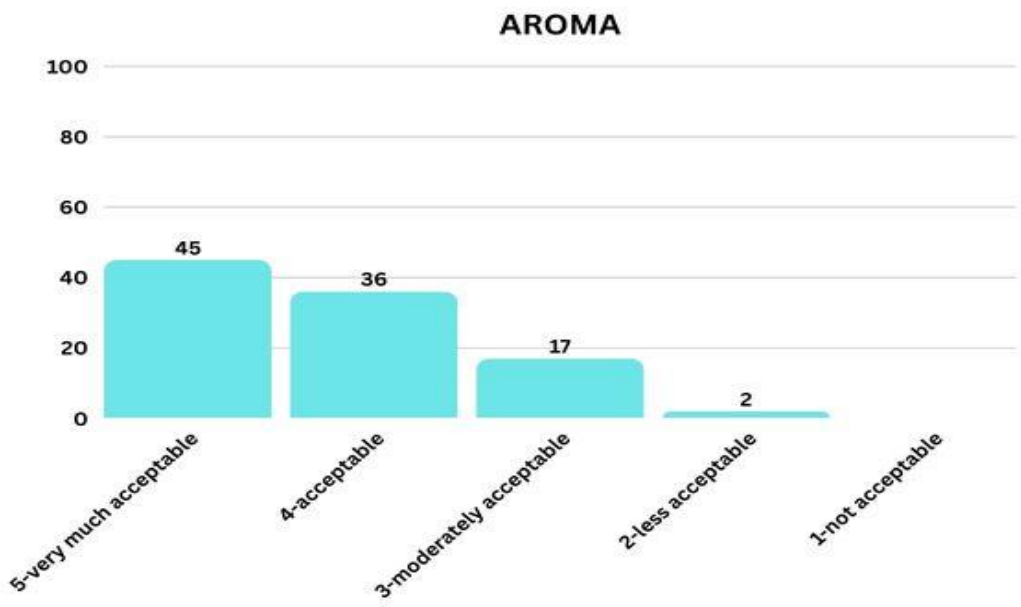
The bar graph further explains the distribution of responses. Out of 100 participants, 49 rated the appearance as "very much acceptable," while 42 considered it "acceptable." Meanwhile, 9 respondents rated it as "moderately acceptable," and none rated it as "less acceptable" or "not acceptable."

In short, both the table and the graph show that the majority of respondents found the *Banisil* crackers visually appealing, suggesting that its appearance successfully attracted consumers and contributed positively to its overall acceptability.

Table 8: Acceptability of Banisil Crackers (Faunus ater) with Malunggay in terms of Aroma/Odor

Statement	Weighted Mean	Standard Deviation (SD)	Description
Aroma/Odor (The smell of Banisil crackers is pleasant and inviting.)	4.24	0.806	**ACCEPTABLE**

Figure 8: Acceptability of Banisil Crackers (Faunus ater) with Malunggay in terms of Aroma



The table shows that the aroma of the crackers was generally found to be pleasant and inviting. It has a weighted mean of 4.24 and a standard deviation of 0.806, which falls under the description "Acceptable." This means that most respondents agreed that the aroma of the crackers was appealing.

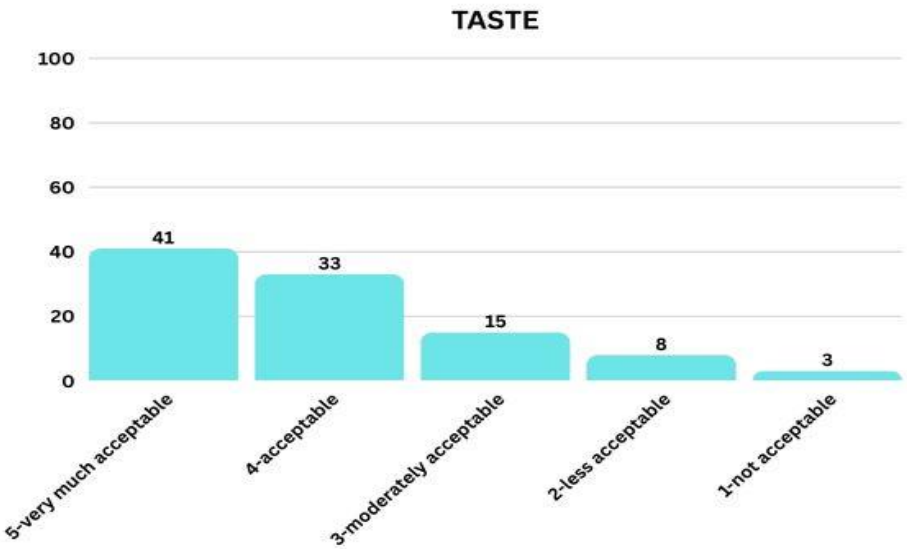
The bar graph further illustrates the responses. Out of 100 respondents, 45 rated the aroma as "very much acceptable," while 36 considered it "acceptable." Meanwhile, 17 respondents said it was "moderately acceptable," and smaller groups gave lower ratings, with 2 saying "less acceptable".

In simple terms, both the table and the graph show that the majority of participants appreciated the aroma of the *Banisil* crackers, though a few respondents suggested that there is still room for improvement to make the smell more appealing to everyone.

Table 9: Acceptability of Banisil Crackers (Faunus ater) with Malunggay in terms of Taste

Statement	**Weighted Mean**	**Standard Deviation (SD)**	**Description**
Taste (The flavor of Banisil crackers is enjoyable and appealing.)	4.01	1.08	**ACCEPTABLE**

Figure 9: Acceptability of Banisil Crackers (Faunus ater) with Malunggay in terms of Taste



The table reveals that the flavor of the crackers was found to be enjoyable and appealing, with a weighted mean of 4.01 and a standard deviation of 1.08. The overall description is "Acceptable," meaning that most respondents liked the taste of the product.

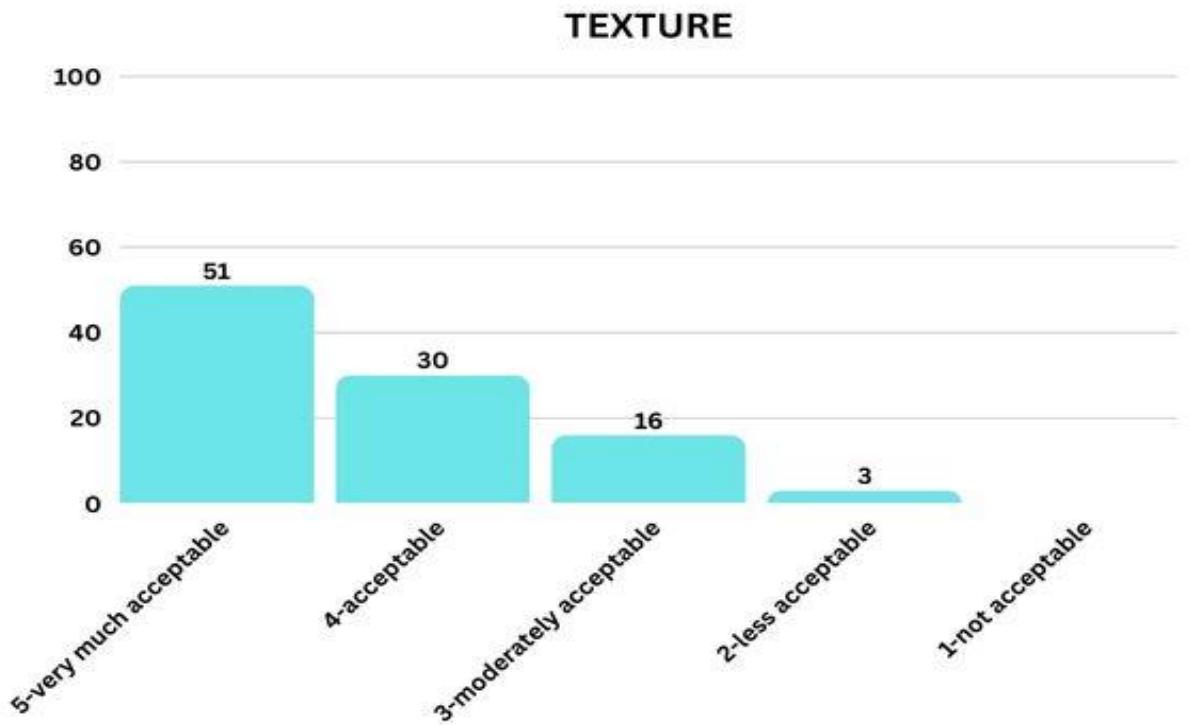
The bar graph further illustrates how the respondents rated the taste. Out of 100 participants, 41 rated it as "very much acceptable," followed by 33 who said it was "acceptable." Meanwhile, 15 respondents considered it "moderately acceptable." A smaller portion, 8 respondents, rated it as "less acceptable," and 3 rated it as "not acceptable."

In simple terms, the results show that the majority of the respondents enjoyed the flavor of the *Banisil* crackers, though a few gave lower ratings. This indicates that while the product's taste is generally pleasing, there is still room for improvement to satisfy all consumers.

Table 10: Acceptability of Banisil Crackers (Faunus ater) with Malunggay in terms of Texture

Statement	Weighted Mean	Standard Deviation (SD)	Description
Texture (The texture of Banisil crackers (crispiness and crunchiness) is satisfying.)	4.29	0.844	**ACCEPTABLE**

Figure 10: Acceptability of Banisil Crackers (Faunus ater) with Malunggay in terms of Texture



The table indicates that the texture, particularly the crispiness and crunchiness of the crackers, was generally rated as acceptable, with a weighted mean of 4.29 and a standard deviation of 0.844. This means that most respondents found the texture satisfying and enjoyable, with only slight differences in opinion.

The bar graph further illustrates the results of the respondents' ratings. Out of 100 participants, 51 rated the texture as "very much acceptable," followed by 30 who said it was "acceptable." Meanwhile, 16 respondents considered it "moderately acceptable," and only 3 marked it as "less acceptable." Notably, no one rated the texture as "not acceptable."

Overall, the data from both the table and the graph highlight that the majority of respondents were pleased with the texture of the *Banisil* crackers, emphasizing its crispness and crunchiness as one of its most appealing qualities.

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

This study assessed the acceptability of *Banisil* crackers fortified with green mussel shell powder in Tanauan Municipality. The majority of respondents were young adults (18-25 years old), with a higher percentage of females. Sensory evaluation revealed positive feedback across appearance, aroma, taste, and texture, with the 5% shell powder formulation receiving the highest overall acceptability due to its balanced visual appeal, flavor, and texture.

Significantly, incorporating green mussel shell powder substantially increased the calcium content of the crackers to approximately 396 mg per serving, enhancing their nutritional value. This fortification also contributed to extended shelf life by reducing water activity and maintaining sensory qualities during storage.

Furthermore, the study demonstrated the high acceptability and improved nutritional profile of *Banisil* crackers fortified with green mussel shell powder. The 5% formulation is recommended for its optimal balance of sensory appeal and nutritional enhancement. Further research could explore consumer preferences across a wider age range and investigate the potential for scaling up production and distribution.

Conclusion

This study concluded that adding green mussel shell powder significantly improved the nutritional profile of *Banisil* crackers without negatively impacting sensory quality, especially at the 5% level. Sensory attributes, particularly appearance, aroma, and texture, proved crucial in determining consumer acceptance.

The successful combination of traditional processing methods with modern formulation techniques resulted in a sustainable and nutritious snack that appealed to consumers. The utilization of shell waste not only enhanced nutritional value, but also promoted sustainable practices and waste reduction.

In summary, the findings support the development and production of a fortified *Banisil* cracker as a nutritious and sustainable food product.

Recommendations

In order to enhance the product and promote its acceptance, the following recommendations are suggested:

1. Standardize processing techniques to ensure uniformity in product appearance, flavor, and texture and explore advanced packaging solutions to extend shelf life and to preserve quality.
2. Highlight the health benefits, especially increased calcium content and environmental sustainability, in marketing efforts and promote the product through health-focused and local markets.
3. Conduct wider consumer testing across different age groups, socioeconomic classes, and locations to gain broader feedback and refine the formulation to meet diverse preferences.
4. Develop product variations (e.g., flavored crackers with cheese, garlic, or herbs) to cater to varying consumer tastes and expand market reach.
5. Collaborate with local farmers and fisherfolk to source *Banisil* and *Malunggay* sustainably, ensuring community livelihood support and long-term supply.
6. Pursue product certification and compliance with food safety and nutritional labeling standards (e.g., FDA approval) to enhance consumer trust and expand distribution.
7. Explore commercial distribution channels such as supermarkets, online marketplaces, school canteens, and local pasalubong centers to increase accessibility and visibility.

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APPENDIX

Acceptability of Banisil Crackers

Havana Street, Brgy San Miguel Tanauan Leyte, 6502

INTRODUCTION

You are being asked to participate in a research study on the acceptability of Banisil crackers with maluggay. This study aims to gather feedback from BSHM students and others regarding the product's acceptability. Your participation in this study is voluntary.

Purpose of the Study

The purpose of this study is to evaluate the acceptability of Banisil crackers with maluggay in terms of appearance, odor, taste, and texture.

Procedures

You will be asked to:

1. Taste the Banisil crackers with maluggay

2. Evaluate the product's appearance, odor, taste, and texture using a 5-point Likert Scale

3. Answer a short questionnaire regarding your demographic information

Risks and Benefits

There are no known risks associated with participating in this study. Your participation will contribute to the development of a new product and provide valuable insights for future research.

Confidentiality

All information collected during this study will be kept confidential. Your name and personal information will not be disclosed to anyone.

Rights as a Respondent

You have the right to:

1. Refuse to participate in this study

2. Withdraw from the study at any time

3. Ask questions about the study

4. Receive a copy of the results (if desired)

Contact Information

If you have any questions or concerns about this study, please contact:

Gares, Maria Jean M.

Valle, Juliet B.

Moro, Maria Rosario B.

Daga, Jay-Ann P.

Bacoto, Shameiah Grace P.

Consent

I, **[Respondent's Name]**, hereby consent to participate in this research study. I understand that my participation is voluntary and that I can withdraw from the study at any time.

Signature: _____

Date: _____

Survey Questionnaire: Acceptability of Banisil Crackers

Part 1: Demographic Profile

1. Age: _____

2. Gender:

☐ Male

☐ Female

☐ Others (please specify): _____

3. Classification:

☐ Student

☐ Instructor

☐ Others (please specify): _____

Part 2: Level of Acceptability

Please rate the level of Acceptability of Banisil Crackers following the attrbutes based on your overall perception:

1. Appearance:

The visual look, color, and shape of Banisil crackers are appealing.

☐ 5 - Very Much Acceptable

☐ 4 - Acceptable

☐ 3 - Moderately Acceptable

☐ 2 - Less Acceptable

☐ 1 - Not Acceptable

2. Aroma/odor:

The smell of Banisil crackers is pleasant and inviting.

☐ 5 - Very Much Acceptable

☐ 4 - Acceptable

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☐ 3 - Moderately Acceptable

☐ 2 - Less Acceptable

☐ 1 - Not Acceptable

3. Taste:

The flavor of Banisil crackers is enjoyable and appealing.

☐ 5 - Very Much Acceptable

☐ 4 - Acceptable

☐ 3 - Moderately Acceptable

☐ 2 - Less Acceptable

☐ 1 - Not Acceptable

4. Texture:

The texture of Banisil crackers (crispiness and crunchiness) is satisfying.

☐ 5 - Very Much Acceptable

☐ 4 - Acceptable

☐ 3 - Moderately Acceptable

☐ 2 - Less Acceptable

☐ 1 - Not Acceptable

DOCUMENTATION