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Banana (Musa Paradisiaca L) Tart Shell

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ABSTRACT
This experimental research aimed to find out the sensory characteristics and level of acceptability of Banana (Musa paradisiaca L.) Tart Shell in terms of appearance, aroma, taste and texture.

This study was conducted on the month of December, 2016 at Jose Monfort National Science High School and Iloilo Science and Technology University, Barotac Nuevo Campus.

The respondents of the study were 20 Home Economics teachers, 20 students taking up cookery as their elective and 20 homemakers. Sensory evaluation and level of acceptability score sheets were used based on the Nine-Point Hedonic Scale. After the evaluation by the panel of evaluators, the results were tabulated and tallied. The data collected was computed using the frequency and percentage for the sensory characteristics. The statistical tools used were Mean and Standard Deviation to determine the level of acceptability and Two-Way Analysis of Variance set at 0.01 level of significance to determine the significant differences.

Results of the study revealed that the sensory characteristics of banana tart shell were as follows, moderately followed molder's shape, wheat brown in color (outside), moderately rough crusty surface, khaki color (inside), moderately distinct banana aroma, moderately distinct banana taste and moderately flaky.

As to the level of acceptability, the banana tart shell prepared from 75% all purpose flour and 25% banana flour were liked very much by the respondents in terms of appearance, taste and texture while 50% all- purpose flour and 50% banana flour was liked very much by the respondents in terms of aroma.

There was a notable difference in the acceptability of the banana tart shell in terms of appearance, aroma, taste, and texture. Consequently, the null hypothesis, which proposed no significant difference in these aspects, was rejected.

It is recommended that the findings of this study be shared with the public through lectures, livelihood training, and food expositions. Additionally, a follow-up study should be conducted to verify the results and assess the proximate composition and shelf-life of the banana tart shell.

Keywords: Banana Tart Shell, Experimental Research, Philippines

INTRODUCTION

Food is man's basic need. With the advent of technology, food products have been developed and out in the market for consumption. Among children, there is higher demand for food products especially food for snacks and children prefer buying their food on streets and those sold by vendors in school. With this practice, quality and nutrition of food products sold are uncertain.

Malnutrition among children is still rampant in the Philippines. In fact, according to the Department of Health (DOH), about 3.6 million of Filipino children are stunted by malnutrition (Department of Health, 2015) due to incorrect food intake. Experimentation of food products that are made from indigenous, nutritious and abundant in the locality is encouraged to address the problem.

The development of food product will greatly contribute to the wellness of the people in the community since people love to eat snacks during their break and this product will not only make them satisfied on food but it will also give them the right nutrition. It will also give additional knowledge to the future entrepreneurs to produce this product to be sold in the market.

The researcher conceptualized this study because *saba* banana is abundant anywhere and it is widely used in other cookeries. It contains protein, carbohydrates and vitamins A, B C and D which are good for our body's health. Saba variety was used in this study because among the species of banana, it contains more dietary fiber

which is good for digestion. It is also recommended by doctors because among other varieties of bananas, it has the highest potassium content, they help the body's circulatory system deliver oxygen to the brain. This also helps maintain a regular heartbeat and a proper balance of water in the body. Potassium is also helpful for reducing strokes and regulating blood pressure because of the way it promotes circulatory health (Department of Agriculture, Davao Region, 2013).

The development of this product would mean improvement in culinary and it will introduce new product to the market. It will also help people maintain health for longer life.

STATEMENT OF THE PROBLEM

This study aimed to determine the sensory characteristics and acceptability of Banana Tart shell.

Specifically, this sought answers to the following questions

1. What are the sensory characteristics of banana tart shell in different proportions of banana flour in terms of appearance, aroma, taste and texture?

2. What is the level of acceptability of banana tart shell in terms of appearance, aroma, taste and texture?

3. Is there a significant difference in the level of acceptability of banana tart shell in terms of appearance, aroma, taste and texture?

SIGNIFICANCE OF THE STUDY

The results of this study will be beneficial to the following:

Consumers. Consumers like parents and children can now avail nutritious food from bakeries aside from the usual bread and pastries which they buy.

Entrepreneurs. Entrepreneurs could produce this product and sell in the market for the consumption by the consumers.

Homemakers. The homemakers can substitute banana flour in baking tart shell which will not only add nutritive value to tart but also providing a good avenue in business.

Home Economics Teachers. The Home Economics teachers could teach their students the new way of baking tarts with the use of indigenous materials which are readily available in our surroundings. It could also be a new idea for the Home Economics teachers in baking.

Students. The students could avail healthy and nutritious food from the canteen and it would give them additional knowledge and idea of baking healthy foods. It could also give them the chance to have an income generating project.

Farmers. The farmers could be given the chance to increase banana production to be made into flour thus, the farmers will have more option in aggregate crop production.

Future Researchers. The result of the study will benefit the future researchers in their investigations on tarts using other indigenous materials available around us.

REVIEW OF LITERATURE

The banana plant, scientifically known as Musa paradisiaca, varies in height from 1 meter (3 feet) to over 9 meters (30 feet) and is classified as a giant herb. Bananas ripen in several colors, including yellow, purple, and red, and come in various sizes. The true stem is located underground, while the visible part of the plant is called the pseudostem. The pseudostem is composed of tightly wrapped, overlapping leaf sheaths.

Typically, each pseudostem produces a single inflorescence, commonly referred to as the banana heart, though there are exceptions. This inflorescence features multiple bracts (often mistakenly called petals) interspersed between rows of flowers. Female flowers, which can develop into fruit, are arranged in rows above the male flowers on the stem. The ovary is positioned below, with the tiny petals and other flower parts situated at the tip of the ovary. The composition of banana has been studied and found out to contain 75,3% water, 1.3% protein, 6% fat, 22% starch, and sugar, 80% ash and 22% carbohydrates. It is a good source of vitamin A,B,C and D (Guillergan, 1985).

Sab-a, also known as Sabal Cardaba, produces large, angular fruits with starchy white pulp that becomes sweet when ripe. Each bunch contains 10-16 hands, with each hand having 12-20 fingers. The fruit matures within 150-180 days from the time it begins to develop. The male bud is often used as a vegetable. The plant exhibits vigorous growth, with its pseudostem reaching up to 5-6 meters in height (Department of Agriculture, 2013). It

is one of the local banana species in the Philippines known for its health benefits. Its deep roots allow it to absorb more nutrients from the soil, contributing to its high nutrient content, as well as its large trunk and fruits.

In this study, *saba* banana was used in making banana flour in proportion with all-purpose flour in baking tart shells.

Saba Banana Has the Highest Nutrients among Other Bananas

While there are many varieties of bananas worldwide, none match the nutrient density of the Cardava banana found in the Philippines. According to the Doctors of Ministry in Alternative Medicines (DMAM), the Cardava banana, also known as "Saba Banana" in the Philippines, has the highest nutrient content compared to other banana varieties.

This fruit is commonly produced in the Philippines and other Asian countries. Although many Filipinos prefer it cooked, DMAM research indicates that cooking the banana significantly reduces its nutritional value. Cooked bananas lose much of their nutrient content and can turn acidic. To maximize the health benefits, it is better to consume the banana raw.

Other Varieties of Banana

Banana has different varieties. The following are its common varieties:

Bulungan. Red bananas, also known for their reddish-purple skin, are a distinct variety that is smaller and plumper than the typical Cavendish banana. When ripe, their flesh ranges from cream to light pink. Red bananas are softer and sweeter than the yellow Cavendish variety and have a subtle raspberry-like flavor. While many red bananas are imported from producers in Asia and South America, they are particularly popular in Central America and are available worldwide.

Lady Finger. **Banana that are smaller and sweeter compared to other bananas.**

Lakatan. It has a light orange to orange pulp, firm and aromatic. Its peel is golden yellow in color when ripe. Each bunch has 10-12 hands with 12-20 fingers. The size of each finger ranges from 10-20 cm in length and 2.0-2.5 cm. in diameter. The fruit matures 80-90 days from shooting (Department of Agriculture, 2013).

Latundan Banana

The Latundan banana features a fine-textured white pulp and a yellow peel. It has a sweet flavor with a mild sub-acid taste. Each bunch consists of 5-9 hands, with each hand containing 12-18 fingers. The fruit is medium-sized, ranging from 10-15 cm in length, and matures in 75-85 days from shooting (Department of Agriculture, 2013). Latundan, also known as apple bananas, rundan, silk bananas, or manzana bananas, is a triploid hybrid cultivar and is one of the most common banana varieties in the Philippines (Choosephils, 2013).

Giant Cavendish Banana

The Giant Cavendish banana typically has a greenish-yellow fruit under normal conditions. Its pulp is white, cream-colored, soft, fine-textured, and sweet. Each bunch produces 7-14 hands, with the entire bunch weighing up to 60 kg. The fruit matures 105-120 days after shooting. The plant can grow to 3-5 meters in height and can produce up to 36 leaves from the emergence of the first leaf to maturity. Each leaf can grow up to 4 meters long and more than a meter wide, with the first leaf emerging in 11-15 days in upland areas and 7-9 days in lowland regions.

Dwarf Cavendish Banana

The Dwarf Cavendish banana is a compact plant, reaching only 1.5 meters in height. It has stout pseudostems with a diameter of 75-80 cm and brown-black blotches. The leaves are clustered at the crown with short internodes and winged petioles that have wide-open canals not clasping the pseudostem. Each bunch has 8-12 hands, and the fruit is yellowish-green with brownish spots.

Parts and Uses of the Banana

Flower: The banana heart or blossom is used as a vegetable in South Asian and Southeast Asian cuisines, either raw or steamed, and is often added to soups, curries, and fried dishes. It has a flavor similar to artichoke, and both the fleshy bracts and the heart are edible.

Leaves: Banana leaves are large, flexible, and waterproof, making them ideal for use as eco-friendly disposable food containers or plates in South Asia and Southeast Asia. They add a subtle sweet flavor when steamed with dishes and are commonly used as wrapping for grilling food, helping to retain juices and protect food from burning.

Trunk: **The tender core of the banana plant's trunk is also utilized as a vegetable.**

Fruit: Bananas are a staple starch for many tropical populations. Depending on the cultivar and ripeness, their flesh can range from starchy to sweet, and from firm to mushy. Bananas can be eaten raw or cooked, and are

used in a variety of ways including fruit cups, salads, sandwiches, custards, and baked goods. Ripe bananas are also processed into puree for infant food, canned with ascorbic acid to prevent discoloration, or combined with other ingredients like applesauce or peanut butter. Banana nectar, made from banana puree with added stabilizers, is homogenized, pasteurized, and canned. Sliced ripe bananas are canned in syrup and used in products like frozen tarts and pies. Due to seasonal gluts and perishability, there is significant interest in developing processing and preservation methods, such as canning green bananas and plantains to make them available for cooking. Research at the University of Puerto Rico focuses on the best procedures for canning these fruits, including enzyme inactivation and hot water treatment to facilitate peeling.

Medicinal Applications: All parts of the banana plant have medicinal uses. Flowers can help with bronchitis, dysentery, and ulcers, and are cooked for diabetics. The plant's astringent sap is used for conditions such as hysteria, epilepsy, leprosy, and fevers, and applied to hemorrhoids and insect stings. Young leaves can be used as poultices for burns and skin afflictions. The astringent ashes of unripe peels and leaves treat dysentery, diarrhea, and malignant ulcers. Banana roots are used for digestive disorders and other ailments, and banana seed mucilage is given for catarrh and diarrhea in India.

Banana Flour

Bananas can be processed in various ways, including frying, freezing, pureeing, drying, or candying. They are used in Filipino recipes like turon, maruya, and native dishes like casseroles and stews, as well as in traditional delicacies like ginataan. Due to their abundance, versatility, and health benefits, bananas are often processed into flour for making tart shells.

Banana or plantain flour is made domestically by sun-drying slices of unripe fruit and pulverizing them, or commercially through spray-drying or drum-drying. This flour can be mixed with wheat flour in a 50-50 ratio for making cupcakes. Plantain flour or a blend of plantain with cassava and cocoyam is used in pastries. Cultivars such as "Saba," "Tundoc," and "Latundan" are particularly suitable for flour production (Moser, 2008).

Health Benefits of Banana Flour

This is made from unripe banana or plantains. It can be used as a substitute for wheat flour or mixed with it to give a starchier taste and provide a nutrient boost. Banana flours typically contain only bananas and salt, making them a healthier alternative to flour that can provide a full serving of fruit.

Bananas are high in several important vitamins, and these vitamins are not lost in the process of making banana flour. A serving of bananas contain approximately 35percent of the daily value of Vitamin B-6 and 20% of the daily value of vitamin C Banana flour is typically made from several crushed and dried bananas, and the actual quantity of bananas you consume will vary with the food you eat. Meals containing high quantities of banana flour frequently offer more than one serving of bananas. Dietary fiber plays a vital role in regulating the digestive tract. It stimulates digestion, which prevents constipation. Fiber also absorbs excess moisture, preventing diarrhea. A single serving of banana flour contains approximately 10 percent of the recommended daily value of dietary fiber.

A tart is a small pie typically filled with cooked fruit or other sweetened ingredients, usually without a top crust. These individual-sized pies, often baked in small pans, come in various shapes, with the most common being the boat tart, though some are shaped like flowers. To make tarts, flour is kneaded with salt and water, then shaped and baked to maintain its form. Although tarts were more prominent in past centuries, they remain popular today. For example, in Hungary, a type of tart known as soft tart bread is still widely made and consumed, particularly in the Hungarian-speaking regions.

The ingredients for tarts can vary based on local cereal preferences. They may be made from wheat, rye, barley, or buckwheat in Western Transdanubia. In some areas, maize meal or potatoes are used. Salt is the primary flavoring ingredient, though pepper and paprika are also common in certain regions. Occasionally, poppy seeds are either mixed into the dough or sprinkled on top. Typically, tarts are about 20 to 30 cm in diameter and 2 to 3 cm thick. Pretzels made from the same dough come in various sizes, ranging from 15 to 20 cm in Western Transdanubia to 4 to 5 cm in the east. In some villages, pretzel-making is a specialized craft, with pretzels sold at fairs or to neighboring villages. Debrecen pretzels, in particular, are still highly sought after as fair souvenirs. In the eastern regions, small loaves of dough, about 6-7 cm high and up to 15 cm in diameter, are baked, with similar loaves used as treats for Christmas carolers in Bodrogkoz.

Sensory Evaluation

Sensory evaluation is a scientific field dedicated to measuring, analyzing, and interpreting the responses to the sensory characteristics of foods and materials, as perceived through sight, smell, taste, touch, and hearing.

With the advent of technology, a lot of food products have been invented to augment the widening need of food of the people. Thus, in the spread of different food product, people's taste seems to undergo several changes

which will make food's taste and quality vary depending on the type of customer. Companies have also undergone customer analysis and survey in order to deliver the best food product to them. Unfortunately, company's best chemists and experts sometimes cannot meet the demands of the customers in the way that the appreciation of the product would change from time to time. With the advancement of modern measurement techniques and their integration into sensory evaluation, it became clear that depending solely on a small group of experts was unreliable. To address this issue, many companies began using sensory evaluation, commonly known as "organoleptic analysis."

In food trades today, a lot of product competition happens and opportunities offshoot nationally and internationally. It expands business opportunities for local and international entrepreneur. With this, companies should catch the sensory standards of the customers. An intelligent customer nowadays selects products based on its utility and based on sensory qualities possessed by a given commodity.

Sensory evaluation is based on the preparation and scoring of the product in terms of food acceptability is the term used to describe whether the consumer likes or dislikes the given food which is associated with the kinds of food to which a customer is accustomed. Acceptance or rejection of food is based largely on the stimulus of the sense organs of the individual. All the senses (even hearing in evaluation of the crispness and crunchiness of some foods) are used in the appraisal of food, but particularly those of sight, smell, taste and touch.

Generally, the sense scrutinizes the item in the following order appearance, aroma, taste and texture. These sensory characteristics make up the quality of the product as perceived by the customer.

Sensory Attributes

Appearance. It is the physical or external aspect of the product. It is usually viewed in varied ways by different persons. It usually depends on visual observation without the use of touch and much less of taste. Appearance is determined by color, shape and size and the general arrangement of the food (De Leon, 1999).

Color

Color is a crucial factor in a product's appearance and significantly influences its appeal. It is an aspect of food that engages the human senses of sight, mind, emotions, and taste (Gatchalian, 1989). In this study, using banana flour might lead to a dark brown appearance due to the banana's discoloration during the drying process, but this change in color is not expected to impact the taste.

Aroma

Aroma, or odor, refers to volatile chemicals in very low concentrations that are detected by the sense of smell. These odors, also known as smells, can be either pleasant or unpleasant.

Taste

Taste is the sensory perception of food or other substances, primarily influenced by the chemical senses of taste and smell. Occasionally, the "trigeminal senses," which detect chemical irritants in the mouth and throat, also contribute to flavor perception. Flavor can be enhanced or altered by natural or artificial flavorings that impact these senses.

Flavoring

Flavoring is a substance that imparts taste to another substance, modifying its characteristics to be sweet, sour, tangy, etc.

Texture

Texture refers to the properties and sensations experienced through the sense of touch from the external surface of objects. It can also describe non-tactile sensations or patterns, particularly in two-dimensional contexts where individual elements are not easily distinguished.

General Acceptability

Overall acceptability refers to the degree to which a product is deemed satisfactory or pleasing, based on sensory attributes such as appearance, texture, aroma, and flavor.

Islam et al. (2014) developed and evaluated pumpkin pies to assess their market potential and shelf life. Using fresh pumpkin, they prepared pies with varying amounts of pumpkin puree, wheat flour, sugar, milk, and egg. Sensory results indicated significant differences in overall acceptability, flavor, texture, and color ($p<0.05$). The most favored sample contained 40% pumpkin puree, 12% wheat flour, 20% sugar, 15% milk powder, and 13% egg. Pies with 25% taro flour were comparable to those made with 100% commercial flour, while those with 50%-75% taro flour showed significant differences in crust appearance, texture, aroma, and flavor compared to

the control. The cost of the most preferred empanaditas, made with 25% taro flour and 75% commercial wheat flour, was PhP 1.40.

In line with these findings, the present study determined that using banana flour in tart shells was highly acceptable, as evaluated by a panel of experts.

Pongjanta et al. (2008) developed pie crust formulas for "Mahajanaka" mango filling and tested five preparations of ripe mango, including fresh slices, square flesh in syrup, and cooked slices. They used a basic pie crust formula comprising 49.96% wheat flour, 37.47% shortening, 0.07% salt, and 12.49% cold water. After baking at 180°C for 30 minutes, the most suitable filling was the mango slices in syrup with an 18°Brix level. The study identified the optimal pie crust formula for "Mahajanaka" mango filling as 66.22% wheat flour, 16.55% shortening, 0.66% salt, and 16.55% cold water. The resulting pie crust's color, crispiness, thickness, mango quantity, taste, odor, and overall acceptance closely matched panelists' preferences. These findings informed the current research on using banana flour in combination with commercial wheat flour to make tarts.

METHODOLOGY

This study used an experimental design. There were 60 respondents composed of 20 high school students major in cookery, 20 Technology and Livelihood Education and Home Economics teachers of Jose Monfort National Science High School and Iloilo Science and Technology University-Barotac Nuevo Campus and 20 homemakers and children. They were selected purposively for this study.

The Sensory Evaluation Score Sheets were used as the instruments in gathering the data. These were composed of two sets of sensory evaluation score sheets namely: sensory evaluation score sheet for banana tart which contains the sensory characteristics such as outside and inside characteristics for its appearance, texture, taste and aroma and evaluation score sheet for banana tart shell which contains the Nine- Point Hedonic Scale. The instrument included the title of the study, direction to be followed by the evaluators in evaluating the finished product according to the level of acceptability of the banana tart shell in different proportions of all-purpose flour as to appearance, texture, aroma, flavor and level of acceptability.

For computation purposes, each response was given an equivalent point as follows:

Response	*Scale*
Liked Extremely	9
Liked Very Much	8
Liked Moderately	7
Liked Slightly	6
Neither Liked nor Disliked	5
Disliked Slightly	4
Disliked Moderately	3
Disliked Very Much	2
Disliked Extremely	1

RESULTS AND DISCUSSION

Shape (Outside Characteristics). Table 1 presents the sensory characteristics of Banana Tart Shell as to shape (outside characteristic).

Table 1 *Sensory Characteristics of Banana Tart Shell as to Shape (Outside Characteristic)*

ATTRIBUTES	**A**		**B**		**C**		**D**	
outside characteristics (shape)	N	%	N	%	N	%	N	%
Perfectly followed the molder's shape	10	16.67	9	15.00	7	11.67	48	80.00
Moderately followed molder's shape	16	26.67	47	78.33	52	86.67	11	18.33
Slightly followed molder's shape	32	53.33	4	6.67	1	1.67	1	1.67
Did not followed molder's shape	2	3.33	0	0.00	0	0.00	0	0.00
Total	60	100	60	100	60	100	60	100

As shown on the table, Product A (25% All-Purpose Flour-75% Banana Flour) was evaluated by 53.33% of the respondents as slightly followed molder's shape, Product B (50% All-Purpose Flour-50% Banana Flour) and, Product C (75%- All- Purpose Flour-25% Banana Flour) were evaluated by 78.33% and 86.67% of the respondents respectively as moderately followed molder's shape and product D (100% all-purpose flour) was evaluated by 80% of the respondents as perfectly followed the molder's shape.

This means that the shape of banana tart shell varies with the different proportions of banana flour and all-purpose flour. The lesser the amount of banana flour added to all-purpose flour, make the dough soft and follows its molder shape. For example, Product C got the highest percentage rating as moderately followed molders' shape because it has lesser amount of banana flour.

This implies that when more banana flour is added to all-purpose flour it will not perfectly follow its molder shape because banana flour has no gluten content that could be molded when baked. Only proportion with more all-purpose flour could achieve the perfect shape.

Color (Outside Characteristics). As shown on Table 7, Product A (25% All- Purpose Flour-75% Banana Flour) was evaluated by 90% of the respondents as khaki, Product B (50% All-Purpose Flour-50% Banana Flour) was evaluated by 66.67% of the respondents as light brown, Product C (75%- All-Purpose Flour-25% Banana Flour) was evaluated by 53.33% of the respondents as wheat brown and Product D (100% All-Purpose Flour) was evaluated by 68.33% of the respondents as light khaki.

Table 2 *Sensory Characteristics of Banana Tart Shell as to Color (Outside characteristic)*

ATTRIBUTES	**A**		**B**		**C**		**D**	
Color	N	%	N	%	N	%	N	%
Light Khaki	2	3.33	1	1.67	8	13.33	41	68.33
Khaki	54	90.00	15	25.00	6	10.00	0	0.00
Wheat Brown	3	5.00	4	6.67	32	53.33	1	1.67
Light Brown	1	1.67	40	66.67	14	23.33	18	30.00
Total	60	100	60	100	60	100	60	100

This means that the color of the products varies from each other based on the amount of banana flour added to all-purpose flour in baking tart shells. The variation in color occurred when 25%, 50% and 75% banana flour was added to all-purpose flour in baking tart shells.

This implies that the different proportions of banana flour to all-purpose flour affected the color of banana tart shell. The more banana flour added to all-purpose flour, the darker the result of banana tart shell. This is due to the properties of banana flour which when processed became light brown in color.

Crust (Outside Characteristics. Table 3 presents sensory characteristics of banana tart shell as to its crust.

Table 3 *Sensory Characteristics of Banana Tart Shells as to Crust (Outside Characteristic)*

ATTRIBUTES	**A**		**B**		**C**		**D**	
Crust	N	%	N	%	N	%	N	%
Very rough crusty surface		0.00	1	1.67	8	13.33	22	36.67
Moderately rough crusty surface	15	25.00	41	68.33	46	76.67	225	41.67
Slightly rough crusty surface	44	73.33	17	28.33	6	10.00	12	20.00
Not rough crusty surface	1	1.67	1	1.67	0	0.00	1	1.67
Total	60	100	60	100	60	100	60	100

As shown on the table, Product A (25% All-Purpose Flour-75% Banana Flour) has slightly rough crusty surface as evaluated by 73.33% of the respondents, Product B (50% All-Purpose Flour-50% Banana Flour), Product C (75%- All-Purpose Flour-25% Banana Flour) and Product D (100% All-Purpose Flour) have moderately rough crusty surface as evaluated by 68.33%, 76.67% and 41.67% of the respondents respectively.

This means that among the products, those made of 25% all-purpose flour and

75% banana flour has slightly rough crusty surface and the rough crusty surface of banana tart shell depends on the amount of banana flour added to all-purpose flour. In products B and C, only 50% and 25% banana flour was added to all-purpose flour that's why it has moderately rough and crusty surface.

This implies that the smaller the amount of banana flour added, the rough and crusty surface of banana tart shell was achieved. This could be attributed to all-purpose flour which resulted to rough and crusty surface crust.

Color (Inside Characteristics. Table 4 presents the sensory characteristics of banana tart shell as to its color.

Table 4 *Sensory Characteristics of Banana tart Shell as to Color (Inside Characteristic)*

ATTRIBUTES	A		B		C		D	
Color	N	%	N	%	N	%	N	%
Light Khaki	4	6.67	4	6.67	9	15.00	46	76.67
Khaki	49	81.67	18	30.00	4	6.67	2	3.33
Wheat Brown	4	6.67	10	16.67	35	58.33	10	16.67
Light Brown	3	5.00	28	46.67	12	20.00	2	3.33
Total	60	100	60	100	60	100	60	100

As shown on the table, Product A (25% All-Purpose Flour-75% Banana Flour) has khaki color as evaluated by 81.67% of the respondents; Product B (50% All-Purpose Flour-50% Banana Flour) has light brown color evaluated by 46.67% of the respondents, Product C (75% - All-Purpose Flour-25% Banana Flour) has wheat brown color as evaluated by 58.33% of the respondents and Product D (100% All-Purpose Flour) has light khaki color as evaluated by 76 67% of the respondents.
This means that the likeness of the evaluators as to inside and outside color of banana tart shell does not change. The use of banana flour in different proportions with all-purpose flour made the products vary in color.

This implies that the inside characteristics of banana tart shell and its outside characteristics do not differ from each other because during the baking process, the temperature of the oven was regulated very well to avoid over baking which could result to darker products Furthermore, this implies that the variables added to all-purpose flour has strong properties in which the color changed with the different products.

Aroma. Table 5 represents the sensory characteristics of banana tart shell as to its aroma.

Table 5 *Sensory Characteristics of Banana Tart Shell as to Aroma*

ATTRIBUTES	A		B		C		D	
Aroma	N	%	N	%	N	%	N	%
Very distinct banana aroma	37	61.67	14	23.33	6	10.00	0	0.00
Moderately distinct banana aroma	14	23.33	29	48.33	20	33.33	8	13.33
Slightly distinct banana aroma	6	10.00	17	28.33	33	55.00	11	18.33
No distinct banana aroma	3	5.00	0	0.00	1	1.67	41	68.33
Total	60	100	60	100	60	100	60	100

As shown on the table, Product A (25% All-Purpose Flour-75% Banana Flour) has a very distinct banana aroma as rated by 61.67% of the respondents. Product B (50% All-Purpose Flour-50% Banana Flour) has moderately distinct banana aroma as rated by 48.33% of the respondents, Product C (75%- All-Purpose Flour-25% Banana Flour) has slightly distinct banana aroma as rated by 55% of the respondents and Product D (100% All-Purpose Flour) has no distinct banana aroma as rated by 68.33% of the respondents. This means that banana aroma was evident on the three experimental formulations Banana has strong aroma property that even if it is processed into flour, its aroma always emerged even in smaller amount like in Product C which consists of 75% all-purpose flour and 25% banana flour. This implies that the aroma of banana can be identified depending on the amount of banana flour added to all-purpose flour The more banana flour added to all-purpose flour, the more distinct the smell of the banana. This further implies that banana has strong aroma which is distinguishable even in small amount.

Banana flour has a pleasing aroma when added to all-purpose flour in baking tart shells.

Taste. Table 6 presents sensory characteristics of banana tart shell as to its taste.

Table 6 *Sensory Characteristics of Banana Tart Shell as to Taste*

ATTRIBUTES	A		B		C		D	
Taste	N	%	N	%	N	%	N	%
Very distinct banana taste	32	53.33	9	15.00	3	5.00	3	5.00
Moderately distinct banana taste	20	33.33	39	65.00	21	35.00	6	10.00
Slightly distinct banana taste	4	6.67	11	18.33	35	58.33	9	15.00
No distinct banana taste	1	6.67	1	1.67	1	1.67	42	70.00
Total	60	100	60	100	60	100	60	100

As shown on the table, Product A (25% All-Purpose Flour-75% Banana Flour) has a very distinct banana taste as evaluated by 53.33 percent of the respondents, Product B (50% All-Purpose Flour-50% Banana Flour) has moderately distinct banana taste as evaluated by 65% of the respondents, Product C (75%- All-Purpose Flour-

25% Banana Flour) has slightly distinct banana taste as evaluated by 58.33% of the respondents and product D (100% All-Purpose Flour) has no distinct banana taste as evaluated by 70% of the respondents.

This means that the three experimental formulations were identified by the evaluators to have banana taste.

Banana has strong taste which can be easily distinguished. For example, in Product C which consisted of 75% all-purpose flour and 25% banana flour was rated to have slightly distinct banana taste.

This implies that the flavor of banana tart depends on the amount of banana flour added to all-purpose flour. The more banana flour added to the mixture, the stronger the distinction of banana taste on the products.

Texture. As shown on Table 7, Product A (25% All-Purpose Flour-75% Banana Flour) was rated by 48.33% of the respondents as not flaky. Product B (50% All-Purpose Flour-50% Banana Flour) was rated by 53 33% of the respondents to have moderately flaky texture, Product C (75% All-Purpose Flour-25% Banana Flour) was rated by 73.33% of the respondents to have moderately flaky texture and product D (100% All- Purpose Flour) has a very flaky texture as rated by 61.67% of the respondents.

This means that a very flaky texture in baking tart shells is achieved only by using 100% all-purpose flour. When more banana flour is added to all-purpose flour, banana tart shell will not become flaky because banana flour has no gluten. Product A, was not flaky because more banana flour was added to all-purpose flour in baking tart shells. while in Products B and C, it has moderate flaky texture because of lesser proportion of banana flour was used.

The results imply that the greater amount of banana flour lessens or eliminates the flakiness of banana tart shell. This is attributed to the banana flour since it has no gluten and therefore it is impossible to achieve a very flaky result on the crust.

Table 7 *Sensory Characteristics of Banana Tart Shell as to Texture*

ATTRIBUTES	**A**		**B**		**C**		**D**	
Texture	N	%	N	%	N	%	N	%
Very flaky	2	3.33	1	1.67	6	10.00	37	61.67
Moderately flaky	8	13.33	32	5.33	44	73.33	16	26.67
Slightly flaky	21	35.00	22	36.67	7	11.67	7	11.67
Not flaky	29	48.33	5	8.33	3	5.00		0.00
Total	60	100	60	100	60	100	60	100

The sensory results showed that texture differed significantly because of the variables added to the product. In this study, the texture of the products differed from each other because of the different proportions of banana flour to all-purpose flour.

Table 8 shows the ANOVA for the appearance of banana tart shell.

Table 8 *ANOVA Table for the Appearance of Banana Tart Shell*

Source	Type III Sum of Squares	Df	Mean Square	F	p
Corrected Model	93.838[a]	15	6.256	14.164	.000
Intercept	52373.387	1	52373.387	118576.414	.000
Tart Shell	90.014	3	30.005	67.932	.000
Error	416.950	944	.422		
Total Corrected Total	52880.351 506.964	948 947			

* p < .01

As shown on the table, there was a significant difference in the level of acceptability of banana tart shell as to appearance (F=67.932, P=.000). This implies that the addition of banana flour to all-purpose flour in different proportions affected the appearance of the finished product.

Table 9 shows the ANOVA for the aroma of banana tart shell.

Table 9 *ANOVA Table for the Aroma of Banana Tart shell*

Source	Type III Sum	Df	Mean	F	p

	of Squares		Square		
Corrected Model	68.299[a]	15	4.553	9.588	.000
Intercept	52771.518	1	52771.518	111120.779	.000
Tart Shell	60.483	3	20.161	42.453	.000
Error	448.308	944	.475		
Total	53,280.309	948			
Corrected Total	516.607	947			

* p < .01

The table shows that there is a significant difference on the level of acceptability of banana tart shell as to aroma (F=42.453, P=.000). This implies that there was a difference as to aroma when different proportions of banana flour was added to all-purpose flour in baking tart shells .

Therefore, the null hypothesis which states that there is no significant difference in the level of acceptability of banana tart shell in terms of aroma was rejected.

Table 10 shows the ANOVA for the taste of banana tart shell.

Table 10 *ANOVA Table for the Taste of Banana Tart Shell*

Source	Type III Sum of Squares	Df	Mean Square	F	p
Corrected Model	226.651[a]	15	15.110	26.600	.000
Intercept	51507.056	1	51507.056	90674.420	.000
Tart Shell	221.330	3	73.777	129.878	.000
Error	536.233	944	.568		
Total	52269.941	948			
Corrected Total	757.563	947			

* p < .01

As shown in the table, there was a significant difference on the level of acceptability of banana tart shell as to taste (F=129.878, p=0.000).

The difference on the banana tart shell existed because when banana flour was added to all-purpose flour in different proportions, it affected the taste of the tart shell.

Table 11 shows the ANOVA for the texture of banana tart shell.

Table 11 *ANOVA Table for the Texture of Banana Tart Shell*

Source	Type III Sum of Squares	Df	Mean Square	F	p
Corrected Model	159.499[a]	15	10.633	23.727	.000
Intercept	52712.665	1	52712.665	117620.804	.000
Tart Shell	151.530	3	50.510	112.706	.000
Error	423.061	944	.448		
Total	53,287.256	948			
Corrected Total	574.591	947			

* p < .01

As shown in the table, there was a significant difference in the level of acceptability of banana tart shell as to texture (F-112.706, p=.000). This means that tart shells were not the same as to texture. The difference on the texture of the tart shell was because of the proportions of banana flour to all-purpose flour.

SUMMARY OF FINDINGS

This is an experimental study which aimed to determine the sensory characteristics and acceptability of Banana Tart Shell. The Nine- Point Hedonic Scale and sensory characteristics score sheet were the instruments used by 20 Home Economics teachers, 20 students taking up cookery as their elective and 20 homemakers of Jose Monfort National Science High School and Iloilo Science and Technology University-Barotac Nuevo Campus.

The data collected was computed using the frequency and percentage for the sensory characteristics. Mean and Standard Deviation were used to determine the level of acceptability and Two-Way Analysis of Variance set at 0.01 level of significance to determine the significant differences. The treatments were replicated three times.

Specifically, this study sought answers to the following questions:

1. What are the sensory characteristics of banana tart shell in different proportions of banana flour in terms of appearance, aroma, taste and texture?

2. What is the level of acceptability of banana tart shell in terms of appearance, aroma, taste and texture?

3. Is there a significant difference in the level of acceptability of banana tart shell in terms of appearance, aroma, taste and texture?

The null hypothesis of this study states that there is no significant difference in the level of acceptability of banana tart shell in terms of appearance, aroma, taste and texture. This was tested at 0.01level of significance.

The following were the findings of the study.

1. The sensory characteristics of Banana Tart Shell were as follows, moderately followed molder's shape, wheat brown in color (outside), moderately rough crusty surface, khaki color (inside), moderately distinct banana aroma, moderately distinct banana taste and moderately flaky.

2. As to the level of acceptability, the Banana Tart prepared from 75% all purpose flour and 25% banana flour were Liked Very Much by the respondents in terms of appearance, taste, texture, while Banana Tart with Calabur Fruit Filling prepared from 50% all purpose flour and 50% banana flour was Liked Very Much by the respondents in terms of aroma.

3. Statistical results of the study showed that there was a significant difference in the level of acceptability of banana tart shell in terms of appearance, aroma, taste and texture.

CONCLUSIONS

Based on the findings, the following conclusions were made:

1. The sensory characteristics of banana tart shell depends on the amount of banana flour added to all-purpose flour. This is attributed to banana flour which when added to all-purpose flour vary its appearance, aroma, taste and texture.

2. Lesser amount of banana flour in proportion with all-purpose flour was the most acceptable in terms of appearance, taste and texture of the tart shell. However, in terms of aroma, the proportion of banana flour and all-purpose flour should be equal to be the most acceptable product to the evaluators.

3. There is a remarkable difference on the appearance, aroma, taste and texture of banana tart shell in different proportions. This is due to the sensory characteristics of banana flour which when added to all-purpose flour in different proportions affected its attributes.

RECOMMENDATIONS

Based on the findings and conclusions, the following were recommended.

1. Since banana tart shell prepared from 75% all-purpose flour and 25% banana flour was comparable with banana tart shell prepared from 100% all-purpose flour, it is recommended that results of the study be disseminated to the public through lecture demonstration, livelihood training and food expositions.

2. It is recommended that entrepreneurs will prepare tart shells from banana flour as snack items to be sold in the market.

3. A follow up study be conducted to check the validity of its results and determine the proximate composition, and shelf-life of the Banana Tart Shell.

4. Farmers should be encouraged to plant more saba banana for the abundant supply and production of banana flour.

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