



EXPLORING BANANA (*Musa balbisiana colla*) BLOSSOM WITH FORTIFIED SAGIP NUTRI-PACK FOR MACAROON PRODUCTION

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<https://doi.org/10.5281/zenodo.12599325>

ABSTRACT

This research study focuses on the innovative utilization of Banana Blossom (*Musa balbisiana colla*) with Fortified Sagip Nutri-Pack for Macaroon Production. The methodology employed involved a comprehensive approach, utilizing a variety of preparation tools, equipment, and specific ingredients tailored for creating banana blossom macaroons. The study's developmental procedure included stages such as harvesting, peeling, washing, boiling, chopping, and squeezing the banana blossoms, followed by measuring, mixing, baking, packaging, and labeling the final product. Sensory evaluation was conducted with 60 respondents from different age groups using a 9-point Hedonic Scale to assess the acceptability of the macaroons based on appearance, aroma, taste, and texture. The nutritional analysis revealed that the banana blossom macaroons are nutritious, offering significant levels of dietary fiber and essential amino acids. The cost and return analysis demonstrated a consistent return on investment of 40% across all treatments. The shelf-life study indicated that these macaroons can maintain quality for up to ten days at room temperature and up to a month when refrigerated. In conclusion, incorporating banana blossom in macaroon production presents a promising innovation with potential for commercial production, highlighting its feasibility, nutritional value, sensory appeal, economic viability, and shelf-life.

Keywords: *Banana Blossom, Sagip Nutri-Pack, Macaroon Production, Nutritional Analysis*

INTRODUCTION

In recent years, the Philippine Congress has enacted various laws to enhance Filipinos' nutritional health, reflecting a broader commitment to public health through dietary improvements. Notably, the Department of Education (DepEd) has implemented policies that regulate the sale of nutritious foods and beverages in schools and mandate feeding programs (Lawson, 2012). These legislative and policy measures underscore the government's dedication to fostering healthier eating habits among the population, particularly among school-aged children.

This study explores the culinary application of banana blossoms (*Musa balbisiana* Colla) as a primary ingredient in macaroon production. Banana blossoms, or banana hearts, are low in calories and contain small amounts of essential minerals such as calcium, potassium, phosphorus, copper, and zinc (Singh, Singh, & Yadav, 2018). Additionally, they are rich in antioxidants and have a lower natural sugar content compared to banana fruits, making them a potentially healthier ingredient for various culinary applications (Poem, 2013; Palczak et al., 2020).

Traditionally, macaroons are recognized as cookies made from sweet meringue and ground almonds, offering a distinct flavor and texture that enriches the sensory experience (Palczak et al., 2020). The choice of macaroons for this research is driven by their cost-effectiveness and popularity, particularly among students at Isabela School of Arts and Trades who favor baked goods like traditional coconut macaroons.

Incorporating banana blossoms with the corn-based SAGIP Nutri-Pack into macaroons could significantly enhance the nutritional value of these snacks. The SAGIP Nutri-Pack is a fortified blend containing corn, mung beans, sesame, cacao pod husk, malunggay (*Moringa oleifera*), and turmeric powder. This mix offers a comprehensive array of macro and micronutrients essential for maintaining bodily functions and preventing nutritional deficiencies (Reyes, 2017). Including these ingredients helps prevent anemia, neuritis, and memory disorders and protects against cancers, infectious diseases, high blood pressure, and strokes (Reyes, 2017; Bernardo, 2018).

The Corn-Based SAGIP Nutri-Pack was developed as a supplementary mix of food by the College of Education at Isabela State University-Main to combat malnutrition (Bernardo, 2018). This study aims to further this initiative by enhancing our understanding of the culinary uses of banana blossoms, locally known as "Susup" in Ilocano. The research will be implemented in the school canteen of Isabela School of Arts and Trades-Main, as part of the ongoing Income Generating Project (IGP) "Project Bake It With You (Bakery Product Making)" undertaken by the researcher.

Importantly, this initiative aligns with DepEd Order No. 13 Series 2017, which outlines policies and guidelines for promoting healthy food and beverage choices in schools and DepEd offices. This policy encourages the provision of healthy, nutritious, and affordable menu options, setting standards for food choices and promoting healthy eating habits among youth and DepEd employees (Department of Education, 2017).

The municipality of Benito Soliven in Isabela stands to benefit significantly from the outcomes of this research, given that bananas are a central agricultural product in the region. Utilizing banana blossoms for various food items can enhance the town's recognition as a leading banana product producer not only in Cagayan Valley but also in the entire Philippines. Similarly, the City of Ilagan would benefit, as the product incorporates a corn-based ingredient, a source of agricultural pride in the city (Philippine Statistics Authority, 2020).

Therefore, the primary objective of this study is to investigate the development of food products utilizing banana blossoms, focusing on their nutritional value and sensory qualities when combined with a Corn-Based SAGIP Nutri-Pack. This research aims to determine their suitability for macaroon production and as a nutritious snack option for school canteens. Overall, this endeavor contributes to achieving several Sustainable Development Goals (SDGs), particularly "No Poverty," "Zero Hunger," "Good Health and Well-being," "Decent Work and Economic Growth," "Industry, Innovation, and Infrastructure," and "Sustainable Cities and Communities" by introducing this innovative product (United Nations, 2020).

Research Questions

Generally, the study aimed to determine the acceptability and nutritive value of Banana Blossom with Fortified Sagip Nutri-pack for Macaroon Production. Specifically, it sought to answer the following:

1. What processes are involved in making banana blossoms with Fortified Sagip Nutri-Pack for Macaroon Production?
2. What is the nutritive value of Banana Blossom with Fortified Sagip Nutri-Pack for Macaroon Production?
3. What is the level of acceptability of the banana blossom with corn-based Sagip Nutri-pack for macaroon production of 1000g, 900g, 800g, 700g, and the original recipe in terms of:
 - a. Appearance;
 - b. Aroma;
 - c. Taste; and
 - d. Texture
4. Is there a significant difference in the evaluation of the food experts, food technology students, and consumers on the prepared banana blossom with corn-based Sagip Nutri-pack for macaroon production in different ratios?
5. What is the cost analysis computed for the different treatments?
6. What is the shelf-life of banana blossom with corn-based Sagip Nutri-pack for macaroon production at room temperature?

METHODOLOGY

A. Materials

1. Tools and Equipment

Table 1 below shows the preparation tools and equipment that will be used during the conduct of the study.

Table 1. Tools, utensils, and equipment used in the conduct of the study

PREPARATION TOOLS	MEASURING TOOLS	CUTTING TOOLS	MIXING TOOLS	PACKAGING MATERIALS	EQUIPMENT
Sterilize knife	Measuring cup	Sterilize knife	Rubber scraper	Small round plastic container	Blender
Spatula	Measuring spoon		Wooden spoon	Medium rectangular plastic container	Stand Mixer
Collander/Strainer	Digital Weighing Scale		Mixing bowl	Macaroon liner	Gas range
Chopping boards				LDPE plastic Bags Food Packaging	Electric Oven
Piping bag					
Disposable gloves					
Utility tray					

2. Ingredients

Table 2 shows the proportion of ingredients to be used in the preparation of banana blossom Macaroon with Corn-Based Sagip Nutri-Pack. The recipes used for Coconut macaroon in this study are based on the standard recipes in the Bread and Pastry Production NC II Module.

Table 2. The proportion of ingredients used in Baking Banana Blossom with Corn-Based Sagip Nutri-Pack for Macaroon Production

Ingredients	T1	T2	T3	T4	T5
Corn Based Sagip Nutri-Pack		100g	100g	100g	100g
All-Purpose Flour	1000g	1000g	1000g	1000g	1000g

Desiccated Coconut	1000g				
Boiled and chopped Banana Blossom/		1000g	900g	800g	700g
Butter	678g	678g	678g	678g	678g
Eggs	810g	810g	810g	810g	810g
Granulated Sugar	820g	820g	820g	820g	820g
Condensed milk	1900g	1900g	1900g	1900g	1900g
Vanilla	18g	18g	18g	18g	18g

B. Developmental Procedure

1. Collection and Preparation of the Material

Banana blossoms were harvested from the Banana Farm in the town of Benito Soliven, Isabela. Detach the Banana blossoms from the Saba variety with tightly packed bracts. The tough outer layers shall be removed until the pale pink leaves appear which are tender and edible. The edible bracts removed were immediately submerged in clean water to avoid discolorations. This process of removing the leaves, and then the smaller fronds was repeated until the leaves became too small to peel. At this point, just chop off whatever remains of the stem, and slice or dice the smaller leaves and small heart at the center. The fronds and bracts submerged in boiling water were chopped before it is squeezed to remove the bitter taste and pongee smell. The Macaroon will be prepared using the proportion of chopped banana blossom with the ratio of 1000g, 900g, 800g, and 700g for the treatment samples. The flowchart for making banana blossom macaroons is shown in Figure 3.

After measuring all the ingredients, preheat first the oven to 350 degrees F. Prepare the macaroon molder. In a mixing bowl, cream the butter, sugar, and eggs. Add condensed milk, all-purpose flour, and vanilla. stir in the boiled and chopped Banana blossom. Use a pastry bag and fill the mixture into it. Drop the batter mixture into lined muffin pans. Bake at 375 degrees F. until golden brown. Remove the baked macaroon from the oven and keep it cold.

The same procedure will be done for the experimental products by using separate baking utensils to eliminate contaminations that will affect the organoleptic characteristics of the product.

For better understanding, the flowchart (Figure 1) below shows the process followed by the researcher during the developmental stage of the product.

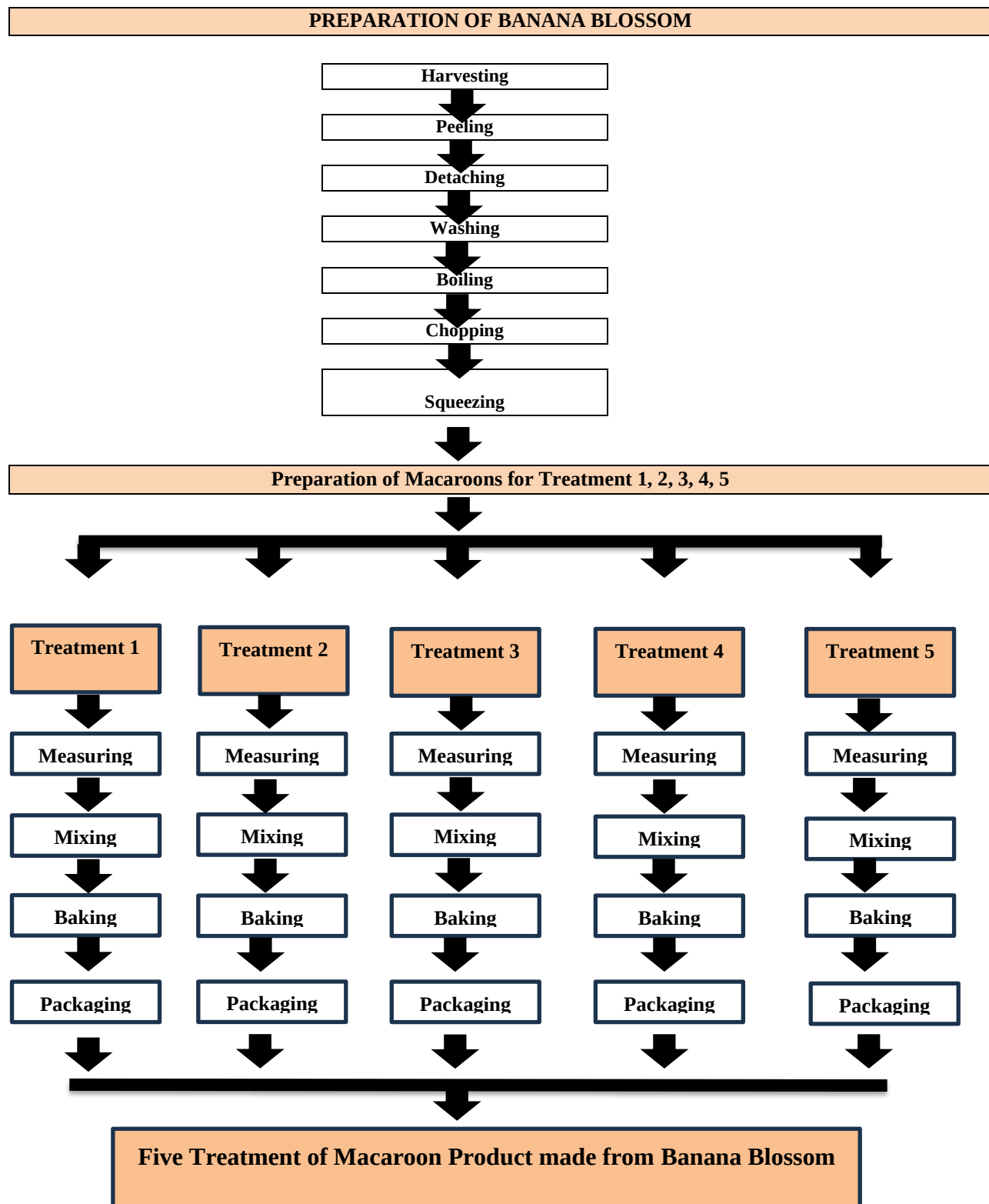


Figure 1. Flow Diagram of the Procedure in Baking Banana Blossom (*Musa acuminata Colla*) with Corn-Based Sagip Nutri-Pack.

Data Gathering Instrument

This study used a modified instrument from Aggabao's (2017) experimental study entitled "Macaroons with shoots from different species of bamboo". The instrument was modified to suit the objectives of the present study.

Data Gathering Procedure

Permission to conduct the study through sensory evaluation was requested from the respondents, consisting of children, teenagers, adults, and experts. After permission was granted, the administration of the sensory evaluation followed. Directions concerning the accomplishment of the questionnaires was discussed by the researcher with the evaluators personally. Copies of the checklist forms were retrieved after being completed by the respondents.

The Department of Agriculture assessed the developed food products to determine their nutritional value. In addition, to determine the shelf life of the food products, the observation method was used to identify changes in the appearance, aroma, taste, and texture of Banana Blossom with Fortified Sagip Nutri-Pack for Macaroon Production. It was conducted at the Regional Food Technology Development and Incubation Center; Integrated Laboratory Division of the Department of Agriculture Regional Government Center, Carig Sur, Tuguegarao City, Cagayan.

C. Treatment of the Study

The proportions of ingredients of Banana Blossom with Fortified Sagip Nutri-Pack for Macaroon Production are the same except for the main ingredient which was the chopped banana blossom. A different ratio of Banana Blossom with Fortified Sagip Nutri-Pack for Macaroon Production was used as the main ingredient in making macaroons.

The treatments to be used in this study are as follows:

- T1 = Commercial Macaroon
- T2 = Corn Sagip Nutri-pack (100g), All-purpose Flour (1000g), Banana blossom (1000g)
- T3 = Corn Sagip Nutri-pack (100g), All-purpose Flour (1000g), Banana blossom (900g)
- T4 = Corn Sagip Nutri-pack (100g), All-purpose Flour (1000g), Banana blossom (800g)
- T5 = Corn Sagip Nutri-pack (100g), All-purpose Flour (1000g), Banana blossom (700g)

D. Sensory Evaluation

The finished products were subjected to sensory evaluation. Sixty (60) respondents from varied age groups shall be selected and properly oriented on how to

evaluate the products using the 9-point Hedonic Scale. The samples were arranged and evaluated.

Sensory evaluation was conducted at the Bread and Pastry Production Laboratory Room, Isabela School of Arts and Trades, City of Ilagan, Isabela to determine the acceptability of the experimental product in terms of color/appearance, odor/aroma, taste/flavor, texture and general acceptability of Banana Blossom with Fortified Sagip Nutri-Pack for Macaroon Production. The instrument for data gathering contained a score sheet using the 9-point Hedonic Scale.

The range of scale is interpreted as follows:

	Range	Qualitative Description
9	8.50-9.00	Like Extremely
8	7.50-8.49	Like Very Much
7	6.50-7.49	Like Moderately
6	5.50-6.49	Like Slightly
5	4.50-5.49	Neither Like nor Dislike
4	3.50-4.49	Dislike Slightly
3	2.50-3.49	Dislike Moderately
2	1.50-2.49	Dislike Very Much
1	1.00-1.49	Dislike Extremely

A sensory panel was composed of sixty (60) individuals who will be identified as (20) food experts, (20) food technology students, and (20) consumers. The qualification of the panelists in terms of age should be 12-60 years old. They will be screened to be non-smokers, not liquor drinkers, and in good health during the sensory evaluation.

The treatment samples of 1 piece of macaroon were tasted and subjected to sensory evaluation by the panelists. The panelists evaluated the samples according to their color/appearance, odor/aroma, taste flavor, texture, and general acceptability using the Hedonic scale ratings. Requiring the respondents to rinse their mouths before tasting each sample was strictly observed as a standard procedure to ensure the credibility and validity of the result of the study.

E. Experimental Design

There were five treatments of the study (T1-301, T2-302, T3-303, T4-304, T5-305) which were assigned randomly to the experimental units within a block (BLK1, BLK2, BLK3, BLK4, BLK5).

The grouping of the experimental units per block was as follows:

Table 3. Arrangement of the 5 treatments (T1-301, T2-302, T3-303, T4-304, T5-305) and blocks of Banana Blossom Macaroon with Sagip Nutri-Pack Powder.

B	1	301	302	303	304	305
L	2	302	303	304	305	301
O	3	303	304	305	301	302
C	4	304	305	301	302	303
K	5	305	301	302	303	304

RESULTS AND DISCUSSION

Product Development

The banana blossom fortified with sagip Nutri-pack in macaroon production underwent different stages of development starting from harvesting, peeling, detaching, washing, boiling, chopping, squeezing, measuring, mixing, baking, packaging, and labeling. Through these stages of development, careful observation and analysis were done to come up with banana blossoms fortified with sagip Nutri-pack in macaroon production.

Preparation of Banana Blossom Macaroon in Five Treatments

The development process started with the creation of banana blossom macaroon with sagip Nutri-pack in four different treatments. The procedure began with peeling the cover of the banana blossom detaching the flowers, washing it after, and removing the buds. Boil the blossom with a small amount of salt to prevent darkness in color until thoroughly cooked, then drain and allow to cool. Chop with a knife and chopping board or grind the banana blossom with a blender then squeeze to remove the excess water. To present the measurements and ingredients systematically including the original recipe of Coconut Macaroon as a control variable in the study, a table is provided.

Table 4. Measurements and ingredients in the preparation of Coconut Macaroon

Measurements	Ingredients
1000 g	Desiccated Coconut
1000 g	All-Purpose Flour
678g	Butter
810g	Eggs
820g	Granulated Sugar
1900g	Condensed milk
18g	Vanilla

Procedure

The process of making coconut macaroons begins with accurately measuring all required ingredients and preheating the oven to 350 degrees Fahrenheit. Meanwhile, prepare the macaroon molder by lining it with appropriate liners or lightly greasing it to prevent sticking. In a mixing bowl, cream together the butter, sugar, and eggs until the mixture is smooth and well combined. Next, add condensed milk, all-purpose flour, and vanilla extract, and stir in the desiccated coconut until evenly distributed.

Once the mixture is ready, transfer it into a pastry bag for easier handling and pipe the batter into the lined macaroon pans, filling each mold to the desired level. Increase the oven temperature to 375 degrees Fahrenheit and bake the macaroons until they turn golden brown, which typically takes about 15-20 minutes. Carefully remove the baked macaroons from the oven and allow them to cool completely.

After the macaroons have cooled, store them in a microwaveable plastic container or transparent plastic wrapper. Seal the container or wrapper to maintain freshness, and label the packaging with the product name, ingredients, and production date for proper identification and traceability. Following these steps ensures the production of delicious and visually appealing coconut macaroons that are ready for storage, sale, or consumption.

Table 5. Measurements and ingredients in the preparation of four different Treatments of Banana Blossom Macaroon.

Measurements				Ingredients
T2	T3	T4	T5	
1000 g	900 g	800 g	700 g	Boiled and chopped Banana Blossom
1000 g	1000 g	1000 g	1000 g	All-Purpose Flour
100g	100g	100g	100g	Corn Based Sagip Nutri-Pack
678g	678g	678g	678g	Butter
810g	810g	810g	810g	Eggs
820g	820g	820g	820g	Granulated Sugar
1900g	1900g	1900g	1900g	Condensed milk
18g	18g	18g	18g	Vanilla

Procedure

The process of making the four treatments of banana blossom macaroons begins with accurately measuring all required ingredients and preheating the oven to 350 degrees Fahrenheit. Meanwhile, prepare the macaroon molder by lining it with appropriate liners or lightly greasing it to prevent sticking. In a mixing bowl, cream together the butter, sugar, and eggs until the mixture is smooth and well combined. Next, add

condensed milk, all-purpose flour, and vanilla extract, and stir in the boiled and chopped banana blossom until evenly distributed.

Once the mixture is ready, transfer it into a pastry bag for easier handling and pipe the batter into the lined macaroon pans, filling each mold to the desired level. Increase the oven temperature to 375 degrees Fahrenheit and bake the macaroons until they turn golden brown, which typically takes about 15-20 minutes. Carefully remove the baked macaroons from the oven and allow them to cool completely.

After the macaroons have cooled, store them in a microwaveable plastic container or transparent plastic wrapper. Seal the container or wrapper to maintain freshness, and label the packaging with the product name, ingredients, and production date for proper identification and traceability. Following these steps ensures the production of delicious and visually appealing banana blossom macaroons that are ready for storage, sale, or consumption.

Report of Analysis on the Nutritive Value of Banana Blossom with Fortified Sagip Nutri-Pack for Macaroon Production

The report analysis on the nutritive value of Banana Blossom with Fortified Sagip Nutri-Pack for Macaroon Production is shown in Table 6 below.

Table 6. Report of analysis on the nutritive value of Banana Blossom with Fortified Sagip Nutri-Pack for Macaroon Production

Lab No.	Sample Description	Crude Protein	Crude Fiber	Crude Fat	Moisture	Ash
		%	%	%	%	%
FT-24-0070	Treatment 1 For Banana Blossom, T1	4.29	1.63	13.28	24.17	0.84
FT-24-0071	Treatment 2 For Banana Blossom, T2	4.65	1.87	13.11	25.15	0.99
FT-24-0072	Treatment 3 For Banana Blossom, T3	4.47	1.41	13.60	25.46	0.95
FT-24-0073	Treatment 3 For Banana Blossom, T4	4.83	1.72	14.48	19.62	1.00

The outcome showed that the standard macaroon crude fat and the resultant crude fat differed little. Consequently, no evidence eating banana blossom macaroons can raise your chance of obesity or other linked health issues like high cholesterol and cardiovascular disease.

Based on the given result with its content of crude fat (13.28, 13.11, 13.60, 14.48 g/180 g) and total carbohydrates of 13 for treatment 2, 101 for treatment 3, 37 for treatment 4, and 108 for treatment 5, as is evident in the table, the Recommended Energy Nutrient Intake per 180 grams of the macaroon was 26% for treatment 2 and treatment 3, while 16% for treatment 4 and 28% for treatment 5. The sagip Nutri-pack enriched banana blossom macaroons can give customers extra energy so their bodies can work and function as intended.

Furthermore, the analysis report reveals that the crude fiber product content containing 1.63 g, 1.87 g, 1.41 g, and 1.72 g/180 g from treatment 2 to treatment 5 can aid in increasing the weight and size of stool as well as softening it. This means that those with stomach issues can benefit from these dietary fibers. A minor amount of protein (4.29 g, 4.65 g, 4.47 g, 4.83 g/180 g) is also present; this protein provides 11% of RENI for treatments 2 and 4, and 12% for treatments 3 and 5. Additionally, protein can provide amino acids, which the body needs to repair some of its muscles and bones.

Lastly, the analysis report reveals that out of all the treatments involving banana blossom fortified with Sagip Nutri-Pack for macaroons, the final treatment involving 700 grams of banana blossom had the highest nutrient content that had been tested.

Banana blossoms offer a noteworthy content of dietary fiber and well-balanced essential amino acids, making them a valuable addition to a healthy diet. These blossoms are abundant in macro elements like calcium (Ca), potassium (K), chlorine (Cl), and sulfur (S), as well as essential microelements such as manganese (Mn), zinc (Zn), and copper (Cu). Additionally, they contain alkaloids, glycosides, steroids, saponins, tannins, flavonoids, and terpenoids. Studies, including those by Tasnim et al. in 2020, suggest that the high levels of dietary fiber and polyphenols in banana blossoms contribute to various health benefits. Extracts from banana blossoms also act as natural antioxidants, aiding in the prevention of oxidative stress. The presence of these bioactive compounds indicates significant therapeutic potential, as highlighted by research conducted by Mapanao et al. in 2022 and Mostafa in an undisclosed year.

The Level of Acceptability of Banana Blossom Fortified with Sagip Nutri-Pack in Macaroon Production

The following table shows the level of acceptability of the banana blossom with corn-based Sagip Nutri-pack for macaroon production of 1000g, 900g, 800g, and 700g, and the original recipe in terms of appearance/color, aroma, taste, and texture.

Table 7. The level of acceptability of the original recipe of Coconut Macaroon in terms of appearance/color, aroma, taste, and texture

Treatment 1 Coconut Macaroon	Mean	Standard Deviation	Description
Appearance/Color			
a. Pleasing combination of colors and forms.	8.27	0.88	Like Very Much
b. Even, golden brown.	8.35	0.88	Like Very Much
c. The macaroon looks delicious.	8.30	0.89	Like Very Much
Grand Mean	8.30	0.77	Like Very Much
Aroma			
a. The coconut macaroon had a distinct aroma.	8.28	0.99	Like Very Much
b. A strong aroma emanates from the coconut macaroon.	8.18	1.16	Like Very Much
c. The coconut macaroon stimulates appetite.	8.30	0.87	Like Very Much
Grand Mean	8.25	0.90	Like Very Much
Taste			
a. The coconut macaroon had a sweet, wheaty flavor.	8.28	1.28	Like Very Much
b. The coconut macaroon is delicious.	8.40	0.92	Like Very Much
c. The taste of the coconut macaroon is just right.	8.35	0.90	Like Very Much
Grand Mean	8.34	0.86	Like Very Much
Texture			
a. The coconut macaroon is tender.	8.37	0.86	Like Very Much
b. The coconut macaroon is velvety and moist.	8.17	1.08	Like Very Much
c. The coconut macaroon is light, not compact or soggy.	8.12	0.92	Like Very Much
Grand Mean	8.22	0.84	Like Very Much

Table 7 shows the acceptability of commercial coconut macaroon as a controlled variable **Treatment 1** in the study focused on four key sensory attributes: appearance, aroma, taste, and texture. The evaluation utilized specific descriptors for each attribute, providing mean scores and standard deviations to quantify the level of acceptability.

For appearance, the macaroons were rated on three criteria: the pleasing combination of colors and forms (mean = 8.27, SD = 0.88), an even, golden brown color (mean = 8.35, SD = 0.88), and overall visual appeal and deliciousness (mean = 8.30, SD = 0.89). The grand mean for appearance was 8.30 with a standard deviation of 0.77, indicating that participants generally "like very much" the visual presentation of the macaroons.

In terms of aroma, participants evaluated the macaroons based on the distinctness of the aroma (mean = 8.28, SD = 0.99), the strength of the aroma (mean = 8.18, SD = 1.16), and the ability of the aroma to stimulate appetite (mean = 8.30, SD = 0.87). The grand mean for aroma was 8.25 with a standard deviation of 0.90, suggesting that the aroma was highly appealing to the participants, who "like very much" the scent of the macaroons.

The taste was assessed by considering the sweetness and wheaty flavor (mean = 8.28, SD = 1.28), overall deliciousness (mean = 8.40, SD = 0.92), and the balance of taste (mean = 8.35, SD = 0.90). The grand mean for taste was 8.34 with a standard deviation of 0.86, reflecting a strong positive reception where participants "like very much" the flavor profile of the macaroons.

Lastly, the texture was evaluated on the tenderness of the macaroons (mean = 8.37, SD = 0.86), their velvety and moist consistency (mean = 8.17, SD = 1.08), and their lightness, avoiding a compact or soggy feel (mean = 8.12, SD = 0.92). The grand mean for texture was 8.22 with a standard deviation of 0.84, showing that participants "like very much" the textural qualities of the macaroons.

Overall, the coconut macaroons scored consistently high across all sensory attributes, with grand means reflecting a high level of acceptability, indicating that participants "like very much" these macaroons in terms of appearance, aroma, taste, and texture.

Table 8. The level of acceptability of Banana Blossom Fortified with Sagip Nutri-Pack In Macaroon Production of 1000g in terms of appearance/color, aroma, taste, and texture

Treatment 2 Banana Blossom Macaroon	Mean	Standard Deviation	Description
Appearance/Color			
a. Pleasing combination of colors and forms.	8.37	0.88	Like Very Much
b. Even, golden brown.	8.35	0.80	Like Very Much
c. The macaroon looks delicious.	8.32	0.85	Like Very Much
Grand Mean	8.34	0.74	Like Very Much
Aroma			
a. The blossom macaroon had a distinct aroma.	8.28	0.88	Like Very Much
b. A strong aroma emanates from the blossom macaroon.	8.23	0.98	Like Very Much
c. The blossom macaroon stimulates appetite.	9.60	0.34	Like Extremely
Grand Mean	8.70	3.54	Like Extremely
Taste			
a. The blossom macaroon had a sweet, wheaty flavor.	8.22	0.88	Like Very Much

b. The blossom macaroon is delicious.	8.42	0.87	Like Very Much
c. The taste of the blossom macaroon is just right.	8.50	0.70	Like Extremely
Grand Mean	8.38	0.69	Like Very Much
Texture			
a. The blossom macaroon is tender.	8.43	0.77	Like Very Much
b. The blossom macaroon is velvety and moist.	8.43	0.77	Like Very Much
c. The blossom macaroon is light, not compact or soggy.	8.48	0.70	Like Very Much
Grand Mean	8.45	0.62	Like Very Much

Table 8 presents the evaluation of the banana blossom macaroon, referred to as **Treatment 2**, focused on the same four sensory attributes: appearance, aroma, taste, and texture. Each attribute was assessed using specific criteria, and the results were summarized with mean scores and standard deviations.

For appearance, the banana blossom macaroons were judged on the combination of colors and forms (mean = 8.37, SD = 0.88), the evenness of the golden-brown color (mean = 8.35, SD = 0.80), and the overall visual appeal and deliciousness (mean = 8.32, SD = 0.85). The grand mean for appearance was 8.34 with a standard deviation of 0.74, indicating that participants "like very much" the visual presentation of these macaroons.

Regarding aroma, the macaroons were rated based on the distinctness of the aroma (mean = 8.28, SD = 0.88), the strength of the aroma (mean = 8.23, SD = 0.98), and the ability of the aroma to stimulate appetite (mean = 9.60, SD = 0.34). The grand mean for aroma was 8.70 with a standard deviation of 3.54, suggesting a high variability in responses but an overall strong positive reception, especially notable with the "like extremely" rating for the appetite-stimulating property.

In terms of taste, the macaroons were evaluated on their sweet, wheaty flavor (mean = 8.22, SD = 0.88), overall deliciousness (mean = 8.42, SD = 0.87), and the balance of taste (mean = 8.50, SD = 0.70). The grand mean for taste was 8.38 with a standard deviation of 0.69, reflecting that the participants "like very much" the flavor profile, with a slight inclination towards "like extremely" for the balance of taste.

For texture, the evaluations considered the tenderness of the macaroons (mean = 8.43, SD = 0.77), their velvety and moist consistency (mean = 8.43, SD = 0.77), and their lightness, avoiding a compact or soggy feel (mean = 8.48, SD = 0.70). The grand mean for texture was 8.45 with a standard deviation of 0.62, indicating a strong preference, with participants "like very much" the textural qualities of these macaroons.

Overall, the banana blossom macaroons in Treatment 2 received high ratings across all sensory attributes. The grand means suggest that participants generally "*like very much*" these macaroons in terms of appearance, aroma, taste, and texture, with

particularly high marks for aroma and texture. The variability in aroma ratings, indicated by the higher standard deviation may reflect diverse preferences among participants, but the overall positive reception is clear.

Table 9. The level of acceptability of Banana Blossom Fortified with Sagip Nutri-Pack In Macaroon Production of 900g in terms of appearance/color, aroma, taste, and texture

Treatment 3 Banana Blossom Macaroon	Mean	Standard Deviation	Description
Appearance/Color			
a. Pleasing combination of colors and forms.	8.45	0.62	Like Very Much
b. Even, golden brown.	8.47	0.79	Like Very Much
c. The macaroon looks delicious.	8.53	0.75	Like Extremely
Grand Mean	8.48	0.64	Like Very Much
Aroma			
a. The blossom macaroon had a distinct aroma.	8.60	0.72	Like Extremely
b. A strong aroma emanates from the blossom macaroon.	8.47	0.81	Like Very Much
c. The blossom macaroon stimulates appetite.	8.53	0.65	Like Extremely
Grand Mean	8.53	0.63	Like Extremely
Taste			
a. The blossom macaroon had a sweet, wheaty flavor.	8.43	0.74	Like Very Much
b. The blossom macaroon is delicious.	8.62	0.71	Like Extremely
c. The taste of the blossom macaroon is just right.	8.58	0.74	Like Extremely
Grand Mean	8.54	0.67	Like Extremely
Texture			
a. The blossom macaroon is tender.	8.47	0.81	Like Very Much
b. The blossom macaroon is velvety and moist.	8.43	0.81	Like Very Much
c. The blossom macaroon is light, not compact or soggy.	8.50	0.70	Like Extremely
Grand Mean	8.47	0.70	Like Very Much

Table 9 presents the assessment of the banana blossom macaroon **Treatment 3**, the sensory attributes of appearance, aroma, taste, and texture were thoroughly evaluated, resulting in high levels of acceptability as indicated by the mean scores and standard deviations.

For appearance, the macaroons were judged on the combination of colors and forms (mean = 8.45, SD = 0.62), the evenness of the golden-brown color (mean = 8.47, SD = 0.79), and their overall visual appeal and deliciousness (mean = 8.53, SD = 0.75). The grand mean for appearance was 8.48 with a standard deviation of 0.64, suggesting

that participants *"like very much"* the visual aspects of these macaroons, with a slight inclination towards *"like extremely."*

In terms of aroma, the distinctness of the aroma (mean = 8.60, SD = 0.72), the strength of the aroma (mean = 8.47, SD = 0.81), and the ability of the aroma to stimulate appetite (mean = 8.53, SD = 0.65) were evaluated. The grand mean for aroma was 8.53 with a standard deviation of 0.63, reflecting that the participants *"like extremely"* the aroma of the macaroons, indicating a strong positive reception across the board.

The taste was assessed based on the sweet, wheaty flavor (mean = 8.43, SD = 0.74), overall deliciousness (mean = 8.62, SD = 0.71), and the balance of taste (mean = 8.58, SD = 0.74). The grand mean for taste was 8.54 with a standard deviation of 0.67, showing that participants *"like extremely"* the flavor profile of these macaroons, emphasizing their high palatability.

For texture, the evaluations considered the tenderness of the macaroons (mean = 8.47, SD = 0.81), their velvety and moist consistency (mean = 8.43, SD = 0.81), and their lightness, avoiding a compact or soggy feel (mean = 8.50, SD = 0.70). The grand mean for texture was 8.47 with a standard deviation of 0.70, indicating that participants *"like very much"* the textural qualities of these macaroons.

Overall, the banana blossom macaroons in Treatment 3 received exceptionally high ratings across all sensory attributes. The grand means suggest that participants generally *"like extremely"* the macaroons in terms of aroma and taste, while they *"like very much"* the appearance and texture. These results indicate a strong positive reception and high acceptability of the banana blossom macaroons.

Table 10. The level of acceptability of Banana Blossom Fortified with Sagip Nutri-Pack In Macaroon Production of 800g in terms of appearance/color, aroma, taste, and texture

Treatment 4 Banana Blossom Macaroon	Mean	Standard Deviation	Description
Appearance/Color			
a. Pleasing combination of colors and forms.	8.52	0.62	Like Extremely
b. Even, golden brown.	8.68	0.60	Like Extremely
c. The macaroon looks delicious.	8.63	0.58	Like Extremely
Grand Mean	8.61	0.51	Like Extremely
Aroma			
a. The blossom macaroon had a distinct aroma.	8.52	0.77	Like Extremely
b. A strong aroma emanates from the blossom macaroon.	8.50	0.75	Like Extremely
c. The blossom macaroon stimulates appetite.	8.55	0.67	Like Extremely
Grand Mean	8.52	0.64	Like Extremely
Taste			

a. The blossom macaroon had a sweet, wheaty flavor.	8.55	0.65	Like Extremely
b. The blossom macaroon is delicious.	8.65	0.61	Like Extremely
c. The taste of the blossom macaroon is just right.	8.58	0.67	Like Extremely
Grand Mean	8.59	0.54	Like Extremely
Texture			
a. The blossom macaroon is tender.	8.58	0.62	Like Extremely
b. The blossom macaroon is velvety and moist.	8.42	0.74	Like Very Much
c. The blossom macaroon is light, not compact or soggy.	8.57	0.70	Like Extremely
Grand Mean	8.52	0.60	Like Extremely

Table 10 shows the sensory evaluation of the banana blossom macaroon in **Treatment 4** showed highly favorable results across all assessed attributes: appearance, aroma, taste, and texture. The means and standard deviations indicate a consistently high level of acceptability.

For appearance, the macaroons were rated on the pleasing combination of colors and forms (mean = 8.52, SD = 0.62), evenness of the golden-brown color (mean = 8.68, SD = 0.60), and their overall visual appeal and deliciousness (mean = 8.63, SD = 0.58). The grand mean for appearance was 8.61 with a standard deviation of 0.51, suggesting participants *"like extremely"* the visual presentation of the macaroons.

Regarding aroma, the macaroons were evaluated based on the distinctness of the aroma (mean = 8.52, SD = 0.77), the strength of the aroma (mean = 8.50, SD = 0.75), and their ability to stimulate appetite (mean = 8.55, SD = 0.67). The grand mean for aroma was 8.52 with a standard deviation of 0.64, indicating that participants *"like extremely"* the aromatic qualities of the macaroons.

For taste, the macaroons were assessed on their sweet, wheaty flavor (mean = 8.55, SD = 0.65), overall deliciousness (mean = 8.65, SD = 0.61), and the balance of taste (mean = 8.58, SD = 0.67). The grand mean for taste was 8.59 with a standard deviation of 0.54, reflecting that the participants *"like extremely"* the flavor profile, suggesting the macaroons are highly palatable.

The texture of the macaroons was evaluated based on their tenderness (mean = 8.58, SD = 0.62), velvety and moist consistency (mean = 8.42, SD = 0.74), and their lightness, avoiding a compact or soggy feel (mean = 8.57, SD = 0.70). The grand mean for texture was 8.52 with a standard deviation of 0.60, showing that participants generally *"like extremely"* the textural qualities of the macaroons, although the moist consistency received a slightly lower rating of *"like very much."*

Overall, the banana blossom macaroons in Treatment 4 achieved exceptionally high ratings across all sensory attributes, with grand means indicating that participants

"like extremely" the appearance, aroma, taste, and texture of these macaroons. This suggests a very strong positive reception and high acceptability for this treatment.

Table 11. The level of acceptability of Banana Blossom Fortified with Sagip Nutri-Pack In Macaroon Production of 700g in terms of appearance/color, aroma, taste, and texture

Treatment 5 Banana Blossom Macaroon	Mean	Standard Deviation	Description
Appearance/Color			
a. Pleasing combination of colors and forms.	8.78	0.45	Like Extremely
b. Even, golden brown.	8.62	0.55	Like Extremely
c. The macaroon looks delicious.	8.68	0.50	Like Extremely
Grand Mean	8.69	0.39	Like Extremely
Aroma			
a. The blossom macaroon had a distinct aroma.	8.67	0.63	Like Extremely
b. A strong aroma emanates from the blossom macaroon.	8.70	0.59	Like Extremely
c. The blossom macaroon stimulates appetite.	8.80	0.55	Like Extremely
Grand Mean	8.72	0.52	Like Extremely
Taste			
a. The blossom macaroon had a sweet, wheaty flavor.	8.73	0.55	Like Extremely
b. The blossom macaroon is delicious.	8.78	0.52	Like Extremely
c. The taste of the blossom macaroon is just right.	8.70	0.56	Like Extremely
Grand Mean	8.74	0.48	Like Extremely
Texture			
a. The blossom macaroon is tender.	8.60	0.64	Like Extremely
b. The blossom macaroon is velvety and moist.	8.67	0.60	Like Extremely
c. The blossom macaroon is light, not compact or soggy.	8.75	0.60	Like Extremely
Grand Mean	8.67	0.55	Like Extremely

Table 11 presents the evaluation of the banana blossom macaroon in **Treatment 5** revealing an exceptionally high level of acceptability across all sensory attributes: appearance, aroma, taste, and texture. The results, reflected through mean scores and standard deviations, demonstrate that participants "*like extremely*" this variant of macaroons.

For appearance, the macaroons were assessed on the pleasing combination of colors and forms (mean = 8.78, SD = 0.45), evenness of the golden-brown color (mean = 8.62, SD = 0.55), and their overall visual appeal and deliciousness (mean = 8.68, SD =

0.50). The grand mean for appearance was 8.69 with a standard deviation of 0.39, indicating a strong preference for the visual presentation of these macaroons.

Regarding aroma, the evaluations considered the distinctness of the aroma (mean = 8.67, SD = 0.63), the strength of the aroma (mean = 8.70, SD = 0.59), and their ability to stimulate appetite (mean = 8.80, SD = 0.55). The grand mean for aroma was 8.72 with a standard deviation of 0.52, showing that participants *"like extremely"* the aromatic qualities of the macaroons, with very consistent ratings across different aspects of aroma.

In terms of taste, the macaroons were judged based on their sweet, wheaty flavor (mean = 8.73, SD = 0.55), overall deliciousness (mean = 8.78, SD = 0.52), and the balance of taste (mean = 8.70, SD = 0.56). The grand mean for taste was 8.74 with a standard deviation of 0.48, reflecting that the participants *"like extremely"* the flavor profile of these macaroons, with a slightly higher mean for deliciousness.

For texture, the macaroons were evaluated on their tenderness (mean = 8.60, SD = 0.64), their velvety and moist consistency (mean = 8.67, SD = 0.60), and their lightness, avoiding a compact or soggy feel (mean = 8.75, SD = 0.60). The grand mean for texture was 8.67 with a standard deviation of 0.55, indicating that participants *"like extremely"* the textural qualities of these macaroons.

Overall, the banana blossom macaroons in Treatment 5 received the highest ratings across all sensory attributes among the treatments, with grand means consistently indicating that participants *"like extremely"* the appearance, aroma, taste, and texture. These results demonstrate an exceptionally strong positive reception and very high acceptability for this treatment of banana blossom macaroons.

Comparison in the Level of Acceptability of Banana Blossom with Corn-based Sagip Nutri-pack for Macaroon Production as Evaluated by Groups of Respondents

Table 5 reflects the evaluation of the banana blossom with corn-based Sagip Nutri-pack for macaroon production, assessed by food experts, food technology students, and consumers, revealing several significant differences across various sensory criteria and treatment variants.

Is there a significant difference in the evaluation of the food experts, food technology students, and consumers on the prepared banana blossom with corn-based Sagip Nutri-pack for macaroon production with different ratios?

Table 12. Comparison in the level of acceptability of banana blossom with corn-based Sagip Nutri-pack for Macaroon production in different treatments across groups of respondents

Variant	Criteria	F-value	p-value	Comparison	Decision	Remark
T1	Appearance	6.31	0.00	p-value< 0.05	Reject Ho	Significant
	Aroma	7.25	0.00	p-value< 0.05	Reject Ho	Significant
	Taste	3.31	0.04	p-value< 0.05	Reject Ho	Significant
	Texture	8.60	0.00	p-value< 0.05	Reject Ho	Significant
T2	Appearance	7.86	0.00	p-value< 0.05	Reject Ho	Significant
	Aroma	1.09	0.34	p-value > 0.05	Accept Ho	not significant
	Taste	8.76	0.00	p-value< 0.05	Reject Ho	Significant
	Texture	6.52	0.00	p-value< 0.05	Reject Ho	Significant
T3	Appearance	3.05	0.05	p-value = 0.05	Accept Ho	not significant
	Aroma	4.92	0.01	p-value< 0.05	Reject Ho	Significant
	Taste	4.37	0.02	p-value< 0.05	Reject Ho	Significant
	Texture	6.15	0.00	p-value< 0.05	Reject Ho	Significant
T4	Appearance	2.76	0.07	p-value > 0.05	Accept Ho	not significant
	Aroma	5.79	0.00	p-value< 0.05	Reject Ho	Significant
	Taste	4.86	0.01	p-value< 0.05	Reject Ho	Significant
	Texture	6.75	0.00	p-value< 0.05	Reject Ho	Significant
T5	Appearance	1.20	0.31	p-value > 0.05	Accept Ho	not significant
	Aroma	3.71	0.03	p-value< 0.05	Reject Ho	Significant
	Taste	2.58	0.08	p-value > 0.05	Accept Ho	not significant
	Texture	1.54	0.22	p-value > 0.05	Accept Ho	not significant

The evaluation of the banana blossom with corn-based Sagip Nutri-pack for macaroon production, assessed by food experts, food technology students, and consumers, revealed several significant differences across various sensory criteria and treatment variants.

In Treatment 1, all sensory criteria—appearance (F-value = 6.31, p-value = 0.00), aroma (F-value = 7.25, p-value = 0.00), taste (F-value = 3.31, p-value = 0.04), and texture (F-value = 8.60, p-value = 0.00)—showed significant differences, indicating varied perceptions among the evaluators.

For Treatment 2, significant differences were noted in appearance (F-value = 7.86, p-value = 0.00), taste (F-value = 8.76, p-value = 0.00), and texture (F-value = 6.52, p-value = 0.00), but not in aroma (F-value = 1.09, p-value = 0.34), suggesting consistent ratings for aroma among the different groups.

Treatment 3 showed significant differences in aroma (F-value = 4.92, p-value = 0.01), taste (F-value = 4.37, p-value = 0.02), and texture (F-value = 6.15, p-value = 0.00), but not in appearance (F-value = 3.05, p-value = 0.05), highlighting that the visual aspect was uniformly rated while other attributes varied.

In Treatment 4, significant differences were found in aroma (F-value = 5.79, p-value = 0.00), taste (F-value = 4.86, p-value = 0.01), and texture (F-value = 6.75, p-value = 0.00), whereas appearance (F-value = 2.76, p-value = 0.07) did not show significant variation, indicating uniformity in the visual appeal among the evaluators.

Lastly, Treatment 5 exhibited a significant difference only in aroma (F-value = 3.71, p-value = 0.03), with no significant differences in appearance (F-value = 1.20, p-value = 0.31), taste (F-value = 2.58, p-value = 0.08), or texture (F-value = 1.54, p-value = 0.22), suggesting that while the aroma was perceived differently, other attributes were consistently rated across the groups.

These findings demonstrate that while some sensory attributes are consistently rated similarly across different groups, others, such as aroma and texture, can vary significantly, influencing the overall acceptability of the banana blossom macaroons.

Cost and Return Analysis of Banana Blossom with Corn-Based Sagip Nutri-Pack for Macaroon Production

Table 13. Summary of Cost and Return Analysis of Banana Blossom with Corn-Based Sagip Nutri-Pack for Macaroon Production

Ingredients	Measurement	TREATMENTS				
		T1	T2	T3	T4	T5
Corn Based Sagip Nutri-Pack	13 g		3.25	3.25	3.25	3.25
All-Purpose Flour	125 g	6.625	6.625	6.625	6.625	6.625
Desiccated Coconut	125 g	8.75				
Boiled and chopped Banana Blossom/	125g, 113g, 100 g, 88 g		5	5	5	5
Butter	85 g	19.125	19.125	19.125	19.125	19.125
Eggs	120 g	16	16	16	16	16
Granulated Sugar	102 g	7.65	7.65	7.65	7.65	7.65
Condensed milk	237 g	25.122	25.122	25.122	25.122	25.122
Vanilla	2.5 g	2	2	2	2	2
Additional Expenses						

Microwavable Container	30	30	30	30	30
Macaroon liner	5	5	5	5	5
Label	5	5	5	5	5
Other Operating Expenses					
Electricity	15	15	15	15	15
Fare	20	20	20	20	20
TOTAL UNIT COST (Php)	160.272	159.772	159.292	158.772	158.292

As shown in Table 13, the costed and estimated recipe was a 1/8 ratio of the original recipe, and the cost of the Corn-Based Sagip Nutri-Pack used in fortifying the four treatments differed. The amount of Sagip Nutri-Pack Powder in treatments 2, 3, 4, and 5 is Php 3.25.

The same amount of the other ingredients was alloyed for the five treatments; All-purpose flour, Php 6.625; Butter, Php 19.125; Eggs, Php 16.00; Granulated Sugar, Php 7.65; Condensed milk, Php 25.122; Vanilla, Php 2.00.

Treatment 1 used a desiccated coconut that cost Php 8.75, while treatments 2, 3, 4, and 5 used a Boiled and chopped Banana Blossom costing Php 5.00 for each treatment.

Additional Expenses

Additional expenses for all treatments amounted to Php 40.00 which includes Macaroon Liner, Php 5.00; Packaging Material Microwavable Container Php 30.00, and the Label at Php 5.00. In addition, other operating expenses such as Electricity at Php 15.00 and fares at Php 20.00 totaled Php 35.00.

Summing up all of the above expenses, the cost incurred in producing the products amounted to Php 160.272, Php 159.772, Php 159.292, Php 158.772, and Php 158.292, for T1; T2, T3, and T5, respectively.

Table 19 presents the summary computation of return on investment. It reveals that the ROI for all treatments was nearly identical, at 40%.

Table 14. Summary Computation of Return and Investment

PARTICULARS	Treatments				
	T1	T2	T3	T4	T5
Total Production Cost (Php)	160.272	159.772	159.292	158.772	158.292
Unit Cost (<i>Total Production Yield (7 boxes of macaroon x 12 pcs)</i>)	160.272	159.772	159.292	158.772	158.292
Selling Price (<i>Unit Cost x 40% + Unit Cost</i>)	224.38	223.68	223	222.28	221.60
Total Sale (<i>Selling Price x yield (1 box of macaroon)</i>)	224.38	223.68	223	222.28	221.60
Income (<i>Total Sales production</i>)	64.108	63.908	63.708	63.508	63.308
ROI (<i>Income x 100/Total Production Cost</i>)	40.00%	40.00%	40.00%	40.00%	40.00%

Shelf-life of the Banana Blossom with Corn-Based Sagip Nutri-Pack for Macaroon Production in Room Temperature

After production, the banana blossom macaroon was stored at room temperature between 25°C and 30°C. Furthermore, the following table displays the observation:

a. Shelf-Life of treatment 1 coconut macaroon at room temperature

Table 15. Shelf-Life of treatment 1 coconut macaroon

Days of Observation	Observation Results
First day	The coconut macaroon was nicely colored, smelled toffy, tasted sweet, and had a texture that was chewy, soft, and tender.
Second day	The coconut macaroon had the same observations as the first day: it was attractive in color and appearance, smelled toffy, tasted sweet, and had a texture that was chewy, soft, and tender.
Third day	The second day's observations were the same: the coconut macaroon had a nice color and appearance, a toffy aroma, a sweet and toffy flavor, and a soft, tender, chewy texture.
Fourth day	Similar observations were made on the third day: the coconut macaroon had a nice color and appearance, a toffy aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture.
Fifth day	coconut macaroon had a nice look and color, a toffy aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture. These observations were made on the fourth day.
Sixth day	The coconut macaroon was nicely colored, smelled toffy, tasted sweet and toffy, and had a texture that was chewy, soft, and tender.
Seventh day	The coconut macaroon had the same observations on the sixth day: it was attractive in color, smelled toffy, tasted sweet and toffy, and had a texture that was chewy, soft, and tender.

Eighth day	The coconut macaroon had a nice look and color, a toffy aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture. These observations were made on the seventh day.
Ninth day	The coconut macaroon had the same observations on the eighth day: it was attractive in color, smelled toffy, tasted sweet and toffy, and had a texture that was chewy, soft, and chewy.
Tenth day	The coconut macaroon was soft, tender, and chewy on the tenth day, and it tasted sweet and toffy. It also had a nice color and appearance.

b. Shelf-Life of treatment 2 banana blossom macaroon fortified with Sagip Nutri-pack at room temperature

Table 16. Shelf-Life of treatment 2 banana blossom macaroon fortified with Sagip nutri-pack

Days of Observation	Observation Results
First day	The banana blossom macaroon was nicely colored, smelled bonbon, tasted sweet, and had a texture that was chewy, soft, and tender.
Second day	The banana blossom macaroon had the same observations as the first day: it was attractive in color and appearance, smelled bonbon, tasted sweet, and had a texture that was chewy, soft, and tender.
Third day	The second day's observations were the same: the banana blossom macaroon had a nice color and appearance, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, chewy texture.
Fourth day	Similar observations were made on the third day: the banana blossom macaroon had a nice color and appearance, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture.
Fifth day	banana blossom macaroon had a nice look and color, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture. These observations were made on the fourth day.
Sixth day	The banana blossom macaroon was nicely colored, smelled bonbon, tasted sweet and toffy, and had a texture that was chewy, soft, and tender.
Seventh day	The banana blossom macaroon had the same observations on the sixth day: it was attractive in color, smelled bonbon, tasted sweet and toffy, and had a texture that was chewy, soft, and tender.
Eighth day	The banana blossom macaroon had a nice look and color, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture. These observations were made on the seventh day.
Ninth day	The banana blossom macaroon had the same observations on the eighth day: it was attractive in color, smelled bonbon, tasted sweet and toffy, and had a texture that was chewy, soft, and chewy.
Tenth day	The banana blossom macaroon was soft, tender, and chewy on the tenth day, and it tasted sweet and toffy. It also had a nice color and appearance.

c. Shelf-Life of treatment 3 banana blossom macaroon fortified with Sagip Nutri-pack at room temperature

Table 17. Shelf-Life of treatment 3 banana blossom macaroon fortified with Sagip nutri-pack

Days of Observation	Observation Results
First day	The banana blossom macaroon was nicely colored, smelled bonbon, tasted sweet, and had a texture that was chewy, soft, and tender.
Second day	The banana blossom macaroon had the same observations as the first day: it was attractive in color and appearance, smelled bonbon, tasted sweet, and had a texture that was chewy, soft, and tender.
Third day	The second day's observations were the same: the banana blossom macaroon had a nice color and appearance, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, chewy texture.
Fourth day	Similar observations were made on the third day: the banana blossom macaroon had a nice color and appearance, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture.
Fifth day	banana blossom macaroon had a nice look and color, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture. These observations were made on the fourth day.
Sixth day	The banana blossom macaroon was nicely colored, smelled bonbon, tasted sweet and toffy, and had a texture that was chewy, soft, and tender.
Seventh day	The banana blossom macaroon had the same observations on the sixth day: it was attractive in color, smelled bonbon, tasted sweet and toffy, and had a texture that was chewy, soft, and tender.
Eighth day	The banana blossom macaroon had a nice look and color, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture. These observations were made on the seventh day.
Ninth day	The banana blossom macaroon had the same observations on the eighth day: it was attractive in color, smelled bonbon, tasted sweet and toffy, and had a texture that was chewy, soft, and chewy.
Tenth day	The banana blossom macaroon was soft, tender, and chewy on the tenth day, and it tasted sweet and toffy. It also had a nice color and appearance.

d. Shelf-Life of treatment 4 banana blossom macaroon fortified with Sagip Nutri-pack at room temperature

Table 18. Shelf-Life of treatment 4 banana blossom macaroon fortified with Sagip nutri-pack

Days of Observation	Observation Results
First day	The banana blossom macaroon was nicely colored, smelled bonbon, tasted sweet, and had a texture that was chewy, soft, and tender.
Second day	The banana blossom macaroon had the same observations as the first day: it was attractive in color and appearance, smelled bonbon, tasted sweet, and had a texture that was chewy, soft, and tender.
Third day	The second day's observations were the same: the banana blossom macaroon had a nice color and appearance, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, chewy texture.
Fourth day	Similar observations were made on the third day: the banana blossom macaroon had a nice color and appearance, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture.
Fifth day	banana blossom macaroon had a nice look and color, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture. These observations were made on the fourth day.
Sixth day	The banana blossom macaroon was nicely colored, smelled bonbon, tasted sweet and toffy, and had a texture that was chewy, soft, and tender.
Seventh day	The banana blossom macaroon had the same observations on the sixth day: it was attractive in color, smelled bonbon, tasted sweet and toffy, and had a texture that was chewy, soft, and tender.
Eighth day	The banana blossom macaroon had a nice look and color, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture. These observations were made on the seventh day.
Ninth day	The banana blossom macaroon had the same observations on the eighth day: it was attractive in color, smelled bonbon, tasted sweet and toffy, and had a texture that was chewy, soft, and chewy.
Tenth day	The banana blossom macaroon was soft, tender, and chewy on the tenth day, and it tasted sweet and toffy. It also had a nice color and appearance.

e. Shelf-Life of treatment 5 banana blossom macaroon fortified with Sagip Nutri-pack at room temperature

Table 19. Shelf-Life of treatment 5 banana blossom macaroon fortified with Sagip nutri-pack

Days of Observation	Observation Results
First day	The banana blossom macaroon was nicely colored, smelled bonbon, tasted sweet, and had a texture that was chewy, soft, and tender.
Second day	The banana blossom macaroon had the same observations as the first day: it was attractive in color and appearance, smelled bonbon, tasted sweet, and had a texture that was chewy, soft, and tender.
Third day	The second day's observations were the same: the banana blossom macaroon had a nice color and appearance, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, chewy texture.
Fourth day	Similar observations were made on the third day: the banana blossom macaroon had a nice color and appearance, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture.
Fifth day	banana blossom macaroon had a nice look and color, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture. These observations were made on the fourth day.
Sixth day	The banana blossom macaroon was nicely colored, smelled bonbon, tasted sweet and toffy, and had a texture that was chewy, soft, and tender.
Seventh day	The banana blossom macaroon had the same observations on the sixth day: it was attractive in color, smelled bonbon, tasted sweet and toffy, and had a texture that was chewy, soft, and tender.
Eighth day	The banana blossom macaroon had a nice look and color, a bonbon aroma, a sweet and toffy flavor, and a soft, tender, and chewy texture. These observations were made on the seventh day.
Ninth day	The banana blossom macaroon had the same observations on the eighth day: it was attractive in color, smelled bonbon, tasted sweet and toffy, and had a texture that was chewy, soft, and chewy.
Tenth day	The banana blossom macaroon was soft, tender, and chewy on the tenth day, and it tasted sweet and toffy. It also had a nice color and appearance.

Shelf-Life of treatment 1 coconut macaroon and treatment 2, 3, 4, and 5 banana blossom macaroon fortified with Sagip Nutri-pack at room temperature will last for ten (10) days and at Refrigerated chiller temperature will last for one month or thirty (30) days. Refrigerated macaroons will have a longer shelf-life than room temperature. However, the chewiness and soft texture of the macaroon will be affected.

Conclusions

Based on the comprehensive study conducted on the development, nutritional analysis, sensory evaluation, cost and return analysis, and shelf-life assessment of Banana Blossom with Fortified Sagip Nutri-Pack for Macaroon Production, it can be

concluded that the incorporation of banana blossom in macaroon production is a promising innovation. The results indicate that banana blossom macaroons fortified with Sagip Nutri-Pack are not only nutritious, with significant levels of dietary fiber and essential amino acids, but also highly acceptable in terms of appearance, aroma, taste, and texture. The cost and return analysis show a consistent return on investment of 40% across all treatments, highlighting the economic viability of this product. Furthermore, the shelf-life study reveals that these macaroons can maintain their quality for up to ten days at room temperature and up to a month when refrigerated, underscoring their potential for commercial production and distribution. Overall, the study demonstrates the feasibility, nutritional value, sensory appeal, economic viability, and shelf-stability of Banana Blossom Macaroons with Sagip Nutri-Pack, suggesting a promising future for this innovative product in the food industry.

Recommendations

Based on the foregoing findings and conclusions, the study recommends the following:

1. The creation of new products is highly encouraged. It is necessary to continuously innovate and improve the recipes for banana blossoms supplemented with Sagip Nutri-pack in macaroon production to meet changing dietary requirements and consumer preferences. Experimenting with diverse flavors, textures, and nutritional profiles may be necessary to expand the product line and attract a larger customer base.
2. Marketing efforts and educational materials should be used to specifically educate consumers about the nutritional advantages and adaptability of Banana Blossom baked goods. The distinct nutrient profiles of banana blossoms enhanced with Sagip Nutri-pack during macaroon production have to be emphasized to enable customers to make well-informed decisions depending on their dietary needs.
3. To increase customer pleasure and acceptability, more work needs to be done on refining the sensory aspects of banana blossom macaroons, such as appearance, aroma, taste, and texture. It is strongly advised to carry out sensory analyses and customer feedback sessions to pinpoint problem areas and adjust product formulas appropriately.
4. Adapted marketing tactics and product offers should be made to cater to the demands and preferences of various consumer categories. For instance, marketing aimed at consumers and culinary specialists should highlight the nutritional benefits and visual appeal of Banana blossom macaroons, to incorporate a more generic message for wider customer demographics. Therefore, collaboration with government organizations such as Outreach Programs in Barangay, the Department of Agriculture, the Department of Science and Technology (DOST), and the Department of Trade and Industry (DTI) is required.
5. It is strongly advised to use banana blossom fortified with Sagip nutri-pack for macaroon production as it offers a higher return on investment than commercial coconut macaroons

and can be found locally in the markets of the City of Ilagan and neighboring towns like Benito Soliven.

6. To increase the shelf life of banana blossoms in baked goods and decrease waste, it is recommended to utilize effective distribution and storage strategies. Ensuring that products get to clients in optimal condition may require investing in packaging technologies that extend shelf life, managing storage conditions, and establishing efficient distribution networks. Collaborating with the Department of Trade and Industry (DTI) is recommended.
 7. It is recommended that funds be set aside for further research and development projects that will investigate the possible uses of banana blossoms in the creation of baked goods. Working together with dietitians, food scientists, and culinary specialists, new Banana blossom bake goods that cater to changing customer tastes and trends may result from this. It is necessary to work with the DOST, the DTI, and the school's Research and Development Unit.
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Compliance with Ethical Standards

As the main author of this research, I affirm my adherence to the highest ethical standards in conducting this study and preparing the manuscript, ensuring the originality of the work, and rigorously avoiding plagiarism by appropriately citing all sources. I confirm that ethical approval was obtained where necessary, with all procedures involving human participants conducted following ethical guidelines, including informed consent and confidentiality. I have disclosed any potential conflicts of interest that may influence the interpretation of my research. Furthermore, all listed authors have significantly contributed to the research and preparation of the manuscript, and there are no undisclosed individuals who contributed to the work. This statement serves as my commitment to integrity, responsibility, and ethical compliance in academic research.

Acknowledgments

I express profound appreciation to my adviser for her unwavering support and expertise. My heartfelt thanks go to the respondents for their involvement in the study, my colleagues for their collaboration, and the school heads for their encouragement. I am grateful to my friends for their assistance and support. To my relatives and family, your love, understanding, and encouragement were invaluable. Lastly, I acknowledge the

divine guidance and blessings from God that have illuminated my path throughout this research journey.

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