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DEVELOPMENT OF MODEL RECIPE FOR MINI DONUTS AS A NUTRITIOUS SNACK FOR SECONDARY SCHOOL LEARNERS

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ABSTRACT

This experimental study aimed to develop a model recipe for mini donuts as a nutritious snack for secondary school learners. The research was conducted during the S.Y. 2023-2024 at Taliktik Integrated School. The products were subjected to sensory evaluation using the 9-point Hedonic Scale acceptability test in terms of color/appearance, odor/aroma, taste/flavor, texture, and general acceptability. A sensory evaluation was conducted to untrained panel composed of fifty (50) individuals who were randomly selected from among the learners and staff of Taliktik Integrated School, whose age ranged from 12-50 years old. The results of the sensory evaluation were statistically analyzed using the one-way classification of the analysis of Variance (ANOVA). F test, mean and descriptive statistics were used to determine if there is a significant difference among the treatments. In terms of degree of acceptability, the study reveals that respondents prefer Treatment 4 containing 25% of Rice-Based Sagip Nutri-Pack and 75% All-Purpose flour. The results indicate that the Nutri-Pack Powder has significant potential market value. The result on the Acceptability Consumer Index (ACI) revealed that treatment 4 gained the highest rank among the five treatments. Nutrient analysis revealed Treatment 5 had the highest crude protein, crude fat, and ash content, Treatment 1 had the highest moisture content, and Treatment 2 had the highest crude fiber content. ROI analysis indicated that all treatments were profitable, with Treatment 1 being the most cost-effective, followed by Treatments 4, 3, 2, and 5.

KEYWORDS- *Mini donuts, Model Recipe, Nutri-pack, Sagip, Sustainable Development Goals, Zero Hunger*

INTRODUCTION

Undernourished children are a common problem in developing nations. It may turn out from a broad range of aspects like deficiencies of macro and micronutrients, infection, and possibly socioeconomic conditions. Every day, 95 children in the Philippines die from malnutrition. Twenty-seven out of 1,000 Filipino children do not get past their fifth birthday. A third of Filipino children are stunted or short for their age. Stunting after 2 years of age can be permanent, irreversible, and even fatal (UNICEF PH,2018).

As it is known, the Department of Education (DepEd) has initiated a program aimed at addressing the issue of malnourishment among students. According to the data of Taliktik Integrated School, Under the School-Based Feeding Program (SBFP) of October - November 2023, it reveals that 32% of learners are dealing with undernourishment, 6% are stunted and 26% are wasted at ages ranging from 12-15 years old. In their feeding programs, learners received nutritious food products containing milk, fortified snacks, and other Nutri-packs to provide the nutritional requirements for each learner (DepEd Order No. 23,2020).

On the other hand, the researcher proposes a locally inspired snack that could act as a dual solution to address the undernourishment of the learners. This innovative development seeks to not only intrigue the taste buds but also contribute to the larger mission of uplifting the health status and general well-being of learners by addressing the fundamental needs of every learner that is under the SBFP program.

Additionally, through the extension programs of the College of Education, Isabela State University, the Barangay Integrated Development Approach for Nutrition Improvement (BIDANI), adopted the 15 Barangays of Echague, Isabela to help improve their ways of living through extending livelihood programs to promote and improve economic growth and health status of the residents in the community. This program aims to achieve poverty alleviation, good health, food security, and good governance for the general well-being of families and their communities (BIDANI, 2018).
However, the development of this mini donut recipe as a nutritious snack has been enhanced with the Rice-Based Sagip Nutri-Pack Fortified with Cacao Pod Husk (CPH), Malunggay, and Turmeric Powder which contains rice, mung beans, sesame, cacao pod husk

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powder, malunggay and turmeric for more nutritional contents that is aligned to the Sustainable Development Goals no.03 good health and well-being. Moreover, this development helps in utilizing the nutritional benefits of Rice-Based Sagip Nutri-Pack Fortified with Cacao Pod Husk (CPH), Malunggay, and Turmeric Powder which contains the macro and micronutrients that the body needs to sustain the body structure and functional system.

In connection with the product, Filipinos are known for their diligent work habits, occasionally taking breaks for merienda to recharge. These delightful miniature treats, small yet satisfying size, have become a cherished indulgence, perfectly aligning with the Filipino fondness for sweet snacks that Filipinos love to eat. Beyond just being a treat, mini donuts have evolved into a daily snack that is consistently offered in school canteens due to their affordable price and help to satisfy hunger. This makes them accessible even for students with limited budgets and who have no time to prepare their food in the morning. Aligned with the 17 Sustainable Development Goals (SDGs), particularly the goal of No Poverty and Zero Hunger, along with this nutritious snack, learners are guaranteed with Good Quality Education through these mini donuts incorporated with a specially crafted blend of locally sourced ingredients. In addition, rice flour is a versatile and gluten-free option and offers several health benefits when incorporated into nutrition. It is ideal for individuals with gluten sensitivity or celiac disease, rice flour provides a safe and nutritious substitute for wheat-based flour. It can be easily digested. It provides a quick and accessible energy boost, supporting overall vitality and stamina. It is a favorable choice for those aiming to manage their fat intake and maintain a balanced diet. It is also packed with vitamins and minerals (Axe,2018).

Likewise, mung beans are type of pulse that has a good nutritional balance with plenty of vitamins and minerals. It offers a range of health benefits due to its nutrient-rich composition. Mung beans are a good source of plant-based protein, complex carbohydrates, fiber, and various essential nutrients, including B vitamins (such as folate and B6), potassium, magnesium, phosphorus, zinc, iron, and manganese. The fiber, potassium, and magnesium content in mung beans can contribute to heart health. These nutrients may help regulate blood pressure, reduce cholesterol levels, and support overall cardiovascular function (Tang et al.,2014).

Additionally, sesame seeds are high in oil, protein, minerals, vitamins, and dietary fiber. Sesame oil, derived from conventional oil production processes, is high in unsaturated fatty acids, fat-soluble vitamins, amino acids, and so on. Sesame seeds contain 21.9% protein, 61.7% fat, and are high in minerals including Fe and Ca (Rout et al., 2018).

In addition, proteins, lipids, and antioxidants, particularly polyphenols, are abundant in cocoa husks. Cocoa polyphenols have several effects that may promote good health according to several studies, Cacao pod husk (CPH) is a good source of phenolic compounds, which can act as antioxidants and could be used in functional meals (Valadez-Carmona et al., 2018).

Furthermore, Moringa oleifera is an effective remedy for malnutrition, it is rich in nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods, and seeds. While turmeric has gained popularity as a dietary supplement, advocated for diverse conditions such as arthritis, digestive disorders, respiratory infections, allergies, liver disease, and even mental health concerns like depression.

With the above mentioned, there is no doubt that the process of enhancement of the mini donuts recipe will not just combat the deficiencies of learners but also create a market for local farmers by actively involving them in the supply chain, this research will not only support their livelihoods, but it also contributes to the overall economic growth of the community by using the raw, ready ingredients from our local farmers.

METHODOLOGY

Ingredients

Ingredients	T1	T2	T3	T4	T5
Rice-Based Sagip Nutri-Pack	0g	750g	500g	250g	1000g
All-purpose flour	1000g	250g	500g	750g	0g
Granulated Sugar	400g	400g	400g	400g	400g
Baking powder	115g	115g	115g	115g	115g
Salt	6.4g	6.4g	6.4g	6.4g	6.4g
Milk	1816g	1816g	1816g	1816g	1816g
Oil	224g	224g	224g	224g	224g
Egg	400g	400g	400g	400g	400g
Vanilla Extract	34.72g	34.72g	34.72g	34.72g	34.72g

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Collection and Preparation of the Material

The Rice-Based Sagip Nutri-Pack Fortified with Cacao Pod Husk (CPH), Malunggay and Turmeric Powder were collected from CEd cafeteria, from Isabela State University, Echague Campus.

In preparing mini donuts, the first thing being done was to prepare all the equipment, tools, materials, and ingredients being used. After the preparation, the mini donut maker was preheated according to the manufacturer's instructions. The dry ingredients were mixed in a bowl and set aside. In a separate bowl, the wet ingredients were whisked and eventually combined. The wet and dry ingredients were mixed until well combined. The batter was poured into a piping bag or a squeeze bottle. The batter was transferred into the molds of the preheated mini donut maker, filling each mold about 2/3 full. The lid was closed and heated for 3-5 minutes or until the donuts turned golden brown. After that a fork or a stick was used to remove the donuts from the molds and were transferred to a wire rack to cool. After completing the final touches in the mini donuts, packaging was the concluding step before they were distributed.

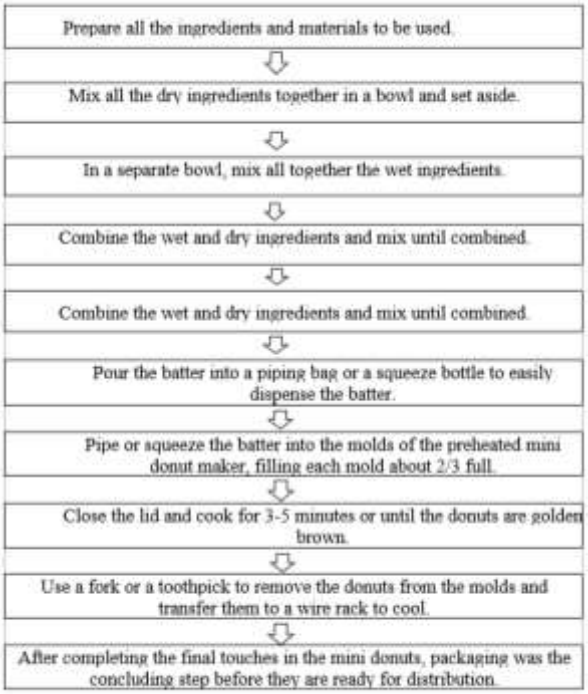


Figure 2. Flow Chart in preparing Mini Donuts

Treatment of the Study

The different proportional levels of Rice-Based Sagip Nutri-Pack Fortified with Cacao Pod Husk (CPH), Malunggay and Turmeric Powder as ingredients in making model recipe for mini donuts which were used as treatment in this study.

T1 = Commercial Mini Donuts
T2 = 75% Rice-based Sagip Nutri-Pack Powder (750g), 25% All-Purpose Flour (250g)
T3= 50% Rice-based Sagip Nutri-Pack Powder (500g), 50%All-Purpose Flour (500g)
T4 = 25% Rice-based Sagip Nutri-Pack Pack Powder (250g), 75% All-Purpose Flour (750g)
T5= 100% Rice-based Sagip Nutri-Pack Powder

Nutrient Analysis

The treatment products of Mini Donuts samples were subjected to nutrient analysis 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.

Sensory Evaluation

Sensory Evaluation was conducted in Taliktik Integrated School, Taliktik, Cordon, Isabela to determine the consumers' acceptability of the experimental product in terms of color/appearance, odor/aroma, taste/flavor, texture, and general acceptability of model recipe for mini donuts as a nutritious snack for secondary learners. The instrument for data gathering was the 9-Point-Hedonic Scale.

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Scale	Range	Descriptive Rating
9	8.50 – 9.00	Like Extremely
8	7.50 – 8.49	Like Very Much
7	6.5 – 7.00	Like Moderately
6	5.5 – 6.49	Like Slightly
5	4.5 – 5.49	Neither Like nor Dislike
4	3.5 - 4. 49	Dislike Slightly
3	2.5 - 3.49	Dislike Moderately
2	1.5 - 2.49	Dislike Very Much
1	1.0 - 1.49	Dislike Extremely

A sensory panel was composed of fifty (50) individuals who were randomly selected among the faculty and learners of Taliktik Integrated School. The qualification of the panelists in terms of age ranged from 12 to 50 years old. They were screened to be non-smokers, not liquor drinkers, and in good health during the sensory evaluation.

The panelist was given a set of coded samples placed in a small tray/plate. They were requested to observe carefully and rate each sample according to their color/appearance, taste/flavor, texture, odor/aroma, and general acceptability. As they tasted the mini donuts, they were asked to drink a sufficient amount of water before and after tasting each sample to rinse their mouth before tasting the next sample and were strictly observed as a standard procedure to ensure the credibility and validity of the results of the study.

Experimental Design

There were five treatments of the study, which were assigned randomly to the experimental units within a block (BLK1, BLK2, BLK3, BLK4 and BLK5). Each treatments have a code (T1-516, T2-728, T3-930, T4-142 and T5-354) to eliminate bias when doing the sensory evaluation.

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

BLOCK					
1	516^{1}	728^{2}	930^{3}	142^{4}	354^{5}
2	142^{4}	516^{2}	728^{3}	354^{5}	930^{1}
3	930^{1}	142^{4}	354^{5}	728^{2}	516^{3}
4	354^{5}	930^{1}	142^{4}	516^{3}	728^{2}
5	728^{2}	354^{5}	516^{3}	930^{1}	142^{4}

Figure 3. Arrangement of 5 treatments

Cost and Return Analysis

Cost analysis was performed to determine the economic feasibility of the product if it will be sold in the market. This was done by listing down all the cost, labor, and other expenses incurred in producing the different proportions of Model Recipe for Mini Donuts as Nutritious Snack for Secondary Learners and computing the unit cost and the return on investment (ROI) per treatment.

Statistical Data Analysis

Results of the sensory evaluation were statistically analyzed using the one-way classification of the Analysis of Variance (ANOVA). F test, mean, and descriptive statistics were used to determine if there is a significant difference among the treatments in terms of color/appearance, odor/aroma, taste/flavor, texture and general acceptability.

Result

This chapter focuses on data presentation, data analysis and discussion.

Profile of the Respondents

This table presents the profile of the respondents who evaluated the model recipe for mini donuts as a nutritious snack for secondary learners as their age and sex.

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Table 8. Profile distribution of the respondents by age

Age Bracket	Frequency	Percentage
13	4	8.00
14	14	28.00
15	28	56.00
16	2	4.00
17	1	2.00
18	1	2.00
Total	50	
Mean	14.70	

Age. It can be seen from the table that age 15 has the highest frequency,28 or 56%, followed by the age bracket 14 with a frequency count of 14 or 28%. Next was 13 with a frequency count of 4 or 8 %, followed by 16 with frequency count of 2 or 4%. The least of them were from the ages 17 and 18 which consist of 1 respondent or 2% of the total number of panelists.

Table 9. Profile distribution of the respondents by sex

Sex	Frequency	Percentage
Male	23	46.00
Female	27	54.00
Total	50	100.00

Sex. As shown from the table, there were more female respondents, 27 or 54%, compared to male respondents with a frequency count of 23 or 46% a total of 50 evaluators or 100%.

Degree of Acceptability

Color/ Appearance. Table 10 shows the degree of acceptability of model recipe for mini donuts as a nutritious snack in terms of color or appearance by the respondents.

Table 10. Degree of acceptability in terms of color or appearance

TREATMENT	MEAN	QD
1- Commercial flour	8.42	Like extremely
2-25% All-purpose flour, 75% Rice-Based Sagip Nutri-Pack Powder	6.56	Like moderately
3-50% All-purpose flour,50% Rice-Based Sagip Nutri-Pack Powder	6.58	Like moderately
4-75% All-purpose flour, 25% Rice-Based Sagip Nutri-Pack Powder	8.02	Like very much
5-100% Rice-Based Sagip Nutri-Pack Powder	5.04	Neither like nor dislike
SD	1.35	
CV (%)	19.4	

(t = 11.51, P 0.00)

The result shows the degree of acceptability of Rice-Based Sagip Nutri-Pack Powder as alternate to commercial flour in the production of mini donuts significantly improved the color or appearance of the product with approximately by 1.35. There is strong evidence (t = 11.51, P 0.00) that Rice-Based Sagip Nutri-Pack Powder affected the color of the product thus influence its acceptability.

Table shows the degree of acceptability for mini donuts in terms of color or appearance by the respondents. Treatment 1 (Commercial flour) obtained the highest degree of acceptability with a mean of 8.42 which were describe as “Like Extremely” exhibited more appealing color and appearance with comparable mean values of treatment 4 (75% All-purpose flour, 25% Rice-Based Sagip Nutri-Pack Powder) with a mean of 8.02 which were described as “Like Very Much”, Treatment 3 (50% All-purpose flour, 50% Rice-Based Sagip Nutri-Pack Powder) which gained a mean of 6.58. While Treatment 2(25% All-purpose flour, 75% Rice-Based Sagip Nutri-Pack Powder) obtained a mean of 6.56. both were labeled as “Like Moderately.” Lastly Treatment 5(100% Rice-Based Sagip Nutri-Pack Powder) with a mean of 5.04 labelled as “Neither like Nor Dislike”, respectively.

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The panelists perceived Treatment 1 as having a more vibrant color due to its higher content of all-purpose flour. The addition of Rice-Based Sagip Nutri-Pack Powder, which contains Cacao Pod Husk, Malunggay, and Turmeric Powder, darkens the color of the mini donuts.

Odor/Aroma. Table 11 presents the degree of acceptability of model recipe of mini donuts as a nutritious snack in terms of odor and aroma.

Table 11. Degree of acceptability in terms of odor or aroma

TREATMENT	MEAN	QD
1- Commercial flour	8.00	Like very much
2-25% All-purpose flour, 75% Rice-Based Sagip Nutri-Pack Powder	6.18	Like slightly
3-50% All-purpose flour,50% Rice -Based Sagip Nutri-Pack Powder	7.02	Like moderately
4-75% All-purpose flour, 25% Rice-Based Sagip Nutri-Pack Powder	8.28	Like extremely
5-100% Rice-Based Sagip Nutri-Pack Powder	4.76	Neither like nor dislike
SD	1.43	
CV (%)	20.92	

(t = 10.69, P 0.00)

As the result shows the degree of acceptability of Rice-Based Sagip Nutri-Pack Powder as alternate to commercial flour in the production of mini donuts significantly improved the odor/aroma of the product with approximately by 1.43. There is strong evidence (t = 10.69, P 0.00) that Rice-Based Sagip Nutri-Pack Powder affected the odor of the product thus influence its acceptability.

As shown in the table, Treatment 4 (75% All-purpose flour, 25% Rice-Based Sagip Nutri-Pack Powder) obtained the highest mean which described as “Like Extremely”. Treatment 1 (Commercial flour) gained a mean of 8.00 with a description of “Like Very Much”. Treatment 3 (50% All-purpose flour, 50% Rice-Based Sagip Nutri-Pack Powder) acquired a mean of 7.02 which describes as “Like Moderately”. Treatment 2 (25% All-purpose flour, 75% Rice-Based Sagip Nutri-Pack Powder) obtained a mean of 6.18 with a description of “Like Slightly” and lastly Treatment 5(100% Rice-Based Sagip Nutri-Pack Powder) which gained a mean of 4.76 which described as “Neither Like nor Dislike”.

The results imply that consumers prefer mini donuts with higher proportions of all-purpose flour together with T4 being the most favored for its odor and aroma due to the addition of 25% Rice-Based Sagip Nutri-Pack and 75% All-purpose flour.

Taste/Flavor. Table 12 shows the degree of acceptability of model recipe of mini donuts in terms of taste or flavor by the respondents.

Table 12. Degree of acceptability of in terms of taste or flavor

TREATMENT	MEAN	QD
1- Commercial flour	7.82	Like very much
2-25% All-purpose flour, 75% Rice-Based Sagip Nutri-Pack Powder	6.06	Like slightly
3-50% All-purpose flour,50% Rice-Based Sagip Nutri-Pack Powder	6.58	Like moderately
4-75% All-purpose flour, 25% Rice-Based Sagip Nutri-Pack Powder	8.52	Like extremely
5-100% Rice-Based Sagip Nutri-Pack Powder	4.70	Neither like nor dislike
SD	1.50	
CV (%)	22.25	

(t = 10.05, P 0.00)

The result shows the degree of acceptability of Rice-Based Sagip Nutri-Pack Powder as alternate to commercial flour in the production of mini donuts significantly improved the taste/flavor of the product with approximately by 1.50. There is strong evidence (t = 10.05, P 0.00) that Rice-Based Sagip Nutri-Pack Powder affected the taste of the product thus influence its acceptability.

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As seen in table 12, Treatment 4(75% All-purpose flour, 25% Rice-Based Sagip Nutri-Pack Powder) has description of "Like Extremely" with mean of 8.52, respectively. Moreover, Treatment 1(Commercial flour) obtained a mean of 7.82 with description of "Like Very Much". Treatment 3 gained a mean of 6.58 with description of "Like Moderately". Treatment 2(25% All-purpose flour, 75% Rice-Based Sagip Nutri-Pack Powder) acquired a mean of 6.02 which describes as "Like Slightly" and lastly treatment 5(100% Rice-Based Sagip Nutri-Pack Powder) garnered a mean of 4.70 which describes as "Neither Like nor Dislike".

The results imply that consumers prefer the taste and flavor of mini donuts with higher Rice-Based Sagip Nutri-Pack Powder content were less liked, indicating that maintaining a higher percentage of all-purpose flour enhances taste and flavor satisfaction due to the addition of Cacao Pod Husk, Malunggay and Turmeric Powder.

Texture. Table 13 shows degree of acceptability of model recipe of mini donuts as a nutritious snack in terms of texture.

Table 13. Degree of acceptability in terms of texture

TREATMENT	MEAN	QD
1- Commercial Mini Donuts	7.64	Like very much
2-25% All-purpose flour, 75% Rice-Based Sagip Nutri-Pack Powder	6.18	Like slightly
3-50% All-purpose flour,50% Rice-Based Sagip Nutri-Pack Powder	6.72	Like moderately
4-75% All-purpose flour, 25% Rice-Based Sagip Nutri-Pack Powder	8.44	Like extremely
5-100% Rice-Based Sagip Nutri-Pack Powder	4.62	Neither like nor dislike
SD	1.35	
CV (%)	20.02	

(t = 10.30, P 0.00)

The result shows the degree of acceptability of Rice-Based Sagip Nutri-Pack Powder as alternate to commercial flour in the production of mini donuts significantly improved the texture of the product with approximately by 1.35. There is strong evidence (t = 10.30, P 0.00) that Rice-Based Sagip Nutri-Pack Powder affected the texture of the product thus influence its acceptability.

As shown in the table, Treatment 4(75% All-purpose flour, 25% Rice-Based Sagip Nutri-Pack Powder), obtained the highest mean of 8.44 which describes as "Like Extremely". Treatment 1(Commercial Mini Donut) gained a mean of 7.64 with a description of "Like Very Much". On the other hand, Treatment 3(50% All-purpose flour, 50% Rice-Based Sagip Nutri-Pack Powder) acquired a mean of 6.72 which was described as "Like Moderately" while treatment 2(25% All-purpose flour, 75% Rice-Based Sagip Nutri-Pack Powder) obtained a mean of 6.18 with a description of Like Slightly" and Lastly treatment 5(100% Rice-Based Sagip Nutri-Pack Powder) which gained a mean of 4.62 which was labeled as "Neither Like nor Dislike".

Consumers prefer the texture of mini donuts with a higher proportion of all-purpose flour. The T4 blend was most liked due to its fluffy texture, while higher Rice-Based Sagip Nutri-Pack Powder content reduced likability. Therefore, using more all-purpose flour improves texture satisfaction.

General Acceptability. Table 14 presents the general acceptability of model recipe for mini donuts as a nutritious snack by the respondents.

Table 14. Degree of acceptability in terms of General Acceptability

TREATMENT	MEAN	QD
1- Commercial flour	8.08	Like very much
2-25% All-purpose flour, 75% Rice-Based Sagip Nutri-Pack Powder	5.86	Like slightly
3-50% All-purpose flour,50% Rice-Based Sagip Nutri-Pack Powder	7.00	Like moderately
4-75% All-purpose flour, 25% Rice-Based Sagip Nutri-Pack Powder	8.42	Like extremely
5-100% Rice-Based Sagip Nutri-Pack Powder	4.58	Neither like nor dislike
SD	1.59	
CV (%)	23.43	

(t = 9.54, P 0.00)

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As the result shows the degree of acceptability of Rice-Based Sagip Nutri-Pack Powder as alternate to commercial flour in the production of mini donuts significantly improved the general of the product with approximately by 1.59. There is strong evidence (t = 9.54, P 0.00) that Rice-Based Sagip Nutri-Pack Powder affected the general acceptability of the product thus influence its overall acceptability.

The table shows that treatment 4 (75% All-purpose flour, 25% Rice-Based Sagip Nutri-Pack Powder) obtained the highest mean of 8.42 and was describes as "Like Extremely" followed by treatment 1 (Commercial Mini Donuts) that gained a mean of 8.08 which described as "Like Very Much". Moreover, Treatment 3 (50% All-purpose flour, 50% Rice-Based Sagip Nutri-Pack Powder), obtained a mean of 7.00 with a description of "Like Moderately" while Treatment 2(25% All-purpose flour, 75% Rice-Based Sagip Nutri-Pack Powder), acquired a mean of 5.86 which labelled of "Like Slightly". Lastly Treatment 5(100% Rice-Based Sagip Nutri-Pack Powder), gained a mean of 4.58 and described as "Neither Like nor Dislike".

Consumers prefer mini donuts with a higher proportion of all-purpose flour. The 75% all-purpose and 25% Rice-Based Sagip Nutri-Pack Powder blend was most favored, while higher Rice-Based Sagip Nutri-Pack Powder content reduced overall acceptability. Thus, using more all-purpose flour enhances general acceptability.

Acceptability Consumer Index

The table 15 shows the acceptability consumer index (ACI) of model recipe for mini donuts as a nutritious snack for secondary school learners.

Table 15. Acceptability Consumer Index (ACI) for the development of Model Recipe for Mini Donuts as a Nutritious Snack for Secondary School Learners.

	Appearance		Aroma		Texture		Taste		ACI	RANK
T1	8.42	1.85	8	1.52	7.64	1.49	7.82	3.09	7.95	2
T2	6.56	1.44	6.18	1.17	6.18	1.21	6.06	2.39	6.22	4
T3	6.58	1.45	7.02	1.33	6.72	1.31	6.58	2.60	6.69	3
T4	8.02	1.76	8.28	1.57	8.44	1.65	8.52	3.37	8.35	1
T5	5.04	1.11	4.76	0.90	4.62	0.90	4.70	1.86	4.77	5

The ranking of treatments indicates the acceptability consumer index of model recipe for mini donuts as a nutritious snack. Treatment 4 achieved the highest ACI with 8.35, indicating the most acceptable overall performance. Treatment 1 comes in second with an ACI of 7.95. While treatment 3 ranks third with an ACI of 6.69. On another hand, treatment 2 got forth with 6.22. Treatment 5 ranking fifth indicating the least desirable option with an ACI of 4.77.

The implication is that consumers prefer mini donuts that are closer to traditional recipes with more all-purpose flour, implying that maintaining a higher proportion of all-purpose flour enhances overall acceptability as a nutritious snack.

Nutrient Analysis

Table 16 displays the result of nutrient analysis of shows the Nutrient Content of Rice based Sagip Nutri-pack for each treatment.

Table 16. Nutrient Analysis of Rice-Based Sagip Nutri-Pack for the Model Recipe for Mini Donuts as a Nutritious Snack for Secondary School Learners.

TREAMENT	Crude Protein (%)	Crude Fiber (%)	Crude Fat (%)	Moisture (%)	Ash (%)
T_1-Commercial Mini Donut	6.64	0.46	12.85	33.11	1.36
T_2-75% Rice-Based Sagip Nutri-Pack Powder	8.08	2.57	16.83	29.49	1.99

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T_3-50% Rice-Based Sagip Nutri-Pack Powder	7.36	1.33	15.55	30.73	1.69
T_4-25% Rice-Based Sagip Nutri-Pack Powder	6.82	1.12	15.61	28.11	1.48
T_5-100% Rice-Based Sagip Nutri-Pack Powder	8.62	2.27	19.65	29.66	2.21

In terms of Crude protein, Treatment 5(100% Rice-Based Sagip Nutri-Pack Powder) had the highest percentage with 8.62 followed by the Treatment 4 (25% Rice-Based Sagip Nutri-Pack Powder) with 6.84. Treatment 2(75% Rice-Based Sagip Nutri-pack Powder) has 8.08 percentage while Treatment 3 (50% Rice-Based Sagip Nutri-Pack Powder) with 7.36 percentage and treatment 1(Commercial Mini Donuts) had the lowest percentage with 6.64 percentage.

On the other hand, T2 had the highest percentage in crude fiber with 2.57 followed by T5 with 2.27 percent, T3 with 1.33 percent followed by T4 with 1.12 percent and lastly T1 which contains the lowest percentage with 0.46.

In terms of crude fat, T5 had the highest percentage with 19.65 followed by T2 with 16.83 percent while T4 has 15.61 percent, T3 has 15.55 percent and lastly T1 with 12.85 percent of crude fat.

For its moisture, treatment 1 had the highest percentage with 33.11 followed by T3 with 30.73 percent, T5 with 29.66 while T2 with 29.49 percent. Lastly, T4 with the lowest percentage of 28.11 percent.

Furthermore, in terms of ash, T5 had the highest percentage of 2.21 followed by T2 with 1.99 percent, T3 with 1.69 percent, T4 with 1.48 percent and lastly, T1 with the lowest percentage of 1.36 percent.

This implies that the addition of the Rice-Based Sagip Nutri-Pack Cacao Pod Husk (CPH), Malunggay and Turmeric Powder increases the nutritional value in terms of protein, fiber, and ash while slightly reducing moisture content compared to the commercial mini donut. The 100% Rice-Based Sagip Nutri-Pack Powder (T5) shows the highest values for protein, fat, and ash, making it a more nutrient-dense option compared to the commercial mini donuts. According to Paz et al, the analysis and application of higher protein rice flours could contribute to a large-scale use in baked goods that may aim to naturally increase nutritional value.

Summary Computation of Cost and Return on Investment

Cost of production. Table 17 shows the summary computation of cost of production among all the five treatments.

Table 17. Summary computation of Cost Production

PARTICULARS	**Treatments**				
Ingredients	T1	T2	T3	T4	T5
Rice-Based Sagip Nutri-pack Powder	0.00	37.50	25.00	12.50	50.00
All-Purpose Flour	7.50	1.88	3.75	2.50	0.00
Granulated Sugar	8.25	8.25	8.25	8.25	8.25
Baking Powder	4.00	4.00	4.00	4.00	4.00
Salt	.20	.20	.20	.20	.20
Milk	15.00	15.00	15.00	15.00	15.00
Oil	6.00	6.00	6.00	6.00	6.00
Egg	7.00	7.00	7.00	7.00	7.00
Vanilla Extract	1.00	1.00	1.00	1.00	1.00
Subtotal	**48.95**	**80.83**	**70.20**	**56.45**	**91.45**
Additional Expenses					
Packaging Material	7.00	7.00	7.00	7.00	7.00
Label	3.00	3.00	3.00	3.00	3.00
Subtotal	**10.00**	**10.00**	**10.00**	**10.00**	**10.00**

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Other Operating Expenses					
Electricity	10.00	10.00	10.00	10.00	10.00
Fare	8.00	8.00	8.00	8.00	8.00
Subtotal	**18.00**	**18.00**	**18.00**	**18.00**	**18.00**
Total Cost (Php)	**76.95**	**108.83**	**98.20**	**84.45**	**119.45**

As shown in Table, the cost of Rice-Based Nutri-Pack Powder used in fortifying the five treatments differed. For T2 (Mini Donuts fortified with 90g Rice Based Sagip Nutri-Pack Powder), the amount of Rice-Based Nutri-Pack Powder is Php37.50; T3(Mini Donuts fortified with 60g Rice Based Sagip Nutri-pack Powder), the amount of Rice-Based Nutri-Pack Powder is Php25.00

The amount of Rice-Based Nutri-pack is Php25.00; and for T4(Mini Donuts fortified with 30g Rice-Based Sagip Nutri-pack Powder), the amount of Rice-Based Nutri-pack powder is Php12.50

The same amount or the other ingredients was given for the four treatments; Granulated sugar, Php8.25; Baking Powder, Php4.00; Salt, Php.20; Milk, Php15.00; Oil, Php6.00; Eggs, Php7.00; Vanilla extract, Php1.00.

Considering all the above expenses for the ingredients, the subtotal for T1; T2, T3, T4, and T5 were Php48.95; Php80.83, Php70.20, Php56.45 and Php91.45 respectively.

Additional expenses for all treatments amounted to Php10.00 which includes Packaging Material and Php7.00 and Label at Php3.00. In addition, other operating expenses such as Electricity at Php10.00 and Fare at Php8.00 totaled Php18.00.

Summing up all the above expenses, the cost incurred in producing the products amounted to Php76.95, Php108.83, Php98.20, Php84.45, and Php119.45 for T1; T2, T3, T4, and T5, respectively.

Return and Investment. Table 18 shows the Summary Computation of Return and Investment of each treatment.

Table 18. Summary Computation of Return and Investment

PARTICULARS	**Treatments**				
	T1	T2	T3	T4	T5
Total Production Cost (Php)	76.95	108.83	98.20	84.25	119.45
Number of box (Rice-Based Mini donuts Nutri-Snack x 12 pcs)	3	3	3	3	3
Selling Price	50.00	50.00	50.00	50.00	50.00
Total Sale	150.00	150.00	150	150	150
Income	73.05	41.17	51.8	65.75	30.55
ROI	**95%**	**38%**	**53%**	**78%**	**26%**

As shown in the table, the cost analysis of the production costs, sales, income, and return on investment (ROI) for the five different treatments of mini donuts, fortified with Rice-Based Sagip Nutri-Pack Powder, reveals distinct profitability profiles for each treatment. Each treatment involves the production of three boxes of mini donuts (36 pieces total), with a consistent selling price of Php 50 per box and a total sale revenue of Php 150.

Treatment 1 stands out as the most profitable option. With a total production cost of Php 76.95, it generates an income of Php 73.05, resulting in a remarkable ROI of 95%. This high ROI indicates that T1 is highly efficient in converting production costs into substantial profits. Treatment 4 follows, with a production cost of Php 84.25, yielding an income of Php 65.75 and an ROI of 78%. This makes T4 a viable and attractive option with a strong return.

Treatment 3 shows moderate profitability, with a production cost of Php 98.2 and an income of Php 51.8, resulting in an ROI of 53%. While profitable, T3's ROI is lower than that of T1 and T4, indicating a lesser, but still reasonable, return on investment. Treatment 2, with a production cost of Php 108.83, generates an income of Php 41.17, leading to an ROI of 38%.

Finally, Treatment 5 has the highest production cost at Php 119.45 and the lowest income at Php 30.55, resulting in the lowest ROI of 26%. Although T5 is still profitable, its low ROI indicates that it is the least efficient in terms of cost-to-profit conversion among all treatments.

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In conclusion, Treatment 1 offers the highest profitability and ROI, making it the best option for maximizing returns. Treatment 4 also presents a strong case with a significant ROI. Treatments 2 and 3, while profitable, provide moderate returns, and Treatment 5, despite being profitable, is the least favorable due to its low ROI. This analysis helps in identifying the most efficient and profitable treatments for mini donut produc

Development of Information, Education, and Communication (IEC) Materials

Figure 3 shows the trifold developed Information, Education, and Communication (IEC) Materials to give information and promote the Nutri-Snack to School Learners, Community and to the public. It is also one way of educating the consumers as well as to easily disseminate and advertise the dish which can help in attaining good health and wellness.

This contains the name, ingredients, and procedure of the Mini Donuts. It also gives information about health benefits and other facts of the Mini Donuts. The contact persons are also included in the material.



Figure 4. Developed Information, Education and Communication (IEC) material.

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Conclusion

Based on the results of the study, the following conclusion were derived:

1. In terms of color/appearance, Treatment 1 is the most acceptable. In terms of odor/ aroma, taste/ flavor, texture and general acceptability, Treatment 4 is more acceptable among the five treatments.
2. In the result of Acceptability Consumer Index, Treatment 4 rank first (1) Treatment1 is second (2), Treatment 3 rank third (3), Treatment 2 rank forth (4) and Treatment 5 rank fifth (5).
3. Among the five treatments, Treatment 5 has the highest crude protein, crude fat, and ash content. While treatment 2 has the highest crude fat content and Treatment 1 had the highest moisture content.
4. As to net profit, the production of mini donuts, Treatment 1 gained the most cost-effective and profitable followed by Treatment 4, Treatment 3, Treatment 2, and Treatment 5.

Recommendation

Based on the results of the study, the following recommendations are given:

1. Treatment 4 is recommended to be introduced as a new fortification of mini donuts to the consumers since it was rated the most liked in terms of the odor/aroma, taste/flavor, texture and general acceptability among other treatments. However, for its color/appearance it was rated" Like Very much" which make it more recommended to add additional garnishes to enhance the color/appearance.
2. Microbial analysis is encouraged to be conducted to determine the microbial content of the finished product.
3. Shelf-life analysis is advised to be conducted to determine the stability of the products.
4. Conduct further analysis and market testing to validate these findings and explore any potential improvements in production processes or ingredient sourcing that could enhance profitability and ROI across all treatments.

REFERENCES

1. *Alemawor, F., Dzogbefia, V. P., & Oddoye, E. O. K. (2009). Enzyme cocktail for enhancing poultry utilization of cocoa pod husk. Academic Journals 4 (6): 556-557. https://academicjournals.org/journal/SRE/article-abstract/0A4ED3517179*
2. *Al-Othman, H., Maghaydah, S., Abughoush, M., Olaimat, A. N., Al-Holy, M. A., Ajo, R., ... & Angor, M. (2022). Development and Characterization of Nutritious Gluten-Free Doughnuts with Lupin and Inulin Flours. Foods, 11(20), 3237.*
3. *Amir, I. Z., Hanida, H. S., & Syafiq, A. (2013). Development and physical analysis of high fiber bread incorporated with cocoa (Theobroma cacao sp.) pod husk powder. International food research Journal, 20(3), 1301.*
4. *Anilakumar R, Pal A, Khanum F et al. Nutritional, medicinal and industrial uses of Sesame (S. indicum L.) seeds-an overview. Agric Conspec Sci.2010;75(4):159-168. Available from: https://hrcak.srce.hr/file/98744*
5. *Babatope, B. (2005). Rheology of cocoa-pod husk aqueous system. Part-I: steady state flow behavior. Rheol Acta 45, 72–76. https://doi.org/10.1007/s00397-005-0450-7*
6. *Ballesteros, J. F., Abilgos-Ramos, R. G., & Amestoso, N. T. EXPERTS'PERSPECTIVE, CONSUMER PERCEPTION ON RICE-BASED PRODUCTS, AND MARKET TREND ON CONSUMER GOODS FOR RICE-BASED PRODUCT IDEA GENERATION.Rice-Based Biosystems Journal, 27. (2019)*
7. *Blasé M. E. M. Optimisation of Rice Flour Traits for the Production of Indigenous Rice Recipes. Curr Res Nutr Food Sci 2020; 8(1). Doi http://dx.doi.org/10.12944/CRNFSJ.8.1.33*
8. *Britannica, T. Editors of Encyclopaedia (2023, December 22). sesame. Encyclopedia Britannica. https://www.britannica.com/plant/sesame-plant*
9. *Britannica, The Editors of Encyclopaedia. "rice". Encyclopedia Britannica, 16 Nov. 2023, https://www.britannica.com/plant/rice. Accessed 28 November 2023.*
10. *Campos-Vega, R., Nieto-Figueroa, K. H., & Oomah, B. D. (2018). Cocoa (Theobroma cacao L.) pod husk: Renewable source of bioactive compounds. Trends in Food Science & Technology, 81, 172-184. https://doi.org/10.1016/j.tifs.2018.09.022.*
11. *De Sena, A.R.; de Assis, S.A.; Branco, A. Analysis of theobromine and related compounds by reversed phase high-performance liquid chromatography with ultraviolet detection: An update (1992–2011). Food Technol. Biotechnol. 2011, 49, 413–423.*
12. *Dias, A. B., Müller, C. M., Larotonda, F. D., & Laurindo, J. B. (2010).*
13. *Biodegradable films based on rice starch and rice flour. Journal of cereal science, 51(2),213-219.*
14. *Fahey JW. Moringa Oleifera: 2015. A review of the medical evidence for its nutritional, therapeutic, and prophylactic properties. Part I. In: Trees for Life Journal pp. 1-5.*
15. *FAOSTAT. FAO Statistic Division. Food and Agriculture Organization of the United Nations. Available online: http://faostat3.fao.org/home/E (accessed on 31December 2015).*
16. *Frank Hu , MD, MPH, PhD, Harvard T.H. Chan School of Public Health Gujral, H. S., &Rosell, C. M. (2014). Improvement of the breadmaking quality of rice flour by glucose oxidase. Food research international, 37(1), 75-81.*
17. *Heuzé, V., G. Tran, D. Bastianelli, and F. Lebas. "Mung Bean (Vigna Radiata)." Feedipedia - Animal Feed Resources Information System. August 13, 2013. Accessed November 19, 2014. https://www.delish.com/cooking/recipe-ideas/g129/rice- recipes/*

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Volume: 9 | Issue: 6 | June 2024 - Peer Reviewed Journal

18. *Ikawa-Yoshida, A., Matsuo, S., Kato, A., Ohmori, Y., Higashida, A., Kaneko, E., & Matsumoto, M. (2017). Hepatocellular carcinoma in a mouse model fed a choline-deficient, L-amino acid-defined, high-fat diet. International Journal of Experimental Pathology, 98(4), 221-233.*
19. *Jaya Singh, Neelma Kunwar and Smita Tripathi. Benefits and nutritive value of sesame seeds. International Journal of Recent Scientific Research Vol. 7, Issue, 9, pp. sepr 2016.*
20. *Kasolo, J. N., Bimenya, G. S., Ojok, L., Ochieng, J., & Ogwal-Okeng, J. W. (2017). Phytochemicals and uses of Moringa oleifera leaves in Ugandan rural communities.*
21. *Lambrides, C. J. ; Godwin, I. D., 2006. Mungbean. In: Chittarajan, K., Genome Mapping and Molecular Breeding in Plants, 3: 69-90*
22. *Lee, J. H., Cho, A. R., Hong, J. Y., Park, D. J., & Lim, S. T. (2019). Physical properties of wheat flour composites dry-coated with microparticulated soybean hulls and rice flour and their use for low-fat doughnut preparation. Journal of cereal science, 56(3), 636-643.*
23. *Lu, F., Rodriguez-Garcia, J., Van Damme, I., Westwood, N. J., Shaw, L., Robinson, J. S., ... & Charalampopoulos, D. (2018). Valorisation strategies for cocoa pod husk and its fractions. Current Opinion in Green and Sustainable Chemistry, 14, 80-88.*
24. *Mallillin, A. C., Trinidad, T. P., Sagum, R. S., de Leon, M. P., Borlagdan, M. P., Baquiran, A. F. P., ... & Aviles, T. F. (2014). Mineral availability and dietary fiber characteristics of Moringa Oleifera. Food Public Health, 4(5), 242-246.*
25. *Mohammed, S. (2022). An overview on nutritional composition and therapeutic benefits of sesame seeds (Sesamum indicum). Int. J. Res. Appl. Sci. Eng. Technol, 10, 1119-1127.*
26. *Nguyen, V.T., Pham, T. D., Vu, L. B., Nguyen, V. H., Tran, N. L. (2021). Microwave- assisted Extraction for Maximizing the Yield of Phenolic Compounds and Antioxidant Capacity from Cacao Pod Husk (Theobroma cacao L.). Bentham Science Publishers, Current Nutrition & Food Science, Volume 17, Number 2, 2021, pp. 225-237(13). https://doi.org/10.2174/1573401316999200503032017*
27. *Ramiro-Puig, E., & Castell, M. (2009). Cocoa: antioxidant and immunomodulator. British Journal of Nutrition, 101(7), 931-940. https://doi.org/10.1017/S0007114508169896*
28. *Paz, G. M., King, J. M., Prinyawiwatkul, W., Tyus, C. M., & Aleman, R. J. (2020). High-protein rice flour in the development of gluten-free muffins. Journal of food science, 85(5), 1397-1402.*
29. *Petruzzello, M. (2023, May 12). mung bean. Encyclopedia Britannica. https://www.britannica.com/plant/mung-bean*
30. *Pratap, A., Gupta, S., Rathore, M., Basavaraja, T., Singh, C. M., Prajapati, U., ... & Kumari, G. (2021). Mungbean. In The beans and the peas (pp. 1-32). Woodhead Publishing.*
31. *Rathaur, P., Raja, W., Ramteke, P. W., & John, S. A. (2012). Turmeric: The golden spice of life. International Journal of pharmaceutical sciences and research,3(7), 1987.Reviewed/Revised Feb 2023*
32. *Rockwood, J. L., Anderson, B. G., & Casamatta, D. A. (2018). Potential uses of Moringa oleifera and an examination of antibiotic efficacy conferred by M. oleifera seed and leaf extracts using crude extraction techniques available to underserved indigenous populations. International Journal of Phytotherapy Research, 3(2), 61-71.*
33. *Rout, K.; Yadav, B.G.; Yadava, S.K.; Mukhopadhyay, A.; Gupta, V.; Pental, D.; Pradhan, A.K. QTL Landscape for Oil Content in Brassica Juncea: Analysis in Multiple Bi-Parental Populations in High and "0" Erucic Background. Front. Plant Sci. 2018, 9, 1448.*
34. *Sánchez-Machado, D. I., Núñez-Gastélum, J. A., Reyes-Moreno, C., Ramírez-Wong, B., & López- Cervantes, J. (2010). Nutritional quality of edible parts of Moringa oleifera. Food analytical methods, 3, 175-180.*
35. *Science Direct Journals and Books: Food Science & Human Wellness Volume 5, Issue 2, 2016-Moringa Oleifera: A review on Nutritive Importance and its Medical Application (Gopalakrishman, 2016)*
36. *Science-Based health Benefits of Moringa Oleifera (Amarzon, 2018)*
37. *Shahrajabian, M. H., Sun, W., & Cheng, Q. (2019). A short review of health benefits and nutritional values of mung bean in sustainable agriculture. Polish Journal of Agronomy, (37), 31-36.*
38. *Shilpa N Bhupathiraju , PhD, Harvard Medical School and Brigham and Women's Hospital;*
39. *Tang, D., Dong, Y., Ren, H. et al. A review of phytochemistry, metabolite changes, and medicinal uses of the common food mung bean and its sprouts (Vigna radiata). Chemistry Central Journal 8, 4 (2014). https://doi.org/10.1186/1752-153X-8-4*
40. *Valadez-Carmona, L., Ortiz-Moreno, A., Ceballos-Reyes, G., Mendiola, J. A., & Ibáñez, E. (2018). Valorization of cacao pod husk through supercritical fluid extraction of phenolic compounds. The Journal of Supercritical Fluids, 131, 99-105. https://doi.org/10.1016/j.supflu.2017.09.011*
41. *Wei, P., Zhao, F., Wang, Z., Wang, Q., Chai, X., Hou, G., & Meng, Q. (2022). Sesame (sesamum indicum l.): A comprehensive review of nutritional value, phytochemical composition, health benefits, development of food, and industrial applications. Nutrients, 14(19), 4079.*