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FORMULATION OF GREEN MUSSEL-BAMBOO SHOOT SIOPAO

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Abstract: The main purpose of the study was to formulated a green mussel-bamboo shoot siopao. This used the Completely Randomized Design (CRD). The sensory qualities were evaluated by semi-trained panelist and for final processes for consumer's preference evaluation by the 100 tasters. Score cards with the Nine (9) Points Hedonic Scale was used to obtain the data. The mean and Analysis of Variance (ANOVA) were used to analysed, the findings of the study revealed that Treatment A (75g green mussel and 25g bamboo shoot) was identified the most appealing, treatment B (50g green mussel and 50g bamboo shoot) consistently excelled in most sensory attributes, including, aroma, taste and texture. While treatment C (25g green mussel and 75g bamboo shoot) was identified is also aromatic. In the general acceptability in terms of appearance, aroma, taste and texture Treatment B (50g green mussels and 50g bamboo shoots) had the highest mean score with qualitative description of "Liked extremely", while Treatments A (75g green mussel and 25g bamboo shoot) and treatment C (25g green mussel and 75g bamboo shoots) followed closely with mean score having qualitative description of "Liked Very much". The findings also indicate that there were no significance differences in appearance, aroma, taste and texture among three (3) treatments of green mussel bamboo shoot siopao. The finding also indicates that there were no significant differences in the sensory attributes of green mussel bamboo shoot siopao in terms of appearance, aroma and taste however there were a significant difference in terms of texture in the favor of Treatment B (50g green mussel and 50g bamboo shoot). The product of green mussel-bamboo shoot siopao was safe for human consumption based on the microbial and proximate analysis.

Keywords: Green Mussel, Bamboo, Shoot, Siopao, Formulation, Analyses and Acceptability

I. INTRODUCTION

Green mussel and bamboo shoot siopao is a unique variation of the traditional steamed bun that features a savory filling made from green mussels (*Perna viridis*) and bamboo shoot. This innovative combination blends the rich, umami flavor of mussel with the crisp texture and subtle earthiness of bamboo shoots, creating a nutritious and flavorful alternative to meat-based siopao. Rich in protein, vitamins, and minerals, this filling not only promotes healthier eating but also highlights the potential of using locally sourced, sustainable ingredients. The green mussel bamboo shoot siopao offers a fresh take on a classic snack, appealing to health-conscious consumers and seafood lovers alike.

The use of green mussel in food products has been widely explored due to their high nutritional value, including significant levels of protein, omega-3 fatty acids, and essential minerals (Gomez et al., 2018). Meanwhile, bamboo shoots have gained attention for their dietary fiber content, antioxidant properties, and low caloric value, making them suitable for health-oriented food innovations (Singh & Prasad, 2020). Combining these two ingredients in a siopao aligns with current trends in functional and sustainable foods. According to Rivera and Santos (2021), the integration of local marine and plant-based ingredients into traditional dishes can enhance both nutritional content and community-based food production. Thus, green mussel bamboo shoot siopao exemplifies a promising approach to creating value-added, health-promoting food products rooted in local resources.

Green mussel offers several advantages, including its nutritional value and the innovation it brings to traditional Filipino cuisine. According to Garcia and Rivera (2021), the inclusion of green mussel enhances protein content and provides essential omega-3 fatty acids, vitamins, and minerals, making it a healthier alternative to traditional pork or chicken-filled siopao. Additionally, the use of locally sourced green mussels supports sustainable seafood practices, benefiting local aquaculture and promoting environmental responsibility (Molina & Cruz, 2020). However, despite these benefits, there are also some disadvantages. The primary concern is that green mussel may not be widely accepted by all consumers due to their distinct taste and texture, which could be unfamiliar or off-putting to some. Furthermore, as highlighted by Alvarez and Santos (2022).

Siopao is a steamed rice flour bun with meat filling that is a very popular Filipino afternoon snack, it is usually eaten with a sweet spicy sauce. It is the Chinese version of baozi which is filled with vegetables or meat. This popular Filipino

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snack can also be eaten as a complete breakfast meal. There are numerous variations on the ingredients of siopao fillings but no existing studies or innovations were made regarding the incorporation of green mussel bamboo shoot or even meat filling in this well-known steam bun. (Ortigas, 2014).

In line with this, the researchers decided to make variations to the usual vegetable and seafood filling of siopao by substituting it with green mussel and bamboo shoot in order to improve its overall appeal, flavor and nutritional qualities.

Furthermore, this study will also encourage farmers and fisher folks to increase their production to sustain the bamboo shoot and green mussel demand in the market. This will also give an idea for entrepreneurs who were engaged siopao business to make variations to their usual siopao filling recipe.

II. METHODOLOGY

Methods of Research

This study used experimental and developmental method of research in the formulation, analyses and acceptability of green mussel-bamboo shoot. It is an experimental method involving the manipulation of conditions to study the relative effect and various treatments applied to members of different samples (Worth, 2016). The dependent variables were evaluation and general acceptability of the product in terms of appearance, aroma, texture and general acceptability.

The key features are controlled methods and the random allocation of participants into controlled and experimental groups. An experiment is an investigation in which a hypothesis is scientifically tested. The experimental method focuses on the study in the future (what will be) when the variables or the study are carefully controlled or manipulated. Hence, in this study, the experimental method attempted to investigate the proportion of green mussel and bamboo shoot using three treatments. Developmental research defined as the systematic study designing, developing, and evaluating instructional programs, processes, and products that must meet criteria of internal consistency and effectiveness. The most common types of development research involve situations in which the product-development process is analyzed and described, and the final products is evaluated (Richey, 2017)

In the developmental research, the product developed is green mussel-bamboo shoot siopao for potential siopao product development and commercialization.

Research Design

The design used was the Complete Randomized Design (CRD) in which the Green Mussel-Bamboo Shoot Siopao Brown are studied with successive replications conducted to determine the cause of change. Samples for evaluation are coded and score card were utilized for randomization. The experiment is carried out in one products formulation with three treatments and three replications. (Anderson & McLean, 2018))

Materials, Tools and Equipment

The tools and equipment used in the study were the following: one (1) unit 4x8 meters stainless working table; one (1) stove; one (1) steamer; three (3) pieces medium- sized stainless mixing bowls; one (1) food processor; one (1) set of stainless measuring spoons; one (1) stainless knife; one (1) piece of chopping board; three (3) piece stainless strainer; one (1) unit digital weighing scale; three (3) piece frying pan; and, one (1) dough cutter,

Treatments Used in the Study

The one product formulations and three treatments were used in the experiment: Treatment A (75g green mussel and 25g bamboo shoot), Treatment B (50g green mussel and 50g bamboo shoot), and Treatment C (25g green mussel and 75g bamboo shoot). In this study, the process was developmental, in order to obtain the desired result of the products. The proportions of the ingredients are found in Table 1 below. The purpose of the treatment is to find out the acceptability of green mussel bamboo shoot siopao.

In all treatments, all ingredients were the same quantity and volume except to bamboo shoot and green mussel which varies in different treatments.

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Table 1. Proportion of the Ingredients in Three Treatment Formulation of Green Mussel-Bamboo Shoot Siopao

	TREATMENT		
Ingredients	**A**	**B**	**C**
Green Mussels	**75 g**	**50 g**	**25 g**
Bamboo Shoots Onion	**25 g**	**50 g**	**75 g**
Garlic	**15 g**	**15 g**	**15 g**
Pepper Powder	**10 g**	**10 g**	**10 g**
Sugar	**1 g**	**1 g**	**1 g**
Soy Sauce	**15 g**	**15 g**	**15 g**
Oyster Sauce	**5 ml**	**5 ml**	**5 ml**
Cornstarch	**5 ml**	**5 ml**	**5 ml**
Water	**10 g**	**10g**	**10g**
Green mussel Broth	**20 ml 40ml**	**20 ml 40 ml**	**20 ml 40 ml**

Table 1. Proportion of ingredients of the hog plum flavored cubes for sensory evaluation.

Table 2 shows the proportion of ingredients among the 3 treatments in making hog plum flavored cubes for general acceptability. Each treatment maintained a consistent amount of garlic powder, white pepper powder, meat powder, butter and iodized salt to ensure consistency across batches. However, the variations lied in the amount of hog plum powder.

Table 2. Proportion of ingredients of the hog plum flavored cubes for general acceptability.

Ingredients	Treatment (Beef)	Treatment (Chicken)	Treatment (Pork)
Hog Plum Powder	15g	10g	15g
Meat Powder	5g	5g	5g
Garlic Powder	2g	2g	2g
White Pepper Powder	2g	2g	2g
Butter	15g	15g	15g
Iodized Salt	3g	3g	3g

Experimental Procedure

Step 1. Preparation and Making of Green Mussel Meat

The raw materials needed for the formulation, analysis, and acceptability of the green mussel-bamboo shoot siopao were gathered and inspected to ensure good quality. One thousand grams of green mussel pick from the shanty town, then they were scrub, washed, and clean in running water, boiled the green mussels for about 20 minutes, drained, removed the shell and stomach, and measured using the weighing scale. Then using a food processor equipment, they were grinding for about 2 seconds.

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Step 2. Preparation and Making Bamboo Shoot

½ kilo of bamboo shoot was purchased at Mambusao market in trusted vendor. Peel off the outer layers and inner layers until you reach the soft, pale -yellow core, washed the bamboo shoots under running water to remove any dirt or debris. Then they were sliced thinly for easy grind, then boiled the bamboo shoots to remove bitterness for about 20–30 minutes to remove bitterness. Drained the bamboo shoots to removed excess water and measured using a weighing scale lastly, then using food processor equipment they were grind for about 3 seconds.

Step 3. Preparation of Making Siopao Dough

In making dough, first, combine or mix the flour, sugar, yeast, and baking powder in a large bowl, pour in water and oil, mixing until a dough forms, turn the dough out onto a flat surface and knead until smooth and elastic (about 10-12 minutes). And place the dough in a bowl, cover, and let it rise in a warm place until doubled in size (about 1 hour), gently punch down the dough to release air bubbles, lastly divide the dough into smaller balls and roll them out.

Step.4 Preparation and Formulation of Green Mussel-Bamboo Shoot Siopao

The tools, materials, ingredients, and workplace have been prepared. The filling form the previous preparation was incorporated and weighed. Then, measured all the ingredients of the green mussel-bamboo shoot siopao. Sauté the garlic, onions, green mussels and bamboo shoot until sticky add water and other ingredients and continue stirring until the water dissolved for about 5 minutes. Then set aside. In a pan wrap the fillings into a dough to form a siopao and in the used of steamer, steamed the green mussel- bamboo shoot siopao for about 15 minutes.

Collection of Data

The instruments used in the study was the evaluation sheets. It dealt with the variables used to evaluate the product such as appearance, aroma, taste, and texture. One hundred (110) evaluators composed of ten (10) semi-trained panelist and one hundred (100) consumers who evaluated the product. The study employed three (3) treatments. The evaluation sheets were disseminated to the evaluators to ensure the reliability of the data. The evaluators were invited and were given an instruction on how to evaluate the product. The data gathered were tabulated and statically analysed using the prescribed statistical tools.

For sensory evaluation, the instrument used a score card. It will look into the quality attributes of the product such as appearance, aroma, taste, and texture. The mean is used to determine the sensory qualities of green mussel-bamboo shoot siopao and its general acceptability as a whole.

The evaluators were invited and were given an instruction on how to evaluate the product. The evaluation sheet was given to the participants, semi-trained panelists, teachers, students and outside consumers, and their honest opinions were solicited. The evaluators were instructed to evaluate the product using a Nine (9) Point Hedonic Scale. The one hundred (100) evaluators comprised of thirty-five (35) JHS students; fifteenth (15) SHS at Mambusao National High Schools; ten (20) JHS teachers at Mambusao National High School; twenty (20) vendors and ten (10) housewives;

After the evaluation of the finished products, the evaluation sheets were gathered, tallied, analysed and interpreted using an SPSS software. The mean was used to determine the sensory qualities of green-mussel bamboo shoot in terms of appearance, aroma, taste and texture and its general acceptability as a whole. ANOVA was also used to analyze and interpret the significant difference among three treatments of the product set at 0.01 level of significance.

Statistical Tools and Analysis

The products and treatments, exhibiting the highest mean scores, underwent consumer evaluation to assess their overall acceptability. The gathered data were organized and subjected to statistical analysis utilizing the mean and Analysis of Variance (ANOVA). This analysis was conducted using the Statistical Package for the Social Sciences (SPSS) software for data processing and comprehensive evaluation.

The mean served as the key statistical tool for determining the level of sensory and general acceptability of appearance, aroma, taste, and texture.

Analysis of Variance (ANOVA) served as the key statistical tool for determining any significant differences among the three products. The ANOVA was applied with an alpha level set at 0.01 to discern any notable differences concerning its appearance, aroma, taste and texture.

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III. RESULTS AND DISCUSSION

Sensory Qualities of Green Mussel-Bamboo Shoot Siopao

Table 2 presents the sensory qualities of the green mussel-bamboo shoot siopao focusing on appearance, Treatment A (75g green mussel and 25g bamboo shoot), with a highest mean score of 8.50 with the adjectival description of "Extremely Appealing". In Treatment B (50g green mussel and 50g bamboo shoot) with the mean of 8.40 which describe as "Extremely Appealing" while treatment C (25g green mussel and 75g bamboo shoot) got the mean 8.10 as described very much appealing.

In terms of aroma Treatment B (50g green mussel and 50g bamboo shoot) and Treatment C (25g green mussel and 75g bamboo shoot) got the same mean 8.40 with adjectival description of "Extremely Pleasant. However, treatment A (75g green mussel and 25g bamboo shoot) got the mean score of 8.10 as rated "Very much Pleasant"

In terms of taste Treatment B (50g green mussel and 50g bamboo shoot) got the mean of 8.50 with adjectival description of "Extremely Delicious". Hence Treatment A, got the mean of 8.10 as rated "Very much Delicious" Followed by treatment C with the mean of 8.00 as described rated "Very much Delicious".

In texture treatment A (75g green mussel and 25g bamboo shoot) and B (50g green mussel and 50g bamboo shoot) got the same highest mean of 8.50 as described "Extremely Soft and Fluffy) While treatment C (25g green mussel and 75g bamboo shoot) got the mean score of 8.10 described as "Very Much Soft and Fluffy

Table 2. Sensory qualities of green mussel- bamboo shoot siopao

TREATMENTS	A		B		C	
Quality Attributes	**Mean**	**AD**	**Mean**	**AD**	**Mean**	**AD**
Appearance	8.50	EA	8.40	EA	8.10	VMA
Aroma	8.10	VMP	8.40	EP	8.40	EP
Taste	8.10	VMD	8.50	ED	8.00	VMD
Texture	8.50	ESF	8.50	ESF	8.10	VMSF

Legend*: Adjectival Description (AD)*

Score:	***appearance***	***Aroma***	***Taste***	***Texture***
8.12 – 9.00	*Extremely Appealing (EA)*	*Extremely Pleasant (EP)*	*Extremely Delicious (ED)*	*Extremely Soft and Fluffy (EFF)*
7.23 – 8.11	*Very Much Appealing (VMA)*	*Very Much Pleasant (VMP)*	*Very Much Delicious (VMD)*	*Very Much Soft and Fluffy (VMFF*
6.34 – 7.22	*Moderately Appealing (MA)*	*Moderately Pleasant (MP)*	*Moderately Delicious (MD)*	*Moderately Soft and Fluffy (MSF)*
5.45 – 6.33	*Slightly Appealing (SA)*	*Slightly Pleasant (SP)*	*Slightly Delicious (SD)*	*Slightly Soft and Fluffy (SSF)*

General Acceptability of Green Mussel-Bamboo Shoot Siopao

Table 3 presents the general acceptability of the green mussel-bamboo shoot siopao. In terms of appearance, all treatments were with qualitative description "Like Extremely" In terms of aroma Treatment C (25g green mussel and 75g bamboo shoot), Treatment A (75g green mussel and 25g bamboo shoot) and Treatment B (50g green mussel and 50g bamboo shoot) got the mean of 8. 40, 8.38, and 8.36 with the qualitative description of "Liked Extremely". In terms of taste Treatment B (50g green mussel and 50g bamboo shoot), Treatment, A (75g green mussel and 25g bamboo shoot)

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and Treatment C (25g green mussel and 75g bamboo shoot) got the mean score of 8.67, 8.51, and 8.20 with the qualitative description of "Like Extremely". In terms of Texture Treatment B (50g green mussel and 50g bamboo shoot), Treatment A (75g green mussel and 25g bamboo shoot) and Treatment C (25g green mussel and 75g bamboo shoot) got the mean score of 8. 54, 8. 40 and 8.20 with the qualitative description of "Like Extremely"

In general acceptability, all treatments got the qualitative description of "Like Extremely", Treatment B (50g green mussel and 50g bamboo shoot), Treatment A (75g green mussel and 25g bamboo shoot) and treatment C (25g green mussel and 75g bamboo shoot) with the mean of 8. 52, 8.40 and 8.31.

The results of general acceptability of the green mussel–bamboo shoot siopao were highly acceptable to the sensory panel, receiving the qualitative rating of "Liked Extremely" across all sensory attributes. Among the treatments, Treatment B (50g green mussel and 50g bamboo shoot) consistently received the highest mean scores in terms of taste (8.67), texture (8.54), and overall acceptability (8.52), suggesting that an equal ratio of green mussel to bamboo shoot offers the most balanced and favorable combination. While Treatments A and C also performed well, the results suggest that a 1:1 ratio provides the most appealing sensory characteristics, making it the most preferred formulation among the three.

Table 3. General acceptability of green mussel- bamboo shoot siopao

TREATMENTS	**A**		**B**		**C**	
Quality Attributes	**Mean**	**AD**	**Mean**	**AD**	**Mean**	**AD**
Appearance	8.29	LE	8.49	LE	8.33	LE
Aroma	8.38	LE	8.36	LE	8.40	LE
Taste	8.51	LE	8.67	LE	8.00	LVM
Texture	8.40	LE	8.52	LE	8.10	LE
A **General Acceptability**	8.40	LE	8.52	LE	8.31	LE

Legend: Adjectival Description (AD)

Score	***General Acceptability***
8.12 – 9.00	*Liked Extremely (LE)*
7.23 – 8.11	*Liked Very Much (LVM)*
6.34 – 7.22	*Liked Moderately (LM)*
5.45 – 6.33	*Liked Slightly (LS)*

IV. CONCLUSION

The findings from the sensory evaluation of the Green Mussel-Bamboo Shoot Siopao indicate that Treatment B (50g green mussel and 50g bamboo shoot), with an equal mix of green mussel and bamboo shoot, delivered the best overall results, particularly in terms of aroma, taste, and texture. This formulation was the most favored by consumers, demonstrating that a balanced ingredient ratio contributes to the most desirable sensory qualities. Although Treatment A (75g green mussel and 25g bamboo shoot) performed well in appearance, while Treatment C (25g green mussel and 75g bamboo shoot) was identified also an aromatic. The higher bamboo shoot content, was less favored due to its softer texture and less richness flavor. Despite these variations, the overall acceptability scores reflected a clear preference for Treatment B, (50g green mussel and 50g bamboo shoot) which also highlighted the importance of taste and texture in influencing consumer satisfaction.

Additionally, the shelf-life and microbial analysis of the siopao showed that the product has a relatively short shelf life at room temperature than shelf life at chilling temperature, requiring refrigeration to maintain its freshness and safety.

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Proximate analysis confirmed that the siopao is a nutritious, low-calorie option, with moderate protein content and low fat. Furthermore, the siopao passed microbial testing with a low microbial count and no harmful bacteria, ensuring its safety for consumption. In conclusion, Green Mussel Bamboo Shoot Siopao with a balanced ratio of ingredients (Treatment B (50g green mussel and 50g bamboo shoot)) is a promising product, offering a nutritious, safe, and consumer-preferred alternative to traditional siopao while meeting food safety standards and sustainability goals.

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