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FORMULATION, ANALYSES AND ACCEPTABILITY OF SEAFOOD LONGGANISA WITH CASSAVA AND GREEN AMARANTH LEAVES

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Abstract: Seafood is a valuable source of protein, omega-3 fatty acids, and other essential nutrients that contribute to a healthy diet. This study aimed to contribute to the culinary landscape by offering consumers a nutritious and flavorful option that gives the unique characteristics of seafood. By exploring the acceptability of seafood longganisa (scallop and cagaycay) with cassava and green amaranth leaves, the researcher sought to meet the needs of health-conscious consumers while tapping into the underutilized potential of marine resources. This focused on developing the seafood longganisa, evaluating their sensory attributes (appearance, aroma, taste, texture). The experimental-developmental method, using a Completely Randomized Design was employed. This included three replications with 10 semi-trained panelists and 100 consumer respondents. A 9-Point Hedonic Scale was used for evaluation, and data were analyzed using mean and ANOVA. The different treatments of proportion used seafood longganisa using scallop and cagaycay. Among treatments, the best proportions were 500 grams. In terms of appearance, Treatment A (scallop) got the highest mean with extremely appealing, extremely pleasant, extremely delicious, and extremely firm, followed by Treatment C (combined scallop and cagaycay) with very much appealing, pleasant, delicious, and firm, and Treatment B (cagaycay) with moderately appealing, pleasant, delicious, and firm. The overall acceptability was uniformly high across all treatments. There was a significant difference in terms of appearance and taste. There was no significant difference in terms of aroma and texture. There was a significant difference in the acceptability of the three treatments in favor of Treatment A (scallop) longganisa, which was tested for shelf life, microbial safety, and nutritional content, confirming that it was both nutritious and suitable for extended use.

Keywords: *Product Formulation, Product Analyses, Acceptability, Seafood Longganisa, Scallop, Cagaycay*

I. INTRODUCTION

Longganisa is a popular Filipino breakfast food that has traditionally been made from pork or chicken, which contributes to its popularity and high-fat content. However, with a rising wave of health-consciousness, particularly among Filipinos residing in coastal areas, there is an increasing demand for innovative and healthier marine food products. The coastal proximity of major cities underlines the necessity for continuous advancements in the seafood industry (Ignacio et al., 2018).

Therefore, there is a clear research gap in understanding the acceptability of seafood longganisa among consumers and exploring its potential as a healthier and more diverse alternative to traditional pork or chicken-based longganisa. By bridging this gap, this study aimed to contribute to the culinary landscape by offering consumers a nutritious and flavorful option that gives the unique characteristics of seafood. By exploring the acceptability of seafood longganisa using scallop and cagaycay (a type of clam) the research sought to meet the needs of health-conscious consumers while tapping into the underutilized potential of marine resources.

Seafood is a valuable source of protein, omega-3 fatty acids, and other essential nutrients that contribute to a healthy diet. In the Philippines, seafood plays a significant role in culinary traditions, especially in coastal areas, where resources like scallops and cagaycay are abundant. To maximize the utility of these seafood resources, innovative food products, such as seafood longganisa (sausage) can be developed. Longganisa, a popular Filipino delicacy, is a versatile product that can be adapted to various flavors and ingredients, making it an ideal candidate for integrating local, sustainable, and nutritious seafood.

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Furthermore, cassava, a commonly grown root crop in tropical regions, is often used as an extender in food products due to its affordability, availability, and starchy properties. Similarly, amaranth leaf or *kulitis* is a nutrient-dense leafy vegetable, rich in vitamins and minerals. The incorporation of cassava and amaranth leaves into seafood longganisa adds not only nutritional value but also a novel texture and flavor profile, enhancing its potential acceptability among consumers.

Studies have demonstrated the importance of developing innovative food products to improve dietary diversity and reduce food waste. For instance, a study by Salayo et al. (2012) highlighted the potential of underutilized marine resources to support food innovation and sustainable livelihood in coastal communities. Another study by Sharif et al. (2017) focused on the sensory evaluation of seafood-based products, underscoring that consumer acceptability is significantly influenced by a product's taste, texture, and appearance. However, there is limited research on incorporating non-conventional ingredients like cassava and amaranth leaves into seafood-based longganisa, leaving a gap in exploring the potential synergies between seafood, local crops, and leafy vegetables in enhancing product acceptability.

Despite the increasing demand for sustainable and nutritious food products, there is also limited research on developing seafood-based longganisa that integrates local, underutilized ingredients such as scallops, cagaycay, cassava, and amaranth leaves. Existing studies focus primarily on the sensory evaluation of traditional longganisa or single-component seafood products, leaving a gap in understanding how the combination of these specific ingredients influences consumer acceptability. Moreover, there is a lack of studies that address the potential contribution of such products to promoting dietary diversity and supporting local economies.

The result of this study has significant implications for both consumers and producers. For consumers, the development of a seafood longganisa enriched with cassava and amaranth leaf may offer a nutritious, affordable, and locally sourced food option. For producers, particularly in coastal communities, this study provides insights into the feasibility and market potential of creating value-added seafood products, thereby contributing to livelihood opportunities and sustainable use of marine resources. Additionally, the findings may guide policymakers and food innovators in designing programs to promote the utilization of underutilized ingredients for food security and sustainability.

II. METHODOLOGY

This chapter presents the research design materials and equipment, experimental treatments and procedures, scoring of variables, and statistical tools and analysis.

Methods of Research

This experimental research aimed to determine the acceptability of seafood longganisa with cassava and green amaranth leaves. The primary objective was to assess teachers' sensory evaluations of the longgganisa in terms of appearance, aroma, taste, and texture. The experimental method is a systematic and scientific approached to research, which the researcher manipulates one or more variables, and controls and measures any change in other variables.

This method was particularly effective for studies requiring objective evaluation and comparison, as it allows for the isolation of specific factors and the observation of their direct effects (McLeod (2019). According to Gravetter and Forzano (2018), the experimental method is highly valued in research for its ability to establish cause-and-effect relationships. It involves a controlled environment, where independent variables are manipulated to observe their impact on dependent variables. This approach is ideal for sensory evaluation studies, as it enables precise measurement of participants' response to different sensory attributes of food products.

Applying this method to research, the seafood longganisa using scallop and cagaycay with cassava and green amaranth leaves was evaluated by the group of teachers. By controlling the preparation and presentation conditions, and systematically collecting sensory data, it reliably assessed the acceptability of seafood longganisa variants.

Experimental Design

The Complete Randomized Design (CRD) was used, which the seafood longganisa was studied with successive replications to determine the cause of change. Samples for evaluation were coded and scorecards were utilized for randomization. The experiment was carried out in three products formulation with three treatments and three replications.

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Tools and Equipment

The tools and equipment used in the study were: one working table; one burner top stove; one electric food processor; one electric weighing scale; one steamer; three mixing bowls; one cutting board; one frying pan; one role sausage casing; one sausage stuffer; and one role cooking twine.

Experimental Treatment

The experiment was carried out in three product formulations with three treatments, namely: Trial 1 comes in Treatment A (500g scallop); Treatment B (500g cagaycay); and Treatment C (combined 250g scallop & 250g cagaycay). In this study, the process was developmental, in order to obtain the desired result of the product. The proportion of the ingredients is shown in Table 1. In all treatments, all ingredients were the same in quantity and volume only.

Table 1. Proportion of ingredients of the seafood longganisa for sensory evaluation.

Ingredients	Treatment A (Scallop)	Treatment B (Cagaycay)	Treatment C (Combined Scallop and Cagaycay)
Scallop	500g	-	250g
Cagaycay	-	500g	250g
Cassava Tubers	30g	30g	30g
Green Amaranth Leaves	15g	15g	15g
Black pepper powder	120g	120g	120g
Brown sugar	45g	45g	45g
Salt	5g	5g	5g
Garlic	45g	45g	45g
Onion	45g	45g	45g
Cassava starch	15g	15g	15g
Bell pepper	30g	30g	30g
Pineapple juice	30ml	30ml	30ml
Anisado wine	15ml	15ml	15ml
Atsuette	25ml	25ml	25ml

Experimental Procedure

The experimental procedure for this study involved a systematic and standardized approach in preparing, cooking, and presenting the seafood longganisa variants. The step-by-step process ensured consistency across all treatments and minimized potential variations that could impact the results.

Step 1. Preparing of Raw Materials

The raw materials needed for the development of seafood longganisa using scallop and cagaycay with cassava and green amaranth leaves were prepared.

Step 2. Procedures in Making Seafood Longganisa

The experimental procedure for producing seafood longganisa involved several steps, such as ingredient preparation, mixing, cooking, and evaluation. First, all the ingredients, such as scallop, cagaycay, cassava tubers, green amaranth leaves, black pepper powder, brown sugar, salt. garlic, onion, cassava starch, bell pepper, pineapple juice, anisado wine, and atsuette were prpeared. Then, the scallop and cagaycay were rinse separately and thoroughly under cold water, and patted dry with paper towels. In a food processor, the scallop and cagaycay were ground separately, pounded until mixed well but still slightly chunky and transferred in a mixing bowl. Afterwards, the cassava tubers and green amaranth leaves were added. Additional ingredients, such as minced garlic, minced onion, black pepper, brown sugar, cassava starch, bell pepper, pineapple, anisado wine, and atsuette were then mixed. Using the food processor, all the ingredients were combined and ground until fully mixed. Next, the sausage casing was prepared according to the package instruction, ensuring it was clean and ready for stuffing. Then, the mixture was put into the sausage casing using a sausage stuffer,

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ensuring to avoid overfilling. The sausage was twisted into individual links, ensuring they were tightly secured. Subsequently, the longganisa was steamed for 10 minutes. Then, the longganisa was allowed to air-dry for a few hours or refrigerate overnight to enhance the flavor. Cooking method could be used, grilling and pan-frying according to decided preference of cooking time and temperature to achieve optimal result for each seafood longganisa variant. Finally, the hot seafood longganisa was served for evaluation purpose by the participants to determine the acceptability of seafood longganisa variants.

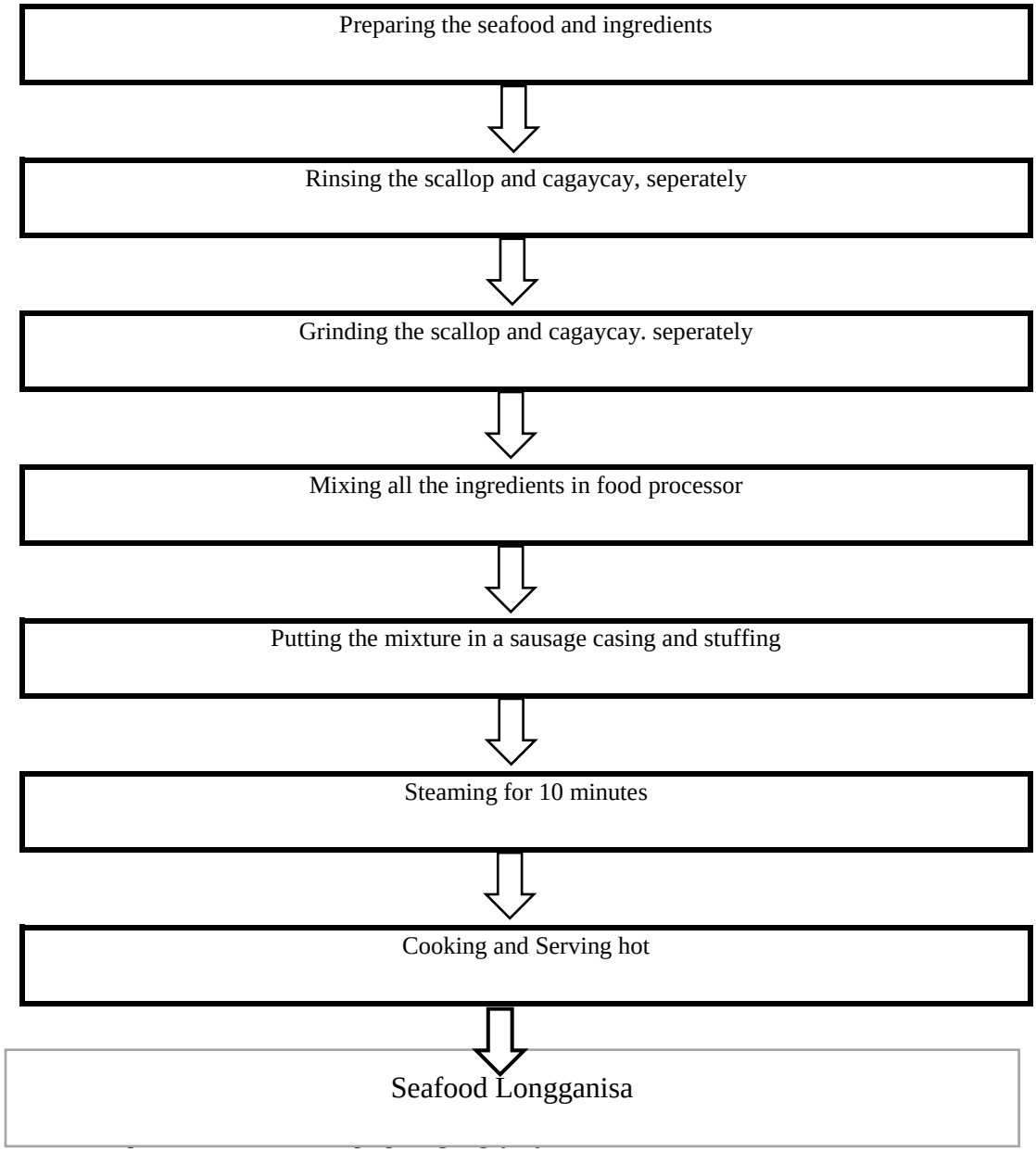

Figure 1. Flow chart in the preparation of seafood longganisa.

Collection of Data

The instrument used in this study was the evaluation sheet; it dealt with the variables used to evaluate the product, such as appearance, aroma, taste, texture. There were 110 evaluators composed of 10 semi-trained panelists and 100 consumers, who evaluated the seafood longganisa in terms of appearance, aroma, taste, and texture. The study employed three treatments. The evaluation sheets were disseminated to the evaluators, who were randomly selected to ensure the reliability of the data. The evaluators were invited and were given instructions on how to evaluate the product. The data gathered were tabulated and statically analyzed using the prescribed statistical tools. The 100 consumer respondents

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comprised of 35 teachers at Estancia National High School; 30 students at Estancia National High School; 15 seafood merchant at Estancia public market; 20 seafood lovers; 10 housewives, evaluated the acceptability of the product prepared in these treatment.

For sensory evaluation, the instrument used a scorecard. It looked into the quality attributes of the product, such as appearance, aroma, taste, and texture. The mean was used to determine the sensory qualities of seafood longganisa using scallop and cagaycay with cassava and green amaranth leaves in terms of appearance, aroma, taste, and texture its general acceptability as a whole.

After the evaluation of the product, the evaluation sheets were gathered, tallied, analyzed, and interpreted using the Statistical Package for the Social Sciences (SPSS) software. The mean was used to determine the sensory qualities of seafood longganisa using scallop and cagaycay with cassava and green amaranth leaves in terms of appearance, aroma, taste, texture, and its general acceptability as a whole. The Analysis of Variance (ANOVA) was also used to analyze and interpret the significant difference among three treatments of the product set at 0.01 level of significance.

Scoring of Variables

In scoring the variables, the researcher used the 9-Ponit Hedonic Rating Scale to rate the product. To have a better understanding of the result, the evaluator was given the equivalent interpretation of each step in the said scale. In determining the level of acceptability of the product, the categorizations of each variation were as follows:

1. Appearance of the Product

Score	Mean Score	Adjectival Description
9	8.12 – 9.00	Extremely Appealing
8	7.23 – 8.11	Very Much Appealing
7	6.34 – 7.22	Moderately Appealing
6	5.45 – 6.33	Slightly Appealing
5	4.56 – 5.44	Neither appealing Nor Not appealing
4	3.67 – 4.55	Slightly Not Appealing
3	2.78 – 3.66	Moderately Not Appealing
2	1.89 – 2.77	Very Much Not Appealing
1	1.00 – 1.88	Extremely Not Appealing

2. **Aroma of the Product**

Score	Mean Score	Adjectival Description
9	8.12 – 9.00	Extremely Pleasant
8	7.23 – 8.11	Very Much Pleasant
7	6.34 – 7.22	Moderately Pleasant
6	5.45 – 6.33	Slightly Pleasant
5	4.56 – 5.44	Neither Pleasant Nor Unpleasant
4	3.67 – 4.55	Slightly Unpleasant
3	2.78 – 3.66	Moderately Unpleasant
2	1.89 – 2.77	Very Much Unpleasant
1	1.00 – 1.88	Extremely Unpleasant

4. **Taste of the Product**

Score	Mean Score	Adjectival Description
9	8.12 – 9.00	Extremely Delicious
8	7.23 – 8.11	Very Much Delicious
7	6.34 – 7.22	Moderately Delicious
6	5.45 – 6.33	Slightly Delicious
5	4.56 – 5.44	Neither Delicious Nor Not Delicious
4	3.67 – 4.55	Slightly Not Delicious
3	2.78 – 3.66	Moderately Not Delicious
2	1.89 – 2.77	Very Much Not Delicious
1	1.00 – 1.88	Extremely Not Delicious

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5. **Texture of the Product**

Score	Mean Score	Adjectival Description
9	8.12 – 9.00	Extremely Firm
8	7.23 – 8.11	Very Much Firm
7	6.34 – 7.22	Moderately Firm
6	5.45 – 6.33	Slightly Firm
5	4.56 – 5.44	Neither Firm Nor Not Firm
4	3.67 – 4.55	Slightly Not Firm
3	2.78 – 3.66	Moderately Not Firm
2	1.89 – 2.77	Very Much Not Firm
1	1.00 – 1.88	Extremely Not Firm

Statistical Tools and Analysis

The products and treatments exhibiting the highest mean scores underwent consumer evaluation to assess their overall acceptability. The data gathered were organized and subjected to statistical analysis utilizing the Arithmetic 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.

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

III. RESULTS AND DISCUSSION

Seafood longganisa made from scallop and cagaycay demonstrates strong potential as a high-value ingredient for enhancing the nutritional and culinary appeal of various cooked dishes.

Seafood longganisa (scallop and cagaycay), when used as a flavoring agent, received positive feedback from both semi-trained panelists and consumers, demonstrating strong overall acceptance.

Significant differences are observed in the sensory evaluation and general acceptability of seafood longganisa (scallop and cagaycay) when used as the main ingredients, demonstrating its superior sensory appeal.

Furthermore, the products derived from seafood longganisa (scallop and cagaycay) are deemed safe for consumption based on microbial analysis which are within the acceptable limits set by the Bureau of Food and Drugs (BFAD) for dry mixes used in meal preparations. These findings confirm that the product meets the necessary microbial safety standards, ensuring it is safe for consumer consumption.

The incorporation of seafood longganisa (scallop and cagaycay) as a primary ingredient in meal preparations significantly enhances sensory attributes, such as appearance, aroma, taste, and texture, thereby improving overall consumer acceptability. These findings support its potential as a viable component in the development of innovative, seafood-based food products. Based on the established generalizations, the following recommendations are suggested:

Seafood longganisa made from scallop and cagaycay is recommended as the primary formulation for seafood-based sausage products. The addition of cassava and green amaranth leaves has demonstrated positive effects on sensory qualities, such as appearance, aroma, taste, and texture, and has contributed to high consumer acceptance.

Seafood products flavored made with longganisa have been well-received by both semi-trained panelists and consumers. Promoting these products across diverse markets is encouraged to maximize their market potential and consumer appeal. Showcasing seafood longganisa at school food fairs and other culinary events may draw attention due to its unique and distinctive flavor profile, offering a fresh and original option that stands out among typical food selections.

To maintain the flavoring agent's freshness over time, it is advisable to use sealed packaging. This will ensure that the product retains its quality during transportation and while being displayed in food centers.

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Future researchers are encouraged to explore other variants or factors not addressed in this study, as this could lead to new insights and innovations in the development of seafood longganisa (scallop and cagaycay).

Adopting these recommendations will allow stakeholders to maximize the potential of seafood longganisa (scallop and cagaycay) as main ingredients, enhancing its marketability and broadening its consumer appeal.

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