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Acceptability of Bangus-Clam Sisig

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Abstract

Milkfish is one of the healthy and nutritious fish available, and it is loaded with omega-3 fatty acids and protein, which are essential for the proper functioning of the body. Mud clams, on the other hand, are rich in Vitamin B12, providing iron and additional protein.

Mud clams, with their potential to regulate high blood pressure and support thyroid health, are a promising addition to any diet. Their rich content of riboflavin, choline, minerals, and vitamins, coupled with their low-fat content, make them a healthy choice.

This study utilized bangus flakes and clam meat in varying proportions, combined with butter, garlic, chili, onion, liver spread, soy sauce, black pepper, annatto oil, oil, and salt. The objectives of the study were to develop a bangus-mud clam sisig product, evaluate its sensory characteristics (color, odor, taste, and texture) in different formulations, and determine whether there were significant differences in the acceptability of bangus-clam sisig across treatments. Moreover, the study aimed to identify the most preferred formulation (MPF) and assess consumer preferences.

The development was performed in five (5) treatments with three (3) replications. The quality of the product was determined through sensory evaluation. The bangus-clam sisig had similar color, odor, taste, texture, and acceptability, regardless of the amount of bangus flakes and mud clam meat added to the formulated product. The addition of bangus and mud clam in the development of sisig, even in varying percentages, had no significant effect on the results in terms of color, odor, taste, and texture. However, during cooking, especially when pan-frying, the skin browns and crisps up. This contributed a significant amount of brown color to the overall dish.

The results show that there was no significant difference in the overall acceptability of bangus-clam sisig, regardless of the amount of bangus and clam. All treatments were acceptable. Out of the five (5) treatments, the most preferred formulation consisted of 50% bangus and 50% mud clams. The findings show that most of the faculty employee and college students at the Capiz State University-Dayao Satellite College, preferred the bangus-clam sisig.

Keywords: Bangus flakes, Seafood, Ready to eat, Processed foods

Introduction

Milkfish Chanos chanos, locally known as "Bangus" is the top fish commodity in terms of production and consumption in the Philippines (BFAR, 2022). Milk Fish is one of the most healthy and nutritious fish available. The fish is loaded with omega-3 fatty acids and protein, which is essential for the proper functioning of the body (Shadrack, R.S., Gevera, S., Pickering, T., and Ferreira, M., 2021).

Bangus can be raised anywhere. The top bangus-producing provinces are Capiz, Ilo ilo, Bulacan, Pangasinan, and Negros Occidental. The most recent report released by the Bureau of Agricultural Statistics (BAS) shows that the combined production of these five provinces alone accounts for more than

50% of the country's total production (Tacio, H., 2010). It is also one of the most significant volumes of fish merchandized daily in almost all public markets in the country (BFAR, 2022).

Most milkfish sold in local markets are fresh, chilled, whole, or deboned. More milkfish harvest is now processed into value-added forms such as smoked, dried, marinated, fermented, canned or bottled (BFAR, 2022).

Clams are popular shellfish that have a high nutritional density and are high in vitamins and minerals. Whether steamed, fried, or grilled, clams are a delicious and nutritious addition to your diet. Clams are bivalve mollusks, a form of shellfish with a shell. This shellfish (typically) resides on the sandy ocean floor and is found in different cuisines worldwide (Elvira, M. and Jumawan, J., 2017).

Clams are nutritious with loads of health benefits. Clams are rich in Vitamin B12, which provides iron and protein. Clams may help to regulate high blood pressure. It also improves thyroid health. They contain high amounts of riboflavin and also choline. Clams are rich in many minerals and vitamins but are low in fat. Clams are considered one of the most nutritious foods all over the world. Clams contain omega-3 fatty acids, which are beneficial to maintain good heart health and reduce inflammation (Arora, R., 2021).

With the abundance of the mentioned raw materials - bangus and mud clam, the researcher would like to explore the utilization of the commodity in the production of sisig. Sisig is a Filipino dish made from pig head and chicken liver parts. Sisig is usually seasoned with calamansi, onions, and chili peppers. Sisig was first mentioned in a Kapampangan dictionary in the 17th century, which means "to snack on something sour" and “salad" (Valenzuela, K. R., Rodriguez, J. ., Guzman, R. S. ., Calades, J. M. ., Dela Cruz, R. ., Abesia, J. ., Nawal Amir, & Tolato, A. L.,2020). The product will add market value to the raw materials and generate income for the community where the technology is transferred.

This study was conducted to determine the acceptability of Bangus- Mud clam sisig. Specifically, it aimed to develop a bangus-mud clam sisig product, assess its sensory characteristics in terms of color, odor, taste, and texture, and determine whether there are significant differences in the acceptability of bangus-clam sisig across treatments.

Additionally, the study aims to identify the most preferred formulation (MPF) of bangus-clam sisig and assess the consumer acceptability of this preferred formulation.

Materials and Methods

Materials

The following are the materials used in the preparation of Bangus-Clam Sisig:

1. Knife
2. Chopping Board
3. Preparation Bowl
4. Weighing Scale
5. Pot Pans
6. Frying Pan
7. Ladle

Raw materials

The following are the raw materials used in the preparation of Bangus-Clam Sisig:

1. Bangus
2. Mud Clam

3. Butter
4. Garlic
5. Chili
6. Onion
7. Liver spread
8. Soy sauce
9. Black Pepper
10. Annato Oil
11. Oil and
12. Salt

Experimental Treatment

Ingredients	Treatment A	Treatment B	Treatment C	Treatment D	Treatment E
Bangus	200g	175g	100g	50g	0
Mud Clam	0	25g	100g	50g	200g
Oil	320ml	320ml	320ml	320ml	320ml
Annatto Oil	30ml	30ml	30ml	30ml	30ml
Butter	20g	20g	20g	20g	20g
Liver spread	15g	15g	15g	15g	15g
Garlic	15g	15g	15g	15g	15g
Onion	15g	15g	15g	15g	15g
Mayonnaise	15g	15g	15g	15g	15g
Soy Sauce	15g	15g	15g	15g	15g
Chili	5g	5g	5g	5g	5g
Salt	5g	5g	5g	5g	5g
Black Pepper	3g	3g	3g	3g	3g

Methods

Collection of Bangus and Clam

Fresh bangus and mud clams were collected from the pond of Capiz State University-Dayao Satellite College and brought to the Fisheries and Food Research Development Center (FFRDC) for deboning of the bangus and depuration of the clams.

Preparation of Bangus

1. Wash the boneless bangus under running water to remove excess blood and dirt.
2. Season the boneless bangus with salt and black pepper.
3. Preheat the vegetable oil to a temperature of 175°F to 190°F.
4. Fry the boneless bangus at 145°F (63°C).
5. Set aside the cooked boneless bangus to cool.
6. Flake the cooled boneless bangus.
7. Set aside.

Preparation of Mud Clam

1. Brush the clam shells and rinse thoroughly under running water to remove any dirt.
2. Soak the clams again in water for 3 hours.
3. Rinse the clams again thoroughly under running water until completely clean.
4. Steam the clams for 20 minutes or until the shells open wide.
5. Allow the clams to cool.
6. Remove the clam meat from the shells.
7. Remove the intestines from the clam meat.
8. Chop the clam meat into small pieces.
9. Set aside.

Cooking Procedure of Bangus-Clams Sisig

1. Heat annatto oil over low heat.
2. Add butter and allow it to melt.
3. Sauté garlic until it turns light brown.
4. Add onions and cook until caramelized.
5. Stir in the clams and cook until tender.
6. Add the bangus flakes and mix well.
7. Add the remaining ingredients, such as liver spread, soy sauce, chili, salt, black pepper, and mayonnaise.
8. Mix thoroughly and adjust seasoning to taste.
9. Once cooked, remove from heat.
10. Allow the mixture to cool completely before storing in a vacuum pack.

Sensory Evaluation of Bangus- Clam Sisig

The sensory evaluation consists of a panel of ten (10) food experts to judge the quality of the Bangus-Mud Clam Sisig. This process focused on analyzing and interpreting the sensory qualities of the dish as perceived by sight, taste, and touch. A category scale was used to assess the sensory characteristics of the developed Bangus-Clam Sisig, with attributes such as color, odor, taste, and texture. A sample group of 100 participants (50 students and 50 professionals) was selected to determine consumer acceptability.

The scoring scales used was:

1. Dislike extremely
2. Dislike very much
3. Dislike moderately
4. Dislike slightly
5. Neither like nor dislike
6. Like slightly
7. Like moderately
8. Like very much
9. Like extremely

Experimental Design and Treatment

Experimental Design

The study used an experimental method of research. An experimental method is a method or procedure involving the control or manipulation of conditions to study the relative effects of various treatments applied to the mixture of the different samples (Calderon, 2002).

Experimental Treatment

The study used five (5) treatments with three replications:

Treatment A (100% bangus, no clam), Treatment B (75% bangus, 25% clam), Treatment C (50% bangus, 50% clams), Treatment D (25% bangus, 75% clams), Treatment E (100% clam, 0 bangus) The exact ingredients and proportion was used in the study except for the proportion of bangus and clam which vary per treatment.

Data Collection

The data was gathered using a 5-category scale for sensory characteristics and a 9-point hedonic scale for acceptability. The data collection was collected after every replication.

Scoring of Variables

The evaluation criteria for the product's sensory characteristics was a 5-category scale in terms of color, odor, taste, and texture. The rating for general acceptability in 9-point hedonic scale was: 9 for like extremely, 8 for like very much, 7 for like moderately, 6 for like slightly, 5 for neither like nor dislike, 4 for dislike moderately, 3 for dislike slightly, 2 for dislike very much and 1 for dislike extremely (Calmorin 2006).

The score on each item was interpreted based on the result of the computation in terms of color, odor, taste, texture, and general acceptability using the following scoring interval and verbal interpretation.

For Color

Scoring	Verbal Interpretation/ Response Categories	Scoring Interval
5	Brown	4.2-5.0
4	Light brown	3.4-4.9
3	Slightly brown	2.6-3.39
2	Moderately brown	1.8-2.59
1	Yellow	1.0-1.79

For Odor

Scoring	Verbal interpretation/ Response Categories	Scoring Interval
5	No fishy odor	4.2-5.0
4	With slight fishy odor	3.4-4.9
3	With slightly strong fishy odor	2.6-3.39
2	Moderately strong fishy odor	1.8-2.59

1	Extremely strong fishy odor	1.0-1.79

For Texture		
Scoring	**Verbal Interpretation/ Response Categories**	**Scoring Interval**
5	Crispy	4.2-5.0
4	Slightly crispy	3.4-4.9
3	soft	2.6-3.39
2	Fairly chewy	1.8-2.59
1	Very chewy	1.0-1.79

For Taste

Scoring	**Verbal interpretation/ Response Categories**	**Scoring Interval**
5	No bangus-clam taste	4.2-5.0
4	With slight bangus-clam taste	3.4-4.9
3	With slightly strong bangus-clam taste	2.6-3.39
2	Moderately strong bangus-clam taste	1.8-2.59
1	Extremely strong bangus-clam taste	1.0-1.79

For Acceptability

Scoring	**Score Interval**	**Verbal interpretation/Response Categories**
9	8.12 – 9.0	Like Extremely
8	7.23 – 8.11	Like Very Much
7	6.34 – 7.22	Like Moderately
6	5.45 – 6.33	Like Slightly
5	4.56 – 5.44	Neither Like nor Dislike
4	3.67 – 4.55	Dislike Slightly
3	2.78 – 3.66	Dislike Moderately
2	1.89 – 2.77	Dislike Very Much
1	1.00 – 1.88	Dislike Extremely

Statistical Tools and Analysis

The data were analyzed using the weighted mean and Analysis of Variance (ANOVA). The weighted mean was used to determine the acceptability of the sensory characteristics such as color, odor, taste, texture, and overall product acceptability. ANOVA was used to determine the significant differences among

treatments in terms of color, odor, taste, and texture.

Results and Discussion

Sensory Attributes of Different Treatments in terms of Color, Odor, Texture and Taste

In terms of color

Table 1 shows the result of the sensory attributes of different treatments in terms of color.

As shown in the Table, Treatment A had a mean score of 3.57, interpreted as light brown. Treatment B had a mean score of 3.37, interpreted as slightly brown, while Treatment C also had a mean of 3.57, interpreted as light brown. Treatment D had a mean score of 3.53, interpreted as light brown, and Treatment E had a mean score of 3.47, also interpreted as light brown.

Bangus, or milkfish, has a naturally grayish-silver skin. During the cooking process, especially when pan-frying, the skin turns brown and crisps up. This contributes a significant amount of brown color to the overall dish.

Table 1: Sensory attributes of different treatments in terms of color

Treatment	Replicate			Total	Mean	Verbal Interpretation
	1	2	3			
A	3.7	3.3	3.7	10.7	3.57	Light brown
B	2.8	3.5	3.8	10.1	3.37	Slightly brown
C	3.3	3.9	3.5	10.7	3.57	Light brown
D	3.5	3.6	3.5	10.6	3.53	Light brown
E	3.6	3.5	3.3	10.4	3.47	Light brown

In terms of odor

Table 2 shows the result of the sensory attributes of different treatments in terms of odor.

As shown in the table, Treatment A had a mean score of 3.97. Treatment B had a mean score of 3.37. Treatment C had a mean score of 3.57. Treatment D had a mean score of 3.40, and Treatment E had a mean of 3.57. All treatments were interpreted as having a slight fishy odor.

The bangus contributes a subtle, fresh seafood aroma. This indicates that regardless of the amount of bangus or clam added to the formulated product, the color remained consistent across treatments.

Table 2: Sensory attributes of different treatments in terms of odor

Treatment	Replicate			Total	Mean	Verbal Interpretation
	1	2	3			
A	4.1	3.7	4.1	11.9	3.97	With slight fishy odor
B	3.2	4.0	4	11.2	3.73	With slight fishy odor

C	3.7	3.2	3.8	10.7	3.57	With slight fishy odor
D	3.5	3.4	3.3	10.2	3.40	With slight fishy odor
E	3.7	3.7	3.3	10.7	3.57	With slight fishy odor

In terms of taste

Table 3 shows the sensory attributes of different treatments in terms of taste.

As shown in the table, Treatment A had a mean score of 3.77. Treatment B had a mean score of 3.57. Treatment C had a mean score of 3.43. Treatment D had a mean score of 3.50, and Treatment E had a mean score of 3.57. All were interpreted as having a slight bangus taste.

This indicates that the taste remains similar regardless of the amount of bangus or clam added to the formulated product.

Table 3: Results of sensory attributes of different treatments in terms of taste

Treatment	Replicate			Total	Mean	Verbal Interpretation
	1	2	3			
A	3.8	3.7	3.8	11.3	3.77	With slight bangus-clam taste
B	3.4	3.6	3.7	10.7	3.57	With slight bangus-clam taste
C	3.2	3.6	3.5	10.3	3.43	With slight bangus-clam taste
D	3.1	3.7	3.7	10.5	3.50	With slight bangus-clam taste
E	3.7	3.6	3.4	10.7	3.57	With slight bangus-clam taste

In terms of texture

Table 4 shows the results of the sensory attributes of different treatments in terms of texture.

As shown in the table, Treatment A and B had a mean score of 3.53. Treatment C had a mean score of 3.57. Treatment D had a mean score of 3.23 and Treatment E had a mean score of 3.57 interpreted as slightly crispy.

The finely chopped parts of the bangus and clam, combined with the sizzling oil, create a crispy and crunchy exterior. It only shows that the texture is still similar regardless of the amount of bangus and clam added to the formulated product.

Table 4: Result of sensory attributes of different treatments in terms of texture

Treatment	Replicate			Total	Mean	Verbal Interpretation
	1	2	3			
A	3.6	3.3	3.7	10.6	3.53	Slightly crispy

B	3.6	3.4	3.6	10.6	3.53	Slightly crispy
C	3.7	3.6	3.4	10.7	3.57	Slightly crispy
D	3.4	3.1	3.2	9.7	3.23	Slightly crispy
E	3.2	3.5	3.4	10.1	3.37	Slightly crispy

ANOVA result of acceptability of different treatments

Table 5 shows the results of significant difference in the acceptability among treatments.

Results show that the significant value was .529 higher with a significant level of 0.05. Results show no significant difference in the overall acceptability of bangus-clam sisig.

Regardless of the amount of bangus and clam sisig. All treatments are acceptable.

Table 5: ANOVA result acceptability of the different treatments

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.200	4	2.050	.796	.529
Within Groups	373.300	145	2.574		
Total	381.500	149			

Most preferred formulation of Bangus-Clam Sisig

Table 6 shows the result of the most preferred formulation among treatments. Treatment A had a total mean of 2.83, ranked 4th; Treatment B had a total mean of 3.13, ranked 5th; Treatment C had a total mean of 2.63, ranked 1st; Treatment D had a total mean of 2.70, ranked 2nd, and Treatment E had a total mean of 2.77 ranked as 3rd.

Results show that the most preferred formulation is treatment C (50% bangus. 50% clam). Bangus sisig typically uses flaked fish, onions, and chicharon (pork rinds) for a mix of textures – soft fish, crisp vegetables, and crunchy pork. Clam sisig might have a chewier texture from the clams. Combining both dishes offers a more interesting textural experience in each bite (Manalo, L. 2022, April 21).

Table 6: Most preferred formulation

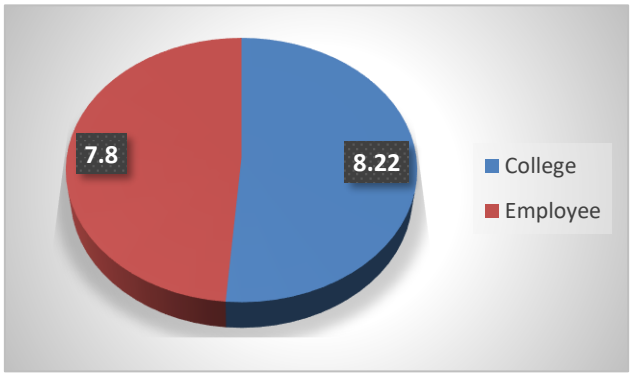
Treatment	Replication			Total	Mean	Rank
A	3	3.1	2.4	8.5	2.83	4th
B	2.8	3.5	3.1	7.9	3.13	5th
C	2.7	2.8	2.4	7.9	2.63	1st
D	2.5	2.6	3	8.1	2.70	2nd
E	2.7	2.4	3.2	8.3	2.77	3rd

Consumer Acceptability of the most preferred formulation

Figure 1 below shows the consumer test results, which consisted of 50 college students and 50 employees from Capiz State University Dayao Satellite College. The college students had a mean score of 8.22, interpreted as "like extremely," while the employees had a mean score of 7.8, interpreted as "like moderately." The results indicate that the college students liked the bangus-clam sisig more than the employees.

College student consume sisig more often due to their lifestyle. They may frequent street food stalls or eateries (Sali et al., 2023). Sisig is usually cheaper than other restaurant dishes, which might suit college students on a tight budget (Sherman, 2022).

Figure 1.0: The result of the consumer acceptability test



Conclusion and Recommendation

The addition of bangus and clam in the developed sisig, even in varying proportions, did not significantly affect the overall results in terms of color, odor, taste, and texture.

However, during the cooking process, particularly during pan-frying, the skin browns and crips, contributing a distinct brown color to the dish.

The results indicate no significant difference in the overall acceptability of bangus-clam sisig across all treatments. Regardless of the amount of bangus and clam used, all formulations were acceptable. Of the five (5) treatments, the most preferred formulation was 50% bangus and 50% clam. Additionally, the findings show that college students favored the bangus-clam sisig more than employees.

Output

The study aimed to develop bangus-clam sisig as a new product. It was conducted at Capiz State University Fisheries and Food Research Development Center, Dayao Satellite College, in May 2024. The study involved five (5) treatments with three (3) replications. Ten (10) food experts evaluated the sensory qualities of the products, while a consumer test was conducted with 100 participants— 50 college students and 50 employees.

Technology Transfer

The production process for Bangus-Clam Sisig will be shared with the target community through the Extension Program. The technology will be demonstrated to community members and local entrepreneurs to encourage adoption. Additionally, the findings and process will be presented at research symposia. The Bangus-Clam Sisig can be used for family consumption and has the potential for development into a small-scale backyard industry.

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