FORMULATION OF OYSTER-BANANA PSEUDOSTEM CHIPS

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Abstract: This study focuses on the formulation, analysis, and acceptability of chips made from oyster and banana pseudostem—an innovative approach to value addition and waste reduction. This research aims to develop a novel snack product that meets consumer expectations for taste, texture, aroma, and appearance. The method used in this study was experimental-developmental method of research. In the experimental method attempted to investigate the proportion of Oyster-Banana Pseudostem Chips using three treatments while developmental research, this method used for formulation of Oyster-Banana Pseudostem Chips for potential development and commercialization. This used the Completely Randomized Design (CRD). The sensory qualities was evaluated by 10 semi-trained panelists and 100 evaluators. 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 analyze the data into alpha level set at 0.01 alpha. Findings on the sensory evaluation of Oyster-Banana Pseudostem Chips showed that Treatment C (75g Pseudostem and 25g oyster) was the best in all three quality attributes. In the general acceptability in terms of appearance, aroma, taste, and texture, Treatment C (75g Pseudostem and 25g Oyster) had the highest mean score with qualitative description of "liked extremely". There was no significant difference in terms of sensory qualities of varied formulation of oyster-banana pseudostem chips among the three treatments. In the general acceptability, there was a significant difference among three treatments in terms of appearance, aroma, taste and texture. Upon testing the microbial and proximate analysis of the best product, the Oyster-Banana Pseudostem Chips was safe for human based on the DOST standard for microorganism test for products belonging to the Snack Foods category.

Keywords: Pseudostem, Oyster, Chips, Formulation, Analyses and Acceptability

I. INTRODUCTION

Oyster-banana pseudostem chips are an innovative snack developed as a sustainable alternative to conventional chips, utilizing banana pseudostems, an agricultural byproduct often discarded. These chips are enriched with an umami-packed oyster flavor, appealing to consumers seeking unique taste experiences and healthier snack options. Their development involves drying and processing pseudostem slices, followed by seasoning to achieve a balance of savory notes. This novel product has gained increasing acceptability due to its eco-friendly origins, nutritional benefits such as fiber content, and alignment with contemporary trends favoring waste reduction and creative culinary exploration. Its growing popularity reflects a shift toward environmentally conscious snacking without compromising taste.

According to (Kumar et al. 2021), the formulation of oyster-banana pseudostem chips provides a sustainable and health-conscious snack option by utilizing banana pseudostems, an agricultural by-product, to reduce waste and promote environmental sustainability. These chips are rich in dietary fiber and have a low-calorie profile, making them a healthier alternative to conventional snacks. The addition of oyster flavor enhances their sensory appeal, meeting consumer demands for innovative and savory snack options. This product demonstrates the potential for value-added food development while addressing both nutritional and environmental concerns.

The production of oyster-banana pseudostem chips offers both advantages and disadvantages. On the positive side, Kumar et al. (2021) highlight that these chips promote sustainable food practices by utilizing banana pseudo-stems, reducing agricultural waste, and providing a fiber-rich, low-calorie snack option that caters to health-conscious consumers. Additionally, the oyster flavor enhances the sensory appeal, making it attractive to a broad consumer base. However, a disadvantage noted by Singh and Patel (2020) is that the specialized flavor may limit market acceptance among individuals with specific dietary restrictions, such as vegetarians or those with shellfish allergies. Furthermore, the processing of pseudostems into chips may require additional technology and investment, posing challenges for small-scale producers.

The researcher aims to study the formulation, analysis and acceptability of oyster-banana pseudostem chips to address both environmental and nutritional challenges. By utilizing banana pseudostems, an often-discarded agricultural by-product, this research promotes sustainability through waste reduction and value-added product development.

Additionally, the study seeks to create a healthier snack alternative, leveraging the high fiber and low-calorie content of pseudostems to meet the growing demand for nutritious food options. Incorporating oyster flavor aligns with consumer preferences for innovative and savory tastes, ensuring the product appeals to a wide audience. This research bridges the gap between sustainable practices and consumer needs, paving the way for marketable, eco-friendly snacks.

II.   METHODOLOGY

Methods of Research

In conducting research for the development of oyster-banana pseudostem chips, a combination of qualitative and quantitative methods was employed to gather relevant data and insights. The method used in this study was the experimental-developmental method of research. Experimental method focuses the study in the future (what will be) when the variables or the study are carefully controlled or manipulated (Coleman and Steele, 2018). The developmental research was the methodical investigation of design, development and evaluation of instructional program products and processes that must meet informal consistency and efficacy criteria (Richey and Klein 2014). Thus, this method was used for the formulation of oyster-banana pseudostem chips, for potential product development and commercialization. For this study, the experimental method was utilized to assess the acceptability of oyster-banana pseudostem chips. In the developmental research, the product developed was the oyster flavored of banana pseudostem chips, composed of 3 treatments, which every treatment varied in the proportion of pseudostem and oyster.

Research Design

Completely Randomized Design was used in the study to generate the data (Anderson & McLean, 2018). Samples for evaluation and score card was utilized for randomization. The experiment was carried out in three (3) treatment formulations namely: Treatment A (25 grams pseudostem with 75 grams oyster meat), Treatment B (50 grams pseudostem with 50 grams oyster meat), and Treatment C (75 grams pseudostem with 25 grams oyster meat).

In this study, the product that was developed was the oyster-banana pseudostem chips with three different formulations of ingredients. The proportions were based on the different proportions of oyster meat and pseudostem that was used since the product to be develop is oyster-banana pseudostem chips.

Materials, Tools and Equipment

For the preparation of oyster-banana pseudostem chips a set of essential tools and equipment was used. These items include; one (1) unit blender, two (2) pieces spoon, two (2) pieces bowl, one (1) piece strainer, one (1) piece measuring spoon, one (1) piece measuring cup, one (1) piece of kitchen knife, (1) one piece of steamer and one (1) unit dehydrating machine. These tools and equipment are integral to the successful creation of the proposed recipe.

Treatments Used in the Study

The experiment was carried out in three (3) treatment namely: Treatment A (25g banana pseudostem + 75g oyster), Treatment B (50g banana pseudostem + 50g oyster), and Treatment C (75g banana pseudostem + 25g oyster). In this study, the process was developmental, in order to obtain the desired result of the products. The proportions of the ingredients were found in Table 1 below. In all treatments, all ingredients were the same quantity and volume except the banana pseudostem and oyster which varies in different treatments. The purpose of the treatment is to find out the acceptability of oyster-banana pseudostem chips.

Table 1. Proportion of the Ingredients in Three Treatment Formulation of Oyster-Banana Pseudostem Chips

Ingredients	TREATMENT		
Oyster-Banana Pseudostem Chips	A	B	C
Pseudostem	25 g	50 g	75 g
Oyster Meat	75 g	50 g	25 g
Rice Flour	250 g	250 g	250 g
White Pepper	10 g	10 g	10 g
Garlic Powder	10 g	10 g	10 g
White Sugar	15 g	15 g	15 g
Iodized Salt	5 g	5 g	5 g
Water	500 ml	500 ml	500 ml

Experimental Procedure

Step 1: Preparation of Raw Materials
The raw materials were prepared through two (2) main processes: the preparation of banana pseudostem and the preparation of oyster meat.

A.   Preparation of Banana Pseudostem
Start at harvesting the banana pseudostem. Select a fresh banana (preferably from a mature banana plant). The hard outer fibrous layers are first removed. The tender pseudostem is then washed thoroughly under running water to eliminate dirt and impurities. After cleaning, it is cut into thin cubes to facilitate further processing. The cubed pseudostem is then measured according to the desired quantity. Following this, the pseudostem is mixed and squeezed with salt to help extract excess moisture and reduce its astringency. Using a small stick, web-like particles are carefully removed from the mixture. Finally, the pseudostem is drained properly, completing the preparation process.

B.   Preparation of Oyster Meat
The preparation of oysters begins with choosing a good variety of oyster, followed by harvesting the selected variety. Once harvested, the oyster shells are thoroughly cleaned to remove any dirt or external contaminants. After cleaning, the oysters are shucked to extract the oyster meat. The extracted meat is then washed thoroughly under running water to ensure it is clean and free from any remaining shell fragments. Finally, the cleaned oyster meat is measured.

Step 2: Procedures in Making Oyster-Banana Pseudostem Chips
First, prepare the necessary tools, materials and ingredients. Second, Pureeing the 75g of pseudostem and 25g of oyster meat in a blender. Third, measuring the other ingredients needed for making oyster-banana pseudostem chips. Fourth, mixing all the ingredients together to make a batter mixture. Fifth, put the battered mixture in a molder then steam using a steamer for about 5-7 seconds with medium heat. Sixth, cool down the steamed mixture. Shaping the jellylike mixture into a triangle shape. Seventh, drying the shaped oyster-banana pseudostem jelly into the food dehydrator for about 12 hours at 70°C. Eighth, deep-frying the oyster-banana pseudostem chips into a pan with oil. Lastly, packing the oyster-banana pseudostem chips to make a finish product.

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, texture and taste. One hundred ten (110) evaluators composed of ten (10) semi-trained panelist and one hundred (100) consumers who evaluated the product in terms of appearance, aroma, texture and taste. The study employed three (3) treatments. The evaluation sheets were disseminated to the evaluators which were randomly selected 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 analyzed 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, texture and taste. The mean is used to determine the sensory qualities of pseudo-stem chips with oyster flavor in terms of appearance, aroma, texture, and taste 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, experts, 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) consumer respondents comprised of fifty (50) Junior High School students at Bilao Integrated School; Ten (10) Semi-trained panelist at Capiz State University Main Campus; ten (10) High School teachers at Bilao Integrated School; ten (10) vendors; fifteen (15) housewives; fifteen (15) fisherfolks evaluated the acceptability of the product prepared in three treatments. After the evaluation of the product, the evaluation sheets were gathered, tallied, analyzed, and interpreted using an SPSS software. The mean was used to determine the sensory qualities of pseudostem chips with oyster flavor in terms of appearance, aroma, texture, taste 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 was undergo consumer evaluation to assess their overall acceptability. The gathered data was organized and subjected to statistical analysis utilizing the Arithmetic Mean, 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 was served as the key statistical tool for determining any significant differences among the three products, labeled as 1, 2, and 3. ANOVA 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

Sensory Qualities of Oyster-Banana
Pseudostem Chips

Table 2 presents the sensory qualities of the oyster-banana pseudostem chips focusing on appearance, aroma, taste, and texture. Treatment A (25g pseudostem and 75g oyster), with a mean score of 8.75. Treatment B (50g pseudostem and 50g oyster), with the mean score of 8.75 and Treatment C (75g pseudostem and 25g oyster), with the mean score of 8.85, all three treatments fall in the "Extreme" range. Treatment A (25g pseudostem and 75g oyster) had a mean score of 8.70 on its appearance, "Extremely Appealing." Treatment B (50g pseudostem and 50g oyster) had a mean score of 8.80 "Extremely Appealing" while the Treatment C (75g pseudostem and 25g oyster) got the highest rating of 8.90, also "Extremely Appealing." Both Treatment A (25g pseudostem and 75g oyster) and Treatment B (50g pseudostem and 50g oyster), got a mean score of 8.80 for its aroma which belong to "Extremely Pleasant" while the Treatment C (75g pseudostem and 25g oyster) got the highest rating of 8.90, "Extremely Pleasant." Both Treatment A (25g pseudostem and 75g oyster) and Treatment B (50g pseudostem and 50g oyster), got a mean score of 8.60 for its Taste, "Extremely Delicious" while the Treatment C (75g pseudostem and 25g oyster) got the highest rating of 8.80, "Extremely Delicious". Both Treatment B (50g pseudostem and 50g oyster) and Treatment C (75g pseudostem and 25g oyster) had the same rating of 8.80 for its texture, "Extremely Crunchy" while the Treatment A (25g pseudostem and 75g oyster) got the highest mean score of 8.90, "Extremely Crunchy".

In general, the sensory results that Treatment C scored the highest in overall sensory qualities, particularly in aroma, taste, and texture. This suggests that the proportion of Pseudostem (75g) and Oyster (25g) results in the most favorable sensory attributes. The aroma and taste were rated as "Excellent Pleasant Aroma" and "Extremely Delicious Taste," meaning this combination provides the most appealing sensory experience for consumers. The texture was also rated as "Extremely Crunchy," which is ideal for a oyster-banana pseudostem chips, giving it a desirable crunchiness. Treatment A performed well in texture, with rated as Excellent. The higher proportion of pseudostem in this formulation likely contributed to a crunchier texture. The appearance, aroma, taste were also rated high in this formulation, indicating that the of pseudostem and oyster was a good combination. The Treatment B. (50g pseudostem and 50g oyster) had the same rating for appearance, aroma and texture which mean it has also contributed an appealing appearance, pleasant aroma and a crunchy texture. of Treament A which mean it is also balanced. Treatment C (75g pseudostem and 25g oyster) received the lowest scores for appearance, aroma, taste, and texture. Overall, all the aspects were rated "Extreme" in range which mean it has contributed a well balance proportion in making oyster-banana pseudo stem chips.

Table 2. Sensory of qualities of oyster-banana pseudostem chips

TREATMENTS		A 25g PS/75g OM		B 50g PS/ 50g OM		C 75g PS/ 25g OM	
Quality	Attributes	Mean	AD	Mean	AD	Mean	AD
Appearance		8.70	EA	8.80	EA	8.90	EA
Aroma		8.80	EP	8.80	EP	8.90	EP
Taste		8.60	ED	8.60	ED	8.80	ED
Texture		8.90	EC	8.80	EC	8.80	EC
Sensory Qualities		**8.75**		**8.75**		**8.85**	

Legend: Adjectival Description (AD)

Score: Appearance	Aroma	Taste	Texture
8.12 – 9.00 Extremely Appealing (EA)	Extremely Pleasant (EP)	Extremely Delicious (ED)	Extremely Crunchy (EC)
7.23 – 8.11 Very Much Appealing (VMA)	Very Much Pleasant (VMP)	Very Much Delicious (VMD)	Very Much Crunchy (VMC)
6.34 – 7.22 Moderately Appealing (MA)	Moderately Pleasant (MP)	Moderately Delicious (MD)	Moderately Crunchy (MC)
5.45 – 6.33 Slightly Appealing (SA)	Slightly Pleasant (SP)	Slightly Delicious (SD)	Slightly Crunchy (SC)

General Acceptability of Oyster-Banana Pseudostem Chips

The table represent the differences in the general acceptability of green mussel-bamboo shoot siopao. Based on the different sensory attributes in terms of appearance, aroma, taste and texture.

In terms of appearance the F value was 28.143 and the P-value was .000, since the P-Value was .000 is less than 0.01, the result is significant (s). There are statistically significant differences in the appearance ratings across the different groups of oyster-banana pseudostem chips.

In terms of aroma the F-value was 12.068 and the P-value was .000, since the P-value was .000 is less than 0.01 the result is significant (s). There are statistically significant differences in aroma ratings among groups.

In terms of taste the F-value was 20.547 and the P-values was .000, while a P value was .000 is less than 0.01 the result is significant (s), indicating that there are significant differences in taste among the different formulations of the chips.

In terms of texture the F-value was 25.622, and the P value was .000. Since the P -value was .000 is less than 0.01, so the result is significant (s). This described there are statistically significance differences in texture ratings among the different formulations of chips.

The P-values for all sensory attributes (appearance, aroma, taste, and texture) are 0.000, which is less than 0.01, indicating that there are statistically significant differences in each of these sensory qualities between the different treatments (A, B, and C) so therefore the null hypothesis that states there is no significant difference in the level of acceptability of the products of sensory qualities in three treatments was rejected. F-values are all quite high, supporting the conclusion that these differences are meaningful and not due to random variation. As supported the result of the study.

Based on general acceptability results Treatment C (75g pseudostem and 25g oyster) and Treatment B (50g pseudostem and 50g oyster) show the likely extreme results across all sensory attributes, suggesting that they have high variation and inconsistency, which could affect general acceptability. Treatment A (25g pseudostem and 75g oyster) has more balanced results, especially in appearance and texture, but still shows likely extreme characteristics in aroma and taste, making it a more consistent option overall, though the flavor and smell may need refinement for wider acceptance.

Table 3. General acceptability of Oyster-banana pseudostem chips

TREATMENTS	A		B		C	
Quality Attributes	*Mean*	*AD*	*Mean*	*AD*	*Mean*	*AD*
Appearance	8.05	LVM	8.16	LE	8.69	LE
Aroma	8.13	LE	8.22	LE	8.57	LE
Taste	8.33	LE	8.36	LE	8.79	LE
Texture	8.07	LVM	8.31	LE	8.69	LE
General Acceptability	**8.15**	**LE**	**8.26**	**LE**	**8.69**	**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)

Differences in the Sensory Qualities of Oyster Banana Pseudostem Chips

The table presents the differences in sensory qualities of oyster-banana pseudostem chips in terms of appearance, aroma, taste, among the three treatments. The results are based on the Z-values and corresponding p-values:

The Z-values for the sensory characteristics of oyster-banana pseudostem chips, indicating the degree of difference perceived among the treatments. For appearance, the Z-value was 0.562, suggesting only a small difference in how the

visual appeal of the chips was perceived across formulations. The aroma had a Z-value of 0.007, indicating virtually no perceptible difference in smell between the treatments. In terms of taste, the Z-value was 0.877, pointing to a moderate difference, though not statistically significant. Lastly, the texture had a Z-value of 0.464, reflecting a relatively small variation in how the crispiness of the chips was experienced by consumers. Overall, these low Z-values suggest that the different ratios of pseudostem to oyster meat did not lead to noticeable differences in the sensory perception of the chips.

In all sensory attributes in terms of appearance, aroma, taste and texture got the p values of .755, .996, .645 and .793. the p-values are greater than the standard significance level of 0.01, The remarks is "ns" indicate that the differences observed are not statistically significant. This means that there are no significant differences in the sensory qualities among the three treatments. Although Treatment C (75g pseudostem and 25g oyster) showed slightly higher mean scores in some attributes, these differences were not statistically significant. Therefore, all three formulations were similarly acceptable from a sensory perspective.

Table 4. Differences of sensory qualities of oyster banana pseudostem chips

Quality Attributes		z	p value	Remarks
Sensory Qualities	Appearance	0.562	.755	ns
	Aroma	0.007	.996	ns
	Taste	0.877	.645	ns
	Texture	0.464	.793	ns

Legend: F-value – 2.410 > 0.01, ns = not significant; level of significance = 0.01 alpha

IV. CONCLUSION

Based on the findings and objectives of the study, the following conclusions were formulated:
The findings of the study on Oyster Banana Pseudostem Chips demonstrate that the product is both nutritionally beneficial and highly acceptable to consumers. Sensory evaluation results indicated strong overall acceptability across all treatments, with Treatment C receiving slightly higher scores due to its enhanced aroma, taste, and crispiness, attributed to the increased pseudostem content. Although Treatments B and C were marked as "likely extreme" due to their strong sensory traits, Treatment A stood out for its consistency, particularly in appearance and texture. Despite the variations in ingredient ratios, consumer ratings across sensory attributes like taste, aroma, and appearance showed no significant differences, suggesting a broad acceptability of all formulations.

From a safety and quality standpoint, the chips met microbial safety standards, showing minimal contamination and no presence of harmful pathogens like E. coli or coliforms. The proximate analysis confirmed the chips' nutritional value, particularly their high carbohydrate and dietary fiber content, alongside low moisture, which supports longer shelf life. Shelf-life testing further revealed that higher pseudostem content enhances product stability, with Treatment C having the longest shelf life. In conclusion, Oyster Banana Pseudostem Chips are a safe, nutritious, and sensory-pleasing snack option with strong potential for commercial success.

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