Banana Core as Substitute Filler in Siomai: A Product Development and Sensory Evaluation Study

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ABSTRACT

Background: The study explored the potential of banana core as an alternative filler for traditional pork-based siomai. Siomai, a popular steamed dumpling in Asian cuisine, traditionally contains ground pork and other meats, but growing health and environmental awareness has encouraged the search for sustainable and nutritious alternatives (Liu et al., 2020). The banana pseudostem's inner core is rich in fiber, potassium, and vitamin B6 (Munishamanna et al., 2020), and previous studies revealed its high nutritional composition, including 50% carbohydrates and 13% protein (Dayod et al., 2016). However, its use in meat-based food products remains limited, presenting a research gap that this study aimed to address. **Methods:** A Completely Randomized Design (CRD) was employed, using five treatments with varying proportions of pork and banana core: T0 (100% pork), T1 (75% pork, 25% banana core), T2 (50% pork, 50% banana core), T3 (25% pork, 75% banana core), and T4 (100% banana core). A total of 78 respondents, including Home Economics students and faculty from Northwest Samar State University – San Jorge Campus, participated in a sensory evaluation using a 9-point Hedonic Scale to assess taste, texture, aroma, appearance, and overall acceptability. **Results:** The revealed that Treatment T3 (25% pork and 75% banana core) achieved the highest ratings across most sensory attributes, indicating an optimal blend that retained the desirable characteristics of traditional siomai while incorporating plant-based ingredients. **Conclusion:** The study concludes that banana core is a viable and sustainable substitute for pork filler in siomai, capable of maintaining favorable sensory qualities and enhancing product innovation.

Keywords: Banana core, Alternative fillers, Siomai, Vegetable-based

INTRODUCTION

A common form of steamed dumpling found in various Asian cuisines, especially in China, Japan, and the Philippines, is the so-called siomai. The traditional filling for siomai is a mixture of ground pork, shrimp, or other meats with veggies, which is then wrapped in thin dumpling skins. You can find siomai as dim sum, street food, and in restaurants and homes. It's a very popular and flexible cuisine. But as dietary trends and environmental concerns change, there's a growing interest in investigating more sustainable and healthful substitutes for the conventional siomai fillings (Liu et al., 2020).

Furthermore, the thick stalk known as the banana pseudostem rises from the ground to serve as the herbaceous plant's backbone. The inner, fibrous section of the banana stem known as the "banana center core" is the edible piece. A banana stem's high fiber, potassium, and vitamin B6 content helps cure ulcers and create a sport drink that helps muscles and the synthesis of insulin and hemoglobin. Emerging at the top, the juvenile inflorescence is carried by the fragile core inside the pseudostems. Thus, the delicate core of the pseudostem contains most of its nutrients (Munishamanna et al., 2020).

Moreover, in the study of Dayod et al., 2016, the tender and edible cores of the pseudostems were sliced into small pieces, oven-dried at 70°C to a constant weight and ground. Ground samples for each cultivar were mixed to obtain a composite sample prior to determination of their proximate nutritional contents. Based on the average value obtained from the six banana cultivars, the tender cores may avail about 50% carbohydrate,

19% crude fibre, 13% protein, 8.0% potassium, 0.4% phosphorus, 0.4% magnesium, 0.4% calcium, 335 ppm iron, 200 ppm manganese and 46 ppm zinc for every 100 g edible portion.

Additionally, more people in the Philippines are realizing the potential culinary uses of banana core, particularly given the country's growing agriculture industry. Banana core is becoming more and more popular among home cooks and chefs alike. It may be used in salads, stir-fries, and even as a filler for siomai and dumplings. Health-conscious consumers are drawn to its fibrous texture because of its unique mouthfeel and nutritional value. This also contributes to the reduction of waste in the manufacture of bananas, which supports environmental sustainability. Chefs are using banana core in traditional and modern Filipino dishes in new ways as more people become aware of its benefits (Araneta & Sison, 2021).

In the study of Leonor (2019), it was found that sixty-three percent of the siomai with 75 percent pork was favored by the customers, 25% choose bamboo shoots, whereas 37% of customers prefer siomai using only pork. Thirty-seven percent did not like the pork-heavy siomai (75%) and bamboo shoot, however 63% of customers thought the siomai was better without whole pork. Moreover, the nutritional information for bamboo shoot siomai is as follows: 68.5g moisture, 1.37g ash, 7.58 g crude protein, 3.0 g total fat, 19.5 g carbohydrate, and 136 Kcal/100g of energy. Sixty-three percent of customers preferred the siomai that contained 75% pork and 25% bamboo shoot, while thirty-seven percent preferred the siomai that contained 100% pork.

Since the literature found only use 75% pork and 25% bamboo shoots and 100 % pork meat content, the researcher will further investigate its acceptability and nutrient content using various composition. Furthermore, this study will make use the ingredients needed in the preparation of banana core siomai, there were five (5) treatments in the study of banana core siomai using 48 grams of eggs, 3 grams of powdered black pepper, 12 grams of sugar, 10 grams of salt, 3 grams of garlic powder, 120 grams of all-purpose flour, and 200 grams of molo wrapper as constant ingredients, while the quantity of ground pork meat and banana core were different in each treatment. The purpose of this research is to determine whether it is feasible to replace the conventional flavors and textures of siomai filling with banana core using the various type of ingredients.

METHODOLOGY

Experimental design and treatment

To ascertain the acceptability of banana core (bc) siomai, this study employed a quantitative research strategy employing a Completely Randomized form (CRD), which is the most straightforward form for comparison studies and involves five (5) treatments in each trial. Additionally, T0 (100% Pork), T1 (75% Pork & 25% bc), T2 (50% Pork & 50% bc), T3 (25% Pork & 75% bc), and T4 (100% bc) were the compositions used in the experiment.

This study employed total enumeration sampling in conjunction with probability sampling, a technique that surveys each respondent to ascertain acceptability. Sixty-six (62) first- to fourth-year students and seventy-eight (78) total respondents from Northwest Samar State University-San Jorge Campus will participate in the study as part of the Bachelor of Technology and Livelihood Education (BTLEd)-Home Economics program, ensuring that everyone is included.

Lastly, by distributing surveys or questionnaires, researchers asked the public to rank the banana core siomai. After that, the replies are collated and reviewed to assess the general acceptability level. Even though comprehensive enumeration sampling gives thorough data, it can be resource- and time-intensive, particularly when working with larger populations. Despite these challenges, the methodology ensures that the results reflect the views of the entire community. A thorough approach to data collection is necessary to make well-informed decisions regarding marketing strategies and product improvements.

Selection of study area

The study was carried out at Northwest Samar State University – San Jorge Campus. The researcher prepared the needed ingredients the laboratory area and the respondents came to evaluate the finished product.

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Processing of Banana Core Siomai.

Preparing the filling:

1. In a clean container, combining grams of ground pork meat, grams of bamboo shoots, grams of egg, grams of powdered black pepper, grams of sugar, grams of garlic powder, grams of all-purpose flour. These ingredients vary each other in each treatment.

2. Mixing them to combine the all the ingredients.

3. Resting the mixture for 3-5 minutes.

Wrapping the banana core siomai:

1. laying the molo wrapper on a clean surface

2. Placing a spoonful of the filling in the center.

3. Folding the edges of the wrapper around the filling, leaving the top open,

4. Pinching the edges to create pleats.

Cooking the banana core siomai:

1. Placing the wrapped banana core siomai in a steamer basket.

2. Steaming the wrapped banana core siomai for 20-25 minutes in a medium fire.

D. Acceptability of the product

The study uses a score card that was modified from the Quartermaster Corps as one of its research tools. The 9-point Hedonic Scale was established in the United States. Economic value survey questionnaire from Kotler 2016 and the Army Food and Container Institute. Banana Core Siomai is evaluated for overall acceptability using a 9-point hedonic scale.

Product Evaluation

The regulated preparation of siomai made from banana core and pork siomai is the first step in the data collection process. Different amounts of banana core, flavor adjustments, and the use of binding agents are some of the formulas used to create the ideal ingredient proportions for vegetable-based siomai. Additionally, a standard formula is employed to make the pork siomai, which serves as a basis for comparison. The primary form of data collection was sensory evaluations; knowledgeable instructors and Home Economics students rated each siomai variation on a Likert scale based on attributes like flavor, texture, aroma, appearance, and overall acceptability. Thus, every siomai sample was also subjected to a nutritional analysis to ascertain its nutritional characteristics. To determine whether a diverse sample of respondents preferred banana core siomai versus pork-based siomai, acceptance surveys were distributed to them. These evaluations produced quantitative data about the nutritional benefits and acceptability of the vegetable-based alternative. Additionally, statistical analysis is used to determine which option is the most pleasant and nutritionally advantageous.

Analysis of Results

This study made sure that all the data was examined and understood. Descriptive statistics, such as frequency counts, percentages, and averages, were calculated as part of the statistical treatments employed in the study to analyze the quantitative data and give a summary of the responses for each siomai type. To determine whether there are any significant differences, inferential statistical tests were used to compare the acceptability of the pork siomai and banana core siomai.

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Ethical Considerations

The researcher made certain that the information acquired, and the data collected were handled with the highest confidentiality. Prior to the study's execution, consent and authorization were also obtained from the institutions, management, authorities, and persons concerned. Before the study started, all participants in the acceptability testing and sensory evaluation were informed of its goals and requested for their consent. Additionally, ethical criteria were followed to protect participants' rights and privacy. Maintaining hygienic conditions in all areas was given top priority during the study's execution, and proper cleaning procedures were adhered to avoid contamination. It adheres closely to food safety regulations, which include handling, preparing, and distributing food samples for tasting in an appropriate manner. A crucial step in the procedure is allergy screening, which is done on each participant prior to any food tasting to ensure their health and safety. Additionally, first-aid care is readily available during the study, and the campus nurse will provide prompt assistance upon request. To help identify any health issues or risks beforehand and to guarantee that the entire study is conducted with the highest care and attention for the participants' safety, screening questions are included before participants start the survey. Throughout the study, the researcher also made sure that research ethics were followed.

RESULTS AND DISCUSSION

The following are the results and discussion of the study based on the collected data from the respondents. They are analyzed in accordance with the specific objectives of the study to provide a holistic picture of the goal of the study.

The product's composition, with varying proportions of ground pork flesh and banana core, for each of the five treatments (T0–T4). 250g (38.70%) of ground pork meat without the banana core added makes up T0 (Control). As the treatments progress from T1 to T4, the amount of ground pork meat per treatment decreases by 62.5g (9.68%), but the amount of banana core increases by the same amount. At T4, 250g (38.70%) of banana core had completely replaced the pork flesh. The same components are used in all formulations: eggs (48g, 7.43%), sugar (12g, 1.86%), salt (10g, 1.55%), powdered black pepper (3g, 0.46%), and garlic powder (3g, 0.46%). Probably as a thickening and binding agent, 120g of all-purpose flour (18.58%) is used for each treatment. Unaltered, the Molo wrapper (200g, 30.96%) acts as the product's exterior covering. Each formulation's total weight is always 646g (100%) to guarantee comparability.

The overall acceptability of Banana Core Siomai (BCS) according to sensory qualities assessed by students and faculty experts. Out of all the tested treatments, Treatment T3 consistently scored the highest on taste, texture, aroma, appearance, and overall mean, suggesting that it has a good chance of becoming the most popular and profitable formulation. Moreover, Students and faculty-experts assessed Banana Core Siomai on five different senses: overall mean, taste, texture, aroma, and appearance. The five formulations or treatments that were evaluated by each group were designated T0 through T4. Treatment T3 was ranked highest by faculty experts in four of the five categories. It scored the highest in terms of overall mean (7.89), taste (7.94), texture (7.94), and aroma (7.88). As for looks, Treatment T4 received the highest score (7.94), marginally higher than T3's (7.81). These results show that across a variety of sensory aspects, faculty experts deemed T3 to be the most consistently acceptable version. In addition, Treatment T3 scored highest in all five categories according to the students' evaluations, with especially high ratings in appearance (8.31) and overall mean (8.19). In addition, T3 was the clear favorite of the student responders in terms of taste (8.21), texture (8.03), and aroma (8.21).

Overall, Treatment T3 is the most popular Banana Core Siomai formulation, according to the thorough data analysis. Among the evaluated therapies, it is the most palatable and possibly the most marketable due to its consistently excellent ratings from students and faculty experts, particularly in taste, aroma, and appearance.

CONCLUSION

The study focuses on developing and evaluating siomai formulations using banana core as a substitute filler for pork meat, aiming to determine its effects on sensory qualities, texture, and overall product acceptability.

Specifically, the study concluded the following:

1. The progressive substitution of pork with banana core across treatments (T0–T4) demonstrated that variation in ingredient ratios directly influenced product characteristics. Maintaining uniform total weight ensured comparability, while the incremental inclusion of banana core provided insight into how plant-based components affect texture, consistency, and overall siomai formulations.

2. Among the five formulations, Treatment T3 consistently achieved the highest sensory ratings from both students and faculty in taste, aroma, texture, appearance, and overall acceptability. This finding indicates that a moderate ratio of banana core to pork meat creates a desirable balance that enhances flavor integration and sensory in siomai.

3. The uniform evaluations from faculty experts and students highlight Treatment T3 as the most acceptable formulation, suggesting that the combination of pork and banana core at this proportion maintains appealing sensory qualities. These results confirm the potential of banana core to enhance product quality while preserving desirable sensory characteristics of traditional siomai.

Declarations:

Ethics approval and consent to participate (Not Applicable)

Consent for publication (Not Applicable)

Availability of data and materials (Not Applicable)

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Authors' information:

The author is a 27-year-old professional from Brgy. San Miguel, Gandara, Samar, known for his strong commitment to education, personal growth, and community service. A Magna Cum Laude graduate of Northwest Samar State University–San Jorge Campus, he holds a degree in Technology and Livelihood Education and a Master’s in Education from Samar State University. With experience in both teaching and youth leadership, he continues to inspire through service, scholarship, and dedication.

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