



FORMULATION, ANALYSES, AND ACCEPTABILITY OF JACKFRUIT BAOZI

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This study developed a jackfruit-based baozi using jackfruit (*Artocarpus heterophyllus* Lam.) seed flour in the dough and jackfruit pulp as filling, offering a novel steamed bun with added functional value. An experimental developmental design was employed using three treatments: Treatment A (25 g jackfruit seed flour/75 g cake flour), Treatment B (50 g/50 g), and Treatment C (75 g/25 g). Sensory qualities and general acceptability were evaluated by 10 semi-trained panelists and 100 consumers using a 9-point Hedonic Scale, with data analyzed through the Kruskal–Wallis test for sensory attributes and one-way ANOVA for general acceptability at a 0.01 level of significance. Shelf life was assessed under room and chilled conditions, and the best formulation underwent microbial and proximate analyses. Results revealed that all treatments were rated “Liked Extremely,” with Treatment A obtaining the highest mean scores, while sensory quality decreased as the proportion of jackfruit seed flour increased. Treatment A demonstrated superior appearance, balanced flavor, pleasant aroma, and soft texture, with significant differences observed in most attributes except aroma. Shelf life was limited at ambient conditions but improved under refrigeration. Microbial analysis confirmed compliance with safety standards, while proximate analysis showed adequate macronutrient content with relatively low fiber. Overall, Treatment A was identified as the optimal formulation, demonstrating that moderate incorporation of jackfruit components can produce a safe, acceptable, and nutritionally viable steamed product.

Keywords: Jackfruit, Baozi, Seed Flour, Functional Healthy Food, Plant-Based Snacks

I. INTRODUCTION

In recent years, the global food sector has undergone a significant transformation as consumers have become increasingly conscious of nutrition, sustainability, and environmental impact. There has been a noticeable shift toward plant-based, functional, and resource-efficient food products, particularly those derived from locally available raw materials. This movement has been driven by growing concerns over food security, climate change, and the reduction of food waste, prompting innovations in food processing and product development (FAO, 2021). Within the context of education and research, these developments align with the thrusts on Sustainability and Disaster Risk Reduction, as well as Entrepreneurship and Community Development, emphasizing the role of innovation in addressing real-world challenges through locally grounded solutions.

At the national level, the Philippines continues to recognize the importance of agriculture not only as an economic pillar but also as a critical component of food security and rural development. Government agencies such as the Department of Agriculture and the Department of Science and Technology have promoted value addition, food innovation, and the utilization of indigenous crops to enhance productivity and income generation among local producers (DA, 2021; DOST-PCAARRD, 2023). In the province of Capiz, where agriculture contributes significantly to local livelihoods, similar challenges have been observed. The seasonal abundance of certain crops often leads to oversupply, resulting in spoilage and reduced economic returns for farmers. Jackfruit (*Artocarpus heterophyllus*), a widely grown tropical fruit in the region, exemplifies this situation. Although known for its rich nutritional profile, including carbohydrates, dietary fiber, vitamin C, potassium, and antioxidant compounds (Ranasinghe et al., 2019), its utilization remains limited. Locally, jackfruit is commonly consumed fresh or processed into traditional products such as jams, candies, and chips; however, a substantial portion goes to waste during peak harvest periods due to inadequate storage and processing systems (Mohammed et al., 2024). Furthermore, jackfruit seeds, which possess significant starch and protein content suitable for flour production and food fortification, are often discarded despite their considerable potential value (Pathak et al., 2022).

In response to these concerns, the development of value-added food products has been identified as a viable strategy to enhance resource utilization and support community-based enterprises. This approach is consistent with the COEd thrust on Entrepreneurship and Community Development, particularly in designing innovative food products that can serve as both learning platforms and income-generating opportunities. One potential product explored in this study is baozi, a traditional steamed bun known for its versatility, soft texture, and wide consumer appeal. Over time, baozi has evolved

to include a variety of fillings, ranging from meat-based to plant-based and fruit-based formulations, making it adaptable to changing dietary preferences and nutritional demands (Yang et al., 2022).

The incorporation of jackfruit into baozi is considered a promising innovation that combines cultural adaptability with sustainable food processing. The fruit's natural sweetness, distinctive aroma, and fiber content make it suitable as a filling ingredient, while its texture contributes to product quality and acceptability. Prior studies indicate that integrating fruit-based ingredients into baked or steamed products can enhance nutritional value without compromising sensory characteristics (Yuwono et al., 2021). In addition, the potential use of jackfruit seed flour as a partial substitute for wheat flour in dough formulation offers an opportunity to reduce reliance on imported wheat, thereby supporting local food systems and economic sustainability (Habibah et al., 2021).

From a broader perspective, this initiative addresses key socio-economic and environmental concerns, including food insecurity, agricultural waste, and limited livelihood opportunities in rural communities. The Food and Agriculture Organization emphasizes that value-added processing can strengthen local food systems, improve farmer income, and reduce postharvest losses (FAO, 2020). Within the educational context, such initiatives are also aligned with Techno Transfer, as they translate research outputs into tangible products with potential commercial applications.

In the field of food science and technology, this study contributes to the growing body of knowledge on the development of composite and functional food products using indigenous materials. It focuses on evaluating the physicochemical properties, nutritional composition, and sensory acceptability of jackfruit-based baozi. The findings are expected to provide empirical support for product optimization, shelf-life improvement, and potential commercialization, thereby reinforcing the linkage between research, innovation, and community development.

Therefore, this study aims to develop a baozi product utilizing jackfruit as a primary ingredient in the filling and/or dough formulation. Specifically, it seeks to determine the proximate composition, sensory characteristics, and level of consumer acceptability of the developed product. It also aims to assess its potential as a nutritious, acceptable, and marketable food innovation. Ultimately, the study intends to promote the sustainable utilization of local agricultural resources, reduce postharvest losses, and contribute to the development of culturally relevant and economically viable food products within the local context of Capiz.

OBJECTIVES OF THE STUDY

This study aimed to formulate and evaluate a value-added meat product, specifically skinless longganisa made from telescope snail and squash. Specifically, it sought to:

1. Describe the sensory qualities of Jackfruit Baozi in terms of appearance, aroma, taste, and texture;
2. Determine the general acceptability of Jackfruit Baozi in terms of appearance, aroma, taste, and texture among treatments;
3. Determine whether there are significant differences in the sensory qualities of Jackfruit Baozi in terms of appearance, aroma, taste, and texture among treatments.
4. Determine whether there are significant differences in the general acceptability of Jackfruit Baozi in terms of appearance, aroma, taste, and texture among treatments.
5. Determine the shelf life of Jackfruit Baozi under room and chilling conditions; and
6. Subject the best-performing product to microbial and proximate analyses.

II. METHODOLOGY

Methods of Research

The study employed an experimental-developmental research design because it was necessary to systematically develop, modify, and evaluate a new food product through controlled manipulation of its key ingredients. This design was appropriate since it allowed the deliberate adjustment of jackfruit seed flour levels in the dough and jackfruit pulp in the filling while observing the effects on product quality.

Treatments of the Study

Three formulations of Jackfruit Baozi were prepared:

Treatment A – 25g Jackfruit seed flour and 75g Cake flour

Treatment B – 50g Jackfruit seed flour and 50g Cake flour

Treatment C – 75g Jackfruit seed flour and 25g Cake flour

Each treatment was prepared in three replications to ensure consistency and reliability of the results.

**Respondents of the Study**

The study involved 10 semi-trained evaluators and 100 randomly selected consumers. The semi-trained evaluators assessed the sensory qualities of the product, while the consumers evaluated the general acceptability of the formulated Jackfruit Baozi

Research Instrument

A researcher-made sensory evaluation questionnaire utilizing a 9-point hedonic scale was used to evaluate the product in terms of appearance, aroma, taste, texture, and overall acceptability. The instrument underwent validation by experts before administration.

Data Gathering Procedure

The Jackfruit seed flour and Jackfruit pulp as filling were prepared and processed into Jackfruit Baozi formulations following standardized food preparation procedures. The finished products were cooked and presented to the evaluators and consumers during sensory evaluation. Shelf-life evaluation was conducted under chilling temperature conditions by observing daily changes in appearance, odor, texture, and spoilage indicators. The formulation that obtained the highest acceptability rating was submitted to Negros Prawn Producers Cooperative Analytical and Diagnostic Laboratory, Inc. for microbial and proximate analyses.

Statistical Treatment of Data

The sensory evaluation data were statistically analyzed using Analysis of Variance (ANOVA) and Kruskal-Wallis test at 0.01 level of significance to determine significant differences among the formulations. Weighted means were used to determine the sensory qualities and general acceptability of the product.

III. RESULTS AND DISCUSSION

The findings revealed that Treatment A, consisting of 25g jackfruit seed flour and 75g cake flour, obtained the highest ratings in appearance, aroma, taste, texture, and overall acceptability among the three formulations. The balanced proportion of jackfruit seed flour contributed to desirable sensory qualities and consumer preference while maintaining the traditional characteristics of steamed baozi. Treatment A was interpreted as “Liked Extremely” based on the 9-point Hedonic Scale evaluation.

Statistical analysis revealed significant differences among treatments in terms of appearance, taste, texture, and overall general acceptability, indicating that varying levels of jackfruit seed flour significantly influenced consumer perception and product quality. However, aroma showed no significant difference in the sensory evaluation among treatments. The findings suggest that moderate incorporation of jackfruit seed flour provided the best balance between nutritional enhancement and sensory acceptability.

Shelf-life evaluation showed that the jackfruit baozi remained safe and acceptable for up to four hours at room temperature and up to two days under chilling conditions. Beyond these storage periods, noticeable deterioration in texture, aroma, and overall quality occurred, while spoilage risks increased. The results emphasized the importance of refrigeration and proper storage temperature in preserving product safety and quality.

Microbial analysis confirmed that the best treatment of jackfruit baozi was microbiologically safe for human consumption. The product exhibited a low aerobic plate count of 20 CFU/g, absence of *Escherichia coli* and *Salmonella*, and minimal yeast and mold counts, all within acceptable Philippine FDA and DOST standards. These findings indicate that proper sanitation, preparation, and thermal processing contributed to the microbiological safety and stability of the product.

Proximate analysis further revealed that the best formulation contained 8.74% protein, 6.73% fat, 65.23% carbohydrates, 0.51% fiber, and 285 kcal per 80 g serving. The findings indicate that jackfruit baozi may serve as a nutritious and energy-rich steamed food product with moderate protein and acceptable fat content. However, the low fiber content suggests the need for further formulation improvement to enhance its nutritional value.

Overall, the findings demonstrated that jackfruit seed flour and jackfruit pulp can be effectively utilized in developing a sustainable, nutritious, acceptable, and value-added steamed food product using locally available and underutilized agricultural resources.

IV. CONCLUSION

Based on the results and findings of the study, the following conclusions were drawn:

It can be concluded that jackfruit baozi can be successfully developed as an acceptable steamed food product using jackfruit seed flour in the dough and jackfruit pulp as filling. All formulations were generally acceptable in terms of appearance, aroma, taste, and texture; however, acceptability decreased as the level of jackfruit seed flour increased. Among the treatments, Treatment A (25g jackfruit seed flour/75g cake flour) was the most preferred formulation, consistently obtaining the highest sensory and consumer acceptability scores due to its superior appearance, balanced flavor, soft texture, and overall familiarity with traditional baozi.

The study further established that significant differences existed among treatments in terms of appearance, taste, and texture, while aroma did not significantly differ. This indicates that formulation level plays a crucial role in determining most sensory attributes, particularly those influenced by dough structure and ingredient composition, while aroma is less affected due to the consistent use of jackfruit pulp filling and steaming conditions.

In terms of shelf life, the jackfruit baozi was found to be highly perishable at room temperature, remaining acceptable only for a limited period, while refrigeration significantly extended its shelf life and maintained acceptable quality for a longer duration. This highlights the importance of proper storage conditions in ensuring product safety and quality.

Furthermore, microbial analysis confirmed that the best formulation met acceptable food safety standards, showing very low microbial counts and the absence of Salmonella, indicating that the product is safe for consumption when properly handled. The proximate analysis also revealed that the product provides a nutritionally adequate composition, with sufficient protein, fat, and energy content, although its low fiber content suggests room for further nutritional improvement.

Overall, the study confirms that jackfruit seed flour and jackfruit pulp can be effectively utilized in developing a nutritious, safe, and acceptable baozi product. This innovation demonstrates strong potential for application in food product development, particularly in promoting the use of underutilized local resources, and may also serve as a useful instructional material in TLE–Food Technology and a basis for small-scale food enterprise development.

V. RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed to support further improvement, application, and potential commercialization of jackfruit-based baozi:

It is recommended that Treatment A (25g jackfruit seed flour/75g cake flour with jackfruit pulp) be adopted as the reference or baseline formulation for future product development. This formulation consistently obtained the highest sensory acceptability and closely resembled traditional baozi in appearance, taste, texture, and overall consumer preference. As such, moderate substitution levels should be prioritized when developing jackfruit-enriched steamed food products.

It is further recommended that any increase in jackfruit seed flour beyond the optimal level be accompanied by appropriate formulation enhancement strategies to maintain product quality. These may include the use of dough improvers or hydrocolloids, adjustment of hydration levels, and optimization of fermentation and steaming conditions to compensate for gluten dilution and to preserve desirable textural and sensory properties.

Refrigeration is strongly recommended as the standard storage condition for jackfruit baozi, as chilled storage significantly extends shelf life and slows down quality deterioration. The use of proper cold-chain systems, along with improved packaging solutions such as airtight and moisture-resistant containers, is also recommended to minimize microbial contamination and maintain sensory quality during storage and distribution.

Strict implementation of good manufacturing practices (GMP) and hygienic handling procedures is highly recommended throughout all stages of production. Given the high moisture content of steamed products, adherence to sanitation protocols and periodic microbial quality monitoring is essential to ensure food safety, particularly if the product is produced at a commercial scale.

Future product development should focus on improving the dietary fiber content of jackfruit baozi, as proximate analysis revealed relatively low fiber levels despite overall nutritional adequacy. This may be achieved through the incorporation



of additional fiber-rich ingredients or the use of whole-grain or composite flour blends to enhance the product's functional and health-promoting properties.

Finally, further research is recommended to expand the application of jackfruit and other underutilized plant-based ingredients in steamed and bakery products. Broader studies involving different formulations, processing methods, and consumer groups are necessary to strengthen the evidence base for functional food innovation and to support the development of sustainable, locally sourced food products.

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