Since 2001 ajfand AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

Afr. J. Food Agric. Nutr. Dev. 2025; 25(10): 28038-28054 https://doi.org/10.18697/ajfand.147.26195

Date	Submitted	Accepted	Published
	24th July 2025	6th November 2025	11th December 2025

ACCEPTABILITY AND MARKETABILITY ASSESSMENT OF LUBEG (*SYZYGIUM LINEATUM*) FRUIT JAM BREAD IN THE PHILIPPINES

Baua MAI[1]*

Mary Ann I. Baua

*Corresponding author email: maryann.i.baua@isu.edu.ph

[1]Isabela State University – San Mariano Campus, San Mariano, Isabela, 3332, Philippines

ajfand Since 2001
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

ABSTRACT

This study assessed the acceptability, marketability and financial viability of bread formulated with Lubeg (*Syzygium lineatum*), an underutilized indigenous fruit abundant in Northern Luzon, Philippines. The research aimed to explore the potential of Lubeg fruit jam as a functional ingredient in bread production and to determine the formulation that best balances consumer preference and profitability. Three treatments were developed: Treatment 1 (Lubeg jam bread), Treatment 2 (Lubeg jam bread with evaporated milk), and Treatment 3 (Lubeg jam bread with both evaporated and condensed milk). A control bread without Lubeg jam served as the reference product. Sensory evaluation was conducted by a panel of forty (40) evaluators composed of twenty (20) Hospitality Management students and twenty (20) faculty members. Using a five-point Likert scale, panelists assessed appearance, aroma, taste, texture, overall acceptability and willingness to purchase. Data were analyzed using one-way Analysis of variance (ANOVA) at a 5% level of significance ($p < 0.05$) to determine differences among treatments. Findings revealed significant variations in sensory ratings across formulations. Treatment 2 achieved the highest mean scores for taste (M = 4.70) and overall acceptability (M = 4.51), alongside the strongest purchase intent (M = 4.60), indicating superior consumer preference and market potential. Treatment 3 also obtained favorable ratings, particularly in appearance and aroma, while Treatment 1 recorded the lowest sensory scores but yielded the highest return on investment (ROI) at 13%, compared with 9% for Treatment 2 and 4% for Treatment 3. These results underscore the trade-off between financial viability and sensory appeal, highlighting the importance of achieving balance between consumer satisfaction and profitability in product development. The study concludes that Lubeg fruit jam is a viable and marketable ingredient that can enhance both the nutritional and economic value of bread products. It recommends Treatment 2 for further optimization, product refinement, and commercialization to promote the utilization of indigenous resources in the local food industry.

Key words: *Lubeg* bread, *Syzygium lineatum*, sensory evaluation, financial viability, marketability, indigenous fruits

Citation: **Baua MAI** Acceptability and Marketability Assessment of Lubeg (*Syzygium lineatum*) Fruit jam Bread in the Philippines. *Afr. J. Food Agric. Nutr. Dev.* 2025; **25(10):** 28038-28054. https://doi.org/10.18697/ajfand.147.26195

ajfand Since 2001
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

INTRODUCTION

Native plants, often overlooked in modern agricultural practices, hold immense potential for addressing global food and nutrition security challenges [1, 2, 3]. These plants are rich in essential nutrients, including vitamins, minerals, antioxidants, and bioactive compounds, which contribute to their significant health benefits [4, 5, 6]. Studies highlight that these bioactive substances not only support immune system function but also reduce the risk of chronic diseases, making indigenous plants vital components of sustainable diets [7, 8]. Despite their benefits, many native plants remain underutilized, calling for innovative strategies to maximize their nutritional and economic potential [9, 10].

One such plant is *Lubeg* (*Syzygium lineatum*), a lesser-known fruit native to the Apayao province in the Philippines [11, 12]. This seasonal fruit, belonging to the Myrtaceae family, is widely used in local delicacies but remains largely unexplored in commercial applications [13, 14, 15]. Although its sour flavor limits direct consumption, ripe *Lubeg* fruits can be eaten raw or incorporated into dishes such as *sinigang* (a traditional Filipino sour soup). However, the fruit is highly perishable, lasting only about two weeks after ripening, leading to significant post-harvest losses during peak seasons [13, 16]. These challenges necessitate the development of value-added products to extend *Lubeg*'s shelf life and enhance its market potential.

The economic implications of processing *Lubeg* into innovative products are substantial, particularly for communities in Apayao and Cagayan provinces. Studies emphasize that developing indigenous plant-based products not only creates employment opportunities but also contributes to local and national economies [17, 18, 19, 20]. For instance, processing *Lubeg* into products such as wine, jams, and jellies reduce wastage while providing new income streams for farmers and small-scale processors. Furthermore, *Lubeg*, along with other fruits in the Myrtaceae family, is a rich source of Vitamin C and antioxidants, which boost immunity and lower the risk of cancer [21, 22, 23]. This dual focus on economic viability and nutritional benefits underscores the importance of utilizing native resources effectively [24, 25].

Technological advancements have facilitated the production of *Lubeg*-based products, highlighting its versatility and potential in the food industry. Phytochemical screenings reveal that *Lubeg* contains flavonoids, tannins, saponins, and other bioactive compounds, which contribute to its therapeutic properties [9, 26, 27]. These phytochemicals not only provide health benefits but also enhance the fruit's functional properties in food processing [28, 29, 30]. The development of *Lubeg*-flavored bread represents an innovative approach to transform this perishable fruit

ajfand Since 2001
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

into a stable, marketable product, addressing both economic and nutritional goals [31].

This study aims to explore the potential of *Lubeg* in bread production, assessing the sensory qualities, marketability, and financial viability of *Lubeg*-flavored bread. By leveraging the unique properties of *Lubeg*, this research promotes the sustainable use of indigenous plants while contributing to product diversification in the food sector. Additionally, it supports local economies by creating opportunities for farmers and processors to benefit from underutilized native resources. Ultimately, this study underscores the broader implications of incorporating indigenous fruits like *Lubeg* into innovative food products, emphasizing their role in enhancing food security, supporting rural development, and promoting sustainable agriculture.

MATERIALS AND METHODS

This study employed a research and development approach to evaluate the production, sensory qualities, and market potential of Lubeg (*Syzygium lineatum*) fruit-flavored bread. Three treatments were formulated: T1 (bread with 100 g Lubeg jam and no milk), T2 (bread with 100 g Lubeg jam and 50 g evaporated milk), and T3 (bread with 100 g Lubeg jam and 25 g sweetened condensed milk), alongside a control bread without Lubeg jam. Sensory attributes, including appearance, aroma, taste, texture, and overall acceptability, were evaluated, while market viability was assessed through a return on investment (ROI) analysis based on production cost and projected selling price.

Materials and Equipment

For the production of Lubeg-flavored bread, fully ripe Lubeg (*Syzygium lineatum*) fruits were sourced from San Mariano, Isabela during their peak fruiting season to ensure optimal sweetness, color and flavor. The fruits were processed into jam prior to bread formulation to reduce their natural astringency, enhance palatability, and extend shelf life, thereby making them more suitable as a bakery ingredient. Jam preparation involved washing and deseeding the fruits, then simmering the pulp with sugar at a 1:1 ratio until the mixture reached approximately 65° Brix, after which it was cooled and stored in sterilized jars until use. The bread was then produced using standard bakery equipment such as mixing bowls, wire whisk, loaf pan, sifter, measuring cups and spoons, bread knife, oven, and utility bowl. Ingredients included all-purpose flour, brown sugar, eggs, honey, butter, vanilla, evaporated milk, condensed milk, baking soda and the prepared Lubeg jam, with each treatment incorporating varying ingredient combinations to determine their effects on sensory qualities.

ajfand Since 2001
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

Preparation of Treatments

The preparation of Lubeg-flavored bread was standardized across all treatments, with variations introduced only in the type of milk derivatives used. To begin, the oven was preheated to 115 °C (240 °F). The dry ingredients—250 g of all-purpose flour, 5 g of baking soda, and 150 g of brown sugar—were sifted together in one bowl. In a separate bowl, 113 g of butter was creamed with sugar until smooth, after which two medium-sized eggs (approximately 100 g) and 250 g of Lubeg fruit jam were added and thoroughly mixed. The wet mixture was then combined with the dry ingredients to form the bread batter. The loaf pans were greased with butter before pouring in the batter, and the bread was baked for 20 to 25 minutes until golden brown and fully cooked.

The Lubeg jam used in all treatments was prepared separately by washing, deseeding, and simmering ripe Lubeg fruits with sugar and honey in a 2:2:1 ratio (100 g fruit pulp, 100 g brown sugar, and 50 g honey) until the mixture reached 65°Brix. This process reduced the fruit's natural astringency, enhanced palatability, and extended its shelf life, making it more suitable for bread formulation.

Three treatments of Lubeg-flavored bread were produced. Treatment 1, considered the control, contained no added milk derivatives and relied solely on the base formulation. Treatment 2 incorporated 60 mL of evaporated milk into the standard mixture, while Treatment 3 followed the formulation of T2 but further incorporated 60 mL of condensed milk with the same base ingredients. Each treatment yielded approximately three loaves of bread. By varying only, the type of milk derivatives, the study systematically tested their influence on the sensory qualities and overall acceptability of the product.

Data Gathering Instrument

The sensory evaluation of the Lubeg-flavored bread was conducted with 40 untrained consumer panelists (20 students and 20 faculty members). Two separate tools were used to avoid overlap between sensory liking and purchase intent. Sensory attributes—appearance, color, aroma, taste, texture, and overall acceptability—were rated on a five-point hedonic scale (1 = dislike very much to 5 = like very much). Willingness-to-purchase was measured separately using a five-point purchase intent scale (1 = definitely would not purchase to 5 = definitely would purchase).

Data Gathering Procedure

Data collection for this study involved both sensory evaluation and Return on Investment (ROI) estimation. The sensory evaluation was conducted by a panel of 40 evaluators, comprising 20 students from the Bachelor of Science in Hospitality

ajfand Since 2001
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

Management (BSHM) program and 20 faculty members of Isabela State University – San Mariano Campus. Using standardized sensory evaluation checklists, the panel assessed three treatments of Lubeg-flavored bread across six attributes: color, appearance, texture, aroma, taste, and overall presentation. Willingness-to-purchase was measured separately using a five-point purchase intent scale. To minimize bias, bread samples were presented in random order.

For the ROI analysis, production costs—including ingredients, utilities, labor, and equipment usage—were computed for each treatment. Sales were determined by applying the average purchase intent scores of the panel to the prevailing local market price of comparable bread products, generating an estimated sales volume. The projected revenue was then compared with total production costs to calculate the ROI for each formulation.

Data Analysis

The data collected from the sensory evaluation checklists were analyzed to determine the overall sensory acceptability of the three treatments of Lubeg-flavored bread. For each sensory attribute—color, appearance, texture, aroma, taste and overall presentation—the mean scores were computed and interpreted based on the five-point Likert scale. A mean score ranging from 1.00 to 1.49 indicated "dislike very much/definitely would not purchase," 1.50 to 2.49 represented "dislike moderately/probably or might not purchase," 2.50 to 3.49 denoted "neither like nor dislike/might or might not purchase," 3.50 to 4.49 indicated "like moderately/probably would purchase," and 4.50 to 5.00 reflected "like very much/definitely would purchase."

To examine whether there were statistically significant differences among the three bread formulations, a one-way Analysis of Variance (ANOVA) was conducted for each sensory attribute. The level of significance was set at $p < 0.05$. When the ANOVA indicated significant differences, a Tukey's Honest Significant Difference (HSD) post hoc test was performed to identify which specific treatments differed in their sensory qualities. These statistical analyses allowed for objective comparison of the formulations and ensured that conclusions were based on rigorous testing.

In addition, a financial analysis was conducted to assess economic viability. The Return on Investment (ROI) for each treatment was calculated by comparing the net income—obtained from the difference between the gross income (estimated from potential sales) and the total production costs—with the overall expenses incurred in producing the bread.

ajfand Since 2001
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

RESULTS AND DISCUSSION

Table 1 presents the evaluation of the acceptability and marketability of Lubeg bread for Treatment 1. The respondents rated the bread's appearance/color (M = 3.90, SD = 0.73) and aroma/smell (M = 3.89, SD = 0.58) as "Like Moderately", respectively. This suggests that the bread was visually appealing and had a pleasant aroma. The taste received a neutral rating (M = 3.36, *SD* = 0.81), categorized as "Neither Like nor Dislike," indicating a mixed response. The presentation was rated as "Like Moderately" (*M* = 3.83, *SD* = 0.81), reflecting a satisfactory but not exceptional appearance. Regarding willingness to purchase, respondents indicated a moderate intent (*M* = 3.63, *SD* = 0.88), which corresponds to "Probably Would" purchase the product. The overall taste of the bread was rated positively (*M* = 3.80, *SD* = 0.52), with most respondents affirming that the product "Tasted Great."

Table 2 shows the evaluation of Treatment 2, where higher ratings were observed across most attributes. The appearance/color (*M* = 4.50, *SD* = 0.60) and aroma/smell (*M* = 4.53, *SD* = 0.72) received ratings of "Like Very Much." The taste was highly favoured with a mean score of (*M* = 4.70, *SD* = 0.56), categorized as "Like Very Much," indicating a strong preference for the flavour. The presentation was rated "Like Moderately" (*M* = 4.30, *SD* = 0.72), while willingness to purchase was notably high (*M* = 4.60, *SD* = 0.63), with respondents indicating they "Definitely Would" purchase the bread. The overall taste was also highly rated (*M* = 4.51, *SD* = 0.54), further reinforcing the positive feedback towards Treatment 2.

Table 3 summarizes the evaluations for Treatment 3. The appearance/color (*M* = 4.55, *SD* = 0.60) and aroma/smell (*M* = 4.53, *SD* = 0.68) were rated "Like Very Much." The taste (*M* = 4.35, *SD* = 0.74) and presentation (*M* = 4.33, *SD* = 0.73), while still positive, received moderately favorable ratings. Respondents indicated a moderate likelihood to purchase the product (*M* = 4.35, *SD* = 0.77), corresponding to "Probably Would" purchase. The overall taste received a high rating (*M* = 4.54, *SD* = 0.56), suggesting that respondents found the bread to be of good quality.

The results (Table 4) revealed significant differences across treatments in appearance/color ($F = 9.27$, $p < .05$, $\eta^2 = 0.4567$), aroma/smell ($F = 9.27$, $p < .05$, $\eta^2 = 0.5632$), taste ($F = 34.26$, $p < .05$, $\eta^2 = 0.6571$), overall taste ($F = 20.84$, $p < .05$, $\eta^2 = 0.5692$), and willingness to purchase ($F = 14.62$, $p < .05$, $\eta^2 = 0.5692$). Treatments 2 and 3 consistently outperformed Treatment 1, with differences attributed to the addition of milk solids that enhanced browning, aroma and crumb structure, leading to higher sensory scores. Treatment 2 achieved the highest taste rating (M = 4.70), indicating that evaporated milk produced a balanced flavor profile that strongly appealed to consumers. Treatment 3 (M = 4.35) was also positively

ajfand Since 2001
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

rated, but its combined use of evaporated and condensed milk made the bread richer and sweeter, which some consumers found overwhelming. These formulation effects also influenced presentation and texture, further shaping consumer perceptions of quality. Willingness to purchase followed the same trend, with Treatment 2 recording the highest score (M = 4.60), underscoring the close link between sensory acceptability and consumer intent to buy.

The return on investment (ROI) analysis (Table 5) highlighted trade-offs between profitability and marketability. Treatment 1, with a production cost of Philippine Pesos 200.00 and net income of PHP 26.00, generated the highest ROI (13%) due to its lower formulation costs, yet it was least preferred by consumers. Treatment 2, with the lowest production cost (PHP 177.00) and a net income of PHP 18.00, achieved a moderate ROI (9%) but stood out as the most market-viable option because of its strong consumer acceptance. Treatment 3, despite matching Treatment 1's production cost (PHP 200.00), yielded the lowest net income (PHP 8.00) and ROI (4%), reflecting that excessive enrichment increased costs without proportional gains in consumer preference.

This study offers important implications for both theory and practice, especially in the context of utilizing indigenous fruits, such as Lubeg (*Syzygium lineatum*), in food innovation. The findings suggest that incorporating Lubeg into bread can enhance its sensory appeal and market potential, supporting the idea that local fruits can play a significant role in sustainable food development. From a theoretical standpoint, this aligns with existing researches on the incorporation of indigenous ingredients into food products, particularly regarding their potential to improve flavor profiles and offer nutritional benefits [32, 33]. These findings contribute to the growing body of literature on sustainable food production by demonstrating that the use of locally sourced, indigenous fruits can provide valuable alternatives to conventional ingredients in food products.

One key implication for practice is the potential for food manufacturers to innovate with indigenous fruits to create new, marketable products. The use of Lubeg in bread formulation illustrates how indigenous ingredients can inform the development of novel food products with consumer appeal. The strong preference for Lubeg-flavored bread, particularly in taste and overall acceptance, indicates potential market interest. This presents an opportunity for food processors to incorporate indigenous fruits into product lines, which may diversify offerings and support local agricultural economies by creating demand for native crops [34, 35].

Another significant implication is the need for further refinement in the formulation and processing of Lubeg-flavored bread to enhance its sensory qualities. The results

ajfand Since 2001
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

indicate that variations in the concentration of Lubeg fruit can have a notable impact on the sensory acceptability of the bread. This highlights the importance of product development processes that consider both the quantity of ingredients and the methods used for processing to ensure the optimal balance between taste and nutritional benefits [36, 37, 38]. The findings suggest that future research should focus on refining the application of indigenous fruits in food products, such as adjusting ingredient concentrations, processing techniques, and exploring the effects of combining multiple indigenous fruits for synergistic benefits. Such research could lead to the development of a more refined product that meets consumer expectations for both flavor and health benefits.

In terms of future research, this study paves the way for a broader exploration of the market potential and consumer preferences for indigenous fruit-based products. While this study was limited by the sample size and geographical scope, further research could expand these parameters to assess how different demographic groups, including varying age groups and cultural backgrounds, respond to indigenous fruit-based products. Additionally, conducting market tests in different regions could provide valuable insights into the broader applicability of Lubeg-flavored bread across diverse consumer segments. Future studies could also examine the economic viability of producing such products on a larger scale, considering factors such as cost of production, sustainability and consumer demand.

The implications of this study extend beyond food production and marketing to the broader field of food security and local agricultural development. By promoting the use of indigenous fruits in food products, there is potential not only to create innovative foods but also to contribute to food security initiatives [39, 40]. Indigenous crops like Lubeg could provide a source of sustainable, locally sourced ingredients that reduce dependence on imported goods and contribute to the diversification of agricultural practices. This could have significant benefits for local farmers, helping to improve their livelihoods and strengthen local economies, particularly in regions where these fruits are abundant but underutilized.

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

This study highlights the potential of Lubeg (*Syzygium lineatum*) as an innovative ingredient in bread production, combining sensory appeal with marketability. Statistical analysis confirmed that the differences among treatments were statistically significant ($p < .05$) across key sensory attributes, including appearance, aroma, taste and willingness to purchase. Among the treatments, Treatment 2 emerged as the most recommendable, receiving the highest ratings for taste, aroma and purchase intent, indicating strong consumer acceptance and market potential.

ajfand Since 2001
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

While Treatment 1 achieved the highest ROI, the trade-off between cost-effectiveness and consumer preference underscores the importance of balancing profitability with product quality. Overall, Lubeg-flavored bread demonstrates promise for local agricultural development and food innovation. Future studies should focus on optimizing packaging, shelf-life, and production scalability to further enhance its market readiness and support income-generating opportunities for the BSHM program, campus, and community.

ACKNOWLEDGEMENTS

The author wishes to acknowledge the support of the Isabela State University – San Mariano Campus, and all participants who took part in the sensory evaluation of the bread products.

Since 2001 ajfand AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

Table 1: Evaluation of the Acceptability and Marketability of Treatment 1

Treatment 1	*M*	*SD*	Description
Appearance/Color	3.90	0.73	Like Moderately
Aroma/Smell	3.89	0.58	Like Moderately
Taste	3.36	0.81	Neither Like or Dislike
Presentation	3.83	0.81	Like Moderately
Willingness to Purchase	3.63	0.88	Probably Would
Overall Taste	3.80	0.52	Taste Great

Table 2: Assessment of the Acceptability and Marketability of Treatment 2

Treatment 2	*M*	*SD*	Descriptive Value
Appearance/Color	4.50	0.60	Like Very Much
Aroma/Smell	4.53	0.72	Like Very Much
Taste	4.70	0.56	Like Very Much
Presentation	4.30	0.72	Like Moderately
Willingness to Purchase	4.60	0.63	Definitely Would
Overall Taste	4.51	0.54	Taste Great

Table 3: Assessment of the Acceptability and Marketability of Treatment 3

Treatment 3	*M*	*SD*	Descriptive Value
Appearance/Color	4.55	0.60	Like Very Much
Aroma/Smell	4.53	0.68	Like Very Much
Taste	4.35	0.74	Like Moderately
Presentation	4.33	0.73	Like Moderately
Willingness to Purchase	4.35	0.77	Probably Would
Overall Taste	4.54	0.56	Taste Great

ajfand Since 2001
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

Table 4: Comparison of the Three Sample Treatments

Criteria	Treatment	*M*	*SD*	*F*	*P*	η^2
Color/Appearance	Treatment 1	3.90[b]	0.73	9.27	0.000	0.4567
	Treatment 2	4.50[a]	0.60			
	Treatment 3	4.55[a]	0.60			
Aroma/ Smell	Treatment 1	3.89[b]	0.58	9.27	0.000	0.5632
	Treatment 2	4.53[a]	0.72			
	Treatment 3	4.53[a]	0.68			
Taste	Treatment 1	3.36[b]	0.81	34.26	0.005	0.6571
	Treatment 2	4.70[a]	0.56			
	Treatment 3	4.35[ab]	0.74			
Presentation	Treatment 1	3.83[b]	0.81	5.55	0.005	0.3425
	Treatment 2	4.30[a]	0.72			
	Treatment 3	4.33[a]	0.73			
Willingness to Purchase	Treatment 1	3.63[b]	0.88	14.62	0.000	0.2345
	Treatment 2	4.60[a]	0.63			
	Treatment 3	4.35[ab]	0.77			
Overall Taste	Treatment 1	3.80[b]	0.52	20.84	0.000	0.5692
	Treatment 2	4.51[a]	0.54			
	Treatment 3	4.54[a]	0.56			

Table 5: Return on Investment (ROI) for Each Treatment

Treatment	Production Cost (₱)	Sales Revenue (₱)	Net Income (₱)	ROI (%)
Treatment 1	200.00	226.00	26.00	13
Treatment 2	177.00	195.00	18.00	9
Treatment 3	200.00	208.00	8.00	4

https://doi.org/10.18697/ajfand.147.26195

Since 2001 ajfand AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
SCHOLARLY, PEER REVIEWED
Volume 25 No. 10
November 2025
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

REFERENCES

1. **Antonelli A** Indigenous knowledge is key to sustainable food systems. *Nature* 2023; **613(7943)**: 239–242. https://www.nature.com/articles/d41586-023-00021-4 *Accessed January 2025.*

2. **Bvenura C and L Kambizi** (Eds). *Food security and nutrition: Utilizing undervalued food plants*. CRC Press. 2024. https://doi.org/10.1201/9781003469766

3. **Padulosi S, King EIO, Hunter D and MS Swaminathan** *Orphan* crops for sustainable food and nutrition security. Routledge, London. 2022. https://doi.org/10.4324/9781003044802

4. **Bharucha Z and J Pretty** The roles and values of wild foods in agricultural systems. Interdisciplinary Centre for Environment and Society and Department of Biological Sciences, University of Essex, Colchester, Essex, UK. 2010. https://doi.org/10.1098/rstb.2010.0123

5. **Onuh JO and YV Pathak** (Eds). Plant food phytochemicals and bioactive compounds in nutrition and health. CRC Press. 2024. https://doi.org/10.1201/9781003340201

6. **Bachheti A, Deepti, Bachheti RK, Singh A, Zebeaman M, Hunde Y and A Husen** Bioactive constituents and health promoting compounds of underutilized fruits of the northern Himalayas of India: a review. *Food Prod Process Nutr* 2023; **5**:24. https://doi.org/10.1186/s43014-023-00140-5

7. **Teodoro AJ** Bioactive compounds of food: their role in the prevention and treatment of diseases. *Oxid Med Cell Longev* 2019. https://doi.org/10.1155/2019/3765986

8. **Samtiya M, Aluko RE, Dhewa T and JM Moreno-Rojas** Potential health benefits of plant food-derived bioactive components: an overview. *Foods* 2021; **10(4)**: 839. https://doi.org/10.3390/foods10040839

9. **Singh S, Singh LB, Singh DR, Chand S, Zamir Ahmed SK, Singh VN and S Dam Roy** Indigenous underutilized vegetables for food and nutritional security in an island ecosystem. *Food Sec* 2018; **10(5)**: 1173–1189. https://doi.org/10.1007/s12571-018-0840-1

10. **Ranil RHG, Pushpakumara G, Fonseka RM, Fonseka H, Bandaranayake PCG and WAP Weerakkody** Utilizing neglected crop genetic resources for food and nutritional security: Special reference to indigenous vegetables of Sri Lanka. In: De Silva RP, Pushpakumara G, Prasada P, Weerahewa J (Eds). *Agricultural research for sustainable food systems in Sri Lanka*. Springer, Singapore. 2020. https://doi.org/10.1007/978-981-15-3673-1_3

11. **Ruma OC** Phytological screening of selected indigenous edible plants from the town of Isabela, Philippines. *Asian J Nat Appl Sci* 2016; **5**: 36–45.

12. **Columna NT** "LUBEG" (Philippine Cherry), *Syzygium lineatum* (Roxb.) (DC.) Merr and Perry: its taxonomic and molecular identification. *Indian J Sci Technol* 2019; **12(35)**. https://doi.org/10.17485/ijst/2019/v12i35/146280

13. **Manicad MZ** Phytochemical analysis of Lubeg (*Syzygium lineatum* (DC.) Merr. & LM Perry) species in Apayao. *Int J Novel Res Life Sci* 2016; **3(6)**: 1–5. www.noveltyjournals.com *Accessed January 2025.*

14. **Manicad MCZ and AG Pattung** Antibacterial properties of Lubeg (*Syzygium lineatum* (DC.) Merr. and LM Perry) leaf extracts. *J Pure Appl Microbiol* 2024; **18(2)**. https://doi.org/10.22207/JPAM.18.2.39

15. **Ochieng MA, Ben Bakrim W, Bitchagno GTM, Mahmoud MF and M Sobeh** Syzygium *jambos* L. Alston: An insight into its phytochemistry, traditional uses, and pharmacological properties. *Front Pharmacol* 2022; **13**: 786712. https://doi.org/10.3389/fphar.2022.786712

16. **Chua LK** Anticancer potential of *Syzygium* species: a review. *Plant Foods Hum Nutr* 2019; **74(1)**: 18–27. https://doi.org/10.1007/s11130-018-0704-z

17. **Caporale F, Mateo-Martín J, Usman MF and C Smith-Hall** Plant-based sustainable development—the expansion and anatomy of the medicinal plant secondary processing sector in Nepal. *Sustainability* 2020; **12(14)**: 5575. https://doi.org/10.3390/su12145575

18. **Gorman J, Ennis G, Wurm P, Bentivoglio M and C Brady** Aboriginal community views about a native plant-based enterprise development in Northern Australia. *Land* 2023; **12(5)**: 1096. https://doi.org/10.3390/land12051096

19. **Grivetti L and BM Ogle** Value of traditional foods in meeting macro- and micronutrient needs. *Nutr Res Rev* 2000; **13(1)**: 31–46. https://doi.org/10.1079/095442200108728990

20. **Ndhlovu PT, Omotayo AO, Olagunju KO, Otang-Mbeng W and AO Aremu** Assessing the impacts of commercializing medicinal plants on livelihood outcomes: Evidence from indigenous knowledge holders in South Africa. *Environ Dev Sustain* 2025; **27**: 4489–4511. https://doi.org/10.1007/s10668-023-04087-y

21. **Oraye C, de Chavez H, Aguilar C, Makiling F, Ladia Jr V, Enicola E, Guevarra L, Gueco L, Maghirang R, Anunciado M, Oro E, Gonsalves JF, Hunter D, Borelli T and S Mendonce** Initiatives on indigenous fruits in the Philippines: a scoping study. *Alliance of Bioversity International and CIAT*, Rome, Italy. 2023. https://cgspace.cgiar.org/items/2dcddab3-8b14-4b1a-a032-643f708a7362 *Accessed January 2025.*

22. **Kaur D, Yousuf B and OS Qadri** *Syzygium cumini* anthocyanins: Recent advances in biological activities, extraction, stability, characterisation and utilisation in food systems. *Food Prod Process Nutr* 2024; **6**:34. https://doi.org/10.1186/s43014-023-00177-6

23. **Abdel-Badeea WIE, Abdel-Wahab A, Mahmoud AA, Abdel-Razik A, Attia E and U Abdelmohsen** *Syzygium cumini* fruit extract and quercetin ameliorate cadmium-induced ovarian apoptosis in rats via miRNA-204-5p-mediated Bcl-2 upregulation and Bax/Caspase 9/Caspase 3 downregulation. *Biol Trace Elem Res* 2025. https://doi.org/10.1007/s12011-025-04632-y

24. **Gonzales M and A Gonzales** Fruit yield potential of Lubeg (*Syzygium lineatum* (DC.) Merr. and LM Perry): its identification and morphological characterization. *J Biodivers Environ Sci* 2023; **22(4)**: 76–80. https://www.researchgate.net/profile/Angelina-Gonzales-3/publication/lubeg-Syzygium-spp-marcots.pdf *Accessed January 2025.*

25. **Mokria M, Gebretsadik Y, Birhane E, McMullin S, Ngethe E, Hadgu KM, Hagazi N and S Tewolde-Berhan** Nutritional and ecoclimatic importance of indigenous and naturalized wild edible plant species in Ethiopia. *Food Chem (Oxf)* 2022; **4**:100084. https://doi.org/10.1016/j.fochms.2022.100084

26. **Martin HT, Tomas OC, Gabit RW, Manicad MCZ and DA Rodolfo** Survey and characterization of edible fruit and ethnomedicinal trees in the forest landscape of Apayao Province. *Nat Environ Pollut Technol* 2024; **23(3)**: 1387–1405. https://neptjournal.com/upload-images/(11)D-1599.pdf *Accessed January 2025.*

27. **Regolo L, Giampieri F, Battino M, Armas Diaz Y, Mezzetti B, Elexpuru-Zabaleta M, Mazas C, Tutusaus K and L Mazzoni** From by-products to new application opportunities: The enhancement of the leaves deriving from the fruit plants for new potential healthy products. *Front Nutr* 2024; **11**:1083759. https://doi.org/10.3389/fnut.2024.1083759

28. **Ocampo R and N Usita** Development of Lubeg (*Syzygium lineatum* (Roxb.) Merr. and Perry) processed products. *Asia Pac J Multidiscip Res* 2015; **3(4)**: 118–123. https://www.researchgate.net/profile/Ronald-Ocampo/publication/Development-of-Lubeg-Syzygiumlineatum-Roxb-Merr-Perry-Processed-Products.pdf *Accessed April 2025.*

29. **Santos CA, Almeida FA, Quecán BX, Pereira PA, Gandra KM, Cunha LR and UM Pinto** Bioactive properties of *Syzygium cumini* (L.) skeels pulp and seed phenolic extracts. *Front Microbiol* 2020; **11**:990. https://doi.org/10.3389/fmicb.2020.00990

30. **Chang SK, Alasalvar C and F Shahidi** Superfruits: Phytochemicals, antioxidant efficacies, and health effects – A comprehensive review. *Crit Rev Food Sci Nutr* 2019; **59(10)**: 1580–1604. https://doi.org/10.1080/10408398.2017.1422111

31. **Columna NT** Morphological characterization and chemical composition of Lubeg (Philippine Cherry). *J Biodivers Environ Sci* 2019; **14(5)**: 27–30. http://www.innspub.net *Accessed January 2025.*

32. **Comunian TA, Silva MP and CJ Souza** The use of food by-products as a novel for functional foods: their use as ingredients and for the encapsulation process. *Trends Food Sci Technol* 2021; **108**: 269–280. https://doi.org/10.1016/j.tifs.2021.01.003

33. **Richmond R, Bowyer M and Q Vuong** Australian native fruits: potential uses as functional food ingredients. *J Funct Foods* 2019; **62**: 103547. https://doi.org/10.1016/j.jff.2019.103547

34. **Leakey RR, Tientcheu Avana ML, Awazi NP, Assogbadjo AE, Mabhaudhi T, Hendre PS, Degrande A, Hlahla and L Manda** The future of food: domestication and commercialization of indigenous food crops in Africa over the third decade (2012–2021). *Sustainability* 2022; **14(4)**: 2355. https://doi.org/10.3390/su14042355

35. **Schreinemachers P, Simmons EB and MC Wopereis** Tapping the economic and nutritional power of vegetables. *Glob Food Sec* 2018; **16**: 36–45. https://doi.org/10.1016/j.gfs.2017.09.005

36. **Alongi M and M Anese** Re-thinking functional food development through a holistic approach. *J Funct Foods* 2021; **81**: 104466. https://doi.org/10.1016/j.jff.2021.104466

37. **Fardet A** Characterization of the degree of food processing in relation with its health potential and effects. *Adv Food Nutr Res* 2018; **85**: 79–129. https://doi.org/10.1016/bs.afnr.2018.02.002

38. **Liu X, Le Bourvellec C, Yu J, Zhao L, Wang K, Tao Y, Renard C and Z Hu** Trends and challenges on fruit and vegetable processing: insights into sustainable, traceable, precise, healthy, intelligent, personalized and local innovative food products. *Trends Food Sci Technol* 2022; **125**: 12–25. https://doi.org/10.1016/j.tifs.2022.04.016

39. **Chanza N and W Musakwa** Revitalizing indigenous ways of maintaining food security in a changing climate: review of the evidence base from Africa. *Int J Clim Chang Strateg Manag* 2022; **14(3)**: 252–271. https://doi.org/10.1108/IJCCSM-06-2021-0065

40. **McMullin S, Njogu K, Wekesa B, Gachuiri A, Ngethe E and B Stadlmayr** Developing fruit tree portfolios that link agriculture more effectively with nutrition and health: A new approach for providing year-round micronutrients to smallholder farmers. *Food Sec* 2019; **11**: 1355–1372. https://doi.org/10.1007/s12571-019-00970-7