IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.311 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 5, May 2026

DOI: 10.17148/IARJSET.2026.13593

Formulation, Analyses And Acceptability of Cassava Leaves- Root Crop Patties

EARLEEN MAY BILLONES ACANTO

Capiz State University - Main Campus, Roxas City, Philippines

Abstract: Cassava leaves and locally grown root crops are widely available in rural communities yet remain underutilized as primary food ingredients despite their nutritional potential. This study explored the development of plant-based patties combining cassava leaves with cassava tubers, sweet potato, and lesser yam to produce a nutritious, affordable, and accessible snack suitable for everyday consumption. An experimental–developmental research design was employed using three formulations per root crop based on varying proportions of cassava leaves to roots: Treatment A (75g cassava leaves:25g root crops), Treatment B (50g cassava leaves:50g root crops), and Treatment C (25g cassava leaves:75g root crops). Sensory qualities in terms of appearance, aroma, taste, and texture were evaluated using a 9-point hedonic scale by semi-trained panelists, while general acceptability was assessed by 100 randomly selected consumers.

Statistical analyses were applied to determine significant differences among treatments. Shelf life was observed under room and refrigerated conditions, and the best-performing formulations underwent microbial and proximate analyses at NPPC Analytical and Diagnostic Laboratory, Inc., Negros to verify safety and nutritional value. This study evaluated the sensory qualities, general acceptability, shelf life, and nutritional density of patties developed from cassava leaves and root crops. Sensory evaluation and ANOVA results revealed that the leaf-to-root ratio is the primary driver of consumer preference, significantly affecting taste while appearance and aroma remained stable. Treatment B (50:50) emerged as the most effective formulation for cassava tuber and lesser yam bases, consistently earning "Extremely Delicious" ratings. However, for sweet potato bases, Treatment C (25:75) was slightly preferred.

Overall, Sweet Potato (Product B) was identified as the superior base, achieving the highest general acceptability score and a "Liked Very Much" rating. Safety and stability tests indicated that the patties are highly perishable, with a room-temperature shelf life of only two hours. Refrigeration (4–6°C) extended quality for two days, though mold growth rendered products unsafe by day five. Laboratory analysis confirmed the product's safety, with microbial counts well below FDA limits and a total absence of E. coli and Salmonella. Proximate analysis validated the patty as a high-protein, energy-dense supplement, containing 10.93g protein, 9.29g fat, and 0.96g carbohydrates per 100g (270 kcal). The study concludes that a balanced 75:25 formulation using a sweet potato base offers the best combination of nutrition and palatability, providing a viable plant-based protein source for food security initiatives and school feeding programs.

Keywords: Cassava Leaves, Root Crops, Cassava Tubers, Sweet Potato, Lesser Yam, Plant-Based Patties, Patties.

I. INTRODUCTION

At the global level, the increasing demand for sustainable, affordable, and nutrient-dense food sources had drawn attention to underutilized crops and plant-based innovations. Root crops, particularly cassava (*Manihot esculenta* Crantz), had been widely recognized as climate-resilient staples capable of thriving in marginal environments where other crops failed. Their ability to provide accessible dietary energy made them essential in addressing food insecurity across developing regions. At the same time, global nutrition efforts had emphasized dietary diversification, encouraging the inclusion of micronutrient-rich crops such as sweet potato (*Ipomoea batatas*) and lesser yam (*Dioscorea esculenta*). These crops contributed not only carbohydrates but also vitamins, minerals, and dietary fiber necessary for balanced nutrition. In this context, the transformation of indigenous crops into value-added food products had emerged as a practical strategy for enhancing both food security and economic sustainability. However, despite their availability, the full utilization of plant parts such as cassava leaves remained limited due to safety concerns and gaps in standardized processing methods.

In the Philippines, root crops had long been embedded in the food culture, particularly in rural and economically constrained communities where affordability and accessibility shaped dietary practices. Cassava, sweet potato, and lesser yam had frequently served as staple or supplementary foods, often incorporated into traditional dishes and local delicacies. Beyond their roots, cassava leaves had been acknowledged for their high nutritional value, containing protein and essential micronutrients that could address common dietary deficiencies. Nevertheless, their use had been constrained

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.311 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 5, May 2026

DOI: 10.17148/IARJSET.2026.13593

by the presence of naturally occurring toxins, which required proper processing to ensure safety. While traditional detoxification practices such as boiling and soaking had been widely practiced, variations in technique often resulted in inconsistent outcomes. In addition, the growing interest in developing plant-based and functional foods in the country highlighted the need to explore innovative yet culturally acceptable food products. Sensory quality remained a critical factor, as Filipino consumers tended to favor foods that met familiar standards of taste, aroma, and texture. Thus, there had been a need to systematically examine how cassava leaves could be effectively incorporated into food formulations without compromising acceptability.

At the local level, particularly in the province of Capiz, agriculture played a significant role in sustaining livelihoods, with root crops commonly cultivated in both upland and lowland areas. Despite their abundance, these crops were often marketed in raw form, limiting their economic potential. The development of value-added products from locally available resources offered an opportunity to enhance income generation while addressing nutritional concerns within the community. Moreover, local households and small-scale food producers often relied on traditional knowledge without access to standardized, research-based processing techniques. This gap underscored the importance of conducting localized studies that translated scientific principles into practical applications. The present research responded to this need by exploring the feasibility of developing patties from cassava leaves and root crops, a product that could be easily prepared, stored, and potentially commercialized within the community.

Within the academic context of Capiz State University, the study was anchored on the College of Education Research Thrusts (2024–2028) and the CRAFT framework (Creating Research-Aligned Futures in Technology Education). It aligned with Entrepreneurship and Community Development by proposing a food innovation that could serve as a livelihood opportunity, particularly for students and local stakeholders. It also supported Health, Well-being, and Holistic Development through its focus on improving nutritional intake and ensuring food safety, and Sustainability and Disaster Risk Reduction by promoting the use of resilient, locally sourced plant materials. Furthermore, the study reflected the principles of CRAFT: it demonstrated Curriculum Innovation and Advanced Pedagogy by integrating food technology concepts into practical applications; embodied Research and Reflective Professional Practice through systematic experimentation and evaluation; supported Applied Technology and Knowledge Transfer by translating research findings into usable products; incorporated Flexible, Cultural, and Global Perspectives by utilizing indigenous resources within a broader sustainability context; and encouraged Transformative Collaboration and Lifelong Learning by linking academic research with community needs and potential enterprise development.

The conduct of this study was therefore grounded in several key considerations. First, there was a recognized need to maximize the utilization of cassava leaves as a nutrient-rich yet underexploited resource. Second, the lack of standardized methods for safely incorporating these leaves into composite food products presented both a challenge and an opportunity for innovation. Third, the importance of sensory acceptability necessitated a careful balance between nutritional enhancement and consumer preference. Fourth, concerns related to food safety and shelf life required empirical validation through microbial and storage analyses. Lastly, the potential of transforming locally available crops into value-added products aligned with broader goals of sustainability, education, and community development.

Guided by these bases, the study had sought to develop and evaluate patties made from cassava leaves combined with cassava tubers, sweet potato, and lesser yam. It aimed to determine appropriate detoxification methods suitable for small-scale preparation, formulate treatment variations based on leaf-to-root ratios, assess sensory qualities using standardized evaluation tools, examine significant differences among treatments, and evaluate both microbial quality and shelf life. In doing so, the research attempted to bridge traditional practices with scientific validation, contributing to the development of safe, acceptable, and sustainable food products for school, household, and community use.

Objectives of the Study

Generally, this study aimed to utilize Cassava Leaves and Root Crops in making patties. Specifically, it sought to:

1. determine the sensory qualities of cassava leaves-root crops patties in terms of appearance, aroma, taste, and texture;
2. determine the general acceptability of cassava leaves-root crops patties in terms of appearance, aroma, taste, and texture;
3. find out if there are significant differences in the sensory qualities of cassava leaves-root crops among treatments;
4. find out if there are significant differences in the general acceptability of cassava leaves-root crops among treatments;
5. find out the shelf life of cassava leaves-root crops patties in terms of room and freezing temperature; and,
6. submit the best cassava leaves-root crops for microbial and proximate analysis.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.311 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 5, May 2026

DOI: 10.17148/IARJSET.2026.13593

II. METHODODLOGY

Methods of Research

The study employed an experimental–developmental research design. The experimental method involved manipulating variables to determine cause-and-effect relationships, with controlled procedures and random allocation of participants into experimental conditions. In this approach, a hypothesis was tested scientifically to observe the effects of specific treatments. The method focused on predicting outcomes under carefully controlled conditions (Calmorin, 2010).

In the present study, the experimental method was applied to examine the effects of varying proportions of cassava leaves and root crops in patty formulations. Three (3) treatment combinations were tested, using tree (3) types of products with the main ingredients of root crops such as cassava tubers, sweet potato, and lesser yam.

Concurrently, the developmental research component involved the actual creation of the cassava leaf–root crop patties, aiming to develop a product suitable for potential commercialization and consumer acceptance. The combination of experimental and developmental methods allowed both systematic evaluation and practical product development.

Treatments of the study

Cassava leaves-root crop patties have three product formulations, and each product has three treatments were prepared:
Product 1 Cassava Leaves and Cassava Tubers
Treatment A – 75g Cassava Leaves and 25g Cassava Tubers
Treatment B – 50g Cassava Leaves and 50g Cassava Tubers
Treatment C – 25g Cassava Leaves and 75g Cassava Tubers
Product 2 Cassava Leaves and Sweet Potato
Treatment A – 75g Cassava Leaves and 25g Sweet Potato
Treatment B – 50g Cassava Leaves and 50g Sweet Potato
Treatment C – 25g Cassava Leaves and 75g Sweet Potato
Product 3 Cassava Leaves and Lesser Yam
Treatment A – 75g Cassava Leaves and 25g Lesser Yam
Treatment B – 50g Cassava Leaves and 50g Lesser Yam
Treatment C – 25g Cassava Leaves and 75g Lesser Yam
Each treatment was prepared to ensure consistency and reliability of the results.

Respondents of the study

The evaluators were invited and given clear instructions on how to assess the products. Evaluation sheets were distributed to ten (10) food technology professors, who used a nine-point Hedonic Scale to rate each treatment based on the four sensory attributes. For broader consumer assessment, one hundred (100) participants were engaged, comprising ten (10) vendors, ten (10) students, ten (10) housewives, twenty (20) potential consumers, and fifty (50) Technology and Livelihood Education teachers from Capiz State University. These evaluators were instructed to assess the three patty treatments and provide their honest opinions on the sensory qualities and overall acceptability.

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 cassava leaves and root crops were prepared and processed into patties 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.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.311 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 5, May 2026

DOI: 10.17148/IARJSET.2026.13593

III. RESULTS AND DISCUSSION

Sweet Potato, Product B: 25g cassava leaves and 75gsweet potato emerged as the most successful variety, securing the highest general acceptability and a descriptive rating of "Liked Very Much.". Sweet Potato provided a more consistent balance of texture and aroma. Ultimately, while all formulations were well-received, the study suggests that using a Sweet Potato base with a balanced leaf-to-root ratio produces the most desirable cassava leaf patty.

For general acceptability, ANOVA and Tukey HSD tests confirmed that balanced formulations (50:50 for cassava/yam and 25:75 for sweet potato) significantly improved the palatability of the patties. These findings suggest that while other sensory traits are stable, the specific ratio of leaf to root is the primary driver of consumer preference and overall satisfaction.The patties demonstrated a limited shelf life at room temperature, remaining safe for only two hours before texture softening and spoilage began. Conversely, storage under refrigerated conditions (4–6°C) successfully extended the shelf life to two days with high quality. By the fifth day of refrigeration, the patties were deemed unsafe due to the appearance of mold and changes in odor, highlighting the necessity of cold storage for product stability.

Laboratory analysis of the top-performing treatments confirmed both safety and nutritional density. Microbial testing showed that aerobic plate counts, yeast, and mold were well below FDA limits, with a total absence of E. coli and Salmonella. Proximate analysis revealed a balanced macronutrient profile, containing 10.93g of protein, 9.29g of fat, and 0.96g of carbohydrates per 100g, yielding a total energy value of 131 kcal. These results validate the product as a safe, high-protein, and energy-dense food supplement.

IV. CONCLUSION

Based on the findings of the study, the following conclusions were drawn such as follows:
The 50g: 50g cassava leaves and root crops ratio (Treatment B) is the most effective formulation for maximizing consumer preference, particularly for cassava tuber and lesser yam bases, by achieving an ideal balance of flavor and texture. Sweet Potato is the most suitable root crop for patty production, as it consistently yields the highest general acceptability and provides the most stable sensory profile across different ratios. While sensory attributes like appearance and aroma remain relatively stable across treatments, the leaf-to-root ratio is the primary determinant of taste, which significantly dictates overall palatability and consumer satisfaction. The product is highly perishable at room temperature (2-hour limit) but can be maintained for up to two days under refrigeration; beyond this period, microbial growth (mold) renders the product unsafe. The patties are safe, nutrient-dense food source, characterized by high protein (10.93g/100g) and energy content (131 kcal), with microbial levels consistently falling within strictly regulated safety limits.

V. RECOMMENDATIONS

In light of the findings and conclusions of the study, several recommendations are offered to guide future utilization, improvement, and possible commercialization of patties made from cassava leaves and selected root crops. Food processors, households, and small-scale entrepreneurs may adopt the identified best formulations, particularly Treatment B (50g leaves:50g root crop) for cassava tuber and lesser yam patties and Treatment C (25g leaves:75g sweet potato) for sweet potato patties. These combinations consistently produced superior taste, texture, and overall acceptability, indicating that balanced or slightly root-dominant ratios should be maintained to ensure consumer satisfaction. Deviating substantially from these proportions may reduce palatability, especially due to excessive leafy flavor or reduced structural integrity.

Sweet Potato as the primary root crop base to ensure a consistently high-quality sensory profile and broader market acceptance is recommended for utilization. Since taste emerged as the most sensitive attribute affected by formulation changes, future product development may prioritize flavor optimization. This may include refining seasoning levels, explore complementary herbs or spices, or adjust cooking methods to further enhance palatability while preserving the nutritional benefits of cassava leaves. Sensory testing with a broader demographic group could also help identify flavor preferences across age groups and cultural backgrounds. Mandate refrigeration (4–6°C) immediately after production is recommended. Marketing materials and packaging must clearly instruct consumers to consume the product within two days and warn against leaving it at room temperature for more than two hours.Given the favorable microbial results, strict adherence to good manufacturing practices (GMP) and sanitation procedures may be maintained during preparation and handling to preserve product safety. Regular microbial testing is advisable if the product is to be produced commercially, particularly when scaling up production where contamination risks may increase.

© IARJSET This work is licensed under a Creative Commons Attribution 4.0 International License

DOI: 10.17148/IARJSET.2026.13593

Proximate analysis indicated that the patties provide meaningful amounts of energy, dietary fiber, and moderate protein while maintaining relatively low-fat levels. Therefore, these products may be promoted as nutritious plant-based snacks or meal supplements, especially in areas where access to animal protein is limited. Nutrition education campaigns may highlight their potential role in supporting balanced diets, school feeding initiatives, and food security programs using locally available crops. Conduct further studies on natural preservatives or dehydration techniques to improve the product's stability for wider distribution. Future researchers are encouraged to conduct further investigations focusing on micronutrient content, consumer willingness to purchase, cost analysis, and long-term storage methods such as freezing. Comparative studies using other indigenous leafy vegetables or root crops may also expand the range of acceptable formulations and increase the versatility of the product.

Finally, government agencies, academic institutions, and community organizations may consider supporting the dissemination of this technology through training programs and livelihood projects. The use of locally grown cassava leaves and root crops not only promotes nutritional well-being but also contributes to agricultural sustainability and rural economic development.

REFERENCES

[1]. Adewuyi, T., & Adebayo, A. (2021). Nutritional composition and health benefits of cassava leaves. Journal of Tropical Agriculture, 58(2), 112–121.
[2]. Adeyeye, S. A., Omololu, A., & Afolabi, O. (2019). Shelf-life evaluation of root and leafy vegetable snacks under different storage conditions. Food Science & Nutrition, 7(6), 1985–1993.
[3]. Akinnifesi, F. K., Chirwa, P. W., Ajayi, O. C., & Sileshi, G. W. (2016). Contribution of root crops to food security in sub-Saharan Africa. Food Security, 8, 891–904.
[4]. Akinwande, T., Bello, O., & Olawale, F. (2018). Nutritional composition and stability of cassava- and leafy vegetable-based snacks. Journal of Food Quality, 41(5), 1–8.
[5]. Ares, G., & Deliza, R. (2017). Studying the influence of sensory factors on food choice and acceptance. Food Quality and Preference, 56, 17–26. https://doi.org/10.1016/j.foodqual.2016.03.001
[6]. Atuna, A., Nwokolo, C., & Olayinka, A. (2021). Sensory acceptability of orange-fleshed sweet potato and cassava composite foods. Food Research International, 141, 110–118. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8216489/
[7]. Brown, P., et al. (2014). Methods and compositions for affecting the flavor and aroma profile of consumed food. U.S. Patent No. 9,700,067. (Assigned to Impossible Foods Inc.)
[8]. Cruz, J., Reyes, M., & Villanueva, R. (2019). Nutritional enhancement of cassava flour chips with malunggay leaves. Philippine Journal of Food Science and Nutrition, 44(2), 55–66.
[9]. De la Cruz, R., Santos, P., & Reyes, J. (2020). Value-added root crop snacks: Small-scale enterprise potential in rural Philippines. Philippine Journal of Food Science, 45(2), 15–28.
[10]. Dela Cruz, P., Aquino, L., & Santos, V. (2022). Consumer acceptability of vegetable-enriched cassava snacks in Metro Manila. Philippine Journal of Culinary and Food Studies, 47(1), 21–35.
[11]. Dela Cruz, P., Reyes, M., & Villanueva, R. (2020). Sensory evaluation of indigenous root crop-based piaya variants. Philippine Journal of Food Science and Technology, 45(1), 33–47.
[12]. Dela Rosa, J., Mendoza, R., & Cruz, A. (2021). Formulation and sensory evaluation of steamed cassava-yam cakes. Philippine Journal of Food Science, 46(2), 57–69.
[13]. FAO. (2019). The state of food security and nutrition in the world 2019. Rome: Food and Agriculture Organization.
[14]. FAO. (2020). Food analysis manual: Proximate composition and safety standards. Rome: Food and Agriculture Organization.
[15]. Farmonaut. (2025). Sustainable food source and economic potential of value-added root crops. Retrieved from https://www.farmonaut.com
[16]. Fellows, P. (2020). Food processing technology: Principles and practice (4th ed.). Woodhead Publishing.
[17]. Garcia, L., Tan, P., & Lopez, M. (2020). Functional properties of cassava and yam blends for traditional snack development. Journal of Root Crop Innovations, 8(1), 22–34.
[18]. Gichuki, S., Kamau, D., & Mburu, J. (2020). Role of indigenous crops in enhancing food security in East Africa. African Journal of Agricultural Research, 15(8), 1102–1111.
[19]. Gonzalez, M., Ramirez, L., & Silva, H. (2018). Aroma perception in leafy vegetable products. Journal of Sensory Studies, 33(1), e12345.
[20]. Ifeoma, N., & Okonkwo, C. (2018). Antinutritional factors and safe utilization of cassava leaves. International Journal of Nutrition and Food Sciences, 7(3), 85–92.
[21]. Latif, S., & Müller, J. (2015). Potential of cassava leaves in human nutrition. Plant Foods for Human Nutrition, 70(3), 305–312.

DOI: 10.17148/IARJSET.2026.13593

[22]. Lawal, O., Adepoju, O., & Oladejo, T. (2021). Consumer acceptance of pasta from yellow cassava and leafy vegetables in Nigeria. Journal of the Science of Food and Agriculture, 101(5), 2021–2032. https://doi.org/10.1002/jsfa.11259

[23]. Lawal, O., Adeyemi, K., & Obasa, S. (2021). Novel application of biofortified crops: Consumer acceptance of pasta from yellow cassava and leafy vegetables. Journal of the Science of Food and Agriculture, 101(7), 2854–2863. https://doi.org/10.1002/jsfa.11259

[24]. Lawal, O., Adeyemi, T., & Musa, H. (2021). Consumer acceptance of pasta from yellow cassava and leafy vegetables in Nigeria. Journal of the Science of Food and Agriculture, 101(4), 1642–1650. https://doi.org/10.1002/jsfa.11259

[25]. Lawless, H. T., & Heymann, H. (2016). Sensory evaluation of food: Principles and practices (2nd ed.). Springer.

[26]. Lee, S., Kim, J., & Park, H. (2022). Effect of the physical fibrillated sweet potato (Ipomoea batatas) stem on plant-based patty analogues. Food Science and Biotechnology, 32(5), 671–678. https://doi.org/10.1007/s10068-022-01211-y

[27]. Magbanua, R., Santos, M., & Reyes, P. (2019). Root crops and rural livelihoods in the Philippines: An economic perspective. Philippine Journal of Crop Science, 44(3), 45–58.

[28]. Magno, L., dela Rosa, M., & Cabrera, A. (2021). Functional properties of yam flour in baked snack products. Asia Pacific Journal of Nutrition and Food Science, 9(1), 45–58.

[29]. Masha, L., Ndugu, L., & Komba, P. (2021). Formulation of cassava root–leaf flakes: Acceptability evaluation and determination of nutritional value. East African Journal of Science, Technology and Innovation, 2(3), 1–15. https://doi.org/10.37425/eajsti.v2i.346

[30]. Massey University. (2023). The History of Meat Alternatives. Food Technology Resource Center.

[31]. Mercado, A., & Santos, J. (2021). Fortification of yam fritters with sweet potato leaves: Nutritional and sensory evaluation. Asia Pacific Journal of Nutrition and Food Research, 10(2), 14–28.

[32]. Messina, M., & Lane, S. (2021). Plant proteins as alternatives to animal-derived proteins: Implications for food systems and nutrition. Frontiers in Nutrition, 8, 672–684. https://doi.org/10.3389/fnut.2021.672684

[33]. Michaels, T. (2017). The Hamburger: A Global History. Reaktion Books.

[34]. Montagnac, J. A., Davis, C. R., & Tanumihardjo, S. A. (2009). Nutritional value of cassava for use as a staple food. Comprehensive Reviews in Food Science and Food Safety, 8(3), 181–194.

[35]. Mosha, T., Phiri, F., & Chirwa, E. (2019). Nutritional and sensory evaluation of cassava leaf dishes fortified with legumes in Zambia. International Journal of Food Science and Nutrition, 70(4), 453–462. https://doi.org/10.1080/09637486.2018.1551234

[36]. Nnamani, C., Obieze, C., & Eze, S. (2019). Value-added products from local vegetables and tubers. International Journal of Food Science, 2019, 1–10.

[37]. Nwachukwu, E., Okafor, R., & Eze, J. (2020). Nutrient profiling of root and tuber-based snacks enriched with green leafy vegetables. Food Control, 113, 107198.

[38]. Peryam, D. R., & Pilgrim, F. J. (2011). Hedonic scale method for sensory evaluation of foods. Food Technology, 15(2), 15–18.

[39]. Rahman, M. S. (2017). Food stability beyond food safety: Shelf life evaluation and accelerated shelf life testing. Academic Press.

[40]. Ramos, E., Fernandez, K., & Ong, D. (2020). Development and sensory evaluation of cookies from cassava, sweet potato, and yam flours. Philippine Journal of Nutrition, 42(1), 12–22.

[41]. Ranganna, S. (2017). Handbook of analysis and quality control for fruit and vegetable products (3rd ed.). New Delhi: Tata McGraw-Hill.

[42]. Reyes, A., & Aquino, L. (2021). Acceptability of cassava-yam cookies enriched with leafy vegetables: A sensory and statistical evaluation. Asia Pacific Journal of Nutrition and Food Research, 12(3), 18–32.

[43]. Salimons et al. (2016), titled "Physicochemical and Sensory Properties of Beef Patties Substituted with Sweet Potato Flour,"

[44]. Santos, E., & Valdez, R. (2022). Development and acceptability of cassava-leaf chips as a nutrient-rich snack. Asia Pacific Journal of Nutrition and Food Research, 13(4), 45–60.

[45]. Santos, V., & de Guzman, R. (2019). Starch functionality of root crop flours in processed Filipino foods. Journal of Culinary Science & Technology, 17(3), 215–230.

[46]. Singh, P., Das, M., & Choudhury, M. (2021). Plant-based meat analogues: Approaches and perspectives for alternative protein foods. Trends in Food Science & Technology, 112, 149–163. https://doi.org/10.1016/j.tifs.2021.05.009

[47]. Villanueva, M., Lopez, R., & Aquino, P. (2022). Sensory acceptability of cassava-leafy vegetable composite patties. Philippine Journal of Food and Nutrition Research, 48(1), 30–42.

[48]. Woolfe, J. (2017). Sweet potato: An untapped food resource. Cambridge University Press.

[49]. Woolfe, J.A.(2016). Sweet potato:An untapped food resource. Cambridge University Press.

© IARJSET This work is licensed under a Creative Commons Attribution 4.0 International License

DOI: 10.17148/IARJSET.2026.13593

[50]. Wuni, A., Addo, D., & Mensah, E. (2022). Physical properties, nutritional profile, and consumer acceptability of gluten-free breakfast flakes from cassava flour. Agricultural and Food Research, 2, 100541. https://doi.org/10.1016/j.afres.2024.100541

[51]. Zhang, M., Li, F., & Wang, H. (2024). Resistant starch from yam: Preparation, nutrition, properties and applications in the food sector. International Journal of Biological Macromolecules, 227, 133087. https://doi.org/10.1016/j.ijbiomac.2024.133087