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ACCEPTABILITY OF CLASSIC CRACKERS FORTIFIED WITH SWEET POTATO (*Ipomoea batatas L.*) LEAVES

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ABSTRACT

This study examined people's perceptions of classic crackers enhanced with sweet potato leaves. The sensory traits checked included appearance, aroma, taste, texture, and overall acceptability. The goal was to investigate how incorporating sweet potato leaves affects the quality of crackers, thereby developing new and authentic African snack options. The study used a quantitative experimental design. Fifty evaluators were carefully chosen from students, faculty, and the local community. Four different product treatments (A, B, C, and D) were made using a standard recipe and tested for sensory analysis. Evaluation tests followed an adapted version of the 9-point Hedonic Scale. Treatment A received the highest average scores for all traits: taste (M = 8.38), texture (M = 8.26), appearance (M = 8.22), and aroma (M = 8.16). It also had the best overall acceptability score of 8.26 and fell into the "very acceptable" category (7.51–8.50). Treatments C and D had slightly lower average scores but were still considered very acceptable by the participants. The research findings indicate that fortifying classic crackers with sweet potato leaves to enhance sensory appeal and consumer acceptability does not compromise product quality. The study recognizes the potential of the innovation for commercialization, community-based food entrepreneurship, and integration in research and laboratory instruction at West Visayas State University – Himamaylan Campus.

INTRODUCTION

A snack food that is among the most consumed foods is crackers. They are liked by all ages, and this is explained by the combination of a crispy texture, savoury flavour profile, and universal utility. Traditional types of crackers are usually made of flour, starch, water, and seasonings, and then baked or deep-fried to give them a particular crunch and flavor. They are appreciated by consumers due to their convenience and affordability, and also, they have a longer shelf life that allows them to be matched with a wide range of foods like soups, spreads, and dips. Shifting consumer needs have exposed a sharp shift in trend towards snacks that are both satisfying in satiety and health-wise. With this changing need, there has been a push to add other ingredients that can help improve the conventional cracker formulations.

To address the growing need to consume healthier and more sustainable dietary products, food scientists and industry players have embarked on the food renewal process in snack recipes in which locally sourced nutrient-rich products have been incorporated in response to the high demand. Of these, sweet potato leaves have surfaced as a promising candidate though its use in most parts of the Philippines among other tropical destinations has been given little attention. The plants are high in vitamin A and C, iron, calcium, dietary fibres and antioxidant substances, such as polyphenols and flavonoids. The combination of these nutrients leads to the support of the immune system and the provision of defense against the development of chronic diseases. Adding sweet potato leaves to crackers can improve their nutritional value while providing an appealing green color and mild flavor that may attract health-conscious consumers. Additionally, using sweet potato leaves supports agricultural sustainability by making use of a commonly discarded by-product of sweet potato farming.

This study aims to evaluate the sensory acceptability of classic crackers fortified with sweet potato leaves, focusing on key sensory attributes, including appearance, aroma, taste, texture, and overall acceptability. By looking at how consumers respond to these new cracker formulations, the research aims to see if adding sweet potato leaves can improve the product's taste and texture without losing its familiar charm. This study's findings should give useful insights to students, faculty, and local entrepreneurs at West Visayas State University -Himamaylan Campus, along with the larger community. It will help in creating fresh, nutritious, and locally inspired snack products that promote health and sustainability.

METHODOLOGY

Research Design

This study employed a quantitative experimental research design to determine the acceptability of classic crackers fortified with sweet potato (Ipomoea batatas L.) leaves. As defined by Bhandari (2020), quantitative research is the method of gathering and analyzing numeric data in a consistent manner. It aims at the

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identification of patterns, hypothesis testing as well as the establishment of relationships between variables. The approach is commonly used in experimental research to test causal association. Furthermore, it enables drawing of inferences which could be projected to a broader population.

In this study, a quantitative experimental design was employed to evaluate the sensory acceptability of the fortified crackers in terms of appearance, aroma, taste, and texture. To compare the effects of the varying concentrations of the sweet potato leaves four treatment formulations were designed based on this: Treatment 1 (25 g), Treatment 2 (50 g), Treatment 3 (75 g), and Treatment 4 (100 g). All formulations were carried out using a standardized recipe and protocol of preparation thus providing uniformity and uniformity.

The sensory evaluation data were gathered from respondents using a 9-point Hedonic Scale questionnaire, which measured their degree of liking for each sensory attribute. Then the researchers conducted the analysis of the obtained data using statistical methods. They obtained the mean, standard deviation and ensured that there were no significant differences between treatments as regards to sensory acceptability. The research design has offered a quantitative and objective comparison of the effect of sweet potato leaf fortification on the overall sensory of the traditional crackers.

Participants and Inclusion Criteria

The participants in this study were fifty (50) purposively selected respondents, comprising students, faculty members, and residents from Himamaylan City. Specifically, twenty-one (21) students and nine (9) faculty members were from West Visayas State University – Himamaylan City Campus, while twenty (20) were residents of Barangay Caradio-an, Himamaylan City. Purposive sampling was employed to include individuals knowledgeable about food products and capable of providing reliable evaluations during sensory testing.

The respondents were chosen depending on how familiar they were and how they had experienced the activity of snack products and food tasting. The presence of students and faculty members guaranteed an academic take on the subject that has its foundation on hospitality and food management with residents providing their own community-based viewpoint based on consumer preferences. Their combined feedbacks gave a overall analysis of the sensory characteristics of the product, as aspect of appearance, smell, taste, and feel, which boosted validity and relevance of the product research findings.

The study inclusion criteria were that the respondents:
(1) had to be students or faculty members or the residents of Himamaylan City;
(2) was exposed to or had experience with food tasting, preparation or consumption of snack products; and
(3) willingly accepted taking part in the sensory assessment.

To achieve unbiased and correct rating, the respondents were directed during the entire tasting process and asked to cleanse their palate between samples to avoid any biasness. No data collected was held as confidential material and receiving information entry was done by strict volunteering.

Sampling Technique and Sample Size

The researchers used the purposive sampling method to collect the required data to conduct this study. Such a methodology was utilized to have the potential number of qualified people in the study, who are familiar and competent to analyze food products, which guarantees the reliability and validity of the findings (Campbell et al., 2020). The number of respondents used in the study was fifty (50) which comprised of twenty one (21) students and nine (9) members of faculty of West Visayas State University - Himamaylan City Campus and twenty (20) members of Barangay Caradio-an, Himamaylan City.

The selection of these participants was done according to their background in knowing about snack products, as well as in terms of food tasting and sensory assessment. The experience in hospitality management, food preparation, and community-based consumption offered all-round and informed feedback on the acceptability of the conventional crackers enriched with sweet potato (Ipomoea batatas L.) leaves in terms of appearance, aroma, taste, and texture.

Questionnaires were distributed to respondents after tasting procedure, and they should have borne the inclusion criteria. This was a sampling method that made sure that the assessment obtained by the participants would be directly pertinent to the aims of the study and involved in the proper determination of consumer preference of the fortified crackers.

Data Collection Instrument

The researchers sought the approval of the Campus Administrator of West Visayas State University, Himamaylan City Campus, to conduct the study. Once the approval was secured, the researchers sent a letter to the participants and handed it to them personally, providing an opportunity to discuss the purpose and significance of the study.

The researchers utilized an adapted sensory evaluation tool based on the 9-Point Hedonic Scale, developed by Peryam and Pilgrim (1957), to collect data on the acceptability of classic crackers fortified with sweet potato (Ipomoea batatas L.) leaves. A modified score sheet was provided to the respondents, where they rated each sample in terms of appearance, aroma, taste, and texture.

The instrument was designed to obtain accurate and systematic feedback from individuals who were knowledgeable in food preparation and sensory evaluation. The responses were gathered immediately after the tasting procedure and were organized and tabulated for analysis. This tool ensured the collection of reliable data that supported the assessment of consumer preferences and

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the overall acceptability of the classic crackers fortified with sweet potato leaves.

Validity and Reliability of the Data

The sensory evaluation instrument used in the study was a modified score card which was of the 9-Point Hedonic Scale put forward by Peryam and Pilgrim (1957). To test the validity of the instrument, a panel of experts in the areas of food science, hospitality management and sensory evaluation was used to review and evaluate the instrument. They provided their comments to improve the way the wording, clarity, and suitability of the items fitted in the study objective of determining the acceptability of the classic crackers that had been fortified using the sweet potato (Ipomoea batatas L.) leaves to the appearance, smell, flavor, and feel.

The validity of the measure had been deemed to be in place because 9-Point Hedonic Scale, is a standardized and well known technique to be applied in conducting a sensory assessment research to obtain an accurate measure of consumer preferences. Its high usage in the past studies makes its results reliable and reproducible. Moreover, the conditions of testing were the same and well-presented to all respondents in the course of the evaluation in order to reduce bias and maximize consistent responses.

Ethical Considerations

Prior to data collection, the researchers sought permission from the Campus Administrator of West Visayas State University – Himamaylan City Campus to conduct the study. Upon receiving approval, informed consent was obtained from all participants. They were clearly informed that their participation was voluntary, and they could withdraw from the study at any point without any penalty or consequence.

The researchers ensured that all communication materials and instructions were written in clear and understandable language to promote transparency and comprehension among participants. Throughout the data-gathering process, the anonymity and confidentiality of all respondents were strictly maintained. The information collected was used solely for research purposes and handled with utmost care and ethical responsibility in accordance with academic research standards.

RESULTS AND DISCUSSIONS

Descriptive Data Analysis

Table 1

Level of Acceptability of Classic Crackers Fortified with Sweet Potato Leaves in Four Treatment Groups in Terms of Appearance, Aroma, Taste, and Texture

		n	Mean	Verbal Description	*SD*
	Appearance	50	8.22	Very Acceptable	.79
	Aroma	50	8.16	Very Acceptable	.82
Treatment A	Taste	50	8.38	Very Acceptable	.73
25 grams	Texture	50	8.26	Very Acceptable	.83
	Overall	50	8.26	Very Acceptable	.65
	Appearance	50	8.12	Very Acceptable	.63
	Aroma	50	8.04	Very Acceptable	.53
Treatment B	Taste	50	7.88	Very Acceptable	.87
50 grams	Texture	50	7.94	Very Acceptable	.71
	Overall	50	8.00	Very Acceptable	.57
		n	Mean	Verbal Description	*SD*
	Appearance	50	7.68	Very Acceptable	1.00
	Aroma	50	7.78	Very Acceptable	1.15
Treatment C	Taste	50	7.64	Very Acceptable	1.16
75 grams	Texture	50	7.66	Very Acceptable	1.19
	Overall	50	7.69	Very Acceptable	1.04
	Appearance	50	7.54	Very Acceptable	1.50
Treatment D	Aroma	50	7.64	Very Acceptable	1.54
100 grams	Taste	50	7.62	Very Acceptable	1.61
	Texture	50	7.70	Very Acceptable	1.53
	Overall	50	7.63	Very Acceptable	1.48

Note: 8.51-9.00 Highly Acceptable; 7.51-8.50 Very Acceptable; 6.51-7.50 Moderately Acceptable; 5.51-6.50 Slightly Acceptable; 4.51-5.50 Neither Acceptable/Unacceptable; 3.51-4.50 Slightly Unacceptable; 2.51-3.50 Moderately Unacceptable; 1.51-2.50 Very Unacceptable; 1.00-1.50 Highly Unacceptable

Table 1 shows the sensory evaluation results of classic crackers fortified with sweet potato leaves, showing consistently high levels of acceptability across all sensory attributes. The table presents the sensory evaluation results of classic crackers fortified with sweet potato leaves under four different treatments (A, B, C, and D), assessed in terms of appearance, aroma, taste, texture, and

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overall acceptability. Each attribute was evaluated by 50 respondents, and the corresponding mean scores and standard deviations were recorded along with verbal descriptions based on a standardized scale. The findings reveal that "Treatment A" achieved the highest acceptability across all sensory parameters, with taste receiving the highest mean score of (8.38), followed closely by texture (8.26), appearance (8.22), and aroma (8.16). Its overall acceptability also scored (8.26), which falls within the "Very Acceptable" range (7.51–8.50), indicating that the formulation under Treatment A was the most well-received by the evaluators.

Treatment B also performed well, particularly in appearance (8.12) and aroma (8.04), though its taste (7.88) and texture (7.94) were slightly lower than those of Treatment A. Still, all attributes in Treatment B remained within the "Very Acceptable" range. On the other hand, Treatment C and Treatment D received relatively lower mean scores, with overall acceptability scores of (7.69) and (7.63) respectively. Despite this, they were still verbally described as "Very Acceptable," indicating that even the least preferred formulations were still positively accepted by the respondents. However, Treatments C and D showed higher standard deviations, particularly in aroma and texture SD for aroma in Treatment D was (1.54, and texture was 1.53), suggesting more variability in individual preferences or perceptions among the respondents. In contrast, Treatments A and B showed more consistent feedback, as reflected in their relatively lower standard deviations.

These results suggest that the incorporation of sweet potato leaves in classic cracker formulations is acceptable to consumers, especially under the Treatment A combination. The favorable sensory responses across all treatments support the feasibility of using sweet potato leaves as a functional and acceptable ingredient in snack production. Further optimization may be explored to reduce variability in sensory responses, particularly in aroma and texture.

Table 2

Differences in the Acceptability of Classic Crackers Fortified with Sweet Potato Leaves among Four Treatment Groups

	n	Mean Rank	Kruskal-Wallis *H*	*p*-value
Treatment A	50	120.18	8.834	.032
Treatment B	50	98.13		
Treatment C	50	87.33		
Treatment D	50	96.36		

*$p < .05$, significant

Table 2 presents the analysis of significant differences in the level of acceptability of classic crackers fortified with sweet potato leaves in terms of appearance, aroma, taste, and texture. Based on the results presented in the table, the Kruskal-Wallis H test revealed a statistically significant difference in the acceptability of classic crackers fortified with sweet potato leaves among the four treatment groups ($H = 8.834$, $p = 0.032$). Treatment A, with the highest mean rank of 120.18, appears to be the most preferred among the groups, followed by Treatment B (98.13), Treatment D (96.36), and Treatment C (87.33). The p-value of 0.032, which is less than the 0.05 level of significance, indicates that at least one treatment group differed significantly from the others in terms of sensory acceptability.

However, while the Kruskal-Wallis H test confirms the existence of significant differences, it does not specify where these differences lie. To identify which specific groups significantly differ from each other, Dunn's post-hoc test was applied. This further analysis helps in pinpointing the exact treatment combinations contributing to the overall significant result. The findings suggest that the level or type of sweet potato leaf fortification influences consumer acceptability, and Treatment A may have contained an optimal formulation leading to higher sensory satisfaction product. The lack of significant difference also points to the potential for consumer acceptance of varied formulations, which could provide more nutritional and flavor options without affecting marketability.

CONCLUSIONS

Based on the findings of the study revealed that the incorporation of sweet potato (Ipomoea batatas L.) leaves into classic cracker formulations was highly acceptable to consumers in terms of appearance, aroma, taste, texture, and overall acceptability. Among the four treatments, Treatment A obtained the highest mean scores across all sensory attributes, indicating that it was the most preferred formulation. The overall results demonstrated that all treatments, regardless of the level of fortification, fell within the "Very Acceptable" range, suggesting that the addition of sweet potato leaves did not negatively affect the sensory qualities of the crackers.

The use of sweet potato leaves as a fortifying ingredient proved to be a feasible and effective approach to enhancing the nutritional value of crackers while maintaining consumer appeal. The significant difference found among treatment groups indicates that the concentration level of sweet potato leaves can influence sensory perception, emphasizing the importance of determining the optimal formulation.

In conclusion, the classic crackers fortified with sweet potato leaves were well accepted by the respondents, confirming their potential as an innovative, nutritious, and locally sustainable snack product. The results support the viability of incorporating underutilized agricultural resources like sweet potato leaves in food production. It is recommended that future research explore nutritional profiling, shelf-life testing, and consumer market studies to further develop and commercialize the product.

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Recommendations

Based on the findings of this study, several recommendations are proposed for product refinement, future experimentation, and potential commercial application of classic crackers fortified with sweet-potato leaves.

With reference from the sensory evaluation results of classic crackers fortified with sweet potato leaves, the researchers recommend the adoption of Treatment A as the prototype formulation. This treatment consistently received the highest mean scores across all sensory attributes, indicating strong consumer acceptance. As such, it is suggested that this formulation be used as the standard for future product development activities, including large-scale production, shelf-life studies, and packaging trials. For the community, especially local food producers and entrepreneurs, adopting Treatment A could serve as a practical guide in developing nutritious and appealing snack products that utilize locally available ingredients such as sweet potato leaves. This initiative may also promote livelihood opportunities and support sustainable food innovation within the locality.

To improve product quality and consumer satisfaction, further refinement of aroma and texture is recommended, particularly for Treatments C and D. The higher variability in sensory responses for these formulations suggests a need for adjustments in processing methods such as blanching time, leaf particle size, or oil type. Faculty members and students of West Visayas State University – Himamaylan Campus, particularly those in Food Science, Home Economics, and related programs, may conduct small-scale reformulation experiments as part of research or laboratory activities. These efforts would not only enhance product consistency but also strengthen students' technical skills in food formulation and sensory analysis.

Moreover, it is encouraged to conduct instrumental analyses, such as Texture Profile Analysis (TPA) and Gas Chromatography–Mass Spectrometry (GC–MS), to complement the sensory evaluation results. This will help identify the specific physicochemical properties responsible for the superior aroma and texture of Treatment A. The university's faculty and research units may collaborate to facilitate access to laboratory resources and establish linkages with other institutions to conduct such advanced analyses.

To broaden the scope of the study, future researchers are encouraged to expand sensory testing to a larger and more diverse group of respondents, including individuals from different age groups and geographic areas. This will help generate more representative data and enhance the reliability of the findings. Additionally, future studies should assess the nutritional and functional properties of sweet potato leaves, such as their β-carotene, polyphenol, and antioxidant content. Highlighting these health-promoting components can contribute to the development of functional food products that align with the university's advocacy for community health and wellness.

In conclusion, the study's findings offer valuable insights not only for product developers but also for the academic community of West Visayas State University – Himamaylan Campus. Through collaborative research, curriculum integration, and community extension programs, the university can play a pivotal role in promoting innovative, nutritious, and locally sourced food products that benefit both the community and the broader food industry.

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