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FORMULATION, ANALYSES AND ACCEPTABILITY OF SQUASH HOPIA WITH MORINGA LEAVES

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Abstract: Bread serves as a staple food for most Filipinos, next to cooked rice. It is a well-loved food item enjoyed by people of all ages and genders. This study evaluated the acceptability of squash as a filling for hopia with Moringa, focusing on sensory qualities, consumer preference, microbial safety, proximate analysis, and shelf life. The study utilized a developmental-experimental research method. Three different formulations were tested to determine variations in appearance, aroma, taste, and texture, employing a Completely Randomized Design (CRD) and the Nine-Point Hedonic Scale. A panel of trained evaluators and 100 consumer respondents assessed the samples, and data were statistically analyzed using mean scores and ANOVA at a 0.01 significance level. Among the three formulations, Treatment C, containing 32.6 grams of squash flour, emerged as the most acceptable. It received the highest ratings in appearance, taste, and texture. The increased amount of squash flour resulted in a more attractive golden-orange color, a pleasant aroma, a rich and satisfying taste, and a soft, appealing texture—making it the most preferred variant. While the difference in aroma was not statistically significant, significant variations were observed in appearance, taste, texture, and overall acceptability. These results are consistent with previous research findings, suggesting that squash can enhance the sensory characteristics of baked products while also improving their nutritional value. Microbial analysis showed that the product met food safety standards, confirming that it is safe for human consumption. Similarly, shelf-life testing revealed no signs of mold growth within the first 2 to 6 days. However, by days 7 to 14, spoilage indicators such as unpleasant odor and mold formation began to appear. Therefore, the product is best consumed fresh and should ideally be consumed within one week of production to ensure quality and safety.

Keywords: Hopia, Squash, Moringa, Formulation, Analyses and Acceptability

I. INTRODUCTION

Bread has long been a symbol of culture and sustenance, shaping societies across the globe. In the Philippines, bread such as pandesal and hopia has evolved into beloved staples, reflecting Filipino innovation and taste. Hopia, a pastry of Chinese origin introduced by Fujianese immigrants, traditionally features mung bean filling but has since embraced a variety of flavors (Lainley, 2021). Modern bakers seek healthier and more cost-effective alternatives, prompting the exploration of local ingredients. Squash (Cucurbita maxima), rich in nutrients, and moringa (Moringa oleifera), a recognized superfood (Palada, 2022), offer promising potential as innovative hopia fillings. According to Business World (2017), Filipinos have a strong preference for diverse bread options, opening opportunities for creative and nutritious variations. This study evaluates the acceptability of squash and moringa in hopia, aiming to reduce reliance on artificial ingredients, enhance nutritional value, and guide future food entrepreneurs toward sustainable, health-conscious baking practices.

This study aimed to determine the acceptability of Squash Hopia with Moringa leaves. Specifically, it aimed to: (1)determine the sensory qualities of squash hopia with moringa leaves in terms of appearance, aroma, taste, and texture; (2) determine the acceptability of squash hopia with moringa leaves among the three (3) treatments in terms of appearance, aroma, taste, and texture;

II. METHODOLOGY

This study used the developmental-experimental method to investigate the acceptability of the formulation of Squash Hopia with Moringa leaves. The researchers systematically manipulated independent variables to observe their direct impact on dependent variables while controlling extraneous factors to establish causal relationships. They developed a recipe for squash Hopia with Moringa leaves using various formulations and ratios of squash flour, water, oil, lard, and squash filling. Sensory evaluation sessions were conducted with trained tasters to evaluate the flavor, texture, scent, and general acceptance of the prototype hopia.

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The Complete Randomized Design (CRD) was used in the experiment, which involved group tests of Hopia bread with successive replications to determine the cause of change. The study used various tools and equipment, including a stainless working table, measuring spoons, weighing scale, kitchen knife, mixing bowls, rubber scraper, spatula, jelly roll pan, rolling pin, chopping board, unit three-burner top stove with oven, non-stick pan, utility bowls, colander, spoon, and glacine.

The three different treatments (A, B, and C) were used in formulating Squash Hopia with Moringa Leaves, with the primary variation being the proportion of first-class flour and squash flour. Treatment A maintained an optimal flour composition that balanced structural integrity with nutritional benefits, while Treatment B produced a softer, lighter texture with less pronounced squash flavor. Treatment C had a denser texture, stronger squash flavor, and more vibrant color due to the increased presence of squash.

Table 1. Treatments used in making Squash Hopia with Moringa leaves.

Ingredients	Treatment A	Treatment B	Treatment C
First Class Flour	225 grams	225 grams	225 grams
Squash Flour	108.6 grams	72.4 grams	36.2 grams
Vegetable Oil	50 grams	50 grams	50 grams
Water	50 grams	50 grams	50 grams
Sugar	25 grams	25 grams	25 grams
Moringa Leaves	10 grams	10 grams	10 grams
Salt	2grams	2grams	2grams
Third Class Flour	185 grams	185 grams	185 grams
Lard	140 grams	140 grams	140 grams
Boiled Squash	125 grams	125 grams	125 grams
Coconut Milk	220 grams	220 grams	220 grams
Condensed Milk	150 grams	150 grams	150 grams
Sugar (for filling)	300 grams	300 grams	300 grams
Bread Crumbs	100 grams	100 grams	100 grams
Butter	115 grams	115 grams	115 grams
Egg Yolk	50 grams	50 grams	50 grams

The primary objective of these variations was to determine the ideal balance of wheat and squash flour that enhanced the nutritional profile of hopia while maintaining its desired sensory attributes. The findings helped establish a nutritionally enhanced hopia variant that aligned with consumer preferences while offering improved functional food benefits.

III. RESULTS AND DISCUSSION

The sensory evaluation results of three treatments of Squash Hopia with Moringa Leaves were analyzed using an adjectival description (AD) scale. Treatments B and C received the highest scores (8.60), categorized as Extremely Appealing (EA), while Treatment A scored 7.50 (Very Much Appealing). This suggests that the higher proportion of squash flour in Treatment C (36.2 grams) and the balanced flour ratio in Treatment B (72.4 grams) contributed to better visual appeal, likely due to the enhanced color and uniform texture of the pastry. Prior studies have highlighted that squash naturally enhances the golden-yellow pigmentation of baked goods, making them visually attractive.

In terms of aroma, Treatment C (36.2 grams) had the highest score (8.40), described as Extremely Pleasant (EP), followed by Treatments B and A, which were categorized as Very Much Pleasant (VMP) with scores of 7.80 and 7.70, respectively. The significant improvement in aroma in Treatment C may be attributed to the increased squash flour content, which has been found to contribute to a mildly sweet and natural scent when baked. Additionally, the Moringa leaves may have complemented the natural aroma of the squash, as observed in previous research that demonstrated the synergistic effect of Moringa on enhancing aroma in functional baked products.

For taste, Treatment C (36.2 grams) achieved the highest rating (8.50 – Extremely Delicious (ED)), followed by Treatment B (72.4 grams) (8.20 – ED) and Treatment A (108.6 grams) (7.90 – Very Much Delicious (VMD). The

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increasing scores suggest that the higher incorporation of squash flour resulted in improved sweetness and overall flavor. The consistent amount of Moringa across all treatments ensured that the flavor remained balanced without overpowering the squash, making it more palatable to consumers.

The results indicated that the proportion of squash flour significantly affected the sensory attributes of Squash Hopia with Moringa Leaves, particularly in appearance, aroma, taste, and texture. Treatments B and C performed better overall, with Treatment C (36.2 grams) being the most preferred, suggesting that a lowest proportion of squash flour resulted in greater consumer acceptability..

Table 1. Sensory qualities of squash hopia with Moringa leaves.

Sensory Qualities	Treatment A (108.6 grams)		Treatment B (72.4 grams)		Treatment C (36.2 grams)	
	Mean	AD	Mean	AD	Mean	AD
Appearance	7.50	VMA	8.60	EA	8.60	EA
Aroma	7.70	VMP	7.80	VMP	8.40	EP
Taste	7.90	VMD	8.20	ED	8.50	ED
Texture	7.30	VMCS	7.50	VMCS	8.30	VMF

Legend: ***Adjectival Description (AD)***

Score	*Appearance*	*Aroma*
8.12 – 9.00	*Extremely Appealing (EA)*	*Extremely Pleasant (EP)*
7.23 – 8.11	*Very Much Appealing (VMA)*	*Very Much Pleasant (VMP)*
6.34 – 7.22	*Moderately Appealing (MA)*	*Moderately Pleasant (MP)*
5.45 – 6.33	*Slightly Appealing (SA)*	*Slightly Pleasant (SP)*

Score	*Taste*	*Texture*
8.12 – 9.00	*Extremely Delicious (ED)*	*Extremely Flaky (ECS)*
7.23 – 8.11	*Very Much Delicious(VMD)*	*Very Much Flaky (VMF)*
6.34 – 7.22	*Moderately Delicious (MD)*	*Moderately Flaky (MF)*
5.45 – 6.33	*Slightly Delicious (SD)*	*Slightly Flaky (SCS)*

The study aimed to evaluate the acceptability of Squash Hopia with Moringa Leaves among three formulations, focusing on appearance, aroma, taste, texture, and overall acceptability. Treatment C (36.2 grams) was found to be the most acceptable, with the highest ratings across all sensory qualities. The higher squash flour content significantly influenced the acceptability of hopia, particularly in terms of appearance, taste, and texture. This aligns with previous research that squash improves the visual appeal, color, and flavor of baked goods. The vibrant orange hue from squash may have enhanced the perceived quality of the hopia, as studies have shown that color plays a crucial role in food perception and acceptability.

The taste and texture ratings of Treatment C suggested that the lowest squash flour content provided a flaky texture, which was validated by earlier studies demonstrating that squash retains moisture and improves the mouthfeel of bakery products. The use of Moringa leaves in a controlled proportion ensured that the nutritional value was enhanced without compromising taste. Prior research confirmed that Moringa fortification in baked goods is best utilized when incorporated in balanced amounts to avoid bitterness or alterations in flavor.

The study validated the importance of sensory evaluation in functional food product development, confirming that ingredient modifications can directly influence consumer perception and market potential. Future research should focus on extending the shelf life of squash hopia while preserving its sensory attributes and exploring different sweeteners and natural preservatives to improve product stability. Large-scale consumer testing across various demographics and market segments could provide deeper insights into the commercial potential of vegetable-based hopia.

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Acceptability of squash hopia with moringa leaves among the three (3) treatments in terms of appearance, aroma, taste, texture, and overall acceptability.

Sensory Qualities	Treatment A (108.6 grams)		Treatment B (72.4 grams)		Treatment C (36.2 grams)	
	Mean	AD	Mean	AD	Mean	AD
Appearance	7.74	LVM	8.29	LE	8.45	LE
Aroma	7.85	LVM	8.03	LE	8.16	LE
Taste	7.88	LVM	8.23	LE	8.28	LE
Texture	7.20	LVM	7.21	LVM	8.13	LE
Overall Acceptability	**7.67**	LVM	**7.94**	LVM	**8.26**	LE

Legend: ***Adjectival Description (AD)***

Score	***Appearance***
8.12 – 9.00	*Liked Extremely (LE)*
7.23 – 8.11	*Liked Very Much (LVM)*
6.34 – 7.22	*Liked Moderately (LM)*
5.45 – 6.33	*Liked Slightly (LS)*

IV. CONCLUSION

Based on the findings and objectives of the study, the following conclusions were formulated. Squash can be utilized as the main ingredient in making hopia. Moreover, all three (3) treatments displayed distinctive sensory characteristics in which all treatments exhibited a visually appealing appearance. The different treatments of Squash hopia with moringa were also favorable in terms of aroma, taste, and texture, as evaluated by panelists and consumers.

Overall, the formulated Squash Hopia with Moringa Leaves was generally accepted. All treatments were well-received by the panelists, indicating a positive perception of the Squash Hopia. However, individual preferences may vary based on personal taste preferences. Moreover, based on the results as evaluated by a panel of experts, among the three (3) treatments of Squash Hopia, Treatment C has the best quality attributes. It has the best proportion among all treatments and was very liked by the evaluators in terms of its appearance, aroma, taste, and texture.

V. RECOMMENDATION

The sensory evaluation, general acceptability assessment, and shelf-life determination of Squash Hopia with Moringa Moringa leaves have led to recommendations for improving the product. Experiments with different vegetable formulations and concentrations, incorporating green leafy vegetables and locally grown fruit, and exploring alternative cooking methods can optimize flavor balance and cater to diverse consumer preferences. Quality control methods, regular sensory evaluations, and investing in excellent packaging materials can ensure consistent product appearance, texture, and flavor. Emphasizing the natural and healthy features of the product, particularly the inclusion of squash and moringa, can differentiate it in the market and attract health-conscious consumers. Information on the health benefits and culinary uses of the herbs used in the chip formulations can increase product appeal.

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Promoting environmental stewardship and social responsibility can be achieved by sourcing ingredients from sustainable and ethical suppliers and exploring eco-friendly packaging solutions. This will foster innovation and continuous improvement within the product development team.

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