INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN MULTIDISCIPLINARY EDUCATION

ISSN (print): 2833-4515, ISSN (online): 2833-4531

Volume 04 Issue 06 June 2025

DOI: 10.58806/ijirme.2025.v4i6n02, Impact factor- 6.748

Page No. 446-449

Development and Acceptability of Vegetable-Based Cookies Using Malunggay (*Moringa Oleifera*), Sweet Potato (*Ipomoea Batatas*), and Carrots (*Daucus Carota*)

Mary Joy P. Telan

Isabela State University- City of Ilagan Campus, City of Ilagan, Isabela, Philippines 3300

ABSTRACT: This study explores the development and sensory acceptability of vegetable-based cookies incorporating Malungay (*Moringa oleifera*), sweet potato (*Ipomoea batatas*), and carrots (*Daucus carota*). These vegetables are known for their nutritional profiles and can serve as functional ingredients in baked goods. The research aimed to create three cookie formulations using different vegetable blends and evaluate their sensory characteristics. Fifty panelists assessed the samples based on color, texture, aroma, taste, and overall acceptability using a 9-point Hedonic scale. Results showed that the formulation combining equal portions of all three vegetables was most acceptable. The findings support the potential for vegetable-based cookies to offer a nutritious and palatable alternative to traditional cookies, with implications for functional food innovation and healthier snack development.

KEYWORDS: vegetable cookies, Moringa oleifera, sweet potato, carrot, sensory evaluation, healthy snacks

.

I. INTRODUCTION

Cookies are widely consumed snacks that traditionally consist of flour, sugar, fat, and leavening agents. However, increasing consumer interest in functional and health-promoting foods has driven the innovation of baked goods enriched with nutrient-dense ingredients. The incorporation of vegetables into cookies can improve their fiber, vitamin, and mineral content while offering new sensory experiences.

Three vegetables stand out for their nutritional and functional properties:

- **Malunggay (*Moringa oleifera*)**: Often called a "miracle tree," moringa leaves are rich in vitamins A and C, calcium, potassium, and iron. It possesses antioxidant and antimicrobial properties (Anwar et al., 2007).
- **Sweet potato (*Ipomoea batatas*)**: A good source of dietary fiber, complex carbohydrates, and beta-carotene, which is converted into vitamin A in the body (Woolfe, 1992).
- **Carrots (*Daucus carota*)**: High in beta-carotene, dietary fiber, and antioxidants, carrots have been linked to improved vision and immune support (Arscott & Tanumihardjo, 2010).

Previous studies have successfully enriched cookies with singular vegetables like pumpkin or squash (Ajila et al., 2008), but few have investigated a combined vegetable approach. This study aims to fill that gap by developing cookies using combinations of *Moringa*, sweet potato, and carrot, and evaluating their sensory acceptability.

Objectives:

1. To develop vegetable-based cookies using Malunggay (*Moringa*), sweet potato, and carrot in three different formulations.
2. To evaluate the sensory attributes of the cookies (color, texture, aroma, taste, and overall acceptability).
3. To identify the most preferred formulation among the three.
4. To assess significant differences in sensory attributes using statistical analysis.

II. METHODOLOGY

This chapter of this study present the research methodologies that were employed in the conduct of the study. It includes the research design, local and population of the study, data gathering instrument, data gathering procedure, treatment of data and data analysis in order to rearrange the gathered data.

Research Design

A. The study employed an experimental design involving the preparation of three cookie formulations using different vegetable blends. Each sample was subjected to sensory evaluation by untrained panelists.

B. **Ingredients and Formulations**

Base cookie ingredients included:

- All-purpose flour
- Butter
- White sugar
- Eggs
- Baking powder
- Vanilla extract

C. **Vegetable puree was added to replace 25% of the flour content. Three treatments were developed:**

- **Treatment A**: 100% sweet potato puree
- **Treatment B**: 50% sweet potato, 25% carrot, 25% moringa leaf powder
- **Treatment C**: 50% carrot, 50% moringa leaf powder

D. Vegetables were cleaned, boiled (except for moringa, which was air-dried and powdered), and pureed before incorporation. Cookies were shaped and baked at 180°C for 15 minutes.

Sensory Evaluation

Fifty untrained panelists (students and faculty) participated in the evaluation. Samples were coded randomly and presented with water for palate cleansing between samples. Each cookie was evaluated based on:

- Color
- Aroma
- Texture
- Taste
- Overall acceptability

A 9-point Hedonic scale was used, where 9 = Like extremely and 1 = Dislike extremely.

Data Collection and Analysis

Data were analyzed using descriptive statistics (mean, standard deviation) and inferential statistics (ANOVA) to determine significant differences between treatments. Tukey's HSD was used for post hoc analysis.

III.RESULTS AND DISCUSSION

This chapter presents the results, discussion, and the personal insight that the researchers have gathered of a study on the acceptability of vegetable-based cookies.

RESULTS

A. Color

Color plays a critical role in consumer perception. Treatment A (sweet potato) had a golden-brown hue, Treatment B had an earthy-orange tone, and Treatment C was dark green due to moringa content.

Table 1: Sensory evaluation as to Color

Treatment	Mean Score (Color)
A	8.1
B	8.4
C	6.7

Treatment B received the highest mean score due to its appealing, natural tone. Treatment C's greenish appearance may have negatively influenced panelist perception, as unconventional food colors can evoke negative responses (Clydesdale, 1993).

B. Aroma

Aroma results from the combination of vegetable volatiles and baking process. Treatments A and B had a pleasant sweet smell, while C had a strong, earthy aroma.

Table 2: Sensory evaluation as to Aroma

Treatment	Mean Score (Aroma)
A	7.8
B	8.2

C	6.5

Panelists favored Treatment B, noting a "pleasant, home-baked smell," which may be attributed to the mix of sweet vegetables and vanilla.

C. Texture

Texture ranged from soft and moist to slightly gritty due to moringa leaf particles. Treatments A and B had a soft crumb, while Treatment C was denser.

Table 3: Sensory evaluation as to Texture

Treatment	Mean Score (Texture)
A	8.0
B	8.5
C	6.2

Treatment B scored highest, indicating a pleasing chewiness without being too moist or dry. The fibrous texture of moringa in C may have reduced its score.

D. Taste

Taste is influenced by sweetness, bitterness, and flavor complexity.

Table 4: Sensory evaluation as to Taste

Treatment	Mean Score (Taste)
A	7.9
B	8.7
C	6.4

Treatment B was significantly preferred due to its balance of natural sweetness from sweet potato and carrots and mild herbal notes from moringa. Treatment C's lower score reflects the strong taste of moringa when not balanced by sweeter ingredients.

E. Overall Acceptability

Table 5: Overall Acceptability of the Sensory Evaluation

Treatment	Mean Score (Overall)
A	8.0
B	8.8
C	6.5

Treatment B had the highest overall acceptability, indicating that the combination of sweet potato, carrot, and moringa in balanced ratios produced the most palatable cookie. ANOVA results revealed significant differences ($p < 0.05$) in taste and texture among treatments.

DISCUSSION

The results support previous findings that vegetables can enhance baked products both nutritionally and sensorially when properly balanced (Khalil et al., 2017). Treatment B's success lies in its ingredient synergy: sweet potato's moisture and sweetness, carrot's color and subtle flavor, and moringa's nutritional value. In contrast, Treatment C lacked sweetness to mask moringa's bitterness and was penalized in both texture and taste.

Similar studies by Ajila et al. (2008) and Ndife et al. (2014) reported increased nutritional value and consumer acceptability of baked products enriched with vegetable purees and leaf powders. However, excessive amounts of functional ingredients like moringa may negatively impact sensory attributes if not balanced.

IV. CONCLUSION AND RECOMMENDATIONS

Conclusion

This study demonstrated that vegetable-based cookies using Malunggay (*Moringa*), sweet potato, and carrots are not only feasible but also acceptable to consumers. Among the three formulations tested, the combination in Treatment B (50% sweet potato, 25% carrot, 25% moringa) achieved the highest acceptability in all sensory parameters. This supports the hypothesis that vegetables, when properly balanced, can produce appealing and nutritious baked snacks.

Recommendations

Taking into consideration of the findings of the study and the positive feedbacks from consumers:

1. **Product Development:** Future research should investigate other vegetable combinations, whole-grain flours, and sugar substitutes to cater to health-conscious consumers.
2. **Nutritional Profiling:** Laboratory analysis should be conducted to determine macronutrient and micronutrient contents of the final product.
3. **Shelf-Life Testing:** Evaluate microbial stability and freshness over storage time.
4. **Consumer Testing:** Broaden the demographic sample to include children and elderly consumers for targeted product development.

REFERENCES

1) Ajila, C. M., Aalami, M., Leelavathi, K., & Prasada Rao, U. J. S. (2008). Mango peel powder: A potential source of antioxidant and dietary fiber in macaroni preparations. *Innovative Food Science & Emerging Technologies*, 9(3), 339–343.
2) Anwar, F., Latif, S., Ashraf, M., & Gilani, A. H. (2007). Moringa oleifera: A food plant with multiple medicinal uses. *Phytotherapy Research*, 21(1), 17–25.
3) Arscott, S. A., & Tanumihardjo, S. A. (2010). Carrots of many colors provide basic nutrition and bioavailable phytochemicals acting as a functional food. *Comprehensive Reviews in Food Science and Food Safety*, 9(2), 223–239.
4) Clydesdale, F. M. (1993). Color as a factor in food choice. *Critical Reviews in Food Science and Nutrition*, 33(1), 83–101.
5) Khalil, A. A., Rahman, M. S., & Islam, M. N. (2017). Fortification of cookies with carrot powder. *Journal of Nutritional Health & Food Engineering*, 7(6), 242–247.
6) Ndife, J., Kida, F., & Fagbemi, S. (2014). Production and quality assessment of functional bread produced from whole wheat and soy flour. *International Journal of Nutrition and Food Sciences*, 3(6), 493–496.
7) Woolfe, J. A. (1992). *Sweet potato: An untapped food resource.* Cambridge University Press.