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Utilization Of Sweet Potato (Ipomoea Batatas) Into Buns Filling: It's Acceptability

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Abstract

Sweet potato (*Ipomoea batatas*), a nutrient-dense and widely available crop in the Philippines, presents potential for improving the nutritional value and local relevance of bakery products. This study explored its use as a bun filling to address limited commercial utilization while promoting consumer acceptability, safety, and support for local agriculture. A descriptive research design was conducted at Cagayan State University–Carig Campus using four bun formulations with varying sweet potato content. Sensory evaluation of appearance, aroma, taste, texture, and overall acceptability was performed by 15 expert panelists and 35 student consumers using a 9-point hedonic scale. The most preferred treatment underwent microbial analysis at the Department of Agriculture. Data were analyzed using weighted means, percentages, ANOVA, and t-tests. Treatment 3, containing the highest proportion of sweet potato, received the highest sensory ratings: appearance (7.92), aroma (8.02), taste (7.88), texture (7.72), and general acceptability (8.02). Microbial analysis confirmed safe levels of bacterial counts with no presence of *Salmonella*. Significant differences ($p < 0.001$) were found between Treatment 3 and the control sample, indicating that sweet potato notably enhanced sensory quality. Findings demonstrate that sweet potato is a safe and effective filling ingredient that improves bun acceptability while supporting local crop utilization. The study recommends adopting a 75% sweet potato filling formulation, conducting nutritional and shelf-life analyses, expanding consumer testing, and exploring its application in other bakery products.

Keywords: *Sweet potato, bun filling, sensory evaluation, consumer acceptability, microbial safety.*

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INTRODUCTION

Food insecurity continues to affect millions worldwide, emphasizing the need for nutrient-dense and sustainable food products (Food and Agriculture Organization [FAO], 2022). Sweet potato (*Ipomoea batatas*), rich in carbohydrates, fiber, beta-carotene, vitamins, and minerals, offers strong potential as a functional ingredient in bakery applications (Woolfe, 1992). With growing interest in functional foods that support disease prevention, incorporating sweet potato into baked products aligns with efforts to improve nutrition and sustainability (Tan et al., 2021). In the Philippines, sweet potato is abundant but typically used in traditional forms (Philippine Root Crops Research and Training Center [PhilRootcrops], 2020). Using it as a bun filling supports local agricultural utilization and aligns with national food innovation initiatives (Department of Science and Technology–Food and Nutrition Research Institute [DOST-FNRI], 2021).

Guided by the Food Product Development Framework (Earle et al., 2001) and the Health Belief Model (Rosenstock, 1974), the study developed sweet potato bun fillings and evaluated their sensory qualities. The research also reviewed literature on sweet potato applications in bakery products (Zuraida et al., 2020; Dlamini et al., 2021) to address existing gaps related to consumer acceptability and commercial potential.

Prior studies highlight sweet potato's value in improving nutritional and textural qualities of baked goods, though limited research explores its use specifically as a bun filling. The current study identifies sweet potato as a feasible ingredient capable of enhancing appearance, aroma, taste, texture, and overall acceptability when incorporated into bakery products. It also shows potential benefits for sustainability and agricultural development due to its local availability.

Findings support sweet potato as a nutritious, affordable, and culturally relevant ingredient for bun fillings. Its use offers an opportunity to reduce reliance on imported fillings, improve nutritional quality, and support local crop utilization. This aligns with broader goals of promoting food security, health-oriented consumer choices, and sustainable food innovation. The study ultimately demonstrates that sweet potato can create bakery products that are both highly acceptable to consumers and beneficial to local agricultural communities.

MATERIALS AND METHODS

Research Design

This study employed a descriptive research design to evaluate the utilization of sweet potato (Ipomoea batatas) as a filling for buns and to determine its microbial safety and consumer acceptability. The sweet potato bun filling was prepared and subjected to microbial analysis to ensure that it met food safety standards and was safe for consumption. A 9-point hedonic scale was also used to assess the product's taste, texture, aroma, appearance, and overall acceptability among selected faculty members and students of the College of Industrial Technology at Cagayan State University – Carig Campus. Data collected from both microbial and sensory evaluations were analyzed to identify the most acceptable and safe formulation. While the study did not include

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nutritional testing, sweet potato is recognized in existing literature as a naturally rich source of carbohydrates, fiber, and essential vitamins, making it a potentially nutritious ingredient for bakery products.

Raw Materials and Ingredients

The Sweet Potato Bun was made using sweet potato, condensed milk, egg, powdered milk, bread flour, yeast, white sugar, bread improver, water, shortening, and salt. The sweet potato was used for the filling, while the other ingredients were combined to make soft and tasty bread. Each ingredient helped create a flavorful and appealing bun.

The preparation also required some tools and equipment, including a mixing bowl, wire whisk, knife, small bowls, spoon or fork, silicone spatula, pastry brush, measuring cups, and a weighing scale. A sifter or strainer was used for dry ingredients, and baking paper lined the trays. The frying pan and gas range were used for cooking the filling, while the oven baked the buns. All tools were cleaned and ready to ensure safe and proper preparation.

Pre-Preparation of Sweet Potato Bun Filling

Raw sweet potatoes are washed, boiled until tender, cooled for a few minutes, and peeled then mashed until smooth. The mashed sweet potato is cooked with condensed milk over low heat until thick and smooth, then set aside to cool and ready to fill the dough of the buns.

General Preparation for Making Sweet Potato (*Ipomoea Batatas*) Bun

The preparation of the sweet potato buns begins with the filling. The cooked sweet potato filling then set aside for the bun dough.

For the dough, bread flour, sugar, salt, and bread improver are mixed in a bowl. Yeast is dissolved in lukewarm water and allowed to activate for 5–10 minutes before being added to the dry ingredients along with egg, shortening, and water. The dough is kneaded for about 10–15 minutes until smooth and elastic, then covered and left to rise for one hour.

After rising, the dough is punched down, divided into equal portions, and flattened. Sweet potato filling is placed in the center, sealed, and shaped into smooth balls, which are arranged on a greased baking tray. The buns are proofed for 30–45 minutes, brushed with egg wash, and baked at 170–180°C for 15–20 minutes until golden brown. Once baked, they are cooled on a wire rack before serving or packaging.

Formulation of the Sweet Potato (*Ipomoea Batatas*) Bun

This table presents the different treatment formulations used in developing sweet potato buns with varying amounts of sweet potato incorporated into the filling. The purpose of the treatments is to determine the most acceptable formulation in terms of taste, texture, aroma, and overall quality.

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Treatments 1, 2, and 3 differ in the quantity of mashed sweet potato (80 g, 160 g, and 320 g, respectively) while maintaining the same proportions of other ingredients. The control sample, on the other hand, contains no condensed milk and serves as the baseline for comparison. This setup allows for evaluating how the amount of sweet potato affects the sensory attributes and overall acceptability of the finished product.

Sensory Evaluation

The sensory evaluation of the sweet potato buns was conducted to determine the level of acceptability of each treatment based on specific sensory attributes. Fifteen expert panelists evaluated the samples according to appearance, aroma, taste, texture, and general acceptability using a 9-point hedonic scale, where a higher score indicated greater preference. Each treatment (T1, T2, T3, and the Control) was prepared under the same conditions to ensure fairness and consistency during evaluation.

Consumers Acceptability

The sweet potato buns from four treatments (T1, T2, T3, and Control) were evaluated based on appearance, aroma, taste, texture, and general acceptability using a 9-point hedonic scale. A total of 35 student consumers and 15 experts from the College of Industrial Technology, CSU – Carig Campus, served as evaluators to determine the most preferred formulation among the treatments.

Table 1. Distribution of Consumers / Respondents

Consumer / Respondents	Number of Respondents
Young Adults (17–22 years)	35
Adults (23 years & above)	15
TOTAL	**35**

Microbial Analysis

The most preferred formulation of the sweet potato bun was submitted to the Department of Agriculture's Regional Feed Chemical Analysis Laboratory, Region II, in Tuguegarao City for microbial testing. This analysis was conducted to ensure the product's safety and compliance with microbiological standards, thereby supporting its potential for consumer acceptability and future utilization.

Statistical Analysis

Data from the sensory evaluation were analyzed to determine the sweet potato buns' acceptability in terms of appearance, aroma, taste, texture, and overall quality. Results were

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summarized using percentages and weighted means, and ANOVA tested differences among treatments, validated by a licensed statistician.

RESULTS AND DISCUSSION

Sensory Evaluation of the Developed Sweet Potato (*Ipomoea Batatas)* Buns to Determine the Best Formulation

Table 2. Sensory Evaluation of the Developed Sweet Potato (*Ipomoea Batatas)* Buns to Determine the Best Formulation

Quality Attributes	Treatments			Control
	Treatment 1	Treatment 2	Treatment 3	
Appearance	7.34 Like Moderately Minor imperfection	6.88 Like Moderately Minor imperfection	7.92 Like Very Much Nice shape & color	6.96 Like Moderately Minor imperfection
Aroma	7.38 Like Very Much Fresh & appealing	6.86 Like Moderately Mild but agreeable	8.02 Like Very Much Fresh & appealing	7.46 Like Very Much Fresh & appealing
Taste	6.74 Like Moderately Good flavor & mildly sweet	6.60 Like Slightly Slightly Sweet	7.88 Like Very Much Very good taste & favorable	6.76 Like Moderately Good flavor & mildly sweet
Texture	6.76 Like Moderately Good texture & slightly firm	6.86 Like Moderately Good texture & slightly firm	7.72 Like Extremely Perfectly soft, moist & tender	7.18 Like Moderately Good texture & slightly firm
General Acceptability	7.26 Like Moderately Tasty with soft texture	6.72 Like Moderately Tasty with soft texture	8.02 Like Very Much Pleasing taste & mouthfeel	7.48 Like Very Much Pleasing taste & mouthfeel

Table 2 shows that the Sweet Potato (*Ipomoea Batatas)* Bun sensory evaluation was conducted to determine which sweet potato bun formulation would be most acceptable to consumers. Treatment 3, containing the highest sweet potato content, consistently scored highest

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in appearance (7.92), aroma (8.02), taste (7.88), texture (7.72), and overall acceptability (8.02), showing strong consumer preference, while Treatments 1 and the control were moderately accepted and Treatment 2 scored the lowest. The improved scores in Treatment 3 suggest that higher sweet potato content enhanced the bun's color, aroma, flavor, and texture, likely due to the natural pigments, inherent sweetness, and moisture-retaining properties of sweet potato, which collectively contributed to a more visually appealing, flavorful, and tender product. These results indicate that incorporating more sweet potato significantly improves sensory quality and overall consumer acceptability.

Consumers Acceptability of the Developed Sweet Potato (*Ipomoea Batatas)* Bun

Table 3. Level of Consumer's Acceptability of Sweet Potato (*Ipomoea Batatas)* Bun

Quality Attributes	Mean	Interpretation
Appearance	7.92	Nice Shape and Color
Aroma	8.02	Fresh and Appealing
Taste	7.88	Flavorful and Enjoyable
Texture	7.72	Soft and Moist
General Acceptability	8.02	Like Very Much

Table 3 shows that the Sweet Potato (*Ipomoea Batatas)* Bun assess consumer acceptability based on appearance, aroma, taste, texture, and overall satisfaction. Results showed that the buns received high scores across all sensory attributes, with appearance rated 7.92, aroma 8.02, taste 7.88, texture 7.72, and overall acceptability 8.02, indicating strong consumer preference. The vibrant orange color, appealing shape, fragrant sweet-roasted aroma, balanced flavor, and soft, moist texture contributed to the product's overall appeal. These findings suggest that incorporating sweet potato significantly enhances the bun's sensory qualities, making it visually attractive, flavorful, aromatic, and enjoyable to eat, which in turn improves overall consumer satisfaction and acceptance.

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Microbial Composition of the Sweet Potato (*Ipomoea Batatas)* Buns

Table 4. Microbial Composition of Sweet Potato Buns

Parameter	Results	Acceptable Level	Interpretation
Yeasts CFU/ g	<10	10	Less than the acceptable level
Molds CFU/ g	$<10^2$	10^2	Less than the acceptable level
Aerobic Plate Count, CFU/g	10^4	10^4	Within the acceptable level
Coliforms, CFU/g	<10	10	Less than the acceptable level
Salmonella/25g	Not detected/ absence		No Salmonella detected; safe for consumption

Legend:

- **CFU/g** – Colony Forming Units per gram (the number of live microbes in 1 gram of food).
- **Yeast (<10 CFU/g)** – The bun should have less than 10 yeast cells per gram.
- **Mold (<10^2 CFU/g)** – The bun should have fewer than 100 mold cells per gram.
- **Aerobic Plate Count (10^4 CFU/g)** – Total bacteria should not exceed 10,000 per gram.
- **Coliforms (<10 CFU/g)** – Should be less than 10 coliform bacteria per gram (indicator of cleanliness).
- **Salmonella (Not detected / Absence in 25g)** – No Salmonella should be present in a 25 g sample.

Source: Regional Feed Chemical Analysis Laboratory D.A Regional Office II

Table 4 shows that the microbial analysis aimed to evaluate the safety and suitability of the developed sweet potato bun for consumption. According to the Department of Agriculture Region 2 (DA-R2), yeast and coliform counts were below detectable limits, mold counts were under 10^2 CFU/g, the aerobic plate count was within acceptable ranges, and Salmonella was not detected, indicating that all microbial parameters were within or below safe limits. These findings suggest that the buns were prepared, baked, and handled under hygienic conditions, ensuring microbiological stability, preventing spoilage, and maintaining overall product safety. Overall, incorporating sweet potato did not compromise microbial quality, and proper sanitation and handling practices effectively produced a safe, high-quality bakery product suitable for consumers.

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Test of Significant Difference in Consumer Acceptability Between the Best Formulation of Sweet Potato Bun and Control

Table 5. Test of Significant Difference in Consumer Acceptability Between the Best Formulation of Sweet Potato (*Ipomoea Batatas)* Bun and Control

Attributes	Treatment	Mean	Sd	t-value	p	Effect Size	Decision
Appearance	Sweet Potato Bun	7.92	0.88	**5.60**	**< .001**	**0.79**	**Reject Ho**
	Control	6.96	1.07				
Aroma	Sweet Potato Bun	8.02	0.94	**3.63**	**< .001**	**0.51**	**Reject Ho**
	Control	7.46	1.07				
Taste	Sweet Potato Bun	7.88	0.90	**7.20**	**< .001**	**1.02**	**Reject Ho**
	Control	6.76	1.04				
Texture	Sweet Potato Bun	7.72	1.16	**3.76**	**< .001**	**0.53**	**Reject Ho**
	Control	7.18	1.24				
General Acceptability	Sweet Potato Bun	8.02	0.87	**3.38**	**< .001**	**0.48**	**Reject Ho**
	Control	7.48	0.89				

Table 5 shows that the study compared the best sweet potato bun formulation with a control to determine significant differences in consumer acceptability. Results showed that the sweet potato bun consistently scored higher across all sensory attributes—appearance (7.92 vs. 6.96), aroma (8.02 vs. 7.46), taste (7.88 vs. 6.76), texture (7.72 vs. 7.18), and overall acceptability (8.02 vs. 7.48)—with p-values less than 0.001, indicating statistically significant improvements. The enhanced scores reflect that adding sweet potato improved the bun's visual appeal, fragrance, flavor, and softness, resulting in a more enjoyable overall sensory experience. These findings demonstrate that incorporating sweet potato significantly enhances product quality and consumer preference, making it a highly effective ingredient for improving both sensory attributes and overall acceptability in bakery products.

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Conclusion

This study successfully developed a sweet potato–based bun and evaluated its sensory, microbial, and overall acceptability qualities. Treatment 3, which contained the highest amount of sweet potato filling, emerged as the best formulation, receiving consistently high scores in appearance, aroma, taste, texture, and general acceptability. These findings show that increasing sweet potato content significantly enhances the bun's appeal and overall palatability.

Consumer evaluations further confirmed that Treatment 3 was highly accepted, with participants describing the bun as attractive, flavorful, soft, and enjoyable to eat. This proves that sweet potato is an effective ingredient for improving bakery products while offering a pleasant eating experience.

Microbiological analyses also confirmed that the sweet potato bun was safe for consumption, as microbial counts remained within acceptable limits and no harmful pathogens were detected. This indicates that proper food handling and sanitation practices were observed throughout the preparation process.

The significant differences between Treatment 3 and the control sample show that sweet potato made a meaningful improvement in the bun's sensory attributes. The addition of sweet potato elevated the product's overall quality, proving that it is an excellent ingredient for bakery innovation.

Overall, this study shows that sweet potato is a viable and nutritious ingredient for bun fillings, contributing to improved sensory qualities, enhanced consumer acceptability, and safe product development. It also supports the potential of sweet potato as a valuable ingredient for promoting local agricultural produce and developing healthier, more appealing bakery items.

Recommendations

Future studies should include proximate and nutritional analyses to determine the actual contribution of sweet potato to the product's nutrient content. Additional studies are recommended to assess microbial safety and shelf-life stability, ensuring that sweet potato–filled buns maintain quality during storage and distribution. Larger-scale consumer testing would help evaluate acceptability across different age groups and communities, supporting commercial validation. Researchers may also explore the incorporation of sweet potato in other bakery and confectionery products, such as rolls, pies, pastries, and tarts, to maximize utilization and promote agricultural sustainability.

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