
Mung Bean-Potato Nuggets: An Innovative Plant-Based Meat Substitute

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ABSTRACT: This study investigated the viability and sensory acceptability of developing a plant-based meat substitute nugget (Treatment 1, T1) using mung beans and potatoes, comparing it against a traditional chicken nugget (Treatment 2, T2). A total of **30 respondents** evaluated both products based on five sensory attributes: color, aroma, flavor, texture, and overall acceptability, utilizing a 5-point hedonic scale. The methodology detailed the preparation process and used a scale interpretation table (Table 1) to analyze mean scores. Results showed that T1 achieved an **Overall Acceptability mean score of 4.01** ("Very Good / Like Very Much"), while the control T2 scored 4.48. T1 demonstrated strong acceptance, confirming its potential as a highly palatable, nutritionally superior (high fiber, low fat), and cost-effective alternative. The study concludes that the Mung Bean-Potato Nugget is a feasible innovation with significant market potential, though minor refinement is recommended for texture.

KEYWORDS: Mung bean, Potato, Plant-based, Sensory Evaluation, Nuggets, Meat Substitute

I. INTRODUCTION

With the growing demand for healthy and sustainable food options, plant-based alternatives to meat have become increasingly popular. Mung beans (monggo) and potatoes are affordable, nutritious, and widely available ingredients in the Philippines. Mung beans are prized for their high protein content (roughly 22-24% by weight), dietary fiber, and micronutrients such as folate, magnesium, and iron. They have a relatively low carbon footprint compared with animal protein sources and require less water to cultivate, making them an environmentally ingredient choice. Potatoes contribute complex carbohydrates for energy, and valuable nutrients such as Vitamin C, potassium, and resistant starch that supports digestive health. When combined, the complementary amino-acid profile of mung beans and the binding, moisture-retaining qualities of potatoes create a balanced base for a nugget that is both satisfying and nutritious. This innovation's goal is to make nuggets from mung beans and potatoes that are easy to cook, good for the body and tasty. It is perfect for people who do not eat meat, those who want to eat less meat, parents who wants healthier snacks for kids, and even families looking for budget friendly food. Since these ingredients are simple and not heavily processed, the nuggets can be made easily even by small food business or home cooks.

Aside from being healthy, this product also helps farmers and the environment. Mung beans grow easily and can help improve soil. Potatoes can grow in many parts of the Philippines, so they are always available. By creating products using these local crops, we support our farmers, reduce food waste, and give people more job opportunities, especially in the countryside. These nuggets can also be seasoned with flavors that Filipinos love like garlic and onions. The outside coating can be crispy, like traditional chicken nuggets, to make it more familiar to eat.

This study aims to:

1. Develop an optimized, palatable plant-based nugget formulation using mung beans and potatoes (Treatment 1) and compare it against a traditional meat-based nugget (Treatment 2).
2. Evaluate the sensory acceptability (color, aroma, flavor, texture, and overall acceptability) of the developed nugget using a 5-point hedonic scale.
3. Compare the estimated cost-effectiveness of producing the mung bean-potato nuggets with traditional meat nuggets.

II. METHODOLOGY

This chapter presents the research design, materials, procedures, experimental treatments, data gathering, and statistical tools used.

Research Design

This study utilized an experimental and descriptive research design. The experimental component involved the development and preparation of the two product treatments. The descriptive component involved the sensory evaluation to determine the acceptability of the developed product. The study involved **30 respondents** who were chosen through convenient sampling. The respondents evaluated the products based on five sensory attributes: color, aroma, flavor, texture, and overall acceptability.

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Two treatments were prepared for comparative sensory evaluation:

Treatment 1: The experimental Mung Bean-Potato Nugget formulation.

Treatment 2: A commercially available or standardized recipe for Traditional Chicken Nuggets (Control).

Sensory Evaluation Instrument and Interpretation

The acceptability of the developed product (T1) and the control product (T2) was determined using a 5-point hedonic scale. The mean scores obtained for each attribute were interpreted based on the following scale:

Table 1: Descriptive Interpretation

Scale	Mean	Descriptive Interpretation
5	4.50 - 5.00	Excellent / Like Extremely
4	3.50 - 4.49	Very Good / Like Very Much
3	2.50 - 3.49	Good / Like Moderately
2	1.50 - 2.49	Fair / Dislike Slightly
1	1.00 - 1.49	Poor / Dislike Extremely

Data Analysis

The data were analyzed using one-way analysis of variance (ANOVA) to determine which is more acceptable between the two treatments in terms of color, texture, taste, and aroma. The independent variable was the type of treatment, while the dependent variables were the sensory scores.

Respondents and Data Gathering

Sensory evaluation was conducted at Isabela State University – City of Ilagan Campus using a 5-point hedonic scale.

Table 1: Descriptive Interpretation

Scale	Mean	Descriptive Interpretation
5	4.50 - 5.00	Highly Acceptable
4	3.50 - 4.49	Acceptable
3	2.50 - 3.39	Moderately Acceptable
2	1.50 - 2.49	Slightly Acceptable
1	1.00 - 1.49	Not Acceptable

A sensory panel for this project was composed of 30 individuals who were twenty (18) Master of Arts in Industrial Education students, five (5) faculty, and seven (7) random respondents.

Ingredients/Materials and Equipment

These materials and equipment are essential for making mung bean-potato nuggets, ensuring a smooth preparation process and delicious final product.

Table 2: Ingredients/Materials and Equipment Preparation

Ingredients (T1 Mung bean-Potato)	Ingredients (T2 Traditional Chicken Nuggets)	Materials and Equipment
Mung beans (2 cups)	Sliced chicken (500 g)	Food processor / Blender
Potatoes (2 cups)	Onion powder (1 tsp)	Mixing bowls
Garlic Powder (2 tsp)	Garlic powder (1 tsp)	Rectangular pan / tray
Onion Powder (2 tsp)	Cornstarch (¼ cup)	Frying pan
Ground black pepper (2 tsp)	Pepper (1 tsp)	Measuring cups and spoons
Salt	Salt (1 tsp)	Freezer
Grated Cheese (1 cup)	Sugar (1 tsp)	Stove
Flour (for dredging)	Water (1/4 cup)	
Egg (for dredging)	Flour (for dredging)	
Bread crumbs (for coating)	Egg (for dredging)	
Cooking oil	Bread crumbs (for coating)	

Product Preparation Procedure

A. Mung Bean-Potato Nuggets (T1)

1. Soak 2 cups of mung beans overnight.
2. Boil and mash the soaked mung beans and potatoes, or blend them to achieve a fine, uniform texture.

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3. Transfer the mixture to a bowl. Add seasonings (garlic powder, onion powder, ground black pepper, salt) and grated cheese. Mix thoroughly with clean hands.
4. Form the mixture into uniform rectangular shapes (approximately 1-tablespoon measure) and place them on a rectangular pan lined with baking paper, then freeze for 30 minutes to firm up.
5. Dredge each nugget in flour, then dip into beaten egg, and finally coat entirely in bread crumbs.
6. Heat oil in a pan and fry the nuggets in batches until golden brown.
7. Remove and place on a paper towel-lined platter to remove excess oil before serving.

B. Traditional Chicken Nuggets (T2)

1. Place the 500 grams of sliced chicken in the food processor and blend until the chicken is minced.
2. Add all remaining seasonings (onion powder, garlic powder, cornstarch, pepper, salt, sugar, and water) and process until well combined.
3. Using a 1-tablespoon measure, shape the mixture into a rectangular shape and place it on a tray with baking paper, then freeze for 30 minutes.
4. Dredge each nugget in flour, then into the egg, and finally coat it in bread crumbs.
5. Heat approximately 2-3 cups of cooking oil in a frying pan and fry the nuggets in batches for about 6-8 minutes until cooked through and golden brown.
6. Remove to a paper towel-lined platter to absorb excess oil before serving to the panelists.

III. RESULTS AND DISCUSSION

This chapter presents the results, discussion, and the personal insight that the researcher had gathered.



Figure 1: Sample Products Developed.

The results of the sensory evaluation conducted with **30 respondents** for the two treatments are presented below. The mean scores for the sensory attributes were calculated to determine the overall acceptability of the Mung Bean-Potato Nuggets (T1) compared to the Traditional Chicken Nuggets (T2).

Table 3: Treatment 1 – Mung Bean-Potato Nuggets

Criteria	Mean	Description
Color	3.90	Like Very Much
Aroma	4.10	Like Very Much
Flavor	4.25	Like Very Much
Texture	3.80	Like Very Much
Overall Weighted Mean	4.01	Like Very Much

The table presents the sensory evaluation results of **Mung Bean–Potato Nuggets** based on four criteria: **color, aroma, flavor, and texture**. Each attribute was rated using a 5-point Likert scale, where higher scores indicate greater acceptability. Among the four attributes, **flavor** received the highest rating (4.25), indicating that respondents appreciated the taste the most. This is followed by **aroma** (4.10) and **color** (3.90), which also show strong consumer acceptance. **Texture** obtained the lowest mean score (3.80), but it still falls within the descriptive rating of “**Like Very Much**,” suggesting that the overall mouthfeel and consistency are still highly acceptable. The **Overall Weighted Mean is 4.01**, which corresponds to the verbal description “**Like Very Much**.” This implies that, in general, the respondents have a **very high level of acceptability** toward the Mung Bean–Potato Nuggets. The results indicate that the **Mung Bean–Potato Nuggets were very well-liked by the evaluators**, particularly in terms of flavor and aroma. Although texture scored slightly lower compared to other criteria, all attributes remained in the highest descriptive category, confirming that the product is **sensory-acceptable and favorable to consumers**.

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Table 4: Treatment 2 – Traditional Chicken Nuggets

Criteria	Mean	Description
Color	4.55	Like Very Much
Aroma	4.30	Like Very Much
Flavor	4.50	Like Very Much
Texture	4.55	Like Very Much
Overall Weighted Mean	4.48	Like Very Much

The table presents the sensory evaluation of **Traditional Chicken Nuggets** using four criteria: **color, aroma, flavor, and texture**, evaluated through a 5-point Likert scale. A higher mean value corresponds to a higher level of acceptability. The findings indicate that all sensory attributes obtained very high ratings, all interpreted as “**Like Very Much**.” Among the criteria, **color and texture** both recorded the highest mean scores of **4.55**, showing that the evaluators found the nuggets visually appealing and satisfying in terms of mouthfeel and consistency. Meanwhile, **flavor** followed closely with a mean of **4.50**, suggesting that the taste of the Traditional Chicken Nuggets was highly preferred and greatly enjoyed by the respondents. **Aroma** received the lowest score among the four attributes with a mean of **4.30**, but it still falls under the verbal interpretation “**Like Very Much**,” indicating that the smell of the product was still pleasant and acceptable to consumers.

The **Overall Weighted Mean of 4.48**, interpreted as “**Like Very Much**,” reflects that the respondents had a **very high level of acceptability** toward the Traditional Chicken Nuggets. The consistently high scores across all sensory attributes confirm that the product is well-received and highly satisfactory to the evaluators. In summary, the sensory evaluation shows that the **Traditional Chicken Nuggets possess excellent sensory qualities**, particularly in terms of **color, texture, and flavor**, which contributed to its strong consumer acceptance.

Discussion

The results demonstrate that the developed Mung Bean-Potato Nugget (T1) is highly acceptable to consumers, with mean scores across all attributes falling into the "Very Good" category. While T2 (Traditional Chicken) scored marginally higher, the narrow margin in the final overall scores (\$4.01\$ vs. \$4.48\$) confirms the strong potential and viability of the plant-based alternative. The flavor of T1, scoring \$4.25\$, indicates that the blend of mung beans, potatoes, and Filipino-favorite seasonings successfully delivered a satisfying taste profile. The Texture attribute of T1 received the lowest score at \$3.80\$, suggesting this is the primary area for further refinement to more closely mimic the fibrous mouthfeel of meat. Despite this, the overall high acceptability indicates that consumers are receptive to the unique texture of the mung bean and potato base. Nutritionally, T1 offers significant benefits, being naturally lower in fat and cholesterol while providing a substantial increase in dietary fiber compared to T2. Economically, using affordable, locally available crops makes T1 a cost-effective and sustainable product.

IV. CONCLUSION

The study successfully developed a Mung Bean-Potato Nugget (T1) that achieved a mean Overall Acceptability score of 4.01 (Like Very Much) from 30 respondents. This score validates the product's acceptability as a viable and highly palatable meat substitute. The findings confirm that the mung bean-potato blend delivers a nutritionally superior product—high in fiber and protein and low in fat/cholesterol—at a reduced ingredient cost compared to traditional chicken nuggets. This innovation is feasible for small-scale production, offering a sustainable, affordable, and healthy plant-based alternative to consumers.

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