



## RESEARCH PAPER

## OPEN ACCESS

## Chemical analysis and consumers' acceptability of kuyot (*Dioscorea hispida* Dennst) kroepeck

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### Abstract

This study evaluates the chemical composition and sensory acceptability of Kuyot Kroepeck, a snack product derived from *Dioscorea hispida* Dennst. The chemical analysis revealed that Kuyot Kroepeck has low moisture content, which is advantageous for prolonging shelf life and maintaining its crisp texture by minimizing microbial growth. Its moderate protein content indicates that while it offers some nutritional value, it is primarily a snack rather than a significant protein source. The product also contains essential minerals, as reflected in its ash content, while its sodium level is within the range typical for processed snack foods, emphasizing the need for mindful consumption. The low water activity also contributes to the product's stability and safety. The sensory evaluation, conducted among teachers, students, and general consumers, demonstrated high acceptability across key attributes, including color, aroma, flavor, texture, and crispness. Notably, crispness was rated highly, reinforcing the product's appeal as a snack food. While the product was well-received overall, slight texture and flavor balance adjustments could further enhance consumer satisfaction. Given these findings, an extension initiative will introduce the recipe to the community and explore income-generating opportunities (IGPs). This initiative aims to equip community members with the necessary skills for production and commercialization, fostering entrepreneurship and local economic development. With its favorable chemical properties and strong consumer acceptance, Kuyot Kroepeck presents a viable opportunity for food innovation and community-based economic growth.

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## Introduction

The food industry is rapidly evolving to align with consumer preferences for products that provide nutritional benefits and sensory satisfaction (Hsieh and Ofori, 2007). This shift is primarily driven by increasing health awareness, an aging population, and rising healthcare expenses (Chopra *et al.*, 2021). In response, retailers are expanding their selection of wellness-oriented foods while considering key factors such as demographics and consumer demand (Boinwad and Shinde, 2024). Additionally, advancements in food technology, including fermentation, extraction, and biotechnology, are crucial in developing healthier food products without compromising taste or overall appeal (Hsieh and Ofori, 2007).

With growing concerns about food security and sustainable alternatives, researchers and communities are exploring underutilized root crops as viable dietary staples. In remote and resource-limited areas, Indigenous populations often rely on alternative carbohydrate sources like *Dioscorea hispida* (locally known as Kuyot) in times of food scarcity. This tuber, belonging to the Dioscoreaceae family, has gained attention for its nutritional and functional properties.

According to Jariyah *et al.* (2024), *Dioscorea hispida* Dennst is rich in bioactive compounds, including starch, protein, fat, and dietary fiber, making it a potential ingredient in functional food products. However, due to toxic alkaloids, proper processing methods such as soaking, boiling, and fermentation are required to ensure their safe consumption (Jariyah *et al.*, 2024). Additionally, the tuber is packed with essential vitamins and minerals, aligning with the current trends in sustainable food development.

Underutilized crops can enhance global food security, nutrition, and sustainability (Rondón and DePlaen, 2021; Mayes *et al.*, 2012), emphasizing their potential to contribute to dietary diversity and resilience against food shortage. The use of *Dioscorea hispida*

Dennst in innovative food formulations aligns with the global movement toward functional and eco-friendly food production. In this context, developing a kuyot-based kroepack (a traditional crispy snack) presents a compelling opportunity. Utilizing Indigenous and traditional food crops (ITFCs) offers significant potential for developing sustainable and healthy food systems in Africa. These crops, including cassava, sweet potatoes, and various roots and tubers, provide nutritional benefits and can enhance dietary diversity (Reddy *et al.*, 2014; Mabhaudhi *et al.*, 2018). Hence, this research aims to investigate the viability of developing kroepack made from kuyot by examining its chemical composition and assessing consumer acceptability.

## Materials and methods

This study utilized an experimental-descriptive approach. The experimental approach allows the researchers to formulate and produce a kroepack made from kuyot and the chemical evaluation of kuyot kroepack. At the same time, the descriptive approach focuses on gathering the consumer's acceptability of the food product.

The preparation and processing of the kuyot kroepack involves the following processes:

### Collection and preparation of kuyot

The research collected the matured Kuyot (*Dioscorea hispida* Dennst) from the mountain of Brgy. Esperanza Carmen, Surigao del Sur. A total of 10kg of crops were collected. It was then appropriately washed to remove the soil and other particles attached to the kuyot.

### Soaking method

Fresh Kuyot (*Dioscorea hispida* Dennst) was thoroughly washed to remove soil and other impurities. It was then peeled and sliced into 3-4 mm thick pieces. The sliced Kuyot was submerged in a brine solution (1 kg of salt per 1 gallon of water) and left in covered containers overnight. After salting, the slices were placed in nylon net bags or sacks and pressed using a heavy object, such as a stone, for at

least one night. Following the pressing process, the Kuyot was washed under running water (e.g., in a river) for two days and two nights to remove toxins.

After washing, the samples were dried and then milled or powdered for further analysis, including chemical evaluation and food product development and acceptability.

#### *Preparation and formulation of kuyot kropek*

To begin, Kuyot root crops are finely blended and sifted to ensure a uniform powder. In a large bowl, the powdered Kuyot is combined with 1.5 cups of flour, 1.5 cups of cornstarch, ½ teaspoon of iodized salt, ½ tablespoon of pepper and garlic powder, and ¼ teaspoon of baking powder. The ingredients are thoroughly mixed before gradually adding 2 cups of water, stirring continuously until a smooth consistency is achieved.

The mixture is then shaped into equal-sized pieces and wrapped to form kropek. These are steamed for 20–30 minutes, then cut into smaller pieces and dried for 4–6 hours to remove excess moisture. Once dried, the kropek is fried until golden brown, then left to cool for an hour before being packed into clean plastic bags.

#### *Chemical analysis of kuyot kropeck*

Experts from the Department of Science and Technology (DOST) Regional Testing Center in Butuan City conducted the proximate composition analysis. The analysis followed standardized protocols and procedures outlined by the Official Methods of Analysis of AOAC International (18th edition, 2nd revision, 2005–2007).

The specific parameters and corresponding methods used are as follows:

1. Ash Content – Determined using AOAC Official Method 923.03
2. Moisture Content – Analyzed following AOAC Official Method 925.10
3. Water Activity – Measured using a Water Activity Meter (Method 978.18)

4. Crude Protein – Assessed based on AOAC Official Method 950.36

5. Total Fat – Evaluated using AOAC Official Method 935.38

6. Sodium Content – Quantified following AOAC Official Method 999.10

These standardized methodologies ensured accuracy and reliability in determining the nutritional composition of the Kuyot-based food product.

#### *Consumers' acceptability of kuyot kropeck*

The sensory evaluation of Kuyot Kropeck was conducted to assess its overall acceptability among a selected group of respondents. Participants were given ample time to taste the product and evaluate its sensory attributes. Following the tasting session, they completed a structured survey rating the product based on five key indicators: color, aroma, flavor, texture, and crispness.

The collected data were systematically organized and analyzed using the weighted mean to determine the product's overall sensory acceptability. Each sensory attribute was assigned a numerical rating, and the weighted mean was computed to reflect the respondents' overall perception. This statistical approach allowed for a more precise assessment of the product's strengths and areas for improvement. The findings from this evaluation provide valuable insights into consumer preferences and serve as a basis for further refinement and enhancement of Kuyot Kropeck's quality, ensuring its suitability for market acceptance and potential commercialization.

## **Results and discussion**

The chemical evaluation of Kuyot Kropeck revealed essential nutritional characteristics that influence its shelf life, texture, and consumer health considerations. The moisture content was 2.11 g/100g, a relatively low value that benefits the product by minimizing microbial growth and spoilage while preserving its crisp texture (Table 1). Moisture content is critical in food quality assessment, affecting texture, stability, and shelf life. Water activity (aw)

and moisture content are key parameters influencing food quality during storage (Mannheim *et al.*, 1994).

**Table 1.** The chemical analysis of kuyot kroepceck

| Parameter      | Kuyot kroepceck |
|----------------|-----------------|
| Moisture       | 2.11 g/100g     |
| Crude protein  | 6.58 g/100g     |
| Ash            | 2.22 g/100g     |
| Sodium         | 780.61 mg/100g  |
| Water activity | 0.410           |
| Total fat      | 20.72 g/100g    |

The crude protein content was 6.58 g/100g, indicating a moderate protein level. While this suggests that Kuyot Kroepceck is not a significant protein source, it can still contribute to daily dietary intake. Studies emphasize the importance of crude protein (CP) as a crucial component in food and animal nutrition, playing a vital role in various metabolic processes and tissue formation (Arora, 2023; Mohanty *et al.*, 2014). Additionally, the ash content was recorded at 2.22 g/100g, reflecting the presence of essential minerals. Although the specific mineral composition was not

determined, ash content is a general indicator of mineral availability in food products, making it a valuable parameter in quality assessment (Ismail, 2017).

A notable finding was the high sodium content of 780.61 mg/100g, aligning with typical levels of processed snack foods. While sodium enhances flavor, excessive intake is linked to health concerns such as hypertension. Research indicates that processed foods contribute significantly to daily sodium intake, with over 75% of sodium in industrialized diets coming from these sources (Dötsch *et al.*, 2009). Studies suggest reducing sodium levels in processed foods could substantially lower overall intake. For instance, in the Netherlands, reducing sodium in processed foods by 50% could decrease median intake by 38% (Hendriksen *et al.*, 2015). Meanwhile, the water activity (aw) was 0.410, a value sufficiently low to inhibit bacterial, yeast, and mold growth, thus enhancing product stability and safety.

**Table 2.** Consumers' evaluation of the kuyot kroepceck

| Sensory indicators | Weighted mean |          |                  | Verbal description |
|--------------------|---------------|----------|------------------|--------------------|
|                    | Teachers      | Students | Common consumers |                    |
| Color              | 4.17          | 3.44     | 4.12             | Satisfied          |
| Aroma              | 3.94          | 3.58     | 3.76             | Satisfied          |
| Flavor             | 3.74          | 4.12     | 3.84             | Satisfied          |
| Texture            | 3.43          | 4.05     | 3.49             | Satisfied          |
| Crispness          | 4.01          | 4.12     | 4.02             | Satisfied          |

Lastly, the total fat content was 20.72 g/100g, indicating that Kuyot Kroepceck is a high-fat snack. While fat contributes to palatability and overall sensory appeal, excessive intake may concern individuals monitoring dietary fat consumption. Overall, the chemical composition of Kuyot Kroepceck highlights its extended shelf life, crisp texture, and nutritional profile. However, its high sodium and fat content warrant consumer awareness, particularly for those with dietary restrictions. These findings provide valuable insights for future product development, with potential formulation adjustments to enhance health benefits while maintaining sensory quality and consumer appeal.

The sensory evaluation of Kuyot Kroepceck by teachers, students, and common consumers provided valuable insights into its acceptability across key indicators: color, aroma, flavor, texture, and crispness. The color of the product received high ratings from teachers (4.17) and consumers (4.12), while students gave a slightly lower score (3.44), though all ratings remained within the "Satisfied" range (Table 2). This suggests that the product's visual appeal is generally well-received but may require slight adjustments to better align with student preferences. Aroma ratings were also positive, with teachers (3.94) and consumers (3.76) giving higher scores compared to students (3.58), indicating an overall satisfactory but slightly varied perception of the product's scent.

For flavor, students gave the highest rating (4.12), reflecting strong approval, while teachers (3.74) and consumers (3.84) rated it slightly lower but still within the "Satisfied" category. This suggests that minor refinements in seasoning or ingredient balance could enhance consistency across consumer groups. Texture received mixed reviews, with students rating it highest (4.05), followed by consumers (3.49) and teachers (3.43), highlighting a potential area for improvement.

Meanwhile, crispness, a crucial characteristic of snack products, achieved high and consistent scores across all groups—teachers (4.01), students (4.12), and consumers (4.02)—confirming it as a standout feature of Kuyot Kroepeck.

These findings indicate that while Kuyot Kroepeck is generally well-accepted, targeted texture and flavor consistency enhancements could improve its overall appeal. Sensory evaluation plays a crucial role in food product development and consumer acceptance. It provides essential insights into product quality, consumer satisfaction, and market success (Mihafu *et al.*, 2020; Sirangelo, 2019). While sensory attributes are key to product success, extrinsic factors such as perceived satiety, brand, labeling, price, and emotional impact also significantly influence consumer decisions (Li *et al.*, 2015).

Given the strong consumer reception of Kuyot Kroepeck, this study recommends implementing an extension activity to introduce the recipe to the community and explore potential income-generating projects (IGPs). By leveraging the product's high acceptability, this initiative could create local economic opportunities, promoting entrepreneurship and food sustainability in the region.

## Conclusion

The chemical and sensory evaluation of Kuyot Kroepeck highlights its promising potential as a marketable snack product with several advantageous properties. Its low moisture content is beneficial for prolonging shelf life and maintaining crispiness by minimizing microbial growth and spoilage. While its crude protein content is

relatively low, categorizing it as a snack rather than a significant protein source, its moderate ash and sodium levels contribute to its mineral nutritional value when consumed in moderation. The sensory evaluation further confirms its high acceptability across various consumer groups, with consistently positive feedback on its color, aroma, flavor, texture, and crispness, demonstrating strong market potential.

Given these findings, an extension initiative will be implemented to introduce the Kuyot Kroepeck recipe and explore its viability as an income-generating project (IGP) for the local community. This initiative aims to empower community members by equipping them with the skills and knowledge to produce and market Kuyot Kroepeck, fostering entrepreneurship and economic development. With its favorable reception and nutritional attributes, Kuyot Kroepeck presents an opportunity for sustainable food innovation and economic improvement, reinforcing its potential as a commercially viable and community-driven food product.

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