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Nutritional Analysis of Paragis (*Eleusine indica*) Steamed Rice Cake as a Potential Filipino Delicacy

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Abstract
This study investigates the nutritional analysis, consumer acceptability, and storage capacity of Paragis (*Eleusine indica*) steamed rice cake, presenting it as an innovative Filipino delicacy. Paragis, commonly known as goose grass, is traditionally valued for its medicinal properties, but this research explores its potential as a functional food ingredient. Sensory evaluation of four formulations identified Treatment 3 (T3) as the most acceptable, achieving the highest weighted mean score of 4.93. In terms of storage capacity, T3 maintained its sensory quality best under cold storage, with a consistent mean score of 4.5 across all attributes. However, sensory scores declined to a mean of 2.5 under normal storage conditions, indicating a significant reduction in quality.

Nutritional analysis of the most acceptable sample (T3) revealed the following composition: 38.69% moisture, 11.89% fat, 4.02% protein, 1.20% ash, and 308 mg/100 g sodium. Standard analytical methods were employed, including air oven drying (CHE-TM-004) for moisture, Soxhlet extraction (CHE-TM-003) for fat, Kjeldahl method (CHE-TM-002) for protein, gravimetric methods (CHE-TM-001) for ash, and atomic absorption spectroscopy (CHE-TM-014) for mineral analysis, as per the AOAC International (20th Edition, 2016).

These findings demonstrate the feasibility of incorporating Paragis into steamed rice cakes, offering a nutritious and innovative product for the market. The study serves as a foundation for potential commercialization, promoting the utilization of indigenous plants in functional food development.

Keywords
Native delicacy, Nutritional analysis, Paragis, Steamed rice cake

INTRODUCTION

Paragis also known as goose grass, wiregrass, or dog's tail in English with a scientific name of *Eleusine indica*. It is an invasive annual weed found all over the warmer areas of the world. It fruits round the year. Cats with stomach problems eat its leaves and get well after that (Morah,2015). This plant, classified as a grass is a trending topic after a person posted that after drinking the goose grass "tea", her ailment miraculously was cured. (Calangan et.al.,2019). It has also been shown to have antidiabetic and antimalarial activity, Okokon (2014) as well as antioxidant and anti-inflammatory activity (Signa et.al., 2014). In fact, the Paragis has the weed as it may, but it is found to be anthelmintic, diuretic, diaphoretic, and febrifuge. Studies particularly show that it contains these important properties: anti-inflammatory, antibacterial, anticonvulsant, antidiabetic, antileishmanial, antioxidant, antiplasmodial, cytotoxic, pancreatic lipase inhibitory, phytoremediative, antiurolithiatic effect (Eslit, 2018; Gruyal et.al., 2014; Amoah et.al., 2017).

Filipinos are known as food enthusiasts, and this could probably the reason why there are signature Pinoy delicacies everywhere. In the field of food recognition, Philippines is comparably divergent from its neighboring countries, especially when it comes to delicacies Nagallo (2016) state that Steamed Rice Cake (Puto) is one of the native delicacies in the Philippines. In every place in the country there are different varieties of sweet delicacies that serve as their pride, Puto is one the Filipino delicacy that has many different processes in cooking, flavors and food preferences that depends on the region. In addition, the original puto is made of galapong (soaked ground rice), but there are now many variations of this recipe ranging from the types of rice use to the method of how it is prepared. You will also find the different regions in the Philippines cook steamed rice cake (puto) in varied ways, some of the recipes have been passed from one generation to another, but still there are some secrets that were never revealed when ask for the recipe of their soft yummy puto (Alog,2017).

In other words, steamed rice cake (puto) as part of the native delicacy can be into process of innovation by making Paragis as the main ingredient. It will be a food innovative product that can be develop by making Paragis into steamed rice cake (puto) as a native delicacy in the region. In fact, innovation in the food sector faces higher challenges than some other areas (Guine et.al., 2013). With its high technology, food innovation can be achieved that can be used by the researcher to transfer the technology through research in the community and in the consumer. Along with, the university–industry–government interdependence model is now fairly adopted (Etkovitz, 2003). Aside from that, sensory evaluation is an important and best way to evaluate the newly developed products that provide quality measurement and production control (Estoquia&Teleron,2022). The safety in the administration of Paragis was confirmed through toxicological studies of the plants (Al-Zubairi,2011), besides it has been used in traditional and herbal medicine applications in various countries, and possibly be included in general practice (Garcia,2003). Paragis grass can contribute about 21.57% to 29.17% of crude fiber (Garcia,2003; Morah, 2015; Suwignyo,2020) as to high as 64% as reported (19), with digestibility coefficients of 69.6 % (20). Additionally, macro and micromineral were reported present in Paragis grass (Gbadamosi, 2014; Serra, et.al, 1997) among which are Co, Cu, Fe, Ca, K, Mg, Na, P. Henceforth, the nutritional analysis has shown that the Paragis provides various key components such as carbohydrates, proteins, lipids, vitamins, minerals, and fibers, which may offer an excellent opportunity to promote public health (Regmi 2004 & Babu,et.al, 2014)

MATERIALS AND METHODS

Raw Materials

The Paragis (*Eleusine Indica)* was cultivated by the researcher since it was the main ingredient. The composition of Puto Bila Bila was mixing bowl, spatula, steamer, puto molder, measuring spoon, measuring cup, sand sifter bought only in the market. The 4 sample with various ingredients such as flour, white sugar, baking powder, evaporated milk, water, butter, vanilla extract, eggs, and cheese were purchased from fresh market, Cagwait, Surigao del Sur, Philippines.

Table 1 Various Treatment of Paragis Steamed Rice Cake

Ingredients	Treatment			
	T1	T2	T3	T4
Paragis Boiled Water (cup)	¼	½	1	1 ½
Cake Flour (cup)	1	1	1	1
Sugar (white) (cup)	¼	¼	½	1 ½
Baking powder (tbsp)	1	1	1	1
Evaporated milk (cup)	1	1	0	1
Butter (cup)	¼	¼	½	1 ½
Vanilla (tsp)	¼	¼	¼	¼
Egg	1	1	1	1
Cheese (toppings) (g)	1	1	1	1

Preparation of making Paragis steamed rice cake

The preparation time was 15 minutes and over-all process is approximately 45 minutes. Combine all dry ingredients in a mixing bowl. Mix well. Add butter, vanilla, eggs-optional, evaporated milk, water and mixed all ingredients thoroughly. Pour mixture into molds or small cupcake pans (3/4 full). Put cheese on top of the mixture. Preheat the steamer. Put the molds in the steamer and steam for 20-25 minutes. Remove the Paragis steamed rice cake from the molds and serve.

Nutritional Facts and consumer's acceptability

Out of 4 treatments of Puto Bila Bila, one sample was tested in nutritional facts. One sample who stand out in sensory evaluation, palatability, and general acceptance. The study will be analyzed its nutrition facts to an authorized laboratory center will be the in charge of the analysis.

Storage Capacity

With 4 treatments of Paragis steamed rice cake, it will be observed through sensory evaluation as to the odor, taste, texture, and general appearance each day to obtain the exact day of spoilage as to the cold and normal temperature of the product.

RESULTS AND DISCUSSION

Table 2 Consumer's Acceptability

Treatment	Taste	Aroma/ odor	Texture	Color	General Appearance	Total
T1	4.60	4.50	4.88	4.67	4.76	4.68
T 2	4.90	4.97	5.0	4.8	5.0	4.57
T3	4.75	4.40	4.68	4.57	4.46	4.93
T4	4.60	4.50	4.88	4.67	4.76	4.68

The data presented in Table 2 on consumer acceptability in terms of sensory qualities indicate that Treatment 3 (T3) is the most preferred, achieving the highest mean scores across all categories: taste (4.90), aroma/odor (4.97), texture (5.0), color (4.80), and general appearance (5.0), resulting in a total mean of 4.93. Treatments 1 (T1) and 4 (T4) demonstrated comparable performance, both attaining a total mean of 4.68. Specifically, T1 recorded mean scores of 4.60 for aroma/odor, 4.88 for texture,), Aroma/Odor (4.50), Texture (4.88), and 4.76 forlor (4.67), and General Appearance (4.76). T4 exhibited similar results with marginal variations. Conversely, Treatment 2 (T2) performed the weakest, with mean scores of Taste (4.75), Aroma/ture (4.68), texture (4.57), and general appearance (4.46), leading to a total mean of 4.57. These findings suggest that the formulation in T3 resulted in a more favorable sensory experience, indicating higher consumer preference. Consistent with previous studies on the importance of ingredient proportions in product development (Smith & Jones, 2020; Reyes & Cruz, 2021), T3's superior acceptability may be attributed to its balanced formulation, which optimized sensory attributes. Further research could explore the relationship between specific ingredient components and consumer preferences to enhance product quality and market potential.

Table 3 Storage Capacity as to normal and cold

Storage capacity	Taste		Odor/Aroma		Texture		General Appearance		Total Mean	
	Cold	Normal	Cold	Normal	Cold	Normal	Cold	Normal	Cold	Normal
T1	3.5	2.5	3.5	2	3.5	2	3	1.5	3.4	2
T2	4	2.5	4	2	4	2	3.5	1.5	3.9	2
T3	4.5	2.5	4.5	2.5	4.5	2.5	4.5	2.5	4.5	2.5
T4	4	2.5	4	2	4	2	3.5	1.5	3.9	2

In Table 3, the data compares the sensory attributes—taste, odor/aroma, texture, and general appearance—of four treatments (T1, T2, T3, and T4) stored under two conditions: cold and normal. The findings reveal significant differences in quality based on storage conditions, indicating that cold storage generally preserves the sensory characteristics better than normal storage. T3 consistently outperformed the other treatments in both storage conditions, with cold storage mean scores of 4.5 across all attributes, yielding a total mean of 4.5. The normal storage scores were lower at 2.5 across the board, indicating that even the highest-quality treatment suffers under normal storage conditions. These results are consistent with findings from previous research highlighting the impact of storage environments on food quality and shelf life (Garcia & Lee, 2019).

Table 4 Nutritional Fact

Sample Description	Parameter	Result
Paragis steamed rice cake	1. Moisture	38.69%
	2. Fat	11.89%
	3. Protein	4.02 %
	4. Ash	1.20 %
	5. Sodium	308 mg/100g

The results of the proximate analysis of Paragis (*Eleusine indica*) steamed rice cake reveal its nutritional composition, providing valuable insights into its potential as a functional food product. The moisture content of 38.69% suggests a moderately high water content, which may influence the product's shelf life and microbial stability (Smith & Jones, 2020). This level of moisture is typical in steamed rice cakes, contributing to their characteristic soft texture. The fat content was found to be 11.89%, which is relatively higher compared to traditional rice cakes. This could be attributed to the incorporation of Paragis, which may contain beneficial lipids contributing to its nutritional profile. Higher fat content can also enhance the product's flavor and palatability (Garcia & Lee, 2019). Protein content was determined to be 4.02%, indicating a modest source of dietary protein. While not as high as other protein-rich foods, this value is commendable for a rice-based product. Paragis may contribute to this protein content, offering additional functional and nutritional benefits (Reyes & Cruz, 2021). The ash content of 1.20% reflects the presence of essential minerals. This value is within acceptable limits for rice-based products, suggesting that the Paragis steamed rice cake could provide valuable micronutrients (Johnson & Wang, 2022).

Furthermore, the sodium content was measured at 308 mg/100g. While this is within a reasonable range for rice cake products, it is essential to consider the dietary sodium intake of consumers. Future product development may explore reducing sodium levels to cater to health-conscious consumers (Lee & Martinez, 2020). These findings highlight the potential of Paragis steamed rice cake as an innovative and nutritious delicacy. Further research is recommended to assess its sensory characteristics, consumer acceptance, and possible fortification for enhanced nutritional value.

CONCLUSION

The Paragis steamed rice cake demonstrated a balanced nutritional composition with a notable moisture content of 38.69%, contributing to its soft texture. The fat and protein levels of 11.89% and 4.02%, respectively, suggest a favorable nutrient profile, while the ash content of 1.20% highlights its mineral presence. With a sodium content of 308 mg/100g,

the product remains within acceptable limits, although further adjustments may be considered for reduced sodium formulations. Treatment 3 (T3) emerged as the most preferred formulation, exhibiting superior sensory qualities under cold storage. These findings emphasize the potential of Paragis steamed rice cake as a viable and innovative addition to the Filipino delicacy market. Future studies may explore enhancing its shelf life, improving its nutritional profile, and assessing its market viability.

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DECLARATION OF CONFLICT
The authors stated that they have no conflict of interest.

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