

Nutrifacts Determination, Microbial Analysis, and Sensory Evaluation of Cacao Tinupig

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Abstract

This research investigated the nutritional profile, safety, and acceptability of Cacao Tinupig, a popular Filipino delicacy prepared from cacao beans and glutinous rice. Nutritional analysis showed that 20 g of Cacao Tinupig provides 60 kcals, 1 g of fat, 11 g carbohydrates, 1 g protein, and 1 g fiber. Microbial testing was performed to ensure that the product is fit for consumption, with presence of coliform, yeast, mold within acceptable levels without *E. coli*. The sensory evaluation through a 9-point hedonic scale also indicated that the snack was overall well accepted by the consumers in terms of appearance, color, fragrance, flavor, texture, and mouthfeel. These combined results suggest that Cacao Tinupig is a healthy, safe and palatable snack that holds a strong potential for further consumer application. However, that additional improvements in hygiene, product fortification, and ongoing consumer feedback would drive incremental sales and nutrition. These indicate the potential of Cacao Tinupig as nutritious and palatable snack food and great potential for commercialization.

Introduction

Tinupig, a sweet Filipino treat from Lasam, Caguyan Valley, Philippines has long delighted its locals, and visitors to the Philippines. This native delicacy of pounded glutinous rice mixed with wooden, shape palm strips then wrapped in banana leaves illuminates the taste history and simplicity of the area's food culture. But with the booming food tourism and health-conscious food trend, there's an urgent for improved persons Tinupig to cater to the millennials taste. A supplier of tinupig said during regular months, they can manufacture at least 150 boxes or 3,000 pieces of the delicacy and four times during festivals. Locals say they purchase the iconic product not only for themselves but also for their family living outside the country. The product comes bottled in recycled juice boxes and has stayed the same since 2005. That's why the researchers are doing a study on how the municipality's signature delicacy could be transformed and promoted. The power of food Travel Much like how the blossoming of a flower naturally leads to the spread of pollen from one location to another, food tourism can create a way to send goods from these small towns to other small towns, cities, or even other countries. This would have had a profound impact on the people in the community that made these products. One innovation is the inclusion of cacao or the other major agricultural product of Lasam. Cacao which is known for its antioxidative properties could be a good candidate to fortify Tinupig. So researchers are hoping to develop a more attractive and nutritious delicacy by infusing them with traditional glutinous rice-and-coconut flavors like cacao. In the experiment of adding cacao, another product of the town, it will also serve as another contributory factor for health benefits. According to Marie, J. (2015), cacao beans is rich in natural antioxidant compounds and also contains a natural chemical called flavonoids, which is an oxidant compound that contributes to holistic health improvement as they help in stabilization and eventually elimination of free radicals in the cells and tissues. So, it could potentially reduce risk for a number of diseases. The researchers expects the new variant of tinupig will be the perfect answer to the traditional method of processing tinupig. Nutritional quality, safety, and consumer acceptability of Cacao Tinupig need further investigation. Detailed nutritional investigation, including micronutrients characterization, would be useful to understand the role of the product in a healthy diet. More

comprehensive analysis of the microbiome can also promote food safety, as well as the detection of potential probiotic benefits. Standardized procedure and trained panelists are essential for objective and reproducible results in sensory evaluation. Looking beyond just simple sensory attributes to consumer preferences has potential to reveal information about the appeal of the product for particular target markets. It is also good to study the effects of processing and storage on the nutritional, microbial and organoleptic qualities of Cacao Tinupig so that an optimum processing could be obtained and the quality guaranteed. Finally, investigating possible functional activities of Cacao Tinupig, such as its antioxidant potential and prebiotic effect, can reveal other health benefits aside from its basic nutritional values. Through answering the gaps identified, the research could further orient knowledge on Cacao Tinupig and its implications as a potential cherished food product. The investigation of Cacao Tinupig as traditional Filipino delicacy is of particular interest as it relates to its nutritional value, safety and consumer acceptance. Nutrition information gives consumers and health professionals access to data that guides nutrition intake and helps to determine a diet plan according to the amount of nutrients available in the food and beverage being consumed. Microbiological investigation checks the safety Cacao Tinupig by detecting and enumerating pathogenic microorganisms. Moreover, a study into the occurrence of health-promoting probiotic bacteria may lead to health benefits. Sensory analysis is crucial for definition of acceptability of the product to the consumers. By evaluating sensory characteristics such as color, odor, appearance, taste, texture, mouthfeel and overall acceptability, scientists can determine consumer preferences and identify potential changes to enhance the product's appeal. The importance of such analyses is in maintaining food safety, reporting nutritional values, learning consumer preferences, and promoting sustainable food production. The study contributes to a number of the United Nations Sustainable Development Goals (SDGs). For example, SDG 2 (Zero Hunger) is clearly applicable since nutritional enhancements in Cacao Tinupig will help ensuring healthier diets in the Philippines. SDG 3 (Ensure Healthy Lives and Promote Well-being for All at All Ages) would benefit from the possible health virtues of adding cacao that has antioxidant capacity. What is more, local cacao integration falls under SDG 8 (Decent Work and Economic Growth) as there is potential for new markets and livelihoods in Lasam. Furthermore, research has implications for the achievement of SDG 12 (Sustainable Consumption and Production) in terms of promoting food tourism and local foods production and consumption practices. Finally, SDG 17 (Partnerships for the Goals) is also important since "Engagement in such innovation is highly dependent on the collaboration between suppliers of locally adapted seeds, researchers, farmers and local communities" (Lusty, 2015, 121), encouraging partnerships to achieve the SDGs. From this knowledge of the nutritional and sensory qualities of Cacao Tinupig, we seek to enhance its production processes to make it more sustainable in the long term and to supported local and global sustainability targets.

Objectives of the Study

The general objective of the study is to determine the nutritive determination, microbial, and sensory evaluation of cacao tinupig;

1. determine the nutritional content cacao tinupig

- a. crude protein
 - b. crude fiber
 - c. crude fat
 - d. moisture
 - e. ash
2. determine the microbial assessment for the food product
- a. Yeasts and molds
 - b. Total Coliform Count
 - c. Escherichia coli Count
3. determine the sensory evaluation of cacao tinupig
- a. color
 - b. aroma
 - c. appearance
 - d. taste
 - e. texture
 - f. mouthfeel
 - g. general acceptability

Review of Literature

Tinupig is a traditional Filipino delicacy that originates from the Cagayan Valley, specifically from the town of Lasam. It is made primarily from glutinous rice and coconut strips, wrapped in banana leaves and often served during festivals or special occasions. This product holds significant cultural value in the region and serves as a symbol of local food heritage. In recent years, however, there has been a growing interest in revitalizing traditional food products, such as Tinupig, to cater to contemporary health-conscious consumers and to tap into the expanding food tourism market. By combining local ingredients and innovating traditional recipes, products like Cacao Tinupig hold the potential to meet consumer demands for both nutrition and taste.

Incorporating Cacao in Traditional Products

The integration of cacao into traditional foods has gained attention due to cacao's health benefits, including its rich antioxidant properties. Cacao is a significant agricultural product in many regions of the Philippines, including Lasam, Cagayan. It is commonly used in chocolate products but has also been explored as an ingredient in various traditional Filipino foods. Studies have shown that cacao, especially in its raw form, is rich in flavonoids, which are natural antioxidants that help reduce oxidative stress and promote heart health (Marie, J., 2015). These properties make cacao an appealing addition to food products like Tinupig, as it not only enhances the flavor profile but also provides health benefits.

Nutritional Benefits of Cacao

The inclusion of cacao in Cacao Tinupig can significantly increase the nutritional value of the product. Cacao is known for its high levels of essential nutrients such as fiber, magnesium, and iron, along with antioxidants like flavonoids and polyphenols. These compounds have been linked to a variety of health benefits, including improved cardiovascular health, enhanced cognitive function, and a reduction in the risk of chronic diseases (Baba et al., 2010). Moreover, cacao has been found to have potential prebiotic effects, which can positively influence gut health (Stewart et al., 2020).

By incorporating cacao into Tinupig, the product can be positioned not only as a delicious and culturally significant snack but also as a functional food that offers nutritional benefits. This innovation can address the growing consumer demand for healthy and indulgent food options.

Microbial Safety and Food Safety Testing

In any food production process, microbial safety is of paramount importance. For Cacao Tinupig, ensuring that the product is safe for consumption is crucial, especially as the product may be distributed to different regions or even internationally. The safety of the product can be ensured by conducting microbial tests, including the total coliform count, yeasts and molds, and *Escherichia coli* count. Total coliform count serves as an indicator of the sanitation and quality of the food, as high levels of coliform bacteria can suggest contamination from water sources or improper handling. Yeasts and molds are important to monitor, as they can affect the shelf life of the product and cause spoilage. While yeasts and molds are naturally occurring, excessive growth can lead to fermentation or undesirable flavors. *Escherichia coli* (*E. coli*) is a pathogenic bacterium often associated with foodborne illnesses. The presence of *E. coli* in food products can pose serious health risks, and its absence is critical to ensure food safety. These tests help ensure that Cacao Tinupig maintains its safety and quality throughout its production and consumption lifecycle.

Sensory Evaluation and Consumer Preferences

In addition to nutritional and microbial safety concerns, the sensory appeal of Cacao Tinupig plays a crucial role in its market success. Sensory attributes such as color, taste, aroma, texture, and overall acceptability significantly influence consumer preferences. Various studies on the sensory evaluation of traditional food products indicate that successful innovations often depend on how well the new ingredients or processing methods maintain or improve these sensory attributes (Zhu et al., 2015).

Sensory testing for Cacao Tinupig involves gathering feedback from trained panels or consumer focus groups to assess the level of acceptability of the cacao-infused version of Tinupig compared to the traditional variant. These evaluations help researchers determine the optimal levels of cacao to incorporate in order to balance the traditional flavor while introducing new tastes and textures.

Food Tourism and Market Opportunities

The integration of cacao into Tinupig can also tap into the growing sector of food tourism. As food tourism is becoming an integral part of global travel, there is increasing interest in exploring local delicacies with unique flavors and health benefits. The promotion of Cacao Tinupig as part of food tourism efforts can help showcase the culinary richness of Lasam and the Cagayan Valley. This could not only boost local pride and interest in the product but also create new markets for it, both locally and internationally.

Studies on food tourism emphasize the role of local foods in the economic development of regions (Hall & Sharples, 2008). By elevating traditional food products like Cacao Tinupig, the community can benefit from the influx of tourists and new consumer markets, leading to increased demand, enhanced income, and job opportunities in the local food industry.

The innovation of Cacao Tinupig represents an exciting opportunity to preserve and modernize a beloved Filipino delicacy. Through the incorporation of cacao, the product can offer improved nutritional benefits, enhanced consumer appeal, and significant market potential. However, for this innovation to succeed, thorough research on nutritional content, microbial safety, sensory evaluation, and market acceptance is essential. This research will help ensure that Cacao Tinupig becomes not only a healthier alternative to traditional Tinupig but also a product that holds promise for the future of food tourism and sustainable local food production.

The growing trend of integrating local ingredients like cacao into traditional foods shows promise for both enhancing local food culture and creating new opportunities for economic growth through the food tourism industry. The success of Cacao Tinupig could pave the way for other traditional Filipino food products to be innovated in a similar fashion, providing a path toward a more sustainable and health-conscious food industry.

Using cacao in classic products

Incorporation of cacao in native foods has emerged, due to health known benefits of cacao particularly with its antioxidant content. Cacao is among the major crops being produced in the Pgilippines including Lasam, Cagayan. Most frequently used in chocolates, it has been tried as an ingredient in several native Filipino dishes. Cacao, particularly raw cacao, has been found in studies to have significant levels of flavonoids (natural antioxidants) that help reduce oxidative stress and have a positive impact on heart health (Marie, J., 2015). These attributes make cacao a welcome ingredient in food items such as Tinupig not only for improving taste but also for the health benefits it imparts.

Nutritional Benefits of Cacao

This product may also be enriched with cacao. Cacao is renowned for its rich nutrient profile of fiber, magnesium, iron and antioxidants like flavonoids and polyphenols. These phytochemicals have been associated with numerous health benefits such as cardiovascular health, cognitive function, and reduction in the prevalence of chronic diseases (Baba et al., 2010). Furthermore, there is evidence to suggest that cacao has prebiotic potential and therefore may support gut health (Stewart et al., 2020).

With this cacao-rich Tinupig, the product could be marketed not just as a tasty, cultural snack, but a functional food that provides nutritional value. This breakthrough could satisfy the increasing consumer want for healthy luxurious food choices.

Testing for Microbial Safety and Food Safety

And it goes without saying that you always must be thinking about microbial safety in any food-making process. For Cacao Tinupig, it is important to do a food safety on it as it can be transported across regions or even countries. Different microbial tests, such as the total coliform, yeasts and molds and *Escherichia coli* count, can be used to ensure product safety. Total coliform number is a sanitation and food quality indicator; high levels of coliform bacilli may indicate contamination with water sources, or improper process of the product. Yeasts and molds are also critical to monitor as they can affect product shelf life and spoilage. While yeast and mold are natural, if airborne particles settle, they can contribute to a musty off-flavor. *Escherichia coli* (*E. coli*) is a foodborne pathogen. The presence of *E. coli* in foodstuffs is now considered a significant health hazard and the absence of *E. coli* is crucial to guaranteeing food safety. These tests are to make sure that Cacao Tinupig is safe and of high quality from production, process, up to bringing it to your home.

Sensory Analysis and Consumer Acceptance

Besides nutritive and microbial safety issues, the sensory acceptability of Cacao Tinupig is of utmost importance for its marketability. Sensory characteristics such as color, taste, smell, texture, and general acceptability have an important role in the acceptability of the product by consumers. Several studies on sensory characterisation of TFPs show that successful innovation rely on how the new ingredients and/or processing methods can preserve or improve such sensory properties (Zhu et al., 2015).

Sensory evaluation of Cacao Tinupig is conducted among trained panels or consumer focus group to determine how far the acceptability of cacao – infused Tinupig is compared to traditional Tinupig. These tastings aid scientists to work out the best proportions of cacao to use to find the balance between the cacao taste they are familiar with, and exploring the new notes and textures.

Culinary Tourism along with other Market Opportunities

The incorporation of cacao into Tinupig can also capitalize on the emerging market on food tourism. With food tourism on the rise as an important aspect of global travel, experiential dining by local gourmets focused on the distinctiveness and the health benefits of local cuisine is gaining popularity. Promoting Cacao Tinupig as a form of food tourism can highlight the culinary wealth of Lasam and Cagayan Valley in general. This could not only increase the sense of pride and interest in the product on a local scale, but create new markets for it, both at home and abroad.

Research into food tourism focus on the contribution of local food to regional economic development (Hall & Sharples, 2008). This could generate demand, which can translate to more income, more jobs in the local food industry with the boom of tourism and new consumers, this time even foreign to the Cacao Tinupig community.

The invention of Cacao Tinupig is definitely an exciting potential to continue the tradition of and update a familiar Filipino treat. The resulting product is enriched with cacao, providing the product with a superior nutritional profile, increased consumer attractiveness and lucrative market opportunities. However, for this technology to be successful, more research on nutritional, microbial, sensory quality and market acceptance is needed. This study will contribute to guarantee that Cacao Tinupig is not just a healthier version of Tinupig but product with the potential for food tourism and locally based food sustainability.

The increasing fashion of incorporating the cacao and other products into traditional food is a potential policy to enrich the local food culture and new cottage industries in the food tourism industry. The breakthrough of Cacao Tinupig may open doors for other traditional Filipino food to be formulated in a similar fashion, taking a step towards a more sustainable and healthy food industry.

Methodology

PREPARATION OF RAW MATERIALS

The process of making of Cacao Tinupig consisted of assembling the required ingredients, using 500g powdered glutinous rice, 150g brown sugar, 250g melted cacao tablea, 56.7g butter, 200g coconut strips, and 710g water. The 770g of water was mixed completely with the glutinous rice powder in a big pot. The remaining melted cacao tablea was mixed with the brown sugar and butter in another bowl until the sugar and butter fully dissolved. The coconut strips were then stirred into the cacao, and the whole works mixed together well. The mixture was then put into banana leaves and rolled into small

compact packages. Every package was individually tightly wrapped and attached to make certain nothing came out while cooking. The packets were put inside a pugon (native Philippine oven) or a regular oven preheated to 180 degree celsius (350 degree Fahrenheit) in which they baked for 30 to 45 minutes, until the banana leaves became slightly burnt and the contents fully cooked. Cacao Tinupig is wrapped in banana leaf (top and bottom) and baked to cook the contents inside. Once it was baked, the wrapped Cacao Tinupig was allowed to cool for a bit then it was unwrapped and ready to be eaten.

LABORATORY TESTING

Proximate Analysis

Samples will be gathered in a clean plastic container and delivered to Regional Food Technology Development and Incubation Center, Department of Agriculture-RF02. The samples will be analyzed for proximate analysis contaminants. Nutrients using published methods for the analysis of crude protein, crude fiber, crude fat, ash and moisture. The portion size, servings per container, and nutrition facts will also be determined for each of the samples.

A.Crude Protein by the Kjeldahl Method

The determination of the protein was based on the Kjeldahl method, which is a common method for the determination of proteins based on nitrogen content. For this estimation, 20 grams of Cacao Tinupig were utilized as the sample. Digestion, distillation and titration are used to liberate nitrogen from proteins, which is converted to ammonia, distilled, and measured in order to determine the percent crude protein.

The protein content estimated is not protein specific, but represents all nitrogenous substances in the sponge. This gives us your grand total protein in Cacao Tinupig – a dessert made with cacao, glutinous rice and coconut.. Its protein content may not as high for the protein-sensitive among you, but surely every gram counts towards nutrition, so a 'light snack' would be the best call.

The findings of this study can guide future interventions to fortify Cacao Tinupig with increased protein and enhancement of its nutritional contents. Knowledge of protein content is valuable for health conscious consumers and may help in product labeling so that they can make more informed dietary choices. In summary, the Kjeldahl method is a reliable method for determining crude protein content, and the results might be useful for enhancing the nutritional quality of the product.

B.Determination of Fat and Fiber Values by Filter Bag Method (AnkomApparatus 200)

The fat and fiber contents of the 250 grams of Cacao Tinupig were determined using The Filter Bag Technique using Ankom Machine 200. the fat%). The fat content was determined by dissolve lipids appearing after evaporation of the solvent and expressing their weight as % of the sample. This weight was the combined fat for the sample. Fat is an essential factor in energy and satiety, and here as well.

For fiber, the method of determination was enzymatic-gravimetric, the sample was hydrolyzed with enzymes to free non-fibre components and the remaining fibre was dried and weighted. This overall fiber count encompasses both soluble and insoluble fiber, which is vital to the digestive process.

Fat and fiber Cacao Tinupig fat and fiber contents are indicative of its nutritive value. Most of the fat comes from the coconut and cacao and most of the fiber comes from the coconut and rice. With that list of ingredients, it would seem that the fat content is moderate and the fiber can potentially be great for the digestive system. These findings are useful for quality improvement, controlling fat levels, enrichment with fiber, and developing product labeling. In the end, the automation supports educated consumer decisions for a healthy diet.

C.Gravimetric Analysis for Moisture and Ash Contents

Moisture and ash content of 250 grams of Cacao Tinupig were both determined through the gravimetric method and these offer a glimpse of the water and mineral content of the snack. The sample was dried in an oven at 105°C to constant weight to analysis moisture content. The weight loss and the water content were reported as the percentage of the initial weight. For ash, we combusted the sample at 550°C, burning off the organic material and leaving the inorganic minerals as ash. The ash not so incinerated was weighed, and the percentage was determined. The moisture level determines the amount of water in the product, and it may influence the stability period and physical properties, and high moisture content promotes microbial activity. The ash content indicates the mineral content, such as calcium and potassium, that may be the essential minerals in Cacao Tinupig contributing to its nutritive values. In summary, this approach assists in determining the water and mineral composition of the snack, which contributes to product quality, safety and nutrition.

Serving Size and Nutrition Facts Determination

The serving size and nutritional facts, including calories per serving, calories from fat, grams of fat, protein, crude fiber, and carbohydrates, will be determined with the assistance of the DA-food tech based on the proximate analysis.

Microbial Analysis Using Compact Dry Method (CDM)

The samples will also be subjected to microbial assessment using Compact Dry Method (CDM) at the Regional Food Technology Development Incubation Center, Department of Agriculture Region 2, Carig Sur, Tuguegarao City.

Results and Discussion

The table provides a demographic profile of 50 Participants in a study conducted at Cagayan State University- Lasam Campus, Local Government Unit of Lasam and Lasam Academy Incorporated. The main results indicate a majority of females in the sample (36%) with a minority of males (14%) and the most frequent age being between 21 and 35 (12%). Most (47%) eat Tinupig followed by few (3%) and do not. Some (44%) are enthusiastic to taste new recipe or a new flavor of Tinupig. (30%) of the consumer's

consume Tinupig multiple times than once or twice a week (20%) and consumers most preferred characteristic of the product difference from flavor (42%) health benefits (32%) to good looking (26%).

Table 1
Socio-Demographic Profile of Participants

	Category	Frequency (n = 50)	Percentage (%)
Sex	Male	14	14
	Female	36	36
Age	15–20	6	6
	21–25	12	12
	26–30	10	10
	31–35	6	6
	36–40	2	2
	41–45	3	3
	46–50	4	4
	51–55	3	3
	56–60	0	0
	61–65	3	3
	66–70	0	0
Consumption of Tinupig	Yes	47	47
	No	3	3
Innovations or New Flavors of Tinupig	Yes	44	44
	No	6	6
Frequency consumption of Tinupig	Daily	3	3
	Once to twice a week	20	20
	Multiple	30	30
Cacao Tinupig Characteristic	Attractive Appearance	26	26
	Flavor	42	42
	Health Benefits	32	32
	Others	2	2

The protein percentage of 2.99% for an intake of 20 g cacao tinupig falls within the recommended range for daily intake and should provide a good amount of protein without approaching the upper limit. Its 3.32% fiber is just above the recommended level, it contains a good amount of beneficial fiber for digestive health. The crude fat content of 7.24% is higher than the ideal range, but as fat is an indispensable part of chocolate, the fat in cacao tinupig may be helpful if taken in moderation. Percentage Moisture: 33.08% is much higher than the preferred range this may affect its shelf-life or texture, please store correctly. It has an ash content of 0.54%, which is less than the optimum level, indicating the cacao tinupig is not as mineral-enriched as other cacao-based products. The product is satisfactory as to protein, fiber and ash quality however its fat and moisture could be improved for a due ratio of nutritional balance and storability.

Table 2
Proximate Analysis of Cacao Tinupig

Lab. No.	Sample Description	Crude Protein, %	Crude Fiber, %	Crude Fat, %	Moisture, %	Ash, %
FT-24-0348	Cacao Tinupig	2.99	3.32	7.24	33.08	0.54

Table 3 presents the microbial examination of Cacao Tinupig for Total coliform, Yeast and mold and Escherichia coli (E. coli) for safety and quality. The total coliforms is 23 MPN/g, it is at low level these equal to 0 coliform/g, which are the indicator of sanitary quality and faecal contamination. This implies the possibility of hygienic conditions in the production of the product, but the fact that there is any number of coliforms should be a prompt for corrective action in the hygienic handling of the product from production through storage. Molds and yeast are found to be at 1.2×10^3 CFU/g, a level that is within limits in food products but a product which is prone to spoil or presence of harmful mycotoxins in the food due to storage conditions. The E. coli count is < 3.0 CFU/g, which means risk of contamination is extremely low and it is safe to eat. On the whole, these findings indicate that cacao tinupig has been made under good sanitary conditions.

Table 3
Microbial Analysis of Cacao Tinupig

Sample Code	Sample Description	Test Method	Result
MIC-1154	Cacao Tinupig	Total Coliform Count	23 MPN/g
		Yeasts and Molds	1.2×10^3 CFU/g
		Escherichia coli Count	< 3.0 CFU/g

Sensory Evaluation Cacao Tinupig had high mean scores for all the attributes, which ranged from 7.96 for Appearance to 8.42 for Aroma indicating very satisfactory consumer acceptability for all attributes. However, the presence of standard deviations, which has the largest standard variation (SD = 0.999149), indicating the level of homogeneity of consumer responses for most of the attributes.

Data analysis using T-test showed that the difference between the groups being compared was statistically significant ($p < 0.05$) for all sensory quality attributes. The high t-values also indicate more of these differences, indicating the differences observed in sensory scores were not likely chance ones. These results strongly suggest that, in the resulting chocolate, the Cacao Tinupig variety contributes in large part to the sensory profile.

Table 4 Computed Mean, Standard Deviation and T-Test Result of the Sensory Evaluation of the Experimental Product.			
Category	Cacao Tinupig		T-test
	Mean	SD	
Appearance	7.96	0.9991493	11.27
Color	8.18	0.7266782	15.92
Aroma	8.42	0.6770032	17.59
Taste	8.36	0.8340133	14.18
Texture	8.22	0.8232382	14.12
Mouthfeel	8.28	0.8416254	13.91
General Acceptability	8.28	0.6770032	17.30

***= significant at p = 0.05**

Conclusions

The study on Nutrifacts Determination, Microbial Analysis, and Sensory Evaluation of Cacao Tinupig was conducted in order to determine the nutritional value, microbial quality and acceptability of this snack food in the Philippines. Nutritional analysis showed that 20 grams of Cacao Tinupig contained 60 kcal, 1 g fat, 11 g carbohydrates, 1 g protein, and 1 g crude fiber. These figures indicate that the product contributes a low percentage of the recommended daily allowance, and is therefore considered a snack. The microbiological investigation which measured total coliform count, yeast and molds and Escherichia coli (E. coli) indicated that the material can generally be considered safe for consumption as microbial content of total coliform was 23 MPN/g, yeast and molds was 1.2×10^3 CFU/g, and E. coli was less than 3.0 CFU/g while the importance of good hygiene during production was emphasized. The sensory evaluation indicated that the consumers highly accepted both the appearance, color, aroma, taste, texture and mouth-feel attributes. Notably high mean scores for general acceptability indicate that Cacao Tinupig is a desirable snack.

According to the investigation, Cacao Tinupig makes for a delicious and healthy midnight snack that can give you just the right kick with its low fat content, high carbs, with just a dash of protein and fiber. The

microbial analysis indicated that the product is safe, with reasonable levels of coliforms and yeast/molds, and no dangerous E. coli contamination, so it is safe to eat. Moreover, sensory evaluation showed that the consumers really like the snack, scoring highly for its appearance, taste, and texture. This study points out Cacao Tinupig as a safe, nutritious, and appetizing snack food alternative. But you should still maintain high hygiene standards at the production and storage stages to preserve its quality and safety.

RECOMMENDATIONS

The authors suggest that sanitation in the preparation and storage of Cacao Tinupig should be enhanced by future researchers.

The researcher recommends that further studies can also be done to improve the nutritional value of Cacao Tinupig by fortifying it with other nutrients such as vitamins, minerals, or higher dietary fiber.

The researchers suggest that further works to conduct a strict quality control with respect to quality of Cacao Tinupig in every batch of production.

Consumer surveys are some of the few instruments available to the artisan food industry for real-time information about sensory attributes (eg flavor, texture, aroma) and their implications for acceptance.

Declarations

Author Contribution

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Figures

Nutrition Facts

No. of servings per container: 12.5

Serving size: 20g

Amount per Serving		%RENI
Energy (kcal)	60	2%
Energy from fat (kcal)	13	

Total Fat (g)	1	
Total Carbohydrates (g)	11	
Crude Fiber (g)**	1	
Total Protein (g)	1	1%

*Percent RENI values are based on 2018 RENI PDRI reference male adult requirement of 19-29 years old.

Figure 1

Nutrition Facts of Cacao Tinupig