

Utilization of Cheesy Jackfruit (*Artocarpus heterophyllus* Lam.) Sw. Embutido

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Abstract. This study aimed to utilize Jackfruit into Cheesy Embutido. This research was conducted to determine the level of consumer's acceptability of Jackfruit Cheesy Embutido. Embutido is a Filipino-style meatloaf made with a festive mixture of any type of meat, carrots, and raisins wrapped around slices of eggs, cheese, and sausage. A set of steps were conducted in this research, such as experimentation, evaluation, and data gathering and analysis. Results revealed that there was no significant difference in the level of acceptability of the jackfruit Embutido as to appearance ($\mu=405$, $p=0.375$), Aroma ($\mu=405$, $p=0.370$), Texture ($\mu=350$, $p=0.122$), Taste ($\mu=338$, $p=0.089$) and General Acceptability ($\mu=395.50$, $p=0.386$).

1 Introduction

Local consumers' love of meat products in the Philippines saw a rise in meat consumption, specifically pork meat. According to Statista Research Department, in 2021, [1] pork was the most consumed type of meat in the Philippines, at approximately 15 kilograms per person per annum. As a meat-loving nation, meat dishes are commonly served even at any party, event, or fiesta [2]. Our country has a rich food culture since it has numerous indigenous and foreign influences, and one example is the embutido. Embutido is a Filipino-style meatloaf made with a festive mixture of any type of meat, carrots, and raisins wrapped around slices of eggs, cheese, and sausage [3]. The Filipino style Embutido can be traced to when Spain colonized the Philippines for three and a half centuries beginning in the middle of the 15th century. The Spaniards introduced different sausage recipes during that time, including chorizo, longaniza, and embutido.

On the other hand, jackfruit scientifically known as *Artocarpus heterophyllus*, is an exotic fruit grown in tropical regions of the world and has increased in popularity in recent years. It was locally grown in the country, wherein in 2020, the volume produced in the Philippines amounted to 40.2 metric tons. This fruit is part of the Moraceae plant family and has a spiky outer skin and is green or yellow. It also has a distinctive sweet flavor and can be used to make a wide variety of dishes. Likewise, it has a comparable texture to meat. Moreover, it is beneficial as it provides a moderate amount of calories and lots of fiber, vitamins, minerals, and antioxidants.

Numerous people are astonished at just how much Filipinos eat in a day. Breakfast, lunch, and dinner are all typically big meals. Filipinos are fond of experimenting with

different kinds of dishes. Hence, with the abundance of jackfruit in the community, the researchers were challenged to utilize this fruit as a meat substitute to enhance the sensory characteristic of the food and create a cost-effective recipe. Likewise, this research was conducted to enhance the product's nutrient values and give an additional income source to the local jackfruit growers.

The primary purpose of this study was to utilize Jackfruit into Cheesy Embutido. This research was conducted to determine the level of consumer's acceptability of Jackfruit Cheesy Embutido. Specifically, this study aimed to:

1. Evaluate and compare the sensory qualities of Jackfruit Cheesy Embutido in two formulations in terms of appearance, aroma, texture, and taste after processing, during, and after storage.
2. Evaluate the perceptibility of Jackfruit Cheesy Embutido of the most preferred formulation.

2 Literature Review

The luscious embutido is one of the many recipes we acquired from the Spaniards. The word embutido is the generic term for cured sausages in Spain, Portugal, and some countries in South America. Embutido is a Filipino-style meatloaf with ground pork as its main ingredient. It is a dish generally served at special events like fiestas.

An embutido is a type of sausage found in Spain and Portugal. It contains hashed meat, generally pork, seasoned with aromatic herbs or spices that are served, which is wrapped in the skin of the pig's intestines. Mass-produced embutido are often wrapped in a type of artificial but edible skin. There are several types of sausages, including cured chorizo, salami, cured loin, and sobrasada or cooked morcilla or androlla. The Filipino embutido frequently contains raisins. Embutido is a type of meatloaf prepared in a Filipino style. Though a well-known dish for a holiday, embutido could be enjoyed every day without any hassle. Several meat processing companies now produce this meatloaf for commercial purposes.

Jackfruit is a tree that could be 30 to 70 ft. (9-21 m.) tall. The leaves are oblong, oval, or elliptical with 4 to 6 inches in length, leathery glossy, and deep green. It is the largest fruit globally, capable of reaching 100 pounds. This fruit is a large tropical Asian tree related to the breadfruit that yields fine-grained yellow wood and immense fruits containing an edible pulp and nutritious seeds and its fruit [4]. Many parts of this plant, including the bark, roots, leaves, fruit, and seeds, have medicinal properties. Jackfruit has many benefits, so the researchers utilize it to make embutido to improve its nutritive value.

Based on the study of Elevitvh and Manner [5], as cited in the preparation of jackfruit chips is effortless and can quickly be done. The bulbs are cut into 4cm x 2cm slices. The cut slices were blanched in water for 10 minutes. Then, the slices are weighed and immersed in 0.1% KMS for 15 minutes using 2 kg. of solution per kilogram of bulb material. After sieving the water, the slices are dried using a mechanical dryer to assure less oil absorption in the subsequent frying. The slices are fried in oil and stirred in a narrow wooden rod maintaining the temperature at 70 °C for 1 hour and 60 °C for another 6 hours. When the slices are light-yellow, the chips are taken from the saucepan. These prepared chips are mixed with some salt and spices in a bowl. Then processed chips can be packed in various packaging materials or containers. Considering moisture content (%), weight gained (%), quality aspect, and sensory attributes like crispiness, color, flavor, and overall acceptability, metal foil pouches were found most suitable for packaging jackfruit chips.

The prepared chips can be stored at ambient conditions in "metalex" foil for two months without loss of organoleptic quality.

Based on Amit and Ambarish study [6], the ripe jackfruit contains a good amount of fermentable sugar, which may be explained for the commercial production of vinegar and wine. It was reported that the maximum alcohol content in jackfruit wine was 10%, with a sugar utilization of 14% of total sugar solids. These early results show promise for using this fruit for commercial wine production. A certain maturity level and ripeness of jackfruit are essential for the production of jackfruit wine.

The jackfruit wine may protect against antioxidant and DNA damage and could become a valuable source of antioxidant-rich nutraceuticals. Additionally, the wine could be a commercially valuable by-product for jackfruit growers.

3 Methodology

3.1 Research Design

The experimental method used in this study was a collection of research designs that used manipulations and controlled testing to understand casual processes. Generally, one or more variables are manipulated to determine their effect on a dependent variable. According to McLeod [7], an experiment is an investigation in which a hypothesis is scientifically tested. The independent variable (the cause) is manipulated in an experiment, while the dependent variable (the effect) is measured, and any extraneous variables are controlled.

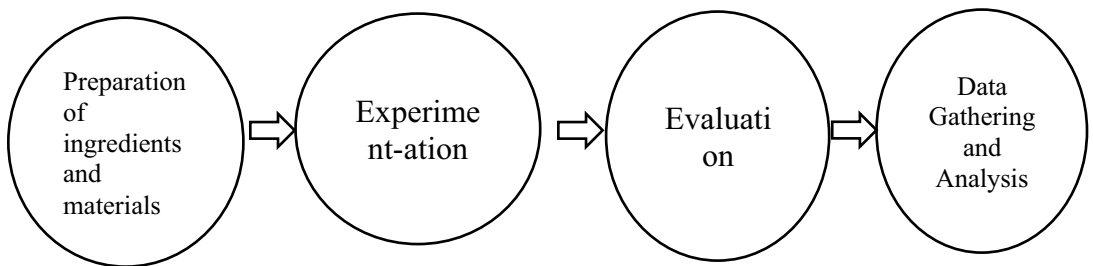


Fig. 1. Process of producing Jackfruit Cheesy Embutido.

3.2 Evaluators

Using purposive sampling, this study was evaluated by fifteen (15) target consumers and fifteen (15) Culinary Instructors during the second semester of Academic Year 2020-2021. The expertise of these people was well-considered, knowing that they could greatly help in achieving the purpose of this experimentation.

3.3 Materials and Instrumentation

The main tools used in making Jackfruit Cheesy Embutido are a steamer, mixing bowl, knives, chopping board, measuring equipment, LPG cooking range, foil, and freezer.

The ingredients used in the two formulations were as follows:

The ingredients of Formulation A (100 % Jackfruit) were (1) 100 grams chopped jackfruit, (2) 8 pieces Vienna sausage, (3) 100 grams bread crumbs, (4) 2 pieces raw eggs, (5) 100

grams chopped carrots, (6) 50 grams chopped bell pepper, (7) 50 grams chopped onions, (8) 50 grams chopped garlic, (9) 50 grams pickle relish, (10) 100 grams grated cheese, (11) 100 grams raisins, (12) ½ tablespoon salt, (13) ½ tablespoon pepper, (14) ½ tablespoon white sugar, (15) 4 pieces hotdog cut half lengthwise, (16) 2 pieces boiled eggs.

Moreover, the ingredients of Formulation B (50% meat and 50 % Jackfruit) were (1) 50 grams chopped jackfruit, (2) 50 grams ground meat, (3) 8 pieces Vienna sausage, (4) 100 grams bread crumbs, (5) 2 pieces raw eggs, (6) 100 grams chopped carrots, (7) 50 grams chopped bell pepper, (8) 50 grams chopped onions, (9) 50 grams chopped garlic, (10) 50 grams pickle relish, (11) 100 grams grated cheese, (12) 100 grams raisins, (13) ½ tablespoon salt, (14) ½ tablespoon pepper, (15) ½ tablespoon white sugar, (16) 4 pieces hotdog cut half lengthwise, (16) 2 pieces boiled eggs.

The instrument used was the sensory evaluation score sheet of the Five-point Likert scale for the characteristics and the nine-point Hedonic scale for general acceptability.

3.4 Data Gathering Procedure

The experimental study was composed of the following: Phase I is preparing materials, tools, equipment, and ingredients. Phase II is the preparation of the product, and Phase III is the evaluation of the finished product.

Phase I: The preparation of the materials and ingredients: (1) Gather all the materials and ingredients needed for cooking, (2) Place the ground meat and chopped jackfruit in a large container, (3) Add bread crumbs and raw eggs and mix well, (4) Put in the carrots, bell pepper, onion, garlic, pickle relish, and grated cheese and mix thoroughly, (5) Add raisins, salt, sugar, and pepper, then, mix well, (6) Place the meat mixture in an aluminum foil and fatten it, (7) Put the slice sliced hotdog, sliced boiled eggs, and sliced cheese alternately on the middle of the flat mixture, (8) Roll the foil to form a cylinder, then, lock the edges of the foil.

Phase II: Cooking procedure: (1) Place the product inside the steamer, (2) Cook for 1 hour, (3) Let it cool, (4) Unwrapped, slice, and serve.

Phase III: Evaluation of the finished product will be conducted after the product has been cooled down. (1) Prepare the evaluation sheet (2) Present the finished product to the evaluators (3) Gather the data (4) Compute and record the results.

3.5 Data Processing Techniques

The data gathered were tallied, tabulated, and analyzed. The gathered data were computed using different statistical tools. The mean and standard deviation were used for descriptive analysis. For inferential analysis, the Mann-Whitney U test was used to test if there is a significant difference between the two formulations of the Jackfruit Cheesy Embutido in terms of appearance, aroma, taste, texture and general acceptability as perceived by the evaluators. The Mann-Whitney U test was used because the assumption for normality of the data for the parametric test was not satisfied.

4 Results

The data shows the level of acceptability of jackfruit in terms of appearance, aroma, texture and taste as perceived by the evaluators in two formulations.

Table 1: Mean Scores of the samples in terms of Appearance

Appearance	μ	SD	Remarks
Formulation A	4.80	0.407	Extremely Embutido Appearance
Formulation B	4.70	0.466	Extremely Embutido Appearance

As to Appearance, Formulation A was perceived as Extremely Embutido Appearance ($\mu = 4.80$, $SD = 0.407$). Likewise, Formulation B was also perceived with Extremely Embutido Appearance ($\mu = 4.70$, $SD = 0.466$).

Table 2: Mean Scores of the samples in terms of Aroma

Aroma	μ	SD	Remarks
Formulation A	2.37	1.326	Extremely Jackfruit Aroma
Formulation B	2.07	1.202	Slightly Jackfruit Aroma

As to Aroma, Formulation A was perceived as Slightly Jackfruit Aroma ($\mu = 2.37$, $SD = 1.326$). Likewise, Formulation B was also perceived with Slightly Jackfruit Aroma ($\mu = 2.07$, $SD = 1.202$).

Table 3: Mean Scores of the samples in terms of Texture

Texture	μ	SD	Remarks
Formulation A	3.93	0.980	Moderately Smooth
Formulation B	3.53	1.008	Moderately Smooth

As to Texture, Formulation A was perceived as Moderately Smooth ($\mu = 3.93$, $SD = 0.980$). Likewise, Formulation B was also perceived as Moderately Smooth ($\mu = 3.53$, $SD = 1.008$).

Table 4. Mean Scores of the samples in terms of Taste

Taste	μ	Sd	Remarks
Formulation A	2.87	1.036	Extremely Jackfruit Flavor
Formulation B	2.30	1.179	Slightly Jackfruit Flavor

As to Taste, Formulation A was perceived as Moderately Jackfruit Flavor ($\mu = 2.87$, $SD = 1.036$). Likewise, Formulation B was also perceived with Slightly Jackfruit Flavor ($\mu = 2.30$, $SD = 1.179$).

Table 5. Comparison of the General Acceptability in Two Formulations

General Acceptability	μ	Sd	Remarks
Formulation A	8.10	0.740	Liked Moderately
Formulation B	8.27	0.759	Liked Extremely

Table 5 shows the result of the General Acceptability. The evaluation outcome revealed that formulation A was perceived as liked moderately ($\mu = 8.10$, $SD = 0.740$) while formulation B was perceived as liked extremely ($\mu = 8.27$, $SD = 0.759$). Formulation B, which comprises 50% pork meat and 50% jackfruit, is the most acceptable type of embutido mixture. The data revealed that jackfruit could be used in making embutido as a new product that provides good nutrition.

Table 6. The difference between Formulation A and Formulation B in terms of Appearance, Aroma, Texture, Taste, and General Acceptability.

Variable	μ rank	Σ rank	MWU Value	P	Remarks
Appearance					
Formulation A	29	870	405	0.375	NS
Formulation B	32	960			
Aroma					
Formulation A	28.57	857	392	0.370	NS
Formulation B	32.43	973			
Texture					
Formulation A	27.17	815	350	0.122	NS
Formulation B	33.83	1015			
Taste					
Formulation A	26.78	803.50	338.50	0.089	NS
Formulation B	34.22	1026.50			
General Acceptability					
Formulation A	26.68	860.50	395.50	0.386	NS
Formulation B	32.32	969.50			

The table shows the Mann-Whitney U Test result on the level of perception of the evaluators of Jackfruit Embutido in two formulations as to appearance, aroma, texture, taste, and general acceptability. Results revealed that there was no significant difference in the level of acceptability of the jackfruit Embutido as to appearance ($\mu=405$, $p=0.375$), Aroma ($\mu=405$, $p=0.370$), Texture ($\mu=350$, $p=0.122$), Taste ($\mu=338$, $p=0.089$) and General Acceptability ($\mu=395.50$, $p=0.386$).

It further implies that the formulations of the Cheesy Jackfruit Embutido contributed to the variation of its appearance, aroma, texture and taste

5 Conclusion

As to appearance, the evaluators described both Formulations A and B has extremely Embutido Appearance. As to aroma, both Formulations A and B were described as Slightly Jackfruit Aroma. As to texture, the evaluators described both Formulations A and B as Moderately Smooth. As to taste, the evaluators described Formulation A as Extremely Jackfruit Flavor, while Formulation B was described as Slightly Jackfruit Flavor. As to General Acceptability, Formulation A was described by the evaluators as Liked Moderately, while Formulation A was Liked Extremely. Hence, Formulation B with 50% pork meat and 50% jackfruit is highly liked by the consumers.

Based on the study's findings, the following conclusions were made on Cheesy Jackfruit Embutido: it was generally accepted as it is Liked Moderately for Formulation A and Liked Extremely for Formulation B. Hence, jackfruit can be a good ingredient in enhancing the Embutido recipe. Also, utilizing this fruit as a meat substitute is cost-effective and provides more nutrients into the finished product.

References

1. Statista, (2021) Per capita meat consumption in the Philippines 2021, Statista Research Department. Retrieved from:
<<https://www.statista.com/statistics/756518/philippines-meat-consumption-per-capita-by-type/>>
2. Rosemary, (2021) *10 Interesting Facts You Need To Know About Food in The Philippines* Retrieved from
<https://www.authenticfoodquest.com/10-facts-food-in-the-philippines/>
3. Embutido (Filipino cuisine) “Embutido” (Filipino Meat Loaf). Saveur. Retrieved 11 December 2018. Retrieved from.
[https://en.wikipedia.org/wiki/Embutido_\(Filipino_cuisine\)](https://en.wikipedia.org/wiki/Embutido_(Filipino_cuisine))
4. Jackfrut Retrieved from <Merriam Webster Dictionary>, (2018)
5. Elevitvh and Manner, Retrieved from
<https://www.esearchgate.net/publication/328354285_Jackfruit_Artocarpus_hetero_phyllis_and_Breadfruit_A_altilis_Phytochemistry_Pharmacology_Commercial_Uses_and_Perspectives_for_Human_Nourishment>, (2006)
6. Amit and Ambarish. Jackfruit wine. Retrieved from
<<https://onlinelibrary.wiley.com/doi/full/10.1111/j.1541-43337.2012.00210.x>>, (2010)
7. McLeod, S. Experimental Method. Retrieved from
<<https://www.coursehero.com/file/19532256/Experimental-Method/>>, (2012)