

Development of a Healthy, Nutritious, and Delicious Tiesa (*Pouteria campechiana*) Polvoron

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Abstract

Canistel fruit also known as tiesa, has a scientific name *Pouteria campechiana*, is a yellow-colored tropical fruit but unlike other fruits, it is not juicy and sweet. The development of tiesa into polvoron was the main purpose of this study. Tiesa fruit was dehydrated and ground. Results showed that ground dehydrated tiesa fruit has a dark orange color and gritty texture. This was added to the classic recipe for polvoron. Three trials were conducted to standardize the procedure and ingredients. The developed tiesa polvoron is a low fat, sweet delicacy. It is a good source of calcium, phosphorus, and vitamin C. It has more fiber, niacin, and vitamin A compared to the classic polvoron. This research also determined the acceptability of tiesa polvoron in terms of appearance, aroma, flavor, and texture. The respondents of the study were 60 grade two students of Puting Kahoy Elementary School who were selected through purposive sampling. The respondents evaluated tiesa polvoron using a modified sensory evaluation form based on seven point facial hedonic scales. Frequencies and percentages were analyzed using Microsoft Excel. The study revealed that tiesa polvoron were liked very much in all the criteria. These results led to the conclusion that tiesa polvoron is healthy, nutritious, and delicious.

Keywords: *Pouteria campechiana*, healthy, nutritious

I. INTRODUCTION

Canistel fruit (tiesa) is an indigenous fruit with high nutritive value. It is an excellent source of carotene (provitamin A) which is needed for healthy eyesight. It also has fair levels of carbohydrates, niacin, ascorbic acid, iron, protein, calcium, phosphorus, thiamin, and riboflavin (Balerdi, 2014). On the other hand, many people, especially children do not like to eat tiesa. Some do not like its appearance while others do not like its taste and texture. For this reason, many disregard this fruit. This is the reason for its cheap price in the market. The Philippines is blessed with this indigenous fruit which, if processed and sold can be a source of income for the family or even a profitable commodity for business and industry. Polvoron is a popular delicacy in many Philippine households. It is one of the Filipino favorite snack or dessert. It is powdery and sweet made from a mixture of toasted flour, powdered milk, sugar, and melted butter. Other ingredients like pinipig or chopped nuts may be added. This study was conducted to enhance the sensory characteristics of tiesa from a neglected fruit to a mouthwatering delicacy. Specifically, this study aimed to establish a standardized recipe for tiesa polvoron; to determine the

nutritional content of tiesa polvoron; to calculate the selling price of tiesa polvoron; and to conduct a sensory evaluation in terms of appearance, aroma, flavor, and texture of tiesa polvoron.

II. METHODS

I. Materials

Equipment.

- Freezer: used to keep the shape and firmness of polvoron.
- Grinder: used to reduce the size of dehydrated tiesa.
- Multi Commodity used as a heat Pump Dryer (MCHPD): to remove the moisture content of tiesa. This help lengthen the shelf life.
- Stove: used to provide heat for cooking.

Utensils.

- Cellophane: used to wrap the polvoron
- Covered container: used in freezing the tiesa polvoron
- Measuring cups: used in measuring the flour, sugar and butter

- Mixing bowl: used as a container in combining all the ingredients
- Polvoron molder: used to shape the polvoron mixture
- Scraper: used to remove the excess ingredients in the molder to make the sizes equal
- Sifter: used to separate and remove the large pieces of tiesa grounds
- Skillet: used to toast and melt the ingredients
- Spoon: used for pressing the polvoron ingredients in the molder
- Weighing scale: used for measuring the ingredients by mass or weight
- Whisk: used to mix all the ingredients in the mixing bowl
- Wooden spoon: used in mixing the ingredients during cooking

Ingredients.

- Tiesa grounds
- All-purpose flour
- Powdered full cream milk
- Sugar
- Butter

II. Procedure

Figure 1 shows the development process of tiesa polvoron.

Preparation of tiesa. Tiesa was obtained at the market. Some were also collected from the neighborhood where the fruit usually fell off the trees but disregarded by many. The fruit was washed, peeled and cut into 3mm thickness before dehydration.

Dehydration and grinding process. The dehydration was done using the Multi Commodity Heat Pump Dryer (MCHPD). This drying condition ensures that the original nutritional properties of tiesa were retained after 24 hours of dehydration. Grinder was used to reduce the size of dehydrated tiesa. After grinding, tiesa grounds were produced. The tiesa grounds is not powder-like rather it is raisin-like creating a chewy texture.

Determine product specification. Tiesa polvoron is a yellow and sweet delicacy. The shape is round or any other desired shape depending on the availability of the molder. It

can be wrapped in colorful cellophane like the classic Filipino polvoron. It also has a chewy texture due to the presence of fruit grounds. The aroma is inviting that complements its sweet and milky taste. Tiesa polvoron is packed with essential nutrients for the body.

Determine the ingredients and procedure. The classic Filipino recipe for polvoron was modified by incorporating tiesa grounds to produce tiesa flavored polvoron. Tiesa grounds were used as the main ingredient of polvoron. Skimmed milk, sugar, and butter were added to come up with a tasty and nutritious polvoron.

Three experimental trials were done before recipe standardization to determine the best proportion of ingredients.

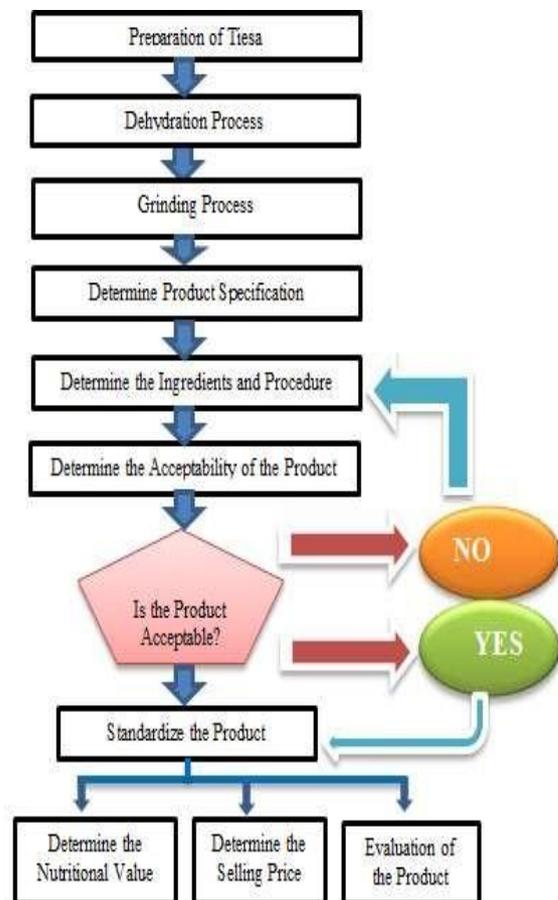


Figure 1: Process Flow of Tiesa Polvoron

First experiment. Table 1 shows the ingredients and the quantity of each ingredient for the first experiment. The purpose of the first experiment was to determine if tiesa polvoron is acceptable even without flour. The tiesa grounds were roasted in low fire for three minutes. In a mixing bowl

roasted tiesa grounds, milk, and sugar were combined. Butter was melted in low fire and put into the dry mixture. The mixture was shaped using polvoron molder. The finished product was placed in the freezer for 15 minutes.

Table 1: *Recipe for the first experiment of tiesa polvoron*

Ingredients	Household Measurements
Tiesa grounds	½ cup
Powdered Whole Milk	½ cup
White Sugar	¼ cup
Butter	2 tablespoons

Second experiment. Table 2 presents the ingredients and the measurement of each ingredient for the second experiment. The purpose of the second experiment was to compare the acceptability of polvoron with all-purpose flour and without all –purpose flour made in the first experiment.

In the second experiment flour was added. In addition, skimmed milk and brown sugar were used instead of whole milk and white sugar to make it healthier. There were little changes in the procedure used in the first experiment. The tiesa grounds were roasted in low fire for three minutes. In addition, all-purpose flour was heated for two minutes separately. In a mixing bowl roasted tiesa grounds, milk, and sugar were combined. The butter was heated in low fire and combined with the dry ingredients. After mixing well the mixture was shaped using polvoron molder. The finished product was placed in the freezer for 15 minutes.

Table 2. *Recipe for the second experiment of tiesa polvoron*

Household Measurements	Ingredients
Tiesa Grounds	½ cup
All Purpose Flour	½ cup
Powdered	½ cup
Skimmed Milk	
Brown Sugar	¼ cup
Butter	2 tablespoons

Third experiment. Table 3 shows the ingredients and the measurement of each ingredient for the third experiment. The

purpose of the third experiment was to compare the acceptability of tiesa polvoron with the ratios of 3:1 and 1:1 (tiesa grounds: all-purpose flour).

Table 3. *Recipe for the third experiment of tiesa polvoron*

Ingredients	Household Measurements
Tiesa Grounds	¾ cup
All Purpose Flour	¼ cup
Powdered	½ cup
Skimmed Milk	
Brown Sugar	¼ cup
Butter	2 tablespoons

Determine the acceptability of the product.

The produced polvoron in each trial were evaluated by fourth year nutrition and dietetics students and faculty. On the third trial, in addition to the usual evaluators, graduate students of Doctor of Public Health evaluated the product. The evaluators answered the sensory evaluation form and gave their comments and suggestions to improve the product in terms of appearance, aroma, flavor, and texture.

Standardize the product. In generating a standardized product that ensures the quality and quantity production of tiesa polvoron, the researchers did another three trials using the recipe on the third experiment. The same ingredients, measurements, utensils, and equipment were used for the three trials. In addition, the same procedure was applied for the three trials. The purpose of recipe standardization is to produce tiesa polvoron with the same taste, color, texture, and aroma on different trials.

Accuracy in measurements and specification of ingredients, materials, and procedure were observed.

Colored cellophane which is commonly used in the polvoron products was adopted in this study because these materials are proven and tested as an effective packaging material for polvoron products.

Determine the nutritional value. Food Composition Table (FCT; 1997) and Microsoft Excel 2013 were used in determining the nutrient content of tiesa

polvoron. Edible portion (EP) weights of each ingredient were also determined. The nutrient content was calculated using the following formula:

$$(FCT\ Value \div 100) \times EP\ wt.\ (g)$$

Nutrient adequacy ratio was also computed based on the recommended energy nutrient intake (RENI) and diet prescription for 7-9 years old. The formula used to determine the adequacy was: $(Nutritional\ Content \div RENI) \times 100$

Determine the selling price. Selling price (SP) was determined using the factor method. Food cost was 40%, thus the mark-up used was 2.5 The formula for computing the retailed price is: $Total\ Cost \div Yield) \times Mark-up = SP$

Evaluation of the product. Purposive sampling was employed in the selection of the respondents of this study. Purposive sampling is based on selecting the individuals as samples according to the purposes of the researchers as the controls (Calmorin et al., 2007). The chosen respondents were 60 grade two students from Puting Kahoy Elementary School. Target group were children because they usually ignore tiesa fruit. The respondents evaluated tiesa polvoron using a modified sensory evaluation form based on seven point facial hedonic scales. The students were instructed to evaluate the acceptability of tiesa polvoron in terms of appearance, aroma, flavor, and texture by checking the facial hedonic scales as a reflection of their feelings for the product during the evaluation.

III. RESULTS AND DISCUSSION

The results presented include the standardized recipe for tiesa polvoron, nutritional value, selling price, and acceptability in terms of appearance, aroma, flavor, and texture.

I. Standardized recipe

Three experiments were done to determine the ingredients and procedures needed to create tiesa polvoron based on its determined specification. In addition, three trials were conducted to determine the exact

measurements of the ingredients, equipment, utensils and procedures needed to come up with a uniform quality and quantity. The recipe standardization is useful for recipe enlargement.

According to the evaluators, the appearance of the product in the first experiment was acceptable; however, most evaluators dislike the consistency and taste. The texture of the tiesa grounds that made it difficult to chew was the main reason for unacceptable product. On the second experiment, most of the evaluators liked the polvoron with allpurpose flour more than without allpurpose flour in terms of appearance, aroma, flavor and texture. On the third experiment, most of the evaluators choose the 3:1 ratio of tiesa grounds and all-purpose flour in terms of appearance, texture, and taste on the third experiment.

The recipe created on the third experiment was used in standardized recipe trials. Table 4 shows the standardized recipe of tiesa polvoron. The yield of the recipe is 24 pieces. The polvoron contains 20g mixture per piece.

It can be done for 30 minutes.

These are the procedures in making tiesa polvoron:

- Measure all the ingredients.
- Slightly roast the tiesa grounds and all- purpose flour separately for three minutes in low fire.
- Combine all the dry ingredients in the mixing bowl.
- Melt the butter and put the melted butter in to the dry mixture.
- Press the molder in the polvoron mixture.
- On a plate, push the ejector handle to release the molded polvoron.
- Place it in a container and freeze for 15 minutes.

Table 4: *Standardized recipe of tiesa polvoron*

Ingredients	HH Meas.	EP wt. (g)
Tiesa Grounds	¾ cup	180
All Purpose Flour	¼ cup	60
Powdered	½ cup	120
Skimmed Milk		
Brown Sugar	¼ cup	60

II. Nutritional value

Table 5 presents the nutritional

Nutrients	Nutrient Content	RENI/ Diet Rx	NAR (%)
Energy (kcal)	60.00	1600.0	4.0
Protein (g)	2.50	43.0	5.8
Fat (g)	1.20	47.6	2.5
Carbohydrate (g)	9.60	249.9	3.8
Dietary Fiber (g)	0.70	25.0	2.8
Calcium (mg)	76.00	700.0	11.0
Phosphorus (mg)	50.00	500.0	10.0
Iron (mg)	0.50	11.0	0.1
Vitamin A (µg RE)	22.00	400.0	6.0
Thiamin (mg)	0.03	0.70	4.36
Riboflavin (mg)	0.05	0.70	7.14
Niacin (mg)	0.08	9.00	0.89
Vitamin C (mg)	4.00	35.00	11.00

content of tiesa polvoron per piece. It also shows recommendation for each nutrient based on the Recommended Energy Nutrient Intake (RENI), and diet prescription of children ages 7-9 years old.

Table 5: *Nutritional content and nutrient adequacy ratio of one piece (20g) tiesa polvoron*

Tiesa polvoron is energy-providing food, where one piece (20g) of polvoron provides 60 kcal. Carbohydrate is the main energy provider; it has 9.6 g (38kcal) per piece while fat provided the least, with only 1.2 g (11 kcal) per piece.

Table 5 also presents the nutrient adequacy ratio (NAR) expressed in percentage. It is based on 7-9 years old nutrient requirements. Results show that one piece of tiesa polvoron provides a variety of nutrients. A food product with ≥10% of RENI is a good source of nutrients based on the guidelines for use of nutrition and health claims from Codex International Food Standards (2013). This criteria shows that tiesa polvoron is a good

source of calcium, phosphorus, and vitamin C. The amount of other nutrients, however, provided in one serving of tiesa polvoron was not adequate to declare that tiesa polvoron is a good source of these nutrients. On the other hand, tiesa polvoron is low in fat as its fat content is ≤3g per portion or reference amount customarily consumed (RACC) as stated in Codex International Food Standards (2013). The developed tiesa polvoron has lower fat content than the usual polvoron because of the replacement of whole milk to skimmed milk.

In addition it is a source of fiber. It contains 0.7 g fiber per portion (20g) or 3.5 g per 100g. Codex International Food Standards (2013) stated that products containing 3 g of fiber per 100g of food can claim that it is a source of dietary fiber.

Tiesa polvoron can be eaten as a dessert or snack. It is recommended that consumers choose snacks that are packed with various nutrients, instead of empty calories (McConnell et al., 2014). Thus, the developed tiesa polvoron is a healthy option because it is low in fat, contains dietary fiber, various minerals and vitamins other than calories.

III. Selling price

Table 6 indicates the computation for the food cost of the product. Possible retailed price of each polvoron is presented after table 6.

Table 6: *Food costing of tiesa polvoron (71.40 ÷ 24)=2.98 Food cost*

$$2.98 \times 2.5 = 7.45 \text{ Selling price}$$

Based on the costing, the total food cost to make 24 pieces of polvoron is ₱71.40. Thus, the food cost for each polvoron is ₱2.98, and the selling price per piece is ₱7.45. The mark-up used was 2.5. This included the utility fee, packaging material and mark-up for man power.

The usual price of polvoron is ten pesos per piece, thus, the price of tiesa polvoron is a reasonable price.

IV. Sensory evaluation

The chosen respondents were students

from the grade two level (children ages 7 – 9 years old) at Puting Kahoy Elementary School. Sixty pupils were given a chance to taste and evaluate the tiesa polvoron. Figure 2 illustrates preference rating from evaluators regarding the sensory attributes of tiesa polvoron in terms of appearance, aroma, flavor, and texture.

Most of the students (85%) *like very much* the appearance and combination of white and orange color of the tiesa polvoron. Only one student (2%) like it slightly.

Results also show that 50 (83%) students indicated that they *like very much* the taste of tiesa polvoron, while 6 (10%) *like* it

moderately and only 4 (7%) *neither like nor dislike* the tiesa polvoron.

Sensory evaluation on texture shows that 50 (83%) students *liked very much* the texture or the mouth feel of tiesa polvoron. On the other hand, 3 (5%) students *dislike* the texture *very much*. Results indicate that 51 (85%) students *liked very much* the aroma of the tiesa polvoron and only 3 (5%) dislike moderately the aroma.

The results reveal that majority of the students *like very much* the tiesapolvoron in terms of appearance, aroma, flavor, and texture. Thus, tiesa polvoron is acceptable among the grade 2 elementary students.

Ingredients	EP wt. (g)	Unit Price per gram	Total (₱)
Tiesa grounds	180	0.120	21.6
Flour	60	0.052	3.12
Milk	120	0.284	34.08
Sugar	60	0.06	3.6
Butter	30	0.3	9
TOTAL PRICE			71.40

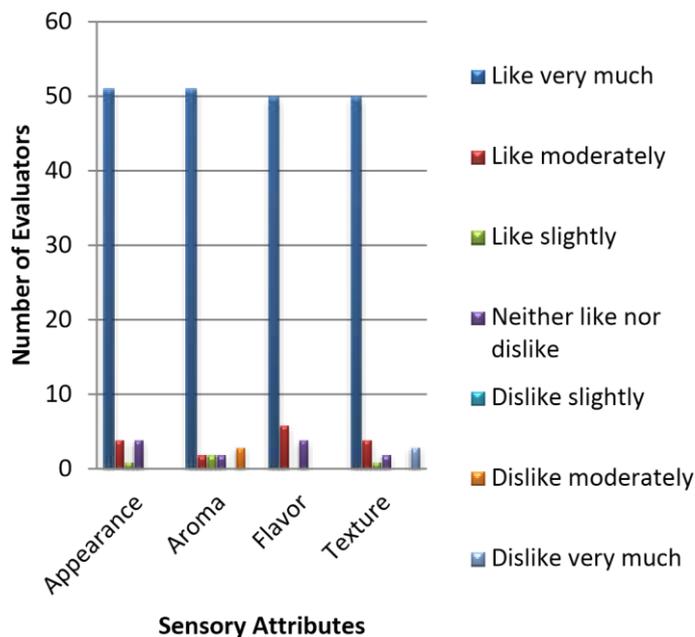


Figure 2. Preference ratings on each sensory attributes of tiesa polvoron

IV. CONCLUSION

Overall, the development of polvoron with tiesa as the main ingredient is possible. The development of tiesa polvoron changed the sensory attributes of tiesa from an undesired fruit to a

mouthwatering delicacy. This polvoron is considered as healthy snack and dessert because it is low in fat but a source of dietary fiber. It is also a good source of minerals such as calcium and phosphorus; and vitamins such as vitamin C. The tiesa polvoron was acceptable among grade 2 elementary students in all sensory attributes evaluated,

with appearance and aroma to be the most preferred attributes. Tiesa polvoron can be sold at a reasonable price of P7.45 per piece.

The development of tiesa polvoron contributes to the wide range of polvoron choices. It gives not just a sweet treat but a healthy and nutritious flavored polvoron.

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