

Sensory Evaluation And Acceptability Of Bambusa Blumeana As Bamboo Shoot Polvoron

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Abstract

The Bamboo shoots of the grassy Poaceae family have fiber, potassium and lignans, which are believed to hold anti-cancer, antibacterial, anti-fungal and anti-viral properties, according to agsy.t.wsu.edu. There is a legion of studies, which pertain to the use of bamboo shoots as the main ingredients in baked goods. An example is the Polvoron which is one of the popular desserts of Filipinos especially among young ones. This study present a new flavor of polvoron derived from the bamboo shoot powder. The product also underwent nutritional analysis that was conducted by the Food and Nutrition Research Institute Service Laboratory in Manila. This study aimed to develop processed bamboo shoot into polvoron along with its sensory evaluation and acceptability among consumers. The researchers used an experimental design for the four treatments with different measurement of bamboo shoot powder for every treatment employed during the evaluation. There are 50 untrained respondents. Respondents were able to select and evaluate the products using the Semantic scale for the color, taste and texture and hedonic scale and facial hedonic scale for the general acceptability of the product. Results showed that Treatment 3 had the most acceptable treatment with a mean value of 7.95, interpreted as Like Very Much with light brown, pronounced bamboo shoot flavor, moderately smooth texture and moderately detected bamboo shoot odour. Hence the incorporation of powdered bamboo shoots into polvoron is widely acceptable among its consumers.

1 Introduction:

Polvoron is a Filipino-style shortbread that is moulded and wrapped in a colourful plastic to maintain its the freshness (Lalaine, 2017). Also, it is one of the popular desserts in the Philippines, which originated in Spain (Kathy, 2013). It is one of the native Filipino delicacies served as dessert and merienda (Talabo and Villaruz, 2007). Eating plain polvoron is not healthy if eaten excessively. Thus, the researchers chose bamboo shoot, as one of the nutritious vegetables be to incorporated in polvoron.

On the other hand, powdered bamboo shoot, the ingredients utilized on the product to be developed came from bamboo which is the tallest grass in the world belonging to the family of Poaceae. It grows in tropical countries like the Philippines (Satya et al., 2012; Nongdam and Tikendra, 2014). Bamboo shoots sprouts adjacent to the bamboo plant (Deckard, 2017). The shoots can grow without any fertilizer or any chemical that can affect the given nutrients on the shoots.

Thus, making the shoots free from a residual Thus, making the shoots free from a residual toxin (Chongtham, Bisht & Haorongbam, 2011).

Furthermore, bamboo shoot is low in cholesterol and fat but, high in potassium, carbohydrate and dietary fats (Choudhury, Sahu, and Sharma, 2011). The rare kind of this edible bamboo shoots is used in cuisines because it has a matchless taste and flavour. Also, bamboo can be used in manufacturing other products and canned goods (Pande and Pandey, 2008). Also, Asian countries utilize bamboo shoot as food and for economic purposes (Organic facts, 2017).

Moreover, the bamboo shoot has sufficient vitamins and minerals such as Vitamin B6, riboflavin, thiamine, niacin, calcium, folate and pantothenic acid. The bamboo shoot also contains a nominal amount of carbohydrates, calories and sugar. It keeps you full for a long time. Thus, it helps you lose weight. It

can also reduce cholesterol, because of its phytonutrients, and phytosterols which helps you lessen the harmful cholesterol in the body. Furthermore, bamboo shoot is a medicinal plant because it can treat cancer, aid wound cleaning and prevent stomach disorder; it can also lower blood pressure (Organic fact, 2017; Deckard 2017). The bamboo shoot has antiinflammatory property. Thus it helps in relieving pain. It also has an anti-bacterial property which helps boosts the immune system (Nelz 2017).

Because of the nutritional value of bamboo shoot, the researchers would want to develop a polvoron with the incorporation of the bamboo shoot as its main ingredient. Previous studies on polvoron have shown that polvoron have been developed from milkfish bone (Food Business, 2016) in Northern Iloilo Polytechnic State Collage. Also Silliman University, also incorporated mango to polvoron (Lahoy et al., 2014). Furthermore, there were also polvoron made of peanut (Marvin, 2012) and polvoron made of squash (Talabo and Villaruz, 2013) as well as ampalaya polvoron (mikersindahawz, 2015).

Thus, the development of polvoron made of bamboo shoot helps in the implementation of National Government Program on food fortification as one way of eradicating malnutrition in the Philippine. DOST Region 02 has identified ISU Cauayan as

DOST Region 02 has identified ISU Cauayan as the beneficiary of assistance for the project entitled: Strengthening Bamboo Industry for Community Development in Cauayan City, Isabela in support of the SMARTER Cauayan City project. Cauayan City plans to revive bamboo as part of its One Town One Product (OTOP). With this, the production of bamboo food products will strengthen tourism industry and provide additional job opportunities in the municipality.

Objectives of the study

The study was conducted to determine the following:

1. Describe the acceptability of the sensory quality of the developed bamboo shoot regarding:
 - a. Colour
 - b. Texture
 - c. Taste
 - d. Odour
2. Determine the most acceptable polvoron at different proportions of bamboo shoot powder and
3. Determine the quality of bamboo shoot polvoron regarding the following:
 - a. Nutritional components
 - b. Cost-benefit analysis

2 Materials And Methods

Materials

I.Utensils

Measuring cups Pan
 Polvoron Molder Electric stove
 Wooden spoon Measuring spoon
 Mixing bowl
 Cellophane

II. Ingredients

Ingredients	Treatment 1	Treatment 2	Treatment 3	Treatment 4
Bamboo shoot powder	59.15 g	118.30 g	177.45 g	Without bamboo shoot powder
All purpose flour	177.45 g	118.30 g	59.15 g	236.59 g
Powdered milk	116 g	116 g	116 g	116 g
Refined sugar	30 g	30 g	30 g	30 g
Sweetened margarine	150 g	150 g	150 g	150 g

Methodology

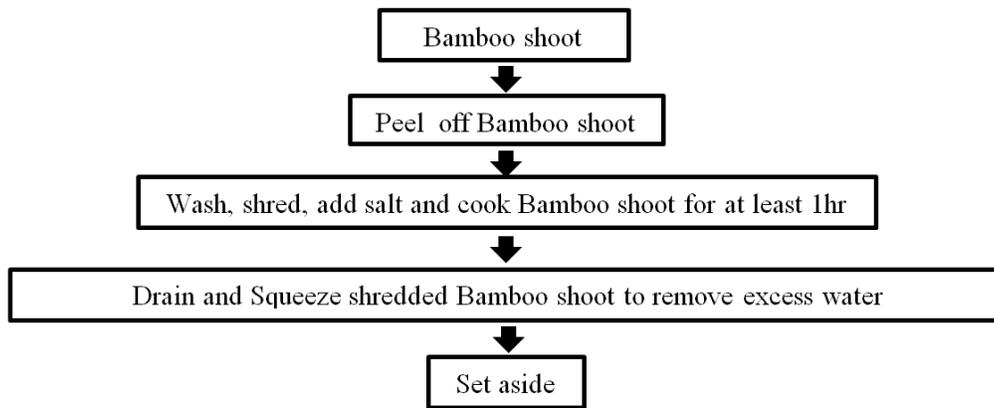


Figure 1. Schematic Diagram for the preparation of bamboo shoot

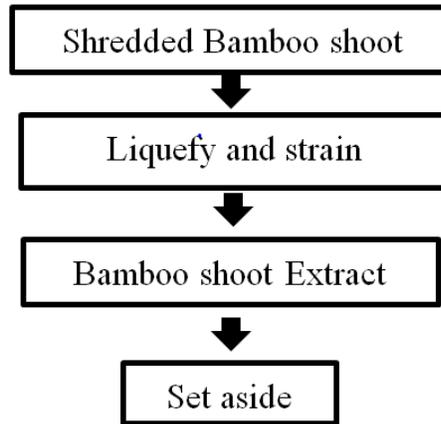


Figure 2. Schematic Diagram for the preparation of bamboo shoot extract

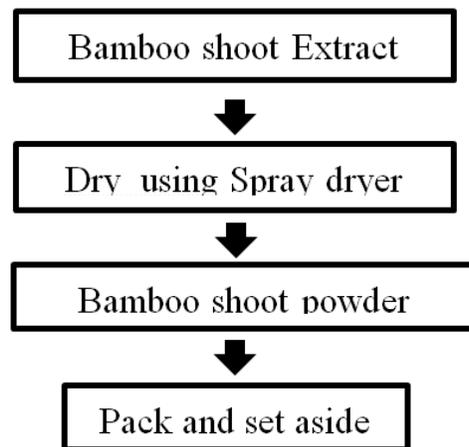


Figure 3.Schematic Diagram for the Preparation of Bamboo shoot Powder

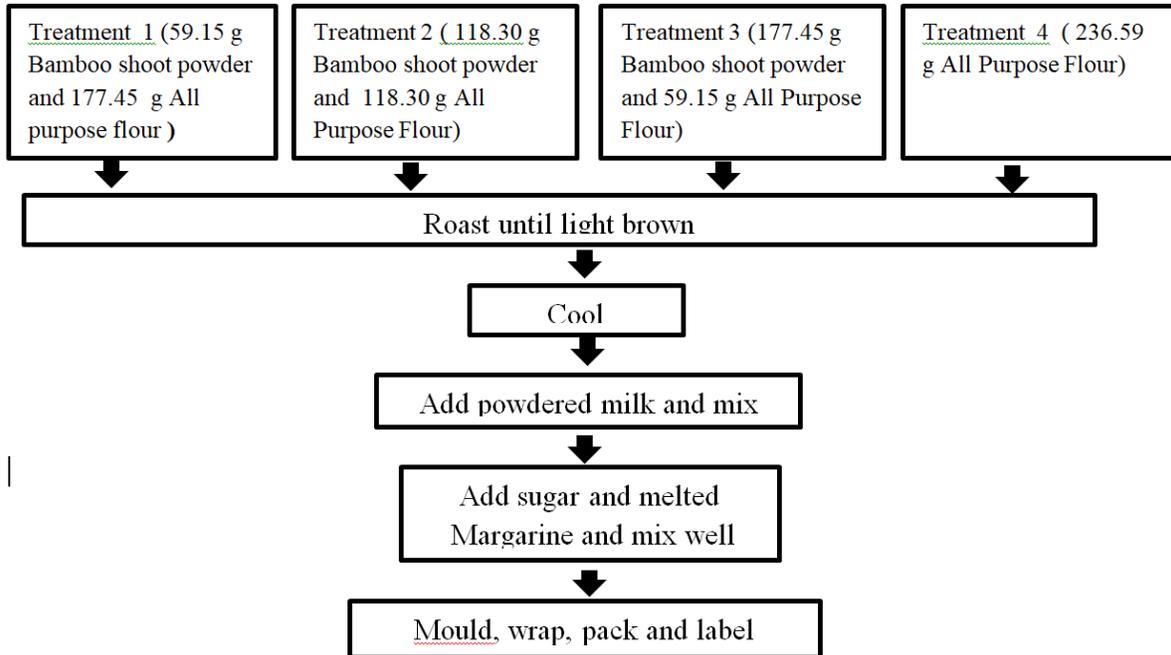


Figure 4. Schematic Diagram for the Preparation of bamboo shoot polvoron

Preparation of Bamboo shoot

Bamboo shoot (bayog) variety was bought at Angandan, Isabela. Peel off bamboo shoot, wash and shred. Add salt and boil shredded bamboo shoots for at least 1 hour. Drain and squeeze shredded bamboo shoot to remove excess water. Set aside. The schematic diagram for the preparation of bamboo shoot is shown in figure 1.

Preparation of Bamboo shoot extract

Liquefy shredded bamboo shoot, strain. Place extract into sterilized containers. Set aside. The schematic diagram for the preparation of bamboo shoot extract is shown in figure 2.

Preparation of Bamboo shoot powder

Use spray dryer to process bamboo shoot extract into powder. The schematic diagram for the preparation of bamboo shoot powder is shown in figure 3.

Preparation of Bamboo shoot Polvoron

Measure dry ingredients. In a medium-sized bowl, mix all purpose flour and bamboo shoot powder. Heat pan and roast all purpose flour and bamboo shoot powder until light brown. Cool. Add powdered milk. Mix well. Add sugar and melted margarine. Mix well. Mould the polvoron mixture to the desired size. Wrap in cellophane. Pack and label. The schematic diagram for the preparation of bamboo shoot polvoron is shown in figure 4.

Research Design

Completely Randomized Design (CRD) was utilized in this study. Four treatments were utilized as

follows: Treatment 1 (59.15 g Bamboo shoot powder and 177.45 g All Purpose Flour), Treatment 2 (118.30 g Bamboo shoot powder and 118.30 g All purpose flour), Treatment 3 (177.45 g Bamboo shoot powder and 59.15 g All Purpose flour) and Treatment 4 (236.59 g All Purpose Flour).

Sensory Evaluation

A sensory evaluation to determine the general acceptability and quality of bamboo shoot polvoron regarding colour, texture, taste and odour was done by a panel composed of 50 untrained judges. Selected judges were faculty, staff, students and vendors of Isabela State University- Cauayan Campus, High School students and Elementary pupils whose ages ranged from 8 years old to 45 years old.

The procedures and precautions involved in proper sensory evaluation as suggested by Gatchalian (1989) and Mabesa (1986) were followed in the study. An equal amount of samples from each treatment were coded with 3- digit random numbers. The coded samples were presented to each panel of evaluators in a randomized order. Score cards were used in the evaluation. The Hedonic scale and the Facial Hedonic scale or “smiley” rating scale was used to determine the general acceptability of the finished products and Semantic Scale was used to evaluate the quality of the products.

Statistical Analysis

Results of the sensory evaluation were statistically analyzed using the two-way classification of the analysis of Variance (ANOVA). Mean was used to determine if there is a significant difference among the treatment samples regarding colour, texture and taste of the bamboo shoot polvoron and its acceptability as well.

3 Results and Discussion

Table 1. Color Preference of Bamboo Shoot Polvoron

Treatment	Color Preference	
	Mean	Description
T1- 59.15 g bamboo shoot powder	4.10	Light Brown
T2- 118.30 g bamboo shoot powder	4.20	Light Brown
T3- 177.45 g bamboo shoot powder	4.18	Light Brown
T4- Control	3.84	Brown

As shown in table 1, the most preferred colour of bamboo shoot polvoron was Treatment 2 with a mean value of 4.20 and a descriptive interpretation of light brown. Treatment 1 and 3 had a mean value of 4.10 and 4.18 respectively and interpreted as light brown. Treatment 4 had a mean value of 3.84 and interpreted as brown. The colour of the food has a large impact on our perception of it. It can enhance the food quality by its colour. (Holland N, 2015).

Table 2. Analysis of Variance on Color Preference of Bamboo Shoot Polvoron

Source of Variation	SS	F	p-value
Between Groups	4.12	1.69	0.153
Within Groups	118.60		

Table 2 shows that there is no significance difference on the colour preference of the bamboo shoot

polvoron between and within groups of the Treatments with an F computed – value of 1.69 at the p-value of 0.153.

Table 3. Texture Preference of Bamboo Shoot Polvoron

Treatment	Texture Preference	
	Mean	Description
T1- 59.15 g bamboo shoot powder	4.00	Moderately smooth
T2- 118.30 g bamboo shoot powder	4.04	Moderately smooth
T3- 177.45 g bamboo shoot powder	4.20	Moderately smooth
T4- Control	4.24	Moderately smooth

As to the texture preference of the evaluators, Treatment 1,2,3 and 4 have a mean value of 4.00, 4.04,4.20 and 4.24 respectively and were interpreted as moderately smooth.

Texture can influence the flavour and appearance of the food. It is assessed in many different ways such as chewing, springiness and its fracturability (J.Smewing 2016).

Table 4. Analysis of Variance on Texture Preference of Bamboo Shoot Polvoron

Source of Variation	SS	F	p-value
Between Groups	2.122	1.01	0.391
Within Groups	134.94		

Table 4 shows that there is no significance difference in the texture preference of bamboo shoot polvoron between and within groups of the treatments with F computed – the value of 1.01 at p- value of 0.391.

Table 5.Taste Preference of Bamboo Shoot Polvoron

Treatment	Taste Preference	
	Mean	Description
T1- 59.15 g bamboo shoot powder	3.85	Moderately Pronounced Bamboo shoot flavor
T2- 118.30 g bamboo shoot powder	3.56	Moderately Pronounced Bamboo shoot flavor
T3- 177.45 g bamboo shoot powder	4.02	Pronounced Bamboo shoot flavor
T4- Control	1.75	Absenceof Bamboo shoot flavor

Regarding taste preference, Treatment 3 has a mean value of 4.02 which is interpreted as pronounced bamboo shoot flavour while Treatment 1 and 2 with a mean value of 3.85 and 3.56 respectively and were interpreted as moderately pronounced bamboo shoot flavour. Treatment 4 had a mean value of 1.75 and interpreted as absence of bamboo shoot flavour.

It has been supported by the study of Ogawa (2017) that the sense of taste is important as it allows for assessment of nutritional value, safety and quality of food for enjoyment and quality.

Table 6. Analysis of Variance on Taste Preference of Bamboo Shoot Polvoron

Source of Variation	SS	F	p-value
Between Groups	158.31	37.90	3.34E-19
Within Groups	261.77		

Table 6 shows that there is a significant difference in the taste preference of bamboo shoot polvoron between and within groups of the treatments with an F computed – value of 37.90 at p- value of 3.34 E – 19.

Table 7. Odor Preference of Bamboo Shoot Polvoron

Treatment	Odor Preference	
	Mean	Description
T1- 59.15 g bamboo shoot powder	3.16	Slightly detected bamboo shoot odor
T2- 118.30 g bamboo shoot powder	3.52	Slightly detected bamboo shoot odor
T3- 177.45 g bamboo shoot powder	3.84	Moderately detected bamboo shoot odor
T4- Control	4.48	Absence of Bamboo shoot odor

Regarding odour preference, Treatment 3 with a mean value of 3.84 which is interpreted as having a moderately detected bamboo shoot odour. While Treatment 1 and 2 with a mean value of 3.16 and 3.52 respectively and were interpreted having a slightly detected bamboo shoot odour. According to Negoias et al.,(2008) asserted that there is an increasing interest in the impact of aroma on appetite sensation and food intake.

Table 8. Analysis of Variance on odor Preference of Bamboo Shoot Polvoron

Source of Variation	SS	F	p-value
Between Groups	42.2	95.57	1.02E-28
Within Groups	14.8		

Table 8 shows that there is a significant difference in the taste preference of bamboo shoot polvoron between and within groups of the treatments with an F computed – value of 95.57 at p- value of 1.02E-28.

Table 9. Panel Evaluation on the General Acceptability of Bamboo Shoot Polvoron using the Hedonic Scale

Treatment	Degree of Acceptability	
	Mean	Description
T1- 59.15 g bamboo shoot powder	6.55	Like Moderately
T2- 118.30 g of bamboo shoot powder	6.53	Like Moderately
T3- 177.45 g of bamboo shoot powder	7.95	Like Very Much
T4- Control	6.55	Like Moderately

As shown in table 9, both Treatment 1 and Treatment 4 had a mean value of 6.55 and interpreted as like moderately. Treatment 3 has a mean value of 7.96 which is interpreted as like very much while treatment 2 has a mean value of 6.53 and interpreted as like moderately.

The most acceptable bamboo shoot polvoron was Treatment 3. Also, it can be gleaned that the more bamboo shoot powder added to the polvoron, the more appetizing it was due to as to its light brown colour. It is more acceptable with its moderately smooth texture, and more acceptable with its moderately pronounced bamboo shoot flavour and strong to slightly detected bamboo shoot odour.

Table 10. Analysis of Variance on the Hedonic Evaluation of Bamboo Shoot Polvoron

Source of Variation	SS	F	p-value
Between Groups	5.93	1.15	0.329
Within Groups	329.31		

The analysis of variance on the hedonic evaluation of bamboo shoot polvoron showed a significant difference in their acceptability for Treatment 1, 2, 3 and 4 with an F value of 1.15 and p-value of 0.329.

Table 11. Result of Nutritional Analysis of Bamboo shoot Polvoron

ANALYTE per 100g	RESULTS	REFERENCE METHOD	
Ash, g	2.0	AOAC 930.30	
Energy. Kcal	500	Computed using at water Factors	
Total fat, g	23.5	Acid Hydrolysis (Soxhlet)	
Total Carbohydrate,g	65.9	Computed by difference	
Parameters	Unit	Test Method	Test Method
Moisture	g/100g	Vacuum Oven Drying	2.32
Protein (N x 6.26)	g/100g	Kjeldahl	6.32

Table 12. Cost and Return of Processing Bamboo shoot Polvoron

Ingredients	Quantity	Price
Sweetened Margarine	150 g	₱43.50
White Sugar	30 g	₱15.00
All- purpose flour	53 g	₱26.00
Powdered Milk	116 g	₱32.00
Japanese wrapper	1	₱10.00
Bamboo Shoot powder	1.5 kg	₱ 117.00
Shellane	11 kg	₱ 26.67

Fare	1	₱50.00
Labor	2 hours	₱ 62.50
Total Expenses		₱ 382.37
Product	Quantity	TOTAL
Bamboo shoot Polvoron	55 x ₱ 8.00	₱ 440.00
Expenses		₱ 382.37
Gross Income		₱ 57.63

4 Conclusion

The development of polvoron made of bamboo shoot helps in the implementation of National Government Program on food fortification as one way of eradicating malnutrition in the Philippines. Having high nutritive value, it can be processed into a wide variety of nutritious product. One of which is the development of bamboo shoot polvoron. The study shows that incorporation of bamboo shoot powder, along with the development of the polvoron, is widely accepted among its possible consumers. Based on the results of the study the most acceptable is Treatment 3 with 177.45 g of bamboo shoot powder regarding texture, taste and odour and over all acceptability. No significant differences were observed on the colour and texture. All the finished products were considered too light brown and with moderately smooth texture. A pronounced bamboo shoot flavour was detected in Treatment 3, and a moderately pronounced bamboo shoot odour was also detected. Significant differences were observed on the taste and over all acceptability of the finished products.

5 Recommendations

The result of the study recommended that in incorporating bamboo shoot as one of the main ingredients of the product polvoron, It is recommended that microbial analysis and shelf life analysis of this product be under taken by the next researchers. Lastly, technology transfer is done to promote bamboo shoot processing, utilization and consumption among its beneficiaries.

Reference

1. Deckard (2017) 6 Proven Benefits of Bamboo Shoots Retrieve from <https://healthyfocus.org/benefits-of-bamboo-shoots/benefits-of-bamboo-shoots/>
2. Calmorin, Surtida(2016) How to Make Milkfish Bone Polvoron
3. Retrieve from <http://businessdiary.com.ph/2743/how-to-make-milkfish-bone-polvoron/>
4. Chongtham N, Singh Bisht M, Haorongbam S, (2011) Nutritional Properties of Bamboo shoots: Potential and Nutritional properties of Bamboo shoots: Potential and Prospects for Utilization as a Health Food First Published: Full publication history DOI:10.1111/j.1541-4337.2011.00147.x
5. Retrieve from <http://dx.Onlinelibrary.wiley.com>
6. D.Choudhury, K. Jatindra Sahu, and G. D. Sharma Jatindra K. Sahu,(2012) J Food Sci Technol. 49(4): 407-414 DOI: 10.1007/s13197-011-0379-z PMID: PMC3550903 Retrieve from <http://www.ncbi.nlm.nih.gov/pmc/article/PMC3550903/>
7. Deckard A. (2017) 6 Proven Benefits of Bamboo Shoots Retrieve from <https://healthyfocus.org/benefits-of-bamboo-shoots/benefits-of-bamboo-shoots/>