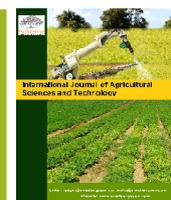




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Development of Turmeric-Flavored Pastillas

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Abstract

Product development has been major activity in the food industry. The pressure for developing a new product became very strong on the needs of the growing markets for constant changing. Filipinos are known for their sweet tooth. They love to eat sweets not just in every occasion but even in a regular time of the day. Sugar is beneficial to the brain; to be exact, sweets are food for the brain but it should be consumed by the body properly because in can also harm us when taken too much. The researchers gathered feedback by distributing survey questionnaire to the respondents. The survey questionnaire consists of questions about the acceptability of Turmeric Flavored Pastillas. The questionnaire also includes the criteria for the evaluation of the product which are the following: appearance, aroma, flavor and taste. The researchers brought some sample of Turmeric Flavored Pastillas to DOST-BSU food testing laboratory for microbiological analysis. Yeast and Molds Count, Aerobic Plate Count, Coliform Count, *Staphylococcus aureus* and *Salmonella* that are within ate FDA microbiological standards. The sample was negative for the presence of *Salmonella*. The sample has passed all the parameters of microbiological quality. Based on the evaluation of the one hundred (100) respondents on the Turmeric Flavored Pastillas, the appearance has the weighted mean of 4.56 which is very acceptable. The aroma has the weighted mean of 4.61 which is very acceptable, the flavor has the weighted men of 4.88 which is very acceptable, the taste has the weighted mean of 4.38 which is also very acceptable and the texture has the weighted mean of 4.89 which is very acceptable. The overall mean from the level of acceptability of all the respondents was 4.664 and concluded as very acceptable. Based on the results, conclusions and recommendation the future researchers are looking forward to develop new product using different flavors aside from turmeric nut still beneficial. Microbial analysis is a must for product development. Proper hygiene and sanitation practices must be observed in order to pass the microbial analysis test.

Keywords: Product development, Food product, Food innovation

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1. Introduction

Nowadays, people tend to consider the use of the Traditional Medical System. According to the study conducted by Firenzuoli (2004), traditional medicines have a very long history: it is the sum total of the practices based on the theories, beliefs, and experiences of different cultures and times, often difficult, used in the maintenance of health, as like in the prevention, diagnosis, improvement, and treatment of illnesses. Natural plant products have been used in human history for various purposes, which may indicate safety but not the efficacy of treatment, still, the product to its target purpose when developed.

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There are lots of plants and herbs emerging today that can be used for treating various illnesses and diseases. This study will focus on turmeric widely known as yellow ginger with the scientific name of *Curcuma longa*. Turmeric is a plant known to have a very long history of medicinal use. In Southeast Asia, turmeric is used not only as a principal spice but also as a component in religious ceremonies. Because of its brilliant yellow color, turmeric is also known as Indian saffron, and now, modern medicine has begun to recognize its importance. As cited by Araujo and Leon (2001), in Ayurvedic medicine, turmeric is a well-documented treatment for various respiratory conditions (e.g., asthma, bronchial hyperactivity, and allergy), as well as for liver disorders, anorexia, rheumatism, diabetic wounds, runny nose, cough, and sinusitis. It has also been used to treat sprains and swelling.

In a study conducted by Aggarwal *et al.* (2013) it is found out that in traditional Chinese medicine, turmeric is used to treat diseases associated with abdominal pain.

For every medicine human consumes, it has a varying effects. Turmeric has its positive and negative effects. Several studies revealed that turmeric is a flavorsome spice that is nutritious to consume. This plant is used to reduce inflammation, used as a pain reliever, adds anti-oxidant capacity to the body and also reduced the risk of cancer. While turmeric does provide potential health benefits, it creates some risks that are worth considering before consuming large amounts. When consumed irresponsibly, turmeric stimulates the stomach to produce more gastric acid. Purifying properties of turmeric may also lead to more natural bleeding; the reason why people who will undergo operations are prohibited from using medicine with turmeric content and turmeric is also forbidden to pregnant women because of its blood-thinning effects.

According to the study conducted by Thimmayamma *et al.* (1983), Polasa (1991) and Krishnaswamy (1996), the reported consumption of turmeric in Asian countries in humans is in the range of 200-1000 mg a day or 160-440 g per person each year. Intake in urban areas is lower 200 mg a day than in rural areas is 600 mg a day per person. People tend to self-medicate because of different reasons but must also know that action, there is a corresponding reaction; same with drinking medicines or even medicinal plants, medication should be consumed by the human body responsibly.

However, the researchers try to develop a productive and healthful product made of turmeric that will be convenient for all, students, school, and community.

It may help us as a source income or business to the local community with a dominant resource of turmeric. This theory supports the researchers in preparing the turmeric flavored pastillas.

With the reasons cited above, the researchers came up with the idea of developing a product from turmeric, which can attract not just herbal lovers but also children and young adults.

1.1. Statement of the Problem

This research study aims to show how herbs such as turmeric as main flavorings of pastillas can be a healthy and delicious dessert.

Specifically, this study sought answers to the following:

1. What is the profile of respondents in terms of:
 - 1.1 Age
 - 1.2 Gender?
2. What are the ingredients in preparation Turmeric Flavored Pastillas?
3. How do a microbiological analysis of Turmeric Flavored Pastillas be evaluated in terms of:
 - 3.1 Aerobic Plate Count
 - 3.2 Coliform Count
 - 3.3 Escherichia Coli Count
 - 3.4 Listeria Monocytogenes; and
 - 3.5 Staphylococcus Aureus Count?
4. How may the sensory quality of Turmeric Flavored Pastillas be assessed in terms of:
 - 4.1 Appearance
 - 4.2 Aroma

- 4.3 Flavor
- 4.4 Taste; and
- 4.5 Texture?

5. What is the level of acceptability of Turmeric Flavored Pastillas with regards to its sensory evaluation?

1.2. Significance of the Studies

The researchers strongly believed that *Curcuma longa* is healthy and delicious based on a survey conducted by DOST, as a dessert and will be beneficial to the following:

1. Children – It will prevent them from getting too much sugar, which they get from eating ordinary candies and also help them gain nutritional benefits.
2. Adult – Turmeric can lower the blood pressure and blood sugar level. It can also increase the antioxidant capacity of the human body and improving the brain function and reduce the risk of brain diseases.
3. Community – The result of this study will provide awareness on the development of a new sweet product and serve as an alternative healthy dessert
4. Business Entrepreneurs – This will provide information on the different features of the food product that will allow them to develop a product of similar nature, properties and nutrient benefits which could be a possible business venture.
5. Future Researchers – The study will be a source of information on how to conduct research. It will also help them understand the other aspects of the product.

1.3. Scope and Delimitation of the Study

This study was concerned principally on the ingredients and process of developing turmeric-flavored pastillas with its proper appearance, aroma, texture, and taste. The 100 respondents as follows: 50 students, 15 entrepreneurs, 15 faculty, and 20 DOST staff. The study covers the first semester of the year 2019. The information is accumulated through surveys and utilizing frequency, average, and percentage.

2. Theoretical Framework

To establish the foundation upon this study, it is necessary to call all reviews that are related in this research,

2.1. Related Literature

The following review of literature helps the researchers in the pursuit of the study. As stated by Prasad and Aggarwal (2012), turmeric is a plant that has a very long history of medicinal use. It proves that even before turmeric is used for healing. This supports the study conducted by Newman and Cragg (2007) that Indians use turmeric as the main plant-based on drugs or formulations to treat different ailments, including cancer.

Moreover, Govindarajan (2004) explained that turmeric is a minor spice in the West but a significant spice in the East. In Asia, both color and aroma are qualities that are equally significant while in the westerners mainly, if not solely, on its color. Turmeric has been used for centuries in Chinese and Ayurvedic medicine for the treatment of dyspepsia and epigastric pain. A clinical trial, which 600 mg turmeric root was administered five times daily to patients with Peptic Ulcer Disease (PUD), reported ulcer resolution at four weeks and 12 weeks in 48% and 76% of patients, respectively, according to Eichen (2018). However, turmeric can have side effects when taken in large doses. Some supplements contain up to 500 mg of turmeric extract. Cox (2017) pointed out that high doses of turmeric can lower blood sugar or blood pressure. Ulbricht in the year 2017, also said that people with diabetes or blood pressure medication should use caution while taking turmeric. Turmeric should not be paired with aspirin, warfarin, anti-platelet drugs, and NSAIDs, such as ibuprofen, because it can cause bruises. Pregnant women should avoid high doses of turmeric; it can promote menstruation, or stimulate the uterus to put the pregnancy at risk. Furthermore, Vaughn *et al.* (2016), argues that ten studies were noted statistically significant improvement in skin disease severity in the turmeric or curcumin treatment groups compared with control groups. Overall, there is early evidence that turmeric products and supplements, both oral and topical, may provide therapeutic benefits for skin health. However, some studies also explain that investigations are still limited, and further studies will be essential to better evaluate the efficacy better and the mechanisms involved.

Turmeric is beneficial to all, especially in the health business. The related literature supports and holds as evidence that turmeric condiments are a healing condiment that can be transform into a product that will help the body and even the community.

2.2. Related Theories

These reviews of related theories aim to contribute towards more precise understanding of the different associated methods of the study that have been identified. These may help the research to support that turmeric is a medicine and is healthy to the body.

According to the study of Bhowmik *et al.* (2009), turmeric is an ancient spice, a native of South East Asia, used from antiquity as dye and condiment. It is also the mild digestive, aromatic, a stimulant, and a carminative. Turmeric is known for nature's most powerful healer. This study supported by Harish (2013) in which turmeric belongs to the family Zingiberaceae that is a medical and aromatic plant with multiple uses.

2.3. Pharmacological Activities

2.3.1. Healing Property, Skincare

According to Chattopadhyaya *et al.* (2004), turmeric's oil and ether and chloroform extract have proved to be anti-protozoan, anti-viral, and antibacterial in the study conducted by Omoloso and Vagi (2001), turmeric shows broadspectrum antibacterial activity in screening for an antibiotic property.

In the study conducted by Negi *et al.* (2000), turmeric oil obtained as a byproduct from curcumin manufacturer was subjected to antibacterial review and found effective against *Bacillus cereus*, *Bacillus coagulans*, *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*.

2.3.2. Anti-cancerous

As cited in the study of Shao *et al.* (2002) and Choudhary *et al.* (2002) which argues that turmeric has shown a suppressive effect on human breast carcinoma cells. This study was proven by Kuo *et al.* (2000) that turmeric has anti-oxidant and anti-tumor promoting impact due to the induction of apoptosis in human leukemia cells.

2.4. Analgesic Action

According to Khare (2002), turmeric paste mixed with lime and saltpeter then applies to hot is a popular application for inflammation.

2.5. Anti-diabetic Property

As cited in the study of Arun and Nalini (2002), turmeric was famous for its ant diabetic property. The other experimental studies proved the efficiency of turmeric in diabetes.

2.6. Related Studies

As stated by Labban (2014) explains that turmeric or *Curcuma longa* is a perennial herb and member of the Zingiberaceae (ginger) family, and is cultivated extensively in Asian Countries. The rhizome, the portion of the plant used medically as a yellow powder which is used as a flavor in many cuisines and as medicines to treat many diseases, particularly as an anti-inflammatory and for the treatment of flatulence, jaundice, menstrual difficulties, hematuria, bleeding, and colic or can be applied an ointment to treat many skin diseases. This study is supported by Allegrì *et al.* (2010), who said that curcumin is a polyphenol, has shown to target multiple signaling molecules while also demonstrating activity at the cellular level, which has helped to support various health benefits. There are countless therapeutic benefits to curcumin supplementation; most of these benefits are its anti-oxidant and antiinflammatory effects. However, the researchers try to develop a productive and healthful product made of turmeric that will be convenient for all students, school, and community. It may help us as a source income or business to the local community with a dominant resource of turmeric.

This theory supports the researchers in preparing the turmeric flavored pastillas.

2.7. Dairy Products

Milk is a widely consumed beverage that is essential to the diet of several millions of people all over the world because it provides crucial micro and micronutrients according to the study of Visioli and Strata (2014). Milk is known and recognized as useful during childhood and adolescent periods because of its composition. Besides, milk or dairy products such as cream, butter, yogurt, cheese, and some desserts have been produced and consumed worldwide. Therefore, the impact of milk and dairy products dominates worldwide, especially for human health is quantitatively relevant.

In the Philippines, Filipinos have this so-called pastillas. Pastillas are said to be sweet milk candies as dessert. This product was an original recipe from carabao’s milk wherein cooking is necessary. Dairy products are the primary source of calcium and other vital nutrients in the human diet, according to Jahan and Hossain (2018).

2.8. Definition of Terms

Anti-inflammatory – Refers to the property of a substance or treatment that reduces inflammation or swelling.

Antioxidant – Refers to one of the properties of turmeric that reduces damage due to oxygen, such as free radicals.

Aroma – Refers to the distinctive smell of the product.

Ayurvedic Medicine – Refers to the system of medicine with historical roots in the Indian subcontinent. Globalized and modernized practices derived from Ayurveda traditions are a type of alternative medicine.

Curcumin – Refers to the bright yellow chemical produced by *Curcuma longa* plants. It was sold as an herbal supplement, cosmetics, ingredients, food flavoring, and food coloring.

Dessert – Refers to the sweet course or dish and usually served at the end of a meal.

Diabetes – Refers to the disease that occurs when your blood glucose, also called blood sugar, is too high.

Escherichia coli – Refers to an indicator of fecal pollution (as of water or food) and in medicine and genetics as a research organism and that occurs in various strains that may live as harmless inhabitants of the human lower intestine or may produce a toxin causing intestinal illness.

Pastillas – Refers to the “milk tablets” or “milk pills”, which describes this sweet delicacy.

Sprain – Refers to a stretching or tearing of ligaments.

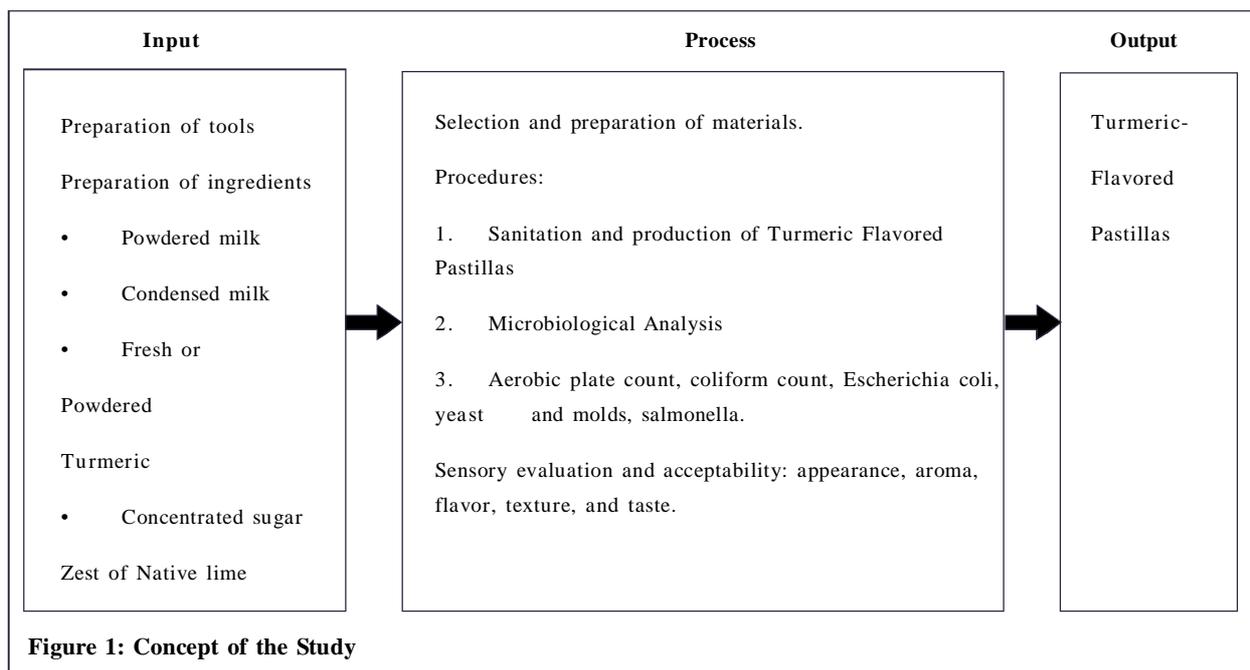
Turmeric – Refers to a flowering plant, *Curcuma longa* of the ginger family as the main ingredient for pastillas.

2.9. Conceptual Framework

The conceptual framework of this study provides everything needed to develop the product. The process will also be stated in the context, and the expected output to be achieved after the study. The following factors are the ingredients and equipment to be used to develop the products that will be stated in the Input. The experiment of the product will be stated on the process, and as of the result, it will have noted on the output.

In the pursuance of the study, Figure 1 shows the IPO model used in the conceptual framework.

The Input shows the ingredients used in the production of Turmeric Flavored Pastillas. The process reveals the different methods used in making the Turmeric Flavored Pastillas, which includes the following: selection and preparation of raw materials, sanitation, production of Turmeric Flavored Pastillas microbial analysis such us; aerobic plate count, coliform count, yeast and molds, Escherichia coli and salmonella. The output shows the development of the finished product of the Turmeric Flavored Pastillas.



2.10. Assumption

The development of Turmeric Flavored Pastillas has a potential to be an indemand business because of its high-quality ingredients and researchers can distribute or can be a supplier of different markets here in Hagonoy or any places because of its tantalizing appearance and taste.

3. Methodology

This chapter presents the product development of the study and the research procedure for the selection and preparation of Turmeric-Flavored Pastillas and the tools and equipment. This also covers the methods and techniques used in the study.

3.1. Research Methods and Techniques

3.1.1. Research Experiment

The researchers used “turmeric” as their main flavoring in the utilization of pastillas. Secondary ingredient is “dayap” and the usual ingredients in pastillas making came after.

3.1.2. Selection and Preparation of Raw Materials

The ingredients of Turmeric-Flavored Pastillas are: Powdered milk, Concentrated Sugar, Condensed milk, Powdered Turmeric, Native Lime. In making Turmeric-Flavored Pastillas, prepare all the tools and ingredients to be used in making the product. First, mix all the dry ingredients in a mixing bowl, make well and pour the evaporated milk and mix well, then, add the native lime extract to add flavor and aroma. Make any shape preferred. Lastly, roll it into the concentrated sugar and pack.

3.2. Supplies and Materials

The researchers prepared the tools and equipment such as a knife, chopping board, mise-en-place bowls, measuring cup, measuring spoon, graduated measuring cylinder, mixing bowl, spatula weighing scale. The product will be developed by testing several formulations until the desired outcome was achieved.

3.3. Methods and Techniques

The product will be tested in terms of Aerobic plate count, Coliform count,

Escherichia coli count, Yeast and Molds count and salmonella determination at BulSU Analytical Testing Laboratory. Table 1 shows the trial and error of the product. At first, the product has the bad aftertaste caused by turmeric so the researchers try to add flavor to the product. Second, the researchers add a flavor of native lime and reduce the turmeric to lessen the taste of turmeric and the result lacks the flavor of turmeric and the lime has dominant taste. Third, the researchers add a little bit of turmeric to balance the taste of turmeric and the native lime.

3.4. Microbiological Analysis of Turmeric-Flavored Pastillas

In preparing the Turmeric-Flavored Pastillas, sterilization and sanitation of tools and equipment needed are necessary. The preparation of the product was done in the HRM laboratory room at BulSU Hagonoy Campus and to ensure that the product would not be contaminated, the researchers wore proper laboratory gown, hairnet, hand gloves and clean apron. The product sample has undergone the microbiological analysis specifically, Aerobic plate Count, Coliform

First Trial	Second Trial	Third Trial
300 g powdered milk 2 cups condensed milk 1 tbsp. powdered turmeric 1/4 kg. concentrated sugar	300 g powdered milk 2 cups condensed milk 1/2 tbsp. powdered turmeric 1 tbsp. Zest of native lime ¼ kg. concentrated sugar	300 g powdered milk 2 cups condensed milk 1 tbsp. powdered turmeric 1 tbsp. Zest of native lime ¼ kg. condensed sugar
The product has bad aftertaste caused by turmeric	It lacks the flavor of turmeric so the taste of lime is more dominant	The product achieved the balanced taste of turmeric and the native lime

Count, Yeast and Molds Count, *Escherichia coli* count and *Salmonella* determination that was conducted at the BulSU-DOST Food Testing Laboratory, Bulacan State University, City of Malolos, Bulacan.

3.5. Instrument of the Study

The main instrument of the study was the survey questionnaires which were distributed among the college students, DOST staff, business entrepreneurs and faculty members. The respondents evaluated the products as its appearance, aroma, taste, texture following the rating scale of 5 very acceptable, 4 acceptable, 3 moderately acceptable, 2 fairly acceptable, and 1 as not acceptable. A portion where the respondents can write their comments and suggestion was also presented on the survey questionnaire.

The researcher brought sample of Turmeric-Flavored Pastillas to DOSTBSU Food Testing Laboratory for microbial analysis. The sample Aerobic Plate Count, Coliform Count, *Escherichia coli* count and yeast and Molds count values are within the BFAD Microbiological Standards.

Table 2 show the distribution of respondents wherein 50% are college students of BulSU Hagonoy Campus, 20% are DOST Staff, 15% are business Entrepreneurs and 15% are faculty members of BulSU Hagonoy Campus from a total of 100 respondents.

The researchers chose the respondents based on random sampling method.

3.6. Sensory Evaluation of Turmeric-Flavored Pastillas

The sensory evaluation of the sample was conducted at the BSU-DOST Food Testing Laboratory. The product was rated base on its Appearance, Taste, Aroma, and Texture and with five (5) as the highest and one (1) as the lowest in the evaluation of the product.

Names of Respondents	Number of Respondents	Percentage
BulSU Hagonoy Campus - College Students	50	50%
DOST Staff	20	20%
Business Entrepreneurs	15	15%
BulSU Hagonoy Campus -Faculty Members	15	15%
Total:	100	100%

Table 3 shows the rating scale shows the scale from 1-5, range of 5.00-1.00 and verbal interpretation of very acceptable, acceptable, moderately acceptable, fairly acceptable and not acceptable.

The scale of 5, with a range of 5.00-4.50, has verbal interpretation of very acceptable. The scale of 4, with a range of 4.49-3.50, has verbal interpretation of acceptable. The scale of 3, with a range of 3.49-2.50, has verbal interpretation of moderate acceptable. The scale of 2, with a range of 2.49-1.50, has verbal interpretation of fairly acceptable. The scale of 1, with a range of 1.49-1.00, has verbal interpretation of very acceptable.

Scale	Range	Verbal Interpretation
5	4.50-5.00	Very Acceptable
4	3.50-4.49	Acceptable
3	2.50-3.49	Moderately Acceptable
2	1.50-2.49	Fairly Acceptable
1	1.00-1.49	Not Acceptable

Table 4 shows the profile of respondents according to age wherein there are 49 college students of BulSU Hagonoy Campus ages 16-25 and 1 whose age is between 26-35. There are 3 DOST staff ages 16-25 and 15 ages 26-35. There are 5 Business entrepreneurs ages 16-25, 7 are ages 26-35 and 2 whose age is above 35. There are 3 Faculty members of BulSU Hagonoy Campus ages 16-25, 7 ages 26-35 and 5 whose ages are above 35. The table shows that 60 or 60% of the respondents are ages 16-25, 30 or 30% ages 26-35 and 10 or 10% are ages 35 above.

Table 4: Profile of Respondents According to Age

Respondent	Age		
	16-25	26-35	35 above
BulSU Hagonoy Campus- College students	49	1	0
DOST Staff	3	15	2
Business Entrepreneurs	5	7	3
BulSU Hagonoy Campus- Faculty	3	7	5
Total	60	30	10

Table 5 shows the profile of respondents according to gender. For the college students of BulSU Hagonoy Campus, there are 36 male and 14 female respondents. The DOST staff has 12 male and 8 female respondents. The business entrepreneur respondents are 5 male and 10 female. Faculty members of BulSU Hagonoy Campus has 9 male and 6 female respondents with a total of 100 respondents.

The table shows that 62% of the respondents are male and 38% are female.

Figure 2 shows the schematic diagram of the preparation of Turmeric Flavored Pastillas. First, the researchers will prepare the tools and ingredients to be used in making the product. Next is, ingredients should be mixed well. After mixing, mold the mixture in any shape preferred. Perform the sugar dusting afterward. Lastly, is the packaging, use candy wrappers with different colors to make it more presentable and appealing to the market.

Table 5: Profile of Respondents According to Gender

Respondent	Gender	
	Male	Female
BulSU Hagonoy Campus-College students	36	14
DOST Staff	12	8
Business Entrep.	5	10
BulSU Hagonoy Campus-Faculty	9	6
Total	62	38

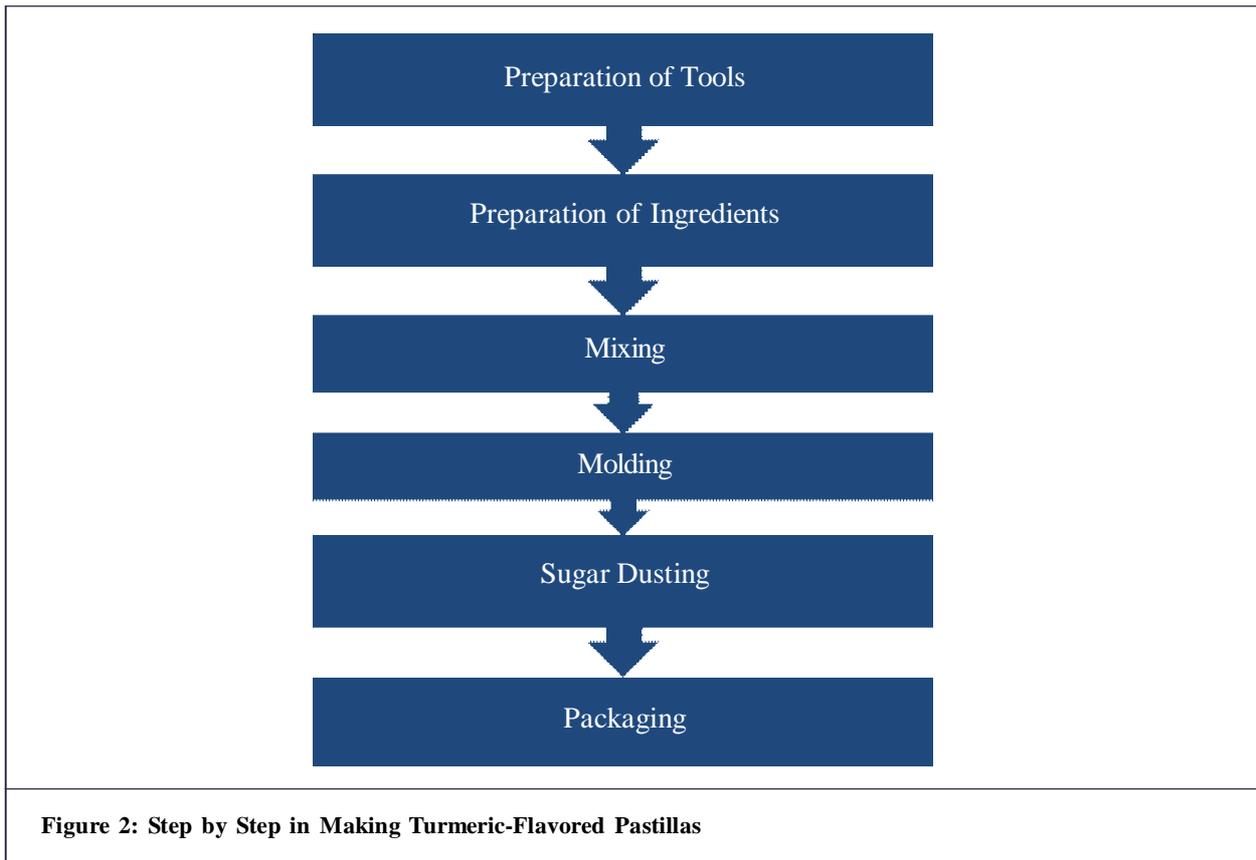
3.7. Statistical Treatment of Data

Frequency count is used to determine the total number of respondents. The formula used is:

$$F = n_1 + n_2 + n_3 + n_4$$

where, n_1 – No. of college students

n_2 – No. of DOST staff



n_3 – No. of business entrepreneur

n_4 – No. of faculty

$F = \text{College students of BulSU Hagonoy Campus} + \text{DOST staff} + \text{business entrepreneur} + \text{faculty members of BulSU Hagonoy Campus}$

3.8. Weighted Mean

The kind of average of each data point contributing equally to find the mean, some data points contribute more “weight” than others. The formula was used:

$$\frac{\sum w_i x_i}{\sum w_i}$$

3.9. Standard Deviation

The measure of the variation of a set of data in terms of the amounts by which the individual values differ from their mean, the formula was used:

$$S = \sqrt{\frac{\sum (x - \mu)^2}{N}}$$

Paired t-test: Paired t-test is used to determine whether difference exist between the assessment on the study. The formula used is:

$$t = \frac{(x_1 - x_2)}{\sqrt{\frac{(s_1)^2}{n_1} + \frac{(s_2)^2}{n_2}}}$$

x_2 – Sample mean

s_1 – Standard deviation 1

s_2 – Standard deviation 2

n_1 – No. of population/respondents 1

n_2 – No. of population/respondents 2

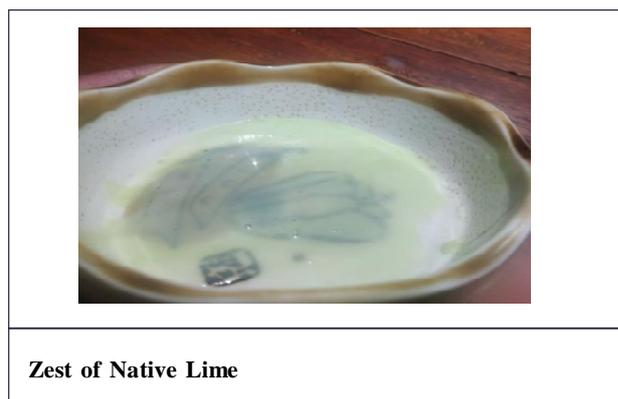
4. Presentation, Analysis, and Interpretation of Data

This chapter incorporates the attributes and depiction of what the item Turmeric-Flavored Pastillas is. It additionally incorporates the item plan, item capacities, restrictions, and the outcome in the assessment.

4.1. Procedure

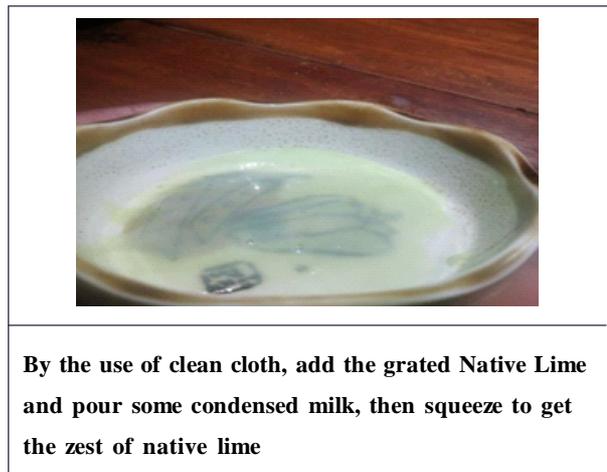
1. Mise-en-place the ingredients included
2. Grating of Native lime
3. Add all the ingredients except for sugar
4. Mix well the ingredients
5. Form a cylindrical shape

Production of Turmeric-Flavored Pastillas The Ingredients and Procedures	
Equivalent Weight	Ingredients
300 grams	Powdered Milk
1 Cup	Condensed Milk
1 Tablespoon	Turmeric Powder
1 Tablespoon	Zest of Native Lime
½ kilogram	Concentrated Sugar

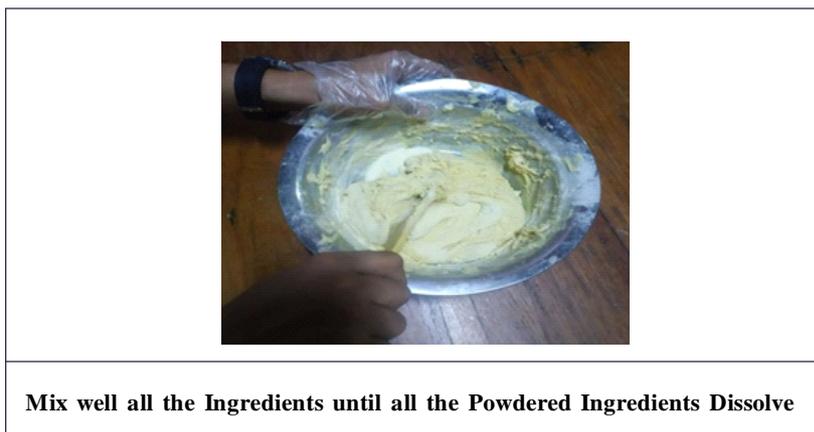
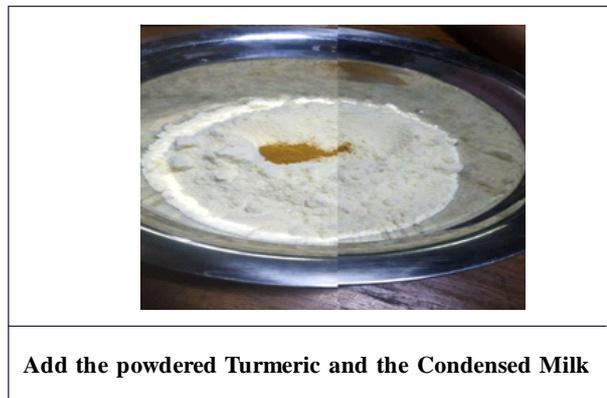
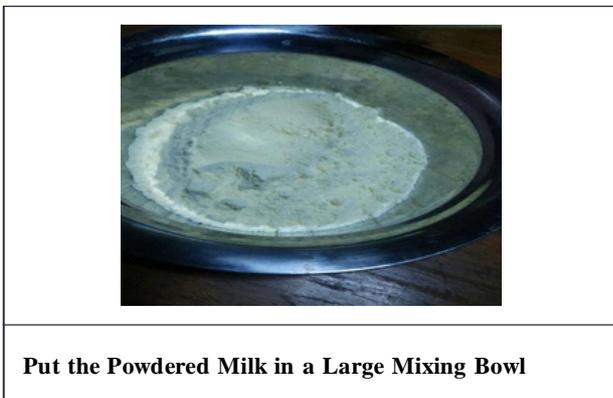




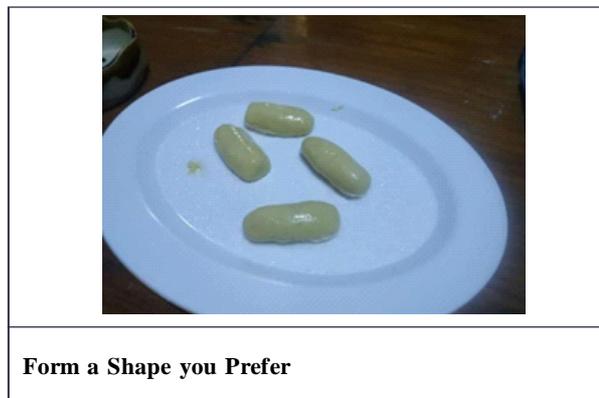
6. Dust with sugar or roll



7. Product Packaging



The sample has the Aerobic plate count, coliform count, yeast and molds count, and *Escherichia coli* count values within the BFAD Microbiological standards. The sample was negative for the presence of *Salmonella*. The sample has passed all the microbiological standards.



The Turmeric Flavored Pastillas microbiological quality could be attributed to the excellent quality of the ingredients. Sanitizing procedures were also employed to ensure that the Turmeric Flavored Pastillas was produced under sterile conditions. The researchers wore complete laboratory output and follow those standard procedures to secure that there will be no contamination on the sample and maintain the excellent quality of the product.

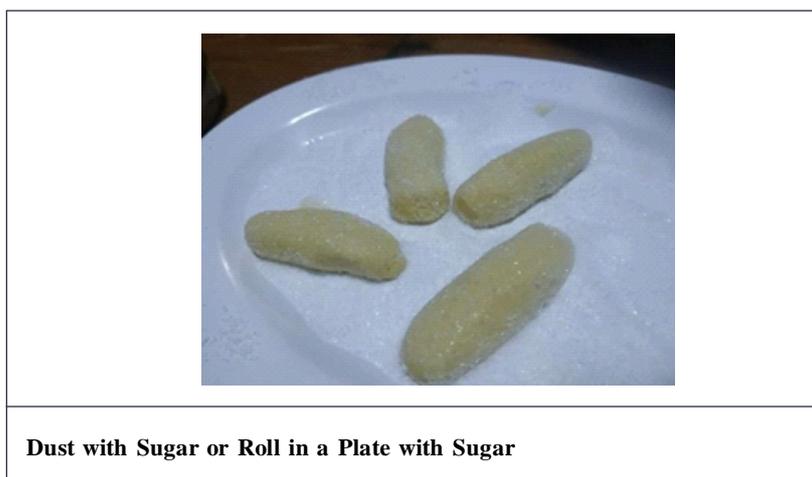


Table 6 shows the result of the microbiological analysis of the product.

Table 7 shows the acceptability of Turmeric Flavored Pastillas based on the perception of the college students of BulSU Hagonoy Campus. Aroma, based on the perception of the college students, appeared to be Very Acceptable while Appearance got the lowest mean.

Table 8 shows the acceptability of Turmeric flavored pastillas based on the perception of the faculty members of the BulSU Hagonoy Campus. Flavor, based on the perception of the faculty members, appeared to be the Very Acceptable while the taste got the lowest rate.

Table 6: Microbiological Properties of Turmeric Flavored Pastillas			
Types of Test	Actual Value	FAD* Standard Value	Result
Aerobic Plate Count	Less than 2x 10 ⁴ cfus/g sample	Less than 2x 10 ⁵ cfus/g sample	PASSED
Coliform Count	Less than 10 cfus/g sample	Less than 10 cfus/g sample	PASSED
Staphylococcus aureus	Less than 10 cfus/g sample	Less than 10 cfus/g sample	PASSED
Yeast and Molds Count	Less than 10 cfus/g sample	Less than 10 cfus/g sample	PASSED
Salmonella Determination	Negative	Negative	PASSED

Table 7: Acceptability of Turmeric Flavored Pastillas							
Criteria	5	4	3	2	1	Weighted Mean	Verbal Interpretation
Appearance	30	12	8	0	0	4.44	Acceptable
Aroma	35	11	4	0	0	4.64	Very Acceptable
Flavor	42	8	0	0	0	4.84	Very Acceptable
Taste	41	5	2	1	1	4.68	Very Acceptable
Texture	48	2	0	0	0	4.96	Very Acceptable
Grand Mean			4.71	Very Acceptable			

Table 8: Faculty Members of BulSU Hagonoy Campus							
Criteria	5	4	3	2	1	Weighted Mean	Verbal Interpretation
Appearance	10	3	2	0	0	4.53	Very Acceptable
Aroma	11	2	2	0	0	4.6	Very Acceptable
Flavor	14	0	0	1	0	4.8	Very Acceptable
Taste	8	3	1	2	1	4	Acceptable
Texture	11	4	0	0	0	4.73	Very Acceptable
Grand Mean			4.53	Very Acceptable			

Table 9 shows the acceptability of Turmeric flavored pastillas based on the perception of the entrepreneurs. Aroma, based on the perception of the business entrepreneurs, appeared to be the Very Acceptable while the Appearance got the lowest rate. Flavor and texture got the highest mean because these are appropriate to the product. However, aroma, flavor, taste, and texture were rated “Very Acceptable” even though appearance was rated “Acceptable.” Still, the quality of the product is very acceptable for the business entrepreneurs and it has the potential to be sold on the market in the near future. Overall, the acceptability of Turmeric flavored pastillas got an average of 4.69 “Very Acceptable,” which mean that the Turmeric flavored pastillas meets the satisfaction of business entrepreneur.

Table 10 shows the summary of the level of acceptability on the sensory quality of Turmeric Flavored Pastillas as assessed by the respondents. The color has the mean of 4.56 as “Very Acceptable,” aroma has the mean of 4.61 as “Very Acceptable,” flavor has the mean of 4.88 as “Very Acceptable,” taste, has the mean of 4.38 and lastly is the texture with the mean of 4.89 as “Very Acceptable.”

Table 11 shows that the product is “Very Acceptable” in terms of overall evaluation from the college students, faculty members, and business entrepreneurs. The evaluation of entrepreneurs was “Very Acceptable” with a weighted

Criteria	5	4	3	2	1	Weighted Mean	Verbal Interpretation
Appearance	9	3	3	0	0	4.4	Acceptable
Aroma	10	4	1	0	0	4.6	Very Acceptable
Flavor	15	0	0	0	0	5	Very Acceptable
Taste	9	4	2	0	0	4.47	Very Acceptable
Texture	15	0	0	0	0	5	Very Acceptable
Grand Mean			4.69	Very Acceptable			

Criteria	College Students	Faculty Member	Entrepreneurs	Weighted Mean	Verbal Interpretation
Appearance	4.44	4.53	4.4	4.56	Very Acceptable
Aroma	4.64	4.6	4.6	4.61	Very Acceptable
Flavor	4.84	4.8	5	4.88	Very Acceptable
Taste	4.68	4	4.47	4.38	Acceptable
Texture	4.96	4.73	5	4.89	Very Acceptable
	Overall Mean		4.66	Very Acceptable	

Total Numbers of Evaluators	Weighted Mean	Verbal Interpretation
College Students	4.71	Very Acceptable
Faculty Members	4.53	Very Acceptable
Business Entrepreneurs	4.69	Very Acceptable
Grand Mean	4.64	Very Acceptable

mean of 4.69. The evaluation of faculty members was “Very Acceptable” with the weighted average of 4.53, and the college students has the verbal interpretation of “Very Acceptable,” and with the weighted mean of 4.71.

Table 12 shows the sensory evaluation of Turmeric Flavored Pastillas in terms of color was 3.7 which results to dark yellow color, the aroma of Turmeric was 2.8 which results to distinct smell, the flavor of Turmeric was 3.2 which also results to distinct flavor, in terms of sweetness, it was 2.7 which results to sweet taste, the texture was only 2.9 which results to the product’s softness, the unpleasant aftertaste was only 1.5 which is only weak and the overall acceptability was 4.0 in which the result was “Like.” Therefore, the sensory evaluation had passed the test conducted by the DOST BulSU Main Campus.

Table 13 shows the ingredients and the exact measurement. The prices of the ingredients were also shown in the table. The table also shows the total capital used to produce the product and the number of pieces that have been made. The material cost per price was only 1.73, and the selling price per piece was only 3, the total profit for this product was 300.

Sensory Attribute	Scoring using 5-point Scale	Result
Color	3.7	Dark Yellow
Aroma (Turmeric)	2.8	Distinct
Flavor (Turmeric)	3.2	Distinct
Sweetness	2.7	Sweet
Texture	2.9	Soft
Unpleasant Aftertaste	1.5	Weak
Overall Acceptability	4.0	Like

Equivalent Weight	Ingredients	Price
300g	Powdered milk	100
370 mL	Condensed milk	23
5 pcs	Native lime	10
50 g	Powdered Turmeric	25
1/4 kg	Concentrated sugar	15
Total Capital		173
Number of Pieces		100
Material cost per Pieces		1.73
Selling Price per Pieces		3
Profit		300

5. Summary, Conclusion, and Recommendation

This chapter discusses the summary of findings from the sensory evaluation of the product, ends drawn from the after-effects of the study, and the recommendations for the problems discovered in the study, which may help the future researchers develop another assortment of pastillas utilizing turmeric as a flavoring. The acceptability of the finished product was determined through a survey among 100 respondents, were divided into two main groups: the producer and the consumer.

6. Summary of Findings

From the analysis of the data presented in the study, the following results were obtained.

1. There are 49 college students of BulSU Hagonoy Campus ages 16-25 and 1 whose age is between 26-35. There are 3 DOST staff ages 16-25 and 15 ages 26-35. There are 5 Business entrepreneurs ages 16-25, 7 are ages 26-35, and 2 whose age is above 35. There are 3 Faculty members of BulSU Hagonoy Campus ages 16-25, 7 ages 26-35, and 5 whose ages are above 35. For the college students of BulSU Hagonoy Campus, there are 36 male and 14 female respondents. The DOST staff has 12 male and 7 female respondents. The business entrepreneur respondents are 5 males and 10 females. Faculty of BulSU Hagonoy Campus has 9 male and 6 female respondents with a total of 100 respondents.

2. The ingredients used to prepare the Turmeric Flavored Pastillas are powdered milk, evaporated milk, powdered turmeric, zest of native lime, and sugar. The process used in preparation was mixing all ingredients except for sugar, forming a shape you prefer, dust with sugar, and packaging.
3. The sensory attribute of Turmeric Flavored Pastillas was evaluated using a 5-point scale. The color dark yellow with a scale of 3.7, the aroma of the turmeric was distinct with a scale of 2.8; the flavor of turmeric was also distinct with the scale of 3.2, and the product was sweet with the scale of 2.7. The texture of the product was soft with a scale of 2.9 and the unpleasant aftertaste was weak with an average of 1.5. The overall acceptability was 4.0 with the verbal interpretation of "Like."
4. The product has undergone the Aerobic plate count, coliform count, yeast and molds count, and *Escherichia coli* count values within the BFAD Microbiological standards. The product was negative for the presence of *Salmonella*. Therefore, the result has passed all the microbiological standards.
5. The level of acceptability on the sensory quality of turmeric flavored pastillas. Based on evaluation of the one hundred (100) respondents, the Appearance with the weighted mean of 4.56 was very acceptable, Aroma with the weighted mean of 4.61 was very acceptable, Flavor with the weighted mean of 4.88 was very acceptable, Taste with the weighted mean of 4.38 was acceptable and Texture with the weighted mean of 4.89 was very acceptable. The total weighted mean from the level of acceptability of all respondents was 4.664 and describe as very acceptable.

7. Conclusion

1. Most of the respondents are ages 16-25 because 50% of the respondents are college students of BulSU Hagonoy Campus. Also, majority, or 50% of the respondents are male. It is probably because of the findings in the study of Mortiz (2019) that men are more risk-taker than women.
2. The researchers have found out that turmeric and native lime can be used as flavors for Pastillas.
3. The preparation of pastillas prepared by the researchers has made the Turmeric Flavored Pastillas safe for consumption since it PASSED the microbiological analysis conducted at DOST Laboratory BulSU Main Campus in compliance with BFAD standards.
4. The sensory quality of Turmeric Flavored Pastillas is acceptable since it has passed the sensory evaluation conducted by DOST Laboratory Bulacan State University Main Campus.
5. The Turmeric Flavored Pastillas was very acceptable to the respondents namely: entrepreneurs and the consumers which are faculty members of BulSU Hagonoy Campus and College Students BulSU Hagonoy Campus.

8. Recommendations

The proposed product: *Turmeric Flavored Pastillas* was produced. For the development of this product, the researchers recommend other ideas, and factors for improving the study as well as the foundation for new or future researchers.

1. It is recommended to have several marketing strategies or concepts on how to encourage both male and female target market.
2. Fresh ingredients must be used along with a clean and sanitized preparation area, tools, and equipment.
3. Subsequent microbiological analyses of samples may be conducted to monitor the microbiological quality of samples, preferably within 12 months' period, to comply with the standards set by the Department of Health.
4. Subsequent evaluation of a different population.
5. The researchers also recommend the use of other flavors aside from native lime. The researchers recommend using only the exact amount of turmeric to avoid unpleasant taste and smell. Appropriate packaging or container must be observed to preserve its good quality and prolong its shelf life. Containers must be sealed properly and tight to prevent air passage. The product has the possibility to sell on the market.

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