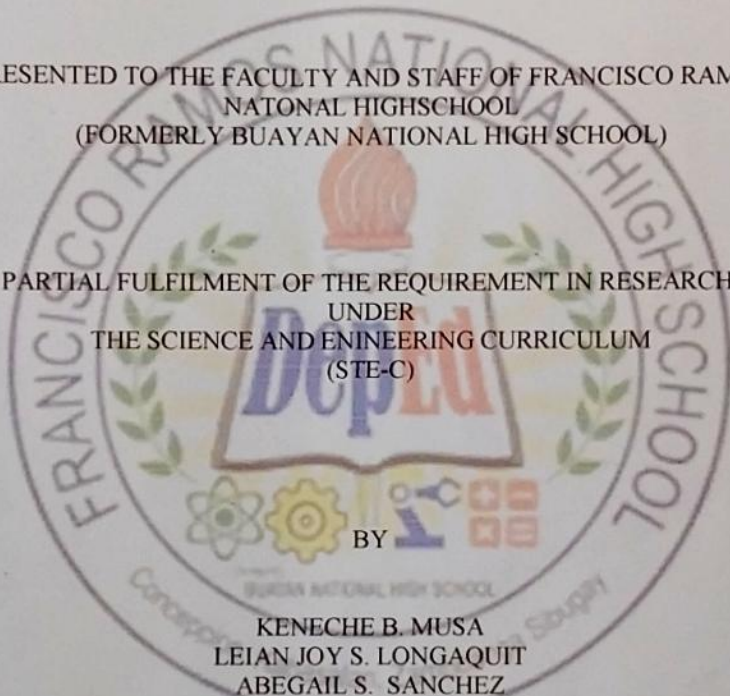


BITTER MELON SEEDS AS AN ALTERNATIVE COFFEE

A SCIENCE INVESTIGATORY RESEARCH

PRESENTED TO THE FACULTY AND STAFF OF FRANCISCO RAMOS
NATIONAL HIGHSCHOOL
(FORMERLY BUAYAN NATIONAL HIGH SCHOOL)

IN PARTIAL FULFILMENT OF THE REQUIREMENT IN RESEARCH-10,
UNDER
THE SCIENCE AND ENGINEERING CURRICULUM
(STE-C)



BY

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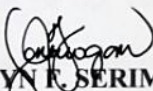


Republic of the Philippines
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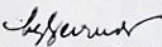



Approval Sheet

In partial fulfillment of the requirements in Research- 10, under the Science, Technology, and Engineering Curriculum (STEC), this research entitled "**BITTER MELON SEEDS AS AN ALTERNATIVE COFFEE**" has been prepared and submitted by **KENECHÉ B. MUSA, LEIAN JOY S. LONGAQUIT, ABEGAIL S. SANCHEZ, ROSEMARIE B. MAMALING, HAREN TOF C. CONSTANTINO, CLARIZA JOY F. CADENAS, JENISE ANNE M. DEQUINA** who is hereby recommended for the corresponding oral examination.


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DEDICATION

This research was truly dedicated to their beloved parents:

Mr. and Mrs. Rolly J. Musa

Mr. and Mrs. Lemuel A. Longaquit Sr.

Mr. and Mrs. Danilo P. Sanchez

Mr. and Mrs. Roly E. Mamaling

Mr. and Mrs. Mary Ann C. Constantino

Mr. and Mrs. Marissa F. Cadenas

Mr. and Mrs. Jerny L. Dequina

For their unconditional support, which has been a constant source of inspiration, and their advice to their children, teaching them in a way that the task could be accomplished, not just financially but also by providing encouragement and belief to the researchers that they can finish this research work.

JAL
9/24/27

ACKNOWLEDGEMENT

The researchers wish to extend their sincere and candor appreciation to those who helped and support their research work, especially to those who in one way contributed to the success of this study.

To Mrs. Jocelyn Serimogan, our research teacher, for the patience, encouragement, concern, and intellectual guidance to finish this research.

To our parents, who send us to school, who support us, who gave advice, who loves us unconditionally, and who inspire us always.

To Mr. and Mrs. Sta. Maria who always gave us bitter melon seeds by their small business.

To our classmates and friends for the help, happiness, and time to treasure unforgettable moments of friendship. To our subject teacher Mr. Michael Troy Labra for the valuable insights and criticism that contributes to the success of this research.

We extend our appreciation to the participants who willingly took part in sensory evaluations and surveys, providing crucial feedback and insights that enriched our understanding of bitter melon seed coffee. Their involvement was pivotal in our research outcomes.

While it is impossible to name everyone, who has contributed to this project, we sincerely appreciate the collective effort and collaboration that has shaped this research endeavor.

And above all, to our creator, our God for the blessings and guidance in the trials that come along our way from the sort of this research with the final presentation of this work.

The Researchers

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ABSTRACT

"Bitter Melon Seeds as an Alternative Coffee" research was conducted which was focused solely on the uses of the bitter melon seed. This study was conducted to determine its capability for effective coffee. Many people drink coffee that contains caffeine. Coffee has several negative effects on the body including insomnia, increased heart rate, blood pressure, anxiety, restlessness, dehydration, and addiction.

Bitter Melon, also known as *Momordica Charantia*, is a tropical vegetable widely known for its traditional medicinal properties. Recently, bitter melon seeds have gained interest for their potential substitute. The seeds which are typically discarded, contain high levels of antioxidants fiber, and fat-soluble vitamins. Drying, roasting, and sifting the seeds create a coffee-like beverage with a bitter taste that can be coffee.

The coffee was prepared using bitter melon seeds. There were three treatments prepared to vary on cooking methods which are sundry, roasting, and both sundry and roasting. The test results showed that the T3 of color and aroma is the ideal method for making coffee. It showed that bitter melon seeds can be an alternative source of coffee. The researchers recommend further tests in terms of its solubility and taste.

CHAPTER I

INTRODUCTION

Background of the Study

Coffee is a brewed beverage with a dark, slightly, acidic flavor prepared from the roasted seeds of the coffee plant, called coffee beans. It is known to be an energizer whenever we feel sleepy, especially during morning and afternoon, it is consecutively becoming partly the day-to-day life of all coffee drinkers. Coffee can have stimulating effects on humans due to its caffeine content. Drinking too much coffee is bad for our health. Some of its harmful effects are insomnia, nervousness, upset stomach, irritability, fast heartbeat, and muscle tremors (Carreos 2015).

Ampalaya (*Momordica Charantia*) also known as Bitter Melon, is a crawling vine that grows well in tropical countries, particularly in the Philippines, known for its bitter taste. The bitter melon is once a staple ingredient in Filipino and Asian cuisine and a reliable home remedy for various illnesses, particularly in diabetics. Just like the other fruit, bitter melon seeds also have been found to be able to regulate blood sugar levels, researchers tested the effect of the seed extract on the rats and found that it has a significant effect when it comes to reducing blood glucose levels. It also contains antioxidants and has benefits in cancer treatment (Batara 2021).

The researchers decided to use bitter melon seeds instead of throwing them and decide to use them as a coffee to know if it could be a good alternative.

Statement of the Problem

The main problem of the study is to make coffee from Bitter Melon seeds. It also answers the following question.

1. Does Bitter Melon seeds can be made as coffee?
2. What is the best drying method for making bitter melon seeds as coffee?
 - a. Sun dry
 - b. Roasting
3. What would be the quality of the product?
 - a. Aroma
 - b. Color
4. Is there a significant difference between the different drying methods and its aroma and color of bitter melon seeds coffee?

Objectives of the Study

The following are the objectives of the study:

1. To produce coffee using bitter melon seeds as the main ingredients.
2. To determine if the bitter melon seeds have considerable characteristics of the product in terms of color and aroma.
3. To determine the levels of acceptability of the coffee samples.

Hypothesis

Null Hypothesis (Ho)

There is no significance different between the different drying methods and its aroma and color of bitter melon coffee.

Significance of the Study

This study aims to produce coffee using bitter melon seeds as an alternative. The study was important because bitter melon is abundant in the Philippines. According to the study of Yasui, its seeds have linoleic acid that can kill colon cancer it also contains polypeptide-p, a plant insulin that helps diabetic patients. The product may be anti-diabetes coffee but it is not the main concern of the study. Everybody can benefit from the results of the study unless a coffee drinker. It would recycle the bitter melon seed instead of being thrown away which a lot of people consider it is a waste.

Scope and Delimitation of the Study

This study focuses on how to make bitter melon seeds into coffee. Three samples were prepared with different methods and concentrations in making the coffee: sun drying, roasting, pounding, and sifting. The products were then evaluated by a minimum of thirty (30) evaluators of coffee drinkers to determine their characteristics. Each of the evaluators was provided with an individual score sheet to evaluate each sample made. The whole fruit is not included in making the product, only the seeds are used to make coffee. The researchers are not focusing on the nutrient values that they can get in the bitter melon seeds, nor will they include them in their research. Instead, researchers are focusing on making coffee out of bitter melon seeds and the sensory qualities (color and aroma) of bitter melon coffee.

Definition of Terms

Aroma- The pleasing smell sensation which comes from freshly brewed coffee.

Bitter Melon- An edible fruit with a strong edible taste.

Coffee- A brewed beverage with a dark, slightly, acidic flavor prepared from the roasted bitter melon seeds of coffee plant.

Color- The property possessed by an object of producing different sensation on The eye as a result of the way it reflects.

Pounding- Use to crush and grind the cooked bitter melon seeds into powder.

Roasting- A cooking method that uses dry heat and hot air to surround the food and cook it evenly on all sides.

CHAPTER II

Review of Related Literature

This part of the research paper reviews literary works and studies which have significant bearings on the study to provide readers an overview of its nature and background.

Coffee

Coffee is a drink that is brewed from the beans of coffee plants. Coffee is cultivated in over 70 countries in the world, it is commonly found in tropical and subtropical regions primarily in Southeast Asia where the Philippines is located, America, India, and Africa. Coffee is also known for an instant pick-me-up energy boost because it can energize us whenever we feel sleepy, especially during morning and afternoons it is becoming part of our daily routines and our day-to-day lives but also drinking too much coffee can be very harmful for our health. Coffee is likely acidic and can affect human health however results may vary in terms of coffee's relative benefit. But many recent researches suggest that moderate coffee consumptions are benign or mildly beneficial in healthy adults. (Carreos 2015).

According to Socala et al (2020). The coffee beverage is in fact a mixture of bioactive compounds such as polyphenols, especially chlorogenic acids (in green beans) and caffein acid (in roasted coffee beans) alkaloids (caffeine and trigonelline) on the diterpenes (cafestol and trigonelline) and also according to Socala et al. There are many researches show that coffee consumption has beneficial expects on human health. Regular coffee intake may protect us from different diseases, it also reduces the risk of stroke. Coffee contains several useful nutrients including riboflavin (vitamin B2) niacin (vitamin B3) magnesium, potassium, and various phenolic compounds or

antioxidants. There are experts suggest that these and other ingredients can variously benefit the human body. (Feller et al 2021).

There are four primary types of coffee beans, these are the most famous and commonly used namely Arabica, Robusta, Excelsa, and Liberica. Among the four, Arabica is the most common and is often used to make instant coffee that can be found in different convenient stores at various places around the globe. Robusta is another type that is often used in making espressos, coffee that is a more concentrated blend by using different machines on making it. Excelsa coffee is often commonly, mistaken as Liberica coffee because of its almost the same contents aroma, taste, and aftertaste. Liberica is the pride of the Malayan race. In the Philippines, the Liberica is commonly regarded as "kapeng barako" which is a highly bitter blend of coffee. Although there are countless types of coffee they have the same functions and properties as to help people every day and be part of a daily routine as a start the day, especially in common breakfast. (Carreos 2015).

Bitter melon seed

A bitter melon seed is a small embryonic plant enclosed in a covering. Bitter melon is often called bitter melon, bitter gourd, or bitter squash because its fruit has a bitter taste. The fruit has been widely used as a vegetable and herbal medicine. The potential role of bitter melon seeds is to make a coffee product that protects against certain diseases and boosts energy and mood. (Rachael 2019).

According to Batařa (2021), bitter melon seeds have also been found to be able to regulate blood sugar levels. It contains antioxidants and has benefits in cancer treatment. Bitter melon seeds when used as an alternative coffee will act as a stimulant in herbal drinks and it can also increase additional properties like the source of insulin and other nutrients found in *Momordica Charantia*.

Bitter melon seeds are a good alternative for making coffee because it has more similar properties to coffee beans like carbohydrates and bitterness. It is also good for dysmenorrhea and amenorrhea provides daily need of iron in the body, and is good for people with diabetes (Socala et al 2020).

Socala et al (2020) mentioned that there are 9 unique benefits of coffee. First, boost energy levels. Coffee contains caffeine, a stimulant that has been shown to increase energy levels and decrease fatigue by altering levels of certain neurotransmitters in the brain. Second, may be linked to a lower risk of type 2 diabetes. Third, could support brain health. Some researchers suggest that drinking coffee could help protect against Alzheimer's disease, Parkinson's disease, and cognitive decline. Fourth, coffee could help support weight management and may be linked to decreased body fat. Fifth, linked to a lower risk of depression. Sixth, could protect against liver conditions. Coffee consumption could be linked to a decreased risk of death from Chronic liver disease, along with other conditions, like liver scarring, and liver cancer. Seventh, supports health. Eighth, could increase longevity. Lastly, may enhance athletic performance.

CHAPTER III

RESEARCH METHODOLOGY

A. RESEARCH ENVIRONMENT

The locale of the study is in Buayan, Francisco Ramos National High School, main campus which is located in Buayan, Kabasalan, Zamboanga, Sibugay Province.

B. MATERIALS AND EQUIPMENT

These are the materials needed; bitter melon seeds, cooking pan, mortar and pestle, spatula, 3 pcs. 250 ml. beaker, 3 vials, stirring rod, mesh strainer (0.250mm), measuring spoons, and weighing scale.

C. PROCEDURE IN MAKING THE PRODUCT

These are the steps you need to follow in making the product. First, wash the bitter melon seeds with water. Second, weigh 50g of the bitter melon seeds using a weighing scale. Third, sundry the bitter melon seeds for 3 hours. Fourth, roast the dried bitter melon seeds using a spatula and cooking pan with low heat for 30 minutes. Fifth, pound the roasted bitter melon seeds using mortar and pestle. Lastly, sift the pounded bitter melon seeds using a mesh strainer (0.250mm).

D. PROCEDURE OF THE TEST CONDUCTED

Color and Aroma

The researchers prepared 100 ml of hot water with 3g of coffee in different treatments then they started the survey through snowball sampling, the researcher also let the respondents rate the coffee of its characteristics which is aroma and color using the scale 1-5.

E. RESEARCH DESIGN

This research is a Quantitative research that uses tables and survey questioner to determine the significance of a drying method of bitter melon coffee, roasted method of bitter melon coffee, and drying, roasted method of bitter melon coffee.

Table 1. Characteristics of the coffee samples.

Treatments	Aroma	Color
1		
2		
3		

Legend:

Rating	Scale	Color	Aroma
5	4.3-5.0	Black	Pleasant
4	3.5-4.2	Dark Brown	Slightly Pleasant
3	2.7-3.4	Brown	Average
2	1.9-2.6	Light Brown	Slightly Not Pleasant
1	1-1.8	Not Brown	Not Pleasant

Table 2. Color

Color (Trials)	Treatment 1					Treatment 2					Treatment 3				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1															
2															
3															
Weighted mean:															

Legend:

Rating	Scale	Remarks
5	4.3-5.0	Black
4	3.5-4.2	Dark Brown
3	2.7-3.4	Brown
2	1.9-2.6	Light Brown
1	1-1.8	Not Brown

Table 3. Kruskal Wallis test for treatments of coffee in terms of color.

Color	Kruskal-Wallis Test			
	P-Value	Statistics	Statistical Decision	Interpretation
Treatment 1-2-3 Trial 1				
Treatment 1-2-3 Trial 2				
Treatment 1-2-3 Trial 3				

Table 4. Aroma

Aroma (Trials)	Treatment 1					Treatment 2					Treatment 3				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1															
2															
3															
Weighted mean:															

Legend:

Rating	Scale	Remarks
5	4.3-5.0	Pleasant
4	3.5-4.2	Slightly Pleasant
3	2.7-3.4	Average
2	1.9-2.6	Slightly Not Pleasant
1	1-1.8	Not Pleasant

Table 5. Kruskal Wallis test fort treatments of coffee in terms of aroma.

Aroma	Kruskal-Wallis Test			
	P-Value	Statistics	Statistical Decision	Interpretation
Treatment 1-2-3 Trial 1				
Treatment 1-2-3 Trial 2				
Treatment 1-2-3 Trial 3				

CHAPTER IV

RESULTS AND DISCUSSIONS

The main concern of this study was to test the potential of bitter melon seeds into coffee alternative production. Three samples were prepared, each varying on how the coffee was made, and eventually related by a panel of coffee drinkers chosen by the researcher.

Table 1. Characteristics of the coffee samples.

Treatments	Color	Aroma
1	(1) Light brown	(1.13) Slightly not pleasant
2	(2.60) Brown	(3.68) Slightly pleasant
3	(3.66) Dark brown	(3.42) Pleasant

Legend:

Rating	Scale	Color	Aroma
5	4.3-5.0	Black	Pleasant
4	3.5-4.2	Dark Brown	Slightly Pleasant
3	2.7-3.4	Brown	Average
2	1.9-2.6	Light Brown	Slightly Not Pleasant
1	1-1.8	Not Brown	Not Pleasant

Table 1, shows the mean ratings of the characteristics of each sample with regard to color and aroma. The three samples shared different characteristics. The evaluators commented that sample C is dark brown. In terms of color samples B and C shared the same characteristics in which the evaluators rated the samples as slightly coffee-like. In terms of overall acceptability sample B and C were liked slightly by the evaluators sample A, on the other hand, were liked moderately.

Table 2. Color

Color (Trials)	Treatment 1					Treatment 2					Treatment 3				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	30	0	0	0	0	0	13	11	4	2	0	9	13	7	1
2	30	0	0	0	0	5	10	10	5	0	0	8	7	11	4
3	30	0	0	0	0	3	5	20	2	0	0	5	7	12	6
Weighted mean:	1.13					3.68					3.42				

Legend:

Rating	Scale	Remarks
5	4.3-5.0	Black
4	3.5-4.2	Dark Brown
3	2.7-3.4	Brown
2	1.9-2.6	Light Brown
1	1-1.8	Not Brown

Table 2 shows the different ratings of the 30 respondents in terms of color, the 30 respondents were provided an individual score sheet to evaluate each sample of coffee from bitter melon seeds.

Table 3. *Kruskal Wallis test for treatments of coffee in terms of color.*

Color	Kruskal-Wallis Test			
	P-Value	Statistics	Statistical Decision	Interpretation
Treatment 1-2-3 Trial 1	.00001	59.6923	Reject Ho since P-value <0.5	The result is significant.
Treatment 1-2-3 Trial 2	.00001	55.0299	Reject Ho since P- value<0.5	The result is significant.
Treatment 1-2-3 Trial 3	.00001	59.8569	Reject Ho since P- value<0.5	The result is significant.

Table 3 shows the result difference between the three coffee treatments in different methods of making the coffee using the Kruskal-Wallis test. In terms of color. It was found that there is a significant difference between the three samples in trials 1, 2, and 3. Reject the null hypothesis since P-value is less than 0.5. Therefore Treatment 3 having a weighted mean of a 3.66 more than the other treatments.

Table 4. Aroma

Aroma (Trials)	Treatment 1					Treatment 2					Treatment 3				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	25	5	0	0	0	0	5	10	13	2	0	7	3	8	12
2	23	7	0	0	0	0	5	4	20	1	0	0	6	10	14
3	30	0	0	0	0	0	0	5	19	6	0	0	1	13	16
Weighted mean:	1.13					3.68					3.42				

Legend:

Rating	Scale	Remarks
5	4.3-5.0	Pleasant
4	3.5-4.2	Slightly Pleasant
3	2.7-3.4	Average
2	1.9-2.6	Slightly Not Pleasant
1	1-1.8	Not Pleasant

Table 4 shows the different ratings of the 30 respondents in terms of the aroma, the 30 respondents were provided an individual score sheet to evaluate each sample of coffee from bitter melon seeds.

Table 5. Kruskal Wallis test for treatments of coffee in terms of aroma.

Aroma	Kruskal-Wallis Test			
	P-Value	Statistics	Statistical Decision	Interpretation
Treatment 1-2-3 Trial 1	.00001	56.7424	Reject Ho since P-value <0.5	The result is significant.
Treatment 1-2-3 Trial 2	.00001	61.1105	Reject Ho since P- value<0.5	The result is significant.
Treatment 1-2-3 Trial 3	.00001	62.2641	Reject Ho since P- value<0.5	The result is significant.

Table 5 shows the result difference between the three coffee treatments in different methods of making the coffee using the Kruskal-Wallis test. In terms of aroma. It was found that there is a significant difference between the three samples in trials 1, 2, and 3. Reject the null hypothesis since P-value is less than 0.5. Therefore Treatment 2 having a weighted mean of a 3.62 more than the other treatments.

CHAPTER V

CONCLUSION AND RECOMMENDATION

Conclusion

Bitter melon seeds as an alternative coffee are both sun drying and roasting. The quality of the product are aroma, and color. The researchers also found out that base on the characteristic which is aroma and color, the Kruskal Wallis test results has significant difference because of the statistic results. Therefore, treatment 3 has a high weighted mean in each characteristics than the other treatments.

Recommendation

The researchers recommend to further test the coffee in terms of solubility and taste, and also gather the bitter melon seeds of the same stem, and the same age. The researchers further recommend to use proper machine for grinding the bitter melon seeds to produce a better size of coffee and find a chemical variables that can clearly dissolve the small particles of the coffee. It is recommended to study bitter melon seeds as tea.

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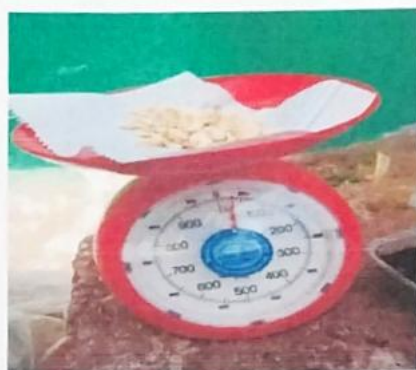
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APPENDICES

A. Pictures



Collecting the bitter melon seeds.



Weighing the bitter melon seeds.



Sun drying the bitter melon seeds.



Roasting the bitter melon seeds.



Pounding the roasted bitter melon seeds.



Sifting the pounded bitter melon seeds.



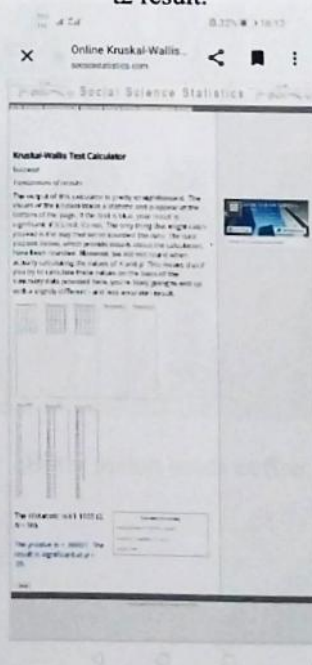
(Color) Kruskal-Wallis Test Calculator
t1 result.



(Color) Kruskal-Wallis Test Calculator
t2 result.



(Color) Kruskal-Wallis Test Calculator
t3 result



(Aroma) Kruskal-Wallis Test
Calculator t1 result.

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