INVESTIGATING THE NUTRITIVE AND LOW GLYCEMIC INDEX SUGAR SYRUP FROM NIPA PALM SAP

A SCIENCE INVESTIGATORY RESEARCH PRESENTED TO THE FACULTY AND STAFF OF FRANCISCO RAMOS NATIONAL HIGH SCHOOL UNDER THE SCIENCE TECHNOLOGY AND ENGINEERING CURRICULUM

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Abstract

Sugar is a strategic commodity because it has used worldwide. It is used as an additive in various foods and beverages consumed daily by the world's community. But taking too much sugar can cause danger in our health, due to its high glycemic index.

Nypa Frutican (Nipa palm), a unique type of palm tree that grows in coastal regions that produces a natural sweet sap. Sugar substitution provides a sweet flavor, but no sugar known to have low glycemic index, which can lessen the burden cases of health issues that involves sugar.

Palm sap sugar is a natural sweetener produced from sap/Nectar of numerous types of palm trees. Its physical properties in terms of glucose content, viscosity, , potassium, sodium content and water content were determined to test it's potential as a sugar syrup. Three treatments with three trials of the different consistenty of Nipa sap were made.

Sugar syrup made out of Nipa palm sap concentrated were prepared in three treatments with variation of 15%,10%, and 5% of Nipa sap. The highest level of glucose content during Benedict's test, viscosity during falling sphere viscometer, water content during drying oven method was obtained from the concentration of 5%,

while the sugar syrup with 15% of Nipa sap has the highest potassium and sodium content during spectrophotometry. However,the rearmost has the lowest level of glucose content, viscosity potassium, and sodium content, and water content.

In the ANOVA (Analysis of Variance), it showed that the data in testing the sugar syrup glucose content, viscosity, potassium content, and sodium content shows no significant difference between the different varying amounts of Nipa palm sap as sugar syrup. On the other hand, it shows that the data in testing the sugar syrup's water content shows a significant difference between the different varying amounts of nipa palm sap.

Chapter I

This chapter shows the background introductn of the study, the statement of the problem, objectives, hypothesis, the concept of the study, the significance of the study, the scope and delimitation, and definition of terms.

Background of the Study

As we all know many people uses sugar to make their food taste better, but one thing they didn’t know is that the sugar they are using can cause harm to their health. Since sugar are mostly made out from canes and beets that has high level of glycemic index. Too much sugar is bad for our health. It's a major cause of obesity because sugary foods are high in calories but low in important nutrients. This can increase the risk of heart disease and type 2 diabetes (Dr. Josh Axe, DC, DNM, CN, 2023). Sugar is also a big cause of dental problems like cavities.

Sugar syrup is primarily used as a substitute for raw sugar and adds rich volume, and can also help lessen the burden cases of health that involves sugar. Palm trees usually produce a large amount of sap each day that can be more sustainable to produce more sugar syrup.

Nipa palm scientifically known as Nypa Fruticans, is a unique type of palm tree that grows in coastal regions, particularly in Southeast Asia. It's known for producing a sweet sap, which is commonly referred to as "Nipa palm sap".

Philippines is known to be one of the most abundances of Nipa Forest with over 80,000 hectares of Nipa forest coverage as it host natural nipa stands (Berto et al., 2020). As Zamboanga Sibugay is known to be the home of many Nipa grown in its coastal area.

Nipa palm sap is a natural sweetener with the level of 27.4 glycemic index that is low from nipa palm tree. And has nutritive components like (potassium, sodium, calcium, magnesium) B vitamins (B1, B2), and antioxidants. These are important for things like heart health, strong bones, energy and maintain a balance of body fluids and keep muscles and nerves running smoothly. The nutrients can vary based on how it's collected and the tree's age and location (Chaijan and Panpipat et al.2021).

Sugar syrup from nipa palm sap can be a great replacement for the usual sugar we are using due to its natural compositions.

Overall, sugar plays a crucial role in enhancing food flavor and texture but excessive consumption poses health risks. Nipa palm sap, a natural sweetener rich in nutrients, emerges as a potential alternative to traditional sugar, offering health benefits and unique characteristics. This sap, abundant in the Philippines, particularly in Zamboanga Sibugay, holds promise as a healthier substitute for those seeking to regulate blood sugar levels and boost overall well-being

Statement of the Problem

The main purpose of the study is to produce nipa palm syrup and determine the effectiveness of Nipa palm sap as sugar syrup. More specifically, to answer the following questions:

1. What are the properties of Nipa palm sap syrup in terms of its present glucose, viscosity, potassium , sodium, and water?
2. How does the different amount of residues affect the presence of glucose, viscosity, potassium, sodium, and water in the Nipa palm sap syrup?
3. Is there any significant difference between the percent of residue with glucose, viscosity, potassium, sodium, and water in the Nipa palm sap syrup?

Objectives:

1. To determine the properties of Nipa palm sap syrup in terms of its present glucose, viscosity, potassium , sodium, and water.
2. To prove if the percentage composition of syrup that has an affect the presence of glucose, viscosity, potassium, sodium, and water in the Nipa palm sap syrup.
3. To determine if there is a significant difference between the percent of residue with glucose, viscosity, potassium, sodium, and water in the Nipa palm sap syrup.

Hypothesis:

Alternative Hypothesis(Ha)

- There is a significant difference between the different percent of residue of nipa palm sap sap as sugar syrup in terms of glucose, viscosity, potassium , sodium, and water content .

Null Hypothesis (Ho)

- There is no significant difference between the different percent of residue of nipa palm sap sap as sugar syrup in terms of glucose, viscosity, potassium , sodium, and water content .

Conceptual Framework

This part focuses on variables. This investigation determined whether the strategies used in the experiment were reliable. The Nipa Palm Sap as the independent variable whereas sugar syrup as the dependent variable.

Independent Variable **Dependent Variable**

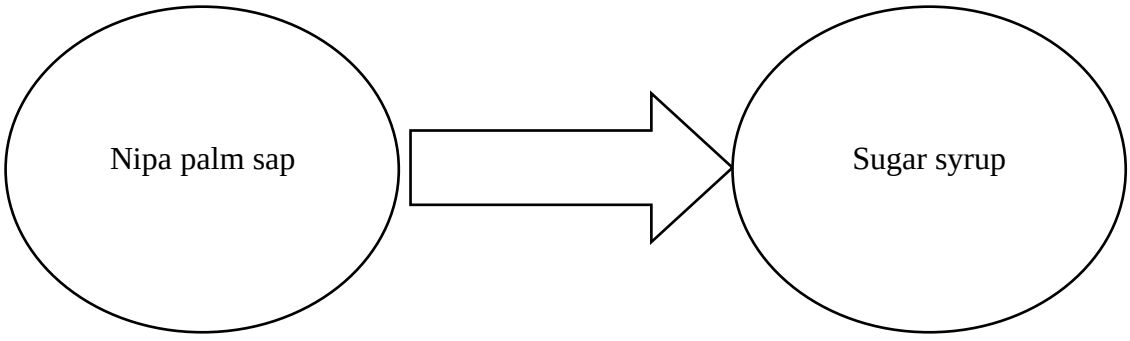


Figure 1: The conceptual framework of the research.

Significance of the Study

This was made to help the sectors of the society with the use of Nipa palm sap as sugar syrup to create a healthy and new production of sugar.

This study is significant to:

- **Community**

  This could help the community to have a healthy substitute for sugar with low glycemic index.

- **People**

  This could help common people to have a source of income and support local industry and economics.

- **Economy**

  Provide important product for our nourishment and provide a cheap product to economy.

Scope and Delimitation of the Study

The study was about “Nipa palm sap as sugar syrup”. This study was delimitated with the enhancement of Nipa palm sap as sugar syrup. It intends to analyze only the glucose content using Benedict’s test, viscosity using falling sphere viscometer, potassium and sodium using spectrometer and water content using drying oven method the syrup. The syrup is prepared with different residue as 5%, 10 %, 15 %. This research was conducted in Francisco Ramos National High School laboratory. The results of the test were analyze using ANOVA (analysis of variance) to see if there is a significant

difference between the three different residue in terms of its with glucose, viscosity, potassium, sodium, and water content.

Definition of Terms

- Glucose – is the main type of sugar in the blood and is the major source of energy for the body's cells
- Nipa palm – is a type of palm tree that grows in coastal region and is known for its long, feather-like leaves and its importance in various tropical ecosystem.
- Nipa palm sap – is the sweet extracted from the Nipa palm tree.
- Nipa Palm syrup- is the residue obtained after heating the Nipa palm sap.
- Residue – a small amount of something that remains after the main part has gone.
- Sugar – is a sweet substance often used to add sweetness to food and drinks.
- Sugar syrup – is a solution made by dissolving granulated sugar in water

Chapter II

Review of Related Literature

This chapter shows all the relevant studies and information of our study.

Sugar is a crystalline sweet material made primarily of sucrose that is derived from a variety of plants, most notably sugar cane and sugar beet. It is used as a sweetener in food and beverages (Margaret Clark, R Paul Singh et al., 2023).According to (Beth Sissons, 2023) sugars are essential for giving the body the energy and range of nutrients it needs to stay healthy. Naturally occurring sugars, like those in fruits and vegetables, are essential to our bodies for a number of processes. All food is broken down by our bodies into simpler components, like glucose, which our bodies can use right away as an energy source as glycogen in our muscles and liver for later use. Overindulgence in sugar, particularly refined sugar has been connected to a number of health issues, including diabetes, cancer, and obesity. A diet high in added sugar can cause fat deposits in the liver, low HDL (good) cholesterol, high blood pressure, and elevated triglycerides 1. By increasing blood pressure and chronic inflammation, two pathological pathways that lead to the heart disease, sugar can also increase the risk of heart disease (Julian Kubala, MS, RD, 2022).

Substitutions for sugar can be a great way to control your weight and cut back on sugar consumption. Sugar replacement can assist you in avoiding added sugar empty calories, which raise your risk of weight gain and major health issues like diabetes and heart disease (Dr. Josh Axe, DC, DNM, CN, 2023). Sap as a liquid that flows through a plant or trees vascular system, supplying water and nutrients to the different sections of

the plant. In palm trees, sap is collected from depression carved into the trees crown (kergus masons et al., 2023).

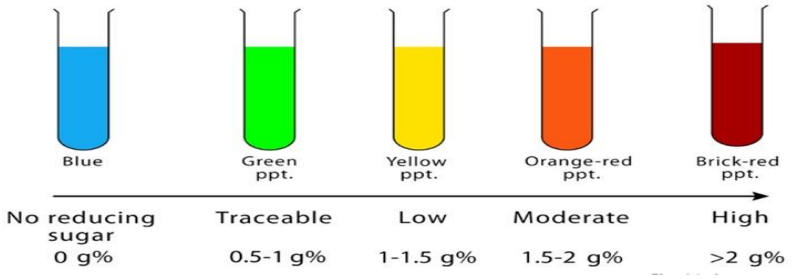
The nipa palm tree (Nypa fruticans) yields a sweet, translucent beverage with low glycemic index known as sap. It basically contains the level of 27.4 glycemic index.(Chaijan and Panpipat et al.2021). Nipa sap also referred to as gula apong locally, is used in Sarawak to make nipa sugar. (Roberto Gumba, 2020).According to (Berto et al., 2020) Philippines is well known for having an abundance of nipa palm forests, covering more than 80,000 hectares, which is sufficient to support nipa wine producers. Nipa wine, a sweet beverage that comes from the nipa palm tree, is also made from nipa sap. Additionally nipa sap is used to make alcohol and vinegar that can be used as fuel (Businessmirror.com.ph).

Referring to an article by (Tony Rodriguez et al., 2018) A gatherer can operate up to 200 taps and collect up to 120 liters of sap per day, or over 3,000 liters per month. Sucrose, glucose, and fructose are present in nipa palm tree sap and syrup, with sugar constituting and majority of dry matter. Potassium, sodium, phosphorus, magnesium, calcium, iron, copper, zinc, manganese, and iodine were also discovered to be present in the sap and syrup (Lauri Braganza et al., 2023). It is the most basic kind of carbohydrate that the body uses as main energy source.

The Glycemic Index (GI) is a way of ranking carbohydrates from 1 to 100 according to how your food will slowly or quickly be digested and increase you blood glucose (Jennie Brand-Miller et al.,2006).

Glucose, is a type of carbohydrate that the body uses as main energy source. It is the most basic kind of carbohydrate, known as monosaccharide, meaning one sugar

syrup. (Stephanie Wright, RN, BSN et al., 2022). The glucose content that is present in the sugar syrup made out of nipa palm sap can be tested through A chemical test called Benedict's test that is used to determine whether reducing sugar is present in the sample. This qualitative test detects reducing sugar with free ketone or aldehyde functional groups, like glucose and fructose (Sagar Aryal et al., 2022). The Benedict's test results will then be interpreted through the Levels of Reducing sugar:



Viscosity, also known as fluids thickness or stickiness, is a property that determines how much internal friction has when it flows. It is a crucial fluid property with a wide range of real world uses. It is use for instance, to explain how fluid move through pipes, how blood moves through the circulatory system, and how the lubricants behave (Amy Tikkanen et al., 2023). Accordingly, to (Ping Yuan, Ben Yuan Lim et al., 2008) by using the Falling sphere viscometer, you can gauge a fluid's viscosity by timing how long it takes a sphere to descend a specific distance through it

It is also important to determine the numerous present percentages of water content to avoid early spoilage of sugar syrup (Sahadat Hossain, Azijul Islam et al., 2021). As this can be easily detected using this kind of laboratory test called the drying oven method where it is used to find out how much water is in the material (K R Arora, Gopal Ranjan et al., 2019).

These two monosaccharides namely potassium and sodium which plays an important role in our body are known being one of the important elements present in the sugar syrup. According to (Barbie Cerroni et al..., 2022). Potassium is a mineral that the body needs for a variety of processes, such as heart, rhythm, nerve and muscle function, and fluid balance. Potassium also plays a key role in regulating blood pressure. A potassium-rich diet is linked to many powerful health benefits. It may help reduce blood pressure and water retention, protect against stroke and help prevent osteoporosis and kidney stones (Ryan Raman, MS, RD, 2023). On the other hand, Sodium is an essential mineral that is found in many foods, including table salt, and is important for regulating blood pressure, fluid balance and nerve and muscle function (Greenwood Norman N et al., 1997).

Referring to (Steven Chuck, J O Stoner et al., 2023) This kind of present elements found in the sugar syrup sample can be tested through spectrophotometry a method for determining how much light a substance in solution absorbs. As the interpretation of this method can be solved using Beer-Lambert Law a technique used to calculate how much light a substance in a sample absorbs (Jim Clark et al., 2023).

Overall, the sugar syrup that is made out of nipa palm sap has the potential to lessen the cases of health issues that involves sugar due to its low glycemic index. In terms of its glucose content, viscosity, water content, potassium, and sodium content, all of nipa saps tendency and characteristics in the relevant studies shows the potential success. Moreover, the sweetness of the sugar syrup is only caused by the nipa palm sap potential.

Chapter III

Methodology

This chapter deals with the procedures and methods that were used in the study. This briefly discusses the research environment, materials and equipment that are used, procedure in making the Nipa palm sap as sugar syrup, the data gathering, and research design.

Research Environment

The locale of the study is in Francisco Ramos national high school. Main campus, which is in Concepcion, Kabasalan, Zamboanga Sibugay.

Materials and Equipment

The materials and equipment needed are nipa palm sap, granulated cylinder, gloves, containers, bowl, spatula, measuring cups, hot plate, test tubes and test tube holders, test tube rack, Benedict's reagent, pipettes, graduated cylinder, spectrometer, marble, flashlight, evaporating dish and petri dish.

Procedure in Making the Product

The sap was extracted from the nipa palm, the palm tree's wurmb was shaked and twisted. It was then tapped gently as the sap flowed. And the flower's stocked was cutted. we waited patiently approximately 24 hours, Then sap was collected And transferred to a clean container.

We made the product as we have followed the steps. First, we gathered the materials and equipment. Next, we strained the sap and we boiled it for 2 hours . Finally, when the sap has reached the desired percent residue as 15 %, 10 % and 5. The residue was transferred to a clean container and cooled

Data Gathering in Procedure

To test the effectiveness of Nipa palm sap as sugar syrup. First, we made three different percentage of residues of nipa palm syrup that serves as the treatments. Treatment 1: 15%, Treatment 2: 10% and Treatment 3: 5%.

The Three treatments were tested on Glucose, viscosity, potassium, sodium, and water content.

Benedict's Test

The researchers prepared 3 trials for each treatments that contains 2 ml of benedict's reagent and 5 ml of the sugar syrup. The residue was undergone for hot bath of water within 5 minutes and after that the sample's color was then observed and recorded.

Viscosity Test

Using the falling sphere viscometer method, the researchers prepared 3 trials for 3 different treatments using a marble and a graduated cylinder that contains 20 ml of every treatment. The marble was drop in the graduated cylinder that contains a residue and was time for how long the marble will touch down the bottom of the graduated cylinder

Spectrophotometry

Using the spectrophotometer, the researchers prepared 3 trials for every 3 treatments. The spectrophotometer has a hole for the entrance of light to pass through the residue sample and another hole for the determination of elements. using a test tube that contains 5 ml of each sample and place within the box and was then determined by the app called spectrometer. And the results was then interpreted through:

$A = \mathcal{E}bc$

- **A** is the amount of light absorbed for a particular wavelength by the sample.
- **Ɛ** is the molar extinction coefficient
- **b** is the distance covered by the light through the solution
- **c** is the residue of the absorbing species
-

Water Content Test

Using the drying oven method, the researchers prepared 3 trials for every 3 treatments. Where the evaporating dish that contains 20 grams of every sample was evaporated using hot plate within 30,20, and 10 minutes.

Research Design

This research used Quantitative experimental research. This research used tables to present the recorded data and ANOVA to determine the residue of Nipa Palm sap as sugar syrup in terms of its glucose content, viscosity, potassium content, sodium, and water content of the sugar syrup. The table below was used in the data presentation.

Table1. Benedict's Test for Glucose Content

Treatments (Percent Residue)	**Glucose Content**			**Mean**
	Trial 1	**Trial 2**	**Trial 3**	
1.) 15%				
2.) 10%				
3.) 5%				

Table 2. Viscosity Test: Falling Sphere Viscometer

Treatments (Percent Residue)	**Trial**			**Mean**
	Trial 1 30 ml	**Trial 2 30 ml**	**Trial 3 30 ml**	
1.) 15%				
2.) 10%				
3.) 5%				

Table 3. Potassium Content: Spectrophotometry

Treatments (Percent Residue)	**Trial**			**Mean**
	Trial 1 30 ml	**Trial 2 30 ml**	**Trial 3 30 ml**	
1.) 15%				
2.) 10%				
3.) 5%				

Table 4. Sodium Content: Spectrophotometry

Treatments (Percent Residue**)**	**Trial**			**Mean**
	Trial 1 **30 ml**	**Trial 2** **30 ml**	**Trial 3** **30 ml**	
1.) 15%				
2.) 10%				
3.) 5%				

Table.5 Water Content: Drying oven method

Treatments (Percent Residue**)**	**Time of Evaporation (Minutes)**	**Trials (Grams)**			**Mean**
		T1 **30**	**T2** **20**	**T3** **10**	
15%					
10%					
5%					

Table 6. Means of Water Content

Mean	**Minutes**		
	30	**20**	**10**
1.) 15%			
2.) 10%			
3.) 5%			

Chapter IV

Results and Discussions

This chapter presents the result, analysis, and discussion of the findings and outcome of the research project.

Results:

Table 7. Benedict's Test for Glucose Content

Treatments **ml (**Residue**)**	**Glucose Content**			**Mean**
	Trial 1	**Trial 2**	**Trial 3**	
1.) 15% 600 ml of Nipa palm sap	1.5%	0.5%	1%	1%
2.) 10% 400 ml of Nipa palm sap	1.5%	0.5%	1.5%	1.2%
3.) 5% 200 ml of Nipa palm sap	1.5%	2%	2%	1.8%

As shown in the table above, the researchers conducted three different treatments and trials to test the glucose content of our nipa palm sap as sugar syrup using Benedict's test with the same amount of sugar syrup which is 5 ml. This involved the use of a test tube and benedict's reagent which will indicate the presence of glucose content in the sugar syrup.

Treatment 1 has an average of 1%, treatment 2 has an average of 1.2% and treatment 3 has an average of 1.8%. In the table above, treatment 3 shows the highest average of glucose content among the three treatments, while treatment 1 has the lowest average of glucose content.

Table 8. One-way Analysis of Variance (ANOVA) of Benedict's test.

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.000117	3	3.89E-05	1.458333	0.331616	5.409451
Within Groups	0.000133	5	2.67E-05			
Total	0.00025	8				

The Analysis of Variance (ANOVA) shows the result, where the P-value (0.331616) is greater than the alpha level 0.05. Therefore, the null hypothesis is accepted. This means that there is no significant difference in the sweetness of Nipa palm sap sugar with different amounts of glucose content when we conducted the Benedict's test.

Table 9. Viscosity Test: Falling Sphere Viscometer

Treatments ml (Residue**)**	**Trials**			**Mean**
	Trial 1	**Trial 2**	**Trial 3**	
1.) 5% 600 ml of Nipa palm sap	0.76	0.73	0.65	0.71
2.) 10% 400 ml of Nipa palm sap	6.02	6.05	5.66	6.12
3.) 5% 200 ml of Nipa palm sap	57.40	57.16	56.66	57.07

As shown in the table above, the researchers conducted three different treatments and trials to test the viscosity of our nipa palm sap as sugar syrup using a falling sphere viscometer with the same amount of sugar syrup which is 30 ml. This involved the use of a 100 ml granulated cylinder and a marble to measure the syrup's viscosity by timing how long it took for the marble to reach the bottom of the granulated cylinders.

Treatment 1 has an average of 0.71%, treatment 2 has an average of 6.12% and treatment 3 has an average of 57.07%. In the table above, treatment 3 shows the highest average of viscosity among the three treatments, while treatment 1 has the lowest average of viscosity.

Table 10. One-way Analysis of Variance (ANOVA) of Viscosity Test

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	5821.142	2	2910.571	45273.31	2.91E-13	5.143253
Within Groups	0.385733	6	0.064289			
Total	5821.527	8				

The Analysis of Variance (ANOVA) shows the result, where the P-Value (2.91E13) is greater than the alpha level 0.05 therefore, the Null hypothesis is accepted. This implies that there is no significant difference between the characteristics of the different amounts of nipa sap as sugar in terms of its viscosity when the falling sphere viscometer was conducted

Table 11. Potassium Content: Spectrophotometry

Treatments **ml (**Residue**)**	**Trial**			**Mean**
	Trial 1 **30 ml**	**Trial 2** **30 ml**	**Trial 3** **30 l**	
1.) 15% 600 ml of Nipa palm sap	60%	15%	8%	28%
2.) 10% 400 ml of Nipa palm sap	35%	16%	12%	21%
3.) 5% 200 ml of Nipa palm sap	32%	8%	11%	17%

As shown in the table above, the researchers conducted three different treatments and trials to test the potassium content of our nipa palm sap as sugar syrup using a spectrophotometry with the same amount of sugar syrup which is 10 ml. This involved the use of a Spectrophotometer to measure the syrup's potassium content.

Treatment 1 has an average of 28%, treatment 2 has an average of 21% and treatment 3 has an average of 17%. In the table above, treatment 1 shows the highest average of potassium content among the three treatments, while treatment 3 has the lowest average of Potassium content.

Table 12. One-way Analysis of Variance (ANOVA) of Potassium Content

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.017422	3	0.005807	0.129823	0.938276	5.409451
Within Groups	0.223667	5	0.044733			
Total	0.241089	8				

The Analysis of Variance (ANOVA) shows the result, where the P-Value (0.938276) is greater than the alpha level 0.05, therefore, the null hypothesis is accepted. This implies that there is no significant difference between the characteristics of the different amount of Nipa sap as sugar syrup in terms of potassium content when the Spectrophotometry was conducted.

Table 13. Sodium Content: Spectrophotometry

Treatments **ml (**Residue**)**	**Trial**			**Mean**
	Trial 1 **30 ml**	**Trial 2** **30 ml**	**Trial 3** **30 ml**	
1.) 15% 600 ml of Nipa palm sap	50%	19%	13%	27%
2.) 10% 400 ml of Nipa palm sap	33%	9%	20%	21%
3.) 5% 200 ml of Nipa palm sap	17%	14%	8%	13%

As shown in the table above, the researchers conducted three different treatments and trials to test the viscosity of our nipa palm sap as sugar syrup using a falling sphere viscometer with the same amount of sugar syrup which is 30 ml. This involved the use of a 100 ml granulated cylinder and a marble to measure the syrup's viscosity by timing how long it took for the marble to reach the bottom of the granulated cylinders.

Treatment 1 has an average of 27%, treatment 2 has an average of 21% and treatment 3 has an average of 13%. In the table above, treatment 1 shows the highest average of sodium content among the three treatments, while treatment 3 has the lowest average of sodium content.

Table 14. One-way Analysis of Variance (ANOVA) of Sodium Content

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.030867	3	0.010289	0.459599	0.722529	5.409451
Within Groups	0.111933	5	0.022387			
Total	0.1428	8				

The Analysis of Variance (ANOVA) shows the result, where the P-Value (0.722529) is greater than the Alpha level 0.05, therefore the null hypothesis is accepted. This implies that there is no significant difference between the residue of the different amount of Nipa sap as sugar syrup in terms of sodium content when the Spectrophotometry was conducted

Table 15. Water Content: Drying Oven Method

Treatments **ml (**Residue**)**	**Time of Evaporation (Minutes)**	**Trials (Grams)**			**Mean**
		T1 **20**	**T2** **20**	**T3** **20**	
15% 600 ml of Nipa palm sap	30	14.34	15.40	13.68	14.47
	20	15.19	16.17	15.33	15.56
	10	19.83	18.631	18.31	18.92
10% 400 ml of Nipa palm sap	30	17.92	14.90	11.01	14.61
	20	18.53	16.79	16.72	17.35
	10	17.50	19.31	11.01	18.74
5% 200 ml of Nipa palm sap	30	16.24	15.02	13.60	14.95
	20	17.02	18.80	17.99	16.81
	10	19.32	18.90	18.89	19.04

As shown in the table above, the researchers conducted three different treatments and trials to determine the water content of our nipa palm sap as sugar syrup using a drying oven method with the same amount of sugar syrup which is 20 grams. This involved the use of a evaporating dish and hot plate to evaporate the remaining residue of the sample by timing it within 30, 20, and 10 minutes and the data was then gathered and recorded

Table 16. Means of Water Content

Mean	Minutes		
	30	**20**	**10**
1.) 15%	14. 47	15.56	18.92
2.) 10%	14.61	17.35	18.74
3.) 5%	14.95	16.81	19.04

The gathered means was recorded in the table above. Treatment 1 has the average of 14.47% in 30 minutes, 15.56% in 20 minutes, and 18.92% in 10 minutes. Treatment 2 has the average of 14.61% in 30 minutes, 17.35% in 20 minutes, and 18.74% in 10 minutes. And Treatment 3 has the average of 14.95% in 30 minutes, 16.81% in 20 minutes, and 19.04% in 10 minutes. In the table above, it shows that in the different trials of each treatments 10 minutes of evaporation shows the greatest remaining water while the 30 minutes of evaporation shows the lowest remaining water content.

Table 17. One-Way Analysis of Variance (ANOVA) of Water Content

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	26.84726667	2	13.42363333	43.45311657	0.000269351	5.14325285
Within Groups	1.853533333	6	0.308922222			
Total	28.7008	8				

The Analysis of Variance (ANOVA) shows the result, where the P-Value (0.000269351) is lesser than the Alpha level 0.05, therefore the null hypothesis is rejected. This implies that there is a significant difference between the characteristics of the different amount of Nipa sap as sugar syrup in terms of its water content when the Drying oven method was conducted.

Chapter V

Conclusion and Recommendation

This chapter presents the conclusion and recommendations of the study.

Conclusion

After the preparation and tests, the researchers are convinced that nipa sap has a potential to be made as a sugar syrup. The glucose, viscosity, potassium, sodium, and water content differs its level base on the residue of nipa sap itself that is used in formulation. The Null hypothesis is accepted in terms of its glucose content, viscosity , potassium content, and sodium content where there is no significant difference among the three treatments using Benedict's test, falling sphere viscometer, spectrophotometry and in different trials. On the other hand, the Alternative hypothesis was accepted in terms of its water where it shows that there is a significant among the three treatments using drying oven method in different trials.

Recommendation

This study revealed the effectiveness of Nipa sap as a main component in making a Nipa palm sugar syrup. It is recommended to conduct a further study on the nutrient that are present in the syrup and make comparison on sugar cane, coconut and honey contents. It is recommended also to have a collection of Nipa sap in different areas considering the salinity and ages of the nipa tree. It is strongly recommended to conduct study to enhance the quality of the syrup in terms of color, texture and odor.

Appendix

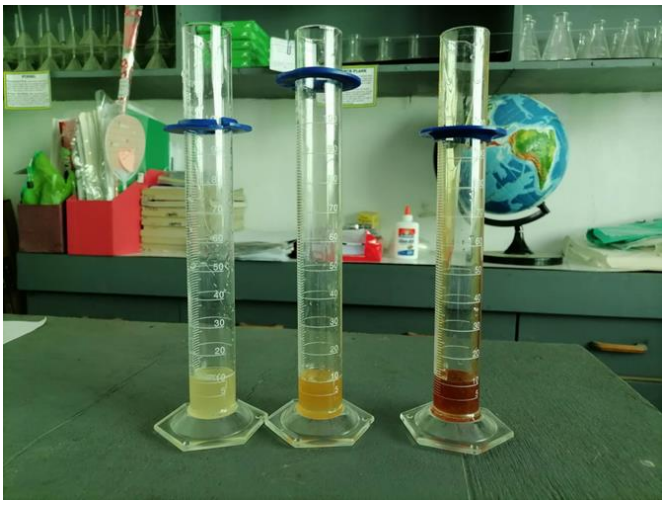
Boil the sap.

Pour the boiled sap in a clean container:

Treatment 1 and 2

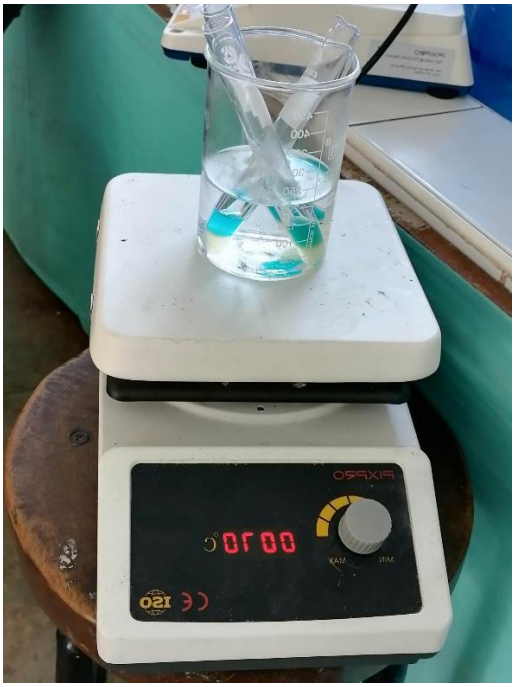
Treatment 3

Measure the sugar syrup samples in graduated cylinder.



Perform Benedict's Test

Before:



After:

Record result's

Bibliography

M Clarke et al.,2023. *Britannica.* “sugar”.

https://www.britannica.com/science/sugar-chemical-compound

B Sissons, 2023. *MedicalNewsToday.* “Does the body need sugar? How much to consume”.

https://www.medicalnewstoday.com/articles/does-your-body-need-sugar

J Kubala, MS, RD, 2022. *healthline.* “11 Reasons Why Too Much Sugar Is Bad for You”.

https://www.healthline.com/nutrition/too-much-sugar

Dr. J Axe, DC, DNM, CN, 2023. *Dr. Axe.* 11 Best Sugar Sabtitutes (the Healthiest Natural Sweeteners).

https://draxe.com/nutrition/sugar-substitutes/

R. Gumba Jr., 2020. *SunStar.* “A sweet fix from nipa palm”.

https://www.sunstar.com.ph/article/1839644/davao/business/a-sweet-fix-from-nipa-palm

S. Wright, RN, BSN et al., 2022. *healthline.* “Everything You Need to Know About Glucose”.

https://www.healthline.com/health/glucose

P Yuan, BY Lin, 2008. *American Laboratory.* "Measurement of Viscosity in a Vertical Falling Ball Viscometer".

https://www.americanlaboratory.com/913-Technical-Articles/778-Measurement-of-Viscosity-in-a-Vertical-Falling-Ball-Viscometer/

S Aryal, 2022. *studocu.* "Unit 6 Individual Project – Benedicts test for reducing sugars".

https://www.studocu.com/en-gb/document/coleg-y-cymoedd/applied-science/unit-6-individual-project-benedicts-test-for-reducing-sugars/72419213

S Hossain, A Islam et al., 2021. *Properties and Behavior of Soil – Online Lab Manual.* "DETERMINATION OF MOISTURE CONTENT".

https://uta.pressbooks.pub/soilmechanics/chapter/chapter-1/

K R Arora, G Ranjan et al., 2019. *Elementary Engineering Library.* "Water Content Determination – Sand Bath Method"

https://www.elementaryengineeringlibrary.com/civil-engineering/soil-mechanics/water-content-determination-sand-bath-method

N Greenwood, A Earnshaw, 1997. *Elsevier.* "Chemistry of the Elements".

https://shop.elsevier.com/books/chemistry-of-the-elements/greenwood/978-0-7506-3365-9

R Raman, MS, RD, 2023. *healthline,* "What Does Potassium Do for Your Body?"

https://www.healthline.com/nutrition/what-does-potassium-do

J Clark, 2023. *Chemistry LibreTexts.* “The Beer-Lambert Law”.

https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Spectroscopy/Electronic_Spectroscopy/Electronic_Spectroscopy_Basics/The_Beer-Lambert_Law

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