



Daffodil
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University

**OPTIMIZING THE PRODUCTION PROCESS FOR NUTRIENT-RICH
CITRON FRUIT JUICE: QUALITY, NUTRITIONAL PROFILE, AND
SENSORY EVALUATION**

A PROJECT REPORT

BY

MD. FORKAN SIKDER

ID: 201-34-297

Submitted to the Department of Nutrition and Food Engineering in the partial fulfillment of
B.Sc. in Nutrition and Food Engineering.

Supervised By

Dr. Md. Mahbubur Rahman

Associate Professor

Department of Nutrition and Food Engineering

Co-Supervised By

Md. Harun-Ar Rashid

Assistant Professor

Department of Nutrition and Food Engineering

FACULTY OF HEALTH AND LIFE SCIENCES (FHLS)

DAFFODIL INTERNATIONAL UNIVERSITY

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APPROVAL

The project titled "**Optimizing the Production Process for Nutrient-Rich Citron Fruit Juice: Quality, Nutritional Profile, and Sensory Evaluation,**" presented by **Md. Forkan Sikder** to the Department of Nutrition and Food Engineering at Daffodil International University, has been deemed acceptable for the partial fulfillment of the requirements for the B.Sc. degree in Nutrition and Food Engineering. It has also been approved for its style and content.

Dr. Nizam Uddin

Head

Nutrition and Food Engineering

Faculty of Health and life Science

Daffodil International University

DECLARATION

We hereby announce the successful conclusion of this research, conducted under the guidance of **Dr. Md. Mahbubur Rahman**, Associate Professor and **Md. Harun-Ar Rashid**, Assistant Professor in the Department of Nutrition and Food Engineering at Daffodil International University. Furthermore, we confirm that neither this study nor any part of it has been presented for evaluation for any degree or certificate elsewhere.

Supervised by:



.....
Dr. Md. Mahbubur Rahman

Associate Professor

Department of Nutrition and Food Engineering

Daffodil International University

Co-Supervised by:

.....
Md. Harun-Ar Rashid

Assistant Professor

Department of Nutrition and Food Engineering

Daffodil International University

Submitted by:



.....
Md. Forkan Sikder

ID:201-34-297

Department of Nutrition and Food Engineering

Daffodil International University

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ABSTRACT

Citron fruits juice is a great vitamin supplement that works without the use of pharmaceuticals to thoroughly saturate the body with the essential nutrients and microelements. All of these things can be achieved with a delightful, refreshing drink produced from citron pulp, including boosting immune, warding off viruses and common microorganisms during the cold and flu season, preventing the onset of oncology and diabetes, and just elevating mood. Citron fruits juice process in nutrition and food engineering lab. it nutritional and Analysis was done on the sensory aspects. In this two sample Citron fruit juice sample 1 more than batter than sample 2. The Sample 1 citron fruit juice contained 88.57% moisture. Brix content for 30%. pH level of 4.35 and vitamin C contained 51.3 mg/L. It's a simple, convenient, and cost-effective recipe. It also contained smaller amount of other vitamin and minerals such as vitamin A, vitamin B6, magnesium, and calcium. It is longer shelf life of citron juice.

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CHAPTER 1

INTRODUCTION

1.1 Introduction of Citron Fruits Juice

Citron fruits, often simply referred to as "citron," are a type of citrus fruit. They are characterized by their large size, thick rind, and unique appearance. Citron fruits have a distinct oblong or oval shape and can be yellow or yellow-green when ripe. Their powerful, fragrant scent is well-known [1].

Citron fruit flesh is incredibly tart and is normally not eaten directly due to this. Instead, the skin of citron fruits, which is frequently candied or used to make zest for seasoning in cooking and baking, is what gives them their greatest culinary worth. Citrus flavors and aromas are highly sought in citron zest. Citron fruits have a long history of culinary and medicinal uses, and they are important in various religious and cultural traditions around the world [2].

Citron Juice is a light and tart beverage produced from the juice of citron fruits. This citrusy concoction offers a zesty flavor that balances sweet and sour notes, making it a delightful choice for a thirst-quenching drink. The juice is extracted from citron fruits, which are known for their large size and bumpy, thick rind. Packed with vitamin C and other nutrients, citron juice is not only tasty but also offers potential health benefits. It provides a healthy amount of vitamin C, which boosts immunity and skin health. Whether enjoyed on its own, mixed with other fruit juices, or used as a base for cocktails, citron juice is a versatile and invigorating choice for anyone looking for a tasty and energizing beverage [3].

Citron juice is a popular beverage in many parts of Asia, including Bangladesh, India, and Nepal. It is made from the Citron fruit, which is a good source of vitamin C [4].

Citron fruit juice is also a good source of flavonoids, which are plant compounds that have been shown to have a number of benefits of health. For example, shown to reduce inflammation, improve blood circulation, and protect against cancer. Citron fruit juice can be enjoyed on its own or added to smoothies, juices, and other beverages. It can also be used in cooking and baking [5].

This revitalizing juice comes from the thick, rough rind of the citron. Citrus juice is a great option for people who want a more subdued citrus taste because it has a lower acidity than some of its siblings. Savory and sweet foods, drinks, sauces, dressings, and desserts can all benefit from the variety of citron juice, which is available to culinary aficionados. The juice, being high in vitamin C, gives you a nutritional boost and benefits your general health and wellness. Citrus fruits have deep historical roots and are valued for their culinary and cultural uses. Although cypress is not as readily accessible as other citrus fruits, cypress juice and its unique flavor contribute to the vast range of beverage options, offering a lovely and aromatic experience for those looking for a distinctive [6].

When choosing citron fruit juice, it is important to select a brand that is 100% pure juice and does not contain added sugar or other additives [9].

One cannot minimize the significance of citron fruit in traditional and cultural practices. Beyond just its culinary uses, it has deeper importance due to its use in religious ceremonies and rituals throughout many countries [11].

1.2 Statement of the Problem/Research Gap

The research on citron fruit juice lacks comprehensive studies on its chemical composition, hindering our understanding of its nutritional value. Additionally, there is limited knowledge about the absorption of nutrients from citron juice, optimal processing methods, potential medicinal properties, and consumer preferences. Addressing these gaps will provide valuable insights for enhancing the nutritional awareness, market potential, and health benefits associated with citron fruit juice consumption.

1.3 Objective of the study

- To optimize citron fruit juice production to enhance quality, focusing on flavor, color, and overall characteristics.
- To analyze and maximize key nutritional components in citron fruit juice through optimized production methods.
- To evaluate sensory attributes post-optimization, understanding consumer preferences for taste, aroma, texture, and overall experience.
- To improve production efficiency of nutrient-rich citron fruit juice, addressing factors like yield, cost-effectiveness, and scalability while maintaining or enhancing quality and nutritional content.

1.4 Hypotheses

Hypotheses for citron fruit juice could focus on its potential health benefits, impact of processing techniques on nutritional content, and consumer preferences. Testing these hypotheses will provide valuable insights, advancing our understanding and practical applications of citron fruit juice.

1.5 Significance of the Study

Studying citron fruit juice is vital for understanding its nutritional value, improving processing techniques, and meeting consumer preferences. The research contributes to informed choices in nutrition and innovations in the food industry.

1.6 Scope and Limitations

The study on citron fruit juice focuses on analyzing its chemical composition, nutritional benefits, and processing optimization, along with exploring consumer preferences and market potential. Limitations may arise from resource constraints, variations in fruit quality, and dynamic consumer preferences.

CHAPTER 2

LITERATURE REVIEW

2.1 Literature Review

Citron juice is a liquid extracted from citron, An enormous orange fruit with a dense, bumpy rind and a relatively small amount of pulp. The citron (*Citrus medica*) is one of the original citrus fruits from which many others varieties have been hybridized. It is known for its fragrant and thick peel. To make citron juice, the citron is typically cut and the juice is extracted using a juicer or by manually squeezing the fruit. The resulting juice can be used in various culinary applications. It has a tart and slightly sweet flavor, adding a refreshing element to both sweet and savory dishes [1].

Citron fruit juice has demonstrated its potential to contribute positively to cardiovascular health. The presence of potassium in citron fruit juice has been associated with the ability to reduce blood pressure levels, thereby lowering the risk of stroke. Furthermore, the antioxidants found in citron fruit juice play a crucial role in safeguarding the heart from oxidative damage, which can be beneficial for overall cardiovascular well-being [2].

Citron fruits juice is a great vitamin supplement that works without the use of pharmaceuticals to thoroughly saturate the body with the essential nutrients and microelements. All of these things can be achieved with a delightful, refreshing drink produced from citron pulp, including boosting immune, warding off viruses and common microorganisms during the cold and flu season, preventing the onset of oncology and diabetes, and just elevating mood. Citron fruits juice process in the nutrition and food engineering lab a. Citron juice contained 88.57% moisture. Brix content 30%. pH level of 4.35 and vitamin c content 51.3 mg/l. It's a simple, convenient, and cost-effective recipe. with a longer shelf life under refrigerated conditions [3].

The Bangladeshi market for citron fruit juice is still in its infancy but has a lot of potential to grow quickly. The expansion of this industry is being fueled by a number of reasons that are consistent with patterns seen in other Asian nations. These variables include a raised consciousness of the benefits of drinking lemon juice for one's health, a rise in consumer disposable money, and an increase in the use of e-commerce platforms [4].

Citron fruit juice is a good of vitamin C, potassium, and dietary fiber. It a smaller number of other vitamins and minerals, such as vitamin A, calcium, and protein [5].

In Southeast Asian countries such as Thailand and Vietnam, the demand for citron fruit juice is shaped by the popularity of citrus-based beverages. Citron fruit juice finds its place as an ingredient in refreshing drinks and traditional herbal remedies, contributing to its demand across these regions. In China, citron fruit juice has garnered increasing attention due to its perceived health benefits and its application in traditional Chinese medicine. The demand for citron fruit juice is growing, particularly in urban areas, where health-conscious consumers are actively seeking natural and nutrient-rich beverage options [5].

The existing literature on citron fruit juice provides valuable insights into various aspects of this citrus product. Studies have explored the chemical composition, highlighting the presence of essential nutrients, bioactive compounds, and potential health benefits. These investigations lay the foundation for understanding the nutritional richness of citron juice and its potential contributions to a balanced diet. Furthermore, the literature offers perspectives on processing techniques, emphasizing methods for extracting and preserving the quality of citron juice. This includes considerations for maintaining the bioavailability of key nutrients during processing. Additionally, the medicinal properties of citron fruit juice have been a subject of interest, with some studies suggesting potential anti-inflammatory and antioxidant effects. Despite these advancements, a research gap remains, particularly in terms of comprehensive analytical studies, bioavailability assessments, and detailed investigations into the medicinal properties. The literature review underscores the need for further research to address these gaps and deepen our understanding of citron fruit juice, fostering its optimal utilization in both nutritional and medicinal contexts [7].

Citron juice, shedding light on consumer preferences and acceptance. This encompasses studies investigating the flavor profile, aroma, and overall sensory experience associated with citron fruit juice, contributing to the development of products that align with consumer tastes. Additionally, research has touched upon the economic aspects, exploring the market potential and commercial viability of citron juice products. Insights from these studies are essential for industry stakeholders seeking to capitalize on the popularity and demand for unique and health-oriented beverages. Despite these advancements, gaps persist, particularly in the integration of consumer perceptions with nutritional attributes and the economic dynamics of the citron juice market. Addressing these aspects in future research will provide a more comprehensive understanding, guiding both scientific exploration and practical applications in the food industry [8].

CHAPTER 3

MATERIALS AND METHODS

3.1 Materials

To ensure authenticity and high quality of the finished product, citron fruit juice manufacturing involves meticulous material selection. Citrus medica fruit, also called a citron, is the main ingredient because of its characteristic rough peel and fragrant qualities. The heavy pulp of the citron can be effectively squeezed out of the juice with the use of an electric or manual citrus juicer. To gather and preserve the freshly squeezed citron juice, use hygienic, food-grade storage containers. A fine-mesh strainer is an additional option for getting rid of pulp and seeds, which will guarantee a smoother finished product. Natural sweeteners or a little water can be added by those who want to intensify the flavor.

Uses of Ingredients:

- Citron fruit
- Sugar
- Water
- Salt
- Baking Soda

Table 1: Ingredients & Amounts

Ingredients	Amounts: Sample 1	Sample: 2
Citron Juice	70 ml	60 ml
Water	30 ml	40 ml
Sugar	25gm	20gm
Salt	0.5gm	0.5gm
Baking Soda	1.5gm	1.5gm

The production process for the two samples of citron fruit juice, using table 1's ingredients and amounts. Samples one and two contain 70 ml of citron juice, 30 ml of water, 25 g of sugar, 0.5 g of salt, and 1.5 g of baking soda. Sample two has 60 ml of citron juice, 40 ml of water, 20 g of sugar, 0.5 g of salt, and 1.5 g of baking soda.

3.2 Method:

Flowchart of Citron Fruit Juice:





Figure -1: Citron Fruit Juice

The finished result of pressing citron fruit is a lovely fusion of flavors. The juice catches the eye with its vivid golden tone and promises a cool experience. The liquid's inherent clarity, which preserves the essence of the *Citrus medica* fruit, attests to the purity of the extraction procedure. The zesty juice is presented in a clear, well-thought-out container that screams freshness and expectation. The essence of ripe citrons is evoked as one inhales the perfume, which is a blast of citrus overtones. When you drink it, the sweetness and tartness dance in a lovely way that is typical of fine citron juice. There is no residue and the texture are smooth, guaranteeing a tidy and shiny finish. This finished result is evidence of thorough processing, careful sourcing, and a steady dedication to providing a genuine and exceptional experience with citron fruit juice.

3.2.1 Determination of Moisture

Objective:

The amount of water or water content in a material is referred to as its moisture content. It has a percentage as its expression. It affects both the shelf life and the physical characteristics of the product.

❖ Procedure----

- Fill the moisture analyzer with 10 milliliters of sample, switch it on, and wait for around five minutes.
- Following that, the moisture analyzer shows the findings on the screen (Digital moisture analyzer operating instructions).
- I observed the moisture value after following the indication.



Figure-2: Moisture Analyzer (nscbd.com)

The Following Was the Formula:

Moisture content % = [Total weight (in grams) / Weight of raw sample (in grams)] × 100

Total weight is equal to the product of the dried and reusable samples

3.2.2 Determination of °Brix

Objective:

The unit of measurement known as Brix bears Adolph Brix's name. It is frequently used by food scientists to determine the amount of sugar dissolved in water.

Procedure:

- Use a dropper to collect the sample.
- Wash the refractometer prism with distilled water.
- Calibrate the refractometer.
- Place a sample drop on the prism and take readings.

- Rinse the prism with distilled water between samples.



Figure-3: Refractometer (nscbd.com)

3.2.3 Determination of pH

Objective:

Acidity is indicated by a pH of less than 7, and baseness is indicated by a pH of more than 7. The pH scale establishes the relative concentrations of free hydrogen and hydroxyl ions in water.

Procedure:

The pH of citron fruit juice measure first, turn on the light. Take a sample and transfer it to a beaker. Ensure that the pH electrode and temperature sensor are clean and dry. Utilizing buffers 1 and 2, calibrate the meter. Gather the sample, then check the pH in a beaker. Place the pH meter inside the measuring cup. Once the digits in meters have been corrected, read.

3.2.4 Determination of Vitamin C

Objective:

In addition to helping the body take in iron, vitamin C is essential for many other aspects of bone, connective tissue, and skin health. It's a frequent misconception that taking vitamin C will help shield you from colds.

❖ **Procedure.....**

- First take 10g Iodine and mix it well.
- Take 6.25g of Iodine in 500ml water in conical flask.
- Take starch, KI and I₂.
- Add KI +I₂ solution in burette.
- Take 10ml of citron juice and add 1ml starch.
- Then titration started wait for color changed.
- Repeat this process and find volume of burette solution which is used.



Figure-4: Titration of Dilution

The Following was the Formula:

$$S_1V_1 = S_2V_2$$

$$S_1 = S_2V_2/V_1$$

S₁=Initial Concentration

S₂=Final Concentration of Solution

V₁=Volume

V₂= Diluted Solution

3.2.5 Determination of Microbial Contamination

Objective:

Citron fruit juice microbiological analysis is essential for guaranteeing food safety and quality. Testing for the presence of dangerous microorganisms, such as bacteria, is necessary to maintain product freshness, avoid foodborne illnesses, and adhere to legal requirements. Frequent testing assures consumer safety, confirms production procedures, and prolongs the juice's shelf life. In the food business, it is essential to quality control, HACCP protocols, and brand reputation in general.

- **The sodium chloride solution is prepared by**
 - mixing 2.5 grams of sodium chloride with 200 milliliters of distilled water, thoroughly mixing.
- **Agar Media Preparation**
 - Add 200 ml of distilled water to 5 grams of nutritious agar powder, and thoroughly.

❖ Procedure---

- First, take all instruments which are need for this test like, test tube, beaker, measuring cylinder, pipette, micro pipette, petri dishes, are keep in autoclave for sterilize at 121 C for 30 min.
- After 30 min all are keep out from autoclave and keep into the air flow laminar.
- Then take 9 ml of sodium chloride into test tube and 1 ml of sample for serial dilution.
- Using a micropipette, remove 1 milliliter of sample from the first test tube and transfer it to the second test tube. Repeat this process with 1 milliliter of sample from the second test tube and transfer it to the third test tube. Fill each test tube with 1 milliliter of sample in the same manner. Also, each test tube indicates like, 10-1, 10-2, 10-3, 10-4, 10-5, 10-6, 10-7.
- Then take 9 ml of agar media into every petri dishes by pipette, and 1 ml of sample every test tube by micro pipette and drop it every petri dishes one by one. Spread every media and wait for the medium to solidify.
- Then take all petri dishes and keep into the incubator at 37o C for 24 hours.
- After 24 hours out of the • Remove all of the petri dishes from the incubator, count them, and make a note of it.
- **Following was the Formula:**
$$\text{Colony-Forming Unit (CFU)} = (\text{Colony Count} \times \text{Dilution Factor}) / \text{Sample Volume}$$

3.3 Sensory Evaluation

Objective:

Assessing the flavor, aroma, look, and overall attractiveness of citron fruit juice requires a sensory analysis. This procedure makes it possible to make changes to preserve a constant flavor profile while also helping to ensure quality and matching the product with consumer preferences. In order to improve customer happiness and brand success in a cutthroat market, sensory evaluation is a useful tool for marketing, quality assurance, and product development.

Sensory Evaluation of Citron Fruit Juice

This Sensory evaluation employs the Hedonic Rating test. Taste, texture, color, appearance and flavor are all important sensory attributes or parameters.

Procedure:

- A hedonic scale is a of verbal expensive that indicate the degree of like and dislike.
- Smiley faces with a 9-point scale.
- Testers can also comment on products appearance, teste, smelling texture.
- Finally need to analyzed the results

Table 2: Sensory Evaluation form of citron fruit juice

Name :		Date:		
ID :				
➤ Taste this samples and checking how much you like or dislike.				
➤ Use the appropriate scale to show your attitude by checking at the point that best describe your feelings about the sample.				
Preference	Colour	Texture	Flavour	Taste
Like extremely				
like very much				
like moderately				
like slightly				
like or dislike				
Dislike slightly				
Dislike very much				
Dislike moderately				
Dislike extremely				
..... Signature				

CHAPTER 4

RESULTS AND DISCUSSTION

4.1 Proximate Composition of Citron Fruit Juice

-The nutritional composition of Citron Fruit Juice has shown in table 3.

Citron fruit juice, a vibrant and flavorful beverage pressed from the throng citron, boasts a treasure trove of nutrients, it making worthy a healthy diet. Citron juice is naturally low in calories and sugar, making it a refreshing and guilt-free beverage.

Table 3: Nutrient content of Citron Fruit Juice

Product	S1&S2	Sample 1	Sample 2
Citron Fruit Juice	Moisture	88.57%	90.60%
	Brix	30%	28%
	pH	4.35	5.56
	Vitamin C	51.3mg/L	49.69mg/L

4.2 Microbiology test quality of Citron Fruits Juice

Table 4: Microbiology test quality of Citron Fruits Juice

Test	Number of colonies	
	Sample 1	Sample 2
TPC	3×10^4 CFU/mi	4.3×10^4 CFU/ml.

A product's optimal citron fruit juice % is determined by taking into account a number of variables, including flavor, nutritional value, and consumer preferences. For a genuine and natural flavor, a generally acknowledged benchmark is around 100% pure citron juice. Any variations from this benchmark, regardless of how big or small, could affect the juice's overall quality. Our product of citron fruit juice keeps a high percentage of pure juice, which guarantees a true and powerful citron flavor.

Our percentage of citron fruit juice complies with industry norms since we value providing a product that captures the essence of the citron fruit in its purest form. This decision is motivated by a dedication to being genuine, satisfying customer needs, and upholding quality standards. To

give customers a refreshing and pleasurable drink, the ideal amount is chosen to balance the citron's acidic and sweet flavors.

Moisture Content: The citron juice sample 1 moisture content around 88.57%. sample 2 has increase for moisture content 90.60%.

Brix Content: Around 30% sugar in citron fruit juice has sample 1. Brix decreased in sample 2 has around 28%.

pH Content: pH content of sample 1 is 4.35 and sample 2 increase of pH has 5.56.

Vitamin C Content: The citron juice around sample 1 vitamin C 51.3mg/L and sample 2 decreased of vitamin c has 49.69mg/L.

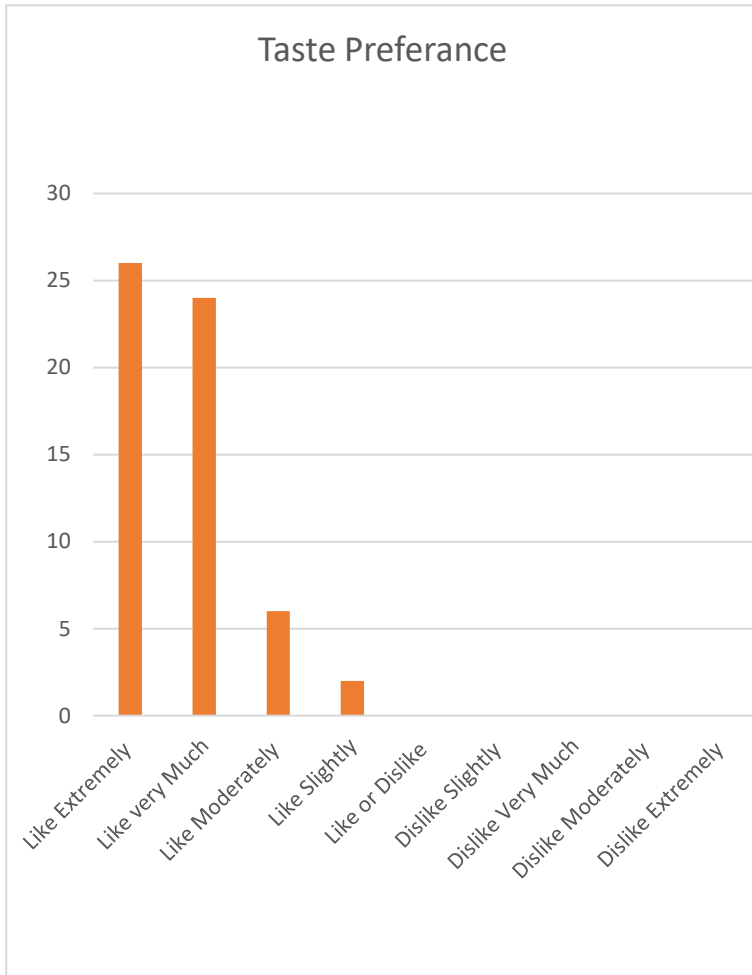
Microbial Analysis:

In this table number 4 shows that microbial quality test for sample 1&2. Here is we get the result has 3×10^4 CFU/ml & 4.3×10^4 CFU/ml.

4.3 Sensory Quality

The term "sensory quality" describes how a product feels to the touch, taste, smell, and texture. It's a vital indicator of a product's overall attractiveness, impacting both customer happiness and its success.

Sample 1



Sample 2

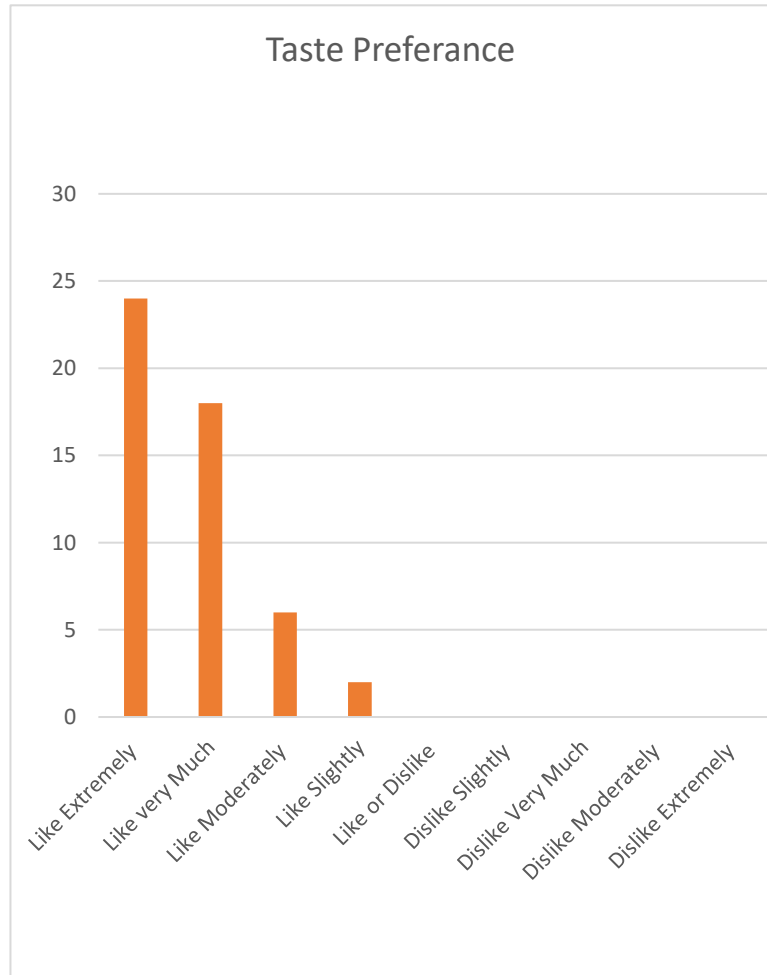


Figure 5&6: Taste Preference

Figure 5&6, shows the two sample taste attributes of citron juice in bar charts in 9 points hedonic scales. The bar chart shows that two sample. the sample 1 citron juice got the highest score as like extremely. It was very well received by 26 of the 30 participants.

Sample1

Sample 2

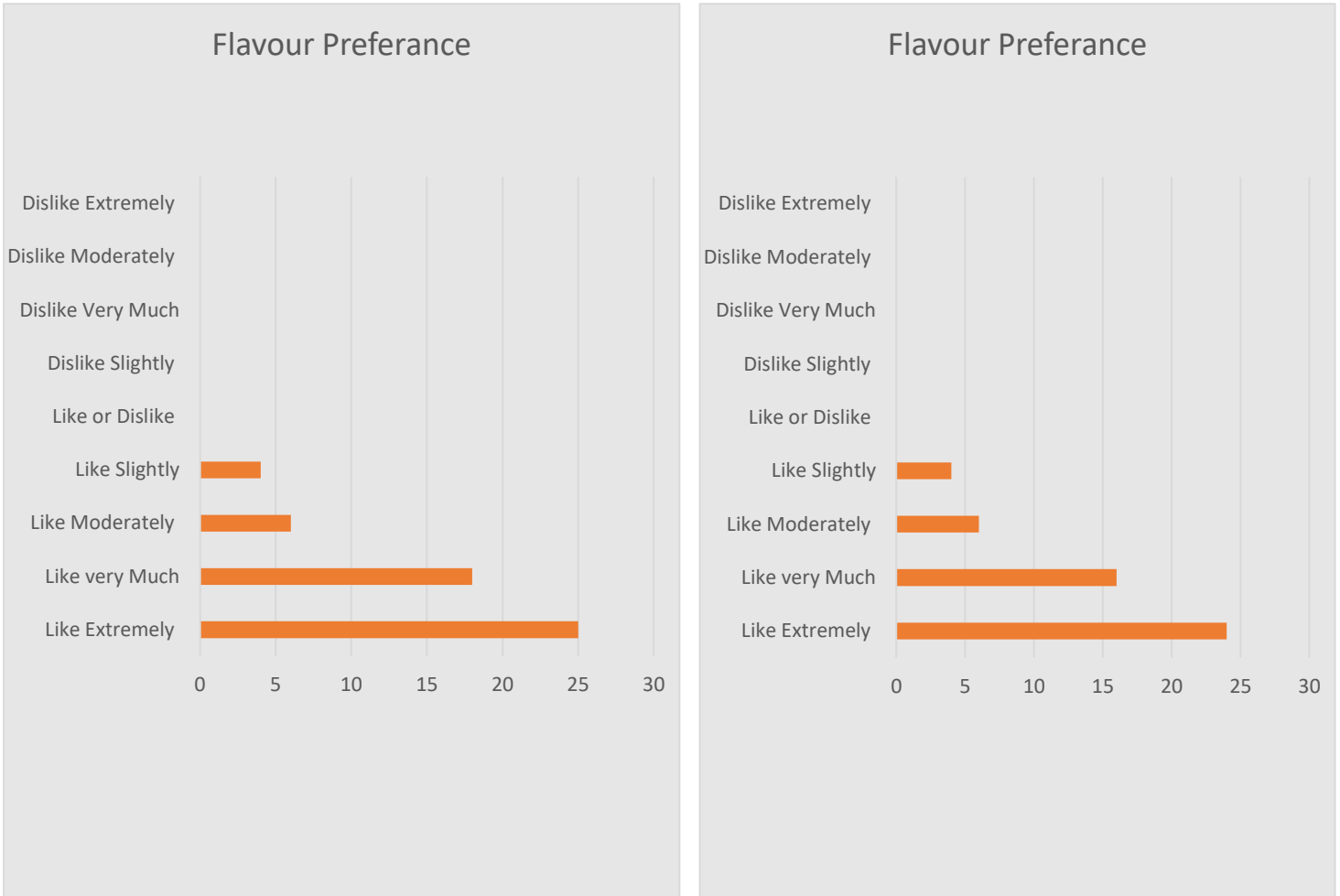
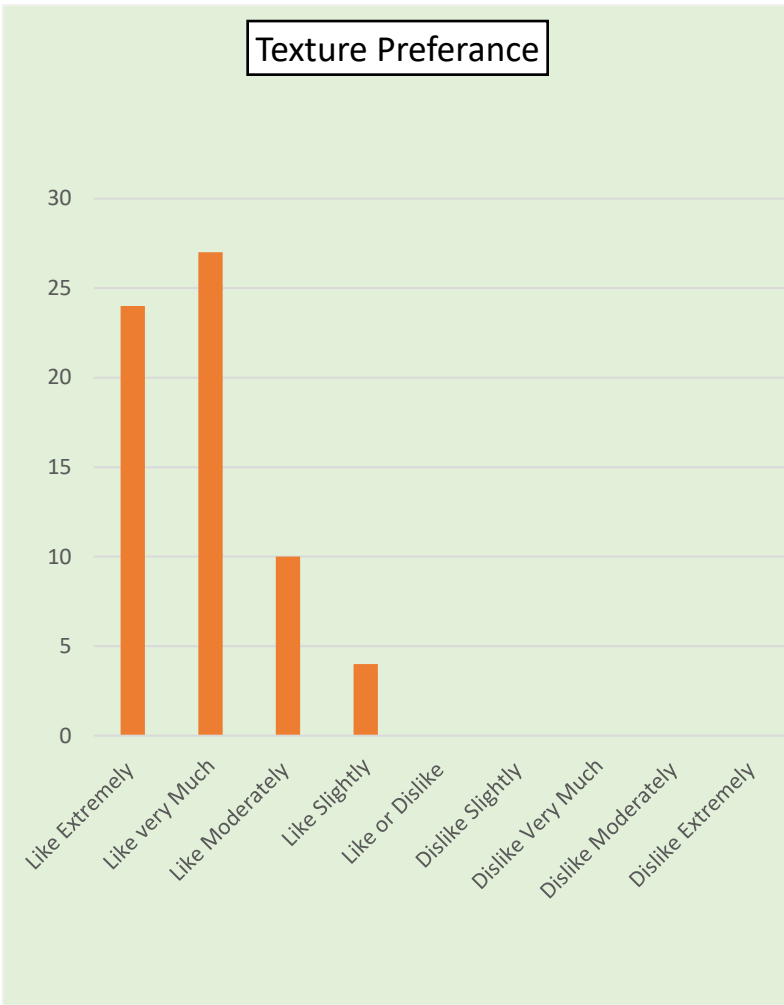


Figure 7&8: Flavor Preference

Figure 7&8, shows the two sample Flavor attributes of citron juice in bar charts in 9 points hedonic scales. The bar chart shows two sample that Sample 1 citron juice got the highest score as like very much. It was very well received by 25 of the 30 participants.

Sample 1



Sample 2

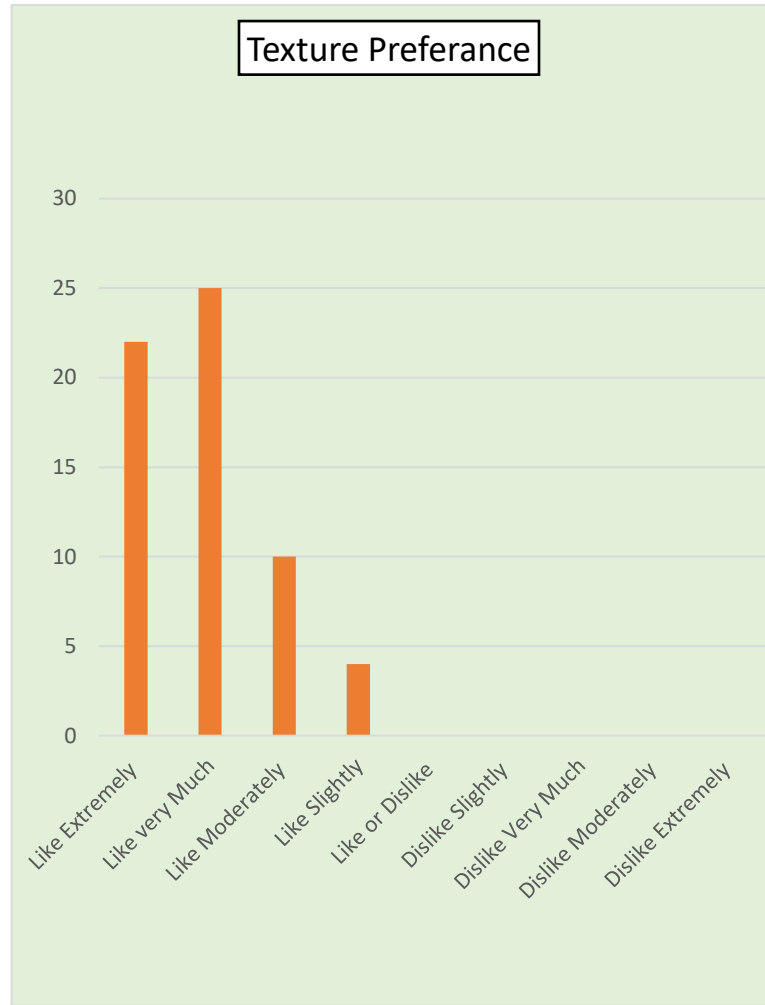
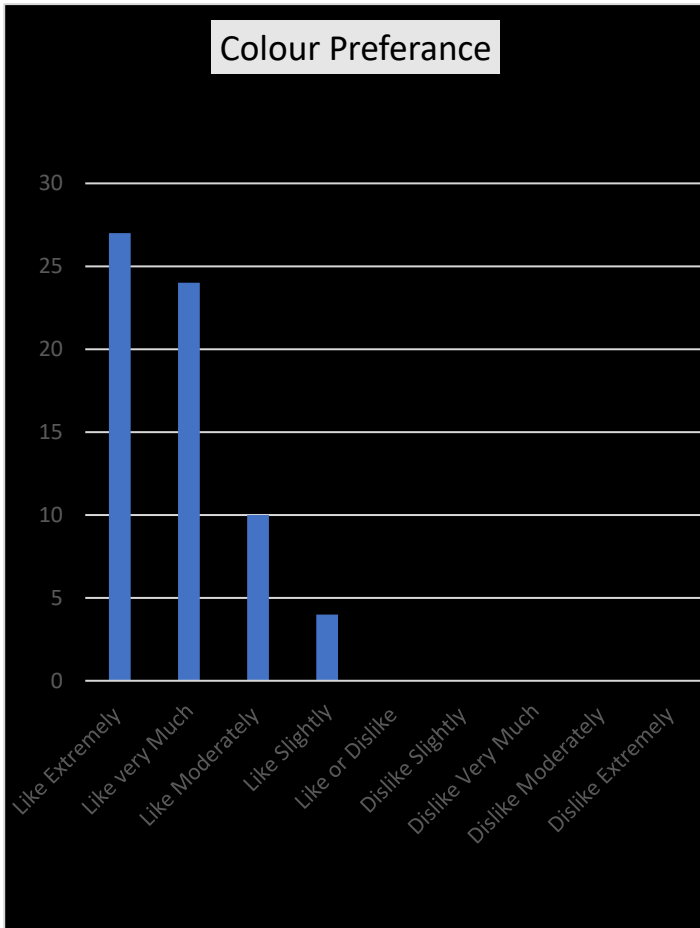


Figure 9&10: Texture Preference

Figure 9&10, shows the two sample texture attributes of citron juice in bar charts in 9 points hedonic scales. The bar chart shows two that Sample. the sample 1 citron juice got the highest score as like very much.

Sample 1



Sample 2

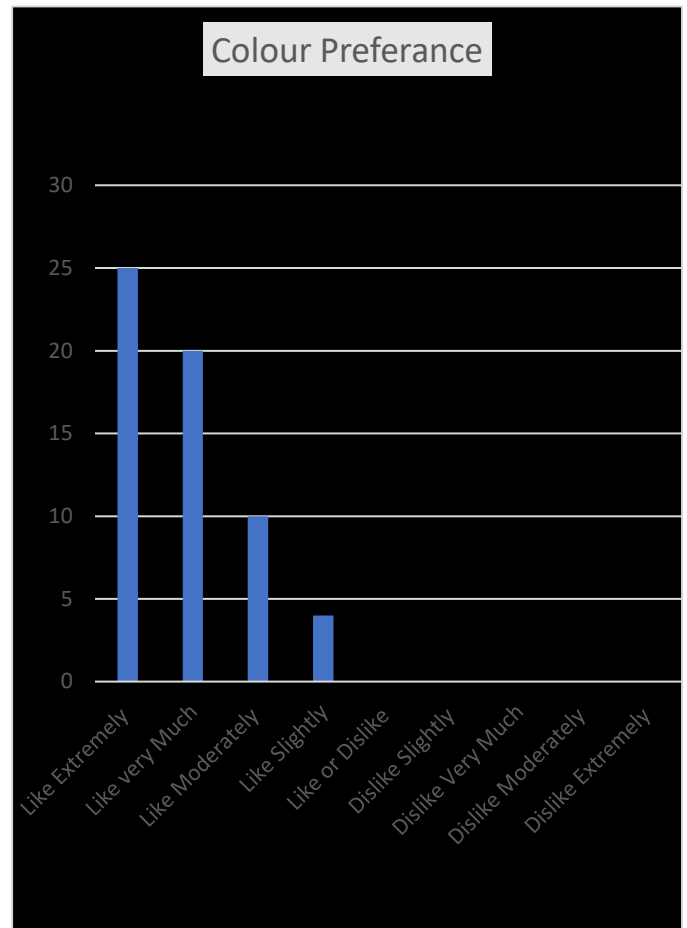


Figure 11&12: Color Preference

Figure 11&12, shows the two sample Color attributes of citron juice in bar charts in 9 points hedonic scales. The bar chart shows that two Sample. The sample 1 got the highest score as like extremely.

Sample 1

Sample 2

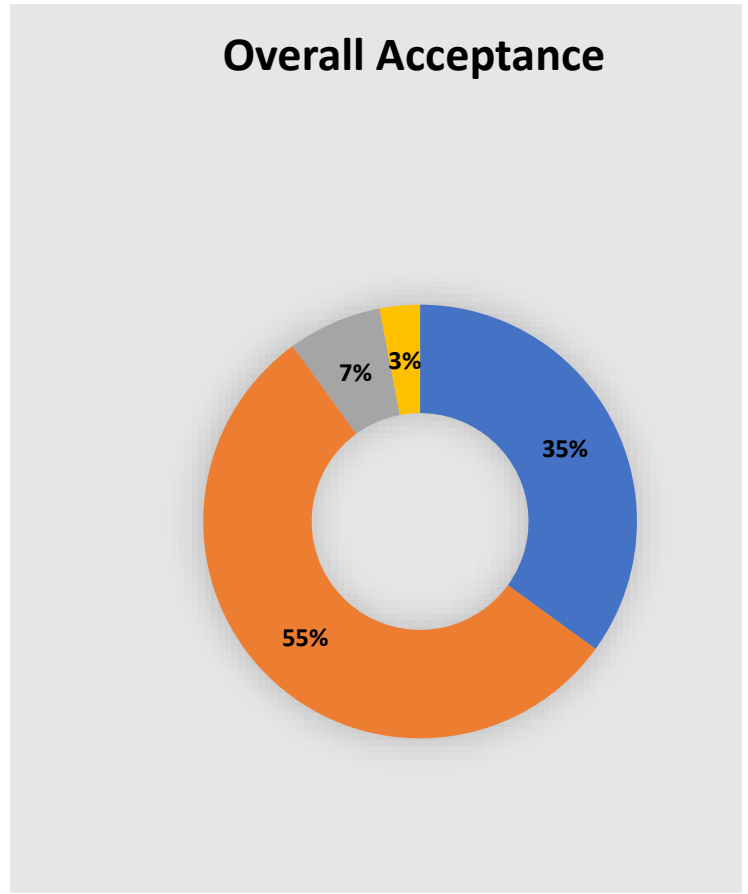
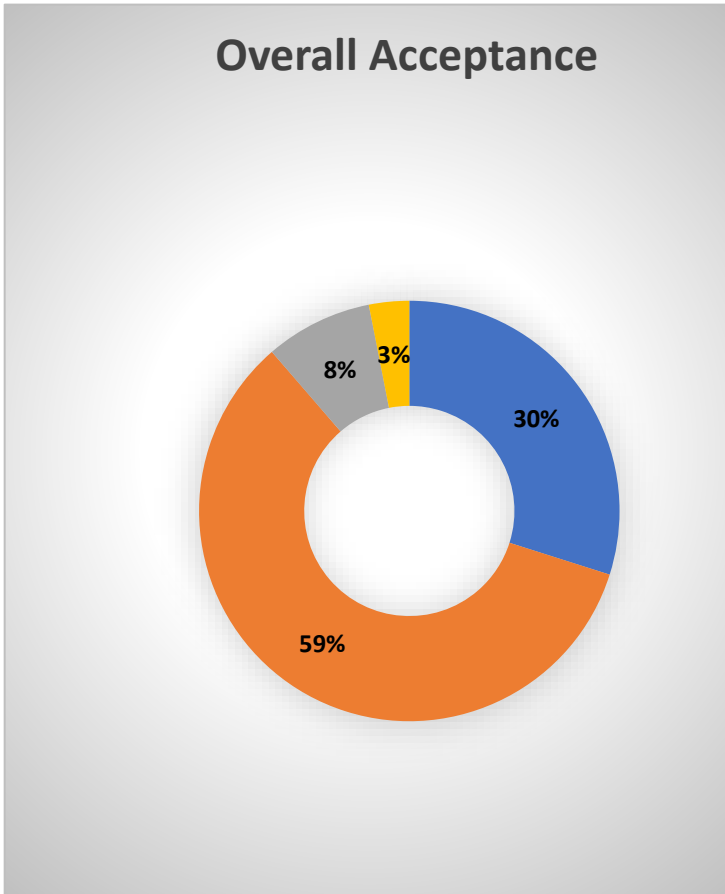


Figure 13&14: Overall Acceptance of Citron Juice

The overall sensory acceptances of citron fruit juice are shown in the two figure 13&14. In sample 1 Among all participants 30% extremely liked. Likewise, 59% participants liked it very much. And sample 2 Among all participants 35% extremely liked. Likewise, 55% participants liked it very much. On the other hand, there was no one who dislike the Citron fruit juice. Based on this result, sample Sample 1 received the highest ratings for both taste and overall acceptance, while Sample 2 had the lowest rating for taste.

CHAPTER 5

CONCLUSION

5. Conclusion

In conclusion, the optimization of the production process for nutrient-rich citron fruit juice within the NFE lab has yielded promising results. The analysis of the juice revealed a notable moisture content, indicating its potential for an extended shelf life. Furthermore, the citron juice emerged as a commendable source of Vitamin C, adding to its nutritional value. Regarding organoleptic qualities, the evaluation, as depicted in Figure-13 sample 1, showcased a high level of overall acceptability. Impressively, 30% of participants expressed an extreme liking for the citron fruit juice, while 59% indicated a very high level of preference. Notably, there were no participants who disliked the citron fruit juice. These findings affirm the successful optimization of the production process, resulting in a citron juice with favorable sensory attributes and nutritional benefits.

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APPENDIX

APPENDIX 1

Synopsis of the thesis

1. Name: Md. Forkan Sikder

2. Id: 201-34-297

3. Project title: Optimizing the Production Process for Nutrient-Rich Citron Fruit Juice: Quality, Nutritional Profile, and Sensory Evaluation.

4. Introduction:

Citron fruits, often simply referred to as "citron," are a type of citrus fruit. They are characterized by their large size, thick rind, and unique appearance. Citron fruits have a distinct oblong or oval shape and can be yellow or yellow-green when ripe. They are known for their strong, aromatic fragrance.

Citron fruit flesh is incredibly tart and is normally not eaten directly due to this. Instead, the skin of citron fruits, which is frequently candied or used to make zest for seasoning in cooking and baking, is what gives them their greatest culinary worth. Citrus flavors and aromas are highly sought in citron zest. Citron fruits have a long history of culinary and medicinal uses, and they are important in various religious and cultural traditions around the world. They are a unique and flavorful addition to the world of citrus fruits (**Jitterbit et al. 2010**).

"Citron Juice" is a refreshing and tangy beverage made from the juice of citron fruits. This citrusy concoction offers a zesty flavor that balances sweet and sour notes, making it a delightful choice for a thirst-quenching drink. The juice is extracted from citron fruits, which are known for their large size and bumpy, thick rind. Packed with vitamin C and other nutrients, citron juice is not only tasty but also offers potential health benefits. It's a good source of vitamin C, which supports the immune system and skin health. Additionally, dietary fiber, calcium, iron, beta-carotene, niacin, manganese, zinc, selenium, vitamin B6 and potassium. Whether enjoyed on its own, mixed with other fruit juices, or used as a base for cocktails, citron juice is a versatile and invigorating option for those seeking a flavorful and revitalizing drink (**Jitterbit et al. 2010**).

Problem Statement and Justification

The citron juice is multifaceted. It aims to provide a refreshing and flavorful beverage option that combines the sweet and sour notes of citron fruit. Beyond its taste, the juice is rich in nutrients, particularly vitamin C and antioxidants, with the goal of potentially benefiting the immune system,

skin health, and overall well-being. Additionally, citron juice serves as a versatile base for various drink creations, catering to different taste preferences and occasions. Ultimately, the objective is to offer a tasty and potentially health-enhancing beverage choice that contributes to a balanced and enjoyable (*John Wiley & Sons, 2010*).

5. Objective:

- A. To add flavor: Citron fruit juice has a tart and refreshing flavor that can be used to enhance the taste of food and drinks. It is often used in cocktails, salad dressings, and marinades (*Zachary and Hopf, 2000*).
- B. For its health benefits: Citron fruit juice is a good source of vitamin C, potassium, and other nutrients. It has been shown to boost the immune system, fight cancer, and improve digestion.
- C. In traditional medicine: Citron fruit juice has been used in traditional medicine for centuries to treat a variety of ailments, including stomachache, diarrhea, and fever.
- D. In perfumery: Citron fruit juice is used in perfumery to create a fresh and citrusy scent.

6. Materials:

6.1 Ingredients:

- Citron fruits
- Water
- Sweetener
- Ice Cubes

6.2 Instrument:

- Blender machine
- Slicer
- Biker
- Knife
- Spoon

7. Method:

A. Prepare the Citron Fruits:

- Wash the citron fruits thoroughly under running water to remove any dirt or impurities.
- Cut the citron fruits into halves or quarters, depending on their size.

B. Extract the Juice:

- Using a citrus juicer or a manual juicer, squeeze the juice from the citron fruit segments. You can also use your hands to squeeze the juice into a bowl or container.

Strain the juice to remove any seeds or pulp.

C. Mixing:

- Stir the citron juice mixture well to ensure the sweetener is dissolved.

D. Bottling:

- Store bottled citron juice in a cool, dark place. The ideal temperature is between 50-70°F (10-21°C). If you're not planning to consume it within a few weeks, can also store it in the refrigerator to extend its shelf life.

E. Storage:

- Short-term Storage (Up to 1 Week): Keep citron juice in the refrigerator in an airtight container or bottle at 32-40°F (0-4°C). Check for spoilage before use.
- Longer-term Storage (Up to 3 Months): Freeze citron juice in airtight containers or ice cube trays. Thaw it in the refrigerator when ready to use. Avoid microwaving for thawing.

8. Place of the Study:

Food processing Lab, Department of Nutrition and Food Engineering, Daffodil international University

9. Period of the Study:

I started my project work on 17 September, 2023.

10. Supervisions:

Main Supervisor: Dr. Md. Mahbubur Rahman, Assistant Professor, Department of Nutrition and Food Engineering.

Co-Supervisor: Mr. Md. Harun- Ar Rashid, Assistant Professor, Department of Nutrition and Food Engineering.

11. Expected Outcome:

- High Quality
- Extended shelf life
- Successful test
- Satisfied customers
- Consumer demand
- As per as product depends on quality

12. Conclusion:

citron juice offers a range of potential health benefits due to, its nutritional composition. It is particularly notable for its high vitamin C content, which supports immune health and skin vitality. Additionally, the presence of antioxidants in citron juice can assist in combating, oxidative stress and inflammation, potentially benefiting individuals with various health concerns.

The citric acid present in citron juice may aid digestion and provide a mildly refreshing taste. The inclusion of potassium contributes to electrolyte balance and heart health. While citron juice can be a part of, a healthy diet, it's important to emphasize that it should not replace medical treatments or professional advice (**Z. Wu et al (2013)**).

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Signature of the Supervisor	Signature of the Co-Supervisor

OPTIMIZING THE PRODUCTION PROCESS FOR NUTRIENT-RICH CITRON FRUIT JUICE: QUALITY, NUTRITIONAL PROFILE, AND SENSORY EVALUATION

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