A Project Report
ON

Pomelo Juice processing

Submitted To:

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Submitted By:

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LETTER OF TRANSMITTAL

Date: 23 December, 2018

To
Prof .Dr. Md. Bellal Hossain
Head
Department of Nutrition and Food Engineering
Daffodil International University

Subject: Submission of project work report

Dear Sir,

It is a great pleasure and honor for me to have the opportunity to submit Project **report on "Pomelo juice processing"** as a part of the Nutrition and Food Engineering (NFE) program curriculum for the fulfillment of undergraduate degree.

I have prepared this report based on the acquired taste knowledge during my project period in NFE lab. It is great achievement to work, without your help it is impossible to complete my work. I request you to excuse me for any mistake that may occur in the report despite of my best effort.

I would really appreciate it you enlighten me with your thoughts and views regarding the report. Also, if you wish to enquire about an aspect of my report, I would gladly answer your queries.

Thank you again for your support and patience.

Sincerely Yours,

Md Rafiqul Islam
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DECLERATION

This Dissertation entitled **"Pomelo juice processing"** is being submitted to the Department of Nutrition and Food Engineering, Faculty of Allied Health Sciences, Daffodil International University Dhaka-1207, Bangladesh as a part of partial fulfillment of the requirements for the degree of Bachelor of Science in Nutrition of Food Engineering. No part of this work referred to in the Thesis has been submitted in support of an application for another degree or qualification of this or any other University or other Institute of learning.

Submitted by

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Supervised by:

Supervisor	**Co-Supervisor**
Prof. Dr. Md. Bellal Hossain **Head** Department of Nutrition and Food Engineering Faculty of Allied Health Science Daffodil International University Dhaka-1207, Bangladesh.	**Effat Ara Jahan** **Lecturer** Department of Nutrition and Food Engineering Faculty of Allied Health Science Daffodil International University Dhaka-1207, Bangladesh.

Acknowledgement

At First thanks to the almighty ALLAH .Who give me the strength for hard working, give me opportunity and responsibilities to complete my project work without any disturbance and complete within time.

I am grateful to my parents without whom I cannot be here. Without the support of them, I could not be able to achieve my objectives and goals.

I am deeply pleased to my Supervisor Sir**, Prof. Dr. Md. Bellal Hossain**, Head Dept. of NFE, Daffodil International University; for his whole-hearted supervision during my organizational attachment period. I would like to give thanks my Co-supervisor, Effat Ara Jahan Lecturer, Dept of NFE;

I want to also thanked to my all teachers of NFE department.

Md Reaz Mahmud, Technical Assistant, Emdad Lab Assistant and Md. Emran Hossain coordination officer Dept. of NFE. They helped me very much directly, indirectly. Their very sincere support helped me to complete the project work and report writing too.

My gratitude goes to entire NFE Department of Daffodil international University for arranging project work that facilitates integration of theoretical knowledge with real life situation.

ABSTRACT

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Pomelo peel is one of the most important cultivar of the citrus genus, which are containing of In this regard, two sample pomelo juice were prepared by taking 2200 gm weight. Quantitative determination of different required parameters of the resultant products were done by following AOAC standard methods. Brix was carried out for all products with the help of refractometer and the values were 14% & 16% respectively . Average value of acidity of these developed juice were 0.17N & 0.14N, determined by titrimetric method. Average p^H of the drinks were found to be 3.40 & 3.68. Total mineral content of the products were investigated as 1.31% , were determined as dry basis by using muffle furnace.

Sensory evaluation of the products on nine point hedonic scale were done by untrained panel of thirty seven assessors at 5% significant level. Thirty seven assessors preferred the juice prepared with Raw pomelo juice.

nutrients advantages to human health. Pomelo peel product changes in p physiochemical properties of moisture, vitamin c of pomelo peel juice sample and post drying pomelo juice were investigated. The objectives of the present study was to evaluate changes of processed for raw pomelo peel juice and after sun drying (50 to 60) ^{0}C in comparison with fresh pomelo peels.

Commented [a1]: Need add findings
Need sensory results

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Chapter I

Introduction

There are many seasonal fruits in Bangladesh pomelo is one of them. Generally pomelo eaten fresh or as juice. It also popular for jam and syrup. On the other site pomelo has several uses like flavoring in food, fragrance in perfumes ,traditional medicine (the fruit peel has been used for cough, swelling, because of the effectiveness of the volatiles),the middle layer have pectin which help for reducing body weight.

Pomelo peel product is excellent source of vitamin c and essential oil. And also variety of compound used for health. Some ingredients of the pomelo peel and dry product are phenolic compound, alkaloids, tannins, flavonoids, glycosides, and phytoestrogens. There are also good source of ascorbic acid.

There are commonly two types of pomelo, which has pink flesh and which has white flesh.. They are also known generally used eaten as fruit. This taste is sweet, and is slightly acidic with a hint of bitterness.

Objective

Generation objectives of pomelo juice

- Preparation and evaluation of chemical and microbial analysis of pomelo juice
- Determine the general acceptability of pomelo juice in terms of sensory qualities
- Identify microbiological load in pomelo juice.
- Evaluate the chemical analysis of raw and dry pomelo juice

CHAPTER II

2.1. Materials and Methods

The thesis work was conducted by the laboratories of the Department of Nutrition and Food Engineering, Daffodil International University, Dhaka.

2.2. Collection of Raw Materials

Fresh mature pomelo was collected from the local market.

Materials:

2.3. Requirements Chemical

- Citric acid
- Sodium benzoate
- Xanthan gum
- NaoH
- Phenopthelin indicator
- color
- The pet bottles were used in the bottling of ripe pomelo juice.

Ingredients :

- 1.pomelo peel
- 2.water
- 3.sugar

Apparatus and Equipment :

- 1.Balance meter
- 2.beaker of taking raw ingredients
- 3. Broad of cutting
- 4. knife
- 5.Tray for finish product of MCSTD
- 6.Measuring cylinder
- 7.Conical flask
- 8.Crucible lid
- 9.Droper
- 10. Filter paper
- 11. Desiccator
- 12. Volumetric flask
- 13. Beaker
- 14. Blender mixer
- 15.PH meter
- 16.Muffle furnace
- 17.Refractometer
- 18.Oven

- 19.Burette & pipet

Cleaning & Hygiene Equipment

- Apron
- Hand gloves
- Musk

Packaging Equipment

- Aluminum foil and Zipper bag

2.4. Methodology

The study on the development of pomelo juice was made using the following equipment. Ingredients and utensil.

Weighing : At first take the weight of the two pieces of pomelo (without peel) was 2200 gm by digital weight machine .

Peeling and Cutting

The pomelo with a sharp knife are Separated from the seed hold the pomelo on its side. Pomelo by slicing the skin has to cut deeply in order to get through the outer peel. After peeling and slicing the weight of the pomelo 1600 gm.

Blanching:

Now pomelo pieces are ready for blanching .Hot water is used for blanching, in this process may range in color from white to pink depending on the variety and being added with water. Blanching process is known as inactivation of enzymes, retain color and flavor. Then blanching is used to boil 2-3 minutes of raw pomelo and continuing up to the pomelos is boiled.

Soak Ingredients:

After blanching soak the total ingredients. It helps to reduce the moisture content.

Drying:

This process used for MCSTD to make it dry. MCSTD controlled the temperature is used to (60-65)℃ then makes it dry. We need to 48 to 76 hours to make it dry depending on the moisture content of raw pomelos.The final product of MCSTD dry pomelo weight was 65 gm.


Production

During my thesis period two samples are prepare by me.

- Sample one Raw pomelo juice and
- Sample two dry pomelo juice

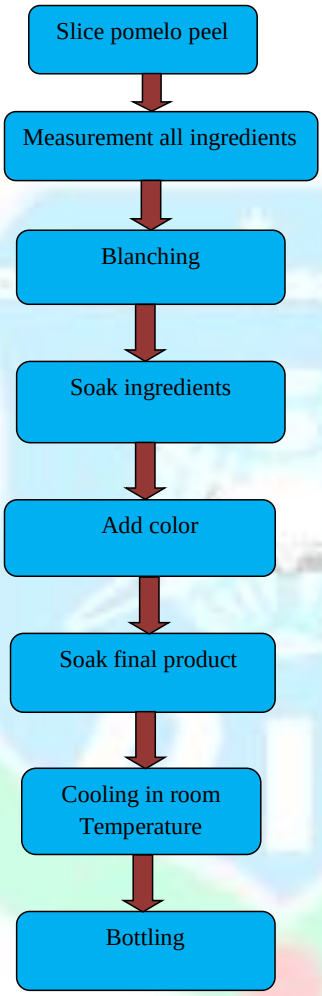
Now, this key step of preparation of described below.

First steps of raw pomelos to pomelo juice

This situation Several requirements need to be met :

- Reduce of insect infestation
- Lack of mechanical injuries
- Check the maturity stage
- Check color & texture
- Minimum soluble solids of 13 brix
- PH value 3.5 to 4.0

Process flow chart



Composition of pomelo juice:

Serial No	Pomelo juice gm	Water gm	Sugar gm	Citric acid gm	Sodium benzoate gm	Xanthan gum gm
Raw sample	100	700	120	1	0.5	0.3
Dry sample	30	1000	120	1	0.5	0.3

CHAPTER III

Chemical Analysis

Moisture, Ash, Brix , titration value of Acidity test of pomelo juices were determined by following methods described by the moisture content by the digital moisture analyzer methods at 105℃ for 1 hours.

Ash content by muffle furnace method at 600^{o} C for 6 hours. Determination of acidity by titration method and total soluble solids and p^{H} of pomelo juice were determined by p^{H} meter. Brix was taken with help of Refractometer.

Determination of brix test

Instruments:

Refractometer, Dropper etc.

Process:

Taken two drops of sample into Refractometer and adjust focus. After that reading was taken.

Determination of p^{H} test

Determination of pH of sample

Instruments:

- pH meter
- Beaker

Process:

- Take sample into a beaker
- Deep the p^{H} meter and taken the reading

Determination of Acidity test

Instruments:

- Conical flak
- Dropper
- Phenolphthalein indicator
- Funnel
- 5.burette
- Distilled water
- 0.1 M sodium hydroxide (NaOH) solution.

Process:

- Take 10 gm sample into conical flask and add two drops of phenolphthalein indicator.
- Added 10 ml distilled water
- Titrate with 0.1 N Sodium Hydroxide Solution until the color changes to pink/rose.

Calculation:

Acidity – (Burette Reading x Normality of sodium Hydroxide x Equivalent weight of Acid x 100) (Weight of sample x 100)

Determination of Moisture content:

The moisture content of the sample was determined using following the hot oven method. First we have taken the weight of crucible lid .Then the sample 4 gm of a sample was put into a washed and dried crucible dish and weight it placed into the oven at a 105^0 C for 1hours until the weight is constant. Then the samples were cooled in a desiccator and weighted .the weight loss was taken as the obtained as the moisture content loss in weight of dried peel samples calculated as:

% Moisture content $= \frac{M1-M2}{M1} \times 100$

Here,

M1 = initial weight of crucible lid

M2=Weight of crucible lid + sample before drying

Determination of ash content:

The ash content was determined using furnace muffle following sample 4 gm. of pomelo peel was placed in a crucible and incinerated at 600 for 6 hours in the ashing muffle furnace until ash was obtained, followed by cooling in a desiccator and weighing using an analytical balance .The temperature of the was allowed to reach 600^0 C after placing the dish in it and maintained until the water was fully removed indicating that all the organic matter content the sample has been destroyed. The dish was brought out from the furnace and cooled in the desiccator and re-weighed the sample.

Calculation

% Ash content $= \frac{C-A\ x\ 100}{B-A}$

Here,

A= weight of crucible lid

B= weight of crucible lid + sample before ashing

C= weight crucible lid + ash

Determination of Protein Test:

Materials required:

- Digestion mixture
- H_2SO_4
- 0.1N HCL
- 40% NaOH
- Methyl red indicator
- Distillation water

Procedure: Digestion

Frist Step

Take the sample 0.4 gm and H_2SO_4 and digestion mixture 2 gm

- Put it on the digestion flask
- Two digestion flask for average value can be taken
- At first slowly heat about 3-4 hours
- The end point will be no while smoke of H_2SO_4 and the solution will be crystal clear
- Cool it for some time

Second step:

Titration flask

25 ml 0.1 (N) HCl for 3 distillation flask

3-4 drops methyl red indicator

Then 30 minutes distillation flask

Calculation

$$= \frac{(B - S) \times 1.4 \times 10 \times 6.25 \times 0.1}{Sample\ weight}$$

$$= \frac{(B - S) \times 1.4 \times 10 \times 6.25 \times 0.1}{0.4}$$

Microbial Analysis (Total Viable Count of pomelo juice)

Method: Standard plate count /Total plate count

Purpose:

This technique consists of growing the bacteria in a nutrient culture Petridis and counting colonies which develop.

Requirements of media preparation:

- Nutrient agar
- Autoclave
- Deionized water
- Analytical balance
- Graduate cylinder
- Stir bar
- Stir plate
- Lap scoop
- Aluminum foil

Media preparation

- Add 100ml of deionized water to a graduate cylinder.
- Place a stir bar in a 250 ml in a flask
- Need to the analytical balance, place a weight boat onto the balance.
- Press the rate to zero out the weight boat
- Use a lab scoop to add 2.35 gm nutrient agar
- Now add the powder to the flask
- Add 100 ml of deionized water
- Place the flask onto a stir flask
- After about 2 minutes add the remaining
- Cover the flask with aluminum foil.
- Use autoclave to sterilize the media
- Use the control panel set to the mode to sterilize, the temperature to 121 degree Celsius.
- We will run this cycle this machine for sterilize for 17 minutes.
- The cycle ends and the pressure gauge reads of 15 psi.
- Now place the flask onto the stir plate and stir the media.

Serial dilution method used for the sample of pomelo juice. That's why decrease the concentration of sample the concentration of sample and helps to microbial count.

Serial dilution method

Materials Required:

- Test tube
- Pipettes
- Beaker
- Sample
- Distilled water

Procedure

- Taken 4 test tube A.B.C.D
- Pour 9ml of distilled water to these test tube
- Transfer 1 ml of sample solution to the test tube A mix well
- Transfer 1ml of solution from the test tube A to test the B and mix well
- Transfer 1ml of solution from the test tube B to test the C and mix well
- Transfer 1ml of solution from the test tube C to test the D and mix well and continue up to be required dilution.
- Now here we are making 10^{-4} dilution.

Inference

- Test tube A has 10 times dilution or 1/10 or 10^{-1}
- Test tube B has 100 times dilution or 1/100 or 10^{-2}
- Test tube c has 1000 times dilution or 1/100 or 10^{-3}
- Test tube D has 10000 times dilution or 1/100 or 10^{-4}

Requirements of Total Viable count:

- Sterile Petridis
- Micropipette
- Alcohol
- Autoclave
- Incubator
- Media
- Laminar air flow
- Serial dilution sample
- Spreader bar

Procedure:

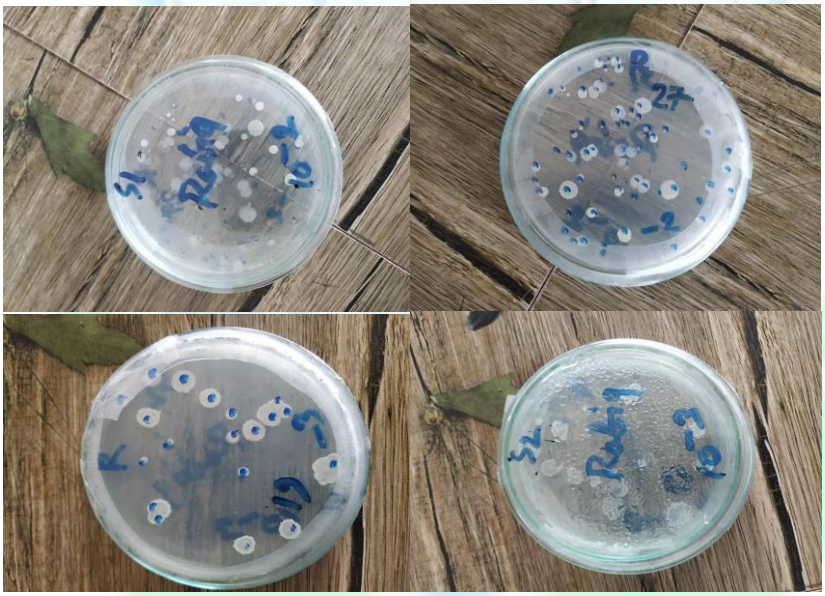
- Media allow cooling in
- Add the media onto the petri dishes. The amount have not to be exact but be sure to cover the entire bottom surface which is about 20 ml for standard size of petri dish.
- The media has cooled at 37 ^{0}c to 38^{0}c add the serial dilution A,B,C,D sample 1ml for each petri dishes and spread it by spreader bar.

- It will solidify and turn opaque, and bind the petri dishes by Para film.
- Put the petri dishes onto the incubator at 37^0c for 24-48 hours.
- After incubator count the colony by colony counter.
- All the steps should be done under laminar air flow to maintain aseptic condition.

Calculation:

Colony forming unit's formula:

Colonies ÷ Amt plated x dilution = CFU/ml



Chapter IV

RESULT AND DISCUSSION

4.1 Determination of Brix of Product

Serial No	Degree Brix
Raw pomelo juice	14 %
Dry pomelo juice	16 %

The FDA standard level of brix is (11-14).The products brix was near to the standard.

The brix level was gradually decreased. All the component of the juice was constant except wt % of pomelo juice. pomelo juice according to sample increased the brix level was decreased. Bitter compound were increased with wt % of pomelo juice. Which is responsible for bitter taste and reduced brix level.

4.2 Determination of Acidity of Product

Serial No	Acidity
Raw pomelo juice	1.70 N
Dry pomelo juice	1.40 N

Acidity of two products gradually decreases. In these two samples acidity was gently decreased for dry samples of pomelo juice. But the amount of pomelo juice is higher than lemon juice.

4.3 Determination of p^H of Product :

Serial No	p^H
Raw pomelo juice	3.40
Dry pomelo juice	3.68

The products p^H gently increases with pomelo juice concentration. Pomelo juice is alkaline compound which was responsible for p^H level increased.

Total viable count of pomelo juice samples

Sample	After 3 days	After 7 days	After 14days
	TVC (CFU/ml)	TVC (CFU/ml)	TVC (CFU/ml)
Raw pomelo	0	0	2.0×10^2
Dry pomelo	0	0	3.0×10^3

Showing that there was no microbial growth in raw sample and dry sample after 3 and 7 days. But after 14 days total viable count (TVC) was found in raw as 2.0×10^2 cfu/ml and dry and 3.0×10^3 cfu/ml

Sensory Evaluation:

I guided a survey among 30 Students and Teachers of daffodil international university.

Total data are submitted below.

Name :	Product : pomelo peel for juice preparation
Panelist no :	Date:

Instructions: Taste the given samples, then place the mark on the point in the scale which best describe

Sample Code	
Sample 1	Sample 2

✓ Mark on the point in the scale which best describes your feeling

Score	Appearance	Flavor	Taste	Texture	Overall acceptance	Appearance	Flavor	Taste	Texture	Overall acceptance
(9)Like extremely	8	9	12		13	13	12	8		6
(8) like very much	17	15	13		21	7	8	11		14
(7) Like moderately	7	8	2		2	9	9	8		8
(6) Like slightly	4	2	3			11	6	5		6
(5) Neither like nor dislike	0	0	0	0	0	0	0	0	0	0
(4) Dislike slightly	0	0	0	0	0	0	0	0	0	0
(2) Dislike very much	0	0	0	0	0	0	0	0	0	0
(1) Dislike extremely	0	0	0	0	0	0	0	0	0	0

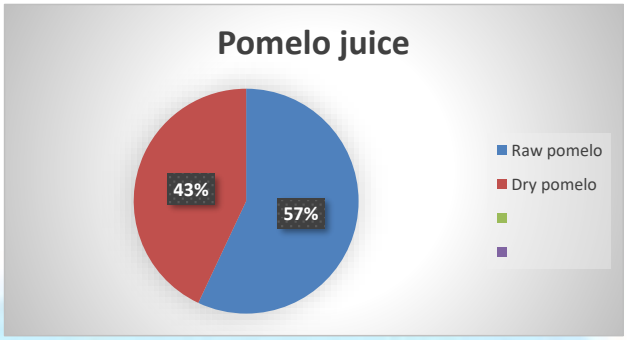
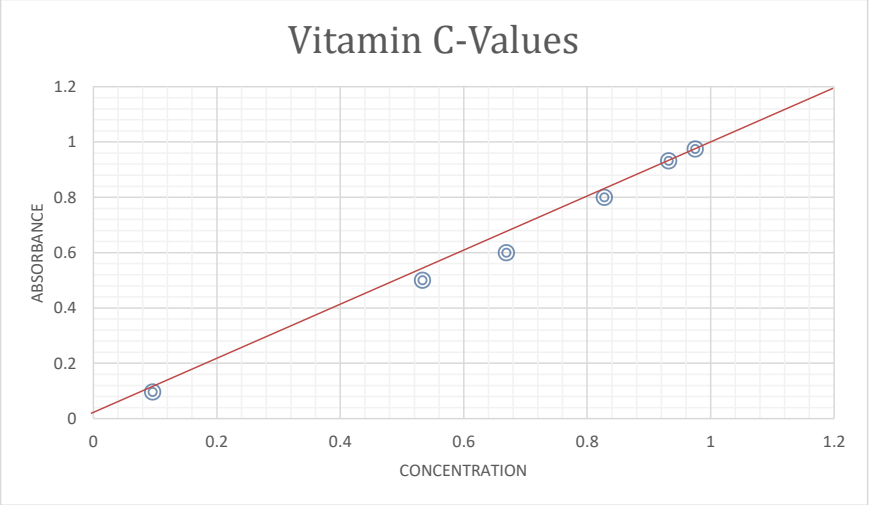


Figure: Pie chart – Overall Acceptance

Showing that the overall acceptance of pomelo juice in pie charts by 9 point hedonic scale. The bars shows that sample -1 raw pomelo containing 12% and 12% sugar got the highest percentage in overall acceptance.


Vitamin C-Values
ABSORBANCE
CONCENTRATION
0
0.2
0.4
0.6
0.8
1
1.2

Conclusion

In our country it is normal matter get huge amount pomelo. People take pomelo and waste the peel. Now a day's pomelo products have been producing in many countries in the world. If we can process all the system these are used to make pomelo product. Our country can develop pomelo product at a very cheaper cost.

The nutrious pomelo product has various verities available in the global market. Such as pomelo peel dried product candied product.

Those products have a self-life up to 4 to 5 month.

Pomelo has variety of compound. That can be used for health. Pomelo peel products are the excellent source of vitamin c and essential oil. Pomelo product have some ingredients such as phytoestrogens, alkaloids, tannins, phenolic compounds , flavonoids. Some of the ingredients can be used to overcome some health problems.