***Project report***

On

# Study of newly developed commercial Beet Root products shelf life

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**Date of Submission: 29March 2022**

# Letter of Transmittal

Date: 29-03-22
To
MS. FouziaAkhter
Head
Department of Nutrition and Food
Engineering (NFE) Daffodil International
University

**Dear Sir,**

**Sub: Submission of the Project Report.**

With due respect, I would like to take this prospect to thank you for giving me the

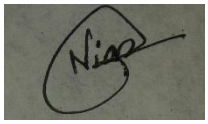
Opportunity to conduct my project work at the laboratory of NFE department, Daffodil

International University. I have successfully completed my project eligible "Study of newly developed commercial Beet Root products' shelf life in due time.

Therefore, with great unpretentiously request you to accept my report for fulfilling the requirement of my graduate degree.

Thank you again for your provision and persistence.

Sincerely Yours,



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# Letter of Authorization

Date: 29-03-22

The Head of the Department

Department of Nutrition and Food Engineering

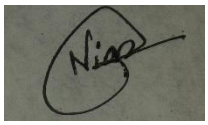
Daffodil International University

Subject: Submission of project Report

Dear Sir,
This is my fair authentication that the “Project Report” will be not a copy of any thesis report beforehand made by any other students.

I am also expressing my true authorization to support the fact that the said thesis report has neither been used before to fulfill my other course related nor it will be submitted to any other person or authority in future.

Sincerely Yours



……..

Md. Niaz Mahmud

ID: 183-34-137

Department of Nutrition and Food Engineering

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# CERTIFICATE OF APPROVAL

I am contented to confirm that the Project repor**t** `` Study of newly developed commercial Beet Root products 'shelf life

In due time on conduct by **Md. Niaz Mahmud** bearing respectively ID NO: 183-34-137,

Department of Nutrition and Food Engineering has been approved for presentation, defense

And viva-voce.

I am also certifying that the data and the findings in this report are authentic work of **Md. Niaz Mahmud** strongly recommended the report presented by **Md. Niaz Mahmud** further academic recommendations and defense and viva-voce. **Md. Niaz Mahmud** bears a good personality. Wish him a successful Future in life.

---

Professor Dr. MD. Bellal Hossain

**Associate Dean Faculty of Allied Health and Science Engineering**

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MS. Fouzia Akter

**Head, Department of Nutrition and Food Engineering**

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# Acknowledgement

The Author likes to thank the Department of Nutrition & Food Engineering, Daffodil International University .Dhaka, Bangladesh for supporting me to complete My Thesis report.

My Deep gratitude and sincere thanks to the honorable Dean, Faculty of Allied Health Science, **Professor Dr. Ahmed Ismail Mustafa** for this kind cooperation and to accept this Degree.

I am also very grateful to My Supervisor **Professor Dr. Md. Bellal Hossain,** Associate Dean Department of Nutrition and Food Engineering, Daffodil International University, for his whole-hearted supervision during my organizational attachment period.


# THE PROJECT WORK

# IS

# Dedicate to my parents and my well wisher’s

# Abstract

Beta Vagaries is ordinarily known as beetroot. It is a Cruciferous tuber vegetable because it is rich in nutrients, minerals, and vitamins but it also has incomparable phytol constituents , which have various therapeutic importance such as antioxidant, anti-depressant, anti- microbial, anti- inflammatory, and diuretic activities . But beetroots are not available in every season. So, there is must to preserve this vegetable. The objective of the present study was to develop some value- added preserve beetroot products from raw beetroot and to evaluate their shelf life. The products were beetroot drinks, jam, jelly, non-fermented pickles, achar, and Spaghetti. Beetroot can reduce water retention and bloating and also boots iron during periods, it's also boosts immune system, prevents heart disease and stroke. Beetroot contains folate which helps cell growth .All the preserve products were kept at room temperature (29-30 $^{0}$c) for 10 monthsand analyzed for their shelf life at 0, 180, 300 days and microbial

analysis by using pour plate technique. In present study, beetroot product has been produced by newly and innovatively.

Drinks were pasteurized at 97 c for five min and stored for 300 day in pet bottle .The TSS and PH of drinks were found range 13.63 to 14. & 3.73 to 3.80 respectively. Maximum acidity 0.19% were found on sample 1. Total microbial plate count found after 3month maximum 2 colony in sample 3. The produced drinks were subjected to chemical and sensory evaluation at 1 months to 2nd and 3rd month storage time. In the storage time TSS, PH, Acidity gradually increases. The mean overall acceptability score of more than 10 .From all the analysis, it can be observed that the drinks can be kept conveniently for 3month in process system.

JAM were pasteurized at 85 c for few min after packaging and stored for 180 days in glass jar. The TSS and PH of jam were found 65to 66 & 4.10 to 4.12.respectively. Maximum acidity 0.11% were found on sample 1.Total microbial plate count found after 3 month of storage maximum 2. In sample 1. The produced jam were subjected to chemical and sensory evaluation at 1 months

to 2nd and 3rd month storage time. In the storage time TSS, PH, Acidity gradually increases. The mean overall acceptability score of more than 10 in sample 2.From all the analysis, it can be observed that the jam can be kept conveniently for 3month in process system.

Jelly were pasteurized at 85 c for few min after packaging and stored for 180 days in glass jar. The TSS and PH of jam were found 65to 66 & 3.97 to 4.1respectively. Maximum acidity 0.10% were found on sample 1.Total microbial plate count found after 3 month of storage maximum 3 cfu . In sample 1. The produced jam were subjected to chemical and sensory evaluation at 1 months to 2nd and 3rd month storage time. In the storage time TSS, PH, Acidity gradually increases. The mean overall acceptability score of more than 10 in sample 2.From all the analysis, it can be observed that the jelly can be kept conveniently for 3month in process system.

Non fermented pickles were pasteurized at 85 c for few min after packaging and stored for 180 days in glass jar. The TSS and PH of jam were found 11 & 3.5 respectively. Maximum ash 13.5% were found on sample 1.Total microbial plate

count found after 3 month of storage maximum 3 cfu. In sample 1. The produced non fermented pickles were subjected to chemical and sensory evaluation at 1 months to 2nd and 3rd month storage time. In the storage time TSS, PH, Acidity gradually increases. The mean overall acceptability score of more than 10 in sample 2.From all the analysis, it can be observed that the non-fermented pickles can be kept conveniently for 3month in process system.

The moisture and ash of beetroot chips were found 8 % and 3.2%.The produced beetroot chips were subject to sensory evaluation at 1 month to 3 month .in this storage time. Moisture was not change in this storage time. Overall sensory evaluation acceptability score of more than 8. From all the analysis, it can be observed that the beetroot chips can be kept conveniently for 3 month in package system.

The moisture and ash of beetroot spaghetti were found 10 % and 2.9%.The produced beetroot spaghetti were subject to sensory evaluation at 1 month to 3 month .in this storage time. Moisture was not change in this storage time. Overall sensory evaluation acceptability score of more than 8. From all the analysis, it

can be observed that the beetroot spaghetti can be kept conveniently for 3 month in package system.

Key word: Beetroot, Microbial analysis, Shelf-life, sensory evaluation.

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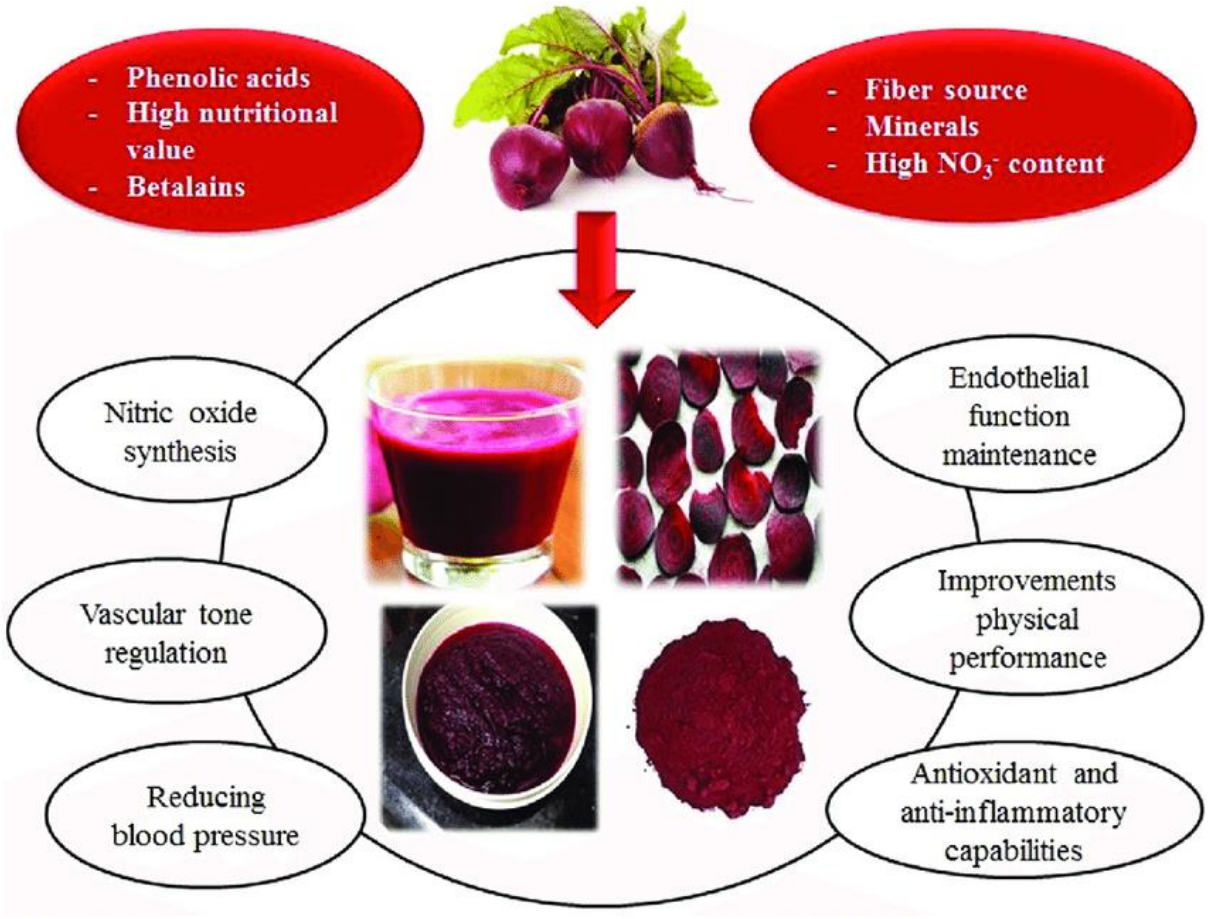
# CHAPTER 1

## Introduction



## 1.1 Introduction:

Different kinds of juice are found in Bangladesh & seasonal fruits, juice are available also, they contain Nutrients, vitamins, and minerals. Some fruits are citrus and sweets. This fruit gives the human body physical, nutritional, chemical, benefits, which play important roles in body regulation so that it maintains blood pressure & also regulates our digestive system [1]. Beet root (Beta vulgaris) is known as garden beet in many developing countries. Many country's people regular consumers are plants. Beetroot is an alkaline food and its pH ranges 7.5 to 8.0. It is also called "super food". The roots and leaves are used as medicine. Beetroot and leaves are also eaten as a vegetable. The little taproot vegetable is filled with the goodness of nature [TNN, 2018][2]. Beetroots are ranked among ten strongest vegetables with respect to the antioxidant capacity and total phenolic content of 50-60 micro mole/g dry weight. Beetroot is a potential source of valuable nitrogenous pigments called battalions [Dr. Lakshmi Bala, 2018][3]. Beetroot belongs to the Beta vulgaris species and it grows as the root of the beet plant. Usually, this species of veggies grows as mostly edible root veggies. They have a lot of nutrients and a low amount of carbs [TNN, 2018][4].

On of beetroot juice, jam, jelly, drinks, non-fermented pickles, achar, spaghetti as it contains high iron calcium and folic acids [5]. Beetroot can reduce water

retention and bloating and also boosts iron during periods, it also boosts immune system, prevents heart disease and stroke. Beetroot contain folate which helps cell growth [6]. Belonging to the same family as chard and spinach, both the leaves and root can be eaten-the leaves have a bitter taste whereas the round root is sweet. Due to its high sugar content, beetroot is delicious eaten raw but is more typically cooked or pickled. Beetroot is a very healthy and tasty vegetable which can be boiled, roast or used in juices. Beetroots also contain carbohydrates, protein, powerful antioxidants and soluble fiber [7]. Beetroot remained first cultivate in Roman. The beetroot is local to Asia Negligible and Europe. It is grown widely in German and France and in other countries like Africa South America. The crops are grown from seed that is sown in May and the beetroot is ready to harvest from early July onwards. The beetroot is packed straight from the field. This continues through the growing season, which finishes in October. Beetroot is most environmental friendly crops, infrequently wanting treatment with pesticides. The vegetable is best suited to the cooler growing conditions found in norther Europe. Jellies are defined by CAC section

2-2 as the products brought to semisolid gelled consistency and made from the juice extracts of one or more fruits or vegetables, mix with foodstuffs with sweetening properties with or without the addition of water [8]. Jellies are made by cooking fruit juice with sugar. A good product is clear and firm enough to hold its shape when turned out of its container yet quivers when moved. When cut, jelly should be tender yet retained the angle of the cut. Jelly should taste fresh and fruity. It should not be gummy, sticky, or syrupy or have crystallized sugar [11]. The product should free from dullness with little or no synergies and neither tough nor rubbery. Pectin, acid, sugar (65%) and water are four essential ingredient. Raw beetroot is 88% water, 10% carbohydrates, 2% protein, and less than 1% fat (see table). In a 100-gram (3+1⁄2-ounce) amount providing 180 kilojoules (43 kilocalories) of food energy, raw beetroot is a rich source (27% of the Daily Value - DV) of folate and a moderate source (16% DV) of manganese, with other nutrients having insignificant content .

## Nutrients found in (100-gram) of boiled beetroot:

- **Calories:** 44
- **Protein:** 1.7 grams
- **Fat:** 0.2 grams
- **Carbs:** 10 grams
- **Fiber:** 2 grams
- **Folate:** 20% of the Daily Value (DV)
- **Manganese:** 14% of the DV
- **Copper:** 8% of the DV
- **Potassium:** 7% of the DV
- **Magnesium:** 6% of the DV
- **Vitamin C:** 4% of the DV
- **Vitamin B6:** 4% of the DV
- **Iron:** 4% of the DV

Beets are particularly rich in folate, a vitamin that plays a key role in growth, progress, and heart health.[9]

## 1.2. The objects

The objective of work was to develop an innovative food product with nutritional properties as well as appealing organoleptic qualities. The preparation of the products involved several trials until the optimum recipe was found. The final products were then submitted to sensorial analysis that revealed the panelists preference for the jam, jelly, drinks, spaghetti, chips, of beetroot products. Moreover, some chemical apparatuses were evaluated to characterize the product in terms of fat, sugars and antioxidant activity, being this one of the most important, given the courtesy of exploiting the antioxidant properties of the beetroot to produce a jam, jelly., drinks ,achar, non-fermented pickles ,chips Enhanced with antioxidants. The results got exposed that the drinks, jelly, achars, jam, pickles, non-fermented pickles, chips, spaghetti of beetroot had a low sugar content and a high anti-oxidant activity, enhancing the potential health benefits related with its ingesting.

In addition, of this work was to development of newly commercial Beet Root products' shelf life with its composition, which would associate the characteristics of an outdated beet root product to the original flavor and improved health assistance spreading to the beet antioxidant properties.

# 1.3. Product of Beet root


FIG: Beetroot jelly

Fig: Beetroot Drinks

Fig: Spaghetti

fig: jam

Fig: Non fermented pickles

Fig: Beetroot Achar

# Chapter 2

## 2.1 Materials & Methods

Beetroot is collected from the local market at Mirpur near Dhaka town .we collect all raw materials in Dhaka local market.

Sugar, Aspartame, Xanthan gum, Sodium benzoate, Potassium sorbate, Vitamin c, Citric acid, Treated water, Baking powder, vinegar, starch powder, agar/ pectin are the other ingredients for **selected foods discussed below:**

**Sugar:**

Sugar is an energetic part of Drinks items we consume. It's provide functional and increase flavor, ensuring drinks different tastes and characteristics together with maximum shelf life.

**Xanthan gum:**

Xanthan Gum (E415) is thickening and stabilizing consequence on emulsions as beetroot (drinks). Xanthan gum constrains ice crystals of beetroot drinks or drinks. It is stimulating like a gel structure to form of drinks.

**Sodium benzoate:**

Sodium benzoate is a preservative.it rise the acidity flavor and as a preservative to spread the shelf life of drinks, jam jelly products.

**Potassium sorbate:**

Potassium sorbate extends the shelf life of foods. It is stopping the growth of mold, yeast, and fungi of foods. It is use as a preservative in foods, drinks, jam, jelly, achar.

**Citric acid:**

It is sour testing preserving agent. It also enhance the flavor it offsets the sweetness of drinks, jam, jelly.

**Agar or pectin:**

Pectin is a carbs that found in raw fruits skin. Pectin is a soluble fiber that has a strong gelatinous texture power. It creates thicken and stabilize jams and jellies.

**Baking powder:**

It is a leavening agent. It's a mixture of sodium bicarbonate and other acids.

# Methods:

## 2.2 Description of the products:

**Beetroot drinks:**

Beet drinks may enhancement endurance to help you exercise longer, recover blood flow, and help lower blood pressure. .basically beetroot drinks made combined elements such as water, sugar, preservative & combined mixture of thickening agent and stabilizer. Basically beetroot drinks color is deep read by naturally.

**Beetroot jam:**

Beetroot jam entail of mash fruits cooked with sugar sometimes add pectin & agar-agar & preservatives. The ratio must be 47 parts by weight fruit to 55 parts sugar. Beetroot Jam must have not less than 65% soluble solids. Sugar performance like prime preservative.it made from fruits all parts. Brix % 65-68. When jam brix% <68 jam consists sugar crystal in few day or month. And also >65 % decrees it not bind jam.



**Beetroot jelly:**

The chief alteration among jam and jelly is that jelly is edgy for a gem-like lucidity without fruit solids. Bright color, crystal-clear reliability, most fruits are extract their juice not solid part of fruits. Juice is boiled speedily with sugar, pectin, preservatives and stabilizers. Jelly is naturally stronger than jam, but not so firm that it's gummy-like. BSTI regulation jelly must contain at least 55% fruit juice. But we use best portion of beetroot juice when we jelly making.

**Beetroot non fermented pickles:**

Pickles come in all sizes, shapes and differences but to make things calmer we can establish that theyall use brine solution for preservation. Whether it is vinegar or salt or other seasoning. Pickles arefirst fermented- where good bacteria break down the sugars in vegetables or fruits and give pickles standard sour teste (Acid Is Key to What a Pickle Is, 2021).

Two types of methods can be used to make pickles such as Fermentation and non-Fermentation. Brine solution is used in mutually methods.

**Beetroot chips:**

Chips are made from many kinds of vegetables, Such as potato, banana. New innovation of beetroot chips made from beetroot vegetables. We made this chips combined of mixer of flower, starch powder, baking powder and concentered beet root juice. Vegetable chips may be fried, deep-fried, dehydrated, dried or baked. Many different root vegetables or leaf vegetables may use. Vegetable chips we eat as a snack food.

**Beetroot spaghetti:**

Spaghetti is one kind of pasta. Many types of pasta found in world. Basically pasta made from flour, starch. Pasta is a type of food naturally made from an unleavened dough of wheat flour mixed with water or eggs, and formed into sheets or other shapes, then cooked by boiling or baking. Pasta is a kind of food made from an unleavened dough of wheat flour mixed with beetroot juice.

# Beetroot achar:

Achar is as none as pickles. Pickles are made in brine solution. But achar is mixer of oil, varieties of spices, sometimes add sugar. It is an Indian food Spices FOOD. Our in innovational food is beetroot pickles or achar.

## 2.3 Process of Beetroot commercial Drinks

Ingredient:

Sugar-15ogm

Aspartame-30gm

Xanthan gum-.04%/L

Sodium benzoate-750mg.

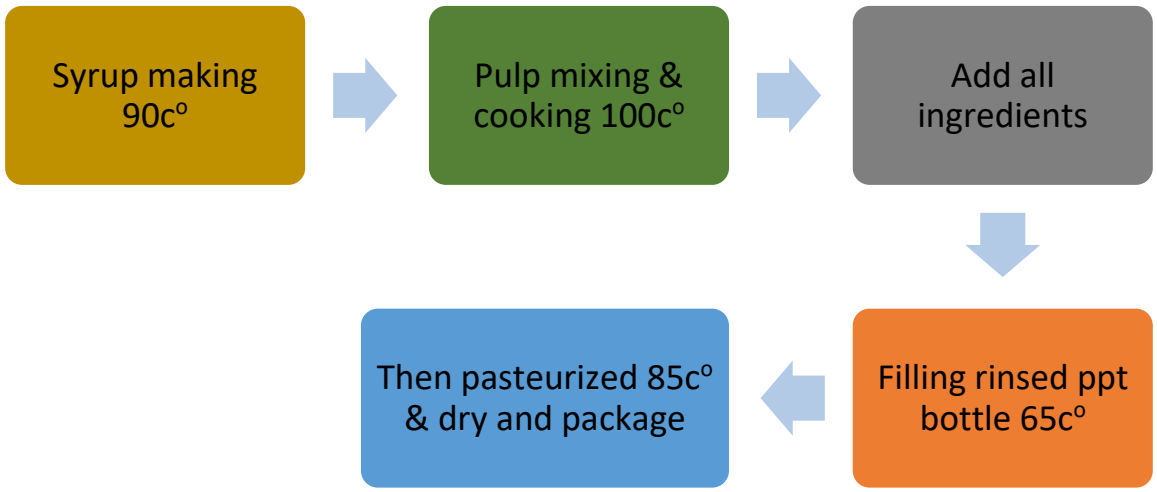
Potassium sorbate -122mg

Vitamin c-105mg

Citric acid-4gm

10% beet root juice-120gm

Treated water-720gm.




Flow Diagram of Beetroot commercial Drinks.

# Beetroot commercial drinks

Fig: Beetroot drinks

## 2.4. Procedure:

I. At first cut the beetroot & blend the beetroot then collect the pulp.

ii. Then make a syrup (add sugar15% 75% water.) when it boiling add pulp 10%.

iii. Add all ingredients (Aspartame 30gm, Xanthan gum0.04%, Sodium benzoate 750mg, Potassium sorbate`122mg, Vitamin c 105mg, Citric acid .02%.

iv. Pasteurized the drinks & homogenization the drinks in 180 t0 200 bar in 5 min.

V. filling the drinks into 75 c temperature into rinsed PPT bottle. Then pasteurized the drinks bottle and dry it into an air blower. Wrapping the bottle & storage at normal temperature.

## 2.5. Process of Beetroot commercial Jam

### Ingredients:

Sugar-1kg

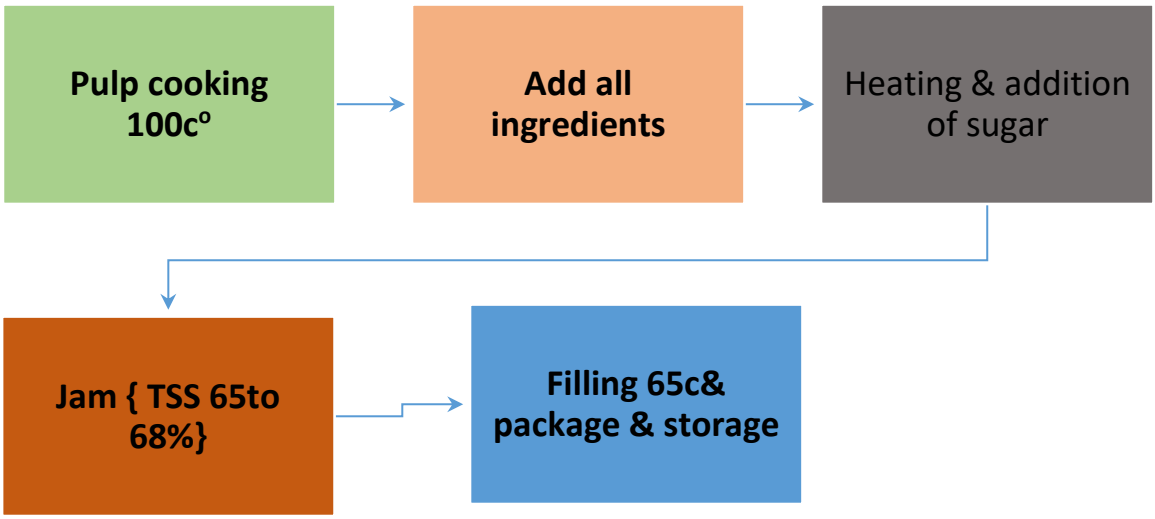
Pectin & Agar-13gm

Sodium benzoate-500mm

Potassium sorbate-105ppm

Citric acid & flavor-15mg

Beetroot pulp-1kg




Flow Diagram of jam

# Beetroot commercial jam

Fig: Beetroot jam.

## 2.6. Procedure:

I. At first cut the beetroot & blend the beetroot then collect the pulp.

ii. Then make a syrup (add sugar50% & 50% pulp.) when it boiling add some water if needed.

iii. Add all ingredients (agar and pectin 25gm, Potassium sorbate105ppm, Vitamin c 100 mg, Citric acid 8 per litter. Sodium benzoate257ppm. When jelly TSS 65 to 68 % then stop the cooking.

iv. Filling the jam into 70c temperature into the rinsed glass jar. Then pasteurize the jar at 90 c and dry it into an air blower. Wrapping the jar & storage at normal temperature.

## 2.7. Process of Beetroot commercial Jelly

### Ingredients:

Sugar-850gm

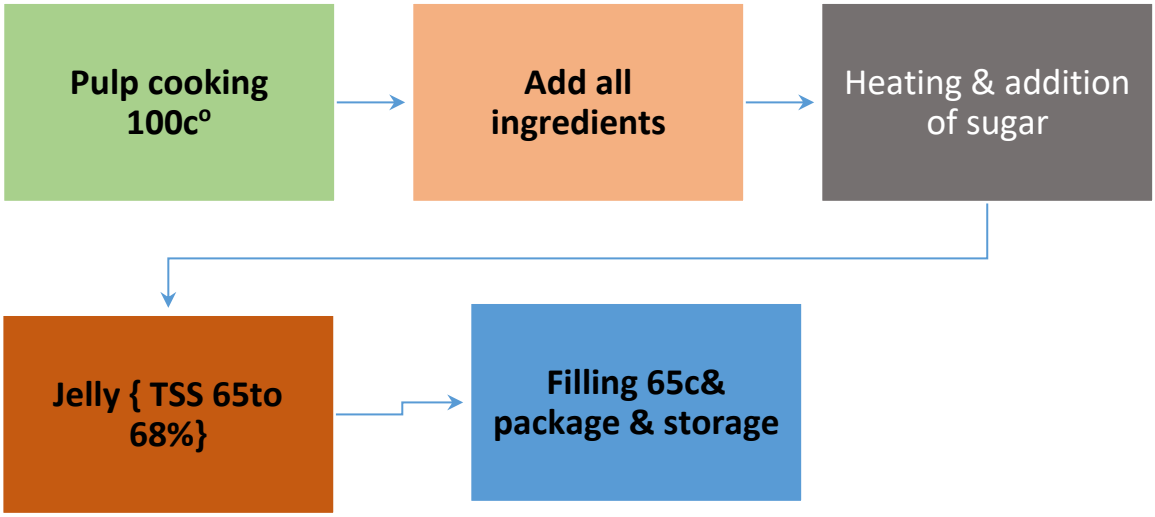
Pectin & Agar-15gm

Sodium benzoate-500mm

Potassium sorbate-105ppm

Citric acid & flavor-10gm

Beetroot Juice-1L




Flow Diagram of jelly

# The procedure of beetroot jelly


Fig: Beetroot jelly.

## 2.8. Procedure:

I. At first cut the beetroot & blend the beetroot then collect the juice.

ii. Then make a syrup (add sugar35%to 40 % & 65% juice.) when it boiling add some water if needed.

iii. Add all ingredients (agar and pectin 15gm, Potassium sorbate105ppm, Citric acid 10gm per liter. Sodium benzoate257ppm. When jelly TSS 65 to 68 % then stop the cooking.

iv. Filling the jelly into 70c temperature into the rinsed glass jar. Then pasteurize the jar at 90 c and dry it into an air blower. Wrapping the jar & storage at normal temperature

# 2.9. Beetroot Non Fermented Pickles

INGREDIENT:

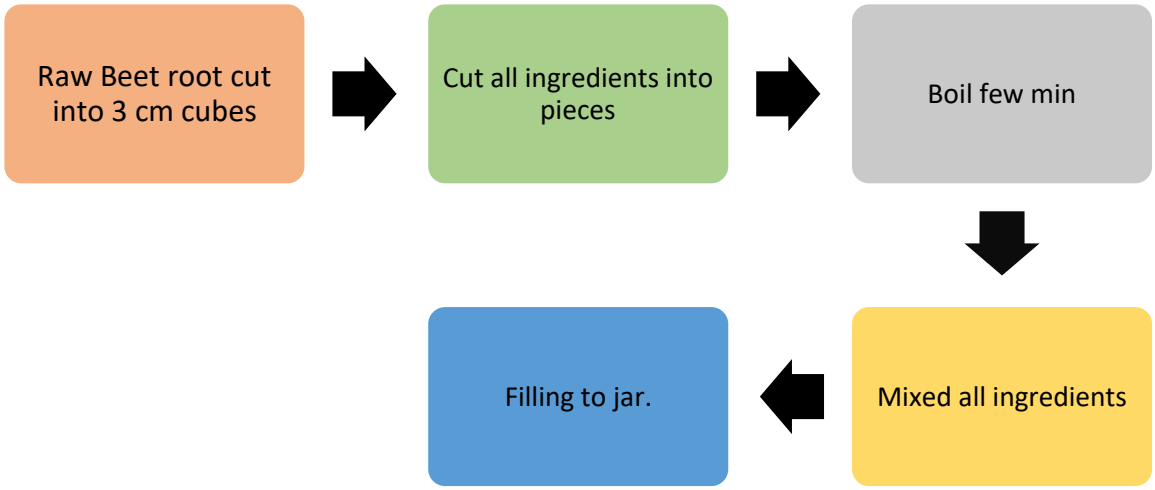
Beet root -1kg

Carrot, garlic, ginger, green chili-200gm

Vinegar-250gm

Cardamom-5gm

Sugar-100gm




## Flow Diagram: Non-Fermented Beet Root Pickles.

# Beetroot Non-Fermented Pickles

## 2.10. Procedure:

At first cut the beetroot in cube 3 cm size.

ii. Boil the cubes

iii. Mixed all ingredients (beetroot, garlic, ginger).

iv. Add vinegar. Filling the beetroot jar (65c temperature).

v. THEN PASTURIZED the jar into hot water (80 c).

## 2.11. BEETROOT CHIPS

### Ingredients:

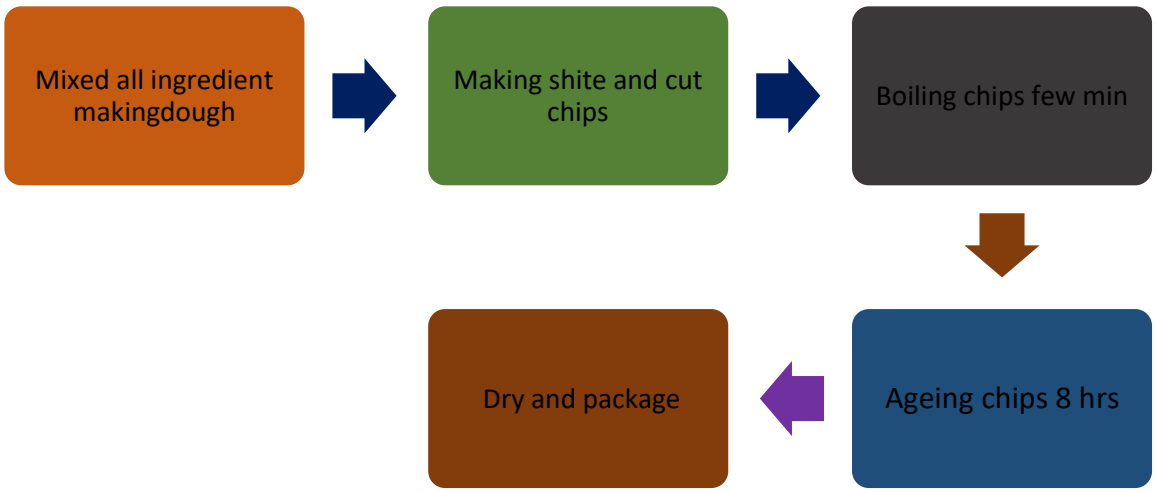
Beetroot juice-needed for dough

Flower-1kg

Starch powder-100gm

Baking powder-2gm

Salt-as 10gm




**Flowchart: Beetroot chips.**

Beetroot chips procedure

## 2.12. Procedure:

I. At first making dough mixed flour, starch powder, salt, baking powder+ soda and beetroot juice.

ii. Then keep the dough rest for a few minutes.

iii. Then making a proper shite. And cut the shite in different chips size.

iv. Boiling the chips.

v. then aging the chips for 8 hr.

vi. After the aging dry the chips & packs the chips.

## 2.13. Beetroot Spaghetti

### Ingredients:

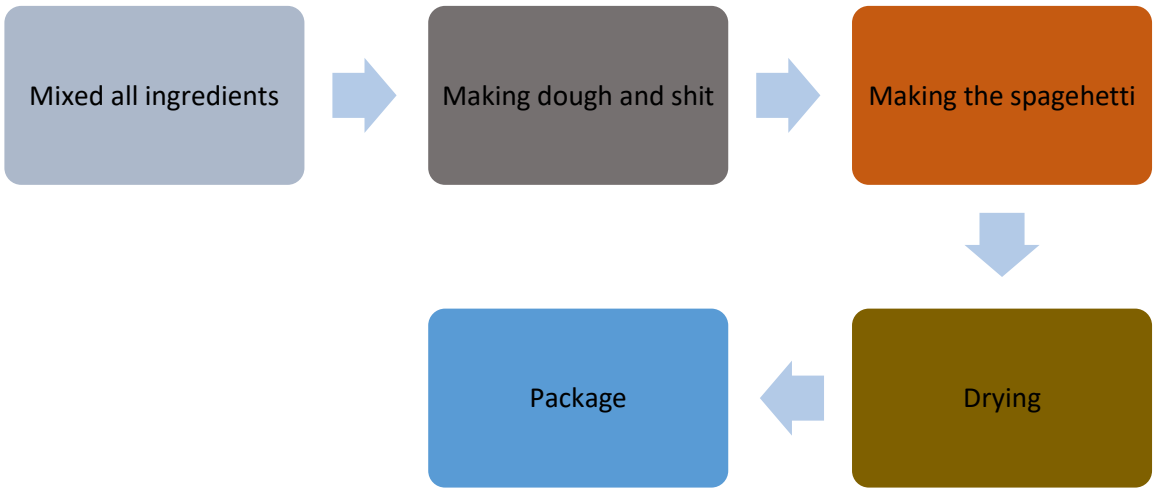
Beetroot juice-as per need

Flower-1kg

Starch powder-105gm

Baking powder-2gm

Salt-10gm




Flow Diagram: Beetroot Spaghetti.

Beetroot spaghetti

Fig: spaghetti.

## 2.14. Procedure:

I. At first making dough mixed flour, starch powder, salt, baking powder+ soda and beetroot juice.

ii. Then keep the dough rest for a few minutes.

iii. Then making a proper shite. And cut the shite in spaghetti size.

iv. Boiling the spaghetti.

v. then aging the spaghetti for 8 hr.

vi. After the aging dry & packs the spaghetti.

# Chapter 3

## Physical Analysis

### 3.1. Physical Analysis:

1. Viscosity Test
2. PH Test.
3. TSS Test
4. Moisture test

### 3.2. Viscosity Test:

1st Blend the drinks/ pickles turn into juice then put into the backer. Then put it into the viscometer and read the reading. Meter Reading: 14% {140.0 M Pa 'S}

**Result:** Viscosity: **14.5% (140.0 m Pa's)**

## PH Test:

PH is measured by PH Meter.  PH means strength of acid. PH range 0 to 14.

## 3.3. PH Test: Beetroot drinks

First we celibate the PH meter by PH: 4 and PH: 7 then, take a sample into a beaker

Then drop the ph road into the sample and measure the sample PH.

Result: 3.80.

## 3.4. PH Test: Beetroot jam

First we celibate the PH meter by PH: 4 and PH: 7 then, take a sample into a beaker

Then drop the ph road into the sample and measure the sample PH.

Result: 4.10

## 3.5. PH Test: Beetroot jelly.

First we celibate the PH meter by PH: 4 and PH: 7 then, take a sample into a beaker, then drop the ph road into the sample and measure the sample PH.

Result: 3.9

## 3.6. PH Test: Beetroot no fermented pickles.

First we celibate the PH meter by PH: 4 and PH: 7 then, take a sample into a beaker

Then drop the ph road into the sample and measure the sample PH.

Result: 3.68

## ° Brix (TSS) :

Total soluble solids TSS is index refraction .This measure by reflectometer & that is degree Brix.

## 3.7. Drinks TSS Measurement:

At first we need a refractometer**.** Then a sample of drops put its lance the put it into the

Sun or light and then we can see the eye shite lance on the light then we can get easily

Brix of its measure scale sample 65%.

## 3.8. Jam TSS measurement:

At first we need a refractometer**.** Then a sample of drops put its lance the put it into the

Sun or light and then we can see the eye shite lance on the light then we can get easily

Brix of its measure scale sample 68%.

## 3.9. Jelly TSS measurement:

At first we need a refractometer. Then a sample of drops put its lance the put it into the

Sun or light and then we can see the eye shite lance on the light then we can get easily

Brix of its measure scale sample 68%.

## 3.10. None fermented pickles TSS measurement:

At first we need a refractometer. Then a sample of drops put its lance the put it into the

Sun or light and then we can see the eye shite lance on the light then we can get easily

Brix of its measure scale sample 11%

## 3.11. Determination of moisture: Beetroot chips

Apparatus:

1. Oven
2. Weight machine
3. Spatula
4. Crucible with lid.

Procedure:

1. At first take the weight of empty crucible with lid (W1)
2. Take sample into the crucible
3. Weight the crucible with sample and determine the sample weight (W2)
4. Place the crucible into an oven at 105 degree Celsius for 1 hour
5. After 1 hour takeout the crucible and put into a desiccator for 30 minute
6. Again weight crucible (W3)

Calculation:

Moisture%= W2-W3/SW*100

Beetroot spaghetti &chips moisture: 10% & 8%.

# *Chapter 4*

# Chemical Analysis

## 4.1. Acidity Test.

### Acidity Test

Vitamin c or ascorbic acids was determined by using the official methods of analysis. Acidity was measured by titration methods by using the NAOH solution**.**

**% acidity** = N*ML*Eq.WT*100/W*1000

Here, N= Normality of NAOH solution

ML=ml.1 NAOH used

W= weight of sample

Eq.wt of NAOH IS 64.

## 4.2. Acidity Test: Beetroot drinks

Sample: beetroot drinks 5ml

Phenolphthalein 2-3 drops

NAOH -.1 N Solution

Procedure:

i. AT fist take 5 ml of sample in a flask.

ii. Then we take 2- 3 drops of Phenolphthalein.

iii. Add drops by drops NAOH solution on the flask when it turns pink color

iv. Then stops the drops of NAOH solution.

**Percent of acidity** =N*ML*Eq.WT*100/W*1000

Here, N= Normality of NAOH solution

ML=ml.1 NAOH used

W= weight of sample

Eq.wt of NAOH IS 64.

Result: 0.19%

## 4.3. Acidity Test: Beetroot Jam

Sample: beetroot jam 5ml

Phenolphthalein 2-3 drops

NAOH -.1 N Solution

**Procedure:**

I.AT fist take 5 ml of sample in a flask.

ii. Then we take 2- 3 drops of Phenolphthalein.

iii. Add drops by drops NAOH solution on the flask when it turns pink color

iv. Then stops the drops of NAOH solution.

**Percent of acidity** =N*ML*Eq.WT*100/W*1000

Here, N= Normality of NAOH solution

ML=ml.1 NAOH used

W= weight of sample

Eq.wt of NAOH IS 64.

Result: 0.11%

## 4.4. Acidity Test: Beetroot Jelly

Sample: beetroot jelly 5ml

Phenolphthalein 2-3 drops

NAOH -.1 N Solution

**Procedure:**

I.AT fist take 5 ml of sample in a flask add 5 ml water.

ii. Then we take 2- 3 drops of Phenolphthalein.

iii. Add drops by drops NAOH solution on the flask when it turns pink color

iv. Then stops the drops of NAOH solution.

**Percent of acidity** =N*ML*Eq.WT*100/W*1000

Here, N= Normality of NAOH solution

ML=ml.1 NAOH used

W= weight of sample

Eq.wt of NAOH IS 64.

Result: 0.10%

## 4.5. Acidity Test: Beetroot Non fermented pickles.

Sample: beetroot non fermented pickles 5ml

Phenolphthalein 2-3 drops

NAOH -.1 N Solution

**Procedure:**

i. AT fist take 5 ml of sample in a flask add 5 ml water.

ii. Then we take 2- 3 drops of Phenolphthalein.

iii. Add drops by drops NAOH solution on the flask when it turns pink color

iv. Then stops the drops of NAOH solution.

**Percent of acidity** =N*ML*Eq.WT*100/W*1000

Here, N= Normality of NAOH solution

ML=ml.1 NAOH used

W= weight of sample

Eq.wt of NAOH IS 64.

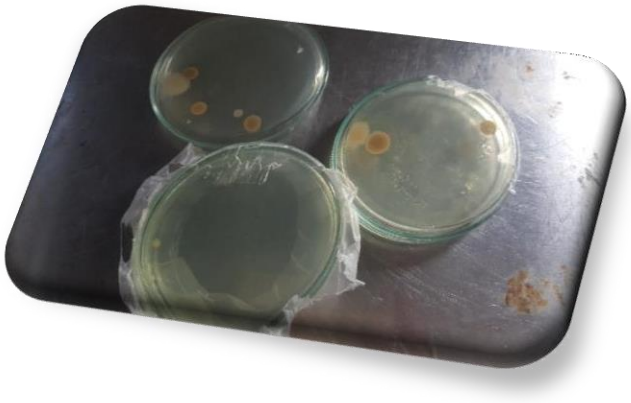
Result: 0.18%

# Chapter 5

## Shelf life Study

## 5. Microbial assay:

### 1. Total Bacterial Plate Count



Microbial analysis

Microbiological quality test of beetroot products enumeration of {ACP}. Total fungal count is performed by ISO methods. By using the serial dilution methods followed by plate agar count used.

## 5.1. The methods of total plate count methods: Beetroot drinks

## Apparatus:

Media, Petri-dish, Beaker, Conical flask, Measuring Cylinder, Autoclave, Spreader, Aluminum Foil, Hot plate, Incubator, Laboratory Films, Micro-pipette, Electronic Balance.

## PROCEDURE:

At first dissolve the (Nutrient agar) into a conical flask and add 100ml D W. Then heat the solution into water bath.

Then auto clave all apparatus in 121 $^{0}$c for 25 min.

After auto clave all apparatus keep them into laminar flow.

For prevent the contamination.

After mixing media conical flask with media, Petridis, Spreader, all wrapped in fuel paper for autoclave. Auto calved the media pure into 3 Petridis and wait for turn into solid& then add 1 ml drinks. After that wrapping all Petridis with film paper in put them incubator at 37 $^{0}$c for 24 to 48, 72 hr. grow the bacteria. After 24 hr. I checked the dis not found any colony.

## 5.2. The procedure of {ACP] METHODS: jam

## Apparatus:

Media, Petri-dish, Beaker, Conical flask, Measuring Cylinder, Autoclave, Spreader, Aluminum Foil, Hot plate, Incubator, Laboratory Films, Micro-pipette, Electronic Balance.

## PROCEDURE:

At first dissolve the (Nutrient agar) into a conical flask and add 100ml D W .Then heat the solution into water bath.

Then auto clave all apparatus in 121 $^{0}$c for 25 min.

After auto clave all apparatus keep them into laminar flow.

For prevent the contamination.

After mixing media conical flask with media, Petridis, Spreader, all wrapped in fuel paper for autoclave. Auto calved the media pure into 3 Petridis and wait for turn into solid& then add 1 ml drinks. After that wrapping all Petridis with film paper in put them incubator at 37 $^{0}$c for 24 to 48, 72 hr. grow the bacteria. After 24 hr. I checked the dis not found any colony.

## 5.3. The procedure of {ACP] METHODS: jelly

### Apparatus:

Media, Petri-dish, Beaker, Conical flask, Measuring Cylinder, Autoclave, Spreader, Aluminum Foil, Hot plate, Incubator, Laboratory Films, Micro-pipette, Electronic Balance.

### PROCEDURE:

At first dissolve the (Nutrient agar) into a conical flask and add 100ml D W .Then heat the solution into water bath.

Then auto clave all apparatus in 121 $^{0}$c for 25 min.

After auto clave all apparatus keep them into laminar flow.

For prevent the contamination.

After mixing media conical flask with media, Petridis, Spreader, all wrapped in fuel paper for autoclave. Auto calved the media pure into 3 Petridis and wait for turn into solid& then add 1 ml drinks. After that wrapping all Petridis with film paper in put them incubator at 37 $^{0}$c for 24 to 48, 72 hr. grow the bacteria. After 24 hr. I checked the dis not found any colony.

## 5.4. The procedure of {ACP] METHODS: non fermented pickles.

## Apparatus:

Media, Petri-dish, Beaker, Conical flask, Measuring Cylinder, Autoclave, Spreader, Aluminum Foil, Hot plate, Incubator, Laboratory Films, Micro-pipette, Electronic Balance.

## PROCEDURE:

At first dissolve the (Nutrient agar) into a conical flask and add 100ml D W .Then heat the solution into water bath.

Then auto clave all apparatus in 121 $^{0}$c for 25 min.

After auto clave all apparatus keep them into laminar flow.

For prevent the contamination.

After mixing media conical flask with media, Petridis, Spreader, all wrapped in fuel paper for autoclave. Auto calved the media pure into 3 Petridis and wait for turn into solid& then add 1 ml drinks. After that wrapping all Petridis with film paper in put them incubator at 37 $^{0}$c for 24 to 48, 72 hr. grow the bacteria. After 24 hr. I checked the dis not found any colony.

# Chapter 6

## 6. Thermal Pasteurization treatment of all packing materials

Fig: Jar pasteurization treatment

Fig: Bottle rinse.

Thermal pasteurization treatment system all beet root products packaging materials by heat. Pasteurization increases the product's shelf life. Different kind of d methods is usually used in the pasteurization system. Hot water is one of them.

# Chapter 7

## Results & Discussions

## 7. Results:

Chemical analysis: The Drinks, jam, jelly, non-fermented pickles, achar are analyzed for TSS, PH, and Acidity. Chips & spaghetti analyzed for moisture, ash, %.

***Table 7.1: The proximate composition of Beetroot Drinks.***

| Sample | TSS($^0$Brix) | pH | Acidity(%of citric acid) |
|---|---|---|---|
| Sample A | 65 | 3.80 | 0.19 |
| Sample B | 65 | 3.77 | 0.18 |
| Sample C | 64 | 3.73 | 0.16 |

**Table 7.2: The proximate composition of Non-Fermentation of pickles.**

| Sample | TSS($^0$Brix) | pH | Acidity(%of citric acid) |
|---|---|---|---|
| Sample A | 11 | 3.68 | 0.2 |
| Sample B | 11 | 3.58 | 0.18 |
| Sample C | 11 | 3.60 | 0.18 |

**Table7.3: The proximate composition of jam**

| Sample | TSS(0Brix) | pH | Acidity(%of citric acid) |
|---|---|---|---|
| Sample A | 66 | 4.12 | o.11 |
| Sample B | 65 | 4.10 | o.10 |
| Sample C | 65 | 3.98 | o.10 |

Table7.4: The proximate composition of jelly.

| Sample | TSS(0Brix) | pH | Acidity(%of citric acid) |
|---|---|---|---|
| Sample | 65 | 3.97 | .10 |
| Sample | 66 | 4.1 | 0.10 |
| Sample | 65 | 4.033 | o.o9 |

## Table7. 5: The proximate composition of CHIPS.

| sample | Moisture% | Ash% |
|---|---|---|
| Sample A | 9% | 3.45% |
| Sample B | 8.6% | 3.58% |
| Sample c | 8.9% | 3.53% |

## Table7. 6: The approximate composition of Spaghetti.

| sample | Moisture% | Ash% |
|---|---|---|
| Sample A | 2.9% | 3% |
| Sample B | 2.8% | 3.2% |
| Sample c | 2.6% | 3.0% |

# Data of Microbiological count of product Different phases:

Table: 7.8

Microbial analysis of Beetroot Commercial Drinks (1st month)

| Sample | APC(CFU/ML) |
|---|---|
| Sample A | After 24 hr.& 72hr not found cfu/ml found |
| Sample B FREEZE | After 24 hr.& 72hr not found cfu/ml found |
| Sample C | After 24 hr.& 72hr not found cfu/ml found |

Table: 7.9

Microbial analysis of Beetroot Commercial Drinks (3rd month)

| Sample | APC(CFU/ML) |
|---|---|
| Sample A nor temperature | After 24 hrs. not found & after 72hr 1 cfu/ml found |
| Sample B freeze | After 24 hrs. not found after 72hr not cfu/ml found |
| Sample c normal temperature | After 24 hrs. not found & after 72hr 2 cfu/ml found |

**Table: 7.10**

Microbial analysis of Beetroot Commercial Jelly (1st month)

| Sample | APC(CFU/ML) |
|---|---|
| Sample A Normal temperature | After 24 hrs. not found & after 72 hr not cfu/ml found |
| Sample B | After 24 hrs. not found & after 72hr cfu/ml found |
| Sample c | After 24 hrs. not found after 72hr cfu/ml found |

Table: 7.11

## Microbial analysis of Beetroot Commercial jelly (3rdmonth)

| Sample A | APC(CFU/ML) |
|---|---|
| Sample A | After 24 hrs. not found & after 72hr 1 cfu/ml found |
| Sample B | After 24 hrs. not found & after 72hr 2 cfu/ml found |
| Sample c | After 24 hrs. not found & after 72hr 3 cfu/ml found |
| | |

## Table: 7.12

## Microbial analysis of Beetroot Commercial jam (1stmonth)

| Sample | APC(CFU/ML) |
|---|---|
| Sample A Normal temperature | After 24 hrs. not found & after 72 hr not cfu/ml found |
| Sample B | After 24 hrs. not found & after 72hr cfu/ml found |
| Sample c | After 24 hrs. not found after 72hr cfu/ml found |

## Table: 7.13

## Microbial analysis of Beetroot Commercial jam (3rdmonth)

| Sample A | APC(CFU/ML) |
|---|---|
| Sample A | After 24 hrs. not found & after 72hr 1 cfu/ml found |
| Sample B | After 24 hrs. not found & after 72hr 2 cfu/ml found |
| Sample c | After 24 hrs. not found & after 72hr 3 cfu/ml found |

## Microbial analysis of Beetroot Commercial Non fermented pickles (1st month)

Table: 7.14

| Sample | APC(CFU/ML) |
|---|---|
| Sample A | After 24 hrs. & 72hr not found cfu/ml found |
| Sample B | After 24 hrs. & 72hr not found cfu/ml found |
| Sample c | After 24 hrs. & 72hr not found cfu/ml found |

Table: 7.15

## Microbial analysis of Beetroot Commercial Non fermented pickles (3rdmonth)

Table: 7.16

| Sample A | APC(CFU/ML) |
|---|---|
| Sample A | After 24 hrs. not found & after 72hr 2cfu/ml found |
| Sample B | After 24 hrs. not found & after 72hr 3 cfu/ml found |
| Sample c | After 24 hrs. not found & after 72hr 1 cfu/ml found |

# CHAPTER 8

## 8. Storage study of developed samples:

Table 8.1: Storage study of Beetroot Drinks

| Storage Time | TSS | pH | Acidity% | color | flavor | Taste | Visual fungal |
|---|---|---|---|---|---|---|---|
| 1st month | 14 | 3.80 | o.19 | Dark red | fresh | Good | No |
| 2nd month | 13.78 | 3.77 | 0.18 | Red | Fresh | Good | No |
| 3rd month | 13.63 | 3.73 | 0.16 | Brown | Fresh | Good | No |

Table 8.2: Storage study of Beetroot non fermented pickles

| Storage Time | TSS | pH | Acidity% | Color Change | Off Flavor | Taste | Visual fungal |
|---|---|---|---|---|---|---|---|
| 1st month | 11 | 3.68 | 0.2o | No | No | Good | No |
| 2nd month | 11 | 3.58 | o.18 | No | No | Good | No |
| 3rd month | 11 | 3.68 | o.18 | Slightly | No | Good | No |

Table 8.3: Storage study of Beetroot JAM

| Storage Time | TSS | pH | Acidity% | Color | Flavor | taste | Visual fungal |
|---|---|---|---|---|---|---|---|
| 1st month | 66 | 4.12 | o.11 | Red | Fresh | Good | No |
| 2nd month | 65 | 4.10 | o.10 | Red | Fresh | Good | No |
| 3rd month | 65 | 3.98 | o.10 | Red | Fresh | Good | No |

Table 8.4: Storage study of Beetroot Jelly

| Storage Time | TSS | pH | Acidity% | color | Flavor | Taste | Visual fungal |
|---|---|---|---|---|---|---|---|
| 1st month | 65 | 3.98 | o.10 | Red | Fresh | Good | No |
| 2nd month | 66 | 4.1 | 0.10 | Red | Fresh | Good | No |
| 3rd month | 65 | 4.033 | 0.09 | Red | Fresh | Good | No |

Table 8.5: Storage study of Beetroot Chips

| Storage time | Ash% | Moisture% | color | Flavor | Taste | Visual fungal |
|---|---|---|---|---|---|---|
| 1st month | 3.2% | 8% | Red | Fresh | Good | No |
| 2nd month | 3.1 | 8% | Red | Fresh | Good | No |
| 3rd month | 3.1 | 8% | Red | Fresh | Good | No |

Table 8.6: Storage study of Beetroot Spaghetti

| Storage Time | Ash% | Moisture% | Color | Flavor | Taste | Visual fungal |
|---|---|---|---|---|---|---|
| 1st month | 2.9% | 10.1% | Red | Fresh | Good | No |
| 2nd month | 2.15% | 10.55% | Red | Fresh | Good | No |
| 3rd month | 2.6% | 10.0% | Red | Fresh | Good | No |

# Chapter 9

## 9. Sensory evaluation:

Sensory evaluation was conducted using the Hedonic scale among trained panelists at the laboratory and awareness workshop center in Bangladesh.

Evaluation Form:

Sensory evaluation:

| **Name:** | Product name: |
|---|---|
| **Panelist no:** | Date: |

**Instructions:**

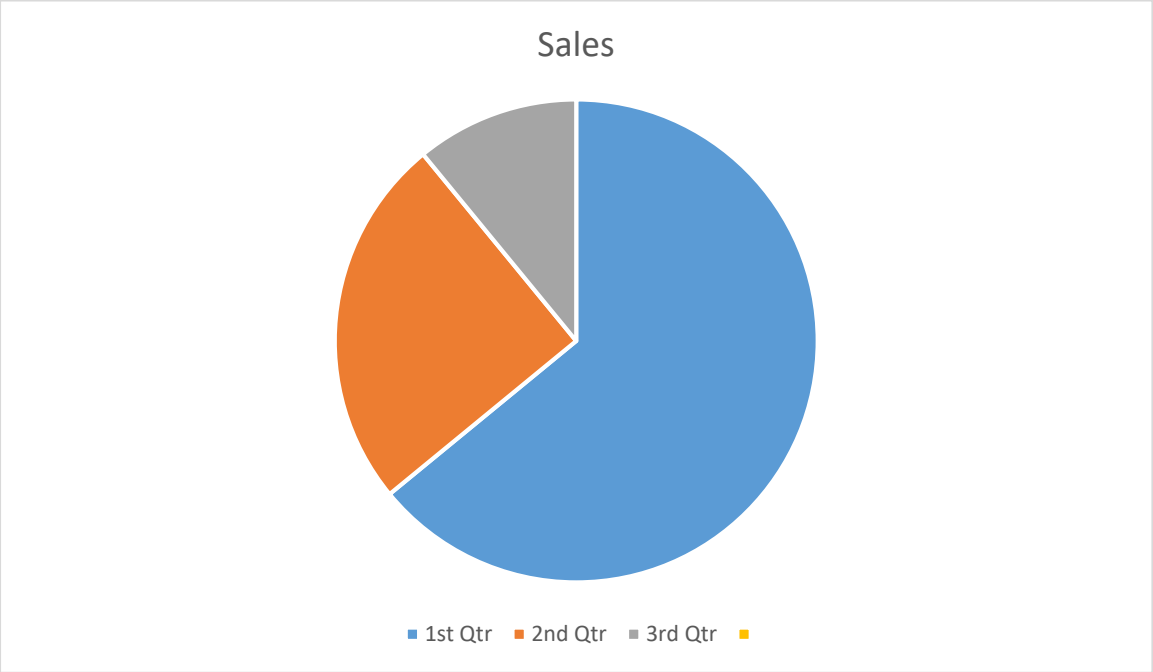
Taste the given sample, then place the x mark on the point in the scale which best describes your feeling.

| Score | Sample | | |
|---|---|---|---|
| | **S1(0days)** | S2(180days0 | **S3(300days)** |
| **9.**Like extremely | | | |
| **8.**Like very much | | | |
| **7.**Like moderately | | | |
| **6.**Like slightly | | | |
| **5.** Neither like nor dislike | | | |
| **4.**Dislike slightly | | | |
| **3.**Dislike moderately | | | |
| **2.**Dislike very much | | | |
| **1.**Dislike extremely | | | |

## 9.1: sensory evaluation beetroot drinks.

| **Name: Sensory Evaluation** | | | | | Product name: beetroot drinks. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Panelist no:** | | | | | Date: | | | | | | | |
| **Instructions:**<br>Taste the given sample, then place the x mark on the point in the scale which best describes your feeling. | | | | | | | | | | | | |
| Score | Sample | | | | | | | | | | | |
| | **S1(0days)** | | | | S2(180days 0 | | | | **S3(300days)** | | | |
| | Appe ance | Fla vor | Ta ste | Ov Era L ac | Appe ance | Fla vor | Ta ste | Ov e Ral ac | App e ance | Fl a vo r | **T a st e** | Over a L ac |
| **9.**Like extremely | 8 | 10 | 9 | 10 | 6 | 7 | 5 | 7 | 4 | 5 | 4 | 3 |
| **8.**Like very much | 6 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 6 | 4 | 6 | 5 |
| **7.**Like moderatel y | 2 | 3 | 4 | 2 | 3 | 3 | 8 | 3 | 5 | 5 | 3 | 6 |
| **6.**Like slightly | 4 | 2 | 2 | 2 | 4 | 2 | 2 | 4 | 3 | 2 | 2 | 4 |
| **5.** Neither like nor dislike | 8 | 10 | 9 | 1 | 2 | 4 | 1 | 1 | 2 | 3 | 2 | 2 |
| **4.**Dislike slightly | | | | | | | | | | | | |
| **3.**Dislike moderatel y | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2.**Dislike very much | | | | | | | | | | | | |
| **1.**Dislike extremely | | | | | | | | | | | | |

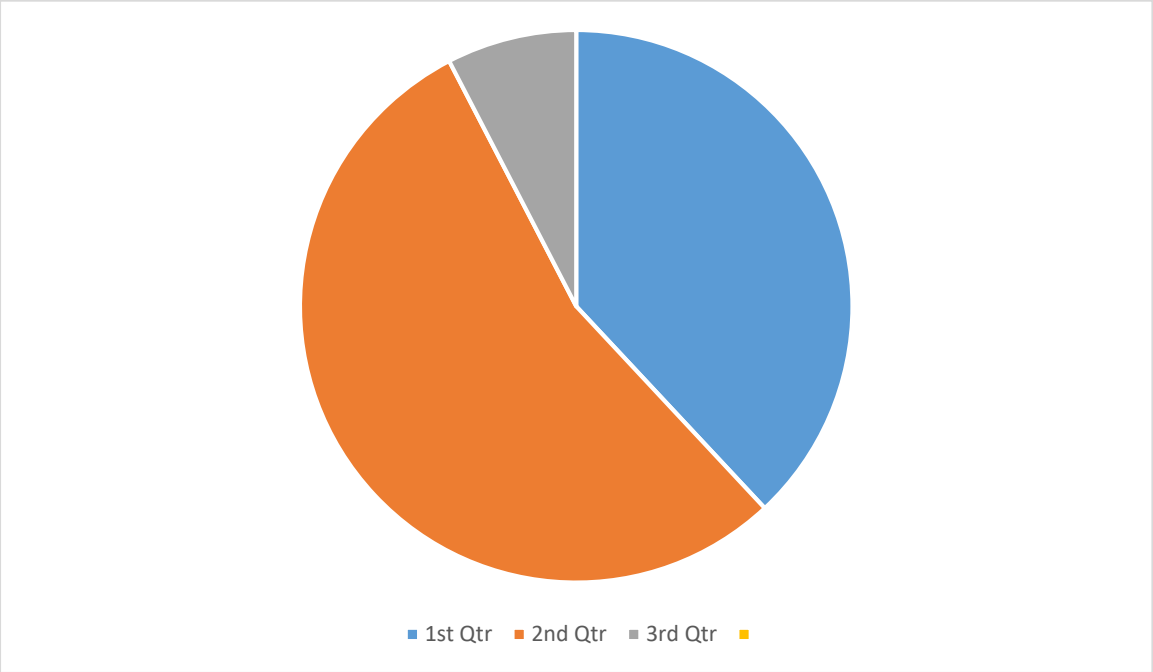



**We can see the nine hedonic point scale; overall acceptance of beetroot drinks. Sample 1 got higher score.**

## 9.2.Sensory evaluation Beetroot jam

| **Name: sensory evaluation** | | | | | Product name: beetroot jam | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Panelist no:** | | | | | Date: | | | | | | | |
| **Instructions:**<br>Taste the given sample, then place the x mark on the point in the scale which best describes your feeling. | | | | | | | | | | | | |
| Score | Sample | | | | | | | | | | | |
| | **S1(0days)** | | | | S2(180days 0 | | | | **S3(300days)** | | | |
| | Appe ance | Fla vor | Ta ste | Ov Era L ac | Appe ance | Fla vor | Ta ste | Ov e Ral ac | App e ance | Fl a vo r | T a st e | Over a L ac |
| **9.**Like extremely | 6 | 7 | 5 | 7 | 8 | 10 | 9 | 10 | 4 | 5 | 4 | 4 |
| **8.**Like very much | 5 | 4 | 4 | 5 | 6 | 5 | 5 | 6 | 6 | 4 | 6 | 5 |
| **7.**Like moderatel y | 3 | 3 | 4 | 3 | 2 | 3 | 4 | 4 | 5 | 5 | 3 | 5 |
| **6.**Like slightly | 4 | 2 | 8 | 3 | 4 | 2 | 2 | 4 | 3 | 3 | 2 | 3 |
| **5.** Neither like nor dislike | 2 | 1 | 2 | 1 | | | | | 2 | 2 | 2 | 2 |
| **4.**Dislike slightly | | | | | | | | | | | | |
| **3.**Dislike moderatel y | | | | | | | | | | | | |

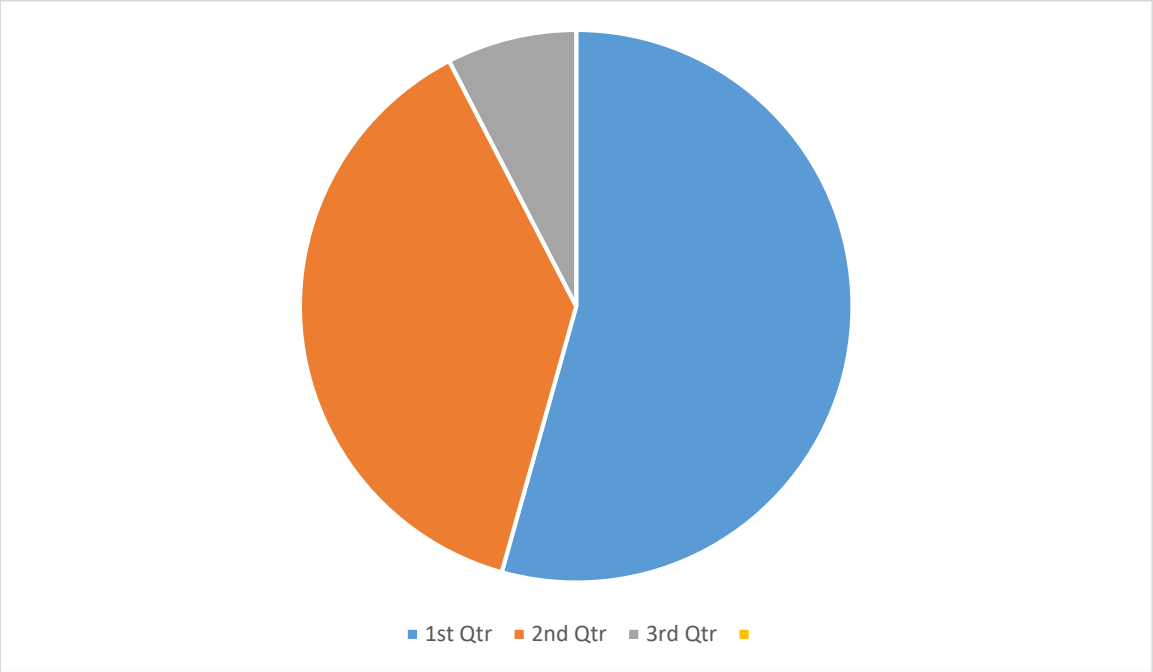
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2.**Dislike very much | | | | | | | | | | | | |
| **1.**Dislike extremely | | | | | | | | | | | | |
| | | | | | | | | | | | | |




**We can see the nine hedonic point scale; overall acceptance of beetroot drinks. Sample 2 got higher score.**

## 9.3. Sensory evaluation Beetroot jelly.

| **Name: sensory evaluation** | | | | | | | | | Product name: beetroot jelly | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Panelist no:** | | | | | | | | | Date: | | | |
| **Instructions:**<br>Taste the given sample, then place the x mark on the point in the scale which best describes your feeling. | | | | | | | | | | | | |
| Score | Sample | | | | | | | | | | | |
| | **S1(0days)** | | | | S2(180days 0 | | | | **S3(300days)** | | | |
| | **Appe ance** | **Fla vor** | Ta ste | Ov Er a L ac | Appe ance | Fla vor | Ta ste | Ov e Ral ac | **Appe ance** | **Fla vor** | **Ta ste** | **Over a L ac** |
| **9.**Like extremely | 8 | 10 | 9 | 10 | 6 | 7 | 8 | 7 | 4 | 5 | 4 | 4 |
| **8.**Like very much | 5 | 4 | 4 | 5 | 6 | 5 | 5 | 6 | 6 | 4 | 6 | 5 |
| **7.**Like moderately | 3 | 3 | 4 | 3 | 2 | 3 | 4 | 4 | 5 | 5 | 3 | 5 |
| **6.**Like slightly | 4 | 2 | 8 | 3 | 4 | 2 | 2 | 4 | 3 | 3 | 2 | 3 |
| **5.** Neither like nor dislike | 2 | 1 | 2 | 1 | | | | | 2 | 2 | 2 | 2 |
| **4.**Dislike slightly | | | | | | | | | | | | |
| **3.**Dislike moderately | | | | | | | | | | | | |
| **2.**Dislike very much | | | | | | | | | | | | |
| **1.**Dislike extremely | | | | | | | | | | | | |

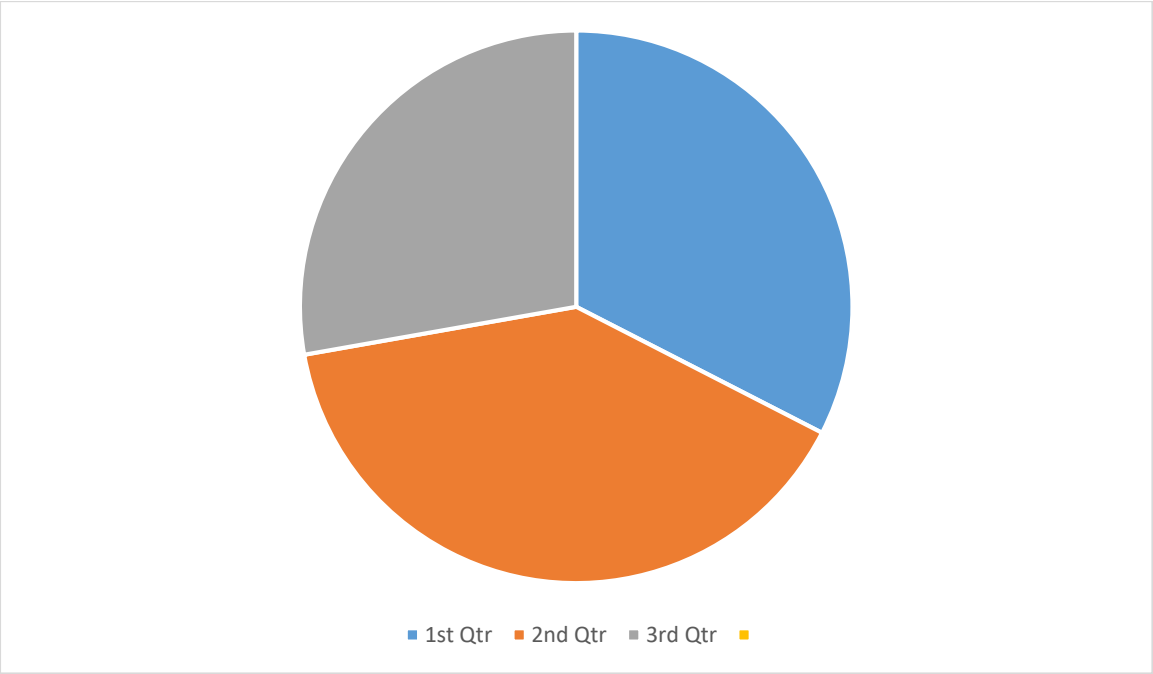



**We can see the nine hedonic point scale; overall acceptance of beetroot drinks. Sample 1 got higher score.**

**9.4.** Sensory evaluation beetroot non fermented pickles

| **Name: sensory evaluation** | | | | | | | | | Product name: beetroot non fermented pickles | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Panelist no:** | | | | | | | | | Date: | | | |
| **Instructions:**<br>Taste the given sample, then place the x mark on the point in the scale which best describes your feeling. | | | | | | | | | | | | |
| Score | Sample | | | | | | | | | | | |
| | **S1(0days)** | | | | S2(180days 0 | | | | **S3(300days)** | | | |
| | **Appe ance** | **Fla vor** | Ta ste | Ov Era L ac | Appe ance | Fla vor | Ta ste | Ov e Ral ac | **Appe ance** | **Fla vor** | **Ta ste** | **Over a L ac** |
| **9.**Like extremely | 4 | 5 | 4 | 5 | 8 | 10 | 9 | 10 | 6 | 7 | 8 | 7 |
| **8.**Like very much | 6 | 4 | 6 | 5 | 5 | 4 | 4 | 5 | 6 | 5 | 5 | 6 |
| **7.**Like moderately | 5 | 5 | 3 | 5 | 3 | 3 | 4 | 3 | 2 | 3 | 4 | 4 |
| **6.**Like slightly | 3 | 3 | 2 | 3 | 4 | 2 | 8 | 3 | 4 | 2 | 2 | 2 |
| **5.** Neither like nor dislike | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 3 | 2 | 1 |
| **4.**Dislike slightly | | | | | | | | | | | | |
| **3.**Dislike moderately | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2.**Dislike very much | | | | | | | | | | | | |
| **1.**Dislike extremely | | | | | | | | | | | | |




**We can see the nine hedonic point scale; overall acceptance of beetroot drinks. Sample 2 got higher score.**

## 9.5. Sensory evaluation of achar

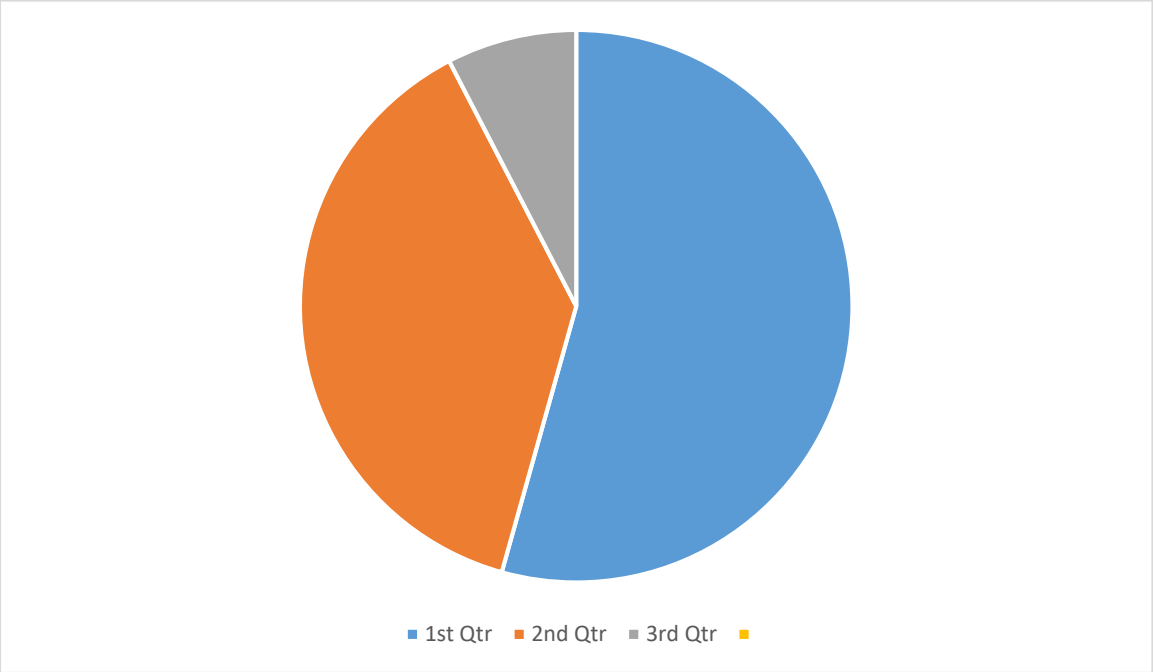
| **Name: sensory evaluation** | Product name: beetroot achar |
|---|---|
| **Panelist no:** | Date: |

**Instructions:**

Taste the given sample, then place the x mark on the point in the scale which best describes your feeling.

| Score | Sample | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S1(0days)** | | | | S2(180days 0 | | | | **S3(300days)** | | | |
| | **Appe ance** | **Fla vor** | Ta ste | Ov Era L ac | Appe ance | Fla vor | Ta ste | Ov e Ral ac | **App e ance** | **Fl a vo r** | **T a st e** | **Over a L ac** |
| **9.**Like extremely | 8 | 10 | 9 | 10 | 6 | 7 | 8 | 7 | 4 | 5 | 4 | 4 |
| **8.**Like very much | 5 | 4 | 4 | 5 | 6 | 5 | 5 | 6 | 6 | 4 | 6 | 5 |
| **7.**Like moderately | 3 | 3 | 4 | 3 | 2 | 3 | 4 | 4 | 5 | 5 | 3 | 5 |
| **6.**Like slightly | 4 | 2 | 8 | 3 | 4 | 2 | 2 | 4 | 3 | 3 | 2 | 3 |
| **5.** Neither like nor dislike | 2 | 1 | 2 | 1 | | | | | 2 | 2 | 2 | 2 |
| **4.**Dislike slightly | | | | | | | | | | | | |
| **3.**Dislike moderately | | | | | | | | | | | | |
| **2.**Dislike very much | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.**Dislike extremely | | | | | | | | | | | | |




**We can see the nine hedonic point scale; overall acceptance of beetroot drinks. Sample 1 got higher score.**

## 9.6. Sensory evaluation of spaghetti.

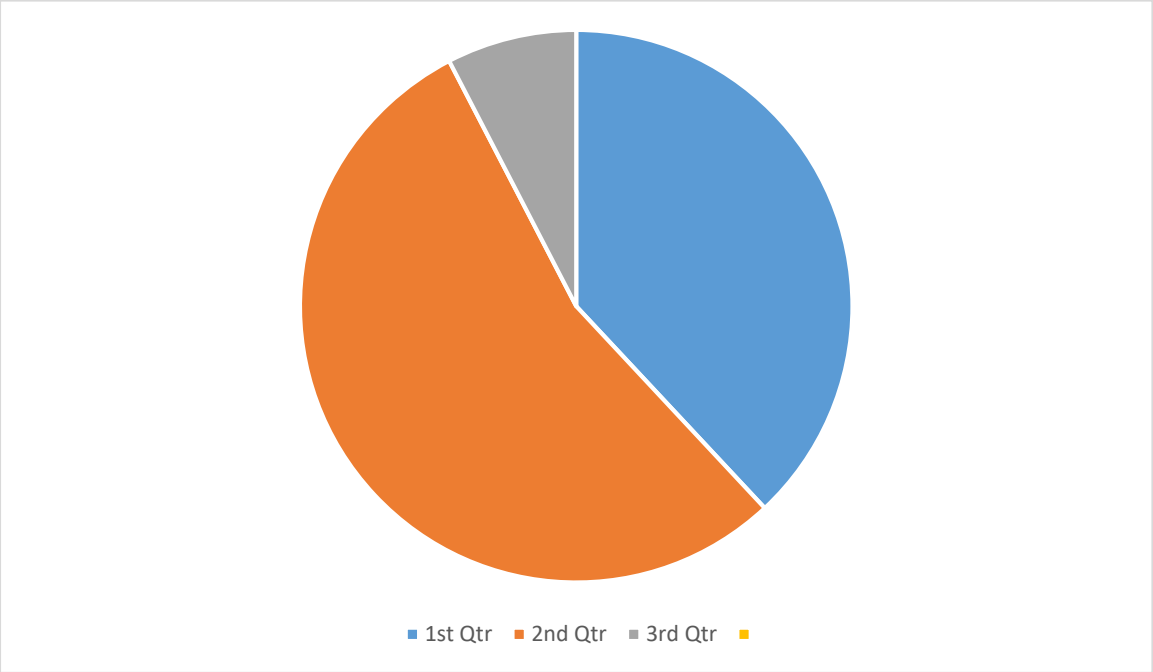
| **Name: sensory evaluation** | Product name: beetroot spaghetti |
|---|---|
| **Panelist no:** | Date: |

**Instructions:**

Taste the given sample, then place the x mark on the point in the scale which best describes your feeling.

| Score | Sample | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S1(0days)** | | | | S2(180days 0 | | | | **S3(300days)** | | | |
| | **Appe ance** | **Fla vor** | Ta ste | Ov Era L ac | Appe ance | Fla vor | Ta ste | Ov e Ral ac | **Appe ance** | **Fla vor** | **Ta ste** | **Over a L ac** |
| **9.**Like extremely | 6 | 7 | 5 | 7 | 8 | 10 | 9 | 10 | 4 | 5 | 4 | 4 |
| **8.**Like very much | 5 | 4 | 4 | 5 | 6 | 5 | 5 | 6 | 6 | 4 | 6 | 5 |
| **7.**Like moderately | 3 | 3 | 4 | 3 | 2 | 3 | 4 | 4 | 5 | 5 | 3 | 5 |
| **6.**Like slightly | 4 | 2 | 8 | 3 | 4 | 2 | 2 | 4 | 3 | 3 | 2 | 3 |
| **5.** Neither like nor dislike | 2 | 1 | 2 | 1 | | | | | 2 | 2 | 2 | 2 |
| **4.**Dislike slightly | | | | | | | | | | | | |
| **3.**Dislike moderately | | | | | | | | | | | | |
| **2.**Dislike very much | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.**Dislike extremely | | | | | | | | | | | | |



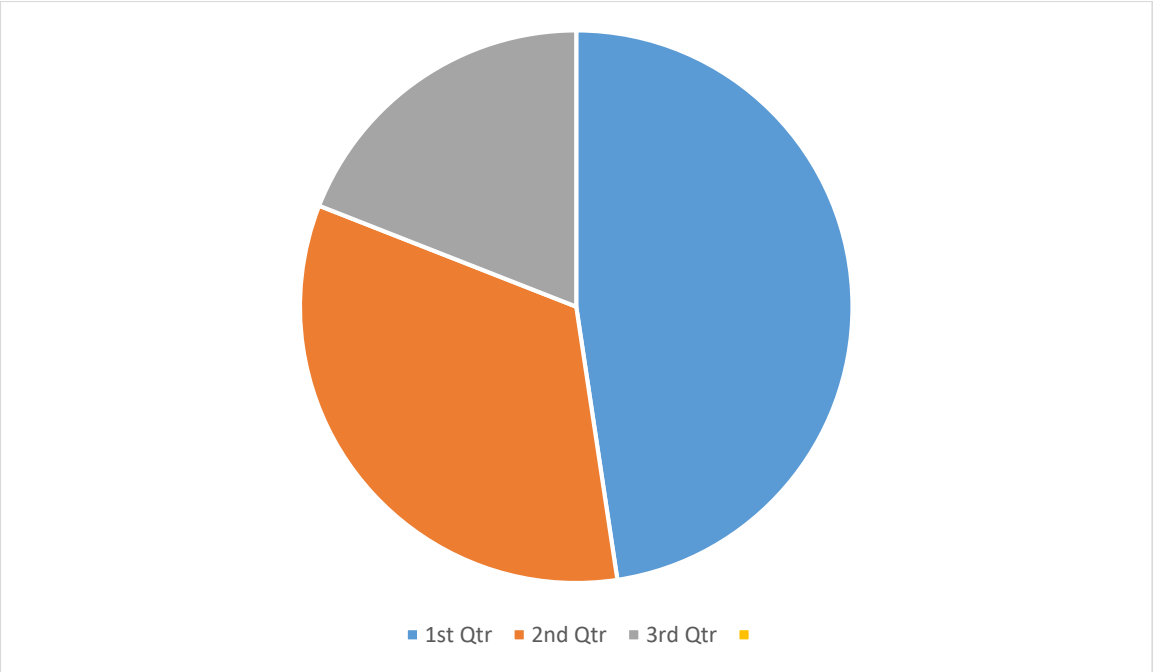

**We can see the nine hedonic point scale; overall acceptance of beetroot drinks. Sample 2 got higher score.**

| **9.7.Name: sensory evaluation** | Product name: beetroot chips |
|---|---|
| **Panelist no:** | Date: |

**Instructions:**

Taste the given sample, then place the x mark on the point in the scale which best describes your feeling.

| Score | Sample | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S1(0days)** | | | | S2(180days 0 | | | | **S3(300days)** | | | |
| | **Appe ance** | **Fla vor** | Ta ste | Ov Er a L ac | Appe ance | Fla vor | Ta ste | Ov e Ral ac | **App e ance** | **Fl a vo r** | **T a st e** | **Over a L ac** |
| **9.**Like extremely | 8 | 10 | 9 | 10 | 6 | 7 | 8 | 7 | 4 | 5 | 4 | 4 |
| **8.**Like very much | 5 | 4 | 4 | 5 | 6 | 5 | 5 | 6 | 6 | 4 | 6 | 5 |
| **7.**Like moderately | 3 | 3 | 4 | 3 | 2 | 3 | 4 | 4 | 5 | 5 | 3 | 5 |
| **6.**Like slightly | 4 | 2 | 8 | 3 | 4 | 2 | 2 | 4 | 3 | 3 | 2 | 3 |
| **5.** Neither like nor dislike | 2 | 1 | 2 | 1 | | | | | 2 | 2 | 2 | 2 |
| **4.**Dislike slightly | | | | | | | | | | | | |
| **3.**Dislike moderately | | | | | | | | | | | | |
| **2.**Dislike very much | | | | | | | | | | | | |
| **1.**Dislike extremely | | | | | | | | | | | | |




**We can see the nine hedonic point scale; overall acceptance of beetroot drinks. Sample 1 got higher score.**

# Chapter Ten

## 10.1Conclusions

In this present study signs that good quality of product also a good quality added value. The Drinks, jam, jelly, pickles, spaghetti, achar & non fermented pickles. Was acceptable up to their shelf life time such as 6month, 3 month, 1 year, 2 years with preservatives and non-preservatives. Beetroot is commonly used as a vegetable. But it can be made more delicious through various processes. So that it was a perishable vegetable. Our farmer produced beet root but they cannot get enough or proper money to sell it.  So that produced Beetroot product must be invigorated to be commercially prepared and preserved in our country. People who are not skilled can also earn money doing this business. This will increase our national economy. And gives us good new nutritional and innovative food.

# 10.2. Reference

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