# DEVELOPMENT OF COMPOSITE FLOUR LADOO/PINNI CONTAINING CARROT POMACE

**Dissertation Report-1**

**Submitted by**

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# CERTIFICATE

This is to certify that Inderjit Singh has personally completed M.Sc. Dissertation-1 entitled 'DEVELOPMENT OF COMPOSITE FLOUR LADOO/PINNI CONTAINING CARROT POMACE 'under my guidance and supervision. To the best of my knowledge, the present work is the result of his original investigation and study. No part of pre-dissertation has ever been submitted for any other purpose at any university.

The project report is appropriate for the submission and partial fulfilment of the conditions for the evaluation leading to the award of Master of Food Science and Technology.

**Signature of Supervisor**

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# DECLARATION

I hereby declare that the work presented in the Dissertation 1 entitled 'DEVELOPMENT OF COMPOSITE FLOUR LADOO/PINNI CONTAINING CARROT POMACE' is my own original work. The work has been carried out by me at School of Agriculture, Lovely Professional University, Phagwara, Punjab, India under the guidance of **Er. Jasleen Kaur Bhasin**, Assistant Professor (Food Technology) of School of Agriculture, Lovely Professional University, Phagwara, Punjab, India for the award of the degree of Master of Science in Food Technology.

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I certify that the above statement made by the student is correct to the best of my knowledge and belief.

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# CHAPTER 1

## INTRODUCTION

The investigation was undertaken to develop carrot pomace pinni using edible gum, jaggery, green gram and carrot pomace. Carrot pomace is used as a major ingredient in the preparation of pinni. The pinni preparation process began with the collecting of carrot pomace from the local juice vendors. The carrot pomace was then dried in tray dryer in several batches at temperature of 65℃ for 4-5 hrs until there is complete removal of water. This carrot pomace powder was incorporated as the main ingredient in preparation of carrot pomace pinni. Each raw material used in the preparation of pinni was analysed for it's proximate composition.

### 1.1TRADITIONAL FOODS

Traditional foods are those foods that are passed through generations and also refers to foods those are eaten over the long-term duration of progression that have been passed through generations. These foods are consumed for millions of years ago by people around the world. They are not processed or packaged and can easily be found in our local community. The most important reason for consuming traditional foods is that they are healthy and contains more nutrients as there is no addition of chemicals into it.

### 1.2 PINNI

Pinni is a general term used for the sweets and deserts prepared in round shape. It is a type of Punjabi and North Indian cuisine traditional dish which is prepared and consumed mostly in winters. It is served as a dessert and is generally made up of desi ghee, wheat,flour, jaggery and almonds. And sometimes to improve the flavours and nutritional quality Raisins are also added. Urad dal pinni is also a variety of pinni which is consumed after the wheat flour. The pinni made with rice is the oldest sweet and is mostly prepared and served in the Punjabi weddings. Pinni is also made by adding of khoya for improving flavours. Pinnis do not go bad for a lengthy time and do not require to be chilled. By rolling the pinnis on cardamom they are served with warm tea.

Milk based pinni is also available. It is dark brown in colour and have granular texture. Pinni is considered an ideal food for growing children, lactating and pregnant women as it is highly nutritive (Talwar*et al*).

### 1.3 CARROT POMACE

It is the waste which is obtained after the juice extraction of carrot on industry level, which is thrown away that causes environmental pollution. Carrot pomace contains fibres and high amount of carotenoids and phenolic compounds that act as auseful ingredient that improves the quality of the food product as well as decrease the issue of environmental pollution. During the processing despite of heating conditions, valuable components such as carotenes, uronic acid and natural sugars are still retained in the carrot pomace. Carrot pomace contains about 80% of the carotene content. Carrot pomace is a best source of antioxidants (Zhang and Hamauzu 2004). Carotene and β-carotene are retained in the products with 4% incorporation of carrot pomace. Also cartenoids are very powerful from health point of view. Antioxidants present in pomace is not only required for proper functioning of human body but also prevents their health from many diseases. The pigment cartenoids are most stable to high temperatures as compared to different pigments present in fruits and vegetables.

**Table 1.3.1:Composition of carrot pomace**

| | |
|---|---|
| Moisture content (%) | 85.62 |
| crude fibre (%) | 15.89 |
| Ash (%) | 2.8 |
| Ascorbic acid (mg/100gm) | 23.44 |
| β carotene (mg/100gm) | 14.39 |

Source: *Upadhyay A., Sharma H.K, and Sarkar B.C.,(2008),* "Characterization and Dehydration Kineticsof Carrot Pomace". Agricultural Engineering International: The CIGR Ejournal. Vol. X..

## 1.4 GREEN GRAM

Green gram is most commonly used component of Indian diet. Green gram, principle pulse is used to fight against cardiovascular diseases, diabetes mellitus which are threatening our lives and have turned to be a major causes of death.

**Table 1.4.1: Nutritional composition of green gram whole seed (per 100gm)**

| | |
|---|---|
| Moisture (gm) | 10.6 |
| Protein (gm) | 22.9 |
| Fat (gm) | 1.2 |
| Carbohydrates (gm) | 61.8 |
| Crude fibre (gm) | 4.4 |
| Minerals<br>Calcium (mg)<br>Phosphorous (mg)<br>Iron (mg)<br>Sodium (mg)<br>Potassium (mg) | <br>105<br>330<br>7<br>6<br>1132 |
| Vitamins<br>β carotene (μg)<br>thiamine (mg)<br>riboflavin (mg)<br>niacin (mg) | <br>55<br>0.53<br>0.26<br>2.5 |

| | |
|---|---|
| ascorbic acid (mg) | 4 |

Source : *Duke ,J.A., (1981),* "Handbook of Legumes of world Economic Importance", Plenum Press, New York.

## 1.5 JAGGERY

It is the natural sweetener that is produced from the juice of sugarcane. It is generally produced from the molasses obtained from the sugarcane. It is present in three forms- solid, liquid and powder. It is light brown to tan brown in colour. It is manufactured by boiling sugar cane juice. Jaggery is used as a sweetener and flavouring agent in food and many beverage industries. It gives best results when compared to refined white sugar. Jaggery is good source of vitamins, salts, minerals and fibres whereas sugar mainly lacks these nutrients as it is highly refined. It is mostly consumed in winters as it provides warming effect. It also provides cooling effect during summers when made into a drink by dissolving in water. It also helps in the prevention of anaemia, liver detoxification, improves immune system and digestive system. (Shrivastav *et al*.)

**Table 1.5.1 :Composition of 100gm of jaggery**

| | |
|---|---|
| Carbohydrates (gm) | |
| Sucrose | 72.78 |
| Fructose | 1.5-7 |
| Glucose | 1.5-7 |
| Minerals (mg) | |
| Calcium | 40-100 |
| Magnesium | 70-90 |
| Phosphorous | 20-90 |
| Sodium | 19-30 |
| Iron | 10-13 |
| Manganese | 0.2-0.5 |
| Zinc | 0.2-0.4 |
| Chloride | 5.3 |

| | |
|---|---|
| Copper | 0.1-0.9 |
| Vitamins (mg) | |
| Vitamin A | 3.8 |
| Vitamin B1 | 0.01 |
| Vitamin B2 | 0.08 |
| Vitamin B5 | 0.01 |
| Vitamin B6 | 0.01 |
| Vitamin C | 7 |
| Vitamin E | 111.30 |
| Proteins (mg) | 280 |
| Water | 1.5-7gm |
| Calories | 312 |

Source: *Singh J, Solomon S, Kumar D ,(2013)*, " Manufacturing Jaggery, a Product of Sugarcane, As Health Food".

## 1.6 EDIBLE GUMS

Edible gums are flakes of dried sap of many trees and shrub that we get after natural and manmade injury to wooden stems and branches. They are ionic,natural, complex polymers of glycopeptides. The gums that are obtained from the trees or shrubs of Fabaceae family are edible. Gums are used for their nutritional, culinary and therapeutic properties in food.

**Table 1.6.1 : Analytical data for gum (Idris et al. 1998)**

| Parameters | Range |
|---|---|
| Moisture content (%) | 12.5-16 |
| Specific rotation | -32.7º to -27º |
| Nitrogen (%) | 0.22-0.39 |
| Protein (%) | 1.5-2.6 |
| Galactose (%) | 39-42 |
| Arabinose (%) | 24-27 |
| Rhamnose (%) | 12-16 |
| Glucoronicacid (%) | 15-16 |
| Equivalent mass (Da) | 1118-1238 |

# CHAPTER 2

## PROBLEM BACKGROUND

As in the present-day situation most of the people are consuming highly processed foodswhich are having less concentration of the nutrients in the foods. In the processing of foods most of the vitamins and minerals are lost and most of the pigments are destroyed, and most of the population consume large amount of these processed foods on daily basis. And among the population children are most affected as in their growing stage they don't get the sufficient amount of vitamins and minerals and show the deficiency diseases. The most common ones are the deficiency disease related to vitamin A in children and most of the population suffer from eye sight problem. The pinni which is prepared using the carrot pomace will supplement them with the precursor of Vitamin A as the pinni is rich in B- carotene. The pinni will also serve to give the sufficient amount of protein as the pinni is prepared using green gram, so it will act as a main source of protein for the vegetarians.

# CHAPTER 3

## OBJECTIVES

1. Development of carrot pomace fortified pinni.
2. Estimation of quality characteristics of the carrot pomace fortified pinni.
3. Storage study of formulated pinni.

# CHAPTER 4

## REVIEW OF LITERATURE

Gayas *et al* (2013) reported that carrot pomace is a major waste generated during the juice extraction of carrot. The produce of juice is found to be close to 60-70% and about 80% of β-carotene is present in carrot pomace. Upadhyay *et al* (2008) reported that dehydrated carrot pomace consists of β-carotene and ascorbic acid contents and their values ranges from 9.87-11.57 mg for β-carotene and 13.53-22.95 mg per 100 gram respectively for ascorbic acid. Roberts *et al* (2008) reported that carrot pomace is highly perishable because of it's high moisture content. Drying and dehydration are the best method to preserve perishable foods. Sharma *et al* (2006) reported that dried carrot pomace can be preserved for longer periods at ambient temperature.

Alam *et al* (2013) reported that samples dried at $65^0$C helped to retain quality of carrot pomace with less drying time, high fibre, total carotenoids, β-carotene contents, negligible change in colour attributes. Nagarajaiah *et al* (2015) reported that dried carrot pomace was evaluated for incorporation into baked goods using an alternative for refined/wheat flour at 4, 8, and 12% levels. He also concluded that carrot pomace is a good source of antioxidants and fibre.

Jyotsna *et al* (2013) reported that grren gram is added to bakery products for nutritional qualities. Patterson *et al* (2009) reported that green gram flour (Phaseolus Aureus) is rich source of protein, dietary fibre, starch, vitamins, minerals and other bioactive components. Swaminathan *et al* (1974) reported that green gram flour is available at affordable price that act as a source of supplementary proteins in Indian diet. Simpson *et al* (1981) reported that green gram helped in the prevention of various metabolic diseases such as diabetes, coronary heart disease and colon cancer.

Gopalan *et al* (2002) reported that green gram flour is composed of various nutrients. He studied the composition of green gram flour per 100 serving. Green gram flour consists of 24 g protein, 1.3 g fat, 3.5 g minerals, 4.1 g fiber, 56.7 g carbohydrates, 334 Kcal energy, 124 mg calcium, 326 mg phosphorous and 4.4 mg iron.

Madan *et al* (2004) reported that in India, jaggery is the main agro processing industries. He studied that 7 million tonnes jaggery was produced from 20-30% of total sugarcane of the

country, that is the most nutritive among all sweeteners. Shahi *et al* (1999) reported that jaggery is used in the preparation of various sweet food products like- reori, gazak, chikki, patti and ramdana, etc..

Nath *et al* (2015) reported that jaggery is a nutritive sweetener that is manufactured using different concentration of sugarcane juice and chemicals . Singh *et al* (2013) compared the mineral content of jaggery with refined sugar. He found that jaggery consists of 2.8 g/100 grams mineral salts whereas refined sugar contains 300 mg/kg of mineral salts. Solomon *et al* (2013) reported that magnesium has many health benefits which includes strengthening of nervous system, providing relief from fatigue and control the flow of blood in vessels. He also studied that when magnesium combines with selenium it act as antioxidant. As an antioxidant it combines with free radicals and get oxidized itself. Potassium and sodium helps in controlling the acid balance in the body cells.

Gartaula *et al* (2014) reported that jaggery has higher mineral contents as compare to sugar but it did not affect the overall acceptability of the product but there is increase in the mineral content of the product. Singh *et al* (2013) studied the chemical composition of liquid jaggery. He found it consist of 30-36% water, 40-60%sucrose, 15-25% invert sugar, 0.30%calcium, 8.5-10 mg/100 mg iron, 05/100 mg phosphorus, 0.10/100 mg protein, and 14/100 mg vitamin B.
Smolinske *et al* (1992) reported that edible gums are hydrophilic and produce viscous solutions (gel like) and are used as thickeners, gelling agents, emulsifiers and stabilizers in food industries. Tapare *et al* (2010) reported that using gums in batter formulations was adequate to obtain crisp and porous products with reduced oil uptake.

# CHAPTER 5

# MATERIALS AND METHODS

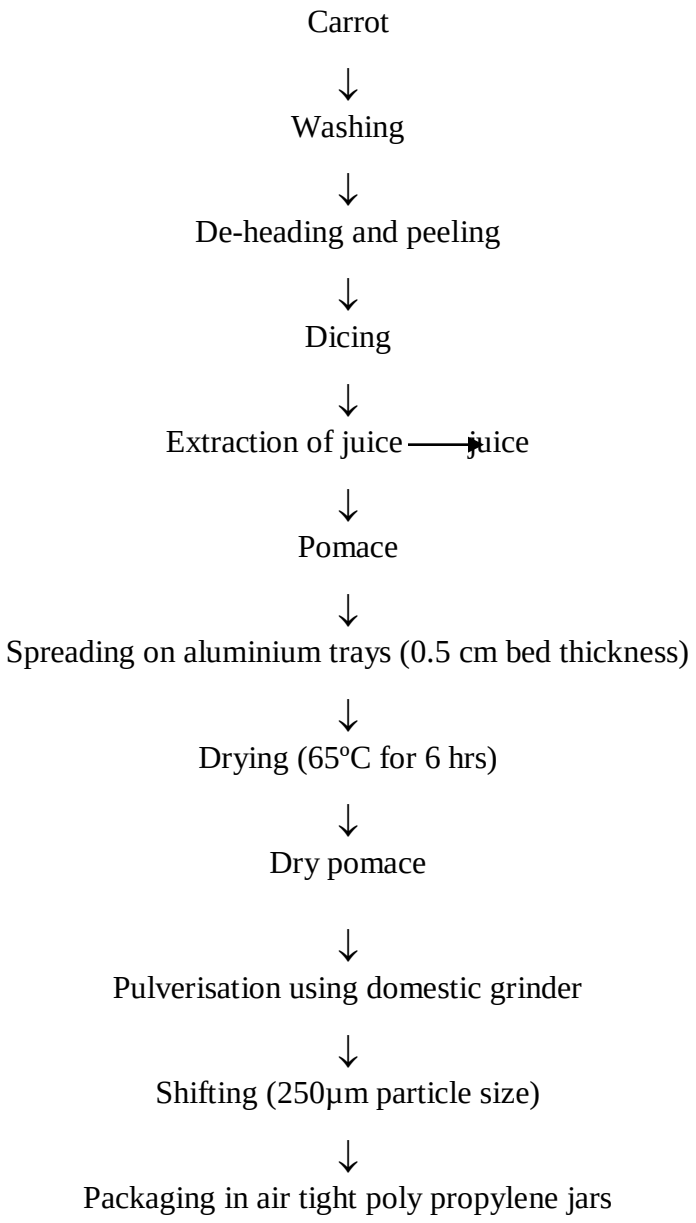
## 5.1 Procurement of raw materials

The current study on preparation of carrot pomace pinni by using various combinations of carrot pomace, green gram flour, wheat flour, jaggery and edible gums. The raw materials were brought from local vegetable market of Jalandhar cantt Punjab and green gram, jaggery and edible gums were brought from Deep nagar in Jalandhar Punjab. The green gram flour where made by giving roasting as a pre-treatment to the grains and then where made to fine flour.

## 5.2 Preparation of carrot pomace powder

The Carrot pomace powder was prepared using the method given by *Prashant sahni and D.M.shere* in the paper "Physicochemical and sensory characteristics of carrot pomace powder incorporated fiber rich cookies." in 2017. The carrot pomace was prepared in the similar way by taking the carrots and cleaning which was followed by dicing and later juice was extracted and the pomace was spread on the tray and dried in a tray drier (65ºC for 6 hrs) and then it was ground to fine powder using domestic grinder and packed in propylene pouches.

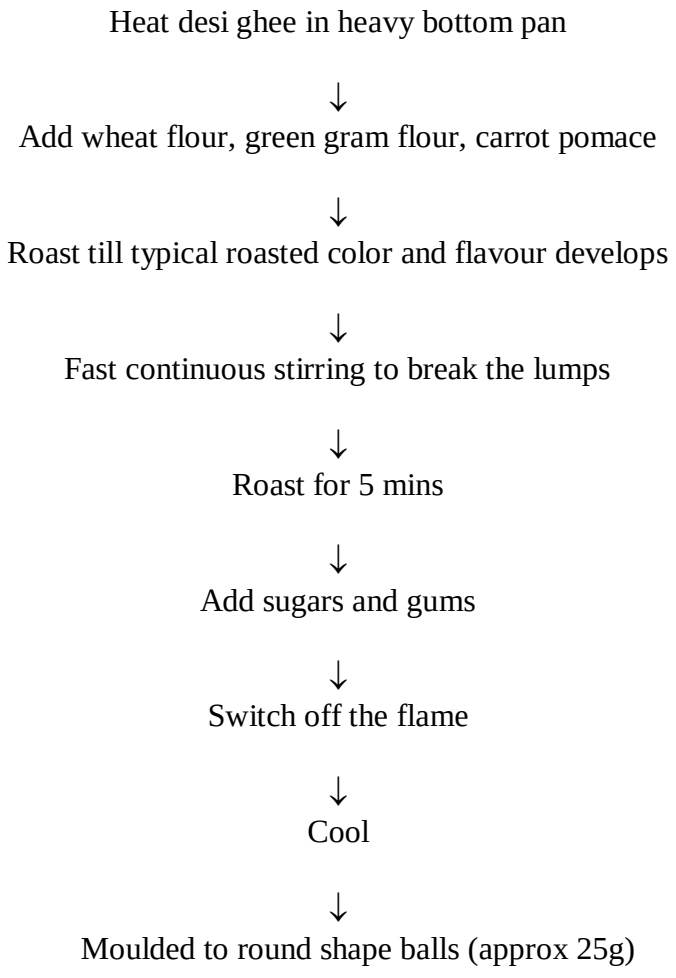
**FIGURE 1: FLOW CHART FOR THE PREPARATION OF CARROT POMACE**



## 5.3 PREPARATION OF PINNI

The pinni was made using the method given by *Gopika talwar and Sandeepal kaur Brar in "Study of physiochemical, sensory and color properties of pinni variants" in 2015.* The pinni was made with minimum modifications in the procedure and ingredients. The pinni was made using various combinations of the green gram flour and carrot pomace with addition of edible gums and jaggery.

**Figure 2: Flow chart for preparation of pinni**



### 5.4 Determination of moisture content

Moisture content is defined as the amount of water present in the sample. Moisture content also affects the taste, texture, appearance, weight and shelf life of the product. Water also acts as source for microbial growth. So it is very important to check the moisture content of the product.

#### 5.4.1 Procedure

Weigh the empty Petri plate($W_1$) with the help of weighing balance. Then the sample (pinni) is weighed 5 gm and transferred to clean and dry Petri plate. Then after weigh the both, i.e, weight of sample+ weight of Petri plate($W_2$). Now set the temperature of the hot air oven to 105℃. The sample is then transferred to hot air oven for about 3-4 hours. Now remove the Petri plate from hot air oven and cool it in a desiccator. Now weigh the Petri plate with sample after removing from hot air oven($W_3$). Repeat the process of heating, cooling and weighing until constant weight is achieved. Calculate the moisture content of the sample by the following formula:-

$$\text{Moisture content (\%)} = \frac{W_2 - W_3}{W_2 - W_1} \times 100$$

Where,

$W_1$= Weight of empty petriplate

$W_2$= Weight of petri plate with sample (before drying)

$W_3$= weight of petriplate with sample (after drying)

### 5.5 Determination of ash content

Ash is defined as the inorganic remaining after all the water and organic matter has been removed in the presence of oxidising agents. It gives the total measure of mineral content present in a sample. It has various applications such as labelling, nutritional information, microbial stability, processing operations.

### 5.5.1 Procedure

Weigh an empty crucible on weighing balance($W_1$) and add 5gm of sample to it, i.e, weight of sample + crucible($W_2$). Now, the charring of sample is done on a Bunsen flame until smoke stops coming out. Now, transfer it into a muffle furnance maintained at temperature 550℃ for about 7-8 hours. Now remove the crucible from muffle furnace and cool it in a dessicator. Now weigh the crucible with sample after removing from muffle furnace($W_3$).

Repeat the process of heating, cooling and weighing until constant weight is achieved. Calculate the ash content of the sample by the following formula:-

$$\% \text{ ash content} = \frac{W_3 - W_1}{W_2 - W_1} \times 100$$

Where,

$W_1$= Weight of empty crucible

$W_2$= weight of crucible with sample

$W_3$ = weight of crucible with ash

### 5.6 Determination of fat content

Fat content is very important to determine the nutritional value and the quality of the product. It also affects the texture quality and flavour of the product.

### 5.6.1 Procedure

8g of green gram flour was weighed and transferred into a thimble and 320ml of solvent (Petroleum ether) was taken in a pre-weighed beaker. The thimble is inserted into an adopter and placed in the beaker containing solvent. The beaker with sample is loaded in the system. Water flow is ensured through the condenser. The time and temperature are set. The sample is allowed to boil for 1hr and temperature raised for the recovery and condensation. The recovered solvent is allowed to rinse through the thimble. Finally, the solvent is recovered from the beaker. The beaker with fat is weighed after drying to know the %age of fat (Mishra *et al.*, 2017).

The fat content was calculated by the following formula:

$$\% \text{ fat content} = \frac{W_2 - W_1}{X} \times 100$$

Where,

$W_1$ =Weight of empty beaker

$W_2$=Weight of beaker after fat extraction

X=Weight of sample

**5.7 Determination of protein content**

The method used for protein determination is macro Kjeldhal method. One gram of pinni sample was weighed and digested in kejldhal flask with digestion mixture consisting of copper sulphate and potassium sulphate in 1:5 and concentrated sulphuric acid(about 20 ml) is added until green colour appears. It is then cooled. An aliquot of the digest was distilled with 50% NaOH and liberated ammonia was collected in 10 ml boric acid containing 3-4 drops of mixed indicator. The titration of the collected distillate was done again 0.1 N HCl. Protein content was calculated by the following formula:-

$$\% \text{ Protein} = \text{normality} \times 6.25$$

**5.8 Determination of vitamin C**

Vitamin C is present in the form of ascorbic acid. Vitamin C is an electron donor and acts as an antioxidant. Antioxidants have many health benefits such as it reduces the risk of cardiovascular diseases, stroke and cancer.

**5.8.1Procedure**

(i) Standardization of dye:- Take 5ml of standard ascorbic acid and add 5ml of 3% metaphosphoric acid which was prepared by dissolving sticks of metaphosphoric in distilled water. Now, fill the burette with dye solution which was prepared by dissolving 50mg of sodium salt of 2,6-dichloroindophenol in 150 ml of hot distilled water containing 42mg of sodium bicarbonate and them Cooling and making the volume upto 200ml. Now, titrate the sample with

dye until pink colour appears and persist for about 15 sec. Now, calculate the dye factor by the given formula:-

$$\text{Dye factor} = \frac{0.5}{\text{Titre value}}$$

(ii) Preparation of sample:- Take about 20ml of sample and make volume upto 100ml with 3% metaphosphoric acid. Filter the solution.

(iii) Assay of extract:- take about 10m of sample and titrate with the dye solution until it gives pink colour.

(iv) Calculation:-

$$\text{mg of ascorbic acid /100gm or ml} = \frac{\text{Titre} \times \text{dye factor} \times \text{volume made up} \times 100}{\text{Aliquot of extract taken for estimation} \times \text{volume of sample}}$$

**5.9 Estimation of fibre**

Crude fibre is determined by using the method of AOAC. 2g of defatted sample was hydrolysed in a beaker with petroleum ether and after that it was boiled under reflux for 30 min with 200 ml of solution containing 1.25% H2SO4 per 100 ml of solution. Then the solution was filtered using filter paper with the help of funnel.

After the filtration, the samples were washed with boiled water until they were no longer acidic. Then the residue was transferred onto a beaker and boiled for another 30 min with 200 ml of solution containing 1.25% $H_2SO_4$ per 100 ml of solution. The boiled sample were washed with boiled distilled water. The residue was filtered through Gooch filter crucible dried at $100^0$C for 2 hrs in an oven, cooled and washed the percentage crude fibre in sample was calculated as per the formula.

**Calculations:**

$$\% \text{ crude fibre} = \frac{\text{Weight after drying}}{\text{Weight of sample}} \times 100$$

**5.10 Estimation of β-carotene in carrot**

Take 5gm sample of extruded material and was grinded with few crystal of anhydrous sodium sulphate. Add 10 to 15 ml of acetone to it. It was then pour to a another beaker without disturbing. Supernatant was collected in a beaker. This process was repeated two times and the combined supernatant was transferred to separating funnel. 5 to 10 ml of petroleum ether was added and mixed. It was than allow to stand. There was a separation between two layers on standing. The upper layer was collected in a volumetric flask and the lower layer was discarded. The collected upper layer in volumetric flask was made up to 100ml with petroleum ether and optical density was recorded at wavelength 452 nm. Petroleum β carotene was calculated by the given formula.

$$\text{B carotene } (\mu g/100g) = \frac{\text{Optical density} \times 13.9 \times 10^4 \times 100}{\text{Weight of sample}}$$

# CHAPTER 6

## EXPECTED OUTCOMES

Substitution of wheat flour for either of carrot pomace powders increased the dietary fibre and carotenoid content in pinni, and also helped to reduce the caloric content of pinni, suggesting these could be employed as raw materials to produce foodstuff high in fiber, with improving phytochemical content and low in calories. Carrot pomace is a major product in pinni. Carrot pomace is a major by-product achieved during the industrial juice extraction process, which is discarded contributing to environmental pollution. This residue is rich in fiber, and contains high amounts of carotenoids and phenolic compounds that could add to its application as functional ingredient, enhancing the quality of foods and helping to decrease the environmental problem. I have included green gram (mung bean) flour instead of other flours as a bean it cooks up fast and has a sweet flavor. It has high fibre and nutrient content and contribute to health benefits. Also, I have used jaggery instead of sugar.Jaggery is a traditional Indian sweetener made from sugarcane and is believed to be a healthy substitute for sugar. The process of making jaggery which does not involve any chemical agents has all natural mineral salts retained in it. Jaggery has many health benefits as compared to sugar. Edible Gum is also added as it**i**s a natural edible gum. It is white or brown in colour. It provides heat to the body and is usually eaten in cold winter months. Dry fruits are also included in my pinni as they can boost your fibre and nutrient intake and supply your body with large amounts of antioxidants.

# CHAPTER 7

# RESULTS AND DISCUSSION

## 6.1 Proximate analysis of raw materials

The data given in table 6 depicts the chemical composition of carrot pomace, green gram flour and gums.

Carrot pomace contains 6.53±0.02 moisture, 5.12±0.02 ash, 22.5±2.5 ascorbic acid, 6.52±0.12 protein, 44.71±0.06crude fiber and 5455.6±1.52 β-carotene, *Nagarajaiah et al, (2015)*, reported similar composition of raw material nutrient contents of carrot pomace.

Green gram flour contains 10.62±0.03 moisture, 3.53±0.05 ash, 22.94±0.04 protein, 4.45±0.05 fibre and 1.25±0.06 fat, *Adsule et al, (2009)*, reported similar composition of nutrient contents of green gram flour.

Gums contain 8.36±0.32 moisture, 0.63±0.15 ash, 5.1±0.78 protein, 2.36±0.2 crude fibre, *Mudgil et al, (2014)*, reported similar composition of nutrient contents of gums.

**Table 6.1: Analysis of raw materials**

| Ingredient | Miosture content | Ash | Crude fibre | Fat | Protein | Ascorbic acid | β-carotene |
|---|---|---|---|---|---|---|---|
| Carrot pomace | 6.53±0.02 | 5.12±0.02 | 44.71±0.06 | -------- | 6.52±0.12 | 22.5±2.5 | 5455.6±1.52 |
| Green gram flour | 10.62±0.03 | 3.53±0.05 | 4.45±0.05 | 1.25±0.06 | 22.94±0.04 | ---------- | ---------- |
| Gum | 8.36±0.32 | 0.63±0.15 | 2.36±0.2 | ---------- | 5.1±0.78 | ---------- | ---------- |

# CHAPTER 8

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