



# Shelf Life Of Tin Sweets Can And Namkeen

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## ABSTRACT

Background information: At the moment, people are getting more picky about the quality of food, with high standards from the point of purchase to the point of consumption. Food should therefore be safe, and sensory changes should be kept to a minimum. The majority of perishable goods' shelf life is determined by researching how long microbes will not survive and proliferate in a product. To guarantee the ultimate quality of products, physiochemical, microbial and sensory analysis must be done as this study is insufficient to guarantee the safety and quality of food. Scope and Methods: This study set out to evaluate the physiochemical, microbiological, and sensory characteristics of two Haldirams ready-to-eat (RTE) products i.e tin sweets can and namkeen products. All the items were kept at room temperature (26°C) for four months. The following parameters were measured during the study: (Namkeen- Moisture, Salt, Acidity, FFA, Oil%, TPC, E. coli, Coliform, Y&M) and (Tin sweets- Acidity, Brix, Vacuum, Drain weight, Water activity, pH, TPC, E. coli, Coliform, Y&M). The following characteristics were assessed by a semi-trained panel during a sensory analysis: look, taste, texture, and flavor. Principal Findings and Conclusions: The data indicated only a major rise in Acidity of Gulab Jamun during storage. According to the standards established by the Institute of Food Science and Technology and the Health Protection Agency, it was determined that the various RTE products meet the requirements for food safety and microbiological quality. Regarding the findings of the sensory study, the panel was able to identify in tin sweets the crust of gulab jamun become little hard and the colour of the syrup become little yellowish as compared to fresh product and rasgulla chenna balls was found to be little coagulated. In namkeens lite mixture turned to be slightly yellowish as compared to fresh and in corn flakes mixture the cashew become soggy the smell of fresh spices was missing. However, there was a minor change in the overall sensory profile after 4 months. According to microbiological analysis, all items are considered microbiologically safe for up to four months at room temperature. There are no major discernible changes between the product after four months and the fresh product.

## CHAPTER – 1

### INTRODUCTION

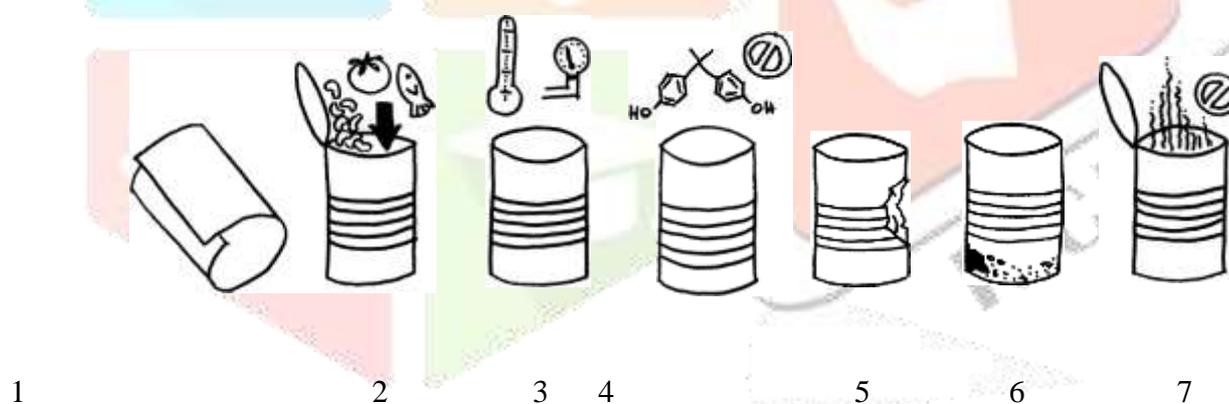
#### 1. INTRODUCTION

A steel can, tin can, steel packaging, or can is a container for the distribution or storage of goods, made of thin metal. They can store a broad variety of contents: food, beverages, oil, chemicals, etc. Steel cans are made of tinplate (tin-coated steel). In some dialects, even aluminium cans are called "tin cans". Steel cans are highly recyclable, with around 65% of steel cans being recycled.

The tin canning process was conceived by the Frenchman Philippe de Girard, who got a British merchant Peter Durand to patent the idea in 1810. The canning concept was based on experimental food preservation. Canned food in tin cans was already quite popular in various countries when technological advancements in the 1920s lowered the cost of the cans even further. In 1935, the first beer in metal cans was sold, it was an instant sales success.

#### 1.1 Need of Coated Cans.

Food and beverage cans preserve the taste and nutritional values of their filling for up to several years. Cans are typically coated with an organic layer that protects the integrity of the can from effects of the food and prevents chemical reactions between the can's metal and the food. To fulfil the technical and legal requirements, can coatings should withstand the production and sterilization processes [1, 3], be universally applicable for all food and beverage types [2], prevent chemical migration into food in quantities that endanger human health [4], adhere to the can even after non-intentional deformation [5], resist aggressive food types and protect the metal of the cans [6], and preserve the food and maintain its organoleptic properties over several years [7].



**Fig. 1. Coating of cans.**

#### 1.2 Can production and market data.

Cans are made of three different materials: aluminium, tin-coated steel (tinplate) and electrolytic chromium coated steel (ECCS). Independently of the material and the production process, most cans are coated internally and externally with films of 1 to 10 µm thickness.

Coatings are usually applied to both sides of planar metal sheets or coils by roller coating before the cans are formed. Food cans are usually pressure-sterilized with the exact conditions depending on the food type. Beverage cans may be pasteurized or sterilized in the sealed cans or filled under aseptic conditions. More than 300 billion beverage cans are produced globally each year. In 2014, 90% of the beverage cans were made of aluminium, the remaining 10% consisted of steel. Furthermore, it was estimated that 75 billion food cans

were sold globally in 2011. In 2013, about US \$30 billion and US \$9 billion were globally earned with beverage and food cans, respectively. In 2011, the global production capacity of can coatings was estimated to be 800'000 metric tons, which corresponds to a market value of 2.8 billion.

The project assigned during the training was the study of 'Shelf life of Tin Sweets can and namkeen' for the period of 4 months to observe the keeping quality which are further used in processing of finished goods. The study included the chemical, microbial analysis and sensory parameters of the products.

**Shelf life** is the length of time that a commodity may be stored without becoming unfit for use, consumption, or sale. It applies to cosmetics, foods and beverages, medical devices, medicines, explosives, pharmaceutical drugs, chemicals, batteries, and many other perishable items. In some regions, an advisory *best before*, mandatory use *by* or *freshness date* is required on packaged perishable foods. The concept of expiration date is related but legally distinct in some jurisdictions. Shelf life is the recommended maximum time for which products or fresh (harvested) produce can be stored, during which the defined quality of a specified proportion of the goods remains acceptable under expected (or specified) conditions of distribution, storage and display. Shelf life depends on the degradation mechanism of the specific product. Most can be influenced by several factors: exposure to light, heat, moisture, transmission of gases, mechanical stresses, and contamination by things such as micro-organisms. Product quality is often mathematically modelled around a parameter (concentration of a chemical compound, a microbiological index, or moisture content).

The shelf life of a product begins from the time the food is prepared or manufactured. It is indicated by labelling the product with a date mark. The study of shelf life helps a food company to understand how long their products will maintain an acceptable degree of quality after they are manufactured. It helps in establishing use before/best before dates for food products for safe consumption of food. It is essential in assuring safety and quality of product. Controlling the pathogen content (safety) of foods should be achieved by using a Hazard Analysis Critical Control Point (HACCP) system. Predictive modelling or challenge testing can be used to assess pathogen growth. However, food safety and product shelf life are inextricably linked. During the shelf life of a food, it should: (a) Remain safe to eat (b) Keep its appearance, odor, texture, and flavour (c) Meet any nutritional claims provided on the label.

Shelf life can be determined from two sides: - *The Product Side* or *The Consumer Side*.

- **The Product Side:** It implies that the deterioration of the product is investigated as a function of time and may involve measuring the number of microorganisms or the decrease in desired components such as nutrients or texture, or the increase in undesired components such as black pigments or yellowish pigments, off-flavors or brix.
- **The Consumer Side:** It implies asking consumer to accept or reject food that has been stored for various lengths of time without normally specifying the reason.

**Chhana** is perishable milk product. At ambient temperatures, its quality deteriorates within a day or two. The shelf life of chhana is greatly influenced by the composition of chhana

particularly moisture content, storage temperature and nature of packaging material. The average shelf life of chhana from both cow and buffalo milk at 4°C, 22°C and 37°C is about 10-12 days, 3-4 days and 2-3 days. The shelf life of chhana based sweets is largely depend on the processing and packaging conditions, method of handling, season and moisture content in the product. Sodium metabisulphite is added to maintain white colour to tinned rasogulla. The shelf life of rasogulla with permissible preservatives in tin containers is above three months.



**Fig. 2. Chhana**

**Khoa** the keeping quality of *khoa* at room temperature is about 5 days and 10 weeks at the refrigeration temperature. Storage of *khoa* at low temperature (5-10°C) though enhances the keeping quality, it adversely affects the body and texture and its portability for sweet making. Hence all care should be taken during manufacture and subsequent handling. The shelf life of *khoa* is mainly dependent on moisture content of *khoa*, temperature of storage, bacteriological quality of raw milk, hygienic conditions maintained during production, duration of storage, type of package and method of packaging. *Khoa* is mainly used in the manufacture of a variety of *khoa* based sweets like *Gulab jamun*. *Khoa* is used for direct consumption after mixing with sugar.



**Fig. 3. khoa**

### Need of Laminates:

For a number of reasons, laminates are frequently utilised in namkeen (Indian savoury snack) goods. Excellent barrier qualities against moisture, air, and light are offered by laminates. This prolongs the shelf life of the namkeen goods by preserving their crispness and freshness.

**Protection:** During storage and transit, laminates shield the namkeen from outside elements including dust, humidity, and contamination, ensuring that the product reaches customers undamaged. **Improved Packaging:** Laminates provide design flexibility, enabling the creation of eye-catching and educational packaging that supports marketing and brand identification. **Better Product Quality:** Laminates help to preserve the texture and quality of the namkeen by keeping air and moisture out of the packaging, so that customers always get to enjoy a crunchy and delicious snack.

Packaging for namkeen and similar snacks often involves laminates, which are made by bonding together multiple layers of different materials. These layers serve various purposes such as providing barrier properties, strength, printability, and sealability.

**Materials:** The materials commonly used in these laminates include:

- Polyethylene (PE): Provides moisture resistance and sealability.
- Polypropylene (PP): Offers heat resistance and strength.
- Polyester (PET): Provides barrier properties and strength.
- Metallized polyester (MET) layers: Thin layers of metals such as aluminum can be added for enhanced barrier properties against oxygen, moisture, and light.
- Printing inks: Food-safe printing inks are used for branding, product information, and decorative purposes.

**Barrier Properties:** Packaging for namkeen typically requires good barrier properties to protect the product from moisture, oxygen, and light, which can degrade its quality and freshness.

**Seal Strength:** The packaging must have sufficient seal strength to maintain product freshness and prevent leakage.

**Regulatory Compliance:** Packaging materials used for food products must comply with regulations regarding food safety and contact materials. This includes regulations regarding permissible materials, migration limits, and labeling requirements.

**Peanut:** Peanuts, scientifically known as *Arachis hypogaea*, are a species of legume. They are an important crop both for direct human consumption and as an oilseed. Peanuts are a good source of protein, vitamins, and minerals, making them a valuable food source. Peanuts are used in various snacks. They can be roasted, or used as an ingredient in a wide range of snacks called namkeens.



**Fig. 4. Peanut**

**Chiwda:** Chiwda, also known as Chivda or Namkeen, is a popular Indian snack mix. Chiwda can be made in large batches and stored in airtight containers, making it a convenient and delicious snack option. There are many regional variations of chiwda, and the ingredients can vary based on personal preferences and local customs.



**Fig. 5. Chiwda**

**Corn flakes:** Several companies produce namkeen (savory snacks) using corn flakes as one of the main ingredients. While corn flakes can be a convenient and tasty breakfast option. Most commercially produced corn flakes are fortified with vitamins and minerals, including: Iron important for red blood cell formation and oxygen transport, Thiamine (Vitamin B1) helps convert food into energy, Riboflavin (Vitamin B2) supports energy production and metabolism, Niacin (Vitamin B3) Important for cellular metabolism. Corn flakes are typically low in sodium and cholesterol, although this can vary depending on the brand and any added flavorings. Corn flakes are often used as a base in various mixtures along with other ingredients such as peanuts, roasted chickpeas, fried lentils, spices, and nuts. This mixture is seasoned with spices like salt, red chili powder, turmeric, and cumin to create a savory and crunchy snack.



**Fig. 6. Corn Flakes**

**Chana:** Chana, also known as chickpeas or garbanzo beans, is a versatile legume commonly used in various savory snacks, including namkeen. Chana is often used in namkeen (lite mixture) as it provides a crunchy texture and nutty flavor. It can be used in various forms, including roasted, fried, or as a flour (besan). Chana is highly nutritious and offers several health benefits. Chana is a good source of several vitamins and minerals, including folate, iron, phosphorus, and manganese. It also contains small amounts of calcium, magnesium, potassium, and zinc.

Chana is an excellent source of plant-based protein, making it an ideal food for vegetarians and vegans. The high fiber content of chana helps improve digestion, promotes satiety, and may help lower cholesterol levels. Chana contains various nutrients such as folate, magnesium, and potassium, which are beneficial for heart health. Chana is low in calories and rich in fiber and protein, making it a filling and satisfying food that may help with weight management. It is a good source of protein, fiber, vitamins, and minerals, making it a healthy addition to savory snacks.



**Fig. 7. Chana**

**Curry leaves:** Curry leaves, also known as kadi patta or karivepallai, are aromatic leaves commonly used in Indian cooking. Curry leaves are shiny, dark green, and have a narrow, elongated shape. They grow on the curry tree (*Murraya koenigii*), which is native to India. They have a slightly bitter taste with a nutty aroma, often described as a blend of citrus, anise, and curry flavors. They are typically used fresh and added to hot oil at the beginning of cooking to release their aroma and flavor. Curry leaves are used in snacks like murukku,

pakorras, and chivda for their aromatic flavor. Curry leaves are not only used for flavor but also offer various health benefits. They are rich in antioxidants, vitamins A, B, C, and E, and minerals like iron, calcium, and phosphorus. They are believed to aid digestion, improve eyesight, and help in controlling blood sugar levels. In summary, curry leaves are a versatile ingredient in Indian cooking, adding a unique flavor and aroma to a wide range of dishes. They are an essential component of many South Indian recipes and are valued for both their culinary and health benefits.



**Fig. 8. Curry leaves**

**Agra Sev:** is a common ingredient used in the preparation of namkeen (savory snacks) by food companies. It is a versatile ingredient used in various Indian dishes, including namkeen. Agra Sev is often used as a base ingredient in namkeen mixes, providing a light and crispy texture to the snack. It adds a light and crispy texture to the snack mix while providing essential nutrients and health benefits.



**Fig. 9. Agra Sev**

**Cashew:** Cashews are a popular nut used in the preparation of various snacks, including namkeen, by food companies. Cashews are often used in namkeen for their rich, buttery flavor and crunchy texture. They are typically added to the snack mix either whole or chopped, providing a delicious and satisfying crunch to the namkeen. Cashews are a good source of vitamins such as thiamine (Vitamin B1), riboflavin (Vitamin B2), niacin (Vitamin B3), and folate (Vitamin B9). They contain essential minerals such as calcium, iron, magnesium, phosphorus, potassium, zinc, copper, and manganese. Cashews contain healthy monounsaturated fats that help lower bad cholesterol (LDL) levels and reduce the risk of heart disease. Despite being calorie-dense, cashews can be part of a healthy diet. They are rich in protein and fiber, which help promote satiety and prevent overeating. Cashews are a good source of minerals such as calcium, magnesium, and phosphorus, which are essential for maintaining healthy bones and teeth. Cashews contain antioxidants such as vitamin E, which help neutralize harmful free radicals in the body and reduce the risk of chronic diseases.



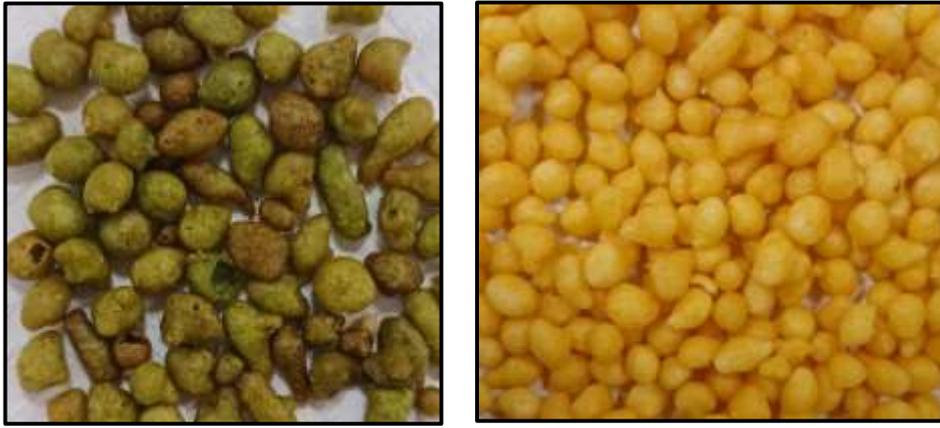
**Fig. 10. Cashew**

**Raisins:** Kishmish, also known as raisins, are commonly used in the preparation of various snacks, including namkeen, by food companies. Raisins are dried grapes and are often used in namkeen for their sweet and tangy flavor. They add a natural sweetness to the snack mix and provide a chewy texture, balancing out the savory and spicy flavors of other ingredients. Raisins are packed with antioxidants that help protect cells from damage caused by free radicals. Raisins contain soluble fiber and polyphenols, which help lower bad cholesterol (LDL) levels and reduce the risk of heart disease. The fiber and natural laxatives in raisins help promote regular bowel movements and prevent constipation. Raisins are a good source of calcium, which is essential for maintaining healthy bones and teeth. Raisins are a concentrated source of energy and provide a quick and natural boost of energy. In summary, kishmish (raisins) are a delicious and nutritious addition to namkeen prepared by food companies. They add natural sweetness, chewy texture, and essential nutrients, making them a popular choice for snack lovers.



**Fig. 11. Raisins**

**Boondi:** Boondi is a popular ingredient used in the preparation of various snacks, including namkeen, by food companies. Boondi is made from gram flour (besan) batter, which is fried into small, crispy, and spherical balls. These balls are then seasoned with spices to create a flavorful snack mix known as boondi namkeen. Boondi adds a crunchy texture and absorbs the flavors of the spices, making it a delicious and satisfying snack. It adds a crunchy texture and delicious flavor to the snack mix while providing essential nutrients and energy.



**Fig. 12. Boondi**

### 1.3 BACKGROUND AND CONTEXT

The samples of tin sweets and namkeens were taken for shelf-life study for the period of 4 months. The sensorial analysis, chemical parameters were studied at regular interval/period of 28 days, to check variation for determining the probability of spoilage.

### 1.4 OBJECTIVES

There are at least three objectives when a shelf life determination might be required.

- ◇ To determine the shelf life of existing product.
- ◇ To study the effect of specific factors or combinations of factors such as storage temperature, packaging material, processing parameters or food additives on product shelf life.
- ◇ To determine the shelf life of prototype or newly developed products.
- ◇ To observe sensorial and nutritive properties of the product and help for the customer's satisfaction.
- ◇ To check the overall acceptability of finished goods.

### 1.6 ABOUT THE COMPANY

"Haldirams" is a name associated with discerning consumers for sweets and namkeens for the past seven decades in India and abroad. It made its modest start at the beginning of 1937 in Bikaner, Rajasthan, India, and was founded by Shivkishan Aggarwal. Haldiram's began as a tiny shop in Bikaner, a land as famed for its savoury foods as for its leather-faced pipe players and fierce warriors. By 1982, Haldiram's had set up shop in Delhi, and the capital had begun to stop by and take note of the savoury and sweet items. It was word of mouth that grew the business manifold over the next decade, until Haldiram's came to stand for a food company that was synonymous with taste, hygiene, and innovation. The USA was the first market where they started exporting their products. Haldirams began with about 15 products, all savoury. Consumers around the world want to be sure that the products they buy are of unparalleled quality. The company's focus is on delivering goods with the highest degree of excellence to the consumer while being committed to using resources responsibly. Haldirams pays the utmost attention to selecting the finest raw materials; this is achieved through proper quality management systems with the help of our suppliers through an internal review procedure. Haldirams' is pleased to certify that all the products are BRC 'A' certified and FSSAI approved and are regularly audited under the guidelines provided by BRC by our professional quality team. The company has invested in a newer and better process in order to make our products of superior quality.

#### **Mission, vision, and values:**

Achieve consistent, long-term growth in the business, both organically and inorganically, domestically and internationally. Objectives Achieve leadership in Western snack items and strengthen leadership in traditional

snack items and Indian sweets. Continue to develop new, high-quality products, and please customers by providing a large selection of fine food items at affordable prices. Provide affordable, high-quality, delicious, and authentic vegetarian food products, both in India and elsewhere, that meet international standards. Stay ahead of the competition by developing innovative products, implementing new technology, and achieving the lowest possible cost of production. Delivering reliable, traditional, and enjoyable food sources is our main focus. Our unwavering focus is on freshness and quality; we recognise our responsibility to continue delivering cuisine that customers value everywhere in the world.

### 1.7 PRODUCT RANGE OF NAMKEEN



### PRODUCT RANGE OF TIN SWEETS





## 1.8 QUALITY ASSURANCE

Consumers around the world want to be sure that the products they buy are of un-paralleled quality. Our focus is on delivering goods with highest degree of excellence to the consumer while being committed to using resources responsibly.

We pay the utmost attention for selecting the finest raw material, this is achieved through proper quality management systems with the help of our suppliers through internal review procedure.

Haldiram is pleased to certify that all our products are BRC 'A' Certified and are regularly audited under the guidelines provided by BRC by our professional quality team. We invest in the newer and better process in order to make our products of superior quality.

## QUALITY CONTROL DEPARTMENT

Quality Control or QC for short, is a process by which entitles review the quality of all factors involved in production. ISO 9000 defines quality control as "A part of quality management focused on fulfilling quality requirements".

Quality control emphasises testing of products to uncover defects and reporting to management who make the decision to allow or deny product release and quality assurance attempts to improve and stabilize production (and associated processes) to avoid or at least minimise issues which led to the defect(s) in the first place.

## 1.9 TESTS CONDUCTED FOR QA/QC

Food product testing refers to scientific analysis of food to provide information about different parameters. Food product lab testing is considered most important step despite being the last process of production of a food product. It is vitally necessary to assure food is free of physical, chemical and biological hazards and also determines safety of food for consumption and use. Food testing is integral to the efficient production of safe, quality products. With the food industry increasingly subject to scrutiny, testing to ensure compliance with food safety regulations and to protect public health, is a must. It is done to provide information about various characteristics of food, including the structure, composition, and physicochemical properties.

Food product testing is also performed for other reasons:

- ⇒ **To test the quality of a product:** This is done to verify claims made by the manufacturer of the product on certain issues; for instance, the ingredients used.
- ⇒ **For quality control:** This is done before, during, and after the manufacturing process to analyse the quality of the food ingredients, and the finished product.
- ⇒ **Food inspection and grading:** They are performed regularly to ensure food manufacturers meet the set laws and standards.
- ⇒ **Foods must have a standardized nutritional label:** Therefore, food needs to be analysed to verify the claims made.

⇒ **Research and development:** It necessary for manufacturers to improve and provide food high quality, healthy, and affordable food; this requires studying and analysing the products already in the market.

QA/QC was assured in the manufacturing plant (namkeen and tin sweets) by conducting general and regular laboratory chemical analysis of daily manufactured products and raw materials which are listed as follows:

#### NAMKEEN

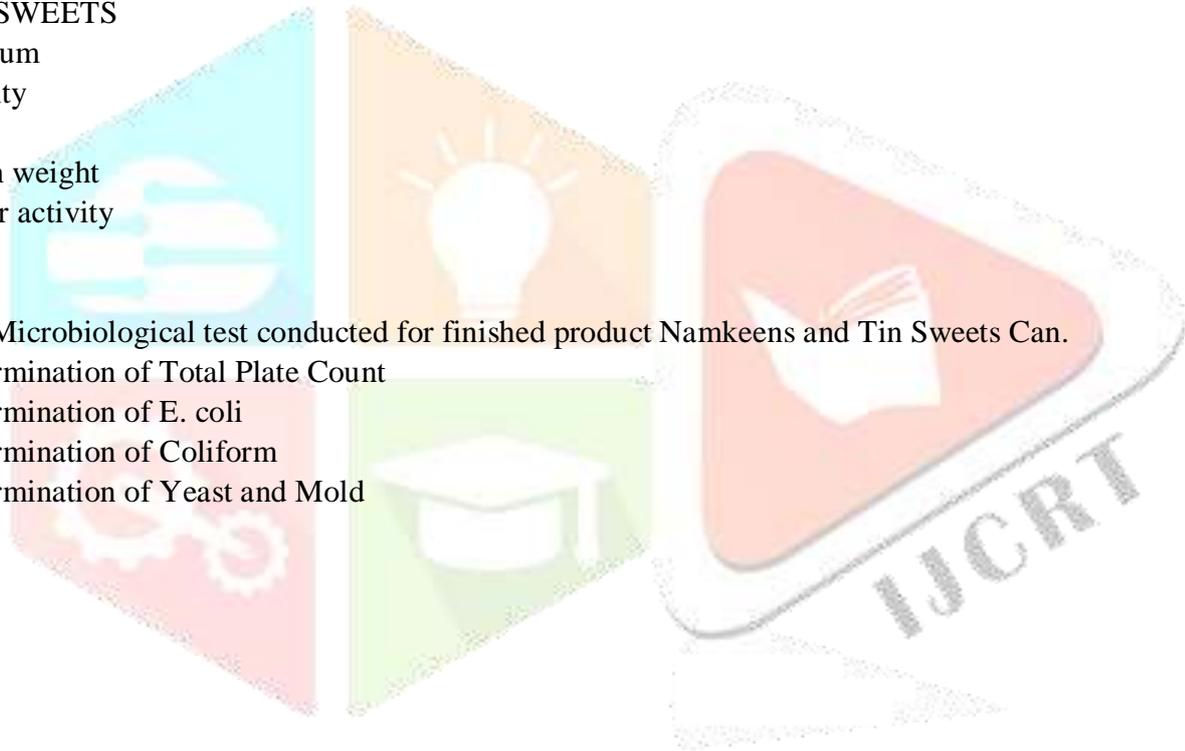
- Acidity content analysis
- Salt content analysis
- Moisture content percentage analysis
- Free Fatty Acid analysis of oils
- Peroxide Value analysis of oils
- Net weight analysis of finished food products (blending)
- Analysis of oil contained in food products using Soxhlet's Apparatus

#### TIN SWEETS

- Vacuum
- Acidity
- Brix
- Drain weight
- Water activity
- pH

The Microbiological test conducted for finished product Namkeens and Tin Sweets Can.

- Determination of Total Plate Count
- Determination of E. coli
- Determination of Coliform
- Determination of Yeast and Mold



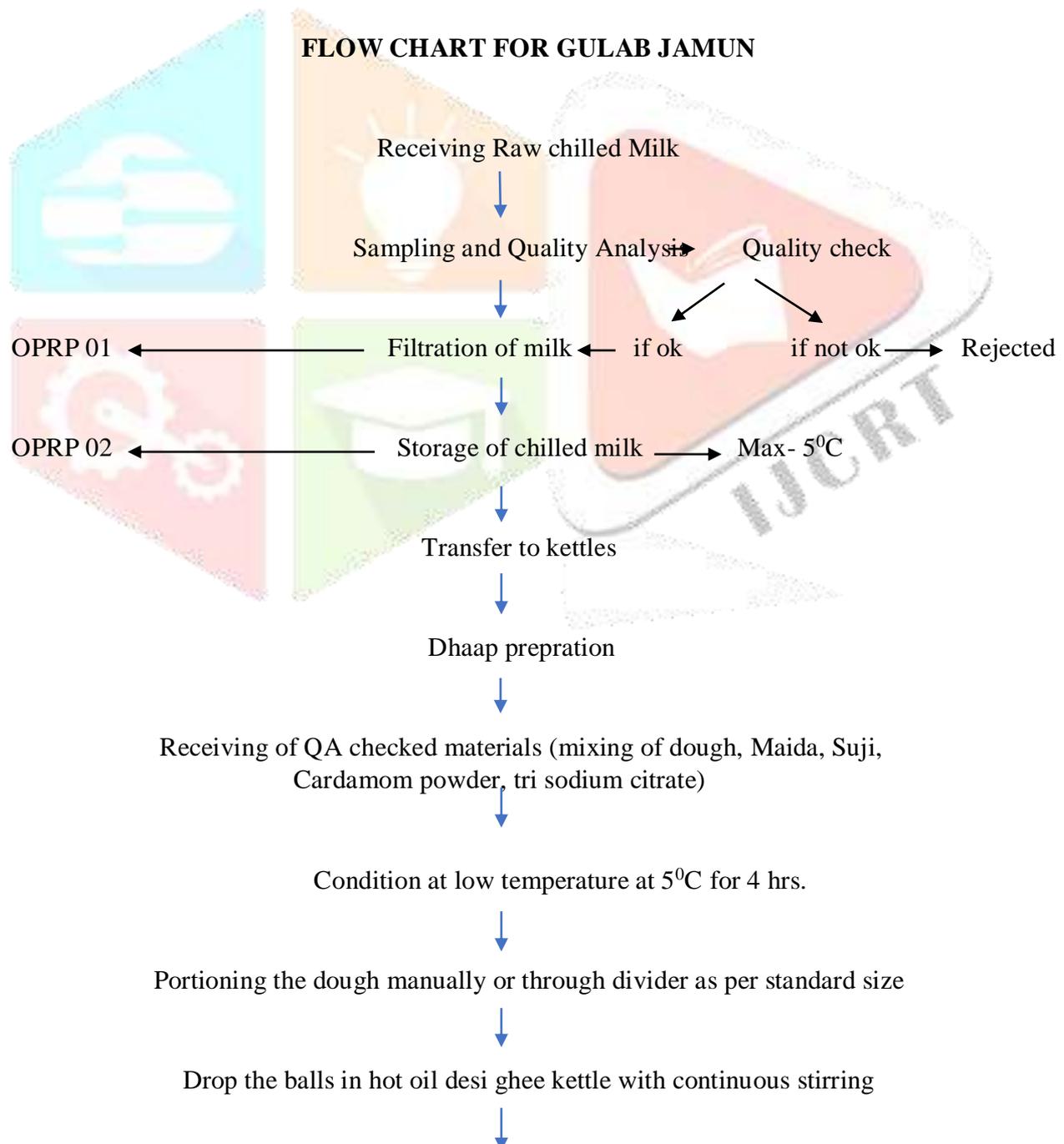
### CERTIFICATE AND LICENCES



Fig. 13. Certificate and Licences.

**CHAPTER – II****REVIEW OF  
LITERATURE****CHAPTER II****REVIEW OF LITERATURE**

In this chapter, an attempt has been made to assimilate the previous work within the framework of the present study, which will help in the interpretation of results. The present review highlights are potential for the development and evaluation of the namkeens and tin sweets. In this section, the available literature on current analysis has been discussed as follows.



OPRP 03 ← Cooking the balls with continuous stirring in desi ghee at temp. 130–150°C for 11-12 min till desired colour.

↓  
First soaking into sugar syrup for 10-15 min.

↓  
Final soaking in syrup solution for 30 min.

↓  
Transfer the balls in the syrup for final packing in to pre heating kettle

↓  
Pre heating of bag 88-95°C

↓  
Hot filling into cans min. 88°C → CCP

↓  
Placing lid at open top filled cans

↓  
Helminthic sealing of cans

OPRP 04 ← Exhausting at temperature min. 90°C and time minimum 7.5 min.

↓  
Colling of cans in colling tunnels (water spray)

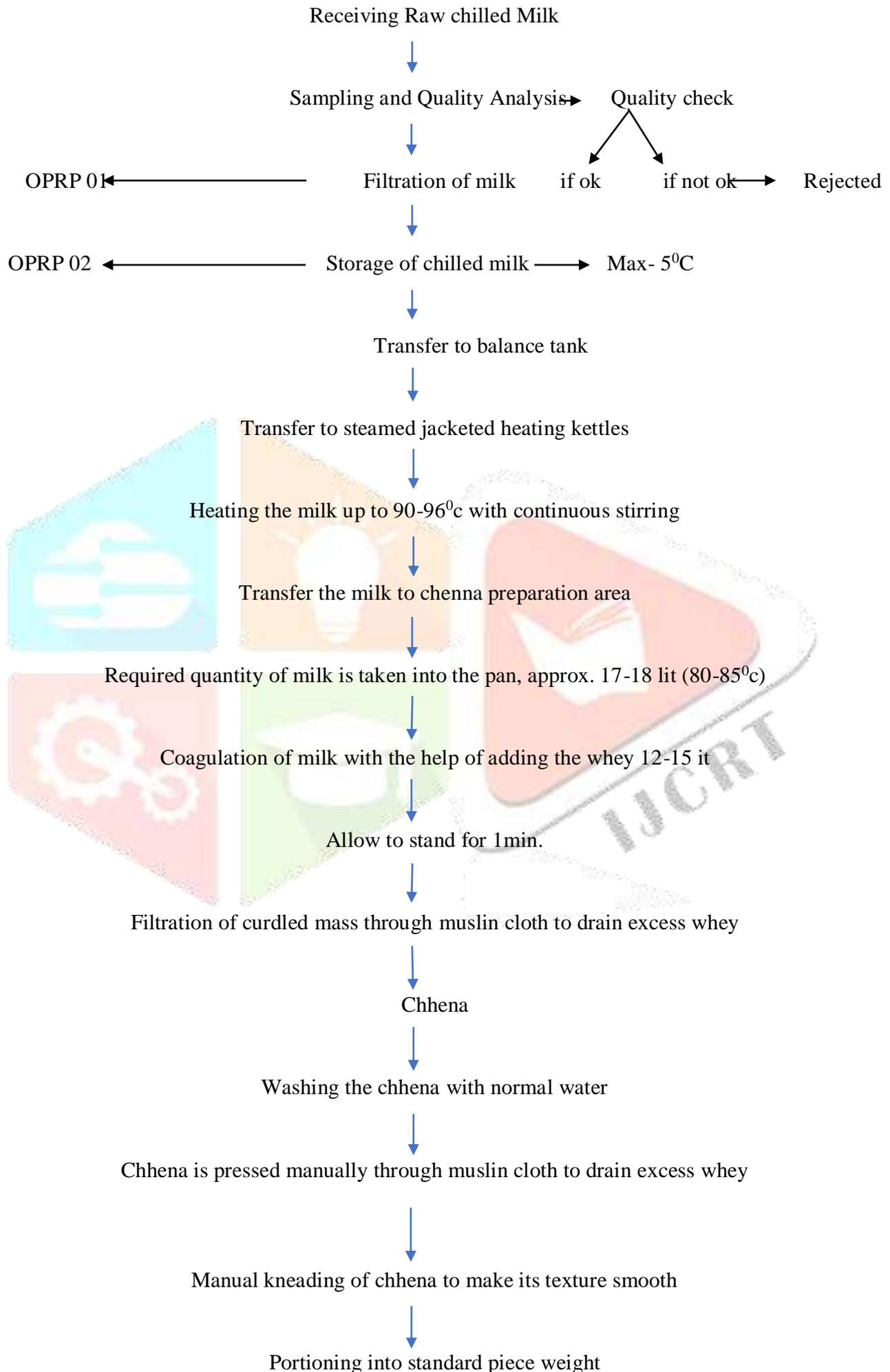
↓  
Drying and checking of cans manually

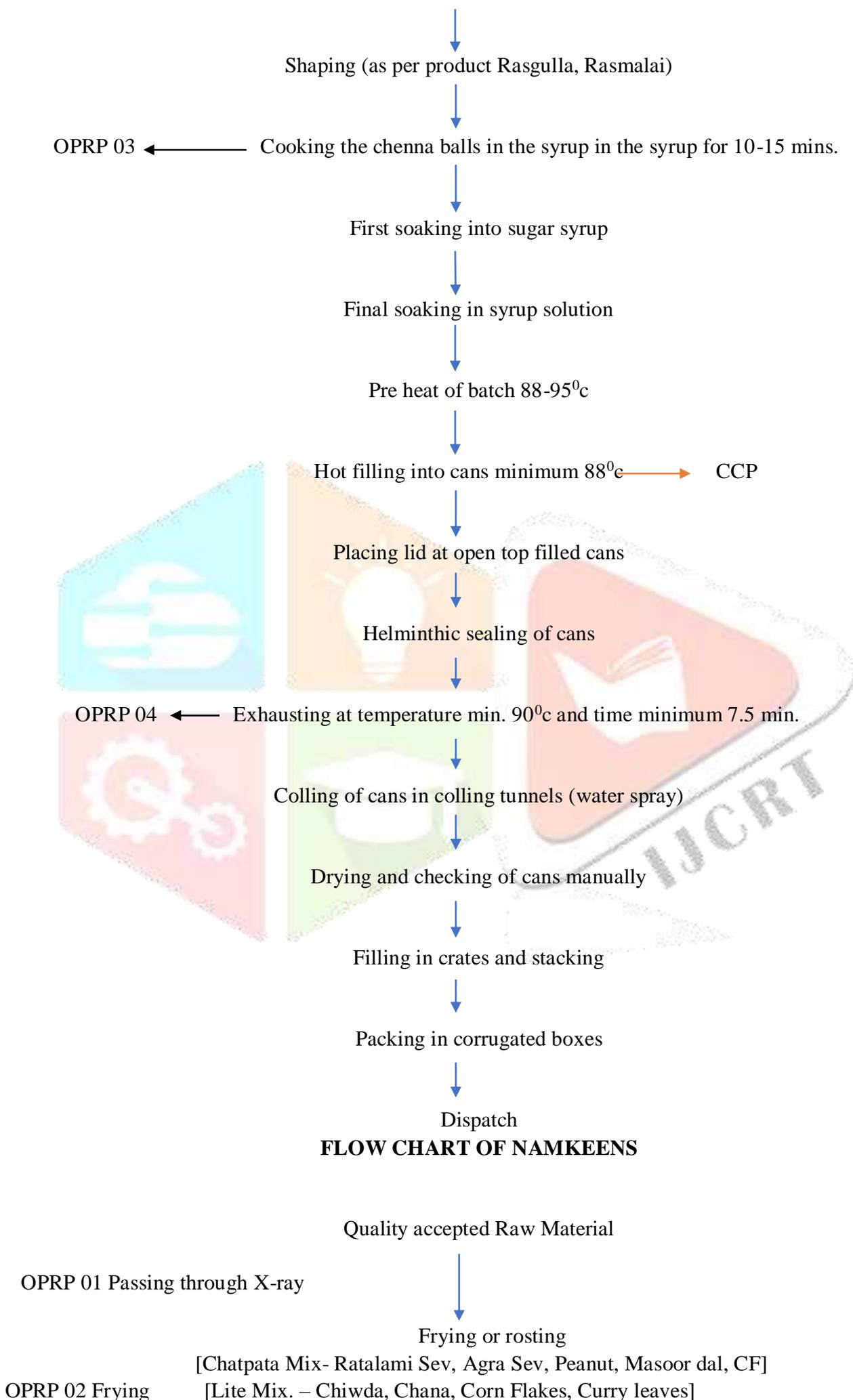
↓  
Filling in crates and stacking

↓  
Packing in corrugated boxes

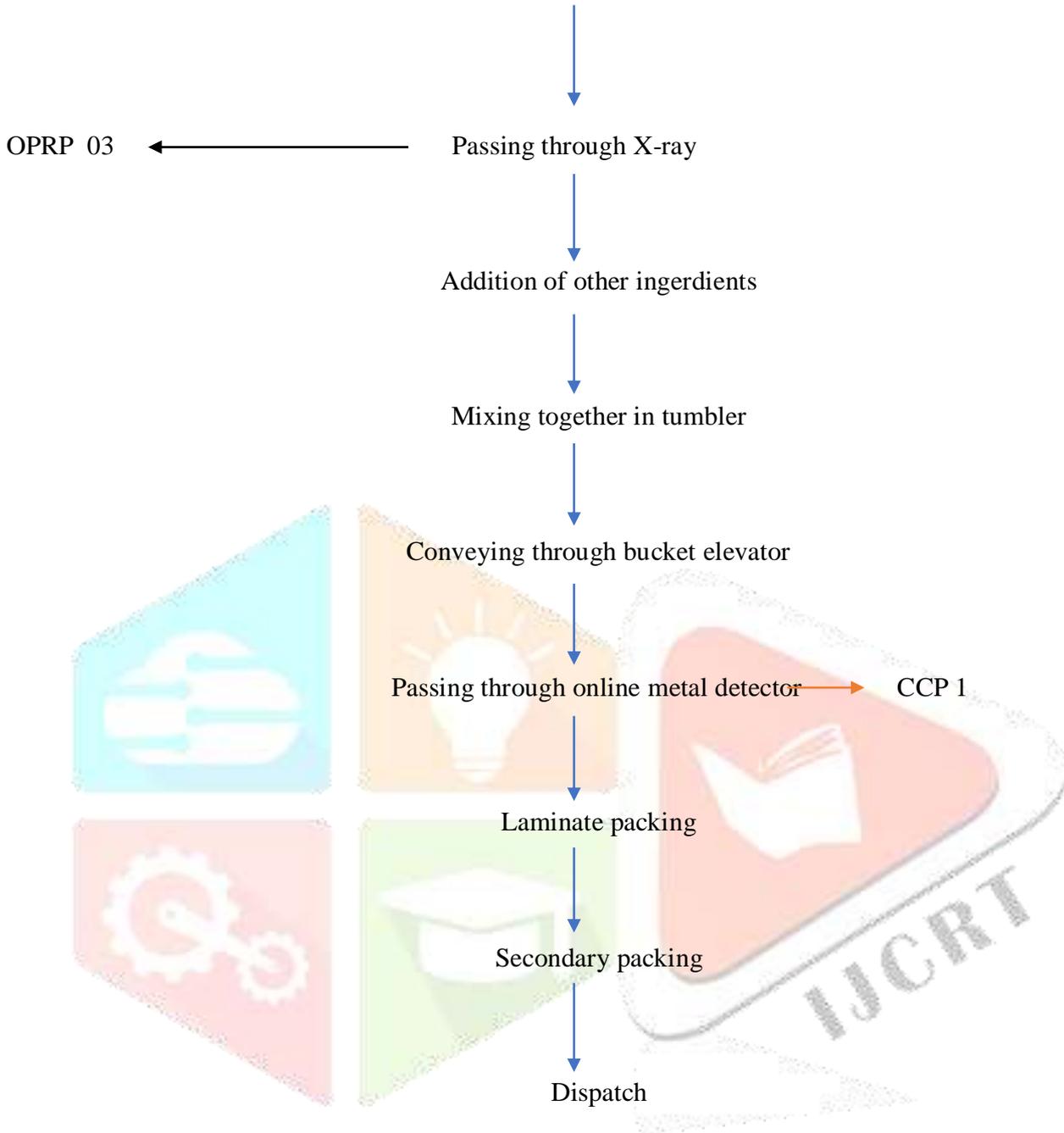
↓  
Dispatch

## FLOW CHART OF RASGULLA AND RASMALAI





[Corn Flakes Mix.- CF, Bondi, Cashew, Raisins, potato sticks]  
separately in different friers at different temperatures.



**CHAPTER – III****MATERIAL & METHODS****3. MATERIALS AND METHODS****3.1 TIN SWEETS [ RASULLA, GULAB JAMUN, RASMALAI]**

**3.1.1 Vacuum:** Vacuum is a negative gauge pressure, usually referenced to the existing standard barometric pressure where the equipment will operate. This means vacuum is a differential reading b/w the surrounding atmospheric pressure and the pressure in the system evacuated.

**Fig. 14. Vacuum gauge**

**PROCEDURE:**

- The can were placed under vacuum gauge.
- Pressure is applied through knob and the reading were recorded on pressure analyzer.

**3.1.2 Acidity:** Acidity percentage in a food product can be determined by using weak acid and strong base titration. It is based on the principal reaction whereby organic acids react with sodium hydroxide. End point indicator used in the concerned titration is phenolphthalein as phenolphthalein is one of the universal indicators which changes its colour to light pink.

**PROCEDURE:**

**Fig. 15. Acidity**

- Take 50 ml of sugar syrup of product in the flask.
- Add 50 ml of distilled water and then stir properly.
- Add a few drops of Phenolphthalein solution.
- Titrate the solution with 0.1N of NaOH solution.
- Observe the occurrence of pink colour at the end point.
- Note the titrate value of the product.

Calculate:

Titrate Value \* 2

**3.1.3 Drain Weight:** It means the weight of the solid or semisolid product representing the contents of a package or container obtained after a prescribed method for excluding the liquid has been employed.

**PROCEDURE:**

- Weigh the full can.
- Open and pour the entire contents on a circular utensil.
- Without shifting the product incline the sieve to facilitate drainage.
- Drain for 15minutes.

Calculate:

$$\% \text{ Drained Wt.} = \text{Drained wt.} / \text{Net weight of contents} * 100$$

**3.1.4 Brix:** It donates °Bx. It is measure by Refractometer device of the dissolved solids in a liquid, and is commonly used to measure dissolved sugar content of an aqueous solution. One degree Brix is 1 gram of sucrose in 100 grams of solution and represents the strength of the solution as percentage by mass.



**Fig. 16. Refractometer**

**PROCEDURE:**

- We can obtain a Brix reading by adding a sample solution to the refractometer's prism and close the lid.
- Then hold the device perpendicular to a light source to look through the lens and see an internal scale.
- The Brix reading is where the light and dark areas meet on the scale.

Calculate:

$$\text{Bx} = (\text{Ds} \times 100) / (\text{Ds} + \text{w})$$

where Ds is the weight of dissolved solids and w is weight of water.

**3.1.5 Water Activity:** The water activity (a<sub>w</sub>) of a food is the ratio between the vapor pressure of the food itself, when in a completely undisturbed balance with the surrounding air media, and the vapor pressure of distilled water under identical conditions.



**Fig. 17. Water activity meter**

**Calculate:**

$$a_w = ERH/100$$

where ERH is the equilibrium relative humidity (%).

**3.1.6 Ph meter:** A pH meter is a scientific instrument that measures the hydrogen-ion activity in water-based solutions, indicating its acidity or alkalinity expressed as pH. The pH meter measures the difference in electrical potential between a pH electrode and a reference electrode, and so the pH meter is sometimes referred to as a "potentiometric pH meter".



**Fig. 18. pH meter**

**PROCEDURE:**

- Clean the electrode with tissue paper.
- Standardise the pH using 4 and 7 buffer solution.
- Clean the electrode by water with wash bottle and dry with tissue paper.
- Dip the electrode into the solution whose Ph to be checked.
- Note the reading is stabilized as the Ph of desired solution.
- Reclean the electrode and put in distilled water.

**3.1.7 Microbial Analysis:**

The Microbiological test conducted for finished product Namkeens and Tin Sweets Can.

- Determination of Total Plate Count
- Determination of E. coli
- Determination of Coliform
- Determination of Yeast and Mold

**PROCEDURE:**

- Preparation of all four media {TPC, E. COLI, Y&M, COLIFORM}
- Preparation of buffer.
- According to the no. of samples prepare the test tubes of buffer solution {3 test tubes}.
- Taking 3 jam bottles with 90ml buffer solution.
- Autoclave all the 4 media, tips, jam bottles, test tubes.
- Switch on the UV of LAF for 15mins.
- Measuring and adding 10g of samples to each 90 ml of jam bottles.
- Taking 1 ml from each jam bottles and add to 9 ml of test tubes to make total 10 ml of each sample.
- For tin sweets we only go to  $10^1$  dilution.
- Mix it properly through vortex.
- Setting pipette at 1000  $\mu$ L and taking 1 ml each sample from test tube and pour into petri plates.

- Poring all the medias, mixing thoroughly and let them solidify.
- Putting the plates in incubator.

### 3.1.8 Sensory Analysis:

Sensory analysis include appearance, taste, texture, flavor of the tin sweets product throughout the shelf life for 4 months.

## 3.2 NAMKEEN [LITE MIXTURE, LITE CHIWDA, CORN FLAKES MIXTURE]

### 3.2.1 Salt:

This test is used to check the amount of salt present in cooked food. The salt content is determined by titrating the sample with the Standard solution of AgNO<sub>3</sub> (0.05 N) using Potassium chromate as an indicator. The salt is also checked by sensory analysis.

For determination of Salt-

Reagents: AgNO<sub>3</sub> solution, Potassium chromate indicator (5%)

#### PROCEDURE:

1. Take 1-2 g of sample and add 100 ml of distilled water.
2. Add 2-3 drops of potassium chromate indicator and titrate with AgNO<sub>3</sub> solution.
3. Note down the burette reading.
4. End point: Yellow to reddish brown colour.

Calculate:

$$\text{salt (\%)} = \frac{\text{titrate value} * 0.5845}{\text{Sample weight}}$$

### 3.2.2 Acidity:

**3.1.2 Acidity:** Acidity percentage in a food product can be determined by using weak acid and strong base titration. It is based on the principal reaction whereby organic acids react with sodium hydroxide. End point indicator used in the concerned titration is phenolphthalein as phenolphthalein is one of the universal indicators which changes its colour to light pink.



**Fig. 19. Acidity**

**PROCEDURE:**

- Take 1-2 g of sample and add 100 ml of distilled water.
- Add a few drops of Phenolphthalein solution.
- Titrate the solution with 0.1N of NaOH solution.
- Observe the occurrence of pink colour at the end point.
- Note the titrate value of the product.

Calculate:

$$\text{Acidity} = \frac{\text{titrate value} * 0.64}{\text{Sample weight}}$$

**3.2.3 IR Moisture:****PROCEDURE:**

1. Take a petri dish.
2. Weigh approximately 5 gram of crushed sample in a petri plate.
3. Put in the digital moisture machine until the beep sound come.
4. Moisture of sample is calculated automatically by the machine.
5. Within 4-5 mins it is calculated.
6. Then note down the moisture%.



**Fig. 20. IR Moisture**

**3.2.4 Oil pick up:****PROCEDURE:**

1. Take a round bottle flask (RBF), weigh the empty weight of RBF.
2. Take the sample, crush it and weigh 10g approx. putting it into a thimble.
3. Add 200ml petroleum ether in RBF.
4. Put the condenser on RBF, keep the thimble into the condenser and fix it properly on RBF.
5. Fix them in Soxhlet Assembly.
6. Adjust the energy = 4,5,6 as much needed and time = 240 sec. approx.

7. After 4 hrs. put the RBF in hot air oven for 4 hrs.
8. Let it cool down in dessicator, calculate the oil%.

Calculate:

$$\text{Oil (\%)} = \frac{\text{final RBF weight with sample} - \text{Empty RBF weight} * 100}{\text{Sample weight}}$$



**Fig. 21. Namkeen products oil%**

### 3.2.8 FFA:

Free Fatty Acid Value is the number of milligrams of sodium hydroxide required to neutralize the FFA present in one gram of oil/fat. It gives an idea about the extent of rancidity of the oil/fat being tested.

#### PROCEDURE:

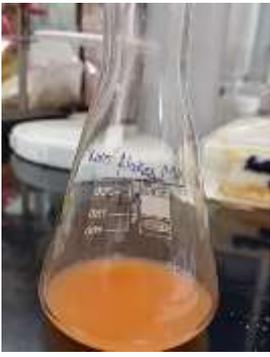
- i. Accurately measure 50 ml of ethyl alcohol in a conical flask.
- ii. Add a few drops of 1% Phenolphthalein indicator to it.
- iii. Titrate against 0.05N NaOH till a light pink color appears.
- iv. Take 20 g oil sample in a flask.
- v. Heat it on hot plate for about 3-4 minutes with periodic agitation of the flask.
- vi. Add 1ml of 1% Phenolphthalein indicator to it.
- vii. Titrate again till pink colour persists.

Calculate:

$$\text{Formula Used: } - \frac{(\text{Titration value} - \text{Blank}) \times \text{Normality of NaOH} \times \text{Factor (2.82)}}{\text{Weight of the sample}}$$

Factors: Oleic acid- 28.2

Acid Value = 1.99 x FFA



**Fig. 22. FFA of Namkeens**

### 3.2.9 Microbial Analysis:

The Microbiological test conducted for finished product Namkeens and Tin Sweets Can.

Determination of Total Plate Count

Determination of E. coli

Determination of Coliform

Determination of Yeast and Mold

#### PROCEDURE:

- Preparation of all four media {TPC, E. COLI, Y&M, COLIFORM}
- Preparation of buffer.
- According to the no. of samples prepare the test tubes of buffer solution {9 test tubes}.
- Taking 3 jam bottles with 90ml buffer solution.
- Autoclave all the 4 media, tips, jam bottles, test tubes.
- Switch on the UV of LAF for 15mins.
- Measuring and adding 10g of samples to each 90 ml of jam bottles.
- Taking 1 ml from each jam bottles and add to 9 ml of test tubes to make total 10 ml of each sample.
- For namkeens we go till  $10^3$  dilutions.
- Mix it properly through vortex.
- Setting pipette at 1000  $\mu$ L and taking 1 ml each sample from test tube and pour into petri plates.
- Poring all the medias, mixing thoroughly and let them solidify.
- Putting the plates in incubator.



**Fig. 23. Media[ EMB, CYGA, PCA, COLIFORM respectively]**

## INCUBATOR



### 3.2.7 Sensory Analysis:

Sensory analysis include appearance, taste, texture, flavor of the namkeen product throughout the shelf life for 4 months.

## CHAPTER – IV

### RESULTS AND DISCUSSION

#### CHAPTER IV

#### **RESULT AND DISCUSSION**

The present investigation was undertaken to evaluate ultimately the quality of the products. The proximate analysis includes the physio-chemical analysis, Microbial analysis and sensory evaluation the tin sweets and namkeens at room temperature.

The following tables sum up the results of chemical, microbial and sensory analysis conducted at regular interval of 28 days of tin sweets cans and namkeens.

#### **4.1 Product Name — Gulab Jamun**

**Batch No. — PBDA03A**

**Manufacturing Date — 03/01/2024**

**Use By Date — 02/01/2025**

**SKU — 1 Kg**

**Packing Material Type — Tin**



	Sample age in days	Fresh	28	56	84	112
<b>S. No.</b>	<b>Test Parameters</b>					
1	Acidity Of Syrup	1.5 ml	3.0 ml	4 ml	5 ml	5.0 ml
2	Water Activity	0.899	0.890	0.882	0.881	0.8918
3	Brix°	60.5°	60°	60°	60°	60°
4	Ph	6.60	6.40	6.47	6.50	5.84
5	Drain Weight	402Kg	402Kg	395 Kg	400 Kg	395 Kg
6	Vacuum Check	9.05	9.84	8.87	10.6	9.93
		mmHg	mmHg	mmHg	mmHg	mmHg
7	Overall Sensory Profile (OK/Not Ok)					
	Appearance	Ok	Ok	Ok	Ok	Ok
	Texture	Ok	Ok	Ok	Ok	Ok
	Flavour	Ok	Ok	Ok	Ok	Ok
	Taste	Ok	Ok	Ok	Ok	Ok
8	Microbial Analysis					
	TPC	AB	AB	AB	AB	AB
	E. coli	AB	AB	AB	AB	AB
	Coliform	AB	AB	AB	AB	AB
	Y&M	AB	AB	AB	AB	AB

Fig- 1 Table on the results of Gulab jamun

#### 4.1.2 Discussions on the results of Gulab Jamun

Acidity content increases with time in tin sweets can.

Vacuum content was under the range throughout the period.

Over the period of time the crust of the balls become slightly hard and the syrup had become slightly yellow as compared to fresh product.

The sudden increase in acidity increases, which might become more prone to rancidity.



## 4.2 Product Name - Rasgulla

Batch No. – PBDA03A

Manufacturing Date - 03/01/2024

Use By Date - 02/06/2024

SKU - 1.25 Kg

Packing Material Type — Tin



### 4.2.1 Table on the results of Rasgulla:

	Sample age in days					
	>	Fresh	28	56	84	112
S. No.	Test Parameters					
1	Acidity Of Syrup	1.4 ml	1.5 ml	1.6 ml	2.0 ml	2.0 ml
2	Water Activity	0.931	0.9156	0.9112	0.9214	0.9296
3	Brioxo	51°	53°	54°	55°	56°
4	Ph	6.41	6.55	6.61	6.69	6.22
5	Drain Weight	528 Kg	550 Kg	540 Kg	530 Kg	535 Kg
6	Vacuum Check	11.02	11.41	9.84	11.4	10.43
		mmHg	mmHg	mmHg	mmHg	mmHg
	Overall Sensory Profile (Ok/Not Ok)					
	Appearance	Ok	Ok	Ok	Ok	Ok
	Texture	Ok	Ok	Ok	Ok	Ok
	Flavour	Ok	Ok	Ok	Ok	Ok
	Taste	Ok	Ok	Ok	Ok	Ok
8	Microbial Analysis					
	TPC	AB	AB	AB	AB	AB
	E. coli	AB	AB	AB	AB	AB
	Coliform	AB	AB	AB	AB	AB
	Y&M	AB	AB	AB	AB	AB

Fig- 2 Table on the results of Rasgulla

#### 4.2.2 Discussions on the results of Rasgulla

Acidity content increases with time due to Channa in tin sweets can.

Vacuum content was under the range throughout the period.

Over the period of time coagulation is observed in the chenna balls, taste deteriorate.

The sudden increase in acidity increases the Vacuum content due to exposure of leakage through tin sweets, which might become more prone to rancidity.



#### 4.3 Product Name - Rasmalai

**Batch No. – PBDA15A**

**Manufacturing Date - 15/01/2024**

**Use By Date - 4/17/2025**

**SKU - 1 Kg**

**Packing Material Type — Tin**

##### 4.3.1 Table on the results of Rasmalai:

S. No.	Test Parameters	Sample age in days				
		Fresh	28	56	84	112
1	Acidity Of Syrup	1.4 ml	1.4 ml	1.4 ml	1.5 ml	1.5 ml
2	Water Activity	0.900	0.912	0.914	0.9214	0.906
3	Brixo	55°	54°	55°	54°	50°
4	Ph	6.41	6.49	6.58	6.59	6.62
5	Drain Weight	380 Kg	365 Kg	371 Kg	380 Kg	379 Kg
6	Vacuum Check	10.82	8.26	11.8	11.02	10.43
		mmHg	mmHg	mmHg	mmHg	mmHg
	Overall Sensory Profile (Ok/Not Ok)					
	Appearance	Ok	Ok	Ok	Ok	Ok
	Texture	Ok	Ok	Ok	Ok	Ok

	<b>Flavour</b>	Ok	Ok	Ok	Ok	Ok
	<b>Taste</b>	Ok	Ok	Ok	Ok	Ok
8	<b>Microbial Analysis</b>					
	<b>TPC</b>	AB	AB	AB	AB	AB
	<b>E. coli</b>	AB	AB	AB	AB	AB
	<b>Coliform</b>	AB	AB	AB	AB	AB
	<b>Y&amp;M</b>	1	1	1	1	1

Fig-3 Table on the results of Rasmalai

#### 4.3.2 Discussions on the results of Rasmalai

Vacuum content was under the range throughout the period.

Appearance, Texture, Flavour and Taste remains same throughout the period

#### 4.4 Product Name – Lite Mixture

**Batch No. – PBDA24A**

**Manufacturing Date - 24/01/2024**

**Use By Date - 22/05/2024**

**SKU - 48 g**



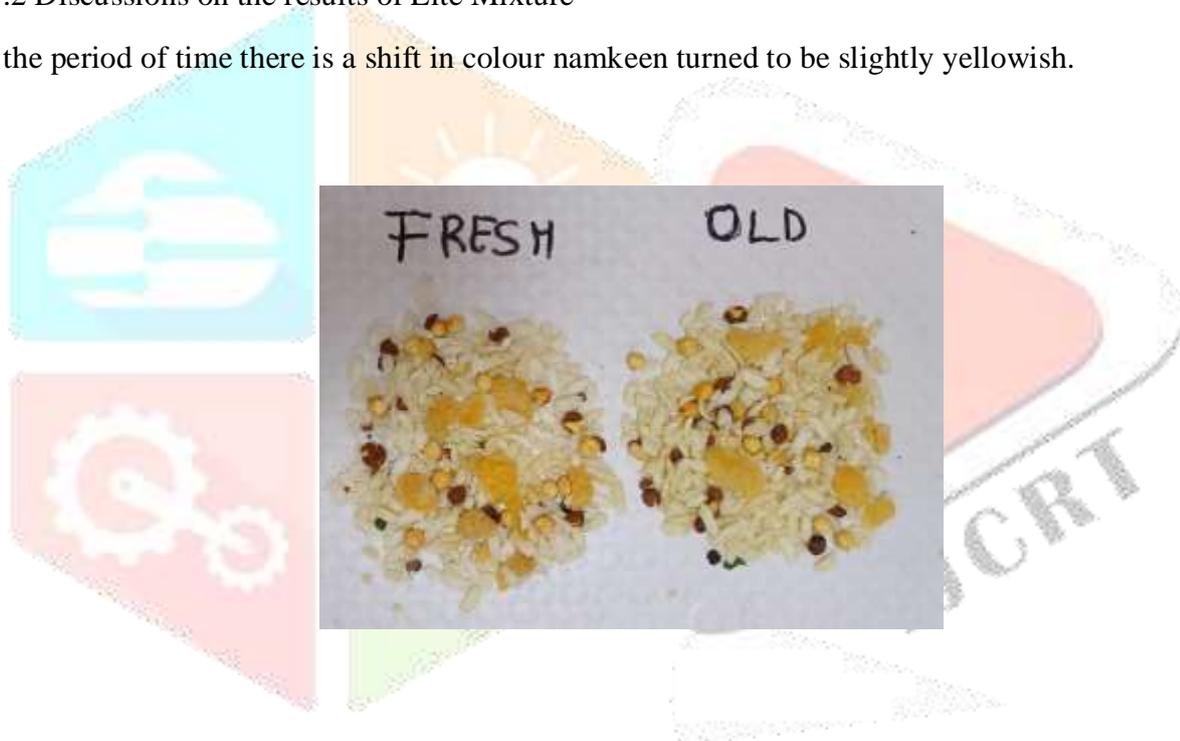
S. No.	Test Parameters	Sample age in days				
		Fresh	28	56	84	112
1	<b>Salt</b>	1.23	1.28	1.25	1.35	1.36
2	<b>Acidity</b>	0.09	0.09	0.10	0.14	0.15
3	<b>Moisture%</b>	1.69%	1.95%	2.77%	2.78%	2.42%
4	<b>Oil pick up</b>	24.59	27.06	31.41	30.50	29.08
5	<b>FFA</b>	0.24	0.52	0.21	0.29	0.26
6	<b>Overall Sensory Profile (Ok/Not Ok)</b>					

	<b>Appearance</b>	Ok	Ok	Ok	Ok	Ok
	<b>Texture</b>	Ok	Ok	Ok	Ok	Ok
	<b>Flavour</b>	Ok	Ok	Ok	Ok	Ok
	<b>Taste</b>	Ok	Ok	Ok	Ok	Ok
8	<b>Microbial Analysis</b>					
	<b>TPC</b>	1	2	AB	2	AB
	<b>E. coli</b>	AB	AB	AB	AB	AB
	<b>Coliform</b>	AB	AB	AB	AB	AB
	<b>Y&amp;M</b>	AB	AB	AB	AB	AB

Fig-3 Table on the results of Lite Mixture

#### 4.4.2 Discussions on the results of Lite Mixture

- Over the period of time there is a shift in colour namkeen turned to be slightly yellowish.



#### 4.5 Product Name – Lite Chiwda

**Batch No. – PBDA24A**

**Manufacturing Date - 24/01/2024**

**Use By Date - 22/05/2024**

**SKU – 24 g**



S. No.	Sample age in days	Fresh	28	56	84	112
	>					
S. No.	Test Parameters					
1	Salt	1.25	1.34	1.45	1.48	1.39
2	Acidity	0.09	0.09	0.10	0.10	0.10
3	Moisture%	1.27%	1.70%	1.13%	1.33%	1.20%
4	Oil pick up	30.10%	36.03%	36.79%	33.07%	34.12%
5	FFA	0.23	0.29	0.33	0.33	0.35
6	Overall Sensory Profile (Ok/Not Ok)					
	Appearance	Ok	Ok	Ok	Ok	Ok
	Texture	Ok	Ok	Ok	Ok	Ok
	Flavour	Ok	Ok	Ok	Ok	Ok
	Taste	Ok	Ok	Ok	Ok	Ok
8	Microbial Analysis					
	TPC	AB	1	2	1	AB
	E. coli	AB	AB	AB	AB	AB
	Coliform	AB	AB	AB	AB	AB
	Y&M	AB	AB	AB	AB	AB

Fig- 5 Table on the results of Lite Chiwda

## 4.5.2 Discussions on the results of Lite Chiwda

- The aroma of fresh namkeen smell was missing.

#### 4.6 Product Name – Corn flakes Mixture

Batch No. – PBDA24A

Manufacturing Date - 24/01/2024

Use By Date - 22/07/2024

SKU – 1kg



S. No.	Test Parameters	Sample age in days				
		Fresh	28	56	84	112
	>					
1	Salt	1.31	1.32	1.29	1.39	1.37
2	Acidity	0.14	0.14	0.15	0.15	0.15
3	Moisture%	1.18%	1.17%	1.13%	1.66%	2.46%
4	Oil pick up	29.9%	30.0%	32.04%	27.79%	30.13%
5	FFA	0.54	0.68	0.52	0.76	0.61
6	Overall Sensory Profile (Ok/Not Ok)					
	Appearance	Ok	Ok	Ok	Ok	Ok
	Texture	Ok	Ok	Ok	Ok	Ok
	Flavour	Ok	Ok	Ok	Ok	Ok
	Taste	Ok	Ok	Ok	Ok	Ok
8	Microbial Analysis					
	TPC	AB	2	1	3	AB
	E. coli	AB	AB	AB	AB	AB
	Coliform	AB	AB	AB	AB	AB
	Y&M	AB	AB	AB	AB	AB

Fig- 6 Table on the results of Corn Flakes Mixture

#### 4.6.2 Discussions on the results of Corn Flakes Mixture

- Over the period of time the crispiness of the namkeen is missing as compared to fresh product.
- Cashews become little soggy, not tasting fresh a different kind of smell was coming.
- The aroma of fresh namkeen smell was missing.



## CHAPTER – V

### SUMMARY

During my 4-month industrial training at Haldiram's Snacks Pvt Ltd, I gained invaluable knowledge and hands-on experience in various aspects of the food industry. The study's main areas of interest were acidity, salt, moisture, FFA, oil pick up, PV, brix, drain weight, pH and vacuum, all of the product's contents fell within acceptable limits. Except for Gulab Jamun, which acidity was recorded at maximum 5, all products were within the range of prescribed by the FSSAI under the Food Safety and Standards (Food Products Standards and Food Additives) Amendment Regulations, 2022. The variation in acidity noted during study may be related to the quality of Mawa used or temperature and conditions during production. All the namkeen products overall sensory profile was found to be ok. Chemical and microbial analysis were found to be ok of tin sweets and namkeens both under standards.

The main objective laid for this study to find the dependency of overall acceptability of finished goods by the tin sweets can and namkeen, which depend to most of extend such as appearance, taste, texture, acidity content, water activity content, present brix degree, salt, acidity, moisture, oil pick up, FFA which maintained to range value to avoid rancidity during processing.

The study was concluded on the note that quality assurance department works regularly on improving the quality of finished foods therefore, the shelf-life study of Tin sweets and namkeens were included to analyse hazards or to be hazards from the grass root level and measures were taken to maintain food quality and safety as "Food Safety is the assurance that food will not cause harm to the consumer when it is prepared and eaten according to the intended use.

**CHAPTER – VI****REFERENCES**

- [1] <https://haldiram.com/>
- [2] <https://en.wikipedia.org/wiki/Haldiram%27s>
- [3] <https://fmtmagazine.in/fssai-issues-draft-norms-on-standards-for-indian-namkeen/>
- [4] [https://www.researchgate.net/publication/272291882\\_Comparative\\_quality\\_evaluation\\_of\\_commercial\\_extruded\\_snacks](https://www.researchgate.net/publication/272291882_Comparative_quality_evaluation_of_commercial_extruded_snacks)
- [5] Viji, P. C., Sivakumar, S., Rekha Chawla, N. G., Ashrita, B., & Kumar, S. (2023). Recent innovations in value added khoa based sweets: An opportunity for dairy entrepreneurship: A review.
- [6] Singh, Meenu, and Suneet Chandorkar. "Is sodium and potassium content of commonly consumed processed packaged foods a cause of concern?." *Food chemistry* 238 (2018): 117-124.
- [7] [https://www.hrpub.org/journals/article\\_info.php?aid=6516](https://www.hrpub.org/journals/article_info.php?aid=6516)
- [8] DOI: [10.9790/2402-08530107](https://doi.org/10.9790/2402-08530107)
- [9] [https://www.shanlaxjournals.in/pdf/ASH/V3N3/Ash\\_V3\\_N3\\_026.pdf](https://www.shanlaxjournals.in/pdf/ASH/V3N3/Ash_V3_N3_026.pdf)