MINISTRY OF FOOD PROCESSING INDUSTRIES
GOVERNMENT OF INDIA

सत्यमेव जयते

NIFTEM
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READING MANUAL FOR SUGARCANE PROCESSING

UNDER PMFME SCHEME

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CHAPTER – 1

RAW MATERIAL

1.1 INTRODUCTION

Sugarcane is the cash crop and main source of sugar around the world. The sugarcane juice is used for products like white sugar, brown sugar (*khandsari*) and jaggery (*gur*). The main by-products of sugarcane industry are bagasse and molasses. Bagasse is mainly used as fuel and for the production of compressed □bre board paper, plastic etc. Molasses is used in distilleries for the manufacturing of ethyl alcohol, butyl alcohol, rum etc. Cane tops and leaves are also good source of cattle feed.

There are two distinct agro-climatic regions of sugarcane cultivation in India, viz., tropical and subtropical. Tropical region has about 45% area and contributes 55% of the total sugarcane production in the country. Thus, sub-tropical region accounts for 55% area and shares 45% of total production of sugarcane. The average sugarcane yield in the country is about 69.4 t/ha. The sugarcane cultivation and sugar industry in India plays a vital role towards socio-economic development of the rural areas by mobilizing rural resources and generating higher income and employment opportunities. About 60 million sugarcane farmers is dependent and a large number of agricultural labours are involved in sugarcane cultivation, harvesting and ancillary activities.

About 80% of sugar is obtained from sugarcane and the remaining 20% is produced through sugar beet. An average person consumes about 24 kg of sugar every year. According to a report, there are more than 120 countries producing sugarcane on large scale to meet their own needs and for export.

1.2 SUGARCANE PRODUCING STATES IN INDIA

Sugarcane productivity is the tropical states is higher than subtropical states. Maharashtra and the adjoining areas of Karnataka, Gujarat and Andhra Pradesh record higher sugar recovery due to long sunshine hours, cool nights with clear sky and the latitudinal position of the area favourable for sugar accumulation. Uttar Pradesh (U.P), Bihar, Haryana and Punjab states face the extremes of climate viz., high and low temperatures, relative humidity, sunshine hours and wind velocity etc. Uttar Pradesh is having maximum area under sugarcane

cultivation. However, the highest sugar recovery can be obtained in the Maharashtra. The high incidence of pests and diseases is major bottleneck in achieving higher sugarcane production.

1.3 CLIMATIC CONDITIONS

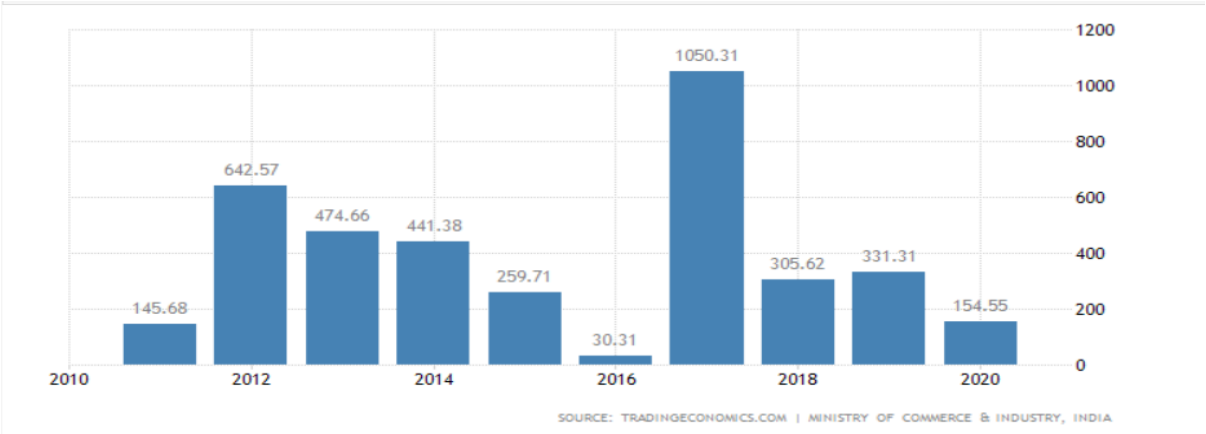
Sugarcane is a tropical plant. A mean temperature of 28-32°C is best suited for the growth of sugarcane. Higher temperature above 45°C reduces tillering and arrests its growth, whereas temperatures below 20°C may slow down the growth. The areas with a minimum temperature <5°C are not suitable for sugarcane cultivation. It requires a long growing season of 10-18 months.

1.4 GLOBAL TREND IN SUGAR CONSUMPTION AND PRODUCTION

Between 2001 and 2018, world sugar consumption increased from 123.454 mln tonnes to 172.441 mln tonnes, the equivalent to an average annual growth of 2.01%. Major sugar consuming markets include India, the EU, China, Brazil, the US, Indonesia, Russia, Pakistan, Mexico and Egypt.

World sugar trade averages about 64 mln tonnes/year. Raw sugar accounts for around 60% of internationally trade volumes. Although many countries produce sugar, top five exporters (Brazil, Thailand, EU, Australia, India) were responsible on average for nearly 70% of the world trade in 2016-18.Brazil, as the largest producing and exporting country in the world, dominates world trade, accounting for about 45% of global exports.

1.5 CURRENT SUGAR AND CONFECTIONARY IMPORT IN INDIA

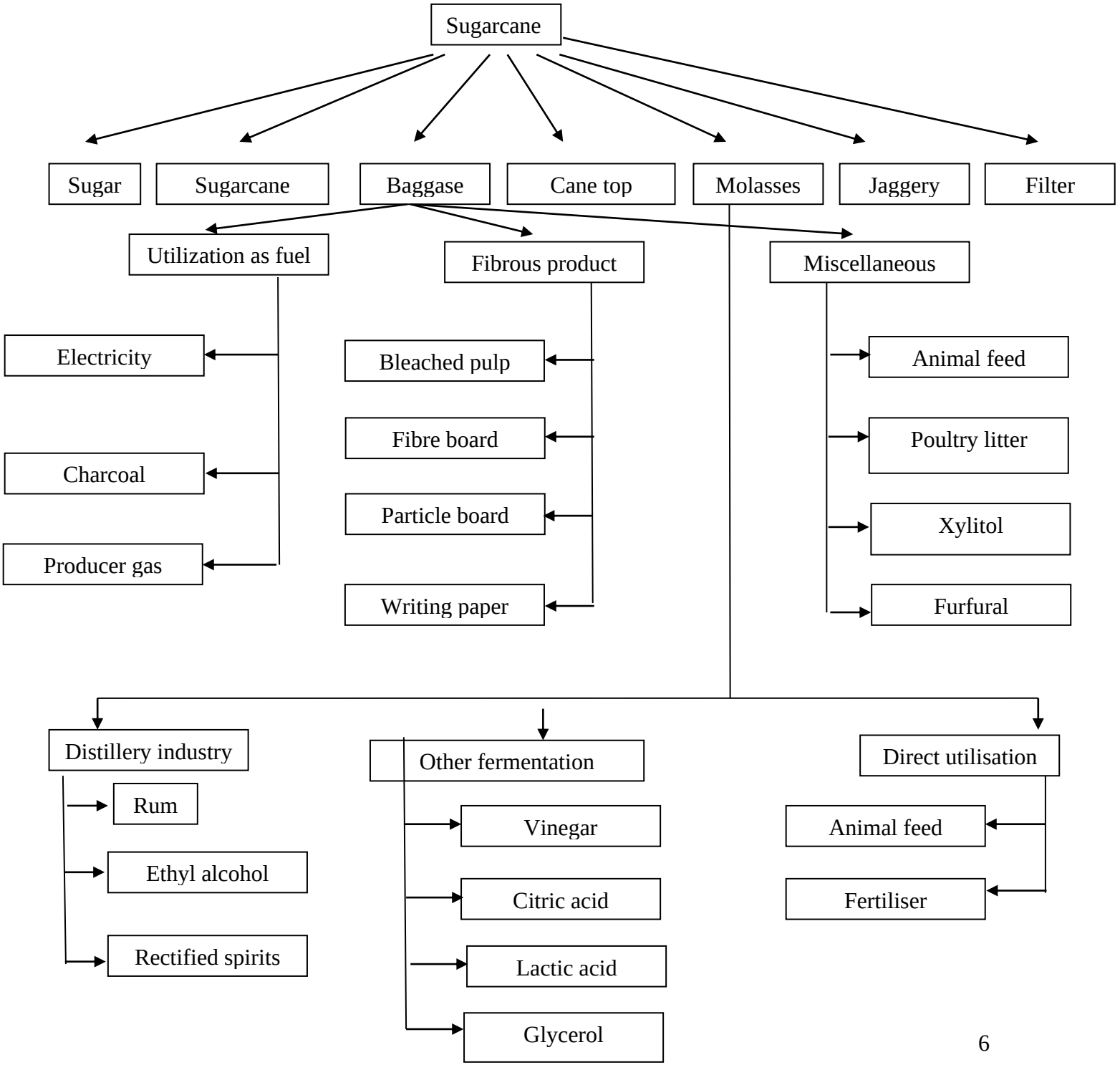


CHAPTER – 2

PROCESSING

2.1 SUGARCANE PROCESSING PRODUCTS

The below flowcharts explain in brief the various products and industries involved and related to sugarcane products and by products processing:



2.2 SUGAR

Both lump sugars and syrup can be produced using the same equipment so a single factory can be used to manufacture either product to suit demand. The size of the plant will depend on the local situation. Where there is sufficient cane grown for a substantial part of the year it is common to have a permanent factory centrally located. There are four stages of production

1. Extraction of juice from the cane
2. Clarification of the juice
3. Boiling of the juice
4. Moulding and pacKaging

EXTRACTION

Small-scale extraction is done using small two or three-roll mills driven either by draught animals or small engines.

JUICE TREATMENT

Juice should be filtered through a cloth before boiling in order to remove any solids such as dirt or particles of cane or lime is added to coagulate impurities which then settle out. The juice is then neutralised with sulphur dioxide. This releases sulphur dioxide into the juice and lightens the colour of the final product. Normally a high sulphur content often remains in the final product.

FILTRATION AND CLARIFICATION

The amount of non-sugars such as bagasse and other particulates in the juice will affect its purity, resulting in discoloration and reduced sweetness. Therefore filtration is essential and if done with care can remove up to 60% of non-sugars from the juice. A filter press, if available, will give the best results but can be expensive for small-scale operations. However, reasonable levels of filtration can be achieved by allowing the juice to stand for a few hours to allow particulates to precipitate out. The tanks should be fitted with a fine mesh lid, through which the juice is poured to filter out large particles of bagasse and other foreign bodies. The mesh will also prevent infestation from insects and help prevent contamination by small animals and birds. After settling the juice should be drawn from the tank ensuring

that particulates settled at the bottom of the tank are not disturbed. The juice can then be poured into the boiling pan through a coarse cotton cloth to filter out fine particles that may remain in suspension. Clarification, if undertaken, is carried out during the boiling process by adding a small amount of vegetable or chemical matter to the juice. The clarificants do not react with the juice but coagulate during the heating process, trapping particles and contaminants and bringing them to the surface during boiling. This appears on the surface as a scum which can be removed using long handled fine-mesh ladles or by passing a fine cotton cloth through the juice.

BOILING

For syrup production the juice is boiled until the required concentration is reached and the strike is made at around 105ºC when most of the moisture has been boiled off and just before crystallisation occurs. If the juice is over-boiled then crystals may be present which may cause discoloration. If under-boiled, too much moisture will remain in the syrup which may, with time, cause cloudiness and shorten its shelf life. For lump sugars the juice is boiled for longer and the strike is made at between 116 and 120ºC. In all cases the furnaces use sun dried bagasse as fuel. The bigger factories often have a surplus at the end of operations while smaller units have to operate their furnaces with much greater care to ensure that they do not use all the bagasse before boiling is completed.

MOULDING AND PACKAGING

For syrup production the juice is poured or ladled from the boiling pan into containers where it is allowed to cool. For lump sugar production, the massecuite is poured into cooling trays where it is stirred to promote even cooling and crystallisation. Upon setting, the lump sugar is cut or moulded into shapes to suit the local market and customer requirements. Alternatively, before the massecuite solidifies it can be poured into pots or moulds to produce various shapes. In Bangladesh where small temporary factories are common the pan is removed from the furnace allowing cooling and crystallisation to occur within the pan while a new pan with fresh juice is placed on the furnace.

2.3 PODUCTION METHOD FOR GRANULAR SUGAR

Medium-scale production of white and brown granular sugars can be undertaken using either the open pan (OP) or vacuum pan (VP) processes. These processes use more complex technology than used for jaggery and syrup production. Open pan sulphitation (OPS) is probably the most common open pan method. In each case the production process can be divided into six stages:

1. Extraction of juice from the cane
2. Clarification of the juice
3. Boiling of the juice
4. Crystallisation
5. Centrifuging
6. Drying and packaging

2.4 OPEN PAN SUPHITATION SUGAR PROCESSING

Developed in India during the 1950s for the production of white granular sugar, OPS is based on an upgrade of khandsari production. The technology uses a mix of traditional and scaled-down versions of modern sugar technologies and is ideally suited to processing between 100 and 500 tonnes of sugar cane per day, with recovery rates of between 5 and 8%. Unlike large-scale sugar factories, OPS plants do not usually have their own estates to supply cane but rely instead on contractual agreements between local growers and the factory. This level of technology can be beneficial to rural communities by creating employment opportunities at the factory and providing income for cane growers in the area. Since the introduction of the technology, large numbers of OPS sugar plants have been built throughout India, with estimates of several thousand still in use by the late 1980s. Dissemination of the technology outside the South Asia has been limited; however, the potential for OPS is considerable in countries that produce non-crystalline sugars (jaggery, gur, panela, muscovado, etc) as they already have some of the necessary expertise.

EXTRACTION

The cane is usually shredded before crushing using two or three 3-roll mill tandem arrangements either electrically or diesel engine powered. The crushers can be hydraulic loaded to improve extraction rates which can be as high as 70% of the available juice

CLARIFICATION

Chemical clarification, based on modern cold lime sulphitation, is carried out to remove impurities which inhibit the formation of the crystals and can discolour the final product. The addition of lime also has the advantage of reducing the natural acidity of the cane juice, limiting the formation of invert sugars. Batches of juice are treated simultaneously with milk of lime (CaO) and sulphur dioxide (SO2) (by air forced through a sulphur furnace) after which the juice is transferred to an open boiling pan and quickly heated to 90ºC or above. The lime and heat treatment form a heavy precipitant that flocculates, carrying with it most of the suspended impurities in the juice. The juice is then filtered and allowed to settle. The clear juice is decanted and transferred to the boiling furnaces.

BOILING

The boiling operation uses cascade type furnaces of various configurations. The massecuite is removed from the final boiling pan at about 84ºBrix, at a temperature of around 112ºC.

CRYSTALLISATION

The massecuite is placed in U-shaped vessels where it is slowly rotated and allowed to cool for up to 48 hours. This technique is often referred to as crystallisation in motion. Rotation promotes even cooling of the massecuite which helps to achieve uniform crystal growth. Seeding can also be carried out: that is granulated massecuite from a crystalliser in which grains have already been developed are placed into the crystalliser before it is filled with fresh massecuite. This helps to promote uniform crystal growth. The massecuite, now consisting of crystals suspended in molasses, is transferred to the centrifuge.

CENTRIFUGING

The centrifuge, a scaled-down version of those used in large-scale factories, consists of a perforated inner drum located inside a larger drum. The perforated drum is rotated rapidly,

forcing the molasses to separate from the crystals. Water is sprayed into the spinning drum to assist in the removal of the molasses. The crystals of sugar are then removed from the centrifuge and transferred for drying. The molasses are collected and can be reboiled, crystallised and re-centrifuged to produce a second, lower quality, crystal sugar know as number two or B-sugar.

DRYING AND PACKAGING

The crystals can be dried in a number of ways: by placing them in the sun, or by using simple solar driers, or rotary or hopper driers which require fuel to provide drying heat. The dried product can then be packed into suitable containers or bags for distribution.

2.5 MINI VACUUM PAN SUGAR PROCESSING

This is a scaled down version of large-scale sugar processing technology common throughout the world. It is a high-cost, low-labour process suited to processing upward of 500 tonnes of sugar cane per day with recovery rates of between 10 and 12%.

EXTRACTION

The cane is first shredded then crushed using hydraulically loaded 3, 4 or 5-mill tandems. The major difference between this and OPS roll mills is that water is sprayed onto the bagasse before the final mill and diluted juice is recirculated to the previous mills. This system, known as imbibition, helps to wash out more of the sucrose with the juice. Typically, extraction rates of 75% of the available juice are common.

CLARIFICATION

Clarification is carried out by lime sulphitation similar to that used in OPS, but here it is a continuous rather than a batch process.

EVAPORATION

The major difference between the VP and OPS technology is the method of evaporating or boiling the juice. Instead of in open pans the juice is boiled under vacuum, to about 70º Brix, inside closed vessels or 'effects'. Low pressure steam is used to boil the juice which circulates through tubes within a closed vessel. The vapour driven off passes into a second similar

vessel, where it is used to heat more juice. In order to maintain suitable temperature differentials for heat transfer to occur, a partial vacuum is applied to each vessel, effectively lowering the boiling temperature of the juice.

It is common for four vessels to be used in series, each subjected to a progressively higher vacuum. This system is capital-intensive but is highly energy efficient and more importantly boils the juice at progressively lower temperatures from 103 to 50ºC, reducing the effects of inversion, minimising discoloration and enhancing the formation of sugar crystals. Final boiling to over 95º Brix takes place under vacuum in a single vessel, known as the vacuum pan, which is designed to handle the viscous massecuite. During this stage crystallisation begins in a controlled manner, enabling the maximum yield of crystals to be developed before the massecuite is transferred to the crystallisers. Bagasse is used to fuel highly efficient high-pressure steam boilers. The high-pressure steam is used to generate electricity to meet the VP plant's needs and the low pressure exhaust steam is then used to boil the juice in the vacuum pans.

CRYSTALLISATION

The massecuite is cooled and the crystallisation process completed using large vessels that stir the massecuite continually for up to 48 hours.

CENTRIFUGING

Takes place on a batch basis using large centrifuges similar in design and operation to those used in the OPS process.

DRYING AND PACKAGING

Drying is carried out at low temperatures using rotary or fluidised bed driers.

2.6 SUGARCANE JUICE

Sugarcane juice can be preserved in bottles for a period up to six months. Process of preservation is mainly by pasteurization and bottling. Preservative used - Sodium Benzoate @ 125 ppm. Shelf life of 6 months at room temperature with quality and flavour maintained. The cost of production is economical. Consumer acceptance of juice is fairly good.

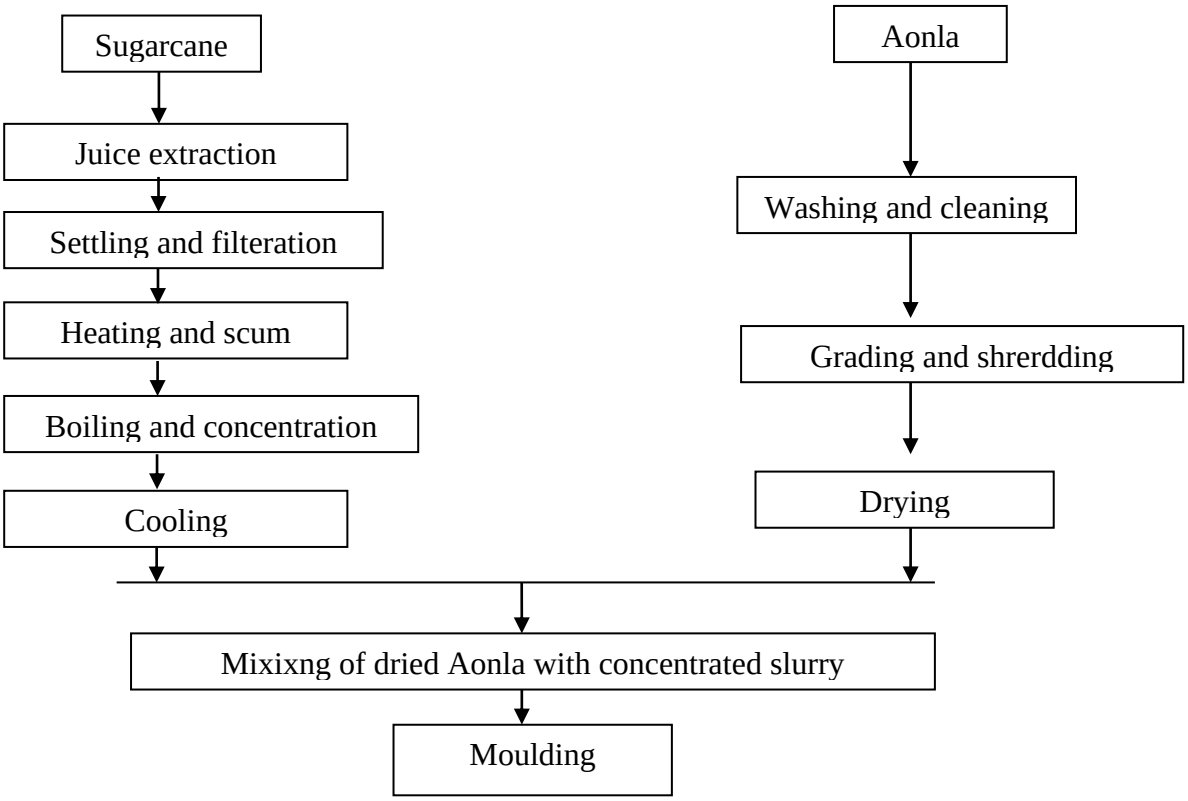
2.7 JAGGERY PRODUCTION

Most common sugarcane juice processed product in rural areas. Now new methods developed by Indian prominent institutes for Indian mass discussed:

2.7.1 NUTRITIOIN RICH JAGGERY

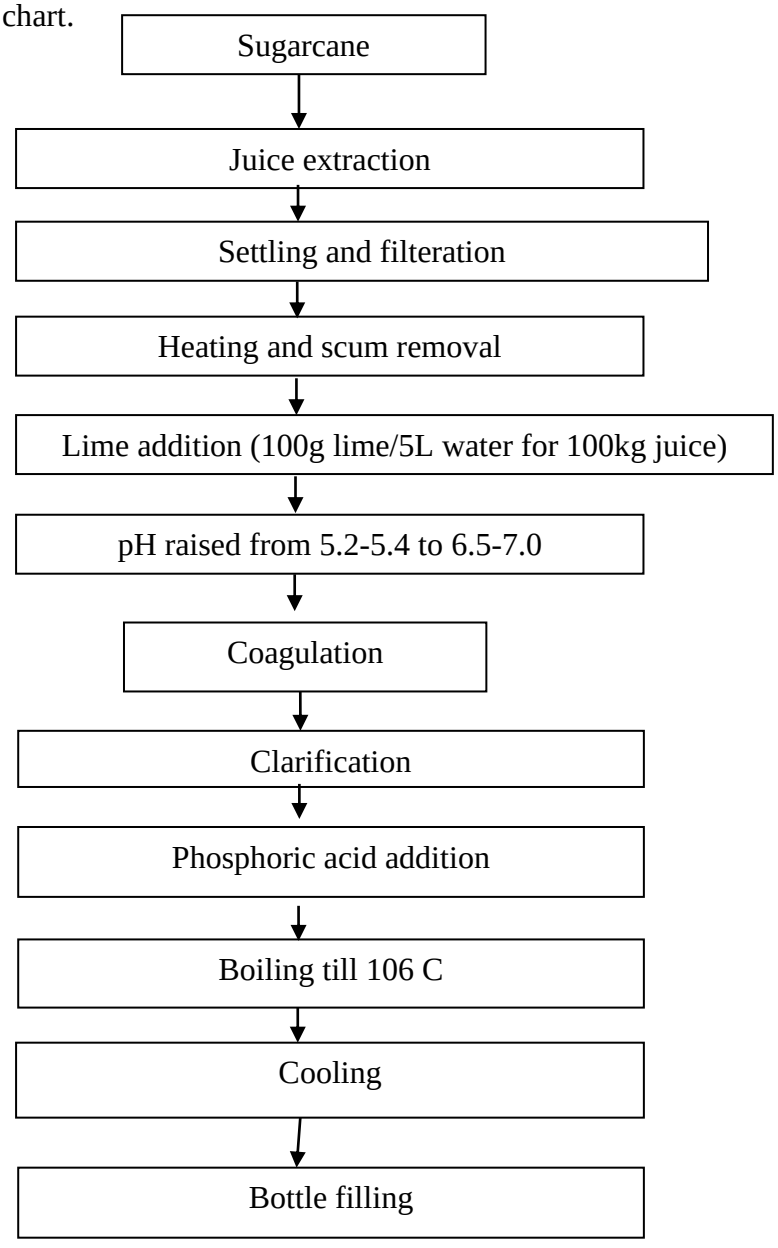
Jaggery is common food prepared from sugarcane. Widely available in Indian market. A rich and natural source of vitamin C i.e. Aonla added in Jaggery. Lead to enhancing nutritional value and fight malnutrition also. Should be added in suitable form and quantity and at a proper stage of jaggery preparation. Value-added jaggery cubes and bars have been prepared.

Below is the flowchart for manufacturing in brief:



2.7.2 LIQUID JAGGERY

Liquid Jaggery can be prepared from sugarcane juice and it is again a relatively easy method of preparation and economic for india's rural population which is majorly farmer and holding small lands. In this product Citric acid @ 0.04% and or 0.5% benzoic acid is added which help in preventing crystallization and increasing shelf life. The flowchart for the preparation is shown below in the chart.



2.8 BAGGASE

It is the dry pulpy fibrous material left after extracting juice. Below is the chemical composition of bagasse :

Cellulose: 45–55%, Hemicellulose: 20–25%, Lignin: 18–24%, Ash: 1–4%, Waxes: <1%

Baggase is a important by product of sugarcane industry as some very important chemical compounds can be obtained from its processing. As we know ethanol is an very important commercially chemical compound. From baggase it can be obtained either by:

1. Acid hydrolysis.
2. Enzymatic hydrolysis.

By this hydrolysis we got hexose and pentoses which further decomposes down to yield ethanol by fermentation.

2.9 MOLASSES

Molasses is the final effluent obtained in the preparation of sugar by repeated crystallisation.

It is residual syrup from which no sugar can be crystallised. It's yield is 3%/tonne of cane sugar. Many products of economic importance can be prepared from Molasses after processing. It can be used in animal feed also.

2.9.1 ALCOHOL FROM MOLASSES

Sugar crops are a major feedstock for renewable bioethanol production for use as a transportation fuel. Other feedstocks include starch-rich crops such as corn, wheat and cassava. Because it is a clean, affordable and low-carbon biofuel, ethanol from sugar crops has emerged as a leading renewable transportation fuel. Ethanol for fuel can be used in two ways:

Blended with gasoline at levels ranging from 5 to 27.5% to reduce petroleum use, boost octane ratings and cut tailpipe emissions.

Pure ethanol – a fuel made up of 85 to 100% ethanol and which can be used in specially designed engines such as flexifuel vehicles.

There are several benefits often recognised from fuel ethanol use. These include cleaner Air. Ethanol adds oxygen to gasoline which helps reduce air pollution and harmful emissions in tailpipe exhaust.

Reduced Greenhouse Gas Emissions. Compared to gasoline, ethanol from sugar crops significantly cuts carbon dioxide emissions.

Better Performance. Ethanol is a high-octane fuel that helps prevent engine knocking and generates more power in higher compression engines.

Lower Petroleum Usage. Ethanol reduces global dependence on oil.

Brazil is the world leader in fuel ethanol production from sugarcane.

World fuel ethanol production and consumption reached new records in 2018. Global production in 2018 rose to 108.2 bln litres, up from 100.6 bln litres in 2017. This increase in output was the highest year-on-year change since 2010. Furthermore, it was the cane industry that has driven output higher while the previous large increments in output – in 2010 and 2014 – were driven by production changes in the US and the EU, where the industry is predominantly grains-based. The consumption side of the balance in 2018 trailed the production number by around 3 bln litres, at 105.3 bln litres. This difference is not surprising in light of Brazil's huge increase in production in 2018/19, which only triggered an increase in demand from August/September onwards, leaving substantially more ethanol in stock at year-end. Stocks in Brazil were further increased by record volumes of imports from the US.

The increase in the consumption figure for "others" to 21.2 bln litres reflects an expansion in ethanol-blending across the globe, with many programmes benefitting from the availability of competitively-priced US export volumes during the year, as well as increasing government support for domestic fuel ethanol programmes.

CHAPTER – 3
PACKAGING

3.1 INTRODUCTION

The selection of packaging materials should take care of functional as well as market requirements.

For bulk packaging, there are no specifications. Commonly, jute fabrics such as hessian, light weight DW, A-twill, heavy Cee, Jumbo bags (Flexible Intermediate Bulk Containers) (FIBCs) are used for bulk packaging.

3.2 PACKAGING MATERIALS USED FOR SUGARCANE PRODUCTS

According to Food Safety and Standards (Packaging) Regulation, 2018, the following packaging materials are recommended for spices:

- Glass bottle with metal lid or plastic (polypropylene (PP) or High density polyethylene (HDPE) caps
- Plastic based rigid container with Plastic cap (Polyethylene terephthalate (PET) and High-density polyethylene (HDPE) Containers)
- Paper & Paper board or Aluminium foil or Plastic Film based Composite Container
- Folding cartons with Plastic based flexible laminated structure (heat sealed) pouch placed inside
- Plastic based multi-layered layered laminated pouch (heat sealed)(FSSAI, 2018).
- Glass bottles

3.3 STORAGE OF SUGAR

Sugar if properly stored may last for year under room temperature.

Following steps needs to be taken care while storing fennel seeds:

- Containers should be kept away from sun, rain and moist conditions in covered premises.
- The room where the sugar is to be stored should have dry atmosphere, free from unwanted odour as well as proofed against insects and vermin entry.

- The room should have controllable ventilation where it could be able to give good ventilation in dry conditions and should have fully closed ventilation in damp conditions. Fumigation facilities should also be there.

CHAPTER – 4

FOOD SAFETY REGULATIONS AND STANDARDS

4.1 REGISTRATION AND LICENSING OF FOOD BUSINESS

All Food Business Operators in the country will be registered or licensed in accordance with the procedures laid down

Registration of Petty Food Business

a. Every petty Food Business Operator shall register themselves with the Registering Authority by submitting
b. An application for registration in Form A under Schedule 2 of these Regulations along with a fee as provided in Schedule 3.
c. The petty food manufacturer shall follow the basic hygiene and safety requirements provided in Part I of Schedule 4 of these Regulations and provide a self-attested declaration of adherence to these requirements with the application in the format provided in Annexure-1 under Schedule 2.
d. The Registering Authority shall consider the application and may either grant registration or reject it with reasons to be recorded in writing or issue notice for inspection, within 7 days of receipt of an application for registration.
e. In the event of an inspection being ordered, the registration shall be granted by the Registering Authority after being satisfied with the safety, hygiene and sanitary conditions of the premises as contained in Part II of Schedule 4 within a period of 30days.
f. If registration is not granted, or denied, or inspection not ordered within 7 days as provided in above sub regulation (3) or no decision is communicated within 30 days as provided in above sub regulation (4), the petty food manufacturer may start its business, provided that it will be incumbent on the Food Business Operator to comply with any improvement suggested by the Registering Authority even later.
g. Provided that registration shall not be refused without giving the applicant an opportunity of being heard and for reasons to be recorded in writing.
h. The Registering Authority shall issue a registration certificate and a photo identity card, which shall be displayed at a prominent place at all times within the premises or vehicle or cart or any other place where the person carries on sale/manufacture of food in case of Petty Food Business.

i. The Registering Authority or any officer or agency specifically authorized for this purpose shall carry out food safety inspection of the registered establishments at least once in a year. Provided that a producer of milk who is a registered member of a dairy Cooperative Society registered under Cooperative Societies Act and supplies or sells the entire milk to the Society shall be exempted from this provision for registration.

4.2 STANDARDS FOR SUGAR

1. Plantation white sugar : crystallized product obtained from sugarcane or sugar beet. It shall be free from dirt, filth, iron fillings and added colourings matter. Extraneous matter shall not exceed 0.1% by weight. It shall conforms below following standards:

(a) Moisture – not more than 0.5% by weight.

(b) Sucrose – not less than 98% by weight.

2. Refined sugar : white crystalline sugar obtained by refining plantation white sugar. . It shall be free from dirt, filth, iron fillings and added colourings matter. Extraneous matter shall not exceed 0.1% by weight. It shall also conforms below following standards:

   (a) Moisture – not more than 0.5% by weight.

   (b) Sucrose – not less than 99.5% by weight.

4.3 HYGIENIC, SANITARY AND GOOD MANUFACTURING PRACTICES (GMP/GHP) AND HACCP

CLEANING AND SANITATION

i. Cleaning and sanitizing programmes shall be established at facility to ensure that the food-processing equipment and environment are maintained in a hygienic condition to prevent contamination of food, such as from metal shards, flaking plaster, food debris and chemicals and records of the same shall be maintained. The programme should ensure that all parts of the establishment are appropriately clean, and shall include the cleaning of cleaning equipment.

ii. Master sanitation schedule shall be maintained for overall facility through checklists

which includes:

- Areas, items of equipment and utensils to be cleaned;
- Responsibility for particular tasks;

- Cleaning method and frequency of cleaning; and
- Monitoring arrangements for checking effectiveness of cleaning
- Person responsible for cleaning
- Persons responsible for monitoring & verification of effectiveness of cleaning
- In case of any deviation what correction & corrective actions being taken.
- Where ever chances of microbial risk with product air count & swab test being recommended.

iii. Cleaning and disinfection chemicals shall be food grade wherever chances of it may come in direct or indirect contact through equipment's or plant surfaces, handled and used carefully and in accordance with manufacturers' instructions, for example, using the correct dilutions, and stored, where necessary, separated from food, in clearly identified containers to avoid the risk of contaminating food.

iv. Cleaning shall remove food residues and dirt and it can be carried out by the separator the combined use of physical methods, such as heat, scrubbing, turbulent flow and vacuum cleaning or other methods that avoid the use of water, and chemical methods using appropriate cleaning agents.

v. These facilities should be constructed of corrosion resistant materials, be easy to clean and shall have adequate supply of hot and cold potable water, where appropriate. It is recommended to have different colour for hot and cold pipes. A validation mechanism should be in place for all cleaning programme.

Cleaning procedure should generally involve;

- Removing gross visible debris from surfaces.
- Applying a detergent solution to loosen soil and bacterial film (cleaning)
- Rinsing with water (hot water where possible) to remove loosened soil and residues of detergent.
- Dry cleaning or other appropriate methods for removing and collecting residues and debris and
- Where necessary, cleaning should be followed by disinfection with subsequent rinsing.

Designated area with lock & key provision should be allocated for cleaning equipment's &

Chemicals where ever necessary & applicable CIP procedure should be defined for equipment's cleaning.

HOUSE KEEPING

i. A housekeeping schedule covering manufacturing and storage areas shall be maintained.
ii. The surrounding areas including roads, parking lots and drains should be well maintained.
iii. Walls and floors should be maintained neat and clean. Ceilings and light fixtures should be easy to clean.
iv. Drains should be sufficiently sized and well sloped. Drains should have removable grates installed for ease of cleaning.
v. For 3rd party (contract) cleaning companies, the supplier should define clear scope, details of services and responsibilities.
vi. Waste storage areas should be clearly marked and waste shall be disposed of in a timely manner.

4.4 HACCP PROCEDURE

According to the nature and size of the operation and sufficient to assist the business to verify that the HACCP controls are in place and being maintained.

Documentation shall include (as a minimum) the following:

- HACCP team composition;
- Product description;
- Intended use;
- Flow chart;
- Hazard analysis;
- CCP determination;
- Critical limit determination;
- Validation process; and
- HACCP plan

The HACCP plan shall include the following information for each identified CCP:

- Food safety hazard(s) to be controlled at the CCP;
- Control measure(s);
- Critical limit(s);

- Monitoring procedure(s);
- Corrections and corrective action(s) to be taken if critical limits are exceeded;
- Responsibilities and authorities for monitoring, corrective action and verification;
- Record(s) of monitoring.

Records to include

- CCP monitoring activities;
- Deviations and associated corrective actions;
- Disposition of non-conforming products;
- Verification procedures performed;
- Modifications to the HACCP plan;
- Validation record;Product release recordsand Testing records.

4.5 PACKAGING AND LABELLING

General Requirements for Packaging

1. A utensil or container made of the following materials or metals, when used in the preparation, packaging and storing of food shall be deemed to render it unfit for human consumption:
   a) containers which are rusty;
   b) enameled containers which have become chipped and rusty;
   c) copper or brass containers which are not properly tinned
   d) containers made of aluminium not conforming in chemical composition to IS:20 specification for Cast Aluminium & Aluminium Alloy for utensils or IS:21 specification for Wrought Aluminium and Aluminium Alloy for utensils.
2. Containers made of plastic materials should conform to the following Indian Standards Specification, used as appliances or receptacles for packing or storing whether partly or wholly, food articles namely;
   i. IS : 10146 (Specification for Polyethylene in contact with foodstuffs)
   ii. IS : 10142 (Specification for Styrene Polymers in contact with foodstuffs);
   iii. IS : 10151 (Specification for Polyvinyl Chloride (PVC), in contact with foodstuffs);
   iv. IS : 10910 (Specification for Polypropylene in contact with foodstuffs);

v. IS : 11434 (Specification for Ionomer Resins in contact with foodstuffs); (vi) IS: 11704 Specification for Ethylene Acrylic Acid (EAA) copolymer. (vii) IS: 12252 - Specification for Poly alkylene terephathalates (PET).

vi. IS: 12247 - Specification for Nylon 6 Polymer; (ix) IS: 13601 - Ethylene Vinyl Acetate (EVA);

vii. IS: 13576 - Ethylene Metha Acrylic Acid (EMAA);

viii. Tin and plastic containers once used, shall not be re-used for packaging of edible oils and fats;

Provided that utensils or containers made of copper though not properly tinned, may be used for the preparation of sugar confectionery or essential oils and mere use of such utensils or containers shall not be deemed to render sugar confectionery or essential oils unfit for human consumption.

3. General packaging requirements for Canned products,
   i. All containers shall be securely packed and sealed.
   ii. The exterior of the cans shall be free from major dents, rust, perforations and seam distortions.
   iii. Cans shall be free from leaks.

GENERAL REQUIREMENTS FOR LABELLING

1. Every pre packaged food shall carry a label containing information as required here under unless otherwise provided, namely;
2. The particulars of declaration required under these Regulations to be specified on the label shall be in English or Hindi in Devnagri script: Provided that nothing herein contained shall prevent the use of any other language in addition to the language required under this regulation.
3. Pre-packaged food shall not be described or presented on any label or in any labelling manner that is false, misleading or deceptive or is likely to create an erroneous impression regarding its character in any respect;
4. Label in pre-packaged foods shall be applied in such a manner that they will not become separated from the container;
5. Contents on the label shall be clear, prominent, indelible and readily legible by the consumer under normal conditions of purchase and use;

6. Where the container is covered by a wrapper, the wrapper shall carry the necessary information or the label on the container shall be readily legible through the outer wrapper and not obscured by it;

License number shall be displayed on the principal display panel in the following format, namely:-

Declaration regarding Food Additives-

i. For food additives falling in the respective classes and appearing in lists of food additives permitted for use in foods generally, the following class titles shall be used together with the specific names or recognized international numerical identifications:

Acidity Regulator, Acids, Anticaking Agent, Antifoaming Agent, Antioxidant, Bulking Agent, Colour, Colour Retention Agent, Emulsifier, Emulsifying Salt, Firming Agent, Flour Treatment Agent, Flavour Enhancer, Foaming Agent, Gelling Agent, Glazing Agent, Humectant, Preservative, Propellant, Raising Agent, Stabilizer, Sweetener, Thickener:

ii. Addition of colours and/or Flavours—

a. Extraneous addition of colouring matter to be mentioned on the label – Where an extraneous colouring matter has been added to any article of food, there shall be displayed one of the following statements in capital letters, just beneath the list of the ingredients on the label attached to any package of food so coloured, namely:

CONTAINS PERMITTED NATURAL COLOUR(S)

OR

CONTAINS PERMITTED SYNTHETIC FOOD COLOUR(S)

OR

CONTAINS PERMITTED NATURAL AND SYNTHETIC FOOD COLOUR(S)

Provided that where such a statement is displayed along with the name or INS no of the food colour, the colour used in the product need not be mentioned in the list of ingredients.

b) Extraneous addition of flavouring agents to be mentioned on the label.

Where an extraneous flavouring agent has been added to any article of food, there shall be written just beneath the list of ingredients on the label attached to any package of food so flavoured, a statement in capital letters as below:

CONTAINS ADDED FLAVOUR (specify type of flavouring agent as per Regulation 3.1.10(1) of Food Safety and Standards (Food product standards and food additive) Regulation, 2011

c) In case both colour and flavour are used in the product, one of the following combined statements in capital letters shall be displayed, just beneath the list of ingredients on the label attached to any package of food so coloured and flavoured, namely:

CONTAINS PERMITTED NATURAL COLOUR(S) AND ADDED FLAVOUR(S)

OR

CONTAINS PERMITTED SYNTHETIC FOOD COLOUR(S) AND ADDED FLAVOUR(S)

OR

CONTAINS PERMITTED NATURAL AND SYNTHETIC FOOD COLOUR(S) AND ADDED FLAVOUR(S)

Provided that in case of artificial flavouring substances, the label shall declare the common name of the flavours, but in case of the natural flavouring substances or nature identical flavouring substances, the class name of flavours shall be mentioned on the label and it shall comply with the requirement of label declaration as specified under the regulation 2.2.2 (5) (ii)

Note: — When statement regarding addition of colours and/or flavours is displayed on the label in accordance with regulation 2.2.2(5)(ii) and regulation 3.2.1 of Food Safety and Standards (Food Product Standards and Food Additive) Regulation, 2011, addition of such colours and/or flavours need not be mentioned in the list of ingredients. Also, in addition to above statement, the common name or

NAME AND COMPLETE ADDRESS OF THE MANUFACTURER

(i) The name and complete address of the manufacturer and the manufacturing unit if these are located at different places and in case the manufacturer is not the packer or bottler, the

name and complete address of the packing or bottling unit as the case may be shall be declared on every package of food;

(ii) Where an article of food is manufactured or packed or bottled by a person or a company under the written authority of some other manufacturer or company, under his or its brand name, the label shall carry the name and complete address of the manufacturing or packing or bottling unit as the case may be, and also the name and complete address of the manufacturer or the company, for and on whose behalf, it is manufactured or packed or bottled;

(iii) Where an article of food is imported into India, the package of food shall also carry the name and complete address of the importer in India.

Provided further that where any food article manufactured outside India is packed or bottled in India, the package containing such food article shall also bear on the label, the name of the country of origin of the food article and the name and complete address of the importer and the premises of packing or bottling in India.

NET QUANTITY

i. Net quantity by weight or volume or number, as the case may be, shall be declared on every package of food; and
ii. In addition to the declaration of net quantity, a food packed in a liquid medium shall carry a declaration of the drained weight of the food.

Explanation – 1: For the purposes of this requirement the expression “liquid medium” include water, aqueous solutions of sugar and salt, fruit and vegetable juices or vinegar, either singly or in combination.

Explanation – 2: In declaring the net quantity of the commodity contained in the package, the weight of the wrappers and packaging materials shall be excluded:

iii. Where a package contains a large number of small items of confectionery, each of which is separately wrapped and it is not reasonably practicable to exclude from the net weight of the commodity, the weight of such immediate wrappers of all the items of the confectionery contained in the package, the net weight declared on the package containing such confectionary or on the label thereof may include the weight of such immediate wrapper if the total weight of such immediate wrapper does not exceed –

a) eight per cent, Where such immediate wrapper is a waxed paper or other paper with wax or aluminium foil under strip; or
b) six per cent. In case of other paper of the total net weight of all the items of confectionery contained in the package minus the weight of immediate wrapper.

4.6 EXEMPTIONS FROM LABELLING REQUIREMENTS

Where the surface area of the package is not more than 100 square centimetres, the label of such package shall be exempted from the requirements of list of ingredients, Lot Number or Batch Number or Code Number, nutritional information and instructions for use, but this information shall be given on the wholesale packages or multi piece packages, as the case may be.

1. The date of manufacture' or 'best before date' or 'expiry date' may not be required to be mentioned on the package having surface area of less than 30 square centimetres but this information shall be given on the wholesale packages or multipiece packages, as the case may be;
2. In case of liquid products marketed in bottles, if such bottle is intended to be reused for refilling, the requirement of list of ingredients shall be exempted, but the nutritional information specified in regulation.
3. “To make a fluid not below the composition of toned milk or skimmed milk (as the case may be) with the contents of this package, add (here insert the number of parts) of water by volume to one part by volume of this condensed milk or desiccated (dried) milk”.
4. In case of food with shelf-life of not more than seven days, the 'date of manufacture may not be required to be mentioned on the label of packaged food articles, but the 'use by date' shall be mentioned on the label by the manufacturer or packer.
5. In case of multi piece packages the particulars regarding list of ingredients, nutritional information, Date of manufacture/ packing, best before, expiry date labelling of irradiated food and, vegetarian logo/non vegetarian logo, may not be specified.

4.7 DATE OF MANUFACTURE OR PACKING

The date, month and year in which the commodity is manufactured, packed or pre-packed, shall be given on the label:

Provided that the month and the year of manufacture, packing or pre-packing shall be given if the "Best Before Date" of the products is more than three months:

Provided further that in case any package contains commodity which has a short shelf life of less than three months, the date, month and year in which the commodity is manufactured or prepared or pre-packed shall be mentioned on the label.

Best Before and Use By Date

i) the month and year in capital letters upto which the product is best for consumption, in the following manner, namely:

"BEST BEFORE ..... MONTHS AND YEAR

OR

"BEST BEFORE ..... MONTHS FROM PACKAGING

OR

"BEST BEFORE .....MONTHS FROM MANUFACTURE

(Note: — blank be filled up)

ii) In case of package or bottle containing sterilised or Ultra High Temperature treated milk, soya milk, flavoured milk, any package containing bread, dhokla, bhelpuri, pizza, doughnuts, khoa, paneer, or any uncanned package of fruits, vegetable, meat, fish or any other like commodity, the declaration be made as follows

"BEST BEFORE ……DATE/MONTH/YEAR"

OR

"BEST BEFORE.....DAYS FROM PACKAGING"

OR

"BEST BEFORE ……..DAYS FROM MANUFACTURE"

Note:

a) blanks be filled up
b) Month and year may be used in numerals

c) Year may be given in two digits

iii. On packages of Aspartame, instead of Best Before date, Use by date/recommended last consumption date/expiry date shall be given, which shall not be more than three years from the date of packing;

iv. In case of infant milk substitute and infant foods instead of Best Before date, Use by date/ recommended last consumption date/expiry date shall be given ,Provided further that the declaration of best before date for consumption shall not be applicable

4.8 DOCUMENTATION AND RECORD KEEPING

Every organization has to maintain records of raw material procurement, production processes, and sales. This is to ensure that the business runs effectively and is profitable. Listed below are some reasons why there is a need for documentation:

1. It gives detailed knowledge about running the business.
2. It helps to control product quality.
3. It helps to keep track of the money invested in the business.
4. It helps to identify the separate costs of raw material or product ingredients.
5. It helps to identify the production cost of a particular process.
6. It helps to make sure that all the quality assurance practices were followed during the production.
7. It helps to make sure that the production equipment is running smoothly/effectively.
8. It works as an evidence for legal procedures.
9. It helps to set an appropriate product price.
10. It helps to take corrective measures at the right time.

4.9 HOW TO KEEP RECORDS?

Every food processing organization follows a more or less similar way of keeping records. Production records keep a log of the following:

- The quantity and type of raw materials received
- The quantity and type of ingredients used during processing
- The processing conditions in which production took place (e.g. the temperature set or the air pressure applied)

- The product quality produced

Product quality can be maintained only when:

- The same quantity and quality of ingredients and raw materials are mixed in every batch
- A standard formulation is used for every batch
- Standard process parameters are applied for every batch

Every batch of food is given a batch number. This number is recorded in:

- Stock control books (where raw material procurement is noted)
- Processing logbooks (where production process is noted)
- Product sales records (where sales and distribution is noted)

The batch number must correlate with the product code number, which is printed on labels. This helps the processor to trace any fault found in a batch back to the raw material used or the production process.