

**PM Formalization of
Micro Food Processing Enterprises (PMFME) Scheme**

HANDBOOK

OF

BAHEDA



AATMANIRBHAR BHARAT

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TABLE OF CONTENTS

	PAGE NO
CHAPTER 1 : INTRODUCTION	
1.1 Introduction.....	04-05
1.2 Health benefits.....	05
CHAPTER 2 : PROCESSING OF BAHEDA	
2.1 Extraction of oil from baheda.....	06-07
2.2 Process of oil refining.....	08-09
2.3 Formation of powder from baheda.....	10-12
CHAPTER 3 : EQUIPMENTS	
3.0 Equipments required for processing.....	13-17
CHAPTER 4 : PACKAGING AND LABELLING	
4.0 Packaging.....	18
4.1 Need of Packaging.....	18
4.2 Types of Packaging.....	19
4.3 Packaging of baheda.....	20-21
4.4 Some Recent Development in Packaging.....	21-22
4.5 Labeling.....	23
4.6 Quality considerations during packing.....	24
CHAPTER 5 : REGULATIONS	
5.1 FSSAI regulation.....	25
5.2 Labeling standards.....	25-26
5.3 Sanitary and hygienic Requirements.....	27-29

ABBREVIATIONS

1	PET	Polyethylene terephthalate
2	LDPE	Low-density polyethylene
3	BIS	Bureau of Indian Standards
4	FSSAI	Food Safety and Standards Authority of India

CHAPTER 1

1.1 INTRODUCTION



Scientific name : *Terminalia bellirica*

Common name : Bahera, Baheda, Bibhitaka, Aksha, Balela, Jaha, sagona, Beda, Tandi, Tani, Barro, Basal, Kalamai, Tadi.

Region : India and South east Asia

1.1.1 DESCRIPTION :

Baheda (*Terminalia bellirica*) is a large deciduous tree common on plains and lower hills of India, and southeast Asia. The leaves are about 15 cm long and crowded toward the ends of the branches; nuts or fruits of the tree are rounded but with five flatter sides. Fruit is externally brown, slightly wrinkled with a small stalk at the bottom. The rind of the fruit becomes yellow after drying and tastes bitter and astringent. Two varieties, one with globular fruits, and the other larger and ovate in shape have been described. The stone (kernel) is hard, oval in shape, of a pale-yellow color, and containing an almond-like seed.

1.1.2 UAGES :

Fruits of *Terminalia bellirica* (Baheda) is widely used in Ayurvedic formulations such as Triphala churna, Pathyadi churna, Phalatrikadi Kwatha churna, Avipattikara churna, and many more. Till now, more than 151 phytochemicals have been isolated from the fruit. The presences of diversified phytochemicals make the fruit a highly potent phytomedicines.

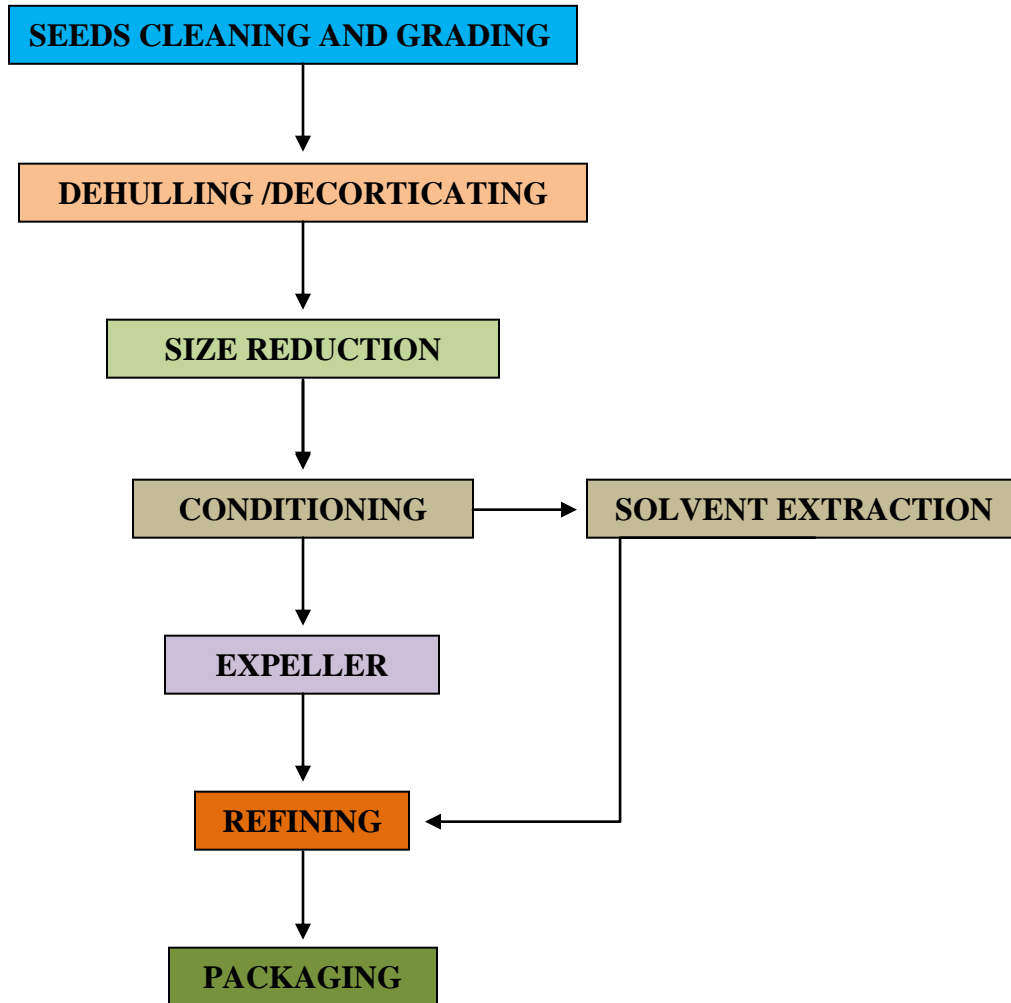
1.2 HEALTH BENEFITS .

- ✓ It is a very commonly used fruit both in Unani and Ayurveda, as antioxidant and to strengthen digestive function, and in cases of chronic diarrhea and dysentery, especially in combination with black myrobalan and emblic myrobalan.
- ✓ Fruits are a rich source of gallic acid and ellagic acid.
- ✓ It contain significant amounts of K and Mn.
- ✓ It good for strengthening the stomach, and eyesight, and to prevent lacrimation.
- ✓ Dried roasted pulp is used as lozenges in sore throat, hoarseness of voice, and dyspepsia.
- ✓ In the Middle East, it is used to stimulate appetite.
- ✓ Oil is used for rheumatic swellings, pulp in ophthamia, bark in anaemia and leucoderma.
- ✓ The seed oil is useful in greyness of hair, helps in lowering cholesterol and blood pressure and paste is applied on conjunctivitis.

CHAPTER 2

PROCESSING OF BAHEDA

2.1 EXTRACTION OF OIL FROM BAHEDA



2.1.1 CLEANING

The first preparation step is cleaning to remove foreign materials from the seeds. This includes the separation of plant tissues, pebbles, dust, etc. to protect the processing equipment and enable the production of high quality soy products. Some weed seeds have been shown to reduce the oxidative stability of the extracted oil if they are not removed.

2.1.2 DRYING

To remove the hull effectively a moisture content of 10% is needed, which requires a drying process prior to dehulling. Heated air is distributed through the oil seeds to achieve some loss of water, followed by cooler air, which removes the residual moisture laden air.

2.1.3 DEHULLING

De-hulling operation is performed for the removal of seed coat which also helps in reducing the anti-nutritional factors.

2.1.4 CONDITIONING

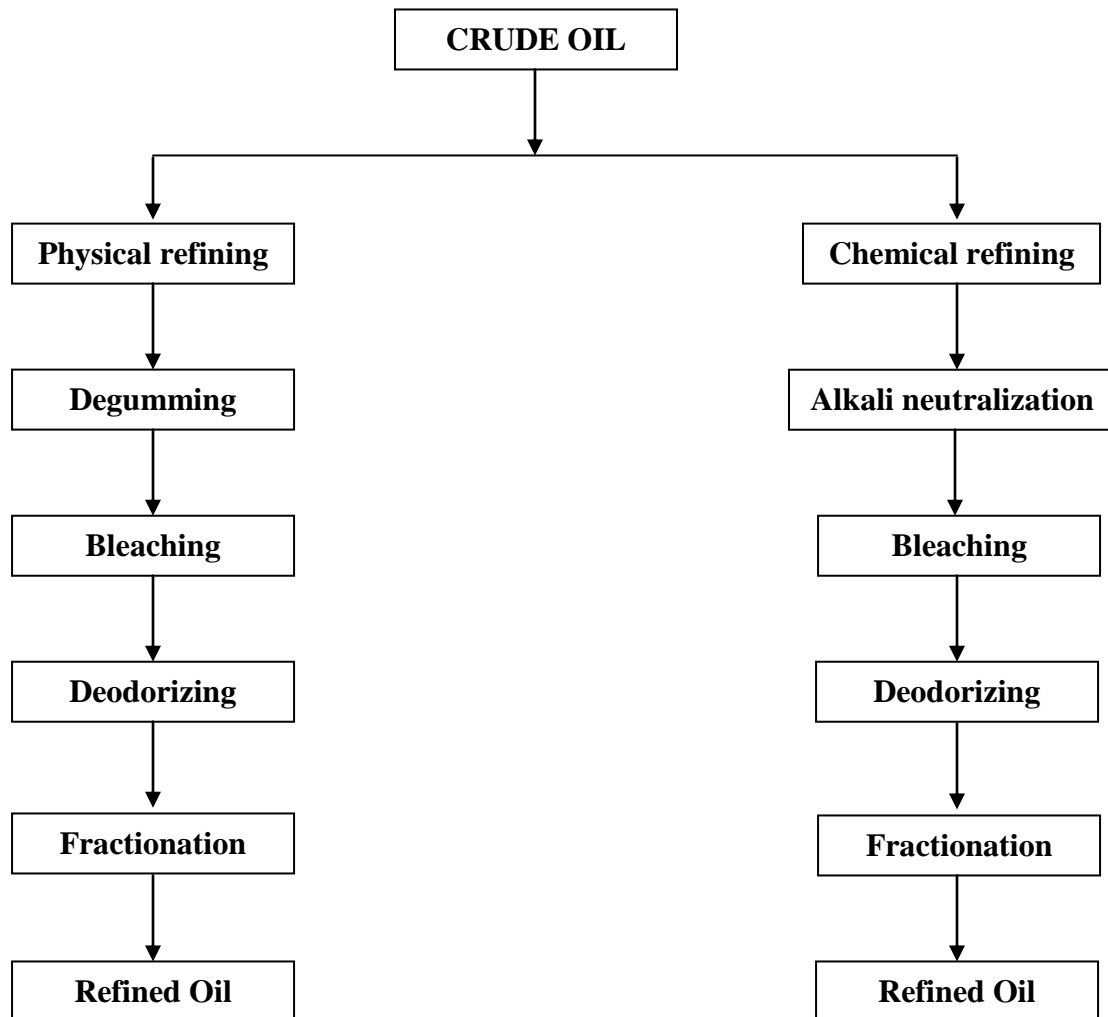
Conditioning is done with the help of heat and moisture to obtain the optimum plasticity necessary for flake production, prior to oil extraction.

2.1.5 EXTRACTION

Extraction of oil from the mash is done with the help of screw, hydraulic, or centrifugal presses, this method is known as dry method. Since centrifugal presses are not so much efficient thus screw and hydraulic presses are more used by modern mill. The factors which determine the extraction are temperature, pressure applied, duration of pressure and the ratio of fiber and kernel. Extraction of oil can also be done through wet method, where hot water as a liquid is used to extract oil from ruptured cell of seeds. Treatment with hot water also helps in protein coagulation and hydrolyze gums, resins and starch thus preventing the oil from foaming during frying. After removal moisture, oil is extracted.

2.2 PROCESS OF OIL REFINING

Although crude oil is directly used, but it has been refined for used as more sophisticated edible oil. Refining of crude oil involves either physical refining or chemical refining. The process of physical refining involves steps like degumming, bleaching, deodorizing and fractionation while chemical withering process involves alkali neutralization, bleaching, deodorizing and fractionation.



2.2.1 ALKALI NEUTRALIZATION :

To reduce free fatty acids and polar lipids in crude oil, it is treated with solution called sodium hydroxide or sodium carbonate and the process is called as alkali neutralization or alkali refining.

2.2.2 DEGUMMING :

Alkali neutralization is not alone sufficient for removal of all the impurities thus the process of degumming is performed in both i.e. physical refining and chemical refining. Degumming is mainly done to target impurities like phospholipids and other polar lipids (gums). Removal of gums are done with the help of centrifugation.

2.2.3 BLEACHING :

Like degumming, bleaching also an important steps of physical refining and chemical refining. The process of bleaching is performed for the removal of pigment by using charcoal or clay.

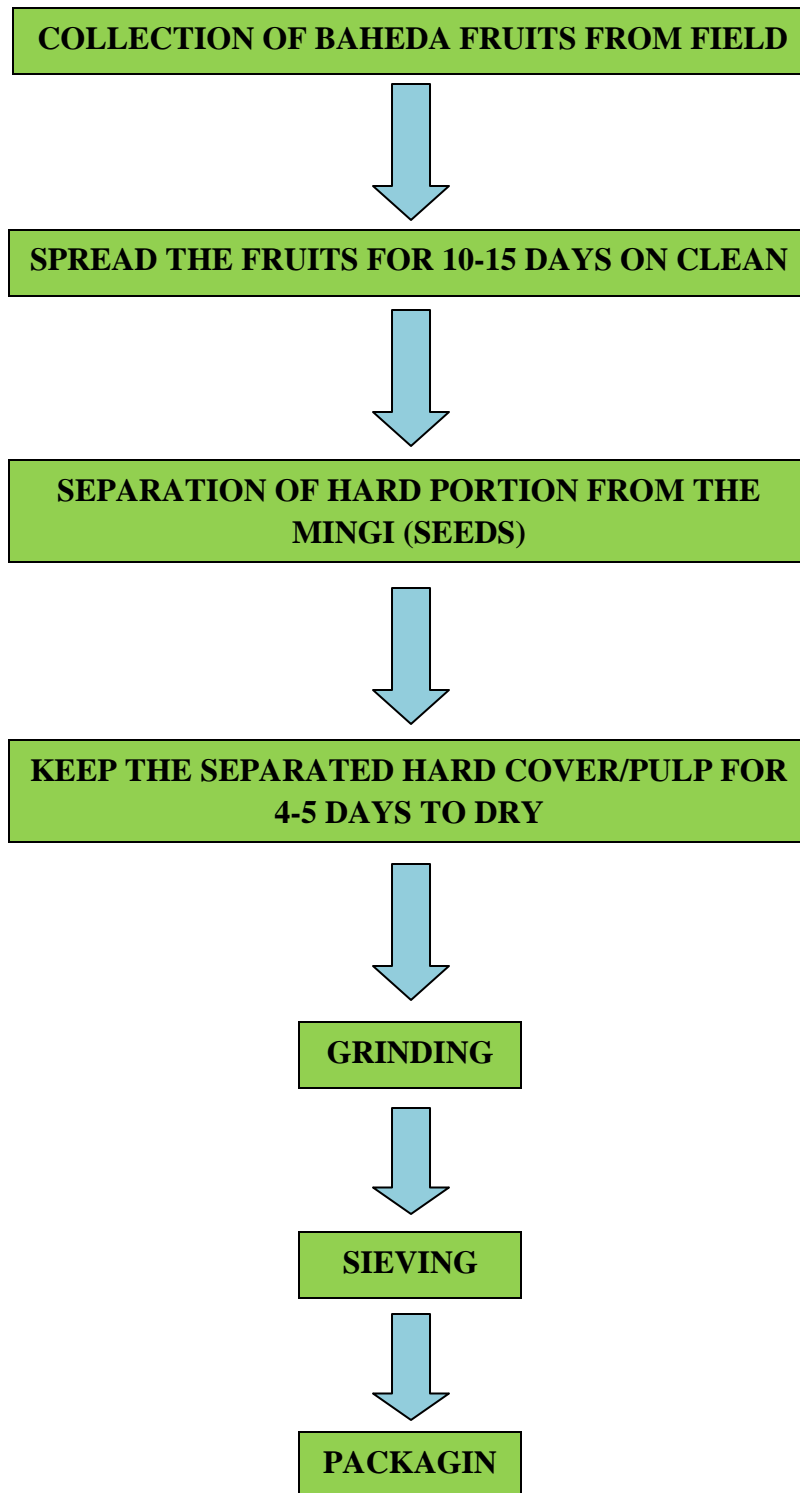
2.2.4 DEODORIZING :

Deodorizing is done by steam distillation and used for removing those products which are volatile in nature. The process of deodorizing is carried out at 230°C for 2 hours followed by cooling of oil and passing it through filter.

2.2.5 FRACTIONATION :

Allowing the oil to stand for a time at low temperatures so that glycerides, which naturally occur in the oil, with higher melting points solidify and can then be removed from the oil by filtering. Over time glycerides can degrade releasing fatty acids into the oil increasing the acidity levels and reducing the quality.

2.3 FORMATION OF POWDER FROM BAHEDA FRUITS



2.3.1 COLLECTION OF BAHEDA FRUITS :

Fruits of baheda are collected from the farm/fields and transported to the mills for further processing. While collecting the fruits from the tree, it must be ensure that fruits are well matured and do not have any microbial growth over it.

2.3.2 CLEANING :

Cleaning of fruits should be done in proper manner so that every foreign particles and dust will be removed. While cleaning one should ensure that the water used for cleaning must be fresh and free from any contaminants. The utensils used for cleaning the fruits must be of food grade quality and non reactive.

2.3.3 SPREADING :

After cleaning, fruits are spread for 10 to 15 days for drying. Layer of thickness should be uniform while spreading. Spreading area must be free from hazardous substances or any other thing which may impact the quality of fruits.

2.3.4 SEPARATION OF HARD PORTION :

Separation of hard portion from the mingi (seeds) is done only when the fruits are properly dried. It can be done either manually or mechanically. For smaller amount of fruits the operation is performed manually while for larger amount it is done mechanically to make the operation more cost effective.

2.3.5 DRYING :

After separation of hard portion from the mingi (seeds), the separated hard cover or pulp are kept for further drying for 4 - 5 days. Drying area must be free from hazardous substances or any other thing which may impact the quality of fruits.

2.3.6 GRINDING:

Grinding of pulp is mainly done with the help of grinding machine and it should be smoothly grind so that texture of powder will be uniform and of good quality.

2.3.7 SIEVING :

The powder which we obtained from the grinding process must be sieved with the help of proper size of sieve so that size of powder should be uniform. The process of sieving also helps in avoiding the unwanted large particles from the final products.

2.3.8 PACKAGING :

After sieving, the powder is either used for manufacturing the products tripahala or selling the whole powder in market thus packaging is done with the help of packaging machine.



CHAPTER 3

EQUIPMENTS REQUIRED FOR PROCESSING

3.1 WEIGHING MACHINE :

For getting good quality of product, all the ingredients should be properly weighed with the help of digital weighing machine.



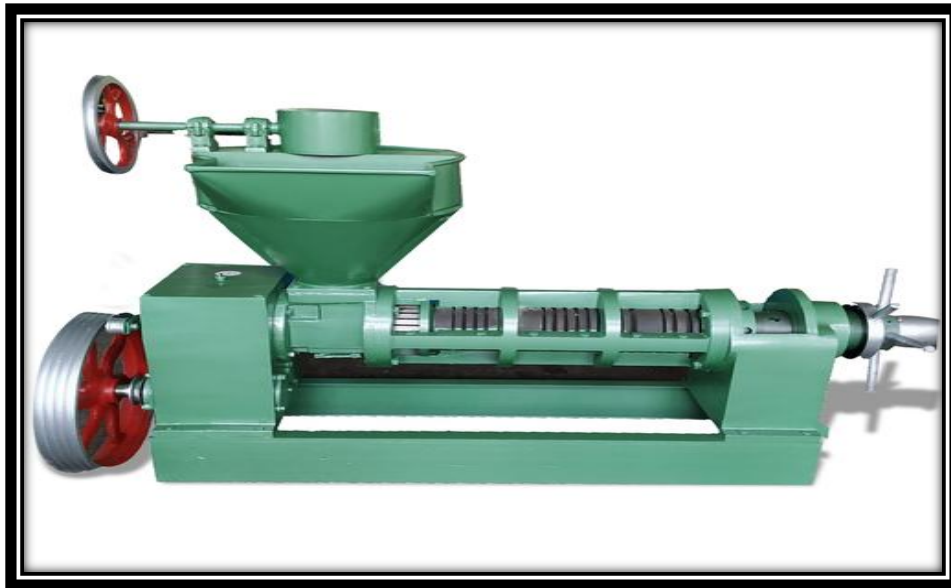
3.2 SIEVE :

It used for sieving powder so that only fine powder can be utilized for manufacturing purpose. Without sieving coarse powder will be mixed up.



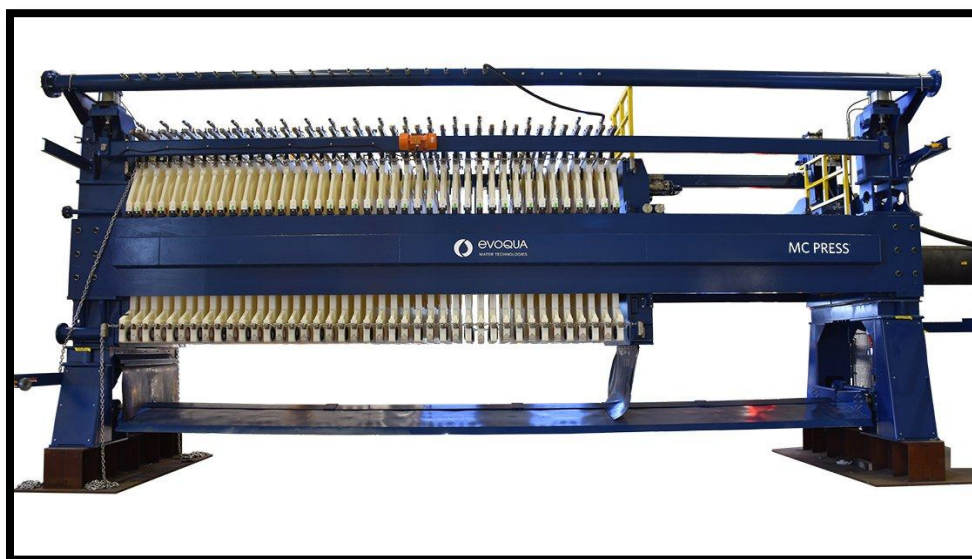
3.3 OIL EXTRACTOR :

Extraction of oil is done either by wet method or dry method. Dry method includes use of screw pressure for extraction oil.



3.4 FILTER PRESS:

A filter press is a batch operation, fixed volume machine that separates liquids and solids using pressure filtration. The extracted oil has some impurities. These oils are sent into the filter press for further filtration.



3.5 CLARIFICATION MACHINE:

Clarification of oil is done to remove non oily solids dirt by passing oil through hot water at 95°C. Oil and dirt separated from each other where dirt settled down at the lower part while clear oil presents at upper part.



3.5 GRAVITY SEPARATOR : Gravity separator machine may be used to separate any type of dry bulk particles that are similar in size and shape but differs in weight. Gravity separator are suitable for processing of the seeds of corn, Wheat, rice, soybean, sorghum, various vegetables and other agricultural and sideline products.



3.6 FOOD GRADE CONVEYOR:

These are conveyors with food grade belt to maintain food safety standards set by monitoring authorities.



3.7 OTHER MATERIAL AND HYGIENE EQUIPMENT :

They are simply used to hold and transfer the given material efficiently.



3.8 POWER DISTRIBUTION EQUIPMENTS :

They are used to safely receive and distribute power.



CHAPTER 4

4.0 PACKAGING :

Packaging is an important part of food manufacturing process. It protect the food products from physical ,chemical, biological damages. Without packaging, food handling would be a messy, inefficient and costly exercise and modern consumer marketing would be virtually impossible. Thus food packaging lies at the very heart of the modern food industry.

Packaging Institute International defined packaging as the enclosure of products, items or packages in a wrapped pouch, bag, box, cup, tray, can, tube, bottle or other container form to perform one or more of the following functions: containment, protection, preservation, communication, utility and performance. If the device or container performed one or more of these functions, it was considered a package.

4.1 NEED OF PACKAGING :

Packaging performs a series functions:

4.1.1 CONTAINMENT : The containment function of packaging makes a huge contribution to protecting the environment from the myriad of products that are moved from one place to another on numerous occasions each day in any modern society. Faulty packaging (or under-packaging) could result in major pollution of the environment.

4.1.2 PROTECTION : the primary function of the package: to protect its contents from outside environmental influences such as water, water vapor, gases, odors, microorganisms, dust, shocks, vibrations and compressive forces.

4.1.3 CONVENIENCE : Products designed to increase convenience include ready to cook or ready to eat foods which can be reheated in a very short time, preferably without removing the primary package. Thus, packaging helps in convenience of consumer. Convenient packages promote sales.

4.1.4 COMMUNICATION : Packaging contains a lot of information such name of its manufacturer, product name, terms and uses, date of manufacturing, best before. nutritional information thus helping the consumer to be more informed.

4.2 TYPES OF PACKAGING :

4.2.1 PRIMARY PACKAGING :

- Primary package are those package which directly came into contact with food products. It provides first or initial layer of protection to the food products.
- Examples - Metal cans, tea bag, paperboard cartons, glass bottles and plastic pouches.

4.2.2 SECONDARY PACKAGE :

- Secondary package are those package which surrounds or contains the primary package.
- It further used to group primary packages together.
- Act as carriers and many a times also used for the display of primary package.
- Examples are Corrugated case, Boxes.

4.2.3 TERTIARY PACKAGE :

- It contains number of secondary package together.
- Mainly used for bulk handling of food products.
- Example : stretch-wrapped pallet.

4.2.4 QUATERNARY PACKAGE :

- Quaternary package is mainly used for handling the tertiary packages.
- It generally includes a metal container which can be transferred to or from ships, trains.

4.3 PACKAGING MATERIALS :

Packaging of baheda powder, fruits and its products are mainly done to protect the food products from outside environment especially after the completion of process so that products can retain flavor, aroma, freshness for a longer period of time. Packaging is also done to increase their shelf life. Powder can be packed in wide range material which includes LDPE, PET, glass, aluminum etc.

4.3.1 LDPE :

Low-density polyethylene is heat sealable, inert, odour free and shrinks when heated. It act as a barrier to moisture and has high gas permeability, sensitivity to oils and poor odour resistance. It is less expensive, therefore widely used. One of the great attributes of LDPE is its ability to be fusion welded to itself to give good, tough, liquid-tight seals.

4.3.2 PET :

PET can be made into film by blowing or casting. It can be blow moulded, injection moulded, foamed, extrusion coated on paperboard and extruded as sheet for thermoforming. Melting point of PET is higher than PP which is around 260°C and due to the manufacturing conditions does not shrink below 180°C. Thus PET is ideal for high-temperature applications. PET is also flexible to low temperature (-100°C). It also act as good barrier of oxygen and water vapour.

4.3.3 POLYPROPYLENE :

Polypropylene films have better clarity than polyethylene and enjoy superior machinability due to stiffness. Lack of good salability has been a problem; however, PVDC and vinyl coating have been used to overcome this problem. Some varieties of PP have been specially developed for twist-wrap applications as they have the ability to lock in position after twisting.

4.3.4 GLASS :

Now a day glass container has been also used for packaging. It has following advantages:

- act as strong barrier to moisture and gases.
- Prevent unwanted odors and microbial growth.
- do not react with food products.

- suitable for heat processing when hermetically sealed
- glass are re-useable and recyclable
- they are transparent to display the contents
- they are rigid, to allow stacking without container damage.

The disadvantages of glass include:

- glass have high weight which increases the transportation cost.
- very much fragile and low resistance to thermal shock as compare to other materials.
- potentially serious hazards from glass splinters or fragments .

4.3.5 ALUMINIUM:

Aluminium is used for packaging due its highly malleable properties: can be easily converted to thin sheets and folded, rolled or packed. Aluminium foil acts as a total barrier to light and oxygen odours and flavors, moistness, and germs, and so it is used broadly in food and pharmaceutical packaging, including long-life packs.

4.3.6 LAMINATE :

The laminates can be formed, filled, gas flushed and sealed on a single machine from reel stock. Gas flushing is achieved by saturating the powder with inert gas. The main advantages associated with laminates are lower material cost and lighter material weight. The disadvantages are that laminates do not have the mechanical strength and durability of rigid containers, and there can be difficulty in obtaining a satisfactory heat seal because of contamination of the heat seal area by powder during filling at high speed.

4.4 SOME RECENT DEVELOPMENT IN PACKAGING :

4.4.1 ASEPTIC PACKAGING

Aseptic packaging is the filling of sterile containers with a commercially sterile product under aseptic conditions, and then sealing the containers so that reinfection is prevented; that is, so that they are hermetically sealed. Application of aseptic packaging involves: packaging of pre-sterilized and sterile product and packaging of a non-sterile product to avoid infection by microorganisms.

The major reasons for the use of aseptic packaging are : to take advantage of high temperature-short time (HTST) sterilization processes, to enable containers to be used that are unsuitable for in-package sterilization and to extend the shelf life of products at normal temperatures.

4.4.2. ACTIVE AND INTELLIGENT PACKAGING

Active packaging is defined as packaging in which subsidiary constituents have been deliberately included in or on either the packaging material or the package headspace to enhance the performance of the package system.

Intelligent packaging is defined as packaging that contains an external or internal indicator to provide information about the history of the package and/or the quality of the food. Sachets and pads are the most widely used forms of active packaging and the various functions which they perform are discussed in the following:

- Oxygen absorber
- Carbon dioxide absorber or emitter
- Ethylene absorber
- Ethanol emitter
- Moisture absorber

4.4.3 MODIFIED ATMOSPHERE PACKAGING

MAP can be defined as packaging of food items where atmosphere inside the packet has been modified to increase the shelf life of food products. It involves active modification or passive modification. In active modification air is displaced with a controlled, desired mixture of gases, and the process is called as gas flushing. Passive modification occurs due to respiration and the metabolism of microorganisms associated with the food. The package structure normally incorporates a polymeric film, and so the permeation of gases through the film also influences the composition of the atmosphere that develops.

4.5 LABELING

Labeling performs the communication function of packaging, informing the consumer about nutritional content, net weight, product use and so on. Labeling acts as a silent salesman through distinctive branding, as well as facilitating identification at check-outs through the Universal Product Code (UPC).

There various types of labeling which are as follows:

4.5.1 GLUED-ON LABELS : These are the simplest type and consist of sheet material (typically paper), which has been printed and cut to size. They are attached to the package with adhesive, which is applied either at the time of application, or at the time of manufacture, in which case the adhesive is activated with moisture immediately prior to application.

4.5.2 SELF-ADHESIVE (PRESSURE-SENSITIVE) LABELS : These can be made from paper, plastic or aluminum foil laminated to paper or plastic, and can be produced to adhere to a wide range of materials.

4.5.3 IN-MOLD LABELS : It offers better resistance to heat, moisture and chemical than those labels made from paper. There are also recycling advantages with film labels. IML materials must be able to withstand the container manufacturing process. The heat generated during blow molding presents a challenge to most inks because pigments can change.

4.5.4 SLEEVE LABELS : A wide range of containers can be sleeve labeled including glass bottles, plastic bottles and metal cans. Sleeve labels shrink into or stretch around contours, penetrate variable geometries and conform to irregular features.

4.5.5 HOLOGRAPHIC LABELS : Holographic labels that incorporate a hologram have large application in food packaging for both marketing and security reasons, specifically in the areas of anticounterfeiting (authentication) and brand protection. Surface relief and volume are the most common type of hologram. Surface relief holograms exhibit a characteristic rainbow-colored pattern or image. Volume, or reflection, holograms have a very different appearance to surface relief holograms and are generally used for authentication.

4.6 QUALITY CONSIDERATIONS DURING PACKING

Quality control of packed products is the last time the product is checked before reaching the customer.

Documented checking of the packages entails:

- Weight of the package
- Weight of the product
- Arrangement of the product
- Defects; and Moisture content.

The surrounding area is also checked:

- Cleanliness of the handling equipment during processing
- Calibration of the scales (automatic or manual);
- Writing on the packages;
- Satisfactory working of the metal detector (installed on every retail packing line);
- Repackaging installations and marking; and

Qualification for international standards such as ISO and HACCP

CHAPTER 5

5.1 FSSAI REGULATION

Botanical name and part used	Official name in Sanskrit	Common name	Maximum usage levels per day for use as a health or food supplement (given in terms of raw herb/material)
Terminalia belerica (Gaertn.) Roxb			
Fruit pericarp	Bibhitaka	Bahera	Adult usage levels: 3-5 g 5-16 years: ½ adult usage levels 1-5 years: ¼ adult usage levels

5.2 LABELING STANDARDS (REGULATION 2.5 OF FSS)

Labeling requirements for packaged food products as laid down in the Part 2.4 of the Prevention of Food Adulteration (PFA) Rules, 1955, and the Standards of Weights and Measures (Packaged Commodities) Rules of 1977, require that the labels contain the following information:

1. Name, trade name or description
2. Name of ingredients used in the product in descending order of their composition by weight or volume
3. Name and complete address of manufacturer/packer, importer, country of origin of the imported food (if the food article is manufactured outside India, but packed in India)
4. Nutritional Information
5. Information Relating to Food Additives, Colors and Flavors
6. Instructions for Use
7. Veg or Non-Veg Symbol
8. Net weight, number or volume of contents
9. Distinctive batch, lot or code number
10. Month and year of manufacture and packaging
11. Month and year by which the product is best consumed
12. Maximum retail price

Provided that — (i) the nutritional information may not be necessary, in case of foods such as raw agricultural commodities, like, wheat, rice, cereals, flour, spice mixes, herbs, condiments, table salt, sugar, jaggery, or non –nutritive products, like, soluble tea, coffee, soluble coffee, coffee-chicory mixture, packaged drinking water, packaged mineral water, alcoholic beverages or flour and vegetables, processed and pre- packaged assorted vegetables, flours, vegetables and products that comprise of single ingredient, pickles, papad, or foods served for immediate consumption such as served in hospitals, hotels or by food services vendors or halwais, or food shipped in bulk which is not for sale in that form to consumers.

Wherever applicable, the product label also must contains the following

The purpose of irradiation and license number in case of irradiated food. Extraneous addition of coloring material. Non-vegetarian food – any food which contains whole or part of any animal including birds, fresh water or marine animals, eggs or product of any animal origin as an ingredient, not including milk or milk products – must have a symbol of a brown color-filled circle inside a brown square outline prominently displayed on the package, contrasting against the background on the display label in close proximity to the name or brand name of the food.

Vegetarian food must have a similar symbol of green color-filled circle inside a square with a green outline prominently displayed.

All declarations may be: Printed in English or Hindi on a label securely affixed to the package, or Made on an additional wrapper containing the imported package, or Printed on the package itself, or May be made on a card or tape affixed firmly to the package and bearing the required information prior to customs clearance.

Exporters should review the Chapter 2 of the “FSS (Packaging and Labeling) Regulation 2011” and the Compendium of Food Safety and Standards (Packaging and Labeling) Regulation before designing labels for products to be exported to India. FSSAI revised the labeling Regulation and a draft notification to that effect was published on April 11, 2018, inviting comments from WTO member countries and the comments received are under review and the publication date remains unknown.

According to the FSS Packaging and Labeling Regulation 2011, “prepackaged” or “pre packed food” including multi-piece packages, should carry mandatory information on the label.

5.3 SANITARY AND HYGIENIC REQUIREMENTS FOR FOOD MANUFACTURER/PROCESSOR/HANDLER

The place where food is manufactured, processed or handled shall comply with the following requirements:

1. The premises shall be located in a sanitary place and free from filthy surroundings and shall maintain overall hygienic environment. All new units shall set up away from environmentally polluted areas.
2. The premises to conduct food business for manufacturing should have adequate space for manufacturing and storage to maintain overall hygienic environment.
3. The premises shall be clean, adequately lighted and ventilated and sufficient free space for movement.
4. Floors, Ceilings and walls must be maintained in a sound condition. They should be smooth and easy to clean with no flaking paint or plaster.
5. The floor and skirted walls shall be washed as per requirement with an effective disinfectant the premises shall be kept free from all insects. No spraying shall be done during the conduct of business, but instead fly swats/ flaps should be used to kill spray flies getting into the premises. Windows, doors and other openings shall be fitted with net or screen, as appropriate to make the premise insect free The water used in the manufacturing shall be potable and if required chemical and bacteriological examination of the water shall be done at regular intervals at any recognized laboratory.
6. Continuous supply of potable water shall be ensured in the premises. In case of intermittent water supply, adequate storage arrangement for water used in food or washing shall be made.

7. Equipment and machinery when employed shall be of such design which will permit easy cleaning. Arrangements for cleaning of containers, tables, working parts of machinery, etc. shall be provided.
8. No vessel, container or other equipment, the use of which is likely to cause metallic contamination injurious to health shall be employed in the preparation, packing or storage of food. (Copper or brass vessels shall have proper lining).
9. All Equipments shall be kept clean, washed, dried and stacked at the close of business to ensure freedom from growth of mould/ fungi and infestation.
10. All Equipments shall be placed well away from the walls to allow proper inspection.
11. There should be efficient drainage system and there shall be adequate provisions for disposal of refuse.
12. The workers working in processing and preparation shall use clean aprons, hand gloves, and head wears.
13. Persons suffering from infectious diseases shall not be permitted to work. Any cuts or wounds shall remain covered at all time and the person should not be allowed to come in direct contact with food.
14. All food handlers shall keep their finger nails trimmed, clean and wash their hands with soap, or detergent and water before commencing work and every time after using toilet. Scratching of body parts, hair shall be avoided during food handling processes.
15. All food handlers should avoid wearing, false nails or other items or loose jewellery that might fall into food and also avoid touching their face or hair.
16. Eating, chewing, smoking, spitting and nose blowing shall be prohibited within the premises especially while handling food.
17. All articles that are stored or are intended for sale shall be fit for consumption and have proper cover to avoid contamination.
18. The vehicles used to transport foods must be maintained in good repair and kept clean.

19. Foods while in transport in packaged form or in containers shall maintain the required temperature.

20. Insecticides / disinfectants shall be kept and stored separately and `away from food manufacturing / storing/ handling areas.