

## Reading Material for Processing of Red Cherry Pepper Under PMFME Scheme



### **National Institute of Food Technology Entrepreneurship and Management**

Deemed to be University (De-novo Category) under Section 3 of the UGC Act, 1956  
An Autonomous Institution under Ministry of Food Processing Industries, Government of India  
Plot no 97, Sector 56, HSIIDC, Industrial Estate, Kundli, Sonapat, Haryana – 131028  
Website: [www.niftem.ac.in](http://www.niftem.ac.in), Email: [pmfmeCELL@niftem.ac.in](mailto:pmfmeCELL@niftem.ac.in) Contact:0130-2281089

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# CHAPTER 1

## INTRODUCTION

### 1.1 STATUS OF CHERRY PEPPER

Red cherry pepper locally known as '*dalleykhursani*' is native to the hills of Sikkim and Darjeeling. It is botanically known as *Capsicum annuum* var. *cerasiforme*. It is a member of the Solanaceae family and *Capsicum* genus. Cherry Bomb pepper or Red Cherry pepper is named as such for its resemblance in size and shape to fruits that share the same name, cherries and cherry tomatoes. They are small, round shaped, fleshy and heavily seeded. They are green in colour in early stage of fruiting and turn to red when fully matured. The area under red cherry pepper is about 248 hectares in Sikkim. Cherry pepper is a kind of chilli closely related to the 'Habanero' widely used in traditional cuisine in Bhat in Nepal and Indian Himalaya.

Cherry pepper is generally grown in warm and humid climate. The crop can tolerate high temperature but cannot withstand heavy rains during growth, flowering or fruit set. Temperatures below 12°C also hampers growth and fruit set of the crop. Ideal temperature for flowering is about 20-25°C. It can be cultivated in wide range of altitudes and soils. Sandy loam soil with pH of 5.5-7.5 is ideal. Cherry pepper starts flowering after 70-80 days of planting and first picking is done at ripening stage. A single plant bears fruits for 2-3 years. Generally 8-10 pickings are done every year. The yield varies from 2-2.5 kg fruit/plant (Lepcha et. al., 2014).

The local varieties of red cherry pepper include *Nagey*, *Sanudalley*, and *Thullodalley*. Red cherry peppers have small, uniform pods, averaging 2 to 7 centimetres in both diameter and length, and are round to slightly ovate in shape attached to dark green, fibrous stems. The skin is glossy, smooth, and taut, ripening from green to dark red when mature. Underneath the surface, the flesh is thick, crisp, and aqueous, encasing a central cavity filled with many round and flat, cream-colored seeds. Cherry pepper is a traditional chilli extremely popular locally for its pungency and unique flavor. The hotness of cherry pepper ranges from moderately mild to medium hot.

### 1.2 USES AND NUTRITIVE VALUE OF CHERRY PEPPER

Cherry pepper is of ideal size for pickling or brining, and they also make for an excellent garnish on a dish. Green cherry pepper is mostly consumed as fresh. Red cherry pepper

is crunchy and juicy and it is used for making pickle, sauce, paste, powder and dry chilli. Very addictive, this chilli/pepper is a favourite side-dish with the usual 'daal-bhaat' in the Nepal-Sikkim belt. Commonly used for chutneys and sauces along with momos, it is regularly consumed in winters as it keeps the body warm. The most commonly used form of it is the fermented pickle *Dalley*. Apart from food uses, *Dalleykhorsania* also has many medicinal benefits.

Fresh cherry pepper contains about 84-88% wb moisture content. It is an excellent source of vitamin A and C, which are important antioxidants (Lee & Howard, 1995). The Vitamin C content in fresh red cherry pepper is about 1000-1010 mg/100 g dry matter. It also has significant amounts of vitamin B, iron, thiamine, niacin, magnesium and riboflavin. It is cholesterol-free, saturated fat-free, low in calories, low in sodium and high in fiber. The amount of capsaicin in hot peppers varies very significantly between varieties. The Capsaicin content in fresh red cherry pepper is around 1 g/100g in dry weight. It is one of the hottest chilli peppers with a Scoville rating of 100,000 to 350,000 SHU (in comparison Naga King chilli has Scoville rating of 330,000-1,000,000 SHU). Pure capsaicin has Scoville rating of 16,000,000 SHU.

### **1.3 MARKET INSIGHTS**

India is not only the largest producer but also the largest consumer of chilli in the world. Chillies are the most common spice cultivated in India. India contributes about 36% to the total world production. Indian chillies have been dominating International market for several years. Owing to the sweet-tingly taste, *Dalley* has now become a very widely used chilli in the North-Eastern regions of India. It is also very popular with foreign tourists coming to Sikkim. Hence, Sikkim Government is encouraging the growth of *Dalley* for exports. The new age urban population around the world including India is extremely health conscious which is causing rise in demands for organic products. Moreover, Sikkim has been declared as Agri-Export Zone for cherry pepper and an 'organic state'.

Red cherry pepper is grown organically in Sikkim and Darjeeling area. This organic pepper can be processed into a variety of products viz., cherry pepper pickle, dried cherry pepper powder and flakes. Chilli powders have their niche market both in India and globally. Pickles are most suitable for small-scale manufacturers. When preserved properly they carry a low risk of food poisoning and have a long shelf life. Pickles can be made using relatively simple equipment that is readily available in most places. The three biggest sectors for marketing of

cherry pepper and its products include retail, industrial and catering sector. Hence, processing of red cherry pepper has huge potential as a remunerative enterprise/business.

## **CHAPTER 2**

### **PROCESSING OF RED CHERRY PEPPER**

Red cherry pepper is one of the valuable cash crops of Sikkim. It is highly popular because of its diverse commercial uses. Red cherry pepper can be processed into many products viz. Red cherry pepper pickle, brined cherry pepper and dried cherry pepper flakes & powder etc. Processing of red cherry pepper starts after harvesting.

#### **2.1 HARVESTING OF RED CHERRY PEPPER**

Harvesting is done when the cherry pepper pods are well ripened. At maturity, the skin colour of the pods should be at least 50% red. During picking/harvesting, the fruit should be gently lifted from the plant without any mechanical damage to the stem. Harvesting should be done during early mornings. It should be avoided during rains or just after rains. The harvested pods are kept in heaps or in bamboo baskets either indoor or in shade away from direct sun light for 2 or 3 days so as to develop uniform red colour.

#### **2.2 RED CHERRY PEPPER FLAKES AND POWDER**

Dried red cherry pepper flakes and powder belong to its high value processed products segment. In addition to the high value, these also have longer shelf life leading to lower spoilage and post-harvest losses. Production of red cherry pepper flakes and powder consist of the following unit operations. The unit operations have been discussed in the following sections.

- Pre-sorting
- Sorting
- Destemming
- Blanching
- Drying
- Grinding
- Packaging

##### **2.2.1 PRE-SORTING**

Pre-sorting is the first operation cherry pepper powder and flakes processing which refers to the removal of unmarketable material. This is because handling of plant material that cannot

be sold is costly. This is performed prior to sorting. This step involves the removal of stones, leaves, over mature, too small, severely damaged, deformed or rotting units. All discarded material should be quickly hauled away from the processing area. Bruised, rotted, off-shaped units, wilted or yellow leaves are usually removed by hand.

### **2.2.2 SORTING**

Sorting is another basic operation undertaken to ensure uniform quality final product. For cherry pepper powder or flakes production, colour is the foremost criteria for sorting. Manual visual sorting can be done for selection of fully ripen uniform red cherry peppers. Colour sorters can also be used for sorting. However, colour sorter are costly.

### **2.2.3 DESTEMMING**

Destemming refers to removal of the stems from the selected cherry pepper. It is essential to reduce the drying load of the dryer. Manual destemming by hand is currently practiced for cherry pepper.

### **2.2.4 BLANCHING**

Blanching is a thermal treatment for cherry pepper in which hot water or steam can be used to heat the product. The main objective of blanching is to inactivate enzymes responsible for quality degradation such as browning, colour and textural changes. Either hot water or steam blanching can be followed. Hot water blanching can be carried out by immersing the cherry peppers in hot water at 100°C for 3 minutes. Electrical hot water blanchers can be used for this purpose. Blanching can also be carried out in large stainless steel containers using hot boiling water. After blanching, the cherry peppers go through rapid cooling in either cold water or cold air for better quality retention.

### **2.2.5 DRYING**

Red cherry peppers contain 84-88% wb moisture content. This moisture content needs to be reduced to less than 8-10% wb for longer shelf life through drying. Various drying methods viz., traditional sun drying, solar drying, hot air drying, vacuum drying etc. can be employed for drying cherry pepper. Each drying method has its own advantages and disadvantages. Selection of drying method is dependent on the cost involved, availability of the machinery and quality of final product desired.

## **TRADITIONAL SUN DRYING**

In traditional sun drying, cherry peppers are dried in sun by spreading on clean dry polythene sheets, cemented / concrete drying yards or even on the roofs of houses etc. Frequent stirrings are given during day time in order to get uniform drying and prevent mould growth. Traditionally, sun drying of chillies is carried out immediately after harvesting without any special form of treatment like blanching. Sun drying of cherry pepper takes about 10-15 days depending on prevailing weather condition. The yield of dried cherry peppers is about 15-20 kg from 100 kg fresh chillies. This is mostly practiced in villages and in cottage scale. However, traditional sun drying has the following inherent problems:

- Contamination of the products by dust, and dirt
- Some percentage will usually be lost or damaged
- Labour intensive
- Nutrient, pungency and colour loss
- Weather dependent and non-uniform drying

## **SOLAR DRYING**

A safer alternative to open sun drying is solar dryer. Solar drying refers to methods of using the sun's energy for drying, but excludes open air '*sun drying*'. Solar dryer consists of a chamber with a transparent top and blackened interior surfaces. Chillies are placed in wire mesh trays in a transparent enclosure of glass or plastic. Ventilation holes in the base and upper parts of side walls maintained a natural air circulation. A chimney may be provided to exhaust the warm air in absence of vent holes. The product is heated by direct radiation of sunlight and some reflected radiation. The drying chamber is usually painted black to absorb the maximum amount of heat. This is a more efficient method of drying that produces better quality products, but it also requires initial investments. If drying conditions such as weather and food supply are good, natural circulation solar energy, solar dryers appear to be increasingly attractive as commercial proposition.

There are many types of solar dryers (Fig. 2.1) which can be employed for drying cherry pepper. In recent years, walk in type solar tunnel dryers (Fig. 2.2) are gaining more attention in large scale low cost drying of cherry pepper. The solar tunnel dryer is a tunnel like semi cylindrical in shape, poly house made up of acrylic polythene sheet. Cherry pepper can be spread on the floor on a polythene sheet or in wire mesh trays placed in racks. The dryer can



be easily constructed on floor or above terrace. Capacity of this dryer can vary from 50 kg to 1000 kg. The drying time for cherry pepper in this dryer is about 2-3 days. This dryer is an efficient dryer; however, the weather dependency makes the dryer unsuitable especially in rainy season.



**Fig. 2.1 Solar dryer**



**Fig. 2.2 Solar tunnel dryer**

## **MECHANICAL HOT AIR DRYING**

Hot air drying of cherry pepper is another suitable option of getting good quality dried cherry peppers. Hot air drying is carried out in mechanical tray dryers (Fig. 2.3). It consists of an insulated cabinet fitted with shallow mesh or perforated trays, each of which contains a thin (2–6 cm deep) layer of cherry pepper. Hot air is blown through a blower at 0.5–5 m/s through a system of ducts and baffles to promote uniform air distribution over and/or through each tray. Air heaters can be direct gas burners, or electrical heaters. By means of a damper system, part of the air can be recycled and discharged. In that case, it is known as recirculatory tray dryer. Drying chillies in these dryers takes about 14-16 hours at 60°C. This is suitable for small scale batch drying. It has low capital and operating cost, and flexible. Quality of final dried product is better than solar dried product.

## **VACUUM DRYING**

Vacuum drying is another alternative drying method that can be effectively used for heat sensitive high value cash crops like cherry pepper (Boris et al., 2018). Since, drying takes place in absence of air/oxygen and at temperatures below 75°C, the nutrients (vitamins) and colour retention in dried cherry pepper is higher compared to sun dried or hot air dried products. Vacuum shelf driers (Fig. 2.4) consist of hollow shelves in a vacuum chamber. Cherry peppers are placed in thin layers on flat metal trays which are carefully made to

ensure good contact with the shelves. A pressure of 1–30 mm Hg is maintained in the chamber using a vacuum pump. Steam or hot water is passed through the shelves to dry the food. Sometimes radiation heaters are provided on the cylinder wall to supply heat for drying. Drying takes place through conduction from hot plates/shelves. The vapours produced are removed by a condenser. Drying time of cherry peppers in this dryer ranges from 8-9 hours at 60°C.



**Fig. 2.3**Tray dryer



**Fig. 2.4**Vacuum dryer

### **2.2.6 GRINDING**

Grinding of dried cherry peppers to suitable size is referred to as milling. During grinding, the dried cherry peppers are ground to fine powder for production of red cherry pepper. The dried products can be coarsely ground to produce dried cherry pepper flakes. Hammer mills/grinders (Fig. 2.5) can be used for grinding dried cherry pepper. Cherry pepper should be ground to a size of less than 500 $\mu$ .

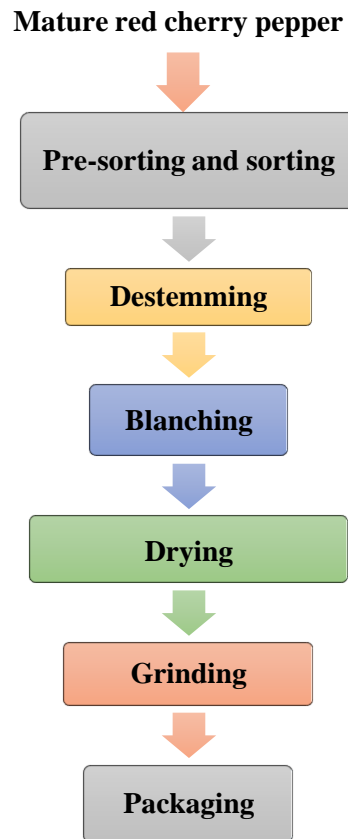


**Fig. 2.5**Grinder

### **2.2.7 PACKAGING**

Red cherry pepper powder should have final moisture content about 8-10%wb for safe storage. The powder/flakes should be packed in laminated polythene pouches for long term storage. Hand sealers and Form-Fill-Seal (FFS) packaging machines can be used for packaging of powder and flakes.

Fig. 2.6 shows the process flow chart for production of cherry pepper flakes/powder.



**Fig. 2.6** Process flow chart for red cherry pepper flakes/powder

## **2.3 RED CHERRY PEPPER PICKLE**

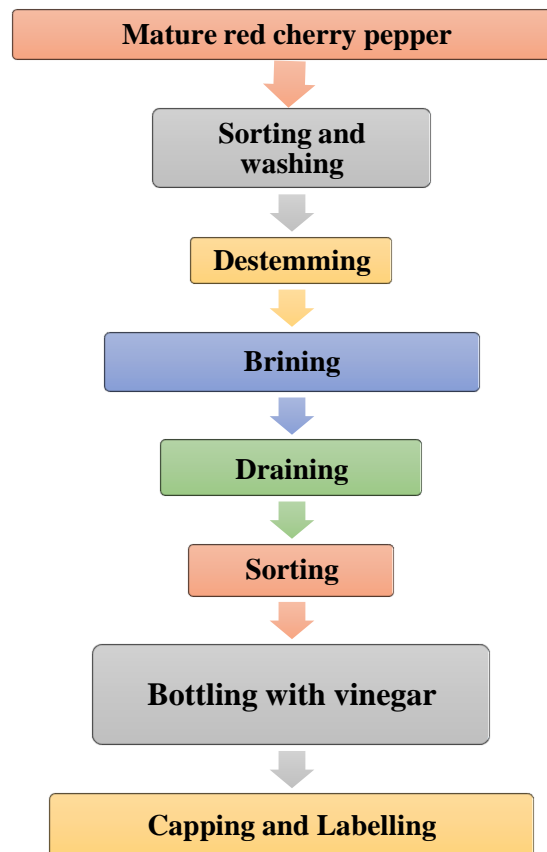
Pickling is one of the most ancient methods of preservation. Pickles are good appetizers and add to the palatability of a meal. They stimulate the flow of gastric juice and thus help in digestion. They are eaten as a savoury, spicy accompaniment to a meal. Pickles are preserved by a combination of increased acidity (reduced pH), added salt, reduced moisture and added spices. Many types of pickles can be prepared from red cherry pepper. Most popular types of *Dalley* pickle are vinegar pickle and oil pickle.

### **2.3.1 RED CHERRY PEPPER VINEGAR PICKLE**

Fig. 2.7 shows the process flowchart for production of red cherry pepper vinegar pickle. In the manufacture of cherry pepper pickle, fresh mature healthy red cherry peppers are selected and washed. The cleaned cherry peppers are destemmed manually. The destemmed chillies are then dipped in 5% brine solution for 2-3 days. For pickling, any type of common salt is suitable as long as it is pure. Iodized table salt darkens pickles. Salt that contains chemicals to

reduce caking should be avoided as the chemicals will make the brine cloudy. Salt with lime impurities can reduce the acidity and shelf life of the product. Salt with iron impurities can cause blackening of the vegetables. Salt with magnesium gives a bitter taste to the pickles. Salt containing carbonates can result in pickles with a soft texture. For long term preservation, sodium benzoate @ 0.02% may be added.

The soaked peppers are then drained and sorted for selecting whole round unshrivelled pepper. The cherry peppers are then filled in pre-cleaned dry PET/glass bottles or jars with vinegar @ 2-5%. The vinegar used for pickling should have an acidity standard of 5%. The pickling vinegar is white distilled vinegar. Colored vinegar should be avoided as it imparts colour to the pickle. The bottles are then capped and labelled.

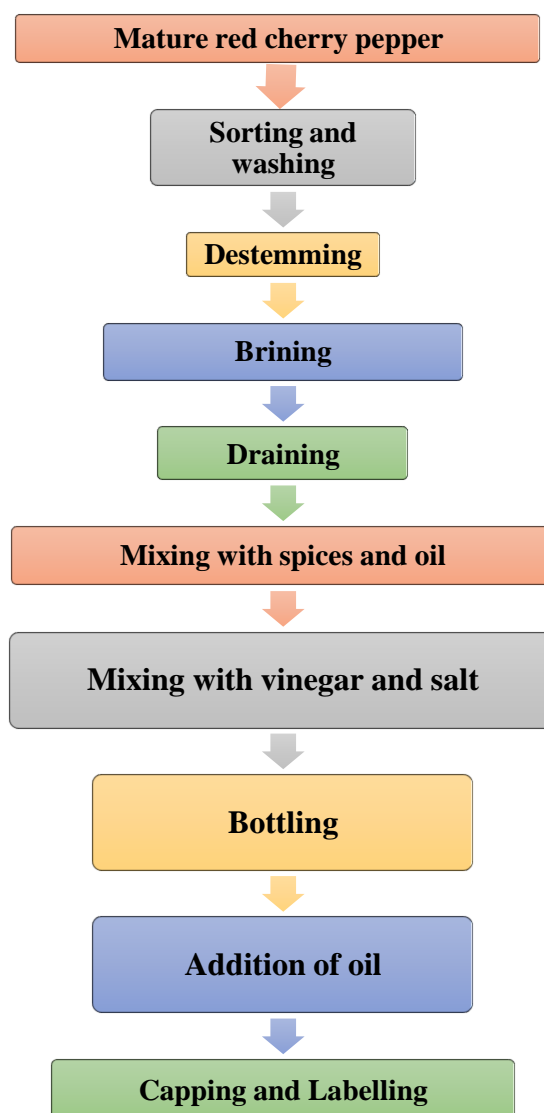


**Fig. 2.7** Process flow chart for red cherry pepper vinegar pickle

### **2.3.2 RED CHERRY PEPPER OIL PICKLE**

In oil pickles, vegetable oil is added to the pickle. It is often mixed with the spices to make a paste. Top quality vegetable oil should be used. In India, mustard oil is commonly used. Fig. 2.8 shows the process flowchart for production of red cheery pepper oil pickle. In the manufacture of cherry pepper oil pickle, fresh mature healthy red cherry peppers are selected

and washed. The cleaned cherry peppers are destemmed manually. The destemmed chillies are then dipped in 5% brine solution for 2-3 days. For long term preservation, sodium benzoate @ 0.02% may be added. The soaked peppers are then drained and mixed with spices (turmeric powder, mustard seeds, fennel seeds or *saunf*, carom seeds or *ajwain*) and oil in a mixer. Spices used should be good quality, clean and free of mould and insects. They can be roasted or fried before adding to the pickle mixture. After mixing, vinegar and salt are added to the pickle mix and mixed thoroughly. The cherry pepper pickle is then filled in pre-cleaned dry PET/glass bottles or jars. Oil is also poured onto the top of pickles to form a barrier against oxygen. The bottles are then capped and labelled.



**Fig. 2.8** Process flow chart for red cherry pepper oil pickle

## CHAPTER 3

### PACKAGING OF PROCESSED RED CHERRY PEPPER PRODUCTS

For a long time packaging plays an active role in preservation and retention of quality of processed products. Due to increased demands on product safety, shelf-life extension, cost efficiency, environmental issues and consumer convenience, packaging has gained prominent role in recent years. The shelf life of processed cherry pepper products is dependent up on the type of packaging materials. In order to select a suitable packaging material for red cherry pepper powder, flakes and pickle, it is essential to know which factors affect their quality. Following are some of the factors which affect the quality of these products.

#### 3.1 FACTORS AFFECTING QUALITY OF PROCESSED RED CHERRY PEPPER PRODUCTS

##### 3.1.1 MOISTURE CONTENT

Moisture content is an important factor for deciding the quality of packaged red cherry pepper powder and flakes. Improperly packed red cherry pepper powder is hygroscopic in nature and absorbs moisture from the surroundings resulting in soggy and lump/cake formation powder. This reduces the flowability and hence, the market value of the product.

##### 3.1.2 LOSS OF COLOUR

The bright red colour of cherry pepper powder and flakes is its unique characteristics. This colour is due to its natural pigments. Packaging the powder/flakes in transparent packages which transmit light may lead to loss of these colouring pigments leading to discolouration of the powder. Loss of colour in cherry pepper pickles is not observed in a properly packed product.

##### 3.1.3 LOSS OF AROMA AND FLAVOUR

The unique pungency and aroma of red cherry pepper powder/flakes is attributed to the volatile oils present in *Dalleykhorsani*. Losses in these volatile oil content or oxidation of some aromatic compounds due to higher temperature of storage may lead to loss of aroma and flavour. In case of *dalleykhorsani* pickle, the flavour/aroma is attributed to both the cherry pepper and the spices added into it. Proper packaging and normal storage temperatures are essential to prevent loss of aroma and flavour of pickles.

### **3.1.4 INSECT INFESTATION**

Red cherry pepper powder/flakes is prone to spoilage due to insect infestation, which can be further accelerated due to high humidity, heat and oxygen. In pickles, insect attack is not prevalent.

### **3.1.5 MICROBIAL CONTAMINATION**

In humid regions having relative humidity of 65% and above, moisture absorption occurs in cherry pepper powder/flakes. The increase in moisture content of the powder also increases its water activity. Microbial growth occurs when water activity becomes more than 0.6. In cherry pepper pickles, the oil and vinegar protects the quality of the product in terms of microbial spoilage. However, fungus growth may be observed if the product is not properly packed and exposed to air.

## **3.2 PACKAGING MATERIALS FOR RED CHERRY PEPPER POWDER AND FLAKES**

Red cherry pepper powder/flakes should be packed in clean, sound and dry containers. These containers can be made of metal glass, food grade polymers, wood or jute bags. The packing material shall be free from any fungal or insect infestation and should not impart any foreign smell. Each container shall be securely closed and sealed. Depending up on the type of packaging viz., bulk packaging, consumer packaging etc. the packaging quantity and material are selected.

### **3.2.1 BULK PACKAGING**

In bulk packaging, the current trend is to use Flexible Intermediate Bulk Containers (FIBCs) commonly known as Jumbo bags. These bags have a capacity of up to 1 tonne. In general these bags are made from cloth, but at present mainly from plastic (PP) fabric, which can be laminated or provided with an inner plastic liner bag. The PP fabric is stabilized against UV degradation. The bags are provided with filling and discharge spouts and slings for hanging during loading/ unloading operations.

### **ADVANTAGES OF JUMBO BAGS**

- ✓ Bags are light in weight and, so transportation costs are reduced
- ✓ Bags are flexible, collapsible and durable

- ✓ Can be used for packaging of powder and flakes
- ✓ Product wastage / spillage and tampering is minimum
- ✓ Less labour is required due to minimum handling
- ✓ Saving in time for loading and unloading

### **3.2.2 INSTITUTIONAL PACKAGING**

The capacity of institutional packs ranges from 2kg to 10kg. The traditional materials that were used such as tinplate containers and jute bags are currently being replaced by materials such as laminated flexible pouches and plastic woven sacks. The sacks are usually Biaxially oriented polypropylene (BOPP)multicolorprinted laminated PP Woven bags. These bags may be gussetedto provide enforcement and have window and micro perforation.

### **3.2.3 CONSUMER PACKAGING**

Consumer packaging is used for both domestic and international marketing. The selection of the correct packaging material depends upon a number of factors, which are broadly listed below:

- Desired shelf-life
- Climatic conditions during storage, transportation and distribution
- Type/ sector of market
- Consumer preferences
- Printability and aesthetic appeal

### **TYPES OF CONSUMER PACKAGING**

- Glass bottles of various sizes and shapes with labels and provided with metal or plastic caps. The plastic caps have added inbuilt features of tamper evidence, dispensing, grinding etc.
- Printed tinplate container with/without dispensing systems
- Compositecontainers with dispensers
- Plastic containers with plugs and caps with dispensing and tamper evidence features
- Printed flexible pouches – pillow pouch, gusseted pouch, stand-up pouch.
- Lined cartons

The printed flexible pouches have recently become very popular due to their easy availability, excellent printability, light weight, machinability and cost-effectiveness. Also, depending



upon the functional and marketing requirements, the laminate/film can be tailor made to serve a specific need.

The printed flexible pouches are generally laminates of various compositions. Some of the commonly used laminates are:

- Polyester/ metallised polyester/LDPE
- BOPP/LDPE
- BOPP/ metallised polyester/LDPE
- Polyester/Al foil/LDPE

3 ply laminates such as 12 $\mu$  PET/ Print/ 12 $\mu$  Met. PET/ PE can avoid delamination and prevents smudging and de-figuring of the print. Polyester and BOPP based laminates are generally more popular for spice packaging due to certain advantageous characteristics of each of these two films.

Polyester used for lamination is generally 10 or 12 $\mu$  thick. The film is highly transparent with excellent clarity, gloss and printability thus enhancing the sales appeal. The film has very low moisture and gas permeability and, therefore, ensures prolonged shelf life of the contents with aroma, flavour and taste retention. The very high mechanical strength (tear, puncture, burst and flex) minimises damage to the contents during handling and transportation. The film has good machinability as well as printability. The latest printing technologies help in improving sales promotions. The film is free from additives and, therefore, does not impart any odour or taint to the sensitive spice product that is packed.

BOPP films may be heat sealable or non-heat sealable. The film has high yields, is stable under climatic changes and has excellent moisture barrier. This film is smooth, glossy, crystal clear and has high mechanical strength and non-contamination property for food contact applications.

Table 3.1 shows the packaging specifications for flexible packs of ground consumer spices, framed by the Indian Institute of Packaging.

**Table 3.1 Packaging specifications for flexible packages of ground consumer spices**

<b>Co-extruded films (up to 500 grams capacity)</b>	<b>Laminates/Co-extruded films (up to 1000 grams capacity)</b>
12 $\mu$ PET / 37.5 $\mu$ LD-HD (30% HD)	12 $\mu$ PET/50 $\mu$ LD-HD (30% HD)
12 $\mu$ MET PET / 37.5 $\mu$ LD-HD (30% HD)	12 $\mu$ MET PET / 50 $\mu$ LD-HD (30% HD)
12 $\mu$ PET / 50 $\mu$ PP	12 $\mu$ PET / 62.5 $\mu$ PP
12 $\mu$ MET PET / 50 $\mu$ PP	12 $\mu$ MET PET / 62.5 $\mu$ PP
10 $\mu$ PET / 9 $\mu$ Al. foil / 37.5 $\mu$ LD-HD (30% HD)	10 $\mu$ PET / 9 $\mu$ Al. foil / 50 $\mu$ LD-HD (30% HD)
12 $\mu$ Al. foil / 37.5 $\mu$ LD-HD (30% HD)	12 $\mu$ Al. foil / 50 $\mu$ LD-HD (30% HD)
25 $\mu$ BOPP / 37.5 $\mu$ LD-HD (30% HD)	25 $\mu$ BOPP / 50 $\mu$ LD-HD (30% HD)
25 $\mu$ MET BOPP / 37.5 $\mu$ LD-HD (30% HD)	25 $\mu$ MET BOPP / 50 $\mu$ LD-HD (30% HD)
35 $\mu$ BOPP / 25 $\mu$ BOPP	35 $\mu$ BOPP / 35 $\mu$ BOPP
30 $\mu$ LD – 7.5 $\mu$ Tie - 25 $\mu$ PA – 7.5 $\mu$ Tie - 30 $\mu$ LD-HD (30% HD)	30 $\mu$ LD – 7.5 $\mu$ Tie - 30 $\mu$ PA – 7.5 $\mu$ Tie - 40 $\mu$ LD-HD (30% HD)
The LD or LD-HD layer could also be LLD (outer) or LLD-HD (inner or outer) or EAA layer (outer)	The LD or LD-HD layer could also be LLD (outer) or LLD-HD (inner or outer) or EAA layer (outer)

### 3.3 PACKAGING MATERIALS FOR RED CHERRY PEPPER PICKLE

Clean glass jars with lids are the preferred type of packaging material for cherry pepper pickles. Glass bottled pickles are almost double in cost because of heavy packing and transportation costs. Glass jars can be used for both consumer and bulk packaging.

HDPE (High density polyethylene) and PET (polyethylene terephthalate) jars are usually used for packing pickles of 1kg and more. HDPE jars are opaque, convenient and break proof. They do not provide visibility. The PET jars are transparent, with good eye appeal and safe for pickle. PC (polycarbonate) bottles are best for pickles but they are still very costly.

Now-a-days, consumer packaging of pickles is done in flexible pouches. The capacity of the pouches ranges from 200 g to 1 kg. The pouches could be flat pillow type or stand-up pouches for shelf display. These are light in weight and hygienic. However, in flexible pouches, the

sealant layer selection is very critical, as the contact layer needs to be acid and oil resistant. Failure of seals or surface stickiness can render the pack ineffective and un-saleable.

The flexible packaging of pickles in simple LDPE (low density polyethylene) pouch, does not provide protection from oxygen. It also does not give an effective heat seal, as LDPE is not compatible with oil, causing failure of pouches. Hence, cost effective flexible pouches of co-extruded and laminated structures are now gaining more attention for packing cherry pepper pickles. The typical structures of these laminated packages are:

- 100  $\mu$  HD – LD – HDPE
- 140  $\mu$  LD – HDPE
- 110  $\mu$  LLDPE – BA – Nylon – BA – LLDPE
- 20  $\mu$  BOPP / 50  $\mu$  LD – HD (or Cast PP or EAA)
- 12  $\mu$  Polyester / 75  $\mu$  LD – HD
- 12  $\mu$  Metallised Polyester / 100  $\mu$  LD – HD

## CHAPTER 4

### FSSAI REGULATIONS AND STANDARDS

#### 4.1 DEFINITION AND STANDARDS FOR RED CHERRY PEPPER POWDER

According to the FSSAI standards, Chillies and Capsicum (LalMirchi) powder means the powder obtained by grinding clean ripe fruits or pods of *Capsicum annum L* and *Capsicum frutescens L*. It shall be free from mould, living and dead insects, insect fragments, rodent contamination. The powder shall be dry, free from dirt, extraneous colouring matter, flavouring matter, mineral oil and other harmful substances. The chilli powder may contain any edible vegetable oil to a maximum limit of 2.0 percent by weight under a label declaration for the amount and nature of oil used.

##### 4.1.1 FSSAI STANDARDS FOR RED CHERRY PEPPER POWDER

The FSSAI standards of Red Chilli powder can be adopted for red cherry pepper powder. These standards are given in Table 4.1.

**Table 4.1 FSSAI Standards for Red Cherry Pepper Powder**

Parameters	Limits
Moisture content	Not more than 11.0 percent by weight
Total ash on dry basis	Not more than 8.0 percent by weight
Ash insoluble in dilute HCl on dry basis	Not more than 1.3 percent by weight
Crude fibre	Not more than 30.0 percent by weight
Non-volatile ether extract on dry basis	Not less than 12.0 percent by weight

##### 4.1.2 MICROBIAL STANDARDS FOR RED CHERRY PEPPER POWDER

The microbial standards for red cherry pepper powder are given in Table 4.2.

**Table 4.2 Microbial Standards for Red Cherry Pepper Powder**

Requirement	Standard
Salmonella	Absent in 25 g

## 4.2 DEFINITION AND STANDARDS FOR RED CHERRY PEPPER PICKLE

As per the general definition for pickles in FSSAI, pickles means the preparation made from fruits or vegetables or other edible plant material including mushrooms free from insect damage or fungal infection, singly or in combination preserved in salt, acid, sugar or any combination of the three. The pickle may contain onion, garlic, ginger, sugar jaggery, edible vegetable oil, green or red chillies, spices, spice extracts/oil, lime juice, vinegar/ acetic acid, citric acid, dry fruits and nuts. It shall be free from copper, mineral acid, alum, synthetic colours and shall show no sign of fermentation.

### 4.2.1 FSSAI STANDARDS FOR RED CHERRY PEPPER PICKLE

The FSSAI standards of general pickle can be adopted for red cherry pepper pickle. These standards are given in Table 4.3.

**Table 4.3 FSSAI Standards for Red Cherry Pepper Pickle**

Type of pickle	Parameters	Limits
Oil pickle	Drained Weight	Not less than 60.0 percent
	Fruit and Vegetable pieces shall be practically remaining submerged in oil	
Vinegar pickle	Drained Weight	Not less than 60.0 percent
	Acidity of vinegar as acetic acid	Not less than 2.0 percent

### 4.2.2 MICROBIAL STANDARDS FOR RED CHERRY PEPPER PICKLE

The microbial standards for red cherry pepper powder are given in Table 4.4.

**Table 4.4 Microbial Standards for Red Cherry Pepper Pickle**

Requirement	Standard
Salmonella	Absent in 25 g

## **4.3 LABELLING**

Labelling is a compulsory requirement for sale of all food products sold in India. The labelling of pre-packaged food products must comply with the Food Safety and Standards (Packaging and labelling) Regulations, 2011. As per the rules, pre-packaged food means food, which is placed in a package of any nature, in such a manner that the contents cannot be changed without tampering it and which is ready for sale to the consumer.

### **4.3.1 GENERAL LABELLING REQUIREMENTS**

The following labelling requirements must be complied with by all prepackaged food sold in India.

- The label must be in English or Hindi or Devnagri language. In addition to the above, the label can contain information in any other language, as required.
- The label must not contain information about the food that could be deemed to be false, misleading, deceptive or otherwise create an erroneous impression regarding the product.
- The label must be affixed to the container in such a manner that it would not easily be separated from the container.
- The contents or information presented in the label should be clear, prominent, indelible and readily legible by the consumer.
- If the container is covered by a wrapper, then the wrapper must contain necessary information or make the label of the product inside readily legible by not obscuring.
- The name of the food must be mentioned along with the trade name and description of the food contained.
- In case the food contains more than one ingredient, then a list of ingredients must be presented in descending order of their composition by weight or volume, as the case may be, at the time of its manufacture.

### **4.3.2 FSSAI GUIDELINES ON LABELLING OF FOOD PRODUCTS**

According to FSSAI Guidelines on labelling of Food Products, the various characteristics which should be mentioned in the label are:

#### **a) Name of the food**

Name of the food/product is one of the first FSSAI Guidelines on Labelling of Food Products. The name of the food product should be in clear format on the packaged product in clear font.

**b) List of ingredients**

List of Ingredients means the elements which have been utilized for making the final product. It is necessary to mention all the ingredients of the product by the manufacturer.

**c) Nutritional information**

Nutritional information of the product must be mentioned in terms of calories, fats, saturated fat, trans fat, cholesterol, sodium, carbohydrates, dietary fiber, sugars, protein, vitamin A, vitamin C, calcium, and iron present in the product.

**d) Declaration regarding Vegetarian or Non-Vegetarian**

According to the FSSAI Guidelines on Labelling of Food Products, the manufacturer on the label should mention whether the product is vegetarian or non-vegetarian. Whether the product is vegetarian or non-vegetarian can easily be known by just looking at the small sign present on the corner of the label. Green colour circle inside a green colour square(Fig. 4.1) indicates the product being vegetarian and brown colour triangle inside a brown square(Fig. 4.2) indicates that the product is non-vegetarian.



**Fig. 4.1 Symbol for veg products**



**Fig. 4.2 Symbol for Non-veg products**

**e) Declaration regarding food additives**

Food additives are substances which are added to food in order to preserve flavor or enhance its taste and appearance. Hence, it is very necessary to give a declaration regarding the additives added on the label or the package.

**f) Name and address of the manufacturer**

The name of the manufacturer and place of the manufacturing is to be mentioned. The manufacturer has to give complete address of his factory which includes street address, city, state, and zip code.

**g) Net Quantity**

Net Quantity refers to the weight of the product which needs to be mentioned in the label.

**h) Code No./Lot No./Batch No**

A batch number or code number or lot number is a mark of recognition through which the food can be found in the manufacture and even recognized in the distribution. Therefore, the Code No./Lot No./Batch No should be mentioned by the manufacturer according to FSSAI Guidelines on Labelling of Food Products.

**i) Date of manufacture and Best Before & Use By Date**

The date of manufacture is when the product has been manufactured. Best Before & Use By Date means by what date and month should the product be consumed. If the product is consumed after expiry date, chances of harm to of the human are there.

**j) Instructions for use**

According to FSSAI Guidelines on Labelling of Food Products, the Instructions for Use should be mandatorily mentioned. It refers to instructions regarding how to utilize the product.



## SUGGESTED LITERATURE

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3. NPCS Board of Food Technologists.2020. Handbook on Manufacture of Indian Kitchen Spices., 4<sup>th</sup> Edition, NIIR PROJECT CONSULTANCY SERVICES, India

**PLANT & MACHINERY SUPPLIERS**

**1. Acufil Machines**

S. F. No. 120/2, Kalapatty Post Office Coimbatore - 641 035 Tamil Nadu India

Tel: +91 422 2666108/2669909

Fax: +91 422 2666255

Email: [acufilmachines@yahoo.co.in](mailto:acufilmachines@yahoo.co.in), [acufilmachines@hotmail.com](mailto:acufilmachines@hotmail.com)

**2. Packaging Solution**

12/46, Site-II, Loni Road Industrial Area,

Mohan Nagar, Ghaziabad, Uttar Pradesh, INDIA

[packagingsolutionindia@gmail.com](mailto:packagingsolutionindia@gmail.com) , [pankaj@pakagingsolutionindia.com](mailto:pankaj@pakagingsolutionindia.com)

Tel: 09310352152/ 09818293306

**3. Bombay Engineering Works**

Navyug Industrial Estate 185 TokerseyJivraj Road Opposite Swan Mill, Sewree (W) Mumbai  
400015 India

Tel: +91 22 24137094/24135959

Fax: +91 22 24135828

E-mail: [bomeng@vsnl.com](mailto:bomeng@vsnl.com)

**4. Mechpro Engineering**

Plot No 3, Gat No. 1573, DehuAlandi Road

Talwade, Pune - 412114 Maharashtra, India

Website: [www.mechproengineering.com](http://www.mechproengineering.com)

Tel: 08048858345

**5. Fry-Tech Food Equipment Private Limited**

S. No. 4, Raviraj Industrial Estate,

BhikhubhaiMukhiKaKuwaBharwadwash,

Ramol, Ahmedabad - 380024

Gujarat, India

**6. Hindustan Vibrotech Pvt. Ltd.**

Office No. 2, Ground Floor,  
Vrindavan Building, Vile Parle East, Mumbai – 400057  
Maharashtra, India.

**7. Premium Engineers Pvt Ltd**

Plot No 2009, Phase IV, GIDC Vatva,  
Ahmedabad- 382445, India  
Tel: +91 79 25830836  
Fax: +91 79 25830965

**8. Master Mechanical Works Pvt Ltd.**

75, Link Rd., LajpatNagarIII, New Delhi-1100243

**9. Gardeners Corporation,**

158, Golf Links, New Delhi-110003  
Tel: +91 11 3344287/3363640  
Fax: +91 11 3717179

**10. AvityAgrotech and Industries**

No.490-491, c-1 Chandan Complex, G.I.D.C,  
Makarpura, Vadodara – 390010 Gujarat  
Ph. 0844 7570776  
[www.avityagrotech.com](http://www.avityagrotech.com)

**11. YagnamPulverier Private Limited**

Plot no. R-869.Rabale M.I.D.C., Thane- Belapur Road,  
Navi Mumbai – 400701, Maharashtra  
Ph. 08447526964  
[www.lithtechindia.com](http://www.lithtechindia.com)

**12. Best Engineering Technologies**

Plot. No. 69-A, No. 5-9-285/13, Rajiv Gandhi Nagar,  
Industrial Estate, Kukatpally, Hyderabad – 500037,

Ph. 08447523620

[www.bestengineeringtechnologies.com](http://www.bestengineeringtechnologies.com)

### **13. Gurdeep Packaging Machines**

Harichand Mill compound LBS Marg

Vikhroli, Mumbai-400079, India

Tel: +91 22 2578 3521/577 5846/579 5982

Fax: +91 22 2577 2846

### **14. Rank and Company**

A-p6/3, Wazirpur Industrial Estate

Delhi – 110 052, India

E-mail: [Rank@poboxes.com](mailto:Rank@poboxes.com)

Tel: +91 11 7456101/ 27456102

Fax: +91 11 7234126/7433905