



PM Formalisation of Micro Food Processing Enterprises Scheme

Processing of Lime Squash



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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Lime (*Lime aurantifolia*) belongs to family rutaceae is the third important lime fruit crop in India next to mandarins and sweet oranges. This lime species is grown in every state of India, but the leading producer states are Andhra Pradesh, Maharashtra, Assam and Karnataka. Out of the total production, only 1 per cent lime fruits is used for processing and approximately 0.5 per cent processed products of lime are exported to the other countries. Lime is not eaten directly due to sour in taste, but can be consumed as squash.

Fruits, whether fresh or dried, have always formed a part of the staple diet of human beings. The reason for this is that, they are rich in nutrients and provides some of the essential minerals and vitamins which are useful to our body. Fruit is rich in vitamin C, excellent source of calcium, phosphorus, iron. Besides, high nutritive value, it is well for its excellent medicinal properties.

Limes contain unique flavonoid compounds that have antioxidant and anti-cancer properties, but it is a natural antiseptic and smells divine. It is a digestive stimulant and improves both digestion and appetite. Lime juice added to one meal each day helped protect people from contracting cholera, cramping. The vitamin C in lime juice boosts immune function and acts as one of the most powerful dietary antioxidants. Lime has been shown to have both medicinal and cosmetic values.

Lime juice benefits are very diverse, Lime juice can be used as a flavoring food, beverages, refreshments, citric acid preservative and cleaning up the rust on the dirty metal and leather.

1.2 AREA AND PRODUCTION

India is the leading producer of Lime globally. The major regions producing almost 80% of limes in India are Gujarat, Madhya Pradesh, Andhra Pradesh, Karnataka, and Odisha. The production of lime in India is continuously increasing due to the growing demand of foods that include lime as an ingredient (including squash, juice, jams, bakery, and confectionery) in India. The growing demand for limes due to health benefits will drive the market during the forecast period.

Lime is used as an ingredient in the production of pectin, citric acid, lime oil, lime juice and many other products. This growing markets creates a steady demand for these products throughout the year. Pectin and citric acid are two products that have witnessed a continuous demand during last few decades. India consumes the maximum portion of lime in the Asia-Pacific region.

1.3 STRUCTURE OF LIME PLANT



- The tree seldom grows more than 5 metres (16 feet) high and if not pruned becomes shrub like.
- Its branches spread and are irregular, with short stiff twigs, small leaves, and many small sharp thorns.
- The evergreen leaves are pale green, and the small white flowers are usually borne in clusters.
- The fruit is usually about 3 to 4 cm (1 to 1.5 inches) in diameter, oval to nearly globular in shape, often with a small apical nipple, and the peel is thin and greenish yellow when the fruit is ripe.
- The pulp is tender, juicy, yellowish green in colour, and decidedly acid.

1.3.1 CHEMICAL COMPOSITION OF LIME

Nutritional value per 100 g	
Energy	126 kJ (30 kcal)
Carbohydrate	10.5 g
Sugars	1.7 g
Dietary Fibre	2.8 g
Protein	0.7g
Fat	0.2 g
Water	88.7g

Source: USDA National Nutrient Database

1.3.2 TYPES OF LIME

Three types are there: -

1. Small fruited one is *Lime aurantifolia*
2. Large-fruited one is *Lime latifolia*
3. Sweet lime is *Lime limettoides*

CHAPTER 2

PROCESSING OF LIME

2.1 LIME PROCESSING

Lime is specially used on large scale in the preparation of pickles and other processed products like squash, cordial, carbonated beverages and syrups. It is consumed not only as a fresh fruit but also used for flavouring and garnishing the dishes of vegetables, fish, meats, salads, etc. In India, excellent sharbat is prepared from lime juice which is not substituted by any other synthetic drink for quenching summer thirst. Lime, being a highly acidic fruit, it is not possible to maintain this high juice level in the lime squash which may otherwise result into a sour RTS after dilution.

Processing lime provides an economical way to store and transport lime from regions of production to distant markets. Processing allows small and medium sized businesses to create jobs in growing, processing, marketing and to contribute to the economic growth of a region.

Ripe lime fruit are utilized either as fresh fruit or processed into juice, squash and special products.

Lime Piece: Lime Pieces are prepared by hand-cutting lime into 4/8 pieces and preserving with salt. Our assortment of lime Pieces is in huge demands in the markets for freshness and high nutritional value.

Dry Lime Peel: Dry Lime Peels is made after extracting the juice from the limes and then sun-dried them. Pack dry lime Peels in required packing to retain its natural qualities.

Lime Juice: lime Juice is obtained by a concentration process in which the water is physically removed from the juice until it has not less than 20% of solids by weight. It is then reconstituted with water before consumption. Unfermented, it may or may not be frozen. Juice is obtained by mechanical extractors, or by pressing, and is then submitted to various processes. Unfermented, it may or may not be frozen.

Lime Squash: This is the most popular beverage. It contains 25% juice or pulp, 40% total soluble solids (TSS) and 3.5% acid. It is made by blending Lime juice with nutritive sweeteners, water and with or without salt, aromatic herbs, peel oil and any other ingredients suitable to it.

2.1.1 HARVESTING OF LIME

Harvesting is the process of collecting fruits that are matured from the fields. Harvesting at the wrong time will lead to undesirable consequence such as fruit rot and post-harvest losses. This unit will help the learner to understand the necessary techniques and methods used for harvesting lime fruits so as to gain high value for the product.

Methods of harvesting: There are two methods of harvesting lime fruits, namely:-

1. Manual method
2. Mechanical method

Manual method: For manual method, fruits are harvested by cutting them off with pruning shears, clippers or by pulling the fruit stalk from the tree. The manual method includes hand picking, (where harvesting of lime fruits is done by pulling or clipping from the stem). The general rule is "twist, jerk, and pull". This procedure is highly recommended for tight-skinned lime like the Late Valencia. This method is used when the fruit is within a reachable height.

Mechanical method: This involves the use of heavy machines or it's an automated form of harvesting lime fruits. Mechanical harvesting of lime fruits can be broadly classified as contact machines and mass- removal machines. The contact machines consist of the positioning mechanism and the picking hand or arm. The mass removal machine operates by applying force or shaking the trunk to remove fruits. Both methods come with a catch frame system which is incorporated to catch the fruit. However mechanical harvesters cannot harvest selectively.

Maturity of lime fruits depends upon the climatic conditions, nutrition, heat units and moisture availability. The period of maturity is shorter in acid lime (5-6 months) and longest in mandarin and sweet orange. The lime and lemon fruits are harvested when they just start changing. They are harvested in installments as they ripen. Major harvesting period in July-September and November-January.

Harvested fruits are graded according to size and colour and packed in bamboo baskets or wooden crates lined with neem foliage. Sometimes fruits are packed in gunny bags and transported by rail or road to distant markets.

2.2 NEED OF PROCESSING

Amongst the various fruits particularly grown in the tropical and subtropical regions, lime is one of the important commercial fruit crop which having the excellent processing qualities. Being non climacteric fruits, lime cannot be stored for a long period. Limes can be kept out at room temperature where they will stay fresh for up to one week. Therefore, the development of appropriate processing technology and product standardization will definitely help in better utilization of lime fruits particularly during the seasonal glut. The processed products prepared from well matured lime fruits are pleasant, best flavored, good storable and eventually represents better value added form that aids to conserve the excess fruit production and fast perishability.

2.3 PREPRATION OF LIME SQUASH

In India cold drinks are in demand practically throughout the year. Among these fruit juices lime squashes have an important place. These are quite popular being rich in essential vitamins, minerals and other nutrient.

Squash is a type of fruit beverage which contains at least 25 per cent of fruit portion (juice/pulp) and not less than 40 per cent of total soluble solids (sugar). In also contains edible acid in the range of 3-4 per cent. Since the sugar content in squash is quite less therefore to preserve it, approved chemical preservative such as sodium or potassium metabisulphite or sodium benzoate should be added along with colour and flavour.

2.3.1 REQUIREMENT:

- Ripe fruits, Juice extractor
- Pulper
- Knives
- Bottles
- Utensil and
- pp Cap sealing machine.

2.3.2 PROCEDURE OF LIME SQUASH PREPRATION

1. Select good quality fully ripe fruits
2. Wash and peel the fruit and extract juice
3. Mix the juice well to make it a smooth paste;

4. Take sugar, water and citric acid as mentioned in Table 1 given below
5. Mix the ingredients and give one or two boils to dissolve the sugar
6. Cool the sugar syrup, and add the fruit pulp
7. Mix the pulp and sugar thoroughly and pass through a muslin cloth
8. Add approved colour and flavour (essence)
9. Add preservative i.e. potassium/sodium metabisulphite (KMS/SMS) @ 0.7g/litre or sodium benzoate (SB)@ 1.0g/litre of finished product
10. Fill the squash in sterilized bottles and seal it with pilfer proof (PP) Cap and store in cool dry place.

TABLE 1

Sr. No.	Product	Quantity of juice/pulp	Sugar	Water	Citric acid	Preservative
1	Lime	1.0	2 kg	0.500 ml	-	KMS/SMS

1. **Inspection:** The fruits are thoroughly inspected to remove unsound, immature and spoilt fruits from the lot. Normally visual inspection is carried out for this.
2. **Sorting:** Fruits must be sorted out and cleaned before being processed. Sorting is the separation of crushed, moldy, damaged fruits and foreign matters like leaves, stalks and etc.
3. **Washing:** Washing is done with plain water or chlorinated water to remove surface dirt dust and microorganisms. Washing usually should be done with at normal temperature.
4. **Cutting:** After washing, the fruits were cut into two halves. Cut them into halves with stainless steel knife or by halving and burring machine.
5. **Extraction of juice or pulp from fruit:** There are several methods to extract juice depending on the type of fruit you use. For lime fruits which are naturally juicy, the best option is to use a hand presser or a revolving lime 'rose'. Roller type press made up of wood is also used for extracting lime juice. Different kind of extraction machines are available in market.
6. **Straining or Sieving:** Then rapid strain lime juice through a stainless steel sieve with pore diameter of 3 mm to accomplish separation of most of the suspended matter from juice.

- 7. Preparation of syrup:** Prepare sugar syrup by mixing sugar, citric acid with water. Use half liter water for every 2 kg of sugar. Heat to boil, strain through muslin cloth and allow to cool.
- 8. Mixing:** Mix fruit pulp or juice with the required quantity of sugar syrup. Add 0.7 g of KMS or sodium benzoate per liter of squash along with permitted edible food color and flavor and mix thoroughly.
- 9. Bottle Filling:** The products should be hot-filled into clean, sterilised bottles. A stainless steel bucket, drilled to accept a small outlet tap, is a very effective bottle filler. After filling hot, the bottles are capped and laid on their sides to cool prior to labelling.
- 10. Packaging:** squashes shall be packed in clean bottles securely sealed. These products when frozen and sold in the form of ice shall be packed in suitable cartons.
Every package of fruit squash by whatever name it is sold, containing additional sodium or potassium salt shall bear the following label, namely: - "IT CONTAINS ADDITIONAL SODIUM/POTASSIUM SALT"
- 11. Storage:** Most squashes contain preservatives such as potassium sorbate or (in traditional cordials) sulphites, as they are designed to be stored on shelves. They keep well because of the preservatives and their high sugar content. Nonetheless, some choose to store their squash in refrigerators.

2.3.3 PRECAUTION:

- Do not heat the juice.
- Do not mix hot sugar syrup in juice or pulp.
- Do not use sodium or potassium metabisulphite for coloured squashes.
- Always use stainless steel utensils, knives etc.

CHAPTER 3

PACKAGING OF LIME SQUASH

Food packaging is the enclosing of food for the purpose of protection and preservation. Squash is an extremely consumer-driven product. Packaging is one of the most important factors driving sales, food identity and brand construction. Package role is to preserve the freshness of lime squash and attractive design for marketing and branding.

In today's competitive world, packaging plays a crucial role in creating value added consumer friendly, self-selling packs. There are several types of packaging machines available such as sealing machines, filling machines, strapping machines, wrapping machines, coding machines, labeling machines.

Functions of packaging

- ☐ Ability to protect the content from spoilage and spillage
- ☐ Offer protection against environmental conditions- moisture barrier
- ☐ Prevent insect infestation and insect damage
- ☐ Offer protection against microorganisms – oxygen barrier
- ☐ Economical, easily available and easy disposal
- ☐ Strength properties to withstand mechanical hazard during transportation and storage

The packaging requirements for all types of squash are:

- ☐ Absolutely leak-proof and prevent contamination
- ☐ Protect the contents against chemical deterioration
- ☐ No pick up of external flavours
- ☐ Be hygienic and safe
- ☐ Retain carbonation in the case of carbonated beverages
- ☐ Economical, easy to use and dispose
- ☐ Good aesthetic appearance

Deteriorative factors for lime

The biggest 'enemy' of any fruit juice is oxygen. Exposing juice to oxygen can cause oxidation, immediately affecting the quality of the product. It can cause browning of the juice, an off-taste and the loss of Vitamin C. To avoid this, lemon juice and lime juice must be packed in a bottle with a sufficient oxygen barrier. Only bottles made

in glass and PET with oxygen barrier can guarantee the proper quality and the preservation of Vitamin C content of the juice.

3.1 NEED OF LIME SQUASH PACKAGING

Different horticultural products need different types of packages depending on their physical, anatomical and physiology (mainly transpiration, respiration and ethylene production rate) nature and susceptibility to microbial decay. Temperature, relative humidity and ventilation also plays a very important role in determining the post-harvest life of the lime.

The major deterioration that occurs in fruit beverages is loss of nutrition, physico-chemical changes and microbial growth. The product characteristics to be considered in relation to packaging are:

- **Acidity:** All the fruit juices usually maintain an acidic character because they contain organic acids.
- **Enzymes:** Enzymes exist in all fruit juices. Sometimes they have to be destroyed and sometimes to be added.
- **Vitamin C (ascorbic acid):** The Vitamin C content of a fruit increases until just before ripening, and then decreases due to the action of an enzyme, ascorbic acid oxidase. When fruits are cooked, most of the ascorbic acid transfers from the tissue into the liquid or may be oxidized, oxidation occurring more easily in iron, copper or badly tinned vessels. Losses of Vitamin C also occur during storage. Storing at low temperature, and preventing contact with air and light reduces this. Addition of sulphite has a preserving effect on Vitamin C.
- **Colour and Flavour:** They are very important, and many fruit drinks contain certain legally permitted colourings. These are added to overcome the bleaching effect of the sulphite used as a preservative, and to provide an attractive appearance.

Spoilage of fruit juices is mainly due to yeast. Its growth depends upon the temperature. Spoilage of raw fruit juice at room temperature results in alcoholic fermentation, followed by the oxidation of alcohol and fruit acids by yeasts or moulds growing on the surface. Hence every living yeast cell must be removed or suppressed by pasteurization, filtration and/or preservatives.

In addition to protection and preservation –

- ☐ Maintenance of the food's shelf life
- ☐ Containing the foods
- ☐ Providing information about the ingredients and
- ☐ Nutritional aspects of its contents
- ☐ Providing convenience for customers during usage and consumption
- ☐ Prevention from environmental damages.

3.1.1 TYPES OF PACKAGING

1. Glass bottle (account for 30%)
2. PET bottle (30%)
3. Aluminum can (20%)
4. Paper-plastic composite materials (10%)

1. Glass bottle package

Glass bottle is a package with long history. With more kinds of packages entering the market, it is less frequently used, but it remain as one of the most popular packages.

Glass bottles have the following advantages: non-toxic, odourless, transparent, beautiful, good barrier, airtight, rich in raw materials, low price, and easy to recycle. Glass bottle is resistant to heat, low temperature, pressure, and cleaning. It is usually used for fruit tea, jujube juice, and those with high requirement on the containers. Glass bottle has good barrier property, heat resistance, low cost, and convenience for recycle. It can meet the requirements of beer to prevent microbial pollution, carbon dioxide and water loss. Therefore, most beers and wines are packaged in glass bottles.

On the other hand, glass containers also have some defects: it has heavy weight, easy to break, high transportation cost, uneasy to print. Therefore, most commercial drinks don't use glass bottle any more.



2. Metal can packages

Metal packages can be classified into 2-piece and 3-piece types. 2-piece metal can usually adopt aluminum alloy sheet, used for the package of soda drinks. 3-piece metal can be made of tinned steel sheet, used for the package of drinks without carbon dioxide gas.

- ☐ Metal cans has good barrier property. It can block air and light so as to prolong the shelf life of drinks.
- ☐ Metal can have good mechanical property. It is resistant to high-temperature, high-moisture, high-pressure, insect-pest, and harmful substance.
- ☐ Metal hand is hard to break. It is easy to take, and meet today's life style.
- ☐ Metal can be well decorated to promote sales.
- ☐ Metal can be melt and recycled.

Metal packages also has some drawbacks: poor chemical stability and alkali resistance. If the interior paint has low quality, it would contaminate the drinks. It is necessary to upgrade the technology, improve the product quality, and solve the problem of break and leakage.



3. Paper carton packages

Paper containers are usually used for the package of fruit and vegetable juice. It can be classified into papers, brick composite paper box, paper cup, and composite can.

Paper packages have the advantages of low cost, light weight, convenience for transportation, no metal dissolving or can smell. Paper packages can be recycled easily, so it is environmentally friendly. But their pressure resistance and air tightness is lower than glass bottle, metal can, and plastic container. Besides, paper packaged drinks cannot be sterilized under high temperature.

The paper cartons are made of high-strength paper boards. They are paper composite materials. They are widely used in fruit juice, teas, coffee, especially milks.

Paper packages have taken over large market space of glass bottles, but it is impacted by pet bottles. Paper packages still play an important role in the drink market, especially in small-capacity packing.



4. PET bottles

PET is the earliest developed and largest produced plastic containers. The PET bottle made by two-axis extended blow molding method has high transparency and glossiness, so it is an ideal replacement for glass bottles. Pet bottles are used in various tea drink, fruit juice and those need hot filling.

PET packages also have disadvantages. The gases may infiltrate through the PET bottle, which will cause the CO₂ loss and destroy the taste of the drinks. The Polyester materials are more active than glass bottles. It may have chemical reaction with beers. The PET bottles are easy to get cut and split in transportation, flushing, and filling.



5. Modified Atmosphere Packaging (MAP) for Squash

- Reducing decay
- Slowing breakdown
- Decreasing weight loss
- Preserving firmness
- Maintaining vegetable's natural color

3.2 IMPACT OF PACKAGING ON INDICES OF FAILURE

3.2.1 MOISTURE TRANSFER

Absorption or desorption of moisture can significantly affect the shelf life of foods. The main purpose of packaging is to protect the food from moisture ingress to preserve the product characteristics. In addition, the moisture may lead to deleterious changes such as structural transformations, enzymatic reactions, browning, and oxidation, depending on temperature and the availability of O₂. Moisture or water vapour ingress in combination with light, O₂, and an elevated temperature can result in physical loss of texture and caking due to lactose crystallization, microbial spoilage, non-enzymatic reactions, and fat oxidation.

3.2.2 OXIDATION

A number of food components react chemically with O₂, affecting the color, flavor, nutritional status, and occasionally the physical characteristics of foods. In some cases, the effects are deleterious and reduce the shelf life of the food; in others they are essential to achieve the desired product characteristics. Packaging is used to exclude, control, or contain O₂ at the level most suited for a particular product. It is therefore not surprising that to prevent oxidation of lime; the packaging should provide a high-level O₂ barrier and be able to retain that barrier during the anticipated shelf life. Gas flushing with a chemically inert gas such as N₂ may be essential to replace O₂ present in the package before closing. Most of the common spoilage bacteria and fungi require O₂ for growth. Therefore, to increase the shelf life of foods, the internal package atmosphere should contain a minimum concentration of residual O₂.

3.2.3 LIGHT

Light-induced degradation reactions in lime create a serious problem for the industry because of the development of off flavours, the decrease in nutritional quality,

and the rate at which these phenomena develop. Packaging materials that can provide a barrier to light are essential to avoid this particular deteriorative reaction in fenugreek products.

THE RESPIRATION IN A PACKAGE IS INFLUENCED BY

- Quantity of the produce
- Stage of maturity
- Temperature
- Concentration of ethylene gas
- Light intensity

THE PERMEATION OF THE PACKAGE IS INFLUENCED BY

- Type and nature of material
- Thickness and surface area of the material
- Temperature and relative humidity
- Partial pressure gradients of O₂ and CO₂

3.3 PACKAGING MACHINERY USE FOR LIME SQUASH PACKAGING



Labelling requirements

1. Name of the food
2. List of ingredients
3. Nutritional information
4. Declaration regarding vegetarian or non vegetarian
5. Declaration regarding food additives
6. Name and address of the manufacturer
7. Net quantity
8. Code No/Lot No/Batch No
9. Date of manufacture and Best before or Use by date
10. Country of origin for imported food
11. Instructions for use.

CHAPTER 4

FSSAI STANDARDS AND FOOD SAFETY

4.1 FSSAI STANDARDS AND ADDITIVES OF LIME SQUASH

2.3.21: SQUASHES, CRUSHES, FRUIT SYRUPS/FRUIT SHARBATS AND BARLEY WATER:

FSSAI's Food Products Standards & Food Additives regulations, 2011 defines the standards for Squashes, Crushes, Fruit Syrups/Fruit Sharbats and Barley Water under Regulation 2.3.21.

Squashes, Crushes, Fruit Syrups/Fruit Sharbats and Barley Water means the product prepared from unfermented but fermentable fruit juice/puree or concentrate clear or cloudy, obtained from any suitable fruit or several fruits by blending it with nutritive sweeteners, water and with or without salt, aromatic herbs, peel oil and any other ingredients suitable to the products.

4.1.1 SQUASH SHALL CONFORM TO THE FOLLOWING ANALYTICAL STANDARDS

1. Squash should contain not less than 25 per cent fruit content in finished product .
2. Total soluble solids content should not be less than 40 percent.
3. The acidity of the squash should not be more than 3.5 per cent as anhydrous citric acid.
4. The maximum permissible limit of preservative in squash is 350 ppm of sulphur dioxide or 600 ppm of benzoic acid.

4.1.2 FOOD ADDITIVES FOR SQUASH

Food Category Name	Food Additive	INS No	Recommended Maximum Level
Concentrates (liquid or solid) for water-based flavoured drinks	L-Tartaric acid	334	GMP
	Curcumin	100	200 mg/kg
	beta-Carotenes, vegetable	160a(ii)	200 mg/kg

(synthetic syrups for dispensers, sharbat (synthetic syrup)*, squashes, crushes, fruit syrups, cordials and barley water	CAROTENOIDS		200 mg/kg
	Canthaxanthin	161g	200 mg/kg
	RIBOFLAVINS		200 mg/kg
	Annatto	160(b)	200 mg/kg
	Ponceau 4R	124	200 mg/kg
	Saffron		GMP
	Erythrosine	127	100mg/kg
	Carmosine	122	200 mg/kg
	Sunset yellow FCF	110	200mg/kg
	Indogotine (Indigo carmine)	132	200mg/kg
	Brilliant blue FCF	133	200mg/kg
	Fast green FCF	143	200mg/kg
	Tartrazine	102	200 mg/kg
	BENZOATES		600 mg/kg
	SULFITES		350 mg/kg
	SORBATES		1,000 mg/kg
	Propylene glycol	405	GMP

2.4.5: TREHALOSE

Trehalose may be added as an ingredient in the Carbonated water, thermally processed fruits, fruit juices, fruit nectars, fruit beverages, fruit squashes, jam, jelly, fruit cheese, marmalade, dairy based drinks, milk powder, subject to label declaration under sub-regulation 49 of FOOD SAFETY AND STANDARDS (Packaging and Labelling) REGULATIONS, 2011. Trehalose should not be more than 3.5 per cent.

4.2 FOOD SAFETY

Part I - General Hygienic and Sanitary practices to be followed by Petty Food Business Operators applying for Registration (See Regulation 2.1.1(2))

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.

4.3 LABELLING

Labeling Requirements

All food products sold in India that are prepackaged are required to comply with the Food Safety and Standards (Packaging and labelling) Regulations, 2011. The Food Safety and Standards Regulation, 2011 is a notification issued by the Food Safety and Standards Authority of India under the Ministry of Health and Family Welfare. In this article, we look at the regulations pertaining to food labelling in India.

Applicability of Food Labelling Regulations

The food labelling regulations require all “Prepackaged” or “Pre-packed food” to comply with the labelling regulations in India. As per the rules, prepackaged 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.

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;

Nutritional Information

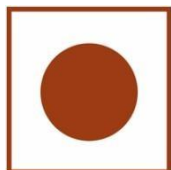
Nutritional Information or nutritional facts per 100 gm or 100ml or per serving of the product must be given on the label along with the following information:

- energy value in kcal;
- the amounts of protein, carbohydrate (specify the quantity of sugar) and fat in gram (g) or ml;
- the amount of any other nutrient for which a nutrition or health claim is made:
- It is important to note that any “health claim” or “nutrition claim” or “risk reduction” claim made in the label will be thoroughly scrutinized by the FSSAI authorities. Hence, any such claim must be validated by test data. As per the rules, the following is the definition for “health claim”, “nutrition claim” and “risk reduction” claim:
- “Health claims” means any representation that states, suggests or implies that a relationship exists between a food or a constituent of that food and health and include nutrition claims which describe the physiological role of the nutrient in growth, development and normal functions of the body, other functional claims concerning specific beneficial effect of the consumption of food or its constituents, in the context of the total diet, on normal functions or biological activities of the body and such claims relate to a positive contribution to health or to the improvement of function or to modifying or preserving health, or disease, risk reduction claim relating to the consumption

- of a food or food constituents, in the context of the total diet, to the reduced risk of developing a disease or health-related condition;
- “Nutrition claim” means any representation which states, suggests or implies that a food has particular nutritional properties which are not limited to the energy value but include protein, fat carbohydrates, vitamins and minerals;
 - “Risk reduction” in the context of health claims means significantly altering a major risk factor for a disease or health-related condition;

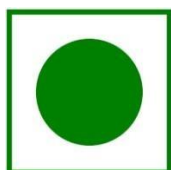
Veg or Non-Veg Symbol

All packaged food that is “Non-Vegetarian” must have a symbol that is a brown colour filled circle inside a square with a brown outline. If a food contains only egg as a non-vegetarian ingredient, then the manufacturer may provide a declaration that the product contains only egg and add the non-vegetarian symbol.



Non-Veg Symbol

Packaged vegetarian food should have a symbol that consist of green colour filled circle inside a square with green.



Veg Symbol

Information Relating to Food Additives, Colours and Flavours

Food additives contained in the food product must be mentioned along with class titles along with the specific names or recognized international numerical identifications. Addition of colouring matter should be mentioned on the label along with certain statements like “CONTAINS PERMITTED NATURAL COLOUR(S)”, just beneath the list of the ingredients on the label. In case of addition of extraneous flavouring agent, then it should be mentioned in a statement like “CONTAINS ADDED FLAVOUR” just beneath the list of ingredients on the label.

Name and Complete Address of the Manufacturer

The name and complete address of the manufacturer must be mentioned on every package of food. In the case of imported food, the package must contain the name and complete address of the importer in India.

Net Quantity

All packaged food must carry the net quantity by weight or volume or number, as the case may be. The net quantity of the commodity contained in the package must exclude the weight of the wrappers and packaging materials.

Lot Number of Batch Identification

A lot number or batch number or code number must be mentioned on all packaged food so that it can be traced while manufacturing and distribution. Only bread and milk including sterilized milk are not required to comply with this regulation.

Date of Manufacture or Packing

The date, month and year in which the commodity is manufactured, packed or pre-packed must be mentioned on the label. In the case of food products having a shelf life of more than three months, then the month and the year of manufacture can be given with the "Best Before Date". In case of products having a shelf life of fewer than three months, the date, month and year in which the commodity is manufactured or prepared or pre-packed must be mentioned on the label with best before date.

Country of Origin for Imported Food

For imported food, the country of origin of the food should be declared on the label of the food. In case a food product undergoes processing in a second country which changes its nature, the country in which the processing is performed should be considered to be the country of origin for the purposes of labelling.

Instructions for Use

Instructions for use, including reconstitution, should be included on the label, if necessary, to ensure correct utilization of the food.

ANNEXURE-1 EQUIPMENT SUPPLIERS

Juice extractors and pulpers :

A variety of juice extractors and pulpers is available from a wide range of suppliers. They are available in different capacities and either manual or powered (either electric or diesel).

Kenwood Limited New Lane Havant Hampshire PO9 2NH United Kingdom Tel: +44 (0) 23 9247 6000 Fax: +44 (0) 23 9239 2400 Website: http://www.kenwood.co.uk	Bajaj Machine Private Limited 7/20, 7/27, Jai Lakshmi Industrial Estate, Side-IV Sahibabad Industrial Area Ghaziabad-201301 U.P India Tel: +91 120 22775119/22775137 Fax: +91 120 22775137 Website: www.indiamart.com/bajajmachine
Alvan Blanch Chelworth Malmesbury Wiltshire, SN16 9SG United Kingdom Tel: +44 (0) 666 577333 Fax: +44 (0) 666 577339 E-mail: info@alvanblanch.co.uk Website: http://www.alvanblanch.co.uk	Buhler (India) Pvt Ltd 13-D, K A I D B Industrial Area, Attibele, Bangalore, Karnataka 562107, India Tel: +91 80- 27820000 Fax: +91 80-7820001 Website: www.buhlergroup.com
Lehman Hardware and Appliances Inc. P.O. Box 41, Kidron Ohio 44636, USA Tel orders: +1 877 438 5346 Tel enquiries: +1 888 438 5346 E-mail: info@lehmans.com Website: http://www.lehmans.com	Delhi Industries 4 Paharganj Lane, New Delhi 110055 India Tel: +91 11 2529720, 27525200, 27536888 Fax: +91 11 25791291
Do-All-Engineering Industries 87/12, Industrial Suburb, Yeshawanthpur Bangalore Karnataka 560022 India Tel: +91 80 23345754, 23372298 Fax: +91 80 23346138	Robot Coupe 12 Avenue Cal Leclerc BP 134 71303 Montceau-les-Mines, France Tel: +33 3 85 58 80 80

Eastend Engineering Company 173/1 Gopal Lal Thakur Road Calcutta 700 035 India Tel: +91 33 2553 6397	DISEG (Diseno Industrial y Servicios Generales) Av Jose Carlos Mariategui 1256 Villa Maria del Triunfo, Lima, Peru Tel: +51 14 283 1417
Bottle filling and packaging equipment	
H Erben Limited Lady Lane, Hadleigh Suffolk IP7 6AS United Kingdom Tel: +44 (0)1473 823011 Fax: +44 (0)1473 828252 Website: http://www.erben.co.uk	Bombay Engineering Industry R NO 6 (Extn) Sevantibai Bhavan Chimatpada Marol Naka Andheri (East) Mumbai 400059 India Tel: +91 22 2836 9368/2821 5795 Fax: +91 22 2413 5828
Sussex and Berkshire Machinery Company PLC Blacknest Alton, Hants GU34 4PX, United Kingdom Tel: + 44 (0)1420 22669 Fax: + 44 (0)1420 22687 E-mail: technical@sabplc.uk Website: http://www.sabplc.co.uk/	Gurdeep Packaging Machines Harichand Mill compound LBS Marg, Vikhroli Mumbai 400 079 India Tel: +91 22 2578 3521/577 5846/579 5982 Fax: +91 22 2577 2846
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 , acufilmachines@hotmail.com http://www.indiamart.com/acufilmachines/#products	MMM Buxabhoy & Co 140 Sarang Street 1st Floor, Near Crawford Market Mumbai, India Tel: +91 22 2344 2902 Fax: +91 22 2345 2532 yusufs@vsnl.com ; mmmb@vsnl.com ; yusuf@mmmb.in
Autopack Machines Pvt Ltd 101-C Poonam Cambers A Wing, 1st Floor Dr Annie Besant Road, Worli Mumbai 400018, India Tel: +91 22 2493 4406/2497 4800/2492 4806 Fax: +91 22 2496 4926 E-mail: autopack@bom3.vsml.net.in www.autopackmachines.com	Orbit Equipments Pvt Ltd 175 - B, Plassy Lane Bowenpally Secunderabad - 500011, Andhra Pradesh India Tel: +91 40 32504222 Fax: +91 40 27742638 Website : http://www.orbitequipments.com



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