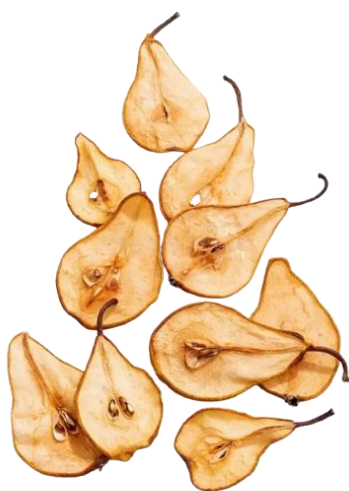




PM Formalisation of Micro Food Processing Enterprises Scheme

Processing of Dehydrated Pear



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CHAPTER 1

INTRODUCTION

1.1 Origin and Distribution

The name pear is derived from Latin, *pera* or *pira*, with some variants like in French as *poire*, in German as *peer*, and in Greece as *acras* as wild type and *apios* as cultivated pear. The pear, of *Pyrus* L., genus is a fruit of big importance for the agriculture of latitude moderate countries, being cultivated on a large scale in China, Western Europe, and the United States. The genus is thought to have originated in present-day Western China in the foothills of the Tian Shan, a mountain range of Central Asia, and to have spread to the north and south along mountain chains, evolving into a diverse group of over 20 widely recognized primary species. The enormous number of varieties of the cultivated European pear (*Pyrus communis* subsp. *communis*), are without doubt derived from one or two wild subspecies (*P. c.* subsp. *pyraster* and *P. c.* subsp. *caucasica*), widely distributed throughout Europe, and sometimes forming part of the natural vegetation of the forests. Asian species with medium to large edible fruit include *P. pyrifolia*, *P. ussuriensis*, *P. × bretschneideri*, *P. × sinkiangensis*, and *P. pashia*. Other small-fruited species are frequently used as rootstocks for the cultivated forms. Pears are some of the oldest fruits in existence. According to the Nanjing Agricultural University, pears likely originated during the tertiary period, approximately 65 to 55 million years ago. Indeed, dried pears were found in Swiss caves dating back to the Ice Age. It's speculated that species in the large *Pyrus* genus come from Europe, North Africa and Asia Minor. Even today, each of these regions cultivates distinct varieties from the other. Asian pears likely predate Occidental, or, European pears. India received pears from China several centuries ago. Peach and pear came to India during the early years of the Eastern Han period (25AD to 220AD).

1.2 Importance & Uses: Pears have an abundance of health benefits, let us take a look at them below.

a). Promote Gut Health: Pears are an excellent source of soluble and insoluble fiber, which are essential for digestive health. These fibers help maintain bowel regularity by softening and bulking up stool. One medium-sized pear (178 grams) packs 6 grams of fiber — 22% of your

daily fiber needs. Additionally, soluble fibers feed the healthy bacteria in your gut. As such, they're considered prebiotics, which are associated with healthy aging and improved immunity. Fiber may help relieve constipation.

b). Helps repair cells: Pear contains appreciable amount of Vitamin C. This vitamin is important for cell growth and repair as well as preventing oxidative damage. Vitamin C has been shown to support immune function, aid in the healing of cuts and bruises, and even protect against infectious diseases. In addition, pear skin contains flavonoids, phenolics, and triterpenes that have antioxidant and anti-inflammatory properties.

c). Reduce Risk of Diabetes: Anthocyanin-rich fruits like red pears was associated with a 23% lower risk of type 2 diabetes. The fiber in pears slows digestion, giving your body more time to break down and absorb carbs. This can also help regulate blood sugar levels, potentially helping prevent and control diabetes.

d). Lowers Risk of Chronic disease: Pears are high in fiber can improve digestive health and reduce odds of developing coronary heart disease, stroke, hypertension, diabetes, and some gastrointestinal diseases.

e). Anti-cancer effect: Pears contain various compounds that exhibit anticancer properties. Anthocyanin and cinnamic acid contents have been shown to fight cancer. Pears protect against some cancers, including those of the lung, stomach, and bladder flavonoid-rich fruits like pears may also safeguard against breast and ovarian cancers,

f). Improve heart health: Pears may lower your risk of heart disease. Their procyanidin antioxidants may decrease stiffness in heart tissue, lower LDL (bad) cholesterol, and increase HDL (good) cholesterol. The peel contains an important antioxidant called quercetin, which is benefit heart health by decreasing inflammation and reducing heart disease risk factors like high blood pressure and cholesterol levels.

g). Helps in weight loss Pears are low in calories, high in water, and rich in fiber. This combination helps in weight loss.

Nutritional Information of Whole Pear Fruit

Nutrients	Quantity per 100g
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Energy	58kCal
Protein	0.38 g
Total lipid	0.12g
Saturated Fat	0.029g
Trans Fat	-
Polyunsaturated Fat	0.029 g
Monounsaturated Fat	0.026 g
Total Carbohydrate	15.46 g
Dietary Fiber	3.1 g
Sugars	9.8 g
Cholesterol	0 mg
Sodium	1 mg
Calcium	9 mg
Iron	0.17 mg
Potassium	119 mg
Vitamin A	1 mcg
Vitamin C	4.2 mg

1.3 Value Added Products from Pear:

Pear can be cleaned and packaged as whole or precut forms for fresh use. Minimally processed ready-to-use fresh produce is more perishable than intact produce. Thus, it is important to start with a high quality raw material and strictly apply the necessary processing and storage requirements for such perishable products. Minimally processed pear product can be fresh, RTS

beverages, and dehydrated slices packaged in modified atmosphere conditions among which the former is more common. After the fruits are harvested, sorted, and cleaned with sanitizers as described in the previous section, can also be cut into smaller pieces or slices for further processing. It is important to note that cutting must be done with sharp knives to decrease the degree of physical injuries to the tissues. The cut slices may be treated with antimicrobial and antioxidant solutions or blanched to retard microbial and oxidative degradations in the product. If whole pear fruits are to be packaged, they must be rinsed with water containing appropriate sanitizers to reduce the microbial load on them. Moisture on the surface can increase microbial decay of the product. Pear is consumed as fresh or processed into different forms including frozen, canned, or dried.

Frozen Pear: Pear can be frozen to increase its shelf life. Freezing inhibits growth of microorganisms and retards degradative biochemical and enzymatic reactions in the product. The process involves sorting, grading, washing, blanching, draining, freezing, and packaging. Frozen pear can be presented in one of the following forms: whole pear, Diced pear and others. Thus, depending on the type of the product to be produced, a size reduction is applied to trimmed, sorted/graded, and cleaned pear. Blanching is one of the most critical steps in freezing of pear. It involves brief immersion of the fresh product in water at 85–100°C or steaming at 100°C primarily to inactivate enzymes such as lipooxygenases (LO), peroxidases (PO), and polyphenol oxidases (PPO), which cause degradations in color, flavor, texture, and nutritional value. It also kills vegetative microbial cells and decreases any pesticide residues on the product. Blanched pear is cooled and usually packaged before freezing, although individual quick freezing of unpackaged pear can also be done followed by packaging.

Dehydrated Pear: Mature pear is preferred for production of dehydrated fenuGreek. The pear is graded and sorted carefully to remove bruised, damaged fruits, older or decayed before washing. The pears are dried at 80°C until the moisture content drops to below 6.5%. Drying can also be conducted with microwaves at 750 W power level, which can be advantageous in terms of drying time, energy consumption, ascorbic acid, and color. Premium quality dried pear can be produced by freeze drying which retains the valuable nutrients and color to a larger extent.

Dehydrated pear slices are a dehydrated version of Pear which can be preserved by drying. It can easily be added into the diet or can be consumed as a low-calorie snack, anywhere, anytime.

Many commercial brands today add ingredients such as salt, spices and vegetable oils not only to boost its flavour but also to lengthen its shelf life. Pear's suitability for drying is fair to good.

Drying or dehydration is one of the most effective means to extend the shelf life of perishable fruits and vegetables. The main purpose of dehydration in preserving fruits and vegetables is to remove moisture so that water activity of the dehydrated products is low enough of a_w less than 0.6 for preventing the spoilage and the growth of pathogenic microorganisms and subsequently to reduce the spoilage reactions. Dehydration is also used in combination with other preservative factors such as initial heating of fruit/vegetable in boiling water and salt solution to extend the shelf life of fruits. Dehydration significantly reduces the cost of transportation and storage due reduced weight and volume of dehydrated fruits. Unlike fresh fruit, dehydrated fruits do not require refrigeration during storage

Canned pear: Harvested pear in crates, directly from the field or in boxes, can be preserved by canning. pear is cleaned, sorted, and graded to remove the diseased, decayed, damaged or rotten followed by washing. Washing is generally done by the bubble washer with water with additional sprays or through a tank on a mesh belt to remove soil, dirt, and insects thoroughly.

1.4 Scope of Pear Industry

Standardization of technology to bring down cost of production of fresh Pear and its adoption by growers, assured market for the produce and to produce Pear throughout the year may go a long way in promoting Pear industry in India. though Pear is an excellent material to be preserved in different forms; bulk of the Pear produced in the country is consumed in fresh form, the production used for processing being less than 10%.

The processing industry for Pear is not very well developed in India. Major constraints in processing are as follows:

1. High cost of canning due to high cost of fruit, sugar, containers and overheads.
2. Non-availability of fruits throughout the year.

CHAPTER 2

PREPARATION OF DEHYDRATED PEAR SLICES

2.1 PEAR PROCESSING

Pear is one of the popular fruits and is liked by majority of the people irrespective of their age group. As is the case with most of the fruits and vegetables, their availability is limited during off-seasons. Many techniques have been developed to make available seasonal fruits as well as vegetables even during off-season. This fruit is highly perishable and seasonal. Hence processing is necessary. Processed pear is popular and is exported by many countries. During processing, nutritional quality of fruit can be affected but there are recent researches carried out which use new technologies to retain the nutritional quality of the fruit as it. This is to meet the consumer demand for healthy, nutritious and natural products. Some of the food industries based on pear are described below.

2.1.1 Fruit Processing

Fruits are highly perishable items which needs processing to make it durable. Fruit processing is any deliberate change in a fruit that occurs before it's available for us to eat. Processing methods extend the shelf life of fruits.

Fruit processing has three major aims:

1. To make fruit safe (microbiologically & chemically).
2. To provide good quality products with good flavor, color, texture and taste.
3. To make convenient fruits products

Fruits should be prepared for preservation as soon as possible after harvesting within 4 to 48 hours. As time passes spoilage increases rapidly. Fruit processing involves many steps.

Cleaning and washing: First, the fruits should be cleaned thoroughly to remove any adhering dirt or pesticide residues. This cleaning process usually involves washing the product with running water.

Sorting: To achieve a uniformly sized product, fruits and vegetables are sorted immediately after cleaning according to their size, shape, weight or color. Sorting by size is especially important if the products are to be dried or heated, because their size will determine how much time will be needed for these processes.

Cutting: Cutting is important in order to get uniform pieces for heating, drying and packing. Fruits are usually cut into cubes, thin slices, rings or shreds. The cutting utensils have to be sharp and clean to prevent micro-organisms from entering the food.

Blanching: Blanching is a slight heat treatment, using hot water or steam that is applied mostly to fruits before canning or freezing. It is done by immersing fruits in water at a temperature of 50-55°C. The result is that fruits become soft and the enzymes are inactivated. Blanching is done before a product is dried in order to prevent unwanted color and odour changes and an excessive loss of vitamins.

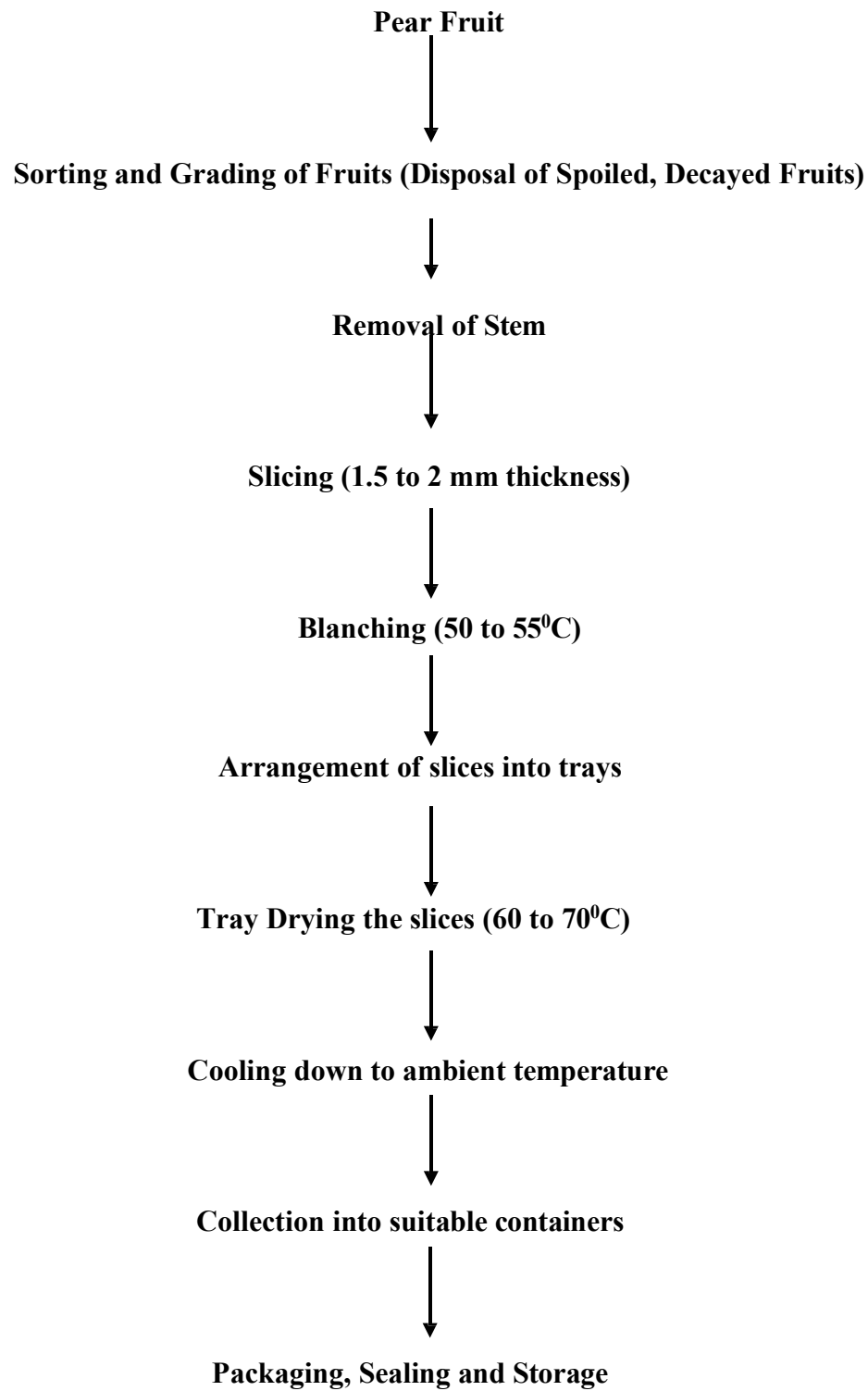
Drying: Sliced pears are then subjected to tray drying by proper arrangement in trays. They are dried till desired finished product quality is obtained.

Packaging, Sealing and Storage: The cooled Pear dehydrated slices are then packed into paper bags, poly pouches or jars as per required pack sizes. Packaging material selection is also of a great importance to preserve the product quality by avoiding the moisture ingress. Packed Products are stored hygienically till dispatch.

2.2 PEAR DEHYDRATED SLICES:

Dehydrated Slices contains approximate 6 % of moisture.

2.2.1 Flow chart for Pear Dehydrated Slices



2.2.3 Equipments involved



Bubble Washer: Sorted Pears are first washed with warm water to remove adhered particles.



Peeler cum slicer: Pears are peeled (optional) and sliced to 1.5 to 2 mm size for further processing. Sliced pears are blanched at 50-55°C.



Typical Tray Dryer: Sliced pears are arranged into trays and dried as per final quality requirement.



Continuous Sealer: Dehydrated pears are cooled and packed into required pack sizes and sealed.



Tray Sealer: Used to seal pack the dehydrated slices into trays

CHAPTER 3

PACKAGING OF PEAR DEHYDRATED SLICES

3.1 THE FACTORS THAT LEAD TO SPOILAGE OF SLICES:

The following are the factors which are affecting the quality of the finished product.

- Unhygienic condition of the processing area, Utensils and Staff
- Fruit Quality
- Post processing handling of the products.
- Packaging material quality & Storage condition

3.2 PACKAGING MATERIAL USED FOR FRUIT SLICES

Factors to consider include product damage, fines, stickiness, bag opening size, re-closure among other things.

Packaging: - The Enclosure of products, items or packages in a wrapped pouch, bag, box, cup, tray, bottle or other container to perform the following function: Containment; Protection; and/or preservation; communication and Utility of performance.

The packaging requirements....

- Absolutely leak-proof and prevent contamination
- Protects the contents against chemical deterioration
- No pick up of external flavors
- Be hygienic and safe
- Economical, easy to use and dispose
- Process
- Maintain product composition & quality at full shelf-life.
- Pack size, printing options, display etc.
- Satisfy legislation requirement
- Free from pin holes from supplier side.

Packaging materials Pear Dehydrated Slices

Glass: Chemically inert & Will not affect the quality, odor or taste of the product. It is strong, rigid & 100 % recyclable.

PET (Polyethylene terephthalate): lightweight, flexible & recyclable, it can be used based on requirements.

Standby pouches: Pear dehydrated slices can be packed into standby pouches. They are more convenient to use and with more appeal with respect to handling.

A variety of others packaging materials are available, the ultimate choice of the packing depends upon the required shelf-life, performance on the filling machine and the cost which is purely based on the segment of the market targeted by the manufacturer. The most common choice of packaging medium is PET (Polyethylene Terephthalate) as it provides the required protection and preservation, grease resistance, physical strength, machinability and printability. Plastics being lighter in weight are, therefore, the most preferred material for packaging of dehydrated slices.

Packaging are also used based on their types:

- Primary Packaging
 - a. Envelops and holds the product.
 - b. Direct contact with the product
- Secondary Packaging
 - a. Used to group the primary packages.
 - b. Present outside the primary unit.
- Tertiary Packaging
 - a. Used for handling of bulk during storage and transport.
 - b. Carton palletized unit of secondary package.

3.3 FUTURE TRENDS

The candies market is one of the most competitive in the FMCG area. Major companies continuously battle to entice sweet-toothed consumers from competing brands a strong brand.

The developing trends in packaging are:

- Widespread and increasing use of cold seal
- Use of laminated structures and cold seals for premium products
- Increasing use of opaque multi-packs for grocery outlets
- Switch over to higher yield opaque films for cost reduction
- Replacement of Al foil / paper wraps by OPP laminates
- Developments in low temperature heat seal packs

CHAPTER 4

FOOD SAFETY REGULATIONS AND STANDARDS OF PEAR DEHYDRATED SLICES

4.1 FOOD STANDARDS

FSSAI category: - it has been covered in category 4.1.2.2

- Dehydrated fruits means the product, prepared from edible part of suitable variety of sound fruit, free from blemishes, insect or fungal infection of appropriate maturity, from which moisture has been removed, under controlled condition of temperature, humidity and air flow, to the extent that the product is preserved.
- It may be whole, sliced, quarters, pieces or powdered.
- The finished product shall have uniform colour and shall be free from extraneous matter
- The product shall have moisture content not more than 20 percent m/m.
- When in powder form, it shall be free flowing and free from agglomerates
- The product may contain food additives permitted in these regulations including Appendix A
- The product shall conform to the microbiological requirements given in the Appendix B.

Additives allowed as per FSSAI for Dehydrated fruits

Code	Food Category	Additive	Additive Number	Permittable Limits
4.1.2.2	Dried Fruits, Nuts & Seeds	Ascorbyl Esters		80 mg/kg
		Benzoates		800 mg/kg
		EDTA		265 mg/kg
		Diacetyl tartaric & Fatty acid esters of Glycerol	472 e	10000 mg/kg
		Hydroxy benzoates		800 mg/kg

		Para		
		Lauric Arginate ethyl ester	243	200 mg/kg
		Mineral Oil, High Viscosity	905 d	5000 mg/kg
		Mineral Oil, Medium Viscosity, Class –I	905 e	5000 mg/kg
		Calcium Phosphate	341 (i)	20000 mg/kg
		Magnesium Phosphate	343 (ii)	20000 mg/kg
		Sorbates		500 mg/kg
		Sulphites		1000 mg/kg
		Tartaric Acid L (+)	334	GMP

4.2 FOOD SAFETY

Part I - General Hygienic and Sanitary practices to be followed by Petty Food Business Operators applying for Registration

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.

Allergy

- ✓ Allergic reactions to pears can be triggered by the presence of a very small amount of the fruit.
- ✓ Reactions can vary in severity. Symptoms include:
 - ✓ swelling of your face, tongue, lips, or throat
 - ✓ itchy skin, including hives and eczema breakouts
 - ✓ itching or tingling in your mouth
 - ✓ wheezing, sinus congestion, or trouble breathing

- ✓ nausea or vomiting
- ✓ Diarrhea
- ✓ People with severe pear allergies may also have a reaction known as anaphylaxis, which can be life-threatening.
- ✓ Seek immediate medical attention if you or someone you know is experiencing any of the following symptoms:
 - ✓ tightening of your airways
 - ✓ swelling of the throat or tongue to the point that it's difficult to breathe
 - ✓ weak and rapid pulse
 - ✓ severe drop in blood pressure, which may result in the person going into shock
 - ✓ lightheadedness or dizziness
 - ✓ loss of consciousness

4.3 LABELLING STANDARDS

Labeling requirements for packaged food products as laid down in the Part VII 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

4.3.1 Wherever applicable, the product label also must contain 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.



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