Pradhan Mantri Formalisation of Micro food processing Enterprises (**PM-FME**) **Scheme**

Walnut packaging Technology

National Institute of Food Technology Entrepreneurship and Management (**NIFTEM**)

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- PPT on Packaging Technology
- 1. Title slide – Refer to Template 4 *****
- 2. Description about the given product
- 3. Principle and types of packaging
- 4. Material of packaging
- 5. Features of Packaging
- 6. Packaging and labelling requirements to be followed for the given product as per
- FSSAI
- 7. Contact details (Refer to Template 3)
- Total Number of Slides- 25 Minimum

Introduction

- “Walnut” originates from “wahlnut” , an old English word for “welsh-nut”
- It is also known from different names “Akhrot” in Hindi , “doon” in Kashmiri , “Gardgani” in Unani.
- The greeks called walnuts karyon, meaning “head ”, because the shell resembles a human skull and the walnut kernel its self looks like a brain.

Overview of Walnut

- Family : *Juglandaceae*
- Centre of Origin : Central Asia
- Chromosome No : 2n = 32
- Fruit Type : Nut
- Edible part : Cotyledon
- Bearing : Axillary old Branches
- Nature of Fruit : Non-Climecteric.
- Hight of plant : 10-40 m tall.

- Walnut (Juglans sp.) important temperate nut fruit having several health benefits.
- It is gronw in jammu and kasmir , uttarkhand , Himachal Pradesh.
- The seedling trees attain giant size and start bearing nuts of variable size and shape after 10-15 years.
- Vegetatively propagated plant are true to type and produces unform size nuts after 4-5 years, They remain within manageable size.
- Most valuable exchange earning nut crop.

Packaging Principle

- Packaging is indispensable to modern society . It allows a multitude of goods to reach the consumer undamaged , in a hygienic condition and with important brand and product information .
- Packaging is the science , art , and technology of enclosing or protecting products for distribution , storage , sale , and use.
- Packaging also refers to the process of design , evaluation ,and production of packages.
- Packaging may also be defined as the collection of different components (e.g. bottle, vial , closure , cap , ampoule , blister) which surround the pharmaceutical product from the time of production until its use.

Types of Packaging

Consumer Packaging

- Designed for consumer convenience and appeal, marketing consideration and display.
- The main emphasis is on marketing

Industrial Packaging

- Industrial packaging is focuses on the handling convenience and protection during transportation
- The main emphasis is on logistics

Types of packaging

Primary packaging

- Primary packaging is the material that first envelops the product and holds it. This usually is the smallest unit of distribution or use and is the package which is in direct contact with the contents.
- Examples : Ampoules , Vials , Containers , Dosing , Dropper , Closure (Plastic metal) , syringe , strip package , Blister Packaging .

Secondary Packaging

- It is outside the primary packaging perhaps used to group primary packages together .
- Example : Paper an board , Cartons , Corrugated Fiber , Box , etc

Tertiary Packaging

- It is used for bulk handling , warehouse storage and transport shipping . The most common form is a palletized unit load that packs tightly into containers .

Function of packaging

Primary Function

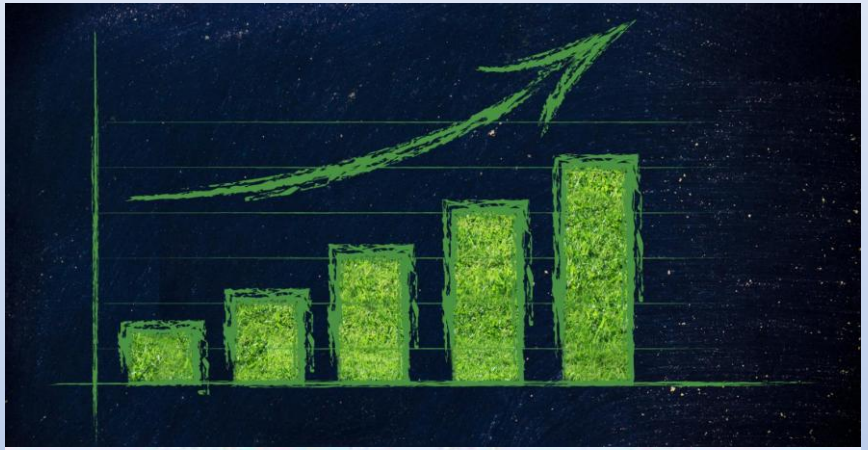
- Presentation
- Protection
- Preservation
- Economy
- Convenience

Secondary Function

- Containment
- Identification
- Suitability
- Labeling
- handling

Factor for package design for international market

- Physical Characteristics
- Language , Colour and size
- Economy
- Container
- Convenience



Labeling and Marking

- The label is printer matters that appeals on the product package.

- Marking means putting some identification mark on the package during transportation

Types of Label

- Brand Label
- Grade label
- Informative label

Packaging Materials

1. Paper

- Paper and paperboard are sheet materials produced form and interlaced network of cellulose fibers derived from wood by using sulfate and sulfite.
- The Fibers derived are the pulped , bleached , and treated with chemicals and strengthening agents to produce the paper product.

2.Paper Board

- Paperboard is thicker that paper , with a higher weight per unit area , and is often made in multiple layers .
- It is commonly used to make containers for shipping , such as boxes , cartons and trays and is seldom used for direct food contact.
- There are several different types of paperboard , including white board , solid board , fiber board and chipboard.

3.Glass

- The production of glass containers involves heating a mixture of silica (the glass former), sodium carbonate (the melting agent) , limestone or calcium carbonate and alumina (stabilizers) to high temperatures util the materials melt into a thick liquid mass , which is then transferred to molds

4.Plastic

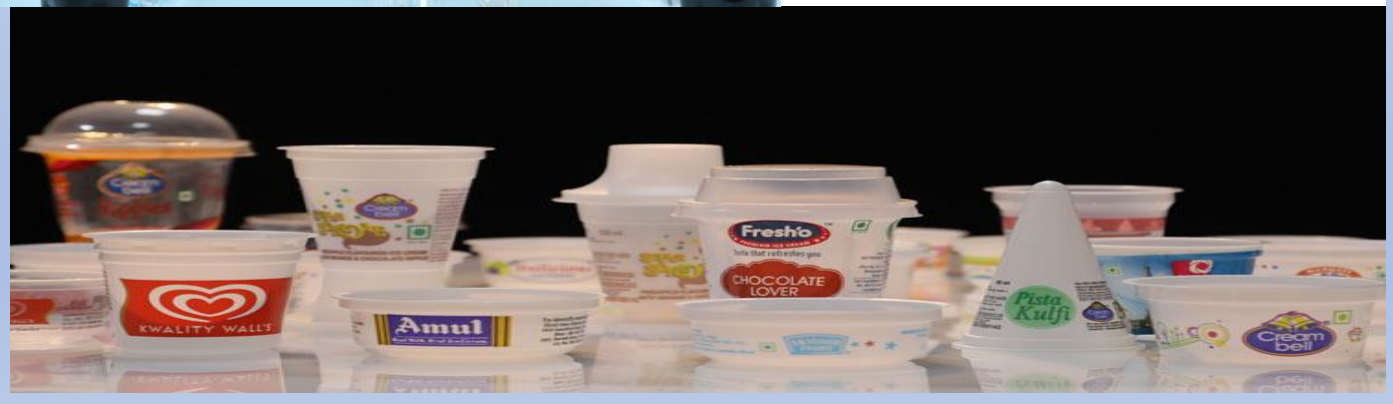
- Plastics are synthesized by condensation , addition or crosslinking polymerization of monomer units.
- In condensation polymerization , the polymer chain grown by condensation reactions between molecules and is accompanied by the formation of water or alcohol.
- The thermal and mechanical properties can be partially modified I order to manufacture retortable packages with plastics that have a high melting point , or thermostable packages making used of plastics with a low melting point and to develop very flexible structures (sachets and wrappings), semirigid structures (trays and tubs) and rigid structures (bottles, closures and tanks).

- Polymers can be classified into two types according to their behavior on heating: thermoplastic and thermosetting polymers
- 1. Thermoplastic polymers soften and melt on heating and solidify again on cooling. They are easily molded and extruded into films, fibers and packaging. Examples include polyethylene, polypropylene and polyvinyl chloride.
- 2. Thermosetting polymers, in contrast, become hardened on cooling, and these plastics retain their shape and cannot return to their original form. They are hard and durable. Thermosets include polyurethanes, polyesters, epoxy resins and phenolic resins.
- Thermoplastics are less rigid than thermosets.

Types of plastic:

- Various types: polyolefins, polyesters, polyvinyl chloride, polyvinylidene chloride, polystyrene, polyamide and ethylene vinyl alcohol.

- Polyolefins and polyesters are the most common.



5.METALS

- Metals are the most versatile of all forms of packaging. They offer the combination of excellent physical protection and barrier properties, formability, decorative potential, recyclability, and consumer acceptance.
- Metal containers are vacuum-sealed and thermally sterilized under low oxygen pressure.
- The decomposition of nutrients is kept to a minimum in metal containers, since metals are a perfect barrier to oxygen, light and moisture.
- The major limitations of metal containers are cost, the weight of the containers and the fact that they are difficult to crush. Aluminum and steel are the most predominantly used metals in food packaging.

Aluminium

- Aluminium is a lightweight, silvery white metal derived from bauxite ore, where it exists in combination with oxygen as alumina.
- Magnesium and manganese are often incorporated into aluminium to improve its mechanical strength
- Aluminium is highly resistant to most forms of corrosion; its natural coating of aluminium oxide provides a highly effective barrier to the effects of air, temperature, moisture and chemical attack.
- The mechanical, physical and chemical properties of aluminum foil such as its barrier effect, deadfold properties and suitability for food contact enable a wide range of applications in many different products and sectors
- The material is light but strong, can be formed and converted into complex shapes, has a high thermal and electrical conductivity, and can be recycled without decrease in quality.
- Aluminium foil is used for aseptic cartons, pouches, wrappings, bottle capsules, push - through blisters, laminated tubes, lids, trays and containers.

Tin plate

- Tinplate has been used for preserving food for well over a hundred years.
- Produced from low-carbon steel (that is, black plate), tinplate is the result of coating both sides of black plate with thin layers of tin.
- The coating is achieved by dipping the sheets of steel in molten tin (hot- dipped tinplate) or by the electrodeposition of tin on the steel sheet (electrolytic tinplate).
- The benefit provided by the bare tin surface inside the can is protection of the natural flavor and appearance of the food, through oxidation of the tin surface in preference to oxidative degradation of the food.

Tin-free steel

- This is also known as electrolytic chromium-coated steel or chrome-oxide-coated steel.
- Tin - free steel requires a coating of an organic material to provide complete corrosion resistance.
- Tin-free steel has good formability and strength, but it is much cheaper than tinplate.

PACKAGING METHODS:

1. ASCEPTIC PACKAGING:

• Process in which a food product, such as ultra high temperature (UHT) milk and its package is sterilized separately and then combined and sealed under sterilized atmosphere.

• It increases the shelf-life.

2. VACCUM PACKAGING

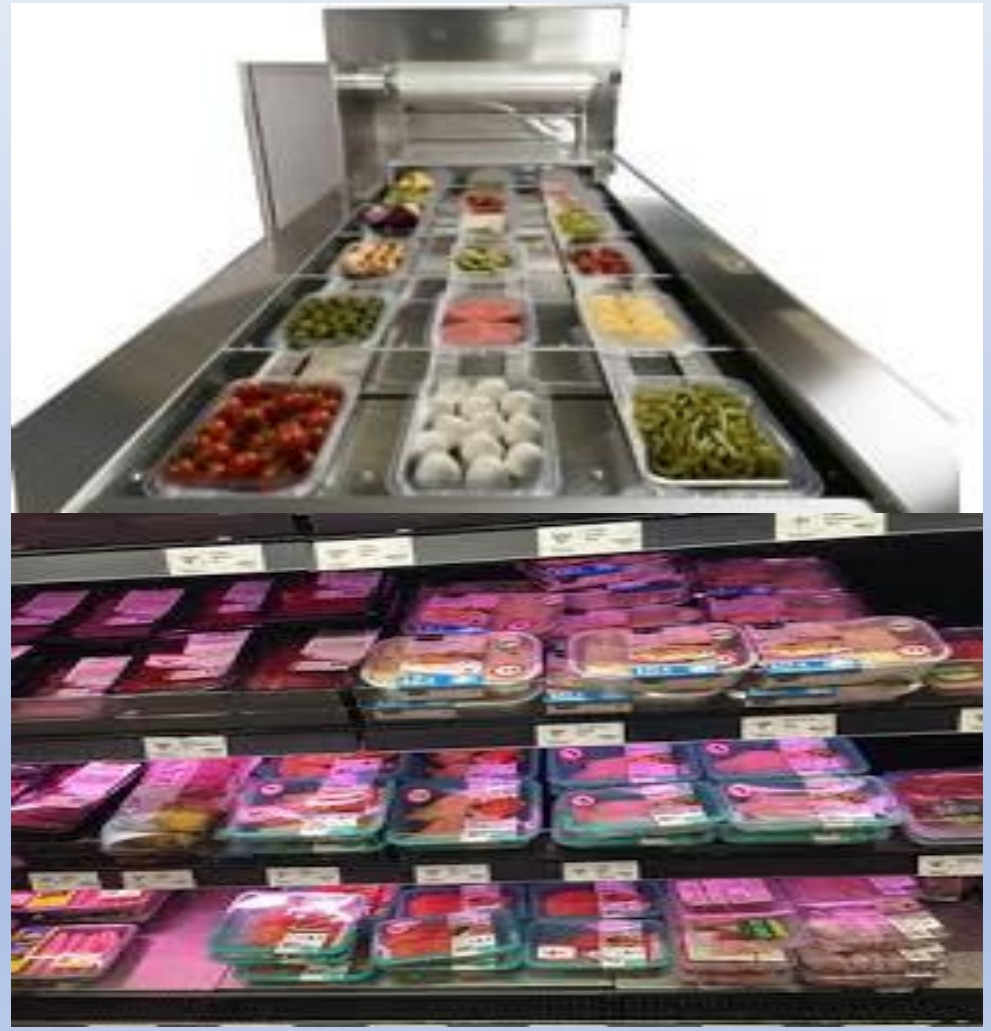
- It is a procedure in which air is drawn out of the package prior to sealing but no other gases are introduced.

- This technique has been used for many years for products such as cured meats and cheese.

3.Modified atmosphere packaging (MAP)

- Modified atmosphere packaging (MAP) is a procedure which involves replacing air inside a package with a predetermined mixture of gases prior to sealing it.
- The gases involved in modified atmosphere packaging, as applied commercially today, are carbon dioxide, nitrogen and oxygen.

1. Carbon dioxide reacts with water in the product to form carbonic acid which lowers the pH of the food. It also inhibits the growth of certain microorganisms, mainly moulds and some aerobic bacteria.
2. Nitrogen has no direct effect on microorganisms or foods, other than to replace oxygen, which can inhibit the oxidation of fats.
3. Oxygen is included in MAP packages of red meat to maintain the red colour, which is due to the oxygenation of the myoglobin pigments.

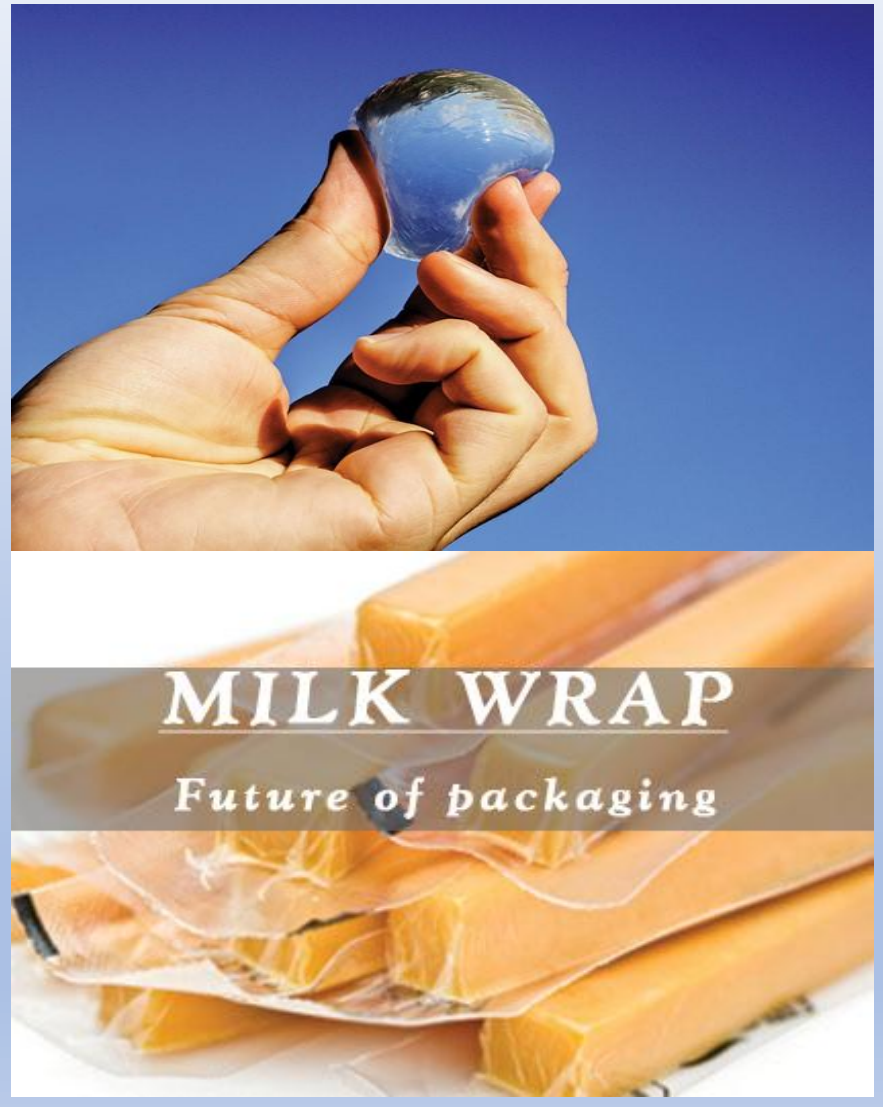


4. ACTIVE PACKAGING

- Active packaging is an innovative concept that can be defined as a mode of packaging in which the package, the product and the environment interact to prolong shelf-life or enhance safety or sensory properties, while maintaining the quality of the product .
- It allows the active preservation of foods, according to their needs, by modification of the environment inside the package by removing undesired gases or by regulating the composition of the gas in the package headspace.
- Active systems can be classified according to their functionality as scavengers, regulators and emitters, and their action can be specific for several substances (O2 , CO2 , ethylene etc.).
- The internal atmosphere may be regulated by substances that absorb (scavenge) or release (emit) gases or vapors.

5.Edible Packaging

- Edible packaging is defined as a thin layer of edible material formed on a food as a coating or placed (preformed) on or between food components
- Natural polymers have been studied extensively for the development of edible packaging.
- A variety of polysaccharides (starch and hydrocolloids), proteins (whey proteins, soybean proteins and fish proteins) and lipids have been used, either individually or in mixtures, to produce edible films.
- Edible films and coatings have some advantages such as edibility, biocompatibility, barrier properties, absence of toxicity, the fact that they are nonpolluting, and low cost
- Moreover, biofilms and coatings, by themselves or acting as carriers of food additives (i.e., antioxidants and antimicrobials), have been considered particularly for food preservation because of their ability to extend the shelf - life .



Intelligent or Smart Packaging

- Intelligent, or smart packaging is basically designed to monitor and communicate information about food quality
- It is essentially an integrating method that deals with mechanical, chemical, electrical and/or electronically driven functions that enhance the usability or effectiveness of the food product in a proven way
- Some common examples of intelligent packaging are Time–Temperature Indicators (TTIs), ripeness indicators, biosensors and radio frequency identification (RFID).
- In addition, self-heating and self-cooling containers with electronic displays indicating use-by dates and information regarding the nutritional qualities and origin of the product in numerous languages are available in smart packaging
- These smart devices may be incorporated into packaging materials or attached to the inside or outside of a package.
- The FDA recognizes TTIs for fish products, so their importance may increase in the seafood industry.

Nano Packaging

- Nanoscale innovation could potentially introduce many amazing improvements to food packaging in the form of barrier and mechanical properties, detection of pathogens, and smart and active packaging with food safety and quality benefits
- Nanotechnology enables designers to alter the structure of packaging materials on the molecular scale, in order to give the material the desired properties.
- Different nanostructures, plastics can be given various gas and water vapor permeabilities to fit the requirements of various foods.
- By adding nanoparticles, one can achieve packages with more resistance to light and fire, better mechanical and thermal performance, and less gas absorption.
- These properties can significantly increase the shelf - life and sensory characteristics of food products, and facilitate transportation and usage.
- The addition of nanosensors to food packages could be used to detect chemicals, pathogens and toxins in foods


NANOTECHNOLOGY IN FOOD PACKAGING

Despite much enthusiasm, the adoption of nanotechnology in the food industry has been slow and limited. Due to restrictions imposed by increased costs, uncertain legislation and fear of a consumer reaction, food manufacturers have been reluctant to push research into proposed "nanofood" technologies, and those that are still being considered are at a very early development stage. In the realm of food packaging, however, nanotechnology is being adopted much more rapidly. Whilst there are still concerns about the degree to which nanomaterials can leach into food from the packaging, and the effect they may have on the health of consumers, most research so far looks promising, and the benefits are highly tangible - several nano-enhancements for packaging are already on the market, helping to prolong the shelf life of food and making it easier to manufacture, process, and manage.

RFID tags used in packaging food materials

FASSI Regulations

- Regulation 5.3.46 NUTS & RAISINS:

5. Dry Fruits and Nuts means the products obtained by drying sound, clean fruits and nuts of proper maturity. The product may be with or without stalks, shelled or unshelled, pitted or unpitted or pressed into blocks. The product shall be free from mould, living / dead insects, insect fragments and rodent contamination. The product shall be uniform in colour with a pleasant taste and flavour characteristic of the fruit/ nut free from off flavour, mustiness, rancidity and evidence of fermentation. The product shall be free from added colouring.

The product shall conform to the following requirements:-

(1)	**Extraneous Vegetable matter (m/m)**	**Not more than 1.0 percent**
(2)	Damaged/ Discolored units (m/m)	Not more than 2.0 percent
(3)	Acidity of extracted fat expressed as oleic Acid	Not more than 1.25 percent

Explanation - For the purpose of this paragraph –
(i) ‘Extraneous vegetable matter’ means stalks, pieces of shells, pits, fibre, peel;
(ii) ‘Damaged or Discoloured’ means units affected by sunburn, scars mechanical injury, discolouration and insects.

Packaging and Labelling Regulations

- Part 4.1: Packaging Regulation 4.1.1:

General Requirements

- 1) A utensil or container made of the following materials or metals, when used in the preparation, packaging and storing of food shall be deemed to render it unfit for human consumption:—
- (a) containers which are rusty;
- (b) enameled containers which have become chipped and rusty;
- (c) Copper or brass containers which are not properly tinned
- (d) containers made of aluminium not conforming in chemical composition to IS:20 specification for Cast Aluminium & Aluminium Alloy for utensils or IS:21 specification for Wrought Aluminium and Aluminium Alloy for utensils

(2) Containers made of plastic materials should conform to the following Indian Standards Specification, used as appliances or receptacles for packing or storing whether partly or wholly, food articles namely :—

- (i) IS : 10146 (Specification for Polyethylene in contact with foodstuffs);
- (ii) IS : 10142 (Specification for Styrene Polymers in contact with foodstuffs);
- (iii) IS : 10151 (Specification for Polyvinyl Chloride (PVC), in contact with foodstuffs);
- (iv) IS : 10910 (Specification for Polypropylene in contact with foodstuffs)
- (v) IS : 11434 (Specification for Ionomer Resins in contact with foodstuffs)

- (vi) IS : 11704 Specification for Ethylene Acrylic Acid (EAA) copolymer.
- (vii) IS : 12252 - Specification for Poly alkylene terephathalates (PET).
- (viii) IS : 12247 - Specification for Nylon 6 Polymer;
- (ix) IS : 13601 - Ethylene Vinly Acetate (EVA)
- (x) IS : 13576 - Ethylene Metha Acrylic Acid (EMAA)
- (xi) Tin and plastic containers once used, shall not be re-used for packaging of edible oils and fats;

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

PART 4.2: Labelling

Regulation 4.2.1:

- General Requirements

1) Every prepackaged food shall carry a label containing information as required under these regulations unless otherwise provided;

2) Language of the particulars or declaration of the label: The particulars of declaration required under these Regulations to be specified on the label shall be in English or Hindi in Devnagri script:

3) Pre-packaged food shall not be described or presented on any label or in any manner that is false, misleading or deceptive or is likely to create an erroneous impression regarding its character in any respect;

4) Label in pre-packaged foods shall be applied in such a manner that they will not become separated from the container;

5) Contents on the label shall be clear, prominent, indelible and readily legible by the consumer under normal conditions of purchase and use;

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

Regulation 4.2.2: Labelling of Pre-packaged Foods

- Every package of food shall carry the following information on the label.

(1) **The Name of Food**: The name of the food shall include trade name or description of food contained in the package.

(2) **List of Ingredients**: Except for single ingredient foods, a list of ingredients shall be declared on the label in the following manner:-

- (a) The list of ingredients shall contain an appropriate title, such as the term “ingredients”;
- (b) The name of ingredients used in the product shall be listed in descending order of their composition by weight or volume, as the case may be, at the time of its manufacture;
- (c) A specific name shall be used for ingredients in the list of ingredients;

- **(3) Nutritional information** – Nutritional Information or nutritional facts per 100 gm or 100ml or per serving of the product shall be given on the label containing the following:-
- (i) energy value in kcal;
- (ii) the amounts of protein, carbohydrate (specify quantity of sugar) and fat in gram (g);
- (iii) the amount of any other nutrient for which a nutrition or health claim is made:

Nutrition Facts

8 servings per container

Serving size **2/3 cup (55g)**

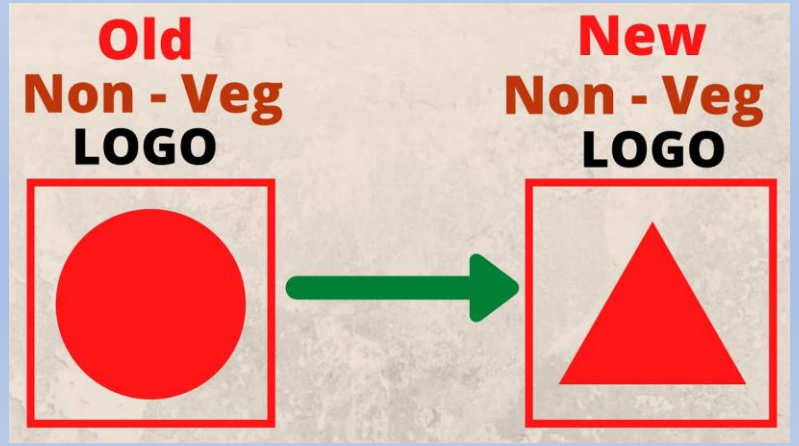
Amount per serving

Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

- **(4) Veg/ Non veg declaration** –
- (i) Every package of "Non Vegetarian" food shall bear a declaration to this effect made by a symbol and colour code as stipulated below to indicate that the product is Non-Vegetarian Food. The symbol shall consist of a brown colour filled triangle



Old logo

- A green colour filled circle, having a diameter not less than the minimum size specified in the Table below, inside the square with green outline having side double the diameter of the circle, as indicated below :
- (a) Green colour

S.No	Area of principle display panel	Minimum size of diameter in mm
1	Upto 100 cms. Square	3
2	Above 100 cms. Square upto 500 cms square	4
3	Above 500 cms square upto 2500 cms square	6
4	Above 2500 cms. Square	8

(5) Declaration of Food Additives:

- **For food additives** falling in the respective classes and appearing in lists of food additives permitted for use in foods generally,
- The following class titles shall be used together with the specific names or recognized international numerical identifications:
- Acidity Regulator, Acids, Anticaking Agent, Antifoaming Agent, Antioxidant, Bulking Agent, Colour, Colour Retention Agent, Emulsifier, Emulsifying Salt, Firming Agent, Flour Treatment Agent, Flavour Enhancer, Foaming Agent, Gelling Agent, Glazing Agent, Humectant, Preservative, Propellant, Raising Agent, Stabilizer, Sweetener, Thickener:

(ii) Addition of colours and/or Flavours-

- CONTAINS PERMITTED NATURAL COLOUR(S) OR CONTAINS PERMITTED SYNTHETIC FOOD COLOUR(S) OR CONTAINS PERMITTED NATURAL AND SYNTHETIC FOOD COLOUR(S)

CONTAINS ADDED FLAVOUR (specify type of flavouring agent)

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

(6) Name and complete address of the manufacturer

- The name and complete address of the manufacturer and the manufacturing unit if these are located at different places and in case the manufacturer is not the packer or bottler, the name and complete address of the packing or bottling unit as the case may be shall be declared on every package of food;

(7) Net content

- (i) Net Content by weight or volume or number, as the case may be, shall be declared on every package of food; and

- **(8) Date of manufacture or packing**.- The date, month and year in which the commodity is manufactured, packed or pre-packed, shall be given on the label: Provided that the month and the year of manufacture, packing or pre-packing shall be given if the "Best Before Date" of the products is more than three months:
- **(9) Best Before**

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

(ii) "BEST BEFORE ..... MONTHS AND YEAR OR "BEST BEFORE ..... MONTHS FROM PACKAGING OR "BEST BEFORE .....MONTHS FROM MANUFACTURE

Walnut packaging

- Walnut can be packed in two ways :

1. walnut in shell

2.Walnut kernels

Walnut in shell packaging

- Retort pouches
- Sack packaging
- Vacuum Packed in retort pouches
- Paper laminates

Walnut kernels packaging

- Vacuum packaging
- Tin packaging
- Glass jar packaging (chipped / powder)
- Retort pouches
- Paper laminates
- Plastic jars

MINISTRY OF FOOD PROCESSING INDUSTRIES
GOVERNMENT OF INDIA

NIFTEM
KNOWLEDGE • INNOVATION • OUTREACH

Thank you