MINISTRY OF FOOD PROCESSING INDUSTRIES
GOVERNMENT OF INDIA

NIFTEM
KNOWLEDGE • INNOVATION • OUTREACH

MAHUA PACKAGING TECHNOLOGY

AATMANIRBHAR BHARAT

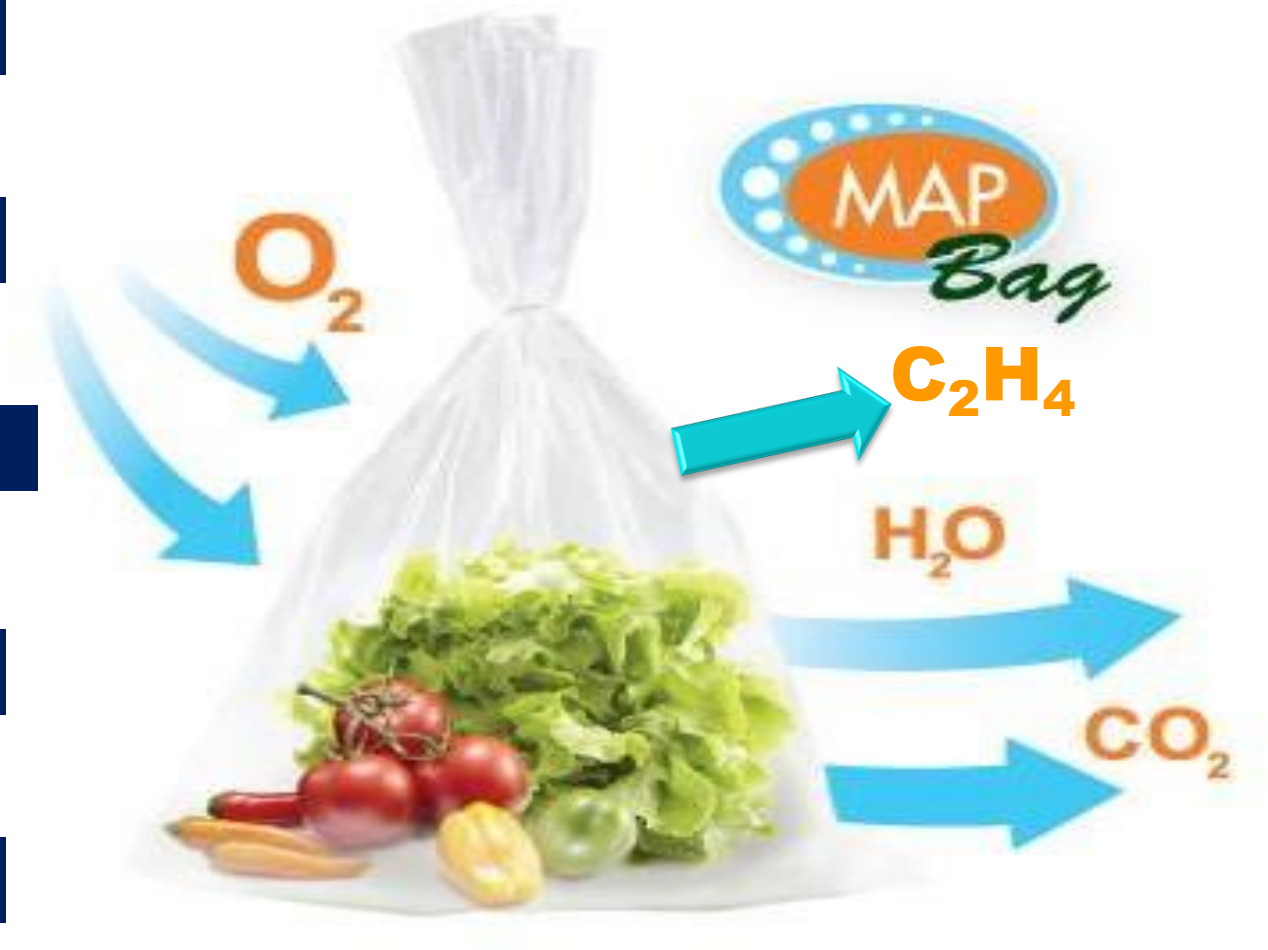
PM Formalisation of Micro Food Processing Enterprises Scheme (PM FME Scheme)

- **What is Packaging ?**
  - A coordinated system of preparing goods for transport, distribution, storage, retailing and end use.
  - A means of ensuring safe delivery to the ultimate consumer in sound conditions at minimum cost.

- **What is the purpose of packaging ?**
  - Protection of produce during Transport, Storage and Marketing till Consumption. Here protection means protect product from physical injuries (impact, compression, abrasion and wounds) and adverse environmental conditions (temperature, relative humidity) during transport, storage and marketing.

Post Harvest Physiology of Fruits and Vegetables

- Respiration
- Transpiration
- Ethylene Produc.
- Ripening
- Senescence



Packaging materials provide

protection

utility

communication

- **Requirements of a Good Package**

  - Physiologically inactive & Environment friendly.
  - Sufficient strength in compression and against impact and vibrations
  - Stable during the entire distribution chain.
  - Compatible with the automatic packing/filling, handling machines (mechanical filling systems)
  - Facilitate special treatments like pre-cooling.
  - Increase consumer appeal.
  - Easily printable and cost effective.

Packaging Materials

- **Traditional**
  - Wooden and earthen– boxes
  - Jute/gunny bags
- **Modern**
  - Canvas – sacks
  - Paper and card board – liners, boxes, trays
  - Plastic – Rigid - crates, pallets, trays
  - Flexible – films (single & multi layered)
  - Polystyrene boxes / trays
  - Combined materials – CFB and plastic

CFB has almost replaced wood and jute and is considered as most important package material to be used in combination with other materials.

TYPES OF PACKAGING

- **Consumer or unit Packaging of Mahua**

- **Corrugated Boxes-**
  - Wooden box having CFB liners.
  - CFB box with plastic film wraps
  - CFB trays with wooden corner supports
  - CFB laminated or waxed containers.
  - CFB box with plastic retailer packs (strawberry boxes)
  - CFB or polystyrene trays/boxes with plastic film wraps.

- **Transport Packaging- II**

Modified Atmosphere Packaging

- The normal composition of air is
  - 21% oxygen,
  - 78% nitrogen and
  - <0.1%carbon dioxide

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Modification of the atmosphere within the package by reducing the oxygen content while increasing the levels of carbon dioxide and/or nitrogen has been shown to significantly extend the shelf-life of perishable foods at chill temperatures.

Modified Atmosphere Packaging

- When a given weight of produce is sealed within a plastic bag, it uses oxygen and produces carbon dioxide.
- As the oxygen concentration inside the package falls, below about 10% the rate of respiration (oxygen use) starts to decrease. At the same time, oxygen moves into the bag through the walls of the plastic bag and carbon dioxide moves out.
- Oxygen and carbon dioxide move across the film in proportion to the drop in concentration of oxygen and rise of carbon dioxide concentration inside the plastic bag.
- The modified atmosphere concept for packaged goods consists of modifying the atmosphere surrounding a food product by vacuum, gas flushing or controlled permeability of the pack thus controlling the biochemical, enzymatic and microbial actions so as to avoid or decrease the main degradations that might occur.

- **The Determining Factors**
  - **The weight of the product in the bag**
  - **The temperature and**
  - **The respiration rate of the commodity.**
    - **Respiration rate may vary among cultivars, seasons and growing conditions.**
  - **The rate of oxygen and carbon dioxide movement through the wall of the bag.**

MAP is the replacement of air in a pack with a single gas or mixture of gases; the proportion of each component is fixed when the mixture is introduced.

- The Modification of Gases
  - Passive: Automatic Modification in hermetically sealed packs
  - Active: Artificial Modification by incorporating know gases
    - CO_2, O_2, N_2,
- The Gas Mixture
  - Three types of gas mixtures used in modified atmosphere packaging
    - Inert blanketing (N_2)
    - Semi-reactive blanketing (CO_2/N_2 or $O_2/CO_2/N_2$)
    - Fully-reactive blanketing (CO_2 or CO_2/O_2)

Advantages of MAP

- Increased shelf-life allowing less frequent loading of retail display shelves;
- Reduction in retail waste;
- Improved presentation-clear view of product and all round visibility;
- Hygienic stackable pack, sealed and free from product drip and odour;
- Little or no need for chemical preservatives;
- Increased distribution area and reduced transport costs due to less frequent deliveries;
- Centralised packaging and portion control;
- Reduction in production and storage costs due to better utilisation of labour, space and equipment

Disadvantages of MAP

- Capital cost of gas packaging machinery;
- Cost of gases and packaging materials;
- Cost of analytical equipment to ensure that correct gas mixtures are being used;
- Cost of quality assurance systems to prevent the distribution of leakers, etc
- Benefits of MAP are lost once the pack is opened or leaks.

ACTIVE PACKAGING

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- **Most Advanced Technology**

- **Packages interact with food and the environment and play a dynamic (active) role in food preservation retaining microbiological or biochemical quality of food contents**

- **Different types of absorber and/or scavengers are used for O_2, Moisture, CO_2, Ethylene and antifogging treatments**

ACTIVE PACKAGING

Oxygen absorbers

in sachets

in labels

in caps

they are used to:

- *prevent oxidation*
- *avoid food discoloration (chlorophyll, carotenoids)*
- *inhibit fungus and aerobic bacteria*
- *avoid nutrient losses (vitamins)*

ACTIVE PACKAGING

ACTIVE PACKAGING

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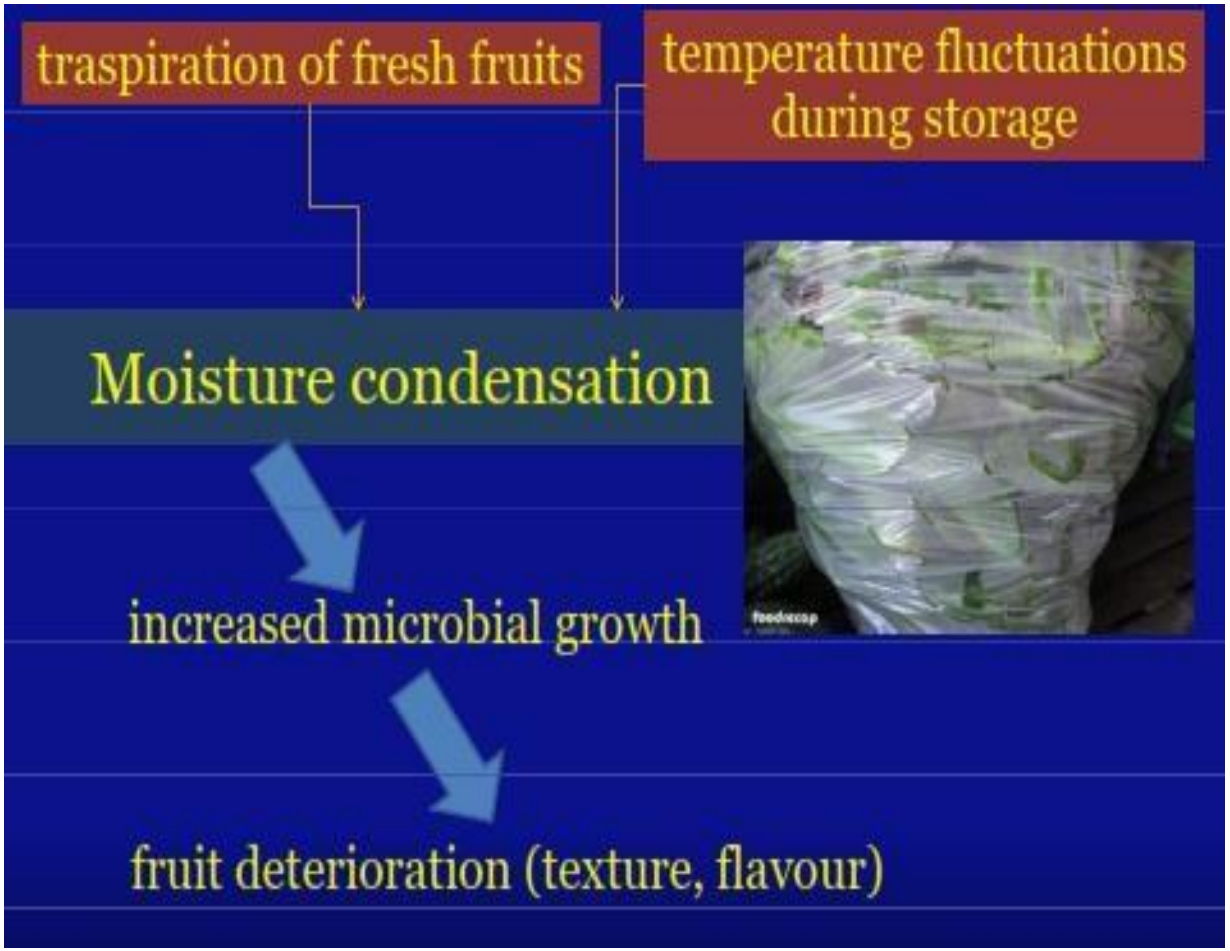
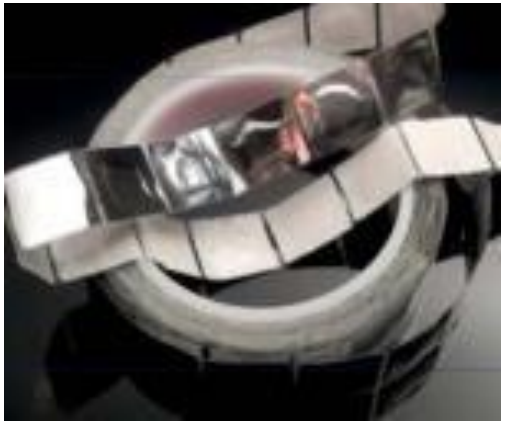
Moisture Absorber



ACTIVE PACKAGING

Moisture Absorbers

Bags



Labels

Pads

Absorbing Materials: Silica gel, NaCl, CaO

Porous Polymeric Materials: CMC, Polycrilate

Active Packaging

Multisorbent Bags

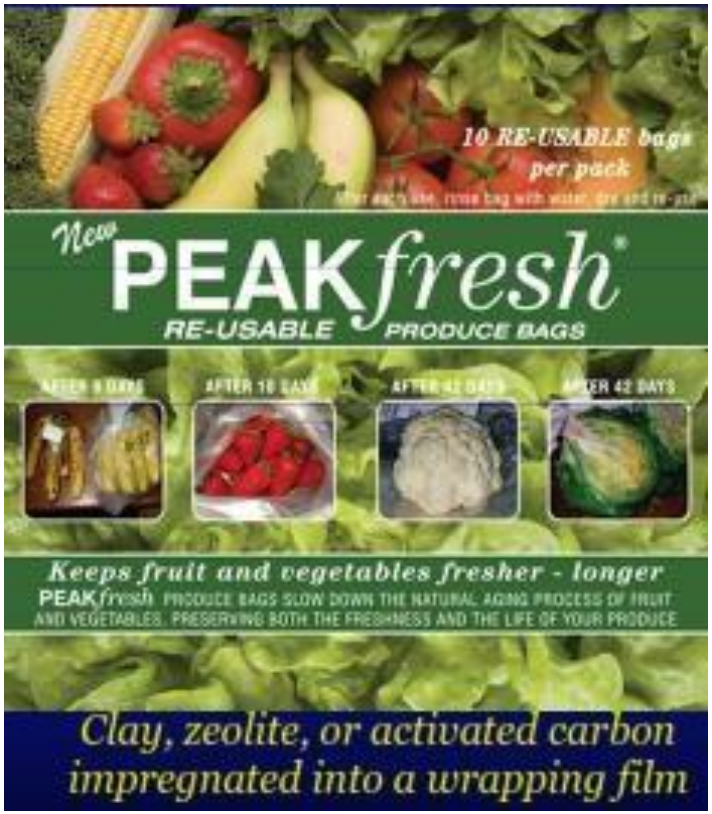
Tyvek (HDPE) bags containing sorbent blends for specific packaging needs

Activated Carbon → **Odor Removal**

Clay or Silica gel → **Desiccating properties**

Active Packaging

Ethylene Absorber



ACTIVE PACKAGING

Ethylene removal:

by adsorption on zeolite or other porous materials (e.g., activated carbon) impregnated into a LDPE film

for bulk packaging

for retail packaging

bags for domestic use

Carbon Dioxide Emitters

- In fresh fruits and vegetables CO_2 is used to reduce the respiration rate.
- CO_2 suppresses the microbial growth and thus deterioration of fresh produce
- CO_2 is released by *Moisture-Activated Bicarbonate* chemicals in sachets and pads
- Used in combination with O_2 scavenger to avoid package collapse or partial vacuum

Concluding Remarks

- Bihar- Immense potential in producing quality produce.
- But Loosing 30% of its production due to poor PHM
- Packaging is an important aspect of PHM
- FnV are living materials so selection of proper packaging is essential.
- Packaging- increases shelf life and marketing potential
- Good Packaging = Good Appearance= Good Profit

SUGGESTIONS FOR THE STATE

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- Modern Packaging- Reduction in loss during transportation

  Transportation
- Introduction of modern technology is needed
- Creating Awareness among the growers
- Popularization of CFBboxes (at least) for transportation and storage
- Market glut during the season may be alleviated/reduced using MAP and Active packaging.

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