Packaging

An important consideration in reducing post-harvest losses of fresh fruits and vegetables

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Direct causes of post-harvest losses

An overview

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Mechanical injuries

- ***Impact injuries***
  - dropping the product onto a hard surface
  - dropping the product into the back of a vehicle
  - excessive drops during loading and unloading
  - suddenly stopping or accelerating a vehicle
- ***Vibration or abrasion injuries***
  - vehicles with small wheels and bad shock-absorbers
  - weak crates
  - bad roads
  - transmission vibration

- ***Compression injuries***
  - over-packing of crates and boxes;
  - too high stacking of crates;
  - weak packaging
- ***Puncturing injuries***
  - nails or splinters from the crate, box or bamboo baskets;
  - fingers or nails of a person;
  - hard and sharp stalks of fruit

Physical and environmental factors

- excessive or insufficient
  - heat
  - Cold
  - Gases
  - Humidity

Holes in cartons should be at least five percent of the total box surface to allow for ventilation. Consumer packages slow the respiration rate by maintaining low oxygen and high CO_2 levels, protect the produce from ethylene and odour absorption.

Biological and microbiological losses

- damage to produce by
  - Insects
  - Birds
  - Rodents
  - Bacteria
  - molds etc.

Correct packaging, stacking and storing can reduce the incidence of this type of losses.

Bio-chemical and physiological losses

- undesirable ***reactions between chemical compounds***
- ***contamination*** with harmful substances such as certain pesticides
- Examples of loss due to ***physiological*** reactions is the sprouting of potato, onion etc..

Indirect causes of post-harvest losses

An overview

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External factors

- ***Consumers' demand:*** Loss due to sudden decrease in consumers' demand
- ***Inadequate marketing systems***: Delayed marketing, damaged products
- ***Facilities***
- ***Policy changes***
- ***Lack of training and awareness***
- ***Underdeveloped infrastructure*** (transportation facilities)
- ***Unreliable supplies*** of packaging or high cost of packaging

Functions of packaging

to *contain*, to *protect*, to *communicate* and to *market*

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- ***To contain produce***
  - As an efficient handling unit, easy to be handled by one person.
  - As a marketable unit.
- ***To protect produce against***
  - Rough handling during loading, unloading and transport – e.g, rigid crate
  - Pressure during stacking
  - Moisture or water loss with consequent weight and appearance loss

- ***To communicate***
  - Identification of the product with a label describing place of origin, volume, type or variety of product, etc.
  - Marketing, advertising: recognizable trade name and trademark
- ***To market the product***
  - Proper packaging reduces injuries and improves appearance
  - Standard units (weight, count) will increase speed and efficiency of marketing.
  - A more efficient use of space by palletizing.
  - Labels facilitate inspection.

Types of packaging

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Types……

- **No packaging**:
  - Hand carried.
  - Bruising and neck damage to the banana fingers
- **Second hand containers**
  - Must be clean
  - More chances of contamination
- **Bags and sacks**
  - Made from a variety of materials such as paper, polyethylene film, hessian

Types.....

- **Woven baskets**
  - made from split ***bamboo***, ***rattan*** or ***palm leaves***
  - variety of ***designs***.
  - Construction is normally ***by hand***
  - ***Good ventilation*** for crops
  - Damage the crop by ***abrasion***
  - ***Cushioning material*** such as paper or leaves reduces abrasion, but this also reduces ventilation.

Types…

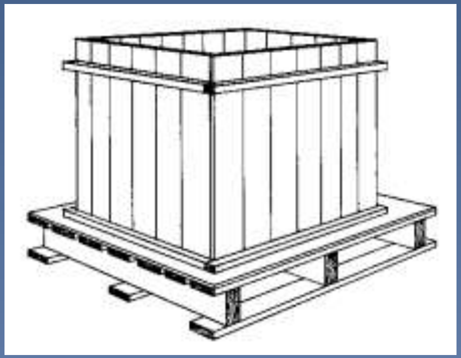
- **Wooden field boxes**
  - good ***stacking*** properties
  - ***expensive*** and ***heavy***, which affects their use in crop handling
  - Many wooden boxes are ***made by hand***, which result in variations in size and shape that creating problem in ***stacking***
  - can take up moisture and, if not properly cured, can lose moisture and become distorted.

Types.....

- **Plastic crates**
  - strong and durable
  - Reusable and recyclable
  - Good stackability
  - Biodegradable plastic material (polyhydroxybutyrate) is also available

Types……

- **Pallet boxes**
  - made from wood or plastic and are used for a whole range of crops
  - Size can vary
  - Standard size of a European pallet of 1.0 x 1.2 m and usually about 0.5 m high.



Types....

- **Fibre-board boxes**
  - made from either laminated fibreboard or, more commonly, corrugated fibreboard
  - reduced injury to the produce
  - Low cost
  - Solid fibreboard is not commonly used for fresh produce
  - easily takes up moisture affecting strength of the box

Special packaging

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Shrink packaging

- Shrink wrap -- plastic film that shrinks tightly over the produce under heat
- Checks spoilage and bruising
- Retains moisture
- Moulded trays, wrapped with film liners (Tray packaging), combine four to six units (citrus, apple, etc.) to one larger unit. The tray will give the produce protection from the bottom and some protection on the sides.

Retail packaging or Prepackaging

- Deterioration or decay is slowed down
- The reduction of spoilage caused by consumers selecting out of a bulk of produce
- Time needed for weighing and checking after selecting by the consumer will be reduced
- Advertisement by abundant supply
- More protection to the produce

Modified atmosphere packaging

- MAP defined as an alteration in the composition of gases in and around fresh produce by respiration and transpiration when such commodities are sealed in plastic films
- Higher CO_2 and lower oxygen
- For fresh fruits and vegetables this is commonly achieved by packing them in plastic films.

AAU's technology for packaging pineapple

- Each perforated box accommodates 12 fruits of 'Kew' pineapple [50 cm (L) × 40 cm (H) × 35 cm (W) size]
- Damage resistant both on full body truck (up to 1000 km) and goods train (up to 2500 km) with no bruising loss and with decay loss of 0.9% and 2.78%, respectively.

AAU's technology for packaging *khasi* mandarin

- 42 cm × 30 cm × 32 cm size having 12 numbers of circular holes (2 cm diameter) and it can accommodate 128 numbers of mandarin fruits.
- Damage resistant on fully-loaded truck covering a distance of 1000 km with no bruising loss and 0.78% decay.