



E. Physical Methods

i. Fruit irradiation:

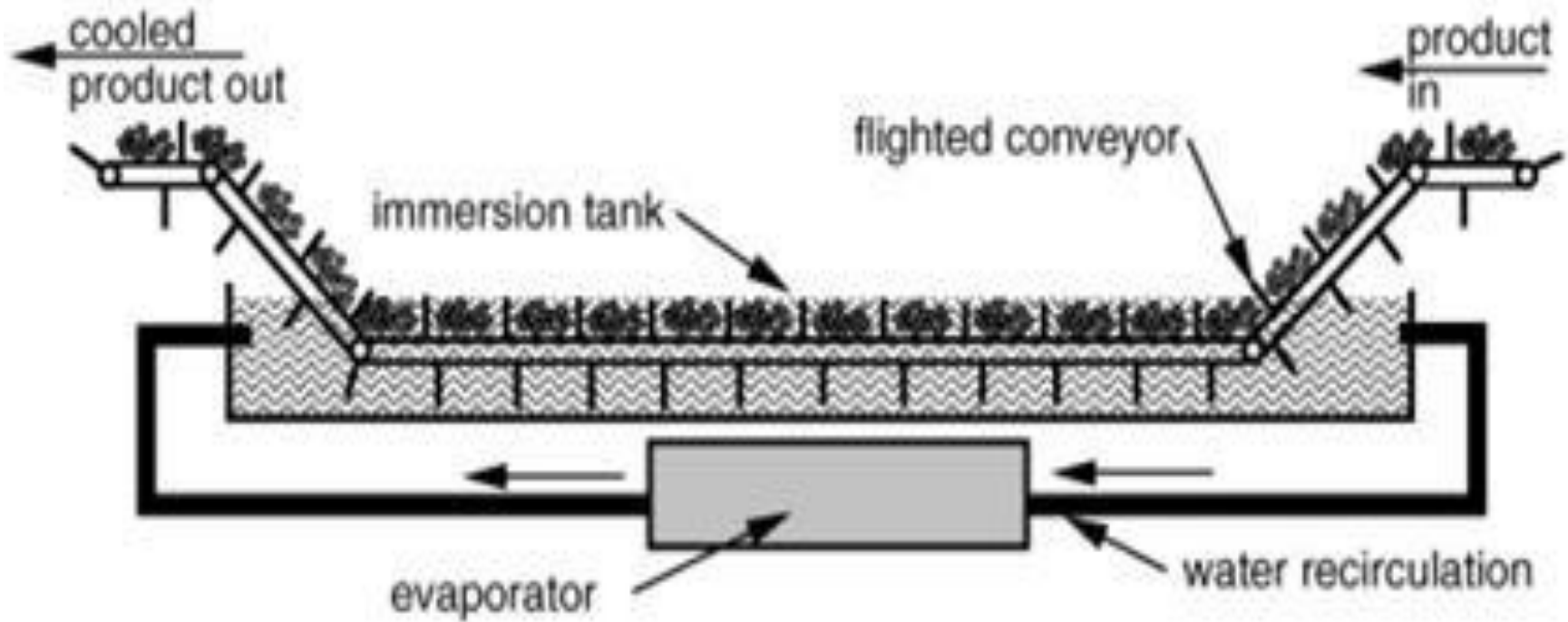
- Food irradiation improves the safety and extends the shelf life of foods by reducing or eliminating microorganisms and insects.
- Among the ionizing radiation, gamma irradiation is most successfully used for inhibiting the growth of pathogens inside fruit tissue.
- Irradiation ranging between 0.3 KGY and 1.2 KGY reduces the incidence of postharvest storage diseases of mango (*Gloesporium* & *Botryodiplodia*) but a dose above 0.6 KGY results in surface discoloration of the fruits. e.g. peaches, strawberries and guava fruits.
- *Alternaria*, *Botrytis* and *Stemphylium* can be controlled in vegetables in greenhouses with special UV-absorbing polyvinyl film.

ii. Washing of Fruits

- After harvest before packing/marketing, individual fruits should be washed in abundant flow of clean water to remove plant debris and trash and pathogens responsible for causing diseases in transit.
- Washing fruits and vegetables in hydro cooler is much beneficial as it extends the shelf life of the produce.

- Hydrocooling is helpful to avoid wilting, shrinking and losing flavor in fresh fruits and vegetables.
- Fruits and vegetables are placed on a conveyor that pushes the boxes through a cooling tunnel.
- Hydro cooling can lower the product's temperature to a safe level.

Hydrocooling



- A hydro cooling unit can cool fruits and vegetables from 30 to 5 °C at a rate of 20,000 kg/h.
- The water is circulated and cooled by the evaporator section of a refrigeration system.

iii. Hot Water Treatment

- **Why hot water treatment is required?**
- **Contaminated** or dirty fresh **fruits** and vegetables may cause food-borne illness.
- **Contamination can** come from water, soil, fertilizer, wild animals or birds, unsanitary processing methods, and when food is handled or prepared by the consumer.

Mode of Entry for Pathogens

- Natural openings
- Mechanical damage
- Bruises
- Severe blemishes
- Direct penetration

- Hot water treatment was first introduced in 1922 to control postharvest decay in citrus fruit.
- In hot water treatment fruits are immersed in hot water before storage or marketing.
- **Hot water** treatment is promising and has been used with success in eradicating or suppressing the development of fungi/bacteria on the fruit surface as well as those situated just below the surface as a result of pre-harvest infection.

Methods of Hot Water Treatment

- 1. Hot water immersion
- 2. Rinsing and brushing

iv. Aerated Steam / Vapour Heat Treatment

- Recently heated forced air treatment has gained some importance in the postharvest treatment of some fruits.
- e.g. treatment of mango at 48 °C for 15 minutes considerably reduces the anthracnose /stem end rot (*B. theobromae*) and also eradicates the infection of fruit fly.

- **Vapor heat treatment** is a method of heating **fruit** with air saturated with water **vapor** at temperatures of 40–50°C to kill insect eggs and larvae as a quarantine **treatment** before fresh market shipment.

Benefits of Vapour Heat Treatment

- VHT system is a non-chemical alternative to control unwanted insects and fungi in perishable commodities and tropical fruits like mangoes or papayas.
- VHT is a very environmentally friendly process of sterilization which is much safer than the use of insecticides and other synthetic chemicals.

Vapour Heat Treatment System



v. Drying fruits

- Many fruits can be stored for longer time after drying and can be kept free of disease because moisture is kept below a certain level during storage e.g. grapes, plums, dates and figs, slices of fleshy fruits apples, peaches and apricots etc.

F. Biological Control

- Use of microbes offers one of the most effective means of controlling the postharvest diseases without any adverse effect on the environment and the consumer.
- Spraying with suspensions of *T. harzinum*, *T. viride*, *Gliocladium roseum* and *Paceilomyces variotii* results in a partial control of *Botrytis* in strawberry fruits and *Alternaria* rot in lemons.

G. Fruit Coating with Vegetable / Edible Oil

- Use of vegetable oils in plant disease control is a recent development in the field of
- plant pathology. e.g. Castor, Linseed, Mustard, Sunflower, Safflower, Groundnut, mineral oils, Palma rosa, red thyme / liquid paraffin etc. are coated on harvested fruits to prevent entry of pathogen as well as decreasing respiration due to their antifungal activity.
- Herbal edible coatings are used as a nutraceutical and beneficial for consumer health.

- Edible coatings are also used for extension of shelf life of fruits and vegetables.
- These can also be safely eaten as part of the product and do not add unfavourable properties to the foodstuff.

- Edible coatings help to prevent loss of firmness and moisture and also control maturation, development and respiratory rate.
- Edible coatings prevent oxidative browning and decrease growth of microorganisms in fruits and vegetables e.g. Tomato, Cucumber, and Cherries.
- They have high potential to manage browning, discolouration activity and off flavor.
- They contain active components such as antioxidants, vitamins etc. and enhance nutritional composition of fruits and vegetables without affecting desired quality.

Examples of Edible Coatings on Fruits and Vegetables

Fruits:

- Orange, Apple, Grapefruit, Cherry, Papaya, Lemon, Strawberry, Mango, Peach etc. and fresh-cut Apple, fresh-cut Peach, fresh-cut Pear etc.

Vegetables:

- Tomato. Cucumber, Capsicum, Cantaloupe and minimally processed Carrot, fresh-cut Potato, Cabbage, fresh-cut Tomato slices, fresh-cut Onion, Lettuce etc.

Classes of Edible Coatings

- The edible coatings are mainly divided into three classes:
- **1. Hydrocolloids:** e.g. Polysaccharides, proteins and alginate.
- **2. Lipids:** e.g. Fatty acids and waxes.
- **3. Composites:** e.g. Protein/protein, polysaccharides/protein, lipid/polysaccharides.

Examples Edible Coating

- Fruit and Vegetable

- Tomato
- Apple

- Mango
- Strawberry

- Edible Coating

Aloe Vera gel

Aloe vera gel, neem oil, guar gum, marigold flower extract.

Aloe vera, chitosan

Sodium Alginate, linseed mucilage extract, Arabian gum

H. Natural Plant Products

- Neem leaves kept in grain store houses prevent deterioration by molds and pests.
- Baskets of fruits and vegetables are lined with neem leaves for their protection against microbial attacks.
- It is believed that toxic substance emitted by the leaves keep the air remarkably free of pathogenic microorganisms.

I. Treatments to minimize water loss

- Postharvest studies have shown that reducing transpiration provides a means of extending the shelf-life of fresh produce.
- Water loss during transpiration leads to shrinkage, drying and softening and triggers senescence, leading to accelerated deterioration of produce.
- Waxing is commercially used to reduce the transpiration rate of fruits and vegetables.

*Sources

- 1. Recommended books.
 - 2. Latest research articles downloaded from Google.
 - 3. Google images.
-
- *Solely for academic purpose and guidance of students.