Role of Biotic and Abiotic Factors

Abiotic factors:

- 1. Moisture and temperature
- 2. Storage period
- 3. Types of storage structures

Biotic factors:

- 1. Physical characteristics of seeds / perishables
- 2. Microorganisms
- 3. Insects and mites

- Effective grain ecosystems can ensure better and long storage of produce.
- e.g. grains can be stored safely for up to three years if their moisture content is reduced to safe levels (12-13 per cent of wet weight) using proper drying techniques and providing cool conditions (under 15 °C) using aeration or chilled aeration.

Physiological and biochemical changes in fruits during transit and storage

- The natural resistance of fruits and vegetables to diseases declines with storage duration and ripeness.
- Weak pathogens which normally require a wound in order to infect can become a problem in produce that has been stored for long periods of time.

- Fruits and vegetables are the best sources of energy due to the availability of sugars, amino acids, organic acids, vitamins and other nutrients.
- Many fruit rot pathogens cause depletion of nutrients resulting in total loss of nutrients.
- Pectolytic and cellulolytic enzymes produced by the pathogens break down the pectic and cellulosic substances of host cell wall.

Management of Postharvest Diseases

I. Pre-harvest Care

- **A. Phyto-sanitation**

- As primary inoculum of most postharvest diseases is carried from the orchard, therefore, pre-harvest cultural practices influence postharvest disease problem.
- Inoculum of the pathogens survives on dead twigs, infected leaves and fallen fruits. So phyto-sanitation provides an effective measure to keep the incidence of diseases at quite low level.
- The fruiting bodies of the pathogens including acervulus, pycnidia, chlamydospores, sclerotia etc. on the plant debris can perpetuate the infection cycle.
- **Examples:** Anthracnose of Guava*, Anthracnose* of mango*,* Crown rot of banana, *Colletotrichum* and Botryosphaeria rot of apple.

- **B. Pre-harvest Chemical Treatments**
- The effective method to reduce field infections is the application of broad-spectrum protective fungicides to the developing fruit. e.g.
  - Copper oxychloride for citrus brown rot.
  - Benomyl for oranges stem end rot.
  - Carbendazim, Topsin-M for Anthracnose and stem-end rot of mango, banana and other tropical fruit crops.

C. Resistant Cultivars

- Plant breeding and genetic engineering aims to incorporate resistant genes in new varieties of crop plants.
- Differences in genetic characteristics affect the shelf life of the fresh produce.
- Promising cultivars are not only high yielding but also possess resistance against different diseases.

II. Care at Harvest

- Harvest of the fruits should be done at proper stage by considering the size, shape, colour, flesh firmness, sugar, starch and oil content.
- Appropriate and careful harvesting techniques are essentially required because of delicate nature of some fruits and vegetables.
- Harvesting by hand is the predominant method for fruits and vegetables.

III. Postharvest Care

A. Handling and Packaging

- Careful handling of fruit is the most important step that has to be taken at all postharvest stages.
- Sorting and grading of the harvested fruits is good farm house practice.
- Discarding the fruits showing blemishes can greatly reduce the intensity of disease at later stages.
- As a modern practice, corrugated boxes, fiber board packs, molded plastic trays and wooden crates are used for packing purpose.

B. Care during Transport

- Guava, papaya, strawberries and mango are comparatively more prone to injury and hence need special care during transportation.
- High value perishables are sent by air, either in wide bodied freights or in the cargo holds of passenger aircraft.

C. Storage

- Cold storage and modified atmosphere storage are aimed out preventing the perpetuation of pathogen and spread of the disease.

  i. **Disinfection of warehouses**

- Remove debris from warehouses/cold storages.
- The walls and floors should be washed with bleaching powder, copper sulfate,

  etc to eradicate the pathogens which are

  surviving in the store structures.

ii. Low temperature storage

- Low temperature storage is less suitable for tropical fruits like mango, banana and guava which are sensitive to chilling.
- Suitable temperature for Mango storage is more than 13° C, temperature below 13 ° C causes chilling injury.
- For Guava more than 15° C, for Banana more than 10° C and for Papaya more than 6 ° C is required.

iii. Modified atmosphere storage

- This method has been found effective in extending the shelf life of harvested fruits.
- In storage maintaining a low temperature, an adequate humidity, low oxygen, low ethylene concentration are favorable.
- If atmosphere of mango storage is modified as 2% CO_2, 6% O_2 and 13 °C temp, it can be stored for longer.

D. Postharvest Treatment with Chemicals

- Copper or sulphur compounds, phenolic compounds, dithiocarbamates, antibiotics, systemic fungicides (Benomy/TBZ), iprodine, imazalil, prochloraz, fosetyl, etc. are generally used for postharvest disease control.
- Blue and green moulds are controlled with pre- and postharvest applications of fungicides such as sodium ortho1phenylphenate (SOPP), thiabendazole (TBZ) and imazalil (IMZ).

- These fungicidal treatments can control established or new infections occurring in pack houses.
- Imazalil and thiabendazole are used in an aqueous suspension before waxing or in the water emulsion wax. Recommended rates are 1,000 ppm for aqueous application and 2,000 ppm when used in the wax.
- The higher rates of the fungicides used in wax are due to the reduced efficacy of fungicide-wax combinations.
- Imazalil also has good activity for control of green and blue mould sporulation and it provides some activity for control of Alternaria stem-end rot.

*Sources

- 1. Recommended books.
- 2. Latest research articles downloaded from Google.
- 3. Google images.

- *Solely for academic purpose and guidance of students.