



Postharvest Pathology

- **Postharvest pathology** deals with the science of, and practices for, the protection of harvested produce during harvesting.
- The development of **postharvest** diseases is a process that involves contamination of the surface of a produce with a pathogen's propagules.

Losses

- Loss **means** any change in the quality of the food that prevents it from being consumed by people.
- Losses caused by postharvest diseases are greater than generally realized because the value of fresh fruits and vegetables increases several-fold while passing from the field to the consumer.
- Postharvest losses in different countries of the world range from 10 to 30% per year despite the provision of modern storage facilities and techniques.

- Postharvest diseases affect a wide variety of crops in developing countries which lack modern postharvest storage facilities.
- Infection by diverse pathogens may occur during the growing season, at harvest time, during handling, storage, transport and marketing, or even after purchase by the consumer.
- The reduction of losses in perishable food crops has become a major concern of international organizations.

- In Sept 1975, the United Nations General Assembly sitting in N.Y. resolved:
- *“The further reduction of postharvest food losses in developing countries should be taken as a matter of priority, with a view to reaching at least a 50% reduction by 1985. All countries and competent international organizations should cooperate financially and technically in the effort to achieve this objective”*

F.A.O. Estimate

- A presumably reliable estimate is the figures quoted by F.A.O. in developing its action programme for Prevention of Food Losses.
- Almost 10% of cereal grains is lost by all developing countries and that losses of up to 25 – 50% occur in perishables in some tropical countries.
- The figure definitely exceeds 30% in most of these developing countries.

Causes of Losses

- **I.** Pre-harvest factors
- **II.** Poor handling factors
- **III.** Parasitic disease factors
- **IV.** Environmental factors
- **V.** Socio-Economic factors

I. Pre-harvest Factors that Influence Postharvest Pathology

- Weather conditions during the growth of crop and at harvest contribute greatly to the possibility of deterioration.
- Some cultivars are more susceptible to decay caused by postharvest pathogens.
- Condition of the crop at harvest, handling techniques and type of storage have a great impact on shelf life of produce.
- Presence of biotic and abiotic stresses in the fields or orchards may severely impact quality and quantity of the produce.

II. Poor Handling Factors

1. Physiological Condition

- Blemishes, bruising, crushing and mechanical damage on the skin of the produce result from non recommended harvesting tools and careless handling.

Bruises and Mechanical Cuts on Apple Fruit



- Proper maturity of different fruit and vegetables occupies paramount importance to get good price in the local and international market.
- Picking of apples is done when they are slightly immature to ensure that they can be stored safely for several months.
- The commencement of ripening and senescence in various fruit and vegetables renders them more susceptible to infection by pathogens.
- Crop nutrition plays an important role to avoid decay in fruits and vegetables making them less susceptible to decay.

2. Storage / Marketing Losses

- **i. Poor Packaging:**
- A major setback suffered by fruits and vegetables during transportation is the type of container in which these crops are packed.
- Due to being expensive, well aerated wooden crates are not used in many countries.
- Due to non-provision of scientifically designed containers, fruits and vegetables are subjected to bruising, squeezing and mechanical damage.

ii. Poor Transportation

- As a traditional practice, the farmers usually carry their produce on their heads in locally made baskets to cover long distances. This results in wastage of time and produce reaches its destination very late after a break of many hours or days.
- Delay may lead to over-ripening before the market is reached.
- Perishable goods carried by vehicles on rough roads don't ensure healthy state of produce to be marketed.

iii. Mechanical Damage

- The effect of mechanical damage caused during the harvesting operation is manifested during storage and marketing.
- The wounds created during the operation provide avenue for pathogenic fungi or bacteria which may disintegrate tissue ultimately causing decay symptoms.
- The bruises or wound may lower the quality of the produce.
- Abrasions, scratches and cuts result in mechanical injuries of the skin of the produce.

- **iv. Absence of Proper Storage Facilities.**
- In third world countries, proper storage is not considered an essential part of farming system.
- The loss may occur due to poor ventilation and biodegradation arising from high temperature of storage.
- The produce deteriorated during improper storage is mostly supplied to the market fetching very low price.

- **v. Absence of Facilities for Processing.**
- Processing facilities are lacking for most of the food crops.
- If the produce is processed as soon as it is harvested wastage would be greatly minimized.

vi. Marketing System

- Most of the farmers live at subsistence level, so they have to harvest their crops in order to meet their family requirements.
- Sometimes crops which are ready for harvest are wasted as they may become overripe.
- In traditional markets, the crops are kept under unhygienic conditions. This enhances the risk of contamination.

vii. Shriveling and Wilting

- Fruits and vegetables are often kept on market floors and tables under the heat of the scorching sun.
- This results in moisture loss causing shrivelling of fruits and vegetables.
- The heat of the sun enhances physiological breakdown resulting in discoloration and softening of the produce.

viii. Poor Packaging and Sanitation

- Due to poor sanitary conditions in the markets, risk of abiotic disorders and microbial contamination is greatly enhanced.
- Bad practice of mixing deteriorated vegetable materials with the healthy ones contaminates healthy fruits and vegetables.
- Under these deteriorating conditions, diseases quickly spreads to the healthy ones resulting in rapid great loss of the produce.

III. Parasitic Disease Symptoms

- Inoculum of most postharvest diseases is carried over from pre-harvest infections combined with new infections arising from germination of spores on the fruit surface.
- Presence of abundant inoculum coincided with favorable conditions for infection results in heavy infection before or at the time of harvest.

- **1. Pre-harvest infection**

- Spores are carried to flowers and fruits by wind and rain splashes.
- Sometimes infections are quiescent but pathogens may become activated in postharvest phase.
- e.g. anthracnose of mango and papaya, crown rot of banana, stem end rots of citrus, brown rot etc.

- **2. Postharvest infection**

- Direct penetration of the skin may occur.
- Infection through natural openings.

3. Food Safety Issues

- The microbial toxins are responsible for unsafe food.
- They can be subdivided into bacterial toxins and toxins produced by fungi or mycotoxins.
- An example of a microbial toxin that is extremely toxic is the botulinum toxin produced by the anaerobic bacterium, *Clostridium botulinum*.
- In 1960 in England, 100,000 turkey poults were killed.
- Aflatoxins produced by fungi in the peanut meal used to feed the birds was the cause.

IV. Environmental Factors

- **1. Temperature:** High temperature of the tropics leaves adverse effects on the keeping quality of the harvested crops.
- The chemical and biochemical changes result in rapid deterioration of the crops. At such high temperatures, the starch content of the crops is greatly reduced.
- The sugars are then quickly oxidized resulting in low food reserve in the tissue.
- For prevention of loss of the harvested crops due to high temperature, cooling is necessary.

2. Humidity

- Many microorganisms become more active when the moisture content of their environment is high.
- At low moisture content, the organisms are less active.

V. Socio-Economic Factors

- Because of socio-economic problems, poverty, illiteracy and complications of rural set up, our farmers are not ready to accept the advanced technologies. This inflicts high economic loss.
- Capacity building of all the stack holders is essential to apprise them of the latest concerns and technologies.

*Sources

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