

LECTURE 6. FACTORS RESPONSIBLE FOR DETERIORATION OF HARVESTED FRUITS AND VEGETABLES

A- Primary causes of loss: Those are directly affect the food

Enzymic changes

Enzymes which are endogenous to plant tissues can have undesirable or desirable consequences.

Examples involving enzymic changes include:

- the post-harvest spoilage of fruit and vegetables
- oxidation of phenolic substances in plant tissues by phenolase (leading to browning)
- sugar - starch conversion in plant tissues by amylases
- post-harvest demethylation of pectic substances in plant tissues (leading to softening of plant tissues during ripening, and firming of plant tissues during processing).

The major factors useful in controlling enzyme activity are:

1. temperature
2. water activity
3. pH
4. chemicals which can inhibit enzyme action

Chemical changes

Sensory quality

The two major chemical changes which occur during the processing and storage of foods and lead to a deterioration in sensory quality are lipid oxidation and non-enzymatic browning. Chemical reactions are also responsible for changes in the colour and flavour of foods during processing and storage.

- Lipid oxidation rate and course of reaction is influenced by light, local oxygen concentration, high temperature, the presence of catalysts (generally transition metals such as iron and copper) and water activity. Control of these factors can significantly reduce the extent of lipid oxidation in foods.

Non-enzymic browning is one of the major causes of deterioration which occurs during storage of dried and concentrated foods.

Colour changes

Almost any type of food processing or storage causes some deterioration of the chlorophyll pigments. This reaction is accelerated by heat and is acid catalysed.

Flavour changes

In fruit and vegetables, enzymically generated compounds derived from long-chain fatty acids play an extremely important role in the formation of characteristic flavors. In addition, these types of reactions can lead to significant off-flavors.

The permeability of packaging materials is of importance in retaining desirable volatile components within packages, or in permitting undesirable components to permeate through the package from the ambient atmosphere.

Nutritional quality

The four major factors which affect nutrient degradation and can be controlled to varying extents by packaging are

1. Light
2. oxygen concentration
3. temperature
4. water activity.

2.3- Physical changes

One major undesirable physical change in food is the absorption of moisture as a consequence of an inadequate barrier provided by the package; this results in caking. It can occur either as a result of a poor selection of packaging material in the first place, or failure of the package integrity during storage. In general, moisture absorption is associated with increased cohesiveness.

Biological changes

Microbiological

Micro-organisms can make both desirable and undesirable changes to the quality of foods depending on whether or not they are introduced as an essential part of the food preservation process or arise unintentionally and subsequently grow to produce food spoilage.

The two major groups of micro-organisms found in foods are bacteria and fungi, the latter consisting of yeasts and moulds. Bacteria are generally the fastest growing, so that in conditions favourable to both, bacteria will usually outgrow fungi.

Foods are frequently classified on the basis of their stability as non-perishable, semi-perishable and perishable.

The protection of packaged food from contamination or attack by micro-organisms depends on the mechanical integrity of the package (e.g. the absence of breaks and seal imperfections), and on the resistance of the package to penetration by micro-organisms.

Macrobiological

Insect Pests

Warm humid environments promote insect growth, although most insects will not breed if the temperature exceeds about 35 C° or falls below 10 C°. Also many insects cannot reproduce satisfactorily unless the moisture content of their food is greater than about 11%.

Rodents

Rats and mice carry disease-producing organisms on their feet and/or in their intestinal tracts and are known to harbour salmonella of serotypes frequently associated with food-borne infections in humans.

B- Secondary causes of loss: Those lead to conditions that encourage a primary cause of loss such as:

1- Inadequate harvesting, packaging and handling skills.

- 2- Lack of adequate containers for the transport and handling of perishables.
- 3- Storage facilities inadequate to protect the food.
- 4- Transportation inadequate to move the food to market before it spoils.
- 5- Inadequate refrigerated storage.
- 6- Inadequate drying equipment or poor drying season.
- 7- traditional processing and marketing systems can be responsible for high losses.
- 8- Legal standards can affect the retention or rejection of food for human use.
- 10- Knowledge of management is essential for maintaining tool in good condition during marketing and storage.
- 11- Bumper crops can overload the post-harvest handling system or exceed the consumption need and cause excessive wastage.

Sites of losses

Losses may occur anywhere from the point where the food has been harvested or gathered up to the point of consumption. Losses can occur during one of the following processes:

- 1- Harvest. The separation of the commodity from the plant that produced it.
- 2- Preparation. The preliminary separation or extraction of the edible from the non- edible portion.
- 3- Preservation. The prevention of lose and spoilage of foods. For example, the sun-drying of fruit, the use of refrigeration and the use of fungicides to inhibit mold growth in fruits.
- 4- Processing. The conversion of edible food into another form more acceptable or more convenient to the consumer, for example, the manufacture of fruit juice and the canning of fruits and vegetables.

5- Storage. The holding of foods until consumption. Most storage is common storage (ambient temperature) but there are extensive storage capacities that can hold food under refrigerated or controlled atmosphere conditions.

6- Transportation. All forms of transportation are used to convey foods from the point of production to the ultimate point of consumption.