



SNS COLLEGE OF TECHNOLOGY
(An Autonomous Institution)
Coimbatore.

Unit III – Topic I

Food Spoilage and its causes

Food Spoilage:

Healthy tissues inside foods and foods in their natural form resist infection and they do not harbour microorganisms. On the other hand, spoilage of highly perishable foods is natural. The onset of food spoilage is rather indefinite. It is a gradual process occurring because of poor sanitation, enzymatic or chemical reactions, improper temperature controls, microbial growth or physical abuse starting from the time food is harvested, slaughtered or manufactured till it is consumed. Physical changes, such as bruising or puncturing of tissue and water loss and chemical changes, such as those caused by enzymes; or the effects of microbial growth can make food unappealing.

Foods undergo undesirable changes in the physical and chemical characteristics of food ultimately leading to spoilage of food. In general, food spoilage is a state in which food is deprived of its good or effective qualities. Spoilage of food refers to the undesirable alterations in foods or the food undergoes some physiological, chemical and biological changes, which renders it inedible or hazardous to eat. In extreme cases, the food becomes totally unpalatable and unfit for human consumption. Hence, it is essential to process or preserve foods after it is harvested or slaughtered to combat the problem of food spoilage.

Undesirable Changes in Food due to Spoilage

Food deterioration is manifested by the reduction in aroma, flavour, textural and nutritional values of foods. Different types of undesirable changes which occur due to spoilage in food are listed as follows:

- Change in colour: The fruits like bananas and apples turn black after storing for a long period of time and reduce the acceptability of food.
- Change in smell: Rancid smell of spoiled oils and fats, bitter smell of curd or sour smell of starchy food.
- Change in consistency: Splitting of milk, curdling of milk, stickiness and undesirable viscosity in spoiled cooked dal and curries and spoiled cooked vegetables.
- Change in texture: Some vegetables like potato, brinjal and carrot undergo too much softening leading to rotting.
- Change due to mechanical damage: Mechanical damages such as eggs with broken shells, mechanical spoilage of fruits and vegetables during transportation also constitute food spoilage.



Factors Affecting food Spoilage

The types of spoilage of a particular food item depend to a great extent on the following:

- **The composition of food:**
The composition of food influences its susceptibility to spoilage. For example- presence of proteins and carbohydrates especially sugars are preferred by microorganisms for energy source. Very few utilize fat for energy production.
- **Structure of the food item:**
Whole healthy tissues of food from inside are sterile or low in microbial content. Skin, rind or shell on food works as its protective covering from spoilage microorganisms.
- **Types of microorganisms involved:**
The types of microorganisms present in food depend on its composition of food.
- **Conditions of storage of the food:**
Conditions of storage of food affect the growth of microorganisms. Even if the proper storage of food is done, the food loses its freshness and nutritive value if it is stored for too long.

Classification of Foods by ease of Spoilage

Foods are classified into three groups based on ease of their spoilage.

- **Relatively stable or non-perishable foods:** Foods that do not spoil unless handled carefully. E.g. grains, flour, sugar, pulses etc.
- **Protectable or semi-perishable foods:** Foods those remain unspoiled for a fairly long period if properly handled and stored. E.g. potatoes, apples, onions etc.
- **Perishable foods:** Foods that spoil readily unless special preservative methods are used. E.g. milk, eggs, meat, fish, poultry, most fruits and vegetables.

Causes of Food Spoilage

There are mainly three types of causes of food spoilage viz. biological, chemical and physical causes. Biological causes comprise of growth and activity of microorganisms such as bacteria, yeast and moulds; activity of food enzymes and damage due to pests, insects and rodents etc.



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Chemical causes include reaction with oxygen and light and chemical reactions within food constituents. Physical causes consist of temperature and physical abuse.

All of these factors can act together. For example, bacteria, insects, and light, all can be operating concurrently to spoil food in a field or in a warehouse. Similarly, heat, moisture, and air at the same time affect the multiplication and activities of bacteria and chemical activities of food enzymes.

The major types of spoilage that occur in foods are due to microbiological, biochemical, physical and chemical changes. These include:

- Growth and activity of microorganisms such as bacteria, yeast and moulds
- Activities of food enzymes, present in all raw foods, promote chemical reactions within the food affecting especially the food colour, texture and flavour
- Inappropriate holding temperatures (heat and cold) for a given food
- Gain or loss of moisture
- Reaction with oxygen and light causing rancidity and colour changes due to oxidative reactions
- Physical stress or abuse
- Damage due to pests, insects and rodents etc.
- Non-enzymatic reactions in food such as oxidation and mechanical damage

Spoilage due to growth and activity of microorganisms:

Most significant deteriorative changes occur in foods due to microorganisms present in air, soil, water and on foods. They use our food supply as a source of nutrients for their own growth, which results in deterioration of food and render our food supply unfit for consumption. Microbes spoil any food in many ways viz. by increasing their number; by utilizing nutrients; by producing enzymatic changes; by contributing off-flavours; by breakdown of a product; and by synthesis of new compounds. The three major types of microorganisms which cause food spoilage are bacteria, yeasts and moulds.

- **Bacteria**
- **Yeasts**
- **Moulds**
- **Factors affecting growth of microorganisms**
- **Spoilage due to enzymatic activity**
- **Factors affecting enzymatic activity**
- **Spoilage due to insects, pests and rodents**
- **Spoilage due to chemical reactions**
- **Spoilage due to physical factors**