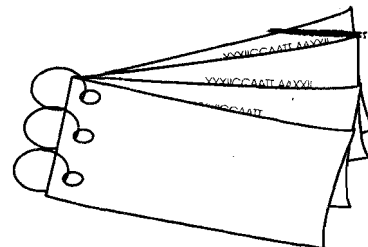


## UNIT 4 FOOD SPOILAGE

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- Spoilage of food may be due to chemical or biological causes. Biological causes include action of inherent enzymes, growth of microorganisms; invasion by insects and contamination with worms.
- The “spoilage” concept includes concepts about edibility or fitness to eat. Spoilage is decomposition. Many foods may not be decomposed but harbour certain kinds of bacteria or their toxins in numbers or amounts which make the food poisonous and thus unfit for human consumption.
- Foods are frequently classified on the basis of their stability as non-perishable, semi-perishable and perishable.

### 4.1 Causes of Food Spoilage

The food may become unacceptable due to the following factors:

- a) Growth and activities of microorganisms principally bacteria, yeasts and moulds (this is by far the most important and common cause of food spoilage);
- b) Activities of food enzymes (enzymatic browning is a common example);
- c) Infestation by insects, parasites and rodents;
- d) Chemical changes in a food (i.e. not catalyzed by enzymes of the tissues or of microorganisms);

For example: The chemical oxidation of fats producing rancidity as well as non-enzymatic browning reactions in foods like Maillard Browning.

- e) Physical changes or damages such as those caused by freezing (freezer burn), by drying (caking) etc.;
- f) Presence of foreign bodies; and.
- g) Contamination with chemical agents.

## 4.2 Role of Microorganisms

Microbial spoilage of foods is the beginning of the complex natural process of decay that, under natural circumstances, leads to recycling of the elements present in the animal or plant tissues in the natural environment.

The natural microflora of living plants and animals is the only one source of microorganisms associated with spoilage. The natural microflora can be added to in a number of ways including during processing and packing. Pests, dust, aerosols, sewage can all contribute to contamination of food with microorganisms.

## 4.3 Factors Affecting Spoilage

Spoilage is determined by the complex interaction between the components of the contaminating microflora (implicit factors), the storage environment (extrinsic factors) and the physico-chemical properties of the food (intrinsic factors).

The intrinsic factors include:

- The nutrient content of the food;
- Any natural anti-microbial substances that may be present;
- The pH of the food and its ability to resist pH change (buffering capacity);
- The oxidation reduction potential (ORP) of the food and its ability to resist redox change (poising capacity);
- The water activity of the food; and
- Mechanical barriers to microbial invasion.

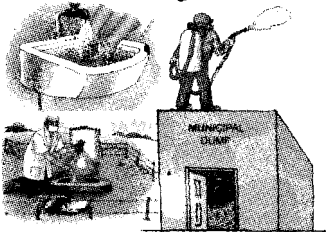
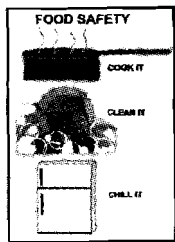
The extrinsic factors include:

- The temperature at which the food is stored;
- The gaseous atmosphere surrounding the food;
- The relative humidity of the atmosphere surrounding the food; and
- Time.

## 4.4 Changes in Foods Caused by Spoilage Microorganisms

Spoilage organisms can produce spoilage symptoms that are associated with:

- general appearance;
- colour;
- texture;
- odour or flavour; and
- a mixture of the above.



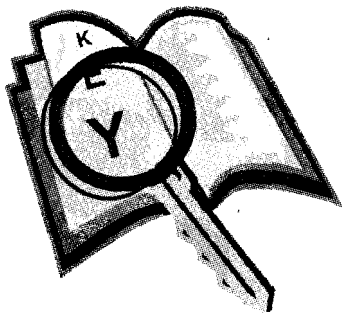
The effects in each case are summarized in the following table:

Characteristics	Changes
1. General appearance	Slime - bacteria Fluffy - Moulds
2. Colour	Colour of fungi or bacteria can be seen in the spoiled food.
3. Colour associated with chemical changes	Blackening of egg, greening of processed meats, browning due to enzymes.
4. Texture	Softening and maceration of tissues.
5. Odour and Flavour	<ul style="list-style-type: none"><li>- Objectionable odour- breakdown of amino acids and proteins</li><li>- Acids from carbohydrates</li><li>- Breakdown of fatty acids leading to microbial rancidity</li><li>- Fizzy feel on palate from excess carbon dioxide.</li></ul>

## 4.5 Retarding or Preventing Food Spoilage

Practising the following can slow spoilage:

- Package the freshest possible product.
- Use good sanitation and personal hygiene habits when processing and packaging food.
- Use the best possible packaging material for the length of time the food remains in the market channel.
- Cool processed or cooked foods as quickly as possible to below 5°C.
- Keep the foods covered.

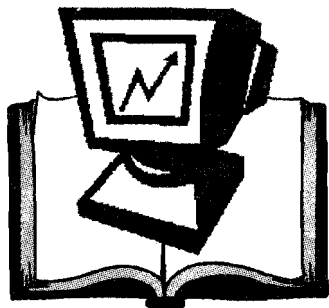


### Key Terms

**Maillard browning:** The **Maillard reaction** is a chemical reaction between an amino acid and a reducing sugar, usually requiring the addition of heat. Like caramelization, it is a form of non-enzymatic browning.

**Maceration:** Softening or breakdown of tissues into smaller pieces

**Rancidity:** Adverse change in flavour and odour due to decomposition of fats and oils



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