

FOOD SPOILAGE (CONTINUED)

Shampa Sarkar

Lecturer

Dept. of Food Science and Engineering

German University Bangladesh

Spoilage by insects parasites and rodents

- Insects are particularly destructive to fruits and vegetables. The loss of food due to insects varies from 5 to 50 per cent depending upon the care taken in the field and during storage. Insect infestation in grains, dry fruits and spices are generally controlled by fumigation with methyl bromide, ethylene oxide or propylene oxide. Apart from the direct loss through consumption of the food, insects cause greater damage by the bruises and cuts they make in foods, thus exposing them to microbial attack resulting in total decay.

Spoilage by insects parasites and rodents

- Certain parasites can spoil foods. A worm occurs in some fish and if such fish is eaten raw the worm can infect man.
- Rats contribute substantially to destruction of food in continue where they are not controlled. Apart from the fact that they consume large quantities of food, they contaminate it with their urine and droppings which harbour disease producing bacteria.

Characteristics and storage conditions of food

(A) Characteristics

i. Composition:

- Protein + proteolytic microorganism \longrightarrow amino acids + amines + ammonia + hydrogen sulphide
- Fat + lipolytic microorganism \longrightarrow fatty acids + glycerol
- Carbohydrate + fermentative microorganism \longrightarrow acids + alcohols + gases

- ii. **Acidity:** The pH of nearly all foods is below 7,0. Foods are classified as acid or nonacid depending on whether the pH is below 4,5. Most fruits are acid foods, while nearly all vegetables, fish, meats and milk products are nonacid. The low pH of acid foods prevents the growth of most bacterial species. Such foods are spoiled mainly by yeast and moulds.
- iii. **Moisture:** Moisture is required for chemical reactions and microbial growth. Foods with a high percentage of water deteriorate fast. Variation in surface moisture due to changes in relative humidity can lead to lumping and caking, surface defects, crystallization and stickiness in foods.

Characteristics and storage conditions of food

(A) Storage Conditions

Temperature, aerial oxygen, light and duration of storage are the important factors that influence the type of microbial growth and spoilage of food during storage.

- i. **Temperature:** Heat and cold, though playing a role in food preservation, contribute to deterioration of food if not controlled. The rate of a chemical reaction doubles itself for every 10°C rise in temp.

- ii. **Oxygen:** Atmospheric oxygen may bring about undesirable changes in food such as destruction of food colour, flavour, and vitamins A and C. Oxygen is necessary for the growth of moulds and, therefore. It must be excluded from food in the course of processing, by deaeration, vacuum packing, or flushing containers with nitrogen or carbon dioxide and in some cases, by the use of oxygen-absorbing chemicals.
- iii. **Light:** Light destroys vitamins B2, A and C and also many food colours. Not all wavelengths of natural or artificial light are absorbed by food constituents or are equally destructive. Foods may be protected from light by impervious packing or keeping them in containers that screen out specific wavelength.

ii. **Duration:** All the above food deteriorating factors are time-dependent. The longer the storage time the greater the deterioration. Deterioration with time takes place with most foods except for cheese.

5. MECHANICAL DAMAGE: Sometimes fruits are bruised or scratched during harvesting and handling. If precautions are not taken, the injured spots become the points of entrance of microorganism which cause spoilage. Important examples of such spoilage are crown rot in banana, pedicel rot in pineapple, stem end rot in mango, green mould in citrus fruits and blue mould in apple.

Classification of foods according to ease of spoilage

1. **Stable or non-perishable foods:** sugars, flour, and dry beans
2. **Semi-perishable foods:** Potato and some varieties of apple
3. **Perishable foods:** most fruits and vegetables, meat, fish, poultry, eggs and milk.

Types of Food Spoilage with Causative Organisms

Food	Types of spoilage	of Causative microorganisms
Fresh meat	Putrefaction Souring	Clostridium, Pseudomonas, Proteus, Alcaligenes, Chromobacterium, Lactobacillus, Pseudomonas.
Cured meat	Mouldy Souring Greening Slimy	Penicillium, Aspergillus, Rhizopus, Pseudomonas, Micrococcus, Bacillus, Lactobacilli Streptococci, Pediococci, Leuconostoc
Fish	Discolouration Putrefaction	Pseudomonas Chromobacterium, Halobacterium, Micrococcus
Poultry Eggs	Odour, Slime Green rot Colourless rot Black rot Fungal rot	Pseudomonas, Alcaligenes, Xanthomonas, Pseudomonas, Fluorescens, Pseudomonas, Alcaligenes, Chromobacterium, Coliform, Proteus, Penicillium, Mucor
Fresh fruits and vegetables	Bacterial soft rot Gray mould rot Rhizopus soft rot Blue mould rot Black mould rot Sliminess or Souring	Erwinia carotovera, Pseudomonas spp. Botrytis cinerea Rhizopus nigrican Penicillium italicum Aspergillus niger, Alternaria Saprophytic bacteria
Pickles, Sauer, kraut	Black pickles Soft pickles Slimy kraut Pink kraut	Bacillus nigricans Bacillus spp. Lactobacillus Plantarum, L. cucumeris Rhodotorula (asporogenous yeasts)
Sugar products, Honey, Syrups	Ropy syrup Yeasty Pink syrup Green syrup	Aerobacter aerogenes Saccharomyces, Torula, Zygosaccharomyces Micrococcus roseus

