



Unit I – Topic 4

Overview of principles and preservation methods of fruits and vegetables

Principals and Methods of Preservation of Fruits and Vegetables Preservation means just protect the foods against the spoilage, but scientifically it may be defined as a science which deals with the process for prevention of decay or spoilage of the food is called preservation. In other words, just controlling the physical, chemical or microbial changes in the foods is called preservation.

1. Physical Changes: Colour, flavour, texture and taste etc.
2. Chemical Changes: Carbohydrate, fats, proteins, vitamins and minerals.
3. Microbial Changes: Mould, yeasts and bacteria

Principles of Preservation: There are three main principles:

- A. Prevention / delay the microbial decomposition of the food.
 - B. Prevention / delay the shelf decomposition of the food.
 - C. Prevention of damage by insects, animals, mechanical causes etc.
- A. Prevention / delay the microbial decomposition of the food
 - a) By keeping out the micro organisms -Asepsis
 - b) By Removal of micro organisms -Filtration
 - c) By Hindering the growth and activity of micro organisms -Anaerobic condition
 - d) By killing the micro organisms -Exposing at high temperature

1. Asepsis: It means preventing the entry of micro organisms by maintaining of general cleanliness, while picking, grading, packing and transporting of fruits and vegetables, increase their keeping quality and the product prepared from them will be superior quality.

2. Filtration: Fruits juice, bear, soft drinks, wines etc. enter through bacteria proof filters



which are made of Asbestos pad or unglazed porcelain type of materials. These filters contain the micro organisms and allow the water or juice to percolate through with or without pressure.

3. Anaerobic conditions: It can be maintained by

- a) Replacing the O₂ by CO₂ carbonation
- b) Evacuating the sealed container (fruit juice)
- c) Use of oils from top of the food (pickles)

4. Exposing at high temperature: Fruits can be exposed by high temperature such as:

i. Canning: Food is exposing to a high temperature (> 100°C) which prevents spoilage and inactivate the enzyme present in the food.

ii. Irradiation: In case of irradiation, the food is exposed to the radiations to kill the micro organism by ionizing and non-ionizing radiation like α , β and gamma rays. Here, food is exposed to electromagnetic or ionizing radiation or various frequencies ranging from low frequency electromagnetic to high frequency i.e., gamma rays which destroy the microorganism present in the food.

B. Prevention/delay the shelf decomposition

(i) By destruction or inactivate the enzyme – Blanching.

(ii) Prevention / delay the non-enzymatic chemical reactions – Antioxidant Blanching

1. It is primary treatments which have to soften the tissues to facilitate packaging.

2. To preserve the original colour and flavour

3. To destroy the certain enzyme which are undesirable

4. Elimination of the air

5. Mostly for vegetables

6. Remove micro-organisms

7. Remove astringent taste and toxins Anti-oxidants

Anti-oxidant are substances which are used to protect the food from deterioration caused by exposure to the air.

1. BHA – Butylated Hydroxy Anisole Vegetable oils BHT – Butylated Hydroxy Toluene



2. Gellales: Animal fat, Vegetable oil
3. Tocopherols: Animal fat
4. Ascorbic acid: Fruit juices, Citrus oil, Wine, Bears etc.
5. Lactic acid: Processed fruits and vegetables, canned fruits,
6. Phosphoric acid: Vegetable oils, Animal fat and cola drinks

Methods of preservation of fruit and vegetable

There are two main basic methods:

- a. Bacteriostatic methods
- b. Bactericidal methods

a. Bacteriostatic Methods In this method, the environmental conditions are change to prevent the growth of micro organisms, such conditions are called bacteriostic. These are: Drying of Foods Drying is just removal of moisture from the food to a certain level at which micro organisms cannot grow is called drying, it can be done by two methods:

(i) Application of heat –

- (a) Sun drying
- (b) Mechanical drying
- (c) Vacuum drying
- (d) Freeze drying

(ii) Binding the moisture in the food-

- (a) Use of Sugar
- (b) Use of Salt Application of Heat

a) Sun Drying: Sun drying is the method in which food is directly exposed to sunlight. It is generally done in the places where plenty sunshine is available for long period e.g., Rajasthan. The dried product in this method is inferior in quality.

b) Mechanical drying: This is a method of drying where application of heat is applied by a mechanical dryer under the controlled conditions of temperature, humidity and air flow.

c) Vacuum drying: The temperature of the food and the rate of water removal are controlled



SNS COLLEGE OF TECHNOLOGY
(An Autonomous Institution)
Coimbatore.

by regulating the degree of vacuum and intensity of heat input.

d) Freeze drying: In this method, the food is dried by sublimation process, i.e., just converting the food into ice without passing through the liquid form of water by means of vacuum plus heat applied in the drying chamber. In this method, product first frozen then water is removed by vacuum and application of heat which occurs simultaneously in same chamber.

Binding the Moisture

a) Use of Sugar: The use of high concentration of sugar bind up the moisture and make the food have a certain level of moisture at which micro organisms are not able to grow.

b) Use of Salt: The concentration of salt causes the high osmotic pressure and tie up the moisture which inhibit the growth of micro organisms. It dehydrates the food by drying out and tie up moisture as it dehydrate the micro organisms cells. Salt reduces the solubility of O₂ in the food by reducing the moisture. It interferes with the action of proteolytic enzyme. The effectiveness of NaCl is varied with the concentration of salt and temperature.

Use of Chemical Preservative Chemical preservatives are substances which are added to food just to retard, inhibit or arrest the activity of micro organisms such as fermentation, pacification and decomposition of the food.

Chemical preservatives are of two types:

Class-1 preservatives: Common salt, sugar, dextrose, spices, vinegar, ascorbic acid

Class-2 preservatives: Benzoic acid and its salt, SO₂ and the salts of sulphuric acid, nitrates, sorbic acid and its salts, propeonic acid and its salts, lactic acid and its salts.

Among the class-2 preservatives, only two chemical preservatives are used in fruits and vegetables Preservation:

(i) KMS

(1) It releases the SO₂ and it is unstable.

(2) It is used for the fruit which have non water solvent pigment (colourless).

(3) It cannot be used in naturally coloured juices such as phalsa, jamun because they have the Anthocynin pigment.



SNS COLLEGE OF TECHNOLOGY
(An Autonomous Institution)
Coimbatore.

(4) It cannot be used in the product which are packed in container because it acts on the tin containers and oil, Hydrogen Sulphide (H_2S) which has an unpleasant smell and also form a black compound with the base plate of containers.

(5) Best to control moulds than bacteria.

(6) 350 ppm KMS is mostly used in fruit juice products.

(ii) Sodium Benzoate

(1) It is salt of benzoic acid and soluble in water.

(2) It delays the fermentation in the juices.

(3) It is commonly used in the product which are having natural colour such as anthocyanin pigment.

(4) It is more effective against the yeast.

(5) 750 ppm Sodium benzoate is mostly used in fruit juices, squashes and cordials.

b. Bactericidal methods

In this method, food material is exposed to higher temperature and high temperature helps to killing of the micro organisms due to coagulation of protein. It helps in inactivation of enzyme. Here moist heat is more effective than dry heat. At low pH high temperature is required than the high pH.

High temperature can be employed by following methods:

(i) Pasteurization: Below $100^{\circ}C$

(ii) (ii) Boiling/ Cooking: at $100^{\circ}C$

(iii) (iii) Canning: Above $100^{\circ}C$



SNS COLLEGE OF TECHNOLOGY
(An Autonomous Institution)
Coimbatore.

