**3rd Year, 2nd Semester**

**Post-Harvest Management and Value Addition of Fruits And Vegetables**

**Credit: 2(1+1)**

**Teacher: Dr. Rajesh Singh**

**Lecture-6**

**Value Addition Concept: Principles and Methods of Preservation**

**Value Addition-** Value addition is a process in which for the same volume of a primary product, a high price is realized by means of processing, packing, upgrading the quality and other such methods.

The stage of crop production immediately following **harvest**, including cooling, cleaning, sorting and packing may be termed as Post Harvest Handling. Fresh Fruits and Vegetables including root crops are mostly perishable in nature. They begin to deteriorate immediately after its separation from the parent plant and suffer considerable losses during the process of Marketing. These losses may be of following nature:

* Quality downgrading due to handling.
* Physiological spoilage (rooting & sprouting).
* Pathological Spoilage from pest and diseases.
* Oversupply to markets.

Main Reason of Post-HarvestLosses:

 Inadequate or Inappropriate application of proper Post Harvest Practices.

 Improper production planning.

On the Other hand, Value Addition in Horticulture is the process in which a high price is realized for the same volume of a primary product, by means of processing, packing, upgrading the quality or other such methods. For example: Making Jam of Pomegranate and Strawberry.

**Need for value addition in Horticulture:**

 To improve the profitability of farmers.

 To empower the farmers and other weaker sections of society especially women through gainful employment opportunities and revitalize rural communities.

 To provide better quality, safe and branded foods to the consumers.

 To emphasize primary and secondary processing.

 To reduce post-harvest losses.

 Reduction of import and meeting export demands.

 Way of increased foreign exchange.

 Encourage growth of subsidiary industries.

 Increase opportunities for smaller farms and companies through the development

of markets.

 Reduce the economic risk of marketing.

 Diversify the economic base of rural communities.

 Overall, increase farmers’ financial stability.

**Importance of Value Addition in Horticulture:**

 Horticulture deals a large group of crops having great medicinal, nutritional, health promoting values.

 India as second largest producer of fruits and vegetables, only 10 per cent of that horticultural produce is processed, but other developed and developing countries where 40-80 per cent produce is value added.

 Horticultural crops provide varied type of components, which can be effectively and gainfully utilized for value addition like pigment, amino acids, oleoresins, antioxidants, flavors, aroma etc.

 Post harvest losses in horticultural produce are 5 to 30 per cent which amounts to more than 8000 crore rupees per annum. If we subject our produce to value addition the losses can be checked.

 Horticultural crops are right material for value addition because they are more profitable, has high degree of process ability and richness in health promoting compounds and higher potential for export.

**Preservation-** The term food preservation refers to any one of a number of techniques used to prevent food from spoiling. It includes methods such as canning, pickling, drying and freeze-drying, irradiation, pasteurization, smoking, and the addition of chemical additives. Food preservation has become an increasingly important component of the food industry as fewer people eat foods produced on their own lands, and as consumers expect to be able to purchase and consume foods that are "out of season."

**Principles of Preservation**

A good method of food preservation is one that slows down or prevents altogether

the action of the agents of spoilage. Also, during the process of food preservation, the foodshould not be damaged. In order to achieve this, certain basic methods were applied ondifferent types of foods. For example, in earlier days, in very cold weather condition, ice wasused to preserve foods. Thus, very low temperature became an efficient method forpreventing food spoilage. Let us now list the principles of food preservation.

**1. Removal of micro-organisms or inactivating them:** This is done by removing air,

water (moisture), lowering or increasing temperature, increasing the concentration of salt orsugar or acid in foods. If you want to preserve green leafy vegetables, you have to removethe water from the leaves so that microorganisms cannot survive. You do this by drying thegreen leaves till all the moisture evaporates.

**2. Inactivating enzymes:** Enzymes found in foods can be inactivated by changing theirconditions such as temperature and moisture, when you preserve peas, one of the methodsof preservations is to put them for a few minutes in boiling water. This method also knownas blanching inactivates enzymes and thus, helps in preserving the food.

**3. Removal of insects, worms and rats:** By storing foods in dry, air tight containers theinsects, worms or rats are prevented from destroying it.

**Methods of Preservation-**

**1. Thermal processing**

* Application of heat
* Inactivate enzymes
* Kill microorganisms. Most bacteria are killed in the range 82-93°c. Spores are not

destroyed even by boiling water at 100°c for 30 min.

* To ensure sterility (total microbial destruction, including spores), atemperature of 121°c must be maintained for 15 min or longer.

**Various methods are** -

a. Blanching

b. Pasteurization

c. Sterilization

d. Boiling

e. Steam under pressure

**2. Removal of heat (cold processing)**

• Lowering temperature of food

• Decreases the rate of enzymatic, chemical and microbial reactions in food

• Storage life is extended

**Various methods are** -

a. Refrigeration

b. Freezing

**3. Control of water content (drying)**

• Microorganisms require free water

• Free water is removed from the food and therefore, is unavailable to

microbial cells

• Multiplication will stop

• Water unavailable for chemical/biochemical reactions

• Storage life extended

**Various methods are** -

a. Freezing

b. Physical removal of water from food (dehydration)

c. Removal of some of the water from food (concentration)

d. Addition of substances that bind water in food, making it unavailable (sugar, salts)

4. Radiation

• Ionizing radiation

• Inactivate microorganisms in food

• Destroy storage pests

• Inactivate enzymes

**Various methods are** -

a. Infrared radiation

b. Ultraviolet radiation

**5. Atmosphere composition**

• Removal of oxygen

• Inhibits o2-dependant enzymatic and chemical reactions

• Inhibits growth of aerobic microorganisms

**Various methods are** -

a. Paraffin wax

b. Nitrogen backflushed bags (potato chips)

c. Controlled atmosphere storage

d. Vacuum packaging of fresh food

**6. Fermentation**

• Specific microorganisms are used (starter cultures)

• Facilitate desirable chemical changes

• Longer storage life

• Produce acids, alcohol that will prevent growth of undesirable

microorganisms

• Produce antimicrobial substances

**7. Addition of chemicals**

**Various chemicals used are** -

a. Acids (inhibit microbial growth and enzymatic reactions)

b. Organic acids (acetic, citric, tartaric acids)

c. Inorganic acids (hydrochloric, phosphoric acids)

d. Food grade, comply w/regulations

e. Antioxidants (to delay oxidative rancidity)

f. Antimicrobial agents:

o sodium propionate (mould inhibitor)

o sodium benzoate (antibacterial)

o sugar and salt (high concentrations)

**8. Smoke**

• Contains preservative chemicals (eg. formaldehyde) from the burning wood

• Heat also helps destroy microorganisms

• Heat dries the food

**9. Curing (Salt and Sugar)**

• Salt binds with water molecules and thus acts as a dehydrating agent in foods.

• Impair the conditions under which pathogens cannot survive.

• Curing is used with certain fruits and vegetables(pickles).

**PRESERVATION BY USING CHEMICALS**

A preservative is defined as only substance which is capable of inhibiting, retarding or

arresting the growth of microorganisms.Microbial spoilage of food products is also controlled by using chemical preservatives.The inhibitory action of preservatives is due to their interfering with the mechanism of celldivision, permeability of cell membrane and activity of enzymes.Pasteurized squashes, cordials and crushes have a cooked flavour. After the containeris opened, they ferment and spoil within a short period, particularly in a tropical climate. Toavoid this, it is necessary to use chemical preservatives. Chemically preserved squashes andcrushes can be kept for a fairly long time even after opening the seal of the bottle. It is however,essential that the use of chemicals is properly controlled, as their indiscriminate use is likely tobe harmful. The preservative used should not be injurious to health and should be non-irritant. Itshould be easy to detect and estimate.Two important chemical preservatives are permitted to beverages according to the FPO(1955).

1. Sulphur dioxide and

2. Benzoic acid

**1. SULPHUR DIOXIDE**

It is widely used throughout the world in the preservation of juice, pulp, nectar, squash,

crush, cordial and other products. It has good preserving action against bacteria and mouldsand inhibits enzymes, etc. In addition, it acts as an antioxidant and bleaching agent. Theseproperties help in the retention of ascorbic acid, carotene and other oxidizable compounds. Italso retards the development of non-enzymatic browning or discolouration of the product. It isgenerally used in the form of its salts such as sulphite, bisulphate and metabisulphite.

**2. Benzoic Acid-**

The quantity of benzoic acid required depends on the nature of the product to be

preserved, particularly its acidity. In case of juices having a pH of 3.5-4.0, which is the range ofa majority of fruit juices, addition of 0.06 to 0.10% of sodium benzoate has been found to besufficient. In case of less acid juices such as grape juice atleast 0.3% is necessary. The actionof benzoic acid is reduced considerably at pH 5.0. Sodium benzoate is excess of 0.1% mayproduce a disagreeable burning taste. According to FPO its permitted level in RTS and nectar is100 ppm and in squash, crush and cordial 600 ppm.