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Value addition

At the most basic level, a value added product simply means any product or action that helps you raise the value of your products or that enables you to increase your profit margin.

Why value addition:

- Reduce post harvest loss thereby increasing the availability of the food.
- Benefits to farmers and to consumer.
- Better nutrition.
- High employment.
- Increase in export trade and foreign exchange.
- Improvement in quality of life.



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Methods of value addition:

- Value addition by harvesting at proper stage.
- Value addition by cleaning, grading and packing.
- Value addition by processing of fruits.
- Value addition by prolonging shelf life.
- Value addition in processing waste. (Wastes can be used as raw material/substrate for the growth of various microbes which in turn used for production of biofuel (Biomethane, bio hydrogen, bioethanol and biobutanol), organic compost, single cell protein, biopolymer and biomass).



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The concept of Value Added is considerably old. It originated in the US treasury in the 18th century. Value Added is the wealth created by the business during a particular period of time and the wealth or the value so created or added is distributed amongst different stake holders who created it.

A company can add value by the efficient use of the resources available to it. These resources can be in the form of manual skills, technical skills, know-how, special purpose machines, factory lay-out, etc. The process of manufacturing begins with a certain quantum of raw material and goes through a conversion process to yield an output. This output is a product with new utility and market value which is different from the original cost of materials. The excess of such market value over the cost of materials is defined as Value Added.



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Principles and methods of preservation





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Preservation:

Scientifically it may be defined as a science which deals with the process of prevention from decay or spoilage of the food. In other words preservation is controlling the physical, chemical or microbial changes in the food.

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

Why do we preserve food?

- To increase the shelf life of the food for increasing the supply.
- To make the fruits and vegetables available throughout the year.



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- To add the variety to the diet.
- To save time by reducing preparation time and energy by fire.
- To stabilise the prices of the food in the market.
- To improve the health of the population.

Principles of preservation:

- 1.Prevention or delay the microbial decomposition of the food.
- 2.Prevention or delay the self decomposition of the food.
- 3.Prevention of damage by insects, animals, mechanical causes.



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1. **Prevention/delay the microbial decomposition of the food**
 - a. By keeping out of 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**

a. ASEPSIS:

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



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b. FILTRATION:

Fruit juice, soft drinks, wines etc. enter through a bacteria proof filter which is made of asbestos pad or unglazed porcelain type of materials.

c. ANAEROBIC CONDITIONS:

It can be maintained by:

Replacing the O₂ by CO₂ ----- Carbonation

Evacuating the sealed container (fruit juice)

Use of oils from top of the food (pickles)

d. EXPOSING AT HIGH TEMPERATURE:

Canning:

Food is exposed to a high temperature ($>100^{\circ}\text{C}$) which reduces spoilage by inactivating the enzyme present in the food. The process of sealing food stuffs hermitically (air tight, protecting from outside agencies) in containers and sealing them by heat for longer storage is called canning.



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Irradiation:

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





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2. Prevention/delay the self decomposition:

- a. By destruction or inactivating the enzyme – Blanching.
- b. Prevention / delay the non-enzymatic chemical reactions – Antioxidant

a. BLANCHING:

Treatment of fruits and vegetables with boiling water or steam for short periods followed by cooling prior to canning is called” blanching”.

- It is a primary treatment which has to soften the tissues to facilitate packaging.
- To preserve the original colour and flavour.
- To destroy certain enzymes which are undesirable.
- Elimination of the air.
- Mostly done for vegetables.
- Remove micro organisms.
- Remove astringent taste and toxins.

b. ANTIOXIDANT:

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

- BHA- Butylactic Hydroxy Anisole & BHT- Butylactic Hydroxy Toluene (vegetable oils)
- Gellales : Animal fat, Vegetable oil
- Tocopherols: Animal fat
- Ascorbic acid: Fruit juices, Citrus oil, Wine, Beer etc.
- Lactic acid: Processed fruits and vegetables, canned fruits.
- Phosphoric acid: Vegetable oil, Animal fat and Cola drinks.



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3. Prevention or damage by insects, animals, mechanical causes.

- This principle of preservation deals with the prevention of damage caused by various external agencies other than micro-organisms and enzymes i.e. animals, man, insects, rodents etc.
- These agencies generally cause physical damage to the food material eg. rats may eat peels of oranges in a storage, animals may also eat the food if kept within their reach etc. If you consume a half eaten apple or orange you are generally never going to die or experience any health risks, but if the food is spoilt by micro organisms and you consume the spoilt food your health shall definitely be at risk.
- The damage of food by animals, man, insects, rodents etc. may later on give way for the initiation of microbial and self decomposition.



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Methods of preservation of fruit and vegetable:

A. Bacteriostatic Methods

1. Drying of foods
2. Use of chemical preservatives
3. Use of food additive
4. Use of low temperature

B. Bactericidal Methods

1. Pasteurization
2. Cooking
3. Canning
4. Irradiation



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A. BACTERIOSTATIC METHODS

In this method, the environmental conditions are changed to prevent the growth of micro organisms.

1. DRYING OF FOODS:

Drying is just removal of moisture from the food to a certain level at which micro organisms can not 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 |
|------------------|-----------------|



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2. 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, SO_2 and the salts of sulphuric acid, nitrates, sorbic acid and its salts, propeonic acid and its salts, lactic acid and its salts.



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3. USE OF FOOD ADDITIVE:

Food additives are substances or mixture of substances other than basic foodstuffs, which are present in the foods as reagent of any aspects of production, processing, storage, packaging *etc.* Food additives are (i) *sugar*, (ii) *salt*, (iii) *acids*, (iv) *spices*. In case of sugar and salts, they exerts osmotic pressure by water is diffuses from the product through a semi-permeable membrane until the concentration reached equilibrium. They kills the micro organisms or do not allow them to multiplication.

1. **Acetic acid:** it is commonly used for pickles, chutney, sauce and ketchup, just to inhibit the growth of micro organisms.
2. **Citric acid:** It is used for preparation of jam, jelly, squash, nectar *etc.* *just to* increase the acidity.
3. **Lactic acid:** It is used for the formation of curd from milk, raw flavour, specific to pickles.



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4. USE OF LOW TEMPERATURE:

Low temperature retards the microbial growth and enzyme reaction because it retards the chemical reactions. This is not a permanent method because some micro organisms can also grow at low temperature.

1. Cellar storage : (Above 15°C)
2. Refrigerated storage : (0 to 5°C)
3. Freezing storage : (-18 to -40°C)

Cellar Storage: These are the underground room where surplus food can be stored for sometime, only root crops such as potato, onion can be stored for a limited period.

Refrigeration: Fruits and vegetables can be stored for 2-7 days. Semi-perishable crops, such as potatoes, apples *etc.* can be stored, in the commercial cold storage with proper ventilation, automatic controlled temperature for one year.

Freezing: It tie up the moisture and increase the concentration of dissolved substances in the food. But, sometimes enzymes are active even below the 0°C . In this case before freezing, 'Blanching' is necessary for vegetable freezing.



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B. Bactericidal Methods

Pasteurization—below 100°C

Pasteurization is a heat treatment that kills part but not all the microorganisms present and the temperature applied is below 100°C. The heating may be by means of steam, hot H₂O, dry heat or electric currents and the products are cooled promptly after the heat treatments. The surviving microorganisms are inhibited by low temperature (or) some other preservative method if spoilage is to be prevented. **Thermal Death Time** is defined as the time required at a given temperature to kill a stated number of organisms under specific conditions.



Mould spores 79⁰ C for 5-10 mins

Yeast and acid tolerant bacteria 66⁰ C

Pectic enzymes in juice 85⁰ C for 4 min or 88⁰ C for 1 min

Methods of pasteurization

- HTST method - High temperature and short time (above 70°C)
- LTHT method - Low temperature and higher time (or) Holding method (60-70°C)

| Pasteurization | Sterilization |
|---|---|
| <ul style="list-style-type: none">• Partial destruction of microorganism• Temperature below 100°C• Normally used for fruits | <ul style="list-style-type: none">• Complete destruction of microorganism• Temperature 100°C and above.• Normally used for vegetables |



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Irradiation:

Also known as cold sterilization (food is free of microorganisms without high temperature treatment).

Success of this technology depends upon the selection of the cultivar, the maturity of the commodity & storage temperature. Ascorbic acid is the most radio sensitive vitamin. The gamma radiation results in the changes in quality & nutrition of several fruits and vegetables. It is useful to disinfect the produce from fruit flies and other insects and extend the shelf life of produce by restricting the growth of pathogen. Slowing down the rate of metabolism of produce. This technology is been used to extend the storage life.



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Examples:

- Sprouting of potato and onion 103-104 rad
- Sterilizing dose for bacterial endospores 3.0×10^6
- Sterilizing dose for yeast and fungi 5.0×10^4
- To control sunscald and brown core of apple (1.5 kgy)
- Inhibition of ripening in banana (.05-.3 kgy)
- Inhibition of brown rot in apricot and peach (2kgy)