

## Lesson 8

### POST HARVEST PROCESSING-II

#### 8.1 Introduction

Fruits and vegetables are important constituents of our diet and they serve as a vehicle of nutrients like vitamins, minerals, sugars and fiber. However, being harvested from farm or field they are prone to contain dirt, soil, bacterial contamination, extraneous matter making them unfit for direct consumption by consumers. Hence, processing interventions are necessary to make fruits and vegetables free from all the above mentioned materials. Also, their processing is required to increase their shelf life as well as to prepare a number of value added products from them. Fruits and vegetables are processed by various methods like low temperature, thermal treatment, concentration, freezing and irradiation. But prior to subjecting fruits and vegetables to such treatments, all fruits and vegetables undergo some preliminary operations. Each processing method is based on certain principles and each has its own advantages and disadvantages.

#### 8.2 Post Harvest Preliminary Processing Operations

The preliminary processing operations of fruits and vegetables are sorting, grading, washing, peeling, sizing, blanching, etc. The importance of each operation is discussed below.

##### 8.2.1 Sorting and grading

Sorting and grading are terms which are frequently used interchangeably in the food processing industry, but strictly speaking they are distinct operations. Sorting is a separation based on individual physical properties of raw materials such as weight, size, shape, density, photometric property, etc. while grading is classification on the basis of quality incorporating commercial value, end use and official standards. The selection of fruits and vegetables is important from processing point of view for the manufacture of a particular end product. The fruit should be ripe, but firm and evenly matured while vegetable should be tender and reasonably free from soil, dirt, etc. They should be free from blemishes, insect damage and malformation. Over ripe fruit is generally infected with microorganisms and would yield a poor quality finished product. After this preliminary sorting, the fruits and vegetables are graded. This is necessary to obtain a pack of uniform quality as regards size, colour, etc. It is done manually or with the help of grading machines.

##### 8.2.2 Washing

The graded fruits and vegetables are washed with water in different ways, such as soaking and subsequent washing in running water or sprayed with water or dry air to remove surface adhering material. A thorough wash is very essential for improved microbiological quality of final product. Vegetables may preferably be soaked in a dilute solution (0.1%) of potassium permanganate or sodium hypochlorite solution to disinfect them. Agitation of the washing water is effected generally by means of compressed air or a force pump or propeller-type equipment. Among all, spray washing is the most efficient method.

### 8.2.3 Size reduction

Fruits and vegetables are processed either as whole or into small pieces by size reduction. Size reduction involves peeling, coring and sizing. Peeling is done to remove unwanted or inedible material and to improve the appearance of the final product using a peeler (Fig. 8.1) while coring is done to remove central inedible portion using a corer (Fig. 8.2). There are five main methods of peeling. They are flash peeling (e.g. for root crops), knife peeling (e.g. for citrus fruits), abrasion peeling (e.g. for potato), caustic peeling (e.g. for guava, orange segments) and flame peeling (e.g. onion and garlic). Some of these are given below:

**a. *Hand peeling***

Many of the fruits and vegetables are peeled and cut by hand with the help of special knives.

**b. *Peeling by heat***

Some fruits and vegetables, particularly certain varieties of peaches and potatoes, are scalded in steam or boiling water to soften and loosen the skin, which is subsequently removed easily by hand. It usually involves exposing the fruit or vegetable to a temperature of 40°C for 10-60 seconds where by the skin bursts and retracts facilitating its easy removal by means of pressure sprays. To achieve good results, the fruits and vegetables should be of uniform size and maturity. Using this method, there is practically no loss of flavour and the product is of uniform colour, free from any blemishes.

**c. *Lye peeling***

Fruits and vegetables such as peaches, apricots, sweet orange, carrots, sweet potatoes, etc. are generally peeled by dipping them in boiling caustic soda or lye solution of 1 to 2 percent strength, for short periods, ranging from 0.5 to 2 minutes depending on the maturity of the fruit or vegetable. The hot lye loosens the skin from the flesh underneath. The peel is then removed easily by hand. Any traces of alkali is removed by washing the fruit or vegetable thoroughly in running cold water or preferably by dipping it for a few seconds in a very weak solution of hydrochloric or citric acid.

**d. *Flame peeling***

It is used only for garlic and onion which have a papery outer covering. This is just burnt off.



**Fig. 8.1 Fruit peeler**



**Fig. 8.2 Pineapple corer and its use**

#### **8.2.4 Blanching**

Blanching refers to the mild heat treatment given to fresh produce such as vegetables to inactivate enzymes. Polyphenol Peroxidase (PPO) is most important groups of enzymes causing browning, off-flavour development in fruits and vegetables. PPO cause oxidation of phenolic compound namely Catechin, Gallic acid, Chlorogenic acid and Caffeic acids. Besides PPO certain peroxidase and pectic enzymes are also require inactivation. Pectic enzymes such as Pectin methyl esterase (PME) and Polygalacturonase (PG) are highly meat resistance and if failed to inactivate may lead to loss of cloud in citrus juices and serum separation in fruits and vegetables products, respectively. Their inactivation is the index of blanching. Blanching also improves colour, flavour and nutritional quality. Usually it is done with boiling water or steam for short periods, followed by cooling. In small scale industries, the fruit or vegetable to be blanched is placed in a wire of perforated basket, which is first dipped in hot water (88-99°C) for about 2-5 minutes. Microwave treatment is also used for blanching. Blanching requirement varies with different fruit or vegetable and depends upon relative enzyme concentration and maturity of commodity.

#### **8.2.5 Ripening**

Ripening before processing may be required for certain fruits such as avocado, banana, kiwifruit, mango, nectarine, papaya, peach, pear, plum, melons, etc. that are picked immature. Ethylene treatment can be used to obtain faster and more uniform ripening. The optimum temperature range for ripening is 15-25°C and within this range, the higher the temperature the faster the ripening. Relative humidity should be maintained between 90 and 95% during ripening. About 10 ppm ethylene in enclosed chamber is sufficient to initiate ripening. Ethylene is produced by the reaction between calcium carbide with moisture, mainly those involved in trade of fruits to hasten the ripening process. However, indiscriminate application may pose serious health hazards.

Commercially ethephon is used for the pre-harvest ripening of top fruits, soft fruits, tomatoes and coffee. It is also used to facilitate the harvest of fruit and berry crops (by loosening the fruits) and to accelerate post-harvest ripening. It is essentially a plant growth regulator with systemic properties. It penetrates into the tissues and is translocated. It decomposes into ethylene which is the active metabolite.

\*\*\*\*\* 😊 \*\*\*\*\*