

HANDLING AND TRANSPORTATION

Where/ How to handle horticultural produce?

It has been observed that improper handling of fresh fruit and vegetables is a major cause of deterioration and post harvest losses. To minimize this produce should be handled carefully during entire supply chain. Handling at each stage plays an important role in protecting the quality and enhancing the shelf life of produce. Produce handling plays an important role in following stages of supply chain:

1. At the time of harvest
2. At the field
3. At the time of loading and unloading
4. At the time of transportation
5. At whole sale market
6. At retail market
7. At customer end

1. Handling at the time of harvest

The throwing of produce during hand harvesting or handling should not be allowed. When crops are harvested at some distance from the packinghouse, the produce must be transported quickly for packing.

- Containers - avoid the use of dirty containers, contaminated with soil/crop residues/ the remains of decayed produce. Containers should be cleaned and disinfected at the end of each storage period.
- Growers should make certain that harvesting labours are fully conversant with the quality control strategy employed on the farm.
- Mechanical damage during harvesting and subsequent handling operations can result in defects on the produce and expose to disease-causing microorganisms. The inclusion of dirt from the field further aggravates the process.
- Every effort should be made to harvest produce at its optimum maturity, as storage life is reduced proportionate to the immaturity and/or over maturity of a vegetable crop.

TIPS FOR HANDLING FRUIT AND VEGETABLES

- Pick all the fruits very gently with thumb and middle finger only
- Never press any fruit and vegetable (Any damage to produce due to bad handling is not visible but damage occurs; however it develops over a period of time.)

- Do not pick banana from the body; Pick them by stem only
- Do not pick leafy vegetables by the leaf end; Pick them from stem only
- Do not press citrus fruits; It damage oil cells present on skin and turn brown after some time
- Do not press ripe fruits like sapota, banana and mango etc. to check the ripening

Examples for checking ripeness

- Papaya – Punch the body with fine needle, if thick milk secretion comes it is unripe, if watery substance comes out it is ripe
- Sapota – Place in your full hand and feel the ripening with slight pressure
- Mango- Press the mango from its beak.; if it hard it is unripe, if it takes pressure/smooth, it is ripe

Growers should follow basic principles when handling fresh produce:

- All labour engaged in handling and transporting fresh produce should be trained
- All cut produce, such as cabbage/others should be kept away from being placed in contact with soil
- Remove or minimise the affect of all likely damage points from within the handling system
- Use methods of padding or cushioning when first filling containers or transport to minimise the risk of bruising or scuffing of produce
- Make certain that vegetables being transferred from one point to another during harvesting or grading and sorting, that they suffer the absolute minimum of drop
- Protect harvested produce from the debilitating effect of sun, wind and rain each of which cause problems especially to crops destined for long term storage.

PRECOOLING AND REFRIGERATED STORAGE OF FRUITS

An understanding of cooling requirement of horticultural commodities begins with adequate knowledge of their biological responses. All fresh horticulture crops are living organisms, carrying on many biological processes that are essential to the maintenance of life. They must remain alive and healthy until process are consumed. The energy that is needed for these live processes comes from the food

reserves present in the fruit. This is utilized by the processes of respiration. Oxygen for this process is taken from the surrounding air and carbon dioxide is released. All the horticulture commodities are having the cells with air spaces and oxygen concentration in these spaces increases. As a result of which the rate of respiration is high in the horticulture commodities. Precooling is the cooling of fresh produce to remove the field heat. Excessive field heat prevalent in the fruits leads to higher rate of respiration during storage and transportation. Higher respiration rate generally leads to early deterioration of fruits during storage and transportation. Pre-cooling is a device to enhance the shelf life of fruits. Temperature affects the rate of ethylene production which affects the fruit ripening. In a ripening fruit minimum concentration of ethylene maintain the slow rate of ripening and enhances the shelf life. In terms of respiratory activity the fruits are classified into two categories i.e. climacteric and non-climacteric. Climacteric fruits normally ripen after harvesting so these are harvested before the process of ripening. Non-climacteric fruits such as citrus, grapes have got ripening before the harvest and are to be harvested only after ripening. There are many methods of cooling. The horticulture products before storage. Some commodities can be cooled by several methods but most commodities respond best to one cooling method. Pre-cooling requirement of any commodity and method used are determined by nature of fruit and the ambient temperature at the harvest time. Highly perishable commodities must be precooled as soon as possible after harvest. Pre-cooling is not as important for winter crops such as apple. Different methods of pre-cooling are as follows: 1. Room cooling: It is most widely used technique due to its versatility and low cost. However, this is not true method of pre-cooling. The room cooled product must be tolerant of slow heat removal because it involves the cooling by heat conduction through container walls. Containers are placed in room cooled by refrigeration system. This system must provide air circulation through and around containers. Cold air from evaporators enters the room from ceiling moves horizontal under the ceiling and then it passes through the produce. Container position is very important in the handling sequence. Main advantage of room cooling it can be cooled and stored in the same room without being transferred, however, it is too slow and can result 12 in excessive water loss. Moreover, addition of warm produce into the cold room may result in condensation of already cooled produce. 2. Forced air cooling: Cooled air is pulled by using fans through container went and warm air is swept away. It is 4 to 10 ten faster than room cooling and 2- 3 time slower than hydro

cooling. It is most effective for strawberry, grapes and soft fruits in general. It consists of row off containers on either side of the exhaust fan leaving space between the rows. Exhaust fan creates negative air pressure within tunnel. Cold air from rooms moves through the opening in between the containers and sweeps the heat from the product. In this case containers must be rearranged in order to prevent dehydration after precooling is achieved. In this method permanent air column is created by the construction of dummy wall equipped with exhaust fans. It is located at one end of the cold room opening are located along the room against which the containers can be placed. This is a good system for operation in which produce arrives at a variable time.

3. Hydro cooling: Cold water treatment is old and effective method for quickly pre-cooling. Wide range of fruits and vegetables hydro cooling can be based on immersion are showering in shower type hydro cooler. Cold water is pumped from bottom to overhead perforated pan. Water shower over commodities may be in bin are boxes or loose on conveyer belt passing beneath. Water leaving product may be filtered to remove the dabarge then passed over refrigeration coils where it is recooled by evaporation or refrigeration. Ice can also be added to water when cooling system is not enough to keep the water temperature near 0oC. Cooling by this method is generally greater than air cooling and there is no product dehydration. Only precaution in this method is that packing and packaging material must be tolerant to wetting, resistance to water impact and tolerant to chemicals which we generally used to santies hydrocooling water. Produce must be tolerant to prolonged exposure to a temperature of 0oC. Hydro cooling operation can require rehandling of produce before packing or storage and increases the labour cost. This is a best method for cherries.