Unit 5

# Harvesting and Post-harvest Management


Pre and post-harvest practices influence cut flower quality and longevity. About 20–40 per cent of the cut flowers produced are lost due to improper post-harvest handling or management. This loss can be reduced by careful harvesting, post-harvest handling, sanitation, temperature management, and judicious use of floral preservatives.

## Session 1: Stage of Harvesting

### General Guidelines of Harvesting

The maturity of the cut flower decides its post-harvest life. Based on purpose, the flowers must reach the right stage of development before harvesting. Most of the cut flowers are harvested early in the morning or late in the afternoon. Flowers are harvested with a sharp knife or secateur. The following points must be kept in mind for harvesting.

- The stage of harvest varies according to the species. The proper stage of openness is a critical factor in vase life. Flowers will have a shorter vase life if they are cut at their peak stage of development.
- Alternatively, flowers harvested too tight will not attract customers, because they may never open.

- Several other factors, such as the plant species, cultivar, weather conditions, distance from the market place and end use, play an important role when flowers are harvested.
- Harvesting of flowers early in the morning after the dew drops dry, is beneficial. The stems are still filled with water and the cooler morning temperatures prevent heat from building up in the bunches.
- While harvesting, keep in mind that a high-quality product is essential for success and should be graded accordingly.
- A clean, sharp knife or clippers should be used for cutting. Immediately after harvesting the stems, they should be placed in a clean bucket filled with tepid, clean water and preferably a floral preservative.
- The buckets full of flowers should be placed in a cool, shaded spot or even better, in a cooler environment, until they are marketed. Freshly cut flowers should be put in the floral preservative solution for at least two to three hours before they are sold.

## Harvesting of Different Flower Crops

### Rose

Harvesting is done when the flower is at the tight bud stage, the colour is fully developed and the petals have not yet started unfolding.

### Carnation

Standard carnation flowers are harvested at the paint brush stage when the flowers are nearly half open whereas spray cultivars are harvested when two flowers are fully opened on the stem.

*Tight bud stage* *Paint Brush* *Cross Bud* *Fully Opened*

*Fig. 5.1: Harvesting stages of different flower crops*

## Orchids

Flowers are harvested when they are fully open. Flowers cut prior to their maturity will wilt before reaching the wholesaler.

## Lilium

Harvest the lilies when they attain a height of 8 to 10 cm above the ground level and the lower first bud shows the colour of the flower. Prevent the stems from drying out during and after harvesting. After harvesting, grading should be done according to the number of flower buds per stem, length and firmness of the stem.

## Practical Exercise

**Activity 1**

Visit a nearby polyhouse and observe different harvesting operations.

**Material required:** Writing material and practical file

**Procedure**

- Note down the flower crops grown in the polyhouse.
- Observe the time and stages of harvesting of flowers.
- Observe harvesting and collection methods in particular crops.

## Check Your Progress

**A. Fill in the blanks**

1. About _____ per cent of the cut flowers produced are lost due to improper harvesting and post-harvest handling.
2. Cut flower quality and longevity mainly depend on _____ and _____ practices.

**B. Multiple choice questions**

1. The right stage for harvesting of cut rose flowers is _____ stage.
   (a) tight bud
   (b) slight bud open
   (c) half bud open
   (d) full bud open

2. Harvest the lilies when they attain a height of _____ cm
   (a) 2–7
   (b) 15–20
   (c) 8–10
   (d) 20–25

**C. Subjective questions**

1. List the factors that play an important role in harvesting of flowers.

   _____

   _____

   _____

2. Why should harvesting be done in cool temperature?

   _____

   _____

   _____

3. List the correct stage of harvesting in different flower crops.

   _____

   _____

   _____

**D. Match the columns**

| A | B |
|---|---|
| 1. Tight bud | (a) Carnation |
| 2. Paint brush | (b) Orchids |
| 3. Fully open | (c) Rose |

## SESSION 2: PRE-COOLING

### Pre-cooling

Freshly harvested flowers have their own physiological processing, adjusted to the high rate of transpiration. To check this, pre-cooling is done to alter it and make the plant comfortable at a lower temperature by pre-cooling and removing the field heat. Pre-cooling is done by keeping the still unpacked flowers or bunches in the boxes at a lower temperature for 6–8 hours in winter and 10–12 hours in summer. This brings down the physiological, respiration and transpiration rate, thereby making the plant lose less moisture, enabling it to remain fresh for a longer duration after cutting.

## Methods of pre-cooling

**Air cooling:** Cold air is passed over unpacked boxes or on conveyor belts through coolers.

**Forced air cooling:** Cold air is forcibly passed over ventilated boxes with a certain number of holes, which allows cooling of the produce kept inside. Forced air cooling method is commonly used for pre-cooling of flowers.

**Hydro-air cooling:** A fine mist of water is mixed with forced air for more effective cooling.

**Pre-cooling temperature for different cut flowers**

| Cut flowers | Pre-cooling temperature (0°C) |
|---|---|
| Gerbera | 2 |
| Rose | 1 – 2 |
| Carnation | 1 |
| Cymbidium | 0.5 – 4.0 |
| Cattleya | 7.0 – 10.0 |

## Pulsing

Pulsing is a procedure that provides conducive conditions to flowers to supply nutrients and requisite water to cut flowers. It is achieved by keeping the harvested flowers in a solution containing high concentration of sucrose and any selected germicide for a short period to improve the shelf life and to promote flower opening. While sucrose provides energy, water in the solution helps in keeping the flowers fresh. Germicide keeps the solution infection free or else the flower base rots. This operation is particularly important when flowers are stored for a longer period for distant transportation.

Light intensity is measured in terms of lumens per square meter or lux. Lux meter device is used to measure light intensity.

Thus, pulsing is a simple procedure that can be easily done by growers, wholesalers or retail florists to lengthen the post-harvest and vase life of flowers in water. Pulsing should be done at 22–24°C temperature with light intensity of around 2000 lux. It prolongs the vase life, promotes bud opening and also improves the colour and size of the flower petals. Pulsing is particularly crucial when the flowers have to be shipped farther.

## Post-harvest Handling of Cut Flowers

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### Rose

Roses are harvested and packed in bunches but before that they are kept in a bucket of water so that the heat of the field is removed effectively. After this, bunching is done along with wrappers. These are stored in cold storage at 2–4°C. The duration of storage of the roses depends on the variety and quality. Then the flowers are graded according to their length. Variation in grading is about 40–70 cm and it also depends on the variety. Packing is done in a bunch of 20 flower sticks each.

### Carnation

Carnation is a very delicate flower that tends to bend. Hence, utmost care has to be taken in its transport to the market or export purposes. After harvest, the flower stems are trimmed at 2" from the base and put immediately in a bucket of a preservative solution of warm and de-ionised water. Flowers are kept in a preservative for two to four hours and then placed in a cold room (0–2°C) for 12–24 hours. The flowers can be stored for two to four weeks before marketing. Cartons used for shipment should have ventilation holes and also be lined with polythene to prevent the flowers from collapsing. The packed cartons should be pre-cooled without a lid. Then plastic should be loosely folded on top of the stems and after that the final lid should be placed. These cartons should be stored in cool chambers maintaining a temperature of 0°C and good air circulation. Relative humidity must be maintained between 90–95 per cent in the cool chambers.

### Gerbera

Harvesting of gerbera is done when the outer two to three rows of disc florets are perpendicular to the stalk. The heel for the stalk should be cut about 2–3 cm above the base and kept in fresh chlorinated water.

### Orchids

Although orchids are very delicate, yet compared to other flowers they can survive for a very long time after harvest.

They are often grown in pots and transported as such, but if they are harvested, they should be stored in cold rooms at 4–5°C and can be safely kept for 10–15 days. They can also be wrapped in plastic films of different colours and design to make them more attractive.

## Grading

Grading refers to an assortment of flowers on the basis of their quality, shape and marketable values. Grading of flowers is based on the following criteria:

- Each bunch should be as uniform as possible in size, weight and quality before marketing them.
- The flowers should appear fresh, harvested at the right maturity stage and free from deformities and infestation of pests and diseases.
- The stems should be straight, free from side shoots and strong enough to hold the flower erect.
- There are no uniform common standards for flowers in the world. Many countries have developed their own grading systems based upon the market requirements.

## Packaging

Packaging is another important aspect in the flower trade. Packets should be air-tight, small in volume, waterproof and strong enough to withstand handling. A wet cotton swab may be put on the cut end of the flower stem which is wrapped in polythene to help maintain humidity. The wetting of the swab may also be done using some preservative to avoid infection.

## Packing Methods of Flowers

Flowers are one of the most valuable products of agriculture. The market of flowers from the local shops, to traders and exporters is highly variable. Packing plays a crucial role in making the flowers still more attractive while also taking care of their shelf or vase life and safety during shipment. The main idea behind packing is slowing down of the physiology of the plant including the rate of transpiration and respiration, so that the flowers retain as much moisture and freshness as possible. While pre-cooling is done as

discussed above, packing has to be linked with pre-cooling and transport. Corrugated fibre board (CFB) boxes are widely used for packing for their light weight, isothermic properties and reusability. The dimensions of packing boxes depend on the type of flower, its stem length, efficient utilisation of space in the cargo and refrigerated trucks, etc. Wet packing for orchids, anthurium; polyethylene foil or sleeve cover for gerbera, chrysanthemum and anthurium; and special packing for exotic flowers and orchids are required. The packed boxes are cooled by forced air cooling method where vents are provided on the boxes (4–5 per cent) for passing cool air onto the flowers wrapped in polyethylene foil.

Box sizes that are commonly used for packing flowers are:

| Flower | Length (cm) | Width (cm) | Height (cm) | Weight (kg) |
|---|---|---|---|---|
| Carnation | 100 | 40 | 20 | 13 |
| Rose | 100 | 40 | 30 | 17 |

## Types of Packaging

(1) Primary packaging: In this, the product is placed directly in the material, wrapper or basket, etc., such as, wrapping materials (paper or polythene), vases, bouquets, carton, crates, etc.

(2) Secondary packaging: In this, the outer wrapping is used to store, transport and display while at the same time protect the product, such as CFBs, decorated carton, gift boxes, perforated boxes, etc.

(3) Tertiary packaging: In this, the assorted groups or clusters of products are kept for storage and transportation, such as pallet boxes, CFBs, cartons, plastic or wooden boxes.

## Transport

The flowers are usually transported in air-cooled containers. For short distances and local markets, rail transport or non-refrigerated insulated trucks can be used. The whole system is referred to as cold-chain or cold-value-chain. The flowers vulnerable to bending

of tips, for example, gladiolus, lilium, etc., should, therefore, be stored vertically and well supported before their transport.

## Practical Exercise

**Activity 1**

Visit any nearby farmer's field or greenhouse and collect information about packaging, storage and transportation.

**Material required:** Writing material

**Procedure**

- Visit a nearby farmer's field or greenhouse and collect information about the packaging of cut flowers.
- Discuss and note down all the practices after harvest and before packaging.

**Activity 2**

Identification of different types of packaging material

**Material required:** Writing material and packaging material

**Procedure**

- Identify different types of packaging material.
- Draw a packaging box of the exact measurement.
- Label the box with dimensions of each side.
- Also mark the places where holes are supposed to be in the boxes.

## Check Your Progress

**A. Fill in the blanks**

1. Pre-cooling removes _____ from freshly harvested flowers.
2. _____ method is commonly followed for pre-cooling of flowers.
3. _____ refers to the categorisation of flowers on the basis of their shape and quality.

**B. Multiple choice questions**

1. Keeping the flowers in a solution containing a high concentration of sucrose and germicide for a short period is called _____.
   (a) pulsing
   (b) pre-cooling
   (c) holding
   (d) air cooling

2. Forcing cold air through ventilated boxes is called _____.
   (a) hydro cooling
   (b) forced air cooling
   (c) air cooling
   (d) pre-cooling

**C. Subjective questions**

1. List the qualities of an ideal package.

   _____

   _____

   _____

2. What is pre-cooling and how is it done?

   _____

   _____

   _____

3. What is the optimum temperature for storage of different flower crops?

   _____

   _____

   _____

4. What are the different types of packaging?

   _____

   _____

   _____

**D. Match the columns**

| A | B |
|---|---|
| 1. Sucrose | (a) Packaging |
| 2. CFB box | (b) Pulsing |
| 3. Refrigerated van | (c) Transport |



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