

Unit



Post Harvest Management and Value Addition

Floriculture industry in India comprises of both cut and loose flowers, the former for export purpose, is being produced mostly under protected conditions. Flowers are highly perishable commodity in nature and owing to poor keeping quality, the post harvest losses in floriculture sector is more than any other agriculture sector. Although, there has been significant increase in the area, production and productivity of flower crops in the last two decades, there is an urgent need to reduce or check the huge post harvest losses of floriculture produce in terms of the value of the products.

The post harvest behaviour of flowers is an outcome of different physiological activities occurring in leaves, stem, flower bud, peduncle, or scape, connecting bud to the stem. The nature and amount of post harvest losses in cut flower industry is different for each crop and/or cultivar. Therefore, careful handling of flowers after harvesting, is of utmost importance.

POST HARVEST

Since flowers are a highly perishable commodity in nature and the post harvest losses of flowers range between 25–40% in India, that is why, their proper management is very important to avoid the losses for



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maximum profit. Post harvest management includes the practices that are followed from the harvesting stage till the flowers reach to the consumer.

STAGE OF HARVESTING

The correct stage of harvesting depends on the crop, variety, market distance, and consumer preference. To have a better vase life, these flowers should be harvested at an appropriate stage. In general, the flowers for distant markets are harvested at tight bud stage, and for local markets at a later stage, that is at opening or opened stage. Standard harvesting stage of various flowers is furnished below.

Crop	Right stage of harvest
Rose, carnation	Tight bud stage
Anthurium, gerbera, orchids	Fully open stage

TIME OF HARVEST

Generally, the flowers should be harvested during the cool hours of either the morning or evening to extend the life and to maintain their quality.

ACTIVITIES INVOLVED IN POST HARVEST HANDLING

Harvesting at the correct stage

Every specific crop should be harvested at the right stage to extend the vase life of flowers.

Conditioning or hardening

This is achieved by treating the flowers with demineralised water supplemented with germicides and acidifiers. It is effective only if its stems are re-cut under water and placed immediately in the conditioning solution. It is normally done by saturating with warm water at room temperature, and then overnight in a cool room.

Pre-cooling

To neutralise the field heat, flowers must be pre-cooled immediately after harvesting to slow down the respiration and transpiration rate so that the manufactured food is preserved, which in turn will cause the extension of



vase life. Flowers can be pre-cooled by placing them in a cold storage without packing or in open boxes until they reach the desired temperature. Pre-cooling temperature varies with the species and cultivars.

Pulsing

This sustains the life of flowers with full vigour until these reach the customers. This is a short-term high concentration treatment given to cut flowers under light before packing. Specific formulations are developed for different flowers. The cut flowers may be pulsed with floral preservatives containing sugars, and antimicrobial cum anti-ethylene substances. The bud or open flowers are treated for 6 to 24 hours in a pulsing solution, of which the main ingredient is sugar. The percentage varies with species and cultivar, as for rose and chrysanthemum, it is 2–6% sucrose + 100 ppm aluminium sulphate + 200 ppm 8-HQC.

Activity

Preparation of a simple pulsing solution for rose

5% sucrose and 300 ppm citric acid

Material Required

Cut flowers, 60 g sugar, 300 mg citric acid, 1 litre distilled water

Procedure

- Citric acid and sugar are to be thoroughly dissolved in distilled water, in a container.
- Cut ends of rose stems must be placed for 12 hours under light in the solution.
- Observe the shelf life of flowers in between the normal water and pulsing solution.

Grading

It is the separation of flowers into different categories according to well-defined international quality standards, which determines their price. Generally, the flowers are graded on the basis of freshness, stem length, and flower diameter. Flowers should be free from bruising injury (damage to the flower due to improper and rough handling), dirt, or foreign material, nutritional,



Fig. 5.1: Grading of Rose flower

chemical, or mechanical abnormality, free from disease and pest or petal discolouration. Size of flowers should be representative of the required cultivar. Bright, clean, and firm flowers must be selected. Flowers with different stem lengths must not be mixed together. Cut stem must be straight and strong enough to hold the flowers in an upright position. Flowers should be cut at the proper stage as per the specification, and must be at a uniform stage of development.

Types of packaging material

For local market, it consists of locally available packaging material, but for distant market, specific corrugated cardboard or fibre board boxes are required for packaging.



Fig. 5.2: Carnation Packaging

Packaging of cut flowers

To ensure that the freshness of flowers reaches the consumer, cut flowers are packed in proper packages to lower the rate of transpiration and respiration. The boxes must be airtight and shock-free so that the quality and shelf life of cut flowers are protected. Generally, the flowers are packed in ‘corrugated fibreboard boxes’ (CFB) with ventilation, and lined internally preferably with a polythene sheet.

Storage

This can be done in different ways. Cold storage is the most commonly used method for cut flowers. In cold storage, the flowers can be stored, by keeping the cut



stems in a bucket, containing cold filtered or distilled water (wet storage), or packed in CFB boxes and stored (dry storage). Different flowers can be stored without losing quality under cold storage for different durations as given below.

Crop	Method	Temperature (°C)	Duration of storage
Rose	Wet	0.5 – 2.0	1 week
	Dry	-0.5 – 0.0	2 weeks
Orchid	Dry	13.0	2 weeks
Anthurium	Dry	13.0	3 – 4 weeks
Chrysanthemum	Dry	-05 – 0.0	3 – 4 weeks
Gladiolus	Wet	1.6 – 4.4	6 – 9 days

The storage room should be ethylene-free, and RH of the room should be 90 – 95% with gentle air movement throughout.

Transportation

For long distance shipment of cut flowers, after proper packing, these are usually transported through road (truck), air or water (ship). For short distance taking less than 20 hours, the flowers can be transported in insulated trucks without refrigeration after pre-cooling and proper packaging. Transportation by air is best for distant markets as the expense involved in air-lifting would be compensated.

Cool chain

The flowers should be kept under optimal cool temperatures, preferably throughout their post harvest life (starting from harvesting till it reaches to the consumer), and this is popularly known as cool chain.

Bud opening solution

Buds smaller than optimum size usually do not open to their full size in usual case so these are not considered the best quality flowers until these are treated with full opening solution. This solution should contain optimum amount of sucrose, germicide, ethylene inhibitor, and



NOTES

some hormones. Treatment given for full commercial opening in case of a bud rose is 2 per cent sucrose + 300 ppm 8-HQC; for chrysanthemum 2% sucrose + 200 ppm 8-HQC + 75g citric acid + 25 ppm aluminium sulphate; and for tuberose 3% sucrose + 0.03% 8-HQC + 0.01% aluminium sulphate.

Vase solution/holding solution

Cut flowers are held in vase solution of sucrose or other such chemicals at low concentration to lengthen the life of the flower.

Crop	Holding solution
Rose	2% sucrose + 100 ppm aluminium sulphate + 200 ppm 8-HQC
Chrysanthemum	2% sucrose + 0.01% aluminium sulphate for 24 hours
Gladiolus	20% sucrose + 200 ppm 8-HQC for 24 hours
Gerbera	10% sucrose + 200 mg/l silver nitrate for 24 hours
Anthurium	BA 50 ppm for 12 hours

Value-added products

Bouquet

These are usually made with the help of cut flowers on the background of fillers (cut greens) in different shapes (cone, oblong or cylindrical). The floral bouquets are encased in polythene films, bamboo baskets, cardboard sheets, etc. Flowers arranged in baskets similar to bouquets can also be used for table arrangement.

Garlands

Loose flowers such as rose, chrysanthemum, jasmine, marigold, tuberose, crossandra, etc., are held together in artistic manner with the help of threads.

Veni

A flower arrangement used to decorate hair mostly in southern and eastern parts of India.



Gulkand

It is a product prepared from rose petals. The petals of Edward rose (*Rosa bourboniana*) are generally used to prepare this product. It is prepared by mixing equal quantity of sugar and petals in alternating layers in a container, and pounded under the sun.

Rose water

It is a by-product while rose flowers are used for the distillation of essential oils. The petals of *Rosa damascena* are used for obtaining rose oil and rose water through steam distillation.

Dry flowers

Dry flowers are prepared by dehydrating fresh flowers either by natural or artificial means. Such flowers are enjoyed during the off-season, especially when either the fresh flowers are not available or are too costly. The most common methods of drying flowers are sun drying, shade drying, press drying, and oven drying. The dried flowers and foliage are used to make greeting cards, paper weight, candles, handmade paper, wall hangings, lampshades, swags, wreaths, boutonnieres, etc. At present, plant materials with distinct shapes are used for this purpose. Any interesting and decorative cone, nut, gourd, seedpod, flowers, sugarcane inflorescence, foliage, fruit, and even small graceful tree branches can be modified into dried forms. There are two general categories of dried materials, those collected in an already dry condition and those picked fresh and dried artificially. Most commonly used plant species as dry flowers are *Acroclinium*, *Helichrysum*, larkspur, *Nigella*, rose, statice, stock, etc.

Flower arrangement

This is an aesthetic and artistic form of flower display, which refreshes one's mind and provides livelihood to others. Cut flowers are used for making various flower arrangements on various occasions such as birthdays, wedding parties, and others. These add beauty to the table when used as centrepieces.



Practical Exercise

Activity 1

Visit a flower market or flower shop.

Procedure

Visit a flower market or a flower shop and note down the following information.

- Types of flower
- Packaging material used
- Method of storage of loose and cut flowers
- Types of value added products prepared
- Transportation mechanism of flowers
- Any other relevant information

Check Your Progress

A. Fill in the Blanks

1. Flowers are highly _____ in nature.
2. Post harvest losses of flowers range between _____ in India.
3. Flowers are harvested during the _____ hours of the day.
4. Hardening is achieved by treating the flowers with _____.
5. Pre-cooling slows down the _____ rate.
6. A short-term high concentration treatment given to cut flowers under light is _____.
7. The main ingredient of pulsing solution is _____.
8. Categorising of flowers according to well-defined international quality standard which determines the price is _____.
9. Loose flowers are held together in an artistic manner with the help of threads, this is called _____.
10. A product prepared from the rose petals is _____.

B. Multiple Choice Questions

1. Proper harvesting stage of loose rose is—

(a) tight bud	(b) slightly loose
(c) half open	(d) Fully open
2. Proper harvesting stage of marigold is—

(a) slightly loose	(b) fully open
(c) Half open	(d) Tight bud



- 3. Which of the following is less sensitive to chilling injury?
(a) Rose (b) Jasmine
(c) Gaillardia (d) Marigold
- 4. Conditioning solution consists of _____ pH.
(a) 1.5 to 3.0 (b) 3.5 to 4.5
(c) 5.5 to 6.5 (d) 6.5 to 7.5
- 5. In which solution, flowers are held for a long duration?
(a) Conditioning (b) Bud opening
(c) Pulsing (d) Vase solution
- 6. Full form of ppm is—
(a) parts per milligram (b) parts per milliliter
(c) parts per million (d) pulse per million

C. Subjective Questions

- 1. Write about the post harvest management of flowers.

- 2. What is pre-cooling of flowers?

- 3. How is pulsing solution prepared?

- 4. What is grading?

- 5. Write about the bud opening solution of flowers.

- 6. Write about flower arrangement.

- 7. Describe the value added products of flowers.

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D. Match the Columns

A	B
1. Packing of cut flowers	(a) Decorate hair
2. Cool chain	(b) 6–9 days storage
3. Gladiolus	(c) Flowers kept under optimal temperature
4. Veni	(d) CFB

