



## Post harvest handling of cut flowers

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Flowers are the most beautiful creation of the earth. Flowers symbolize beauty, purity, peace, love affection and honesty. Flowers have been associated with Indian art and culture from the time immemorial starting with the offering of flowers during worship by the ancient *Rishis* (sages). Floriculture has emerged as a viable diversification option in the agri-business. It is a rapidly expanding dynamic industry recording a growth rate of more than 15 per cent per annum in the last two decades. Rapid urbanization, increased income levels and changes in social values resulted in increase of domestic market both for modern (cut flowers) as well as traditional (loose flowers) flowers significantly. At present, the area under flower crops in India is 306000 ha with a production of 1840000 MT of loose flowers and 548000 MT of cut flowers (NHB Indian Horticulture Database 2014-2015).

Flowers are highly perishable unlike other horticultural or agricultural crops. Owing to poor keeping quality the post harvest losses in floriculture are significantly higher than any other 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 minimize the huge post harvest losses in terms of the value of the produce which are estimated to be 30-40 per cent of farm value. The post harvest losses become important especially when dealing with the export of fresh flowers to distant and foreign market. Therefore, patient, soft and expert handling of flowers is of utmost importance after harvest. Below are the top 10 reasons why flowers do not last.

- Food depletion
- Attacked by bacteria and fungi
- Normal maturation and aging
- Wilting—water stress and xylem blockage
- Bruising and crushing
- Fluctuating temperatures during storage and transit
- Colour change-bluing
- Accumulation of ethylene
- Poor water quality
- Suboptimal cultural practices or conditions

Systems for harvesting and marketing cut flowers vary according to individual crops, growers, production areas, and marketing systems.

**Harvesting :** The most important factors for harvest are when, how and where. Regarding when, each flower has its own best harvest stage and this can vary depending on the use and types and distance market. Flowers for preserving usually are harvested more mature than those for fresh, wholesale markets. There are some general thumb rules for harvesting flower, spike type flowers-harvest when one-fourth to one-half of the individual florets are open; daisy type flowers- harvest when flowers are fully open.

The other “when” is, when the best time of day for harvesting flowers is. The best time is the coolest part of the day and when there is no surface water from dew or rain on the plants. Also, harvesters need enough light to see what they are harvesting. This usually is in the cool of the morning after the dew has dried. Late afternoon or evening also has possibilities because the plants have stored carbohydrates from the day which will provide a food reserve for the plant material. But, late summer afternoons are quite warm. Morning cut is useful for those flowers which transpire at the higher rate for example, in case of roses. Most important thing is that harvesting of flowers and florists green should not be done at high temperature and high light intensity. “How” and “where” go together. Besides knowing at what stage of development to harvest, where and how to cut the flower on the plant also is important. Most stems should be at least 15 to 18 inches long. Longer lengths usually are better. It does not matter if the cut is slanted or squared, but it does matter that you use sharp, clean cutting utensils. At no time should harvested flowers be placed on the ground because of the danger of contaminating the flowers with disease organisms. Ideally, harvesting, grading and packing should all be done dry that is to say without the use of chemical solutions or water. If this is not possible, however, clean buckets containing clean water and a biocide should be used.



**Grading and sorting :** Sort the flowers according to the following: cultivar, stage of maturity, extent of damage due to pests and diseases, malformed floral parts and colour defects.

– Grade according to stem length or size.

– Bunch flowers according to number, cost, susceptibility to injury, and display quality of individual flower heads. Flowers are normally bunched, except for anthuriums, orchids and some other specialty flowers. The number of flowers in the bunch varies according to growing area, market and flower species.

Groups of 10, 12 and 25 are common for single-stemmed flowers. Spray-type flowers are bunched by the number of open flowers, by weight or by bunch size. Bunches are held together by string, paper-covered wire or elastic bands and are frequently sleeved soon after harvest to separate them, protect the flower heads, prevent tangling and identify the grower or shipper. Materials used for sleeving include paper (waxed or unwaxed), corrugated card (smooth side towards the flowers) and polyethylene (perforated, imperforated and blister). Sleeves can be preformed (although variable bunch size can be a problem), or they can be formed around each bunch using tape, heat sealing (polyethylene), or staples.

**Pre-cooling :** Pre-cooling is a treatment given to flowers to remove the field heat immediately after harvest. It can be done with ice cold water, cold water or forced air.

#### **Conditioning:**

**Solutions :** The various chemical solutions used after harvest to improve the quality of cut flowers usually have specific purposes.

**Rehydration :** Wilted flowers, placed in water to restore turgidity, should be rehydrated with deionized water containing a germicide. Wetting agents (0.01 to 0.1%) can be added, and the water should be acidified with citric acid, HCl, or aluminium sulphate to a pH near 3.5. No sugar should be added to the solution, and rehydration should be carried out in a cooler.

**Pulsing :** The term “pulsing” means placing freshly harvested flowers for a relatively short time (a few seconds to several hours) in a solution specially formulated to extend their storage and vase life. Pulsing solutions are specific to the individual crop. At the present time, they are used to provide additional sugar (gladiolus, tuberose, hybrid statice, lisianthus), to extend the life of ethylene-sensitive flowers (carnation, delphinium, gypsophila) and to prevent leaf yellowing (alstroemeria).

Sucrose is the main ingredient of pulsing solutions providing additional sugar, and the proper concentration

ranges from 2 to 20 per cent, depending on the crop. The solution should always contain a biocide appropriate for the crop being treated.

**Bud opening :** Bud-cut flowers must be opened in bud-opening solutions before they are sold to the consumer. These solutions contain a germicide and sugar. Foliage of some flowers (especially roses) can be damaged if the sugar concentration is too high. Buds should be opened at relatively warm temperatures (21-27°C), moderate humidities (60-80% R.H.) and reasonably high light intensities (15 – 30  $\mu\text{mol.m}^{-2}.\text{sec}^{-1}$  PAR).

**Packing :** There are many shapes of packing containers for cut flowers, but most are long and flat and a full telescoping design (top completely overlaps the bottom). This design restricts the depth of the flowers in the box, which may in turn reduce physical damage of the flowers. In addition, flower heads can be placed at both ends of the container for better use of space. With this kind of flower placement, whole layers of newspaper have often been used to prevent the layers of flowers from injuring each other. The use of small pieces of newspaper to protect only the flower heads, however, is a better practice, since it allows for more efficient cooling of flowers after packing. It is critically important that containers be packed in such a way that transport damage is minimized. Frequently the flower heads are individually protected by paper or polyethylene sleeves. Cushioning materials such as shredded paper, paper wool and wood wool may be distributed between the packed flowers to further reduce damage.

**Cold storage:** After pre-cooling and pulsing the flowers can be stored at low temperature *i.e.* in cold store to regulate the flower market or to avoid the glut in the market. Controlled atmospheric (CA) modified atmospheric (MA) or hypobaric (LP) storage method can be used to enhance the post harvest life of flower.

**Transport:** Flower should be transported in corrugated cardboard boxes. The flowers which are sensitive to ethylene, ethylene scrubbers containing  $\text{KMnO}_4$  should be added to those boxes. Some of the flowers are like gladiolus and snapdragon are sensitive to geotropic bending, so these should be transported in upright position. Some of the flower crops show yellowing during transportation due to lack of light, therefore there should be a provision of light inside the transporting vehicle.

**Holding:** After pulsing and storage flowers are held in a solution containing sucrose, germicide ethylene inhibitor and growth regulator. The flowers can be kept in holding solution either at wholesaler, retailer or consumer level.

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