



## New Frontiers in post-harvest management to extend Cut Flower Lifespan

\*Varsha Tiwari<sup>1</sup>, Abhay Bisen<sup>2</sup>

<sup>1</sup>Department of Floriculture and Landscape Architecture, K. L. S. CHRS, Rajnandgaon, MGUVV, Chhattisgarh, India

<sup>2</sup>S. K. S. College of Agriculture and Research Station, Rajnandgaon, IGKV, Chhattisgarh, India

\*Corresponding email: [varshatwar17@gmail.com](mailto:varshatwar17@gmail.com)

ARTICLE INFO	ABSTRACT
<p><b>Original Research Article</b> Received on November 16, 2024 Revised on November 20, 2024 Accepted on December 06, 2024 Published on December 15, 2024</p> <p><b>Article Authors</b> Varsha Tiwari, Abhay Bisen</p> <p><b>Corresponding Author Email</b> <a href="mailto:varshatwar17@gmail.com">varshatwar17@gmail.com</a></p>	<p>The floriculture industry in India is centered on cultivating traditional loose flowers in open fields and growing cut flowers in protected environments. Flowers are highly perishable compared to other horticultural crops, resulting in significantly higher postharvest losses, estimated at 30-40% of the farm value. Despite notable progress in the area, production, and productivity of flower crops over the past two decades, minimizing postharvest losses remains a pressing challenge. Postharvest performance is governed by physiological processes in various flower parts, including leaves, stems, buds, and the peduncle or scape connecting the bud to the stem. These processes, either independently or interdependently, affect senescence and vase life. The nature and severity of postharvest damage are unique to each crop or cultivar, making it crucial to adopt crop-specific handling practices. Losses are especially critical when exporting fresh flowers to distant markets, where maintaining quality is essential. To address this issue, careful, gentle, and skilled postharvest handling is vital. Improved techniques can help reduce damage, preserve flower quality, and enhance the economic sustainability of the floriculture industry.</p>
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Floriculture has emerged as a key avenue for diversification in agri-business, experiencing over 15% annual growth over the past two decades. Factors such as rapid urbanization, rising income levels, and changing social values have significantly expanded the domestic market for both traditional loose flowers and modern cut flowers. Flowers hold cultural significance and have become increasingly integral to daily life with improving living standards. Meeting the growing demand for flowers requires not only increased production but also effective postharvest management, which remains a major challenge worldwide. Postharvest handling begins immediately after harvest and includes essential processes like cleaning, cooling, sorting, and packing.

However, flowers remain metabolically active after detachment from the parent plant, leading to carbohydrate depletion, increased respiration, and temperature fluctuations. These metabolic activities cause deterioration, significantly reducing the longevity and freshness of harvested flowers. Various factors influence the vase life of cut flowers. Chemical factors such as carbohydrate balance, ethylene production, and pathogen activity, along with physiological factors like nutrient storage, humidity, water availability, light, and temperature, play critical roles. Water uptake is particularly crucial for postharvest flower life. Issues like air embolisms and vascular blockages disrupt water flow, causing water stress and hastening flower senescence.

Postharvest losses often result from nutrient deficiencies, bacterial and fungal infections, water stress-induced wilting, and the effects of ethylene. Key causes of reduced vase and storage life include wilting, food depletion, bluing, and vascular blockage, which impedes water supply. Proper postharvest management and skilled handling of flowers are vital to minimizing losses, preserving quality, and ensuring the economic sustainability of the floriculture industry.

**Table 1. The post-harvest quality of flowers depends upon mainly three factors**

S.N. Factors	Post-Harvest Quality
1. Pre-harvest factors	Genetic or inherent makeup Growing conditions
2. Harvest factors	Stage of harvest
3. Post-harvest factors	Environment Water relations a. Respiration b. Transpiration Post-harvest Operations a. Precooling and storage b. Conditioning/hardening c. Pulsing d. Bud opening e. Grading, bunching and packaging f. Cold storage g. Packing and transporting h. Holding solutions

**Post-Harvest Loss**

Postharvest handling of cut flowers is crucial for all stakeholders, including growers, wholesalers, retailers, and consumers. However, studies reveal a lack of adequate postharvest knowledge across all stakeholder levels. The cumulative postharvest losses of cut flowers are significant, with losses reported as 5% at the growers' level, 15% at the wholesale level, and 5% at the florist level, resulting in a total loss of 25%.

**Factors Affecting Storage Life of Flowers**

- Flowers should be of good quality free from injury, pest and diseases otherwise prone to ethylene production and infection with pathogens.
- Harvested at optimum stage
- Stored at cool temperature (1-4°C)
- High relative humidity (90-95%) and maintenance of storage room in hygienic conditions are important.

**Post-Harvest Guidelines**

**Table 2. Optimum stages of harvesting for important flowers**

S.N. Flowers	Purpose	Stage of Harvest
1 Rose	Cut flower	1-2 petals beginning to unfold. At tight bud stage.
2 Chrysanthemum -um	Pompons, Centre of the oldest decorative flower	fully open Anemones Open but before central disc florets begin to elongate.
3 Anthurium	Cut flower	Spadix almost fully developed 1/3rd of flowers on spadix mature. Change of colour from base to top.
4 Antirrhinum	Cut flower	1/3rd florets open
5 Carnation	Standard Spray	Paint brush stage when flowers are half open At least two flowers fully open
6 Gerbera	Cut flower	Flowers open but outer two rows show shedding of pollens (fully mature)

**Conditioning**

Conditioning referred to placing of stem cut ends in water immediately after harvest to avoid water stress.

**Table 3. Pre-Cooling of cut flowers**

S.N.	Crop	Pre-cooling temp. (°C)
1.	Rose	1-3
2.	Anthurium	13
3.	Gerbera	4
4.	Carnation	0.5-1
5.	Chrysanthemum	0.5-4
6.	Gladiolus	4-5

**Methods of Storage of Cut Flowers**

There are 3-4 general methods of storage of flowers, they are following:

1. Refrigerated Storage: Most widely used method of storage of cut flowers. There are two types such as: (a) Wet storage and (b) dry storage.
2. Controlled atmosphere storage (CA)
3. Modified Atmosphere storage (MA)
4. Hypobaric or Low pressure storage (LPS)

**Table 4. Grading and its methods**

S.N.Crop	Grading Methods
1. Rose	Based on stem length. Long stemmed graded from 40-90 cm with 10 cm difference. Short stemmed from 40-65 with 5 cm difference.
2. Gladiolus	Based on spike length, no. of florets.
3. Carnation	Based on degree of bud opening.
4. Chrysanthemum	Based on stem length and flower size.
5. Gerbera	Based on length of stem
6. Anthurium	Based on spathe size

**Table 5.Box sizes, which are commonly used for packing flowers**

Flower	Length (cm)	Width (cm)	Height (cm)	Weight (kg)
Carnation	100	40	20	13
Chrysanthemum	80	50	23	15
Gladiolus	120	50	15	15
Rose	100	40	30	17

Large size 50 kg returnable boxes holding 1000 to 2000 stems are being increasingly used by large exporters.

**Types of Packaging**

**Primary Packaging**

Container that directly holds the product ex., wrapping materials (paper, polythene),vases, bouquets, carton, crates, etc.

**Secondary Packaging**

Any outer wrapping that help to store, transport, inform, display and protect the product ex. CFB’s, decorated carton, gift boxes, etc.

**Tertiary Packaging**

Grouping of products for storage and transportation,ex. pallet boxes, CFB’s, cartons, plastic/wooden boxes

**Labeling**

The packed boxes should be labeled in the following manner:

1. Crop
2. Variety
3. Colour
4. Grade or standard
5. Grower identification
6. Date of harvest o Quantity etc.

**Transport**

The flowers are usually transported by air and by refrigerated vans. For short distance and local markets, transport through rail or non-refrigerated insulated trucks can be used. The flowers such as gladiolus, snapdragon, antirrhinum and freesia which show bending of tips should be hold vertically during transport.

**Table 6.Vase life of outflower**

Crop	Vase Life
China Aster	: 5 to 10 days
Bird of Paradise	: 1 to 2 weeks
Canna lily	: 4 to 8 days
Carnation	: 03 weeks
Chrysanthemum	: 1 to 2 weeks
Dahlias	: 2 to 14
Gladiolus	: 6 to 12 days
Rose	: 7 to 10 days

**Conclusion**

Improper post-harvest handling is a significant cause of loss in the cut flower industry, as cut flowers are highly sensitive to deterioration and require meticulous care after harvest. To minimize wastage and enhance economic benefits for farmers, it is essential to address both pre-harvest and post-harvest factors. Extending the shelf life of cut flowers necessitates a thorough understanding of quality standards, grading and bunching techniques, ethylene sensitivity, pretreatment methods, packaging practices, storage conditions, and other crucial considerations that influence post-harvest quality. Ensuring fresh and high-quality products not only satisfies end-users but also enhances the reputation of sellers and benefits both farmers and consumers alike.

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