

Original Research Article

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Influence of Post-harvest Chemical Treatments on Shelf life of Gerbera (*Gerbera jamesonii*)

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ABSTRACT

A Lab experiment was conducted at Vanavarayar Institute of Agriculture, Pollachi, Tamil Nadu with an objective of studying the influence of chemicals for better vase life of Gerbera. The experiment was carried out during March – April 2016 in a completely randomized design (CRD). The experiment consisted of seven treatments with pink coloured variety. Six different types of chemicals are used in this study viz., Boric acid (2%), Sucrose (3%), Calcium Chloride (0.3%), Salicylic acid (300ppm), Citric acid (300ppm), Ascorbic acid (2%) with water as blank. The observations were recorded on various parameters like fresh weight (g), flower diameter (cm), solution uptake (ml), flower longevity (days). The results indicated that the treatment T₅ (Citric acid) has highest diameter of 26.83 cm while on treatment the same treatment recorded 9.50 cm diameter. The higher amount of water uptake of the flower was recorded in T₅ (Citric acid) of 90ml. The highest vase life of the flower was recorded in Calcium chloride 0.3% (T₃) followed by Sucrose 3% (T₂).

Keywords

Post-harvest,
Chemical
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Introduction

In the modern horticulture, there is more interest to find economic effective preservatives to improve post-harvest life of cut flowers, gerbera (*Gerbera jamesonii*) is one of the popular cut flowers in the world

having short vase life and mostly are used freshly, so their vase life improvement is one of the first floriculture purposes (Cho *et al.*, 2007). The major reasons for shorten vase life of cut flowers are nutrient deficiency, bacterial and fungal contaminations, water stress induced wilting and vascular blockage.

Application of various chemicals could alter the post-harvest life of cut flowers (Sajjad Ahmadnia *et al.*, 2013). Different chemicals have been used in vase solution to extend the vase life of cut flowers mainly by improving their water uptake and reducing transpiration, thereby promote the vase life (Mousa *et al.*, 2009).

Aim of this study was to search for the preservative solutions for extending vase life of cut gerbera. Some of the chemicals are commercially used for extending the shelf life of flowers. Some of them are 8-hydroxyquinoline sulphate, sucrose, silver nitrate, boric acid, calcium chloride, citric acid, sodium chloride and copper sulphate etc. Plants produce sugar through photosynthesis from water, carbon dioxide, and sunlight. When a flower is cut from the plant, photosynthesis is no longer an option for the production of sugar.

Chemicals provide a nutrient supplement to assure the continuation of development of the flower bud into a fully opened and beautiful flower. With the use of chemicals, the flower will perform better in terms of size, color, and vase life. Chemicals help lower the pH which keeps the water and food conducting system in flowers working at maximum efficiency. When a flower has been dehydrated through the normal course of postharvest and shipping it needs a jump-start. When the pH of a solution is more acidic, the molecules are more hydrophilic or they tend to stick together more. A good chemical includes an agent to lower the pH of the solution which encourages hydration, keeping the tiny tubes, or vessels, in the stem continually drawing up water (Lavanya *et al.*, 2014).

From grower to end consumer in the transport chain, a flower is exposed to many chances of becoming exposed to debris which can clog the stems, resulting in the reduction of ability

to take up water and nutrients. This blockage can easily shorten the life of a flower and result in a higher percentage of non-usable products by the retail florist, or even an unhappy customer. Chemicals include a special ingredient to keep the water uptake flowing. With this background in consideration, the experiment was taken up to study the influence of post-harvest chemical treatments on shelf life of gerbera.

Materials and Methods

The study was conducted at Vanavarayar Institute of Agriculture, Pollachi, Tamil Nadu. Geographically it is located at 11° 02' N latitude, 77° 03' E longitude and at an altitude of 426.76M above MSL. The study was carried out during 2017 - 2018. Pink colour variety (Variety: Elegant Pink) of gerbera flowers were collected to carry out the study.

The research work was carried out under lab condition. The experiment was laid out in a Completely Randomized Design (CRD) with ten treatments replicated thrice. The size of conical flask used is 250 ml Flask. The main factor is variety and the sub factors are T₀- Water (Blank), T₁- Boric acid (2%), T₂- Sucrose (3%), T₃- Calcium Chloride (0.3%), T₄- Salicylic acid (300ppm), T₅- Citric acid (300ppm), T₆- Ascorbic acid (2%).

The chemicals used in the study are as follows

Boric acid: 1ml of ethanol is added to 2g boric acid powder to dissolve it, since it will not dissolve in water, then 99ml of distilled water is added to make 2% boric acid.

Sucrose: 3g of sucrose is dissolved in 100ml of distilled water to make 3% of sucrose solution.

Calcium chloride: 0.3g of CaCl₂ is added to 100ml of distilled water to make 0.3% of CaCl₂ solution.

Salicylic acid: 0.3mg Salicylic acid is dissolved first with 1ml of ethanol and then the volume is made upto 100ml by adding 99ml of distilled water to make 300ppm of salicylic acid.

Citric acid: Citric acid of 0.3g is dissolved in ethanol of 1 ml and 99 ml of distilled water is added to make 300ppm of citric acid.

Ascorbic acid: 1ml of ethanol is added to 2g Ascorbic acid powder to dissolve it, since it will not dissolve in water, then 99ml of distilled water is added to make 2% Ascorbic acid.

Observation

One flower in each treatment in each replication were selected at random and utilized for recording observations on the following characters and the mean values were subjected to statistical analysis. The observations were taken at 1st, 2nd, 3rd, 6th, 7th, 8th days. Fully opened flowers were used for recording observations.

Fresh weight

Fresh weight of the flowers was determined just before the immersion of the flowers into the solutions and repeated until the vase life of the flowers was terminated. The fresh weight of each flower was expressed in grams (Hailay Gebremedhin *et al.*, 2013).

Flower diameter

The initial diameter of each flowers are recorded before placing it in a holding solution. The flower diameter was recorded until the flowers showed symptoms of bent neck (Kamran Asadi *et al.*, 2014).

The flower diameter is measured using the ruler.

Solution uptake

Solution uptake was determined by taking flower stalks and subtracting the volume of water evaporated from a flask of the same volume without cut flower using volumetric flasks (Mahfam Hamidi Imani *et al.*, 2013).

Flower longevity (Vase life)

After storage, the flowers were taken out from the pack. The stem ends were recut diagonally and their vase life was noted by daily evaluation of the appearance of the flowers. The flowers were placed individually in holding prepared solutions and distilled water in conical flasks. Each flower was tagged. Flower longevity was recorded as the number of days on vase until the flowers showed symptoms of bent neck or advanced signs of fading on all petals (Hailay Gebremedhin *et al.*, 2013).

Statistical analysis

The experimental data were statistically analyzed as per the method suggested by Panse and Sukhatme (1978). The critical difference was worked out for 5 percent (0.05) probability.

Results and Discussion

Wide ranges of variations among the treatments were observed for the traits.

Diameter of flower

The diameter of the flowers gradually increases with flower opening and it surprises to reduce due to senescence. On T₅ has highest diameter of 26.83 cm while on treatment the same treatment recorded 9.50 cm diameter (Table 1).

Solution uptake of flower

The higher amount of water uptake of the flower was recorded in T₅ (Citric acid) of 90ml. T₂ (sucrose) and T₃ (Calcium chloride) were similar with each other with solution uptake of 60ml. Control has the lowest solution uptake of 40 ml respectively (Table 2).

Vase life of the flower

The highest vase life of the flower was recorded in T₃ Calcium chloride 0.3% followed by T₂ Sucrose 3% .While T₁ Boric acid 2% has the lowest vase life (Table 3).

Petal colour

All treatment on the first day remains green, while T₃ and T₆ slightly changes to brown colour and on the last day all petal colour changes to brown colour (Table 4).

Stem texture

Stem texture remains hard for the first day, T₁ and T₆ turns semi-hard hard on the second day. While T₂ and T₃ remains semi-hard until the 6th day and at the last day all flower stem turns to soft (Table 5).

Table.1 Influence of post-harvest chemical treatments on diameter of the flowers (cm)

Treatment	Diameter of the flowers before treatment (cm)	Diameter of flowers after treatment (cm)
T ₀	27.00	6.75
T ₁	21.83	8.16
T ₂	23.83	9.00
T ₃	26.50	8.16
T ₄	26.16	7.83
T ₅	26.83	9.50
T ₆	26.33	8.16
Grand Mean	25.35	8.16
SD	1.85	9.00
CV (%)	7.30	8.16

Table.2 Influence of post-harvest chemical treatments on solution uptake of flowers

Treatment	Solution uptake of flowers (ml)
T ₀	40
T ₁	70
T ₂	60
T ₃	60
T ₄	65
T ₅	90
T ₆	80

Table.3 Influence of post-harvest chemical treatments on vase of life cut gerbera

Treatment	Vase of life cut gerbera (days)		
	F ₁	F ₂	F ₃
T ₀	4	4	4
T ₁	2	2	2
T ₂	5	5	5
T ₃	6	6	6
T ₄	2	2	2
T ₅	5	5	5
T ₆	2	2	2

Table.4 Influence of post-harvest chemical treatments on petal colour

Treatments	Days						
	1	2	3	4	5	6	7
T ₀	Pink	Pink	Partially Brown	Brown	Brown	Brown	Brown
T ₁	Pink	Pink	Partially brown	Brown	Brown	Brown	Brown
T ₂	Pink	Pink	Pink	Pink	Pink	Pink	Pale pink
T ₃	Pink	Pink	Pink	Pink	Pink	Pink	Pale pink
T ₄	Pink	Pink	Pink	Partially Brown	Brown	Brown	Brown
T ₅	Pink	Pink	Partially Brown	Brown	Brown	Brown	Brown
T ₆	Pink	Partially brown	Partially Brown	Brown	Brown	Brown	Brown

Table.5 Influence of post-harvest chemical treatments on stem texture

Treatments	Days						
	1	2	3	4	5	6	7
T ₀	Hard	Hard	Semi-hard	Semi-hard	Soft	Soft	Soft
T ₁	Hard	Semi-Hard	Semi-hard	Semi-hard	Soft	Soft	Soft
T ₂	Hard	Hard	Semi-hard	Semi-hard	Semi-hard	Semi-hard	Soft
T ₂	Hard	Hard	Semi-hard	Semi-hard	Semi-hard	Semi-hard	Soft
T ₄	Hard	Hard	Semi-hard	Semi-hard	Soft	Soft	Soft
T ₅	Hard	Hard	Semi-hard	Semi-hard	Soft	Soft	Soft
T ₆	Hard	Semi-Hard	Semi-hard	Semi-hard	Soft	Soft	Soft

The results obtained from the trails were subjected to statistical analysis and the conclusions drawn are discussed. All the chemical treatments were found to be superior over the control treatment.

Weight of flower

In gerbera the weight of the flowers increases up towards flower opening and its weight gradually decline with the senescence of the flowers in almost all treatments. Among these 20 flowers every flower has an equal weight of exactly 15g. Sugar effect on further increasing the osmotic pressure increases is relative to water content in stems and flowers and thus improves the ability to absorb water (Kamran Asadi *et al.*, 2014). The similar results with increase in fresh weight before senescence were also reported by Pal *et al.*, 2003.

Diameter of flower

The diameter of the flowers gradually increases with flower opening and it surprises to reduce due to senescence. On 5th treatment F₂ has highest diameter of 30cm while on T₀-F₂ recorded 28.5cm diameter which follows F₂. On flower bud expansion that carbohydrates are necessary for turgor pressure maintenance and important energy sources facilitating flower opening which shows similarity with results from Hailay Gebremedhin *et al.*, (2013). Senescing carnation flowers exhibit a climacteric-like rise in ethylene production and exposure of carnation flowers to exogenous ethylene induces in rolling of petals, triggering ethylene synthesis, and inducing chemical and physical changes in microsomal membrane lipids of senescing petals (Jamie, 2003).

Solution uptake of flower

Water uptake T₅ of has significantly high water uptake when comparing with the other

treatments and other variety shows, Nijse *et al.*, (2001) realized that variability among cultivars as to water uptake may be due to differences in xylem anatomy, which has been shown to greatly influence hydraulic conductivity. Usually, solution uptake decreased with increasing storage time. This could be due to air embolism of cut stem, proliferation of microbes, and plant reaction to wounding as described by Hailay Gebremedhin *et al.*, (2013).

Vase life of the flower

In gerbera the vase life of the flower shows variable results that T₃ has longest vase life of six days. Petal senescence was seen on T₁, T₄, T₆ on the second day and on the next day all the treatment flowers has start their petal discoloration. However, petal senescence in Famosa was accompanied by reduced total ACC and ethylene production (Asghar Ebrahimzadeh *et al.*, 2013).

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