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# ROLE OF PRESERVATIVE CHEMICALS ON EXTENDING THE VASE LIFE ALONG WITH QUALITY ATTRIBUTES OF GERBERA CUT FLOWERS

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## Abstract

An experiment was conducted at post-harvest laboratory, Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamil Nadu, India, during February 2017 to evaluate the vase life of cut gerbera flowers using different chemical preservatives. Variety of gerbera chosen was goliath and experiment was conducted in CRD with eleven different treatments of preservative solutions. Treatment details are $T_1$ - 8-HQS 100 ppm, $T_2$ - 8- HQS 100 ppm + sucrose 8%, $T_3$ - Citric acid 100 ppm, $T_4$- Citric acid 100 ppm + sucrose 8%, $T_5$- GA 100 ppm, $T_6$- GA 100 ppm + sucrose 8%, $T_7$- $Al_2(SO_4)_3$ 100 ppm, $T_8$- $Al_2(SO_4)_3$ 100 ppm + sucrose 8%, $T_9$-Salysilic acid 100 ppm, $T_{10}$-Salysilic acid 100 ppm + sucrose 8%, $T_{11}$ - Distilled water (control). The minimum weight loss, number of days taken for flower head drooping, petal discolouration, petal fall and the solution uptake was observed. Minimum weight loss, less number of days taken for flower head drooping and petal discolouration was in treatment $T_8$($Al_2(SO_4)_3$ 100 ppm + sucrose 8%) followed by treatment $T_2$ 8-HQS 100 ppm + sucrose 8%. The vase life characters was higher when the cut flower stems are treated with $T_8$ ($Al_2(SO_4)_3$ 100 ppm + sucrose 8%).

***Key words:*** Cut gerbera flowers, preservative chemicals, vase life, post harvest.

## Introduction

Gerbera belongs to the family 'Asteraceae' is the most elegant cut flower and ranks fifth among top ten cut flowers. The flowers are found in a wide range of colours and size with good keeping quality, leading them attractive to different floral arrangements. The plant is dwarf, herbaceous, perennial and grows in clump with solitary flower head on long slender stalks, which grows well above the foliage. Depending on the cultivar, post-harvest handling operations and vase life, the gerbera flowers can last long for one to four weeks. The main post harvest disorder of gerbera is stalk bending and breakage (Rogers, 1973). The genetic makeup of gerbera appears to play a significant role in vase life. Plant hormones like ethylene and cytokinins may change the incidence of stalk break during postharvest storage life. Moreover, highest levels of electrolyte leakage and low water potential were also found to be the reason for stalk bending.

The major reasons for less vase life may be due to nutrient deficiency, bacterial and fungal infection, water stress induced wilting and vascular blockage and the action of ethylene in plant cells. By applying various chemicals the post-harvest life of cut flowers can be extended. The accumulation of bacteria in vase water and subsequent xylem clogging by the bacteria in the cut end is often associated with premature senescence in gerbera (Acharyya *et al.,* 2013). Another important factor which helps the vase life is its content of stored foods. Sucrose act as a source of energy required for the continuation of the vase life of the cut flowers and also helped for the improvement in the keeping quality Therefore, this experiment was conducted to extend the post-harvest vase-life of cut gerbera flowers through the use of floral preservatives under tropical conditions where there is a shortage of cut flowers at affordable prices.

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## Materials and Methods

The experiment was conducted at post graduate laboratory, Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamil Nadu, India on February 2017. Gerbera flowers of the variety 'Goliath' were harvested when all the florets opened fully and were perpendicular to the stalk. The flowers were harvested early in the morning and were immediately placed in water for pre-cooling. The flower stalks are given slant cut to provide more solution absorbtion area. Eleven treatments of holding solutions were used and the treatments are $T_1$- 8-HQS 100 ppm, $T_2$- 8- HQS 100 ppm + sucrose 8%, $T_3$- Citric acid 100 ppm, $T_4$- Citric acid 100 ppm + sucrose 8%, $T_5$ - GA 100 ppm, $T_6$- GA 100 ppm + sucrose 8%, $T_7$ - $Al_2(SO_4)_3$ 100 ppm, $T_8$- $Al_2(SO_4)_3$ 100 ppm + sucrose 8%, $T_9$- Salysilic acid 100 ppm, $T_{10}$- Salysilic acid 100 ppm + sucrose 8%, $T_{11}$- Distilled water (control). The experiment was conducted in completely randomized design with three replications. The post- harvest parameters observed were initial and final weight of cut flowers, days taken for drooping of flower heads, days taken for discolouration of petals, days taken for petal fall and solution uptake by the flowers. The data collected data were statistically analyzed using OPSTAT computer package program.

## Results and Discussion

The holding solutions significantly influenced all the treatments and its performances on prolonging the vase life of cut gerbera flowers. Among the different treatments used, $Al_2(SO_4)_3$ 100 ppm + sucrose 8% recorded the maximum results and enhanced the postharvest life of cut gerbera flowers (Table 1). The readings of fresh weight of cut flower stems were taken initially and the final weight was observed at the end of the experiment (Table 1). The cut flowers stems kept in treatment $T_8$ ($Al_2(SO_4)_3$ 100 ppm + sucrose 8%) showed minimum weight loss, whereas the maximum weight loss was observed in treatment $T_{11}$ (distilled water) (Fig. 1). The stems of gerbera are highly prone to water stress. The blockage of the base of stem due to bacterial plugging results in decrease of water uptake by stem which results in gradual weight loss. Jowkar, *et al.,* (2012) reported that aluminum sulfate treatment significantly increases vase life and improve postharvest visual quality by retaining freshness even at the end of vase life.

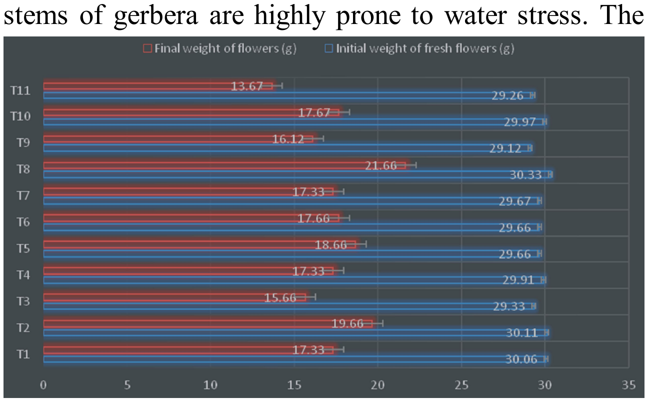


**Fig. 1:** Effect of chemical floral preservatives on initial weight and final weight of cut flowers.

The useful vase-life of the cut blooms terminated when the flower heads started drooping, which was followed by petal discolouration and petal fall, which represented the end of effective vase-life of cut flowers. The highest number of days taken for flower head drooping was recorded in the treatment $T_8$($Al_2(SO_4)_3$ 100 ppm + sucrose 8%), followed by treatment $T_2$(8-HQS 100 ppm + sucrose 8%). Whereas, the minimum number of days for flower head drooping was recorded in distilled water ($T_{11}$) (Table 1). These results are similar to the findings of Awad *et al.,* (1986), $Al_2(SO_4)_3$ decreased ethylene production and also highly efficient in reducing bacterial growth in the vase solution which led to increase in the water uptake of the flower. Sucrose helps in maintaining the water balance and turgidity. Sucrose act as a source of energy required for the continuation of the vase life of the cut flowers (Halevy and mayak, 1981).

The maximum number of days for discolouration of petals was in $Al_2(SO_4)_3$ 100 ppm + sucrose 8% ($T_8$) and the minimum was recorded on $T_{11}$ -(Distilled water). The beneficial effect of sucrose on prolonging vase life in cut flowers has been attributed to suppression of ethylene biosynthesis or sensitivity to ethylene (Aarts, 1957). These results are similar to the findings of Vignesh Kumar, (2018) in gladiolus cv. American Beauty. The number of days taken for discolouration of petals was early in control ($T_{11}$). Without the addition of sucrose and biocides, the water uptake and fresh weight of cut gerbera decreased considerably and leads to drooping and discolouration of petals (Van Meeteren, 1978).

Petal fall in cut blooms represented the termination of the effective vase-life which was prolonged by using $Al_2(SO_4)_3$ 100 ppm + sucrose 8% in the holding solution. The petal fall was accelerated when no preservatives were added to the holding solution which was observed in treatment $T_{11}$ (control). Sucrose is widely used in floral preservatives, which acts as a food source or respiratory substrate and delays the degradation of proteins and improves the water balance of cut flowers. Steinitz, (1982) opined that addition of sucrose to the solution increased the mechanical rigidity of the stem by inducing cell wall thickening and lignification of vascular tissues. Sucrose antagonizes the effect of ABA, which promotes senescence (Halevy and Mayak, 1979) and thereby reduces petal fall.

**Table 1:** Effect of chemical floral preservatives on vase life characteristics of gerbera.

| Treatments | Days taken for flower head drooping | Days taken for petal discolouration | Days taken for petal fall | Solution uptake (ml) |
|---|---|---|---|---|
| $T_{1}$ - 8-HQS 100 ppm | 5.91 | 10.92 | 11.35 | 127.3 |
| $T_2$ - 8-HQS 100 ppm + sucrose 8% | 6.66 | 10.43 | 11.09 | 131.5 |
| $T_3$ - Citric acid 100 ppm | 5.91 | 9.55 | 9.66 | 119.7 |
| $T_4$ - Citric acid 100 ppm + sucrose 8% | 6.39 | 10.09 | 12.66 | 128.6 |
| $T_5$ - GA 100 ppm | 6.44 | 11.13 | 12.07 | 125.5 |
| $T_6$ - GA 100 ppm + sucrose 8% | 6.67 | 11.34 | 11.04 | 123.3 |
| $T_7$ - $Al_2(SO_4)_3$ 100 ppm | 7.31 | 11.73 | 13.23 | 131.1 |
| $T_8$ - $Al_2(SO_4)_3$ 100 ppm + sucrose 8% | 8.43 | 13.67 | 15.73 | 139.5 |
| $T_{9}$ - Salysilic acid 100 ppm | 6.12 | 9.23 | 11.41 | 132.9 |
| $T_{10}$ - Salysilic acid 100 ppm + sucrose 8% | 6.34 | 9.12 | 10.98 | 131.5 |
| $T_{11}$ - Distilled water | 3.18 | 5.78 | 6.39 | 102.9 |
| S.Ed. | 0.23 | 0.26 | 0.55 | 0.99 |
| CD(P=0.05) | 0.49 | 0.55 | 1.18 | 2.14 |

There is a close relationship between vase life and water stress in gerbera (Nazari deljou *et al.,* 2011). The solution uptake was significantly better in treatment $T_8$ ($Al_2 (SO_4)_3$ 100 ppm + sucrose 8%), while the minimum uptake of solutions by flower stalks was noticed in distilled water $T_{11}$. The gerbera flowers after harvest is very sensitive to water uptake (Zamani *et al.,* 2011). The decrease in solution uptake of cut flowers during vase life period was probably due to growth of microbes and air embolism in vascular tissues. It is in conformity with the findings of Ketsa *et al.,* (1995) who opined that $Al_2 (SO_4)_3$ prevents microbial occlusion of xylem vessels in Dendrobium, thereby enhancing water uptake and increasing the longevity of cut flowers.

## Conclusion

The improvement in vase-life of gerbera flowers in $T_8$ ($Al_2 (SO_4)_3$ 100 ppm + sucrose 8%), solution might be due to the appropriate concentration of chemical floral preservatives and very effective biocide for preventing xylem clogging by the bacteria in the cut end, which completely inhibits the microbial growth and sucrose supply optimum food to the cut stems after harvesting. Sucrose act as a source of energy required for the continuation of the vase life of the cut flowers, sucrose supply increases the longevity of many cut flowers, since sucrose can act as a source of nutrition for tissues approaching carbohydrate starvation and also helped for the improvement in the keeping quality. The second best result were observed in 8-HQS 100 ppm + sucrose 8% ($T_2$) and least performance in Distilled water (control $T_{11}$).

## Reference

Awad, A.R.E., A. Meawad, A.K. Dawh and M. El-Saka (1986). Cut flower longevity as affected by chemical pre-treatment. *Acta Hort.,* **181:** 177-193.

Acharyya, P., D. Mukherjee, S. Chakraborty and L. Chakraborty (2013). Effects of Flower Preservatives on the Vase Life of Gerbera (*Gerbera jamesonii* H. Bolus) Flowers. *Acta Hort.,* **970:** 287-292.

Halevy, A.H. and S. Mayak (1979). Senescence and post-harvest physiology of cut flowers: Part 1. *Hort. Reviews* (ed. J. Janick), **1:** 204-236.

Jowkar, M.M., M. Kafi, M. Khalighi and N. Hasanzadeh (2012). Evaluation of aluminum sulfate as vase solution biocide on postharvest microbial and physiological properties of 'Cherry Brandy' rose. *Annals of Biological Research.*, **3:** 1132-1144.

Ketsa, S.A., Y. Piyasaengthong and S. Parthuangwong (1995). Mode of action of $AgNO_3$ in maximizing vase life of Dendrobium 'Pompadour' flowers. *Postharvest Biol. Technol.,* **5:** 109-117.

Nazari deljou, M.J., A. Khalighi, M. Arab and R. Karamian (2011). Postharvest evaluation of vase life, stem bending and screening of cultivars of cut gerbera (*Gerbera jamesonii* Bolus ex. Hook f.) flowers. *Afr. J. Biotech*., **10(4):** 560-566.

Rogers, M.N. (1973). A historical and critical review of post harvest physiology research on cut flowers. *Hort Science.,* **8:** 189-194.

Steinitz, B. (1982). Role of sucrose in stabilization of cut gerbera flower stalks. *Gartenbouwissenschaft.*, **47(2):** 77-81.

Van Meeteren, U. (1978). Water relations and keeping quality of cut gerbera flowers. The cause of stem break. *Scientia Hort.,* **8:** 65-74.

Vignesh Kumar, A. (2018). Effect of floral preservatives on post harvest life of gladiolus (*Gladiolus grandiflorus* L.) cv. American Beauty. M.Sc. Thesis, Department of Horticulture, Annamalai University, Annamalai Nagar, Tamil Nadu.

Zamani, S., E. Hadavi, M. Kazemi and J. Hekmati (2011). Effect of some chemical treatments on keeping quality and vase life of chrysanthemum cut flowers. *World Appl. Sci. J.*, **12(11):** 1962-1966.