POST HARVEST TREATMENT AND VASE LIFE ANALYSIS OF GERBERA Var. ARKA KRISHIKA USING DIFFERENT VASE SOLUTIONS

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ABSTRACT

Gerbera (*Gerbera jamesonii*) is one of 10 most important cut flowers in the world. Gerbera is very popular and widely used as a decorative garden plant and as cut flower. It is one of the popular cut flower having short vase life and are mostly used freshly, so the improvement of vase life is the required quality to the customers. But the most important problem faced by the flowers is the short-life after harvest and stem neck bending. It is very much important to improve and to increase longevity and quality of these flowers by using chemical solutions. In this study, effects of various postharvest treatments on postharvest quality and quantity parameters of Gerbera were evaluated. To increase the postharvest shelf life of gerbera flowers experiments were conducted by using Preservative solutions viz. Citric Acid and Silver nitrate in 4 different concentrations viz. 10, 20, 30 and 40 ppm and control treatment with distilled water were used. The experiment was conducted with total nine treatments. The application of silver nitrate declined the rates of relative fresh weight reduction. The solution uptake and soluble solid contents in silver nitrate treated cut flowers were significantly higher than other treatment during the experimental days. The application of silver nitrate led to the promoted longevity of gerbera cut flowers and positive effects on the vase life of gerbera cut flowers. Stem bending, and petal shriveling were also found to be delay in the treatment with Silver nitrate 40 ppm. Treatment with Silver nitrate 40-ppm can extend the vase life of harvested gerbera flowers by reducing the fungal infection, increase the solution uptake and by supplementing carbohydrate for harvested flowers.

Keywords: Gerbera, vase life, preservatives.

Introduction

Gerbera is a genus of plants in the Asteraceae family. It was named in honour of German botanist and medical doctor Traugott Gerber. Gerbera species bear a large capitulum with striking two-lipped ray florets in yellow, orange, white, pink or red colours. The capitulum, which has the appearance of a single flower is actually composed of hundreds of individual flowers. Gerberas are grown for garden decoration also as cut flowers for interior decoration and for making bouquets. The morphology of the flowers varies depending on their position in the capitulum. They are easy to grow, light weight flowers with long and slender flower stalk (50-70 - cm), exquisitepetal arrangements with different shades of attractive colours and moderate vase life, all in a combined way renders gerbera flowers to a prominent position the fourth place amongst the elite group of top ten cut flowers of the international flower markets (Choudhary and Prasad, 2000). The flower heads can be as small as 7 cm in diameter or up to 12 cm. Adding chemical preservatives to the holding solution is recommended to prolong the vase life of the cut flowers. All holding solutions must contain essentially two components, sugar and germicides. The sugar provides a respiratory substrate, while the germicides control harmful bacteria and prevent plugging of the conducting tissues. (Redman, *et al.*, 2002). The major reasons for less vase life of cut flowers may be due to nutrient deficiency, bacterial and fungal infection, water stress-induced wilting and vascular blockage (Alaey *et al*., 2011). Application of various chemicals could alter the post-harvest life of cut flowers (Prashanth *et al*., 2010). Different chemicals have been used in vase solution to extend vase life of cut flowers mainly by improving their water uptake and reducing transpiration, thereby promoting the vase life of cut flowers (Amariutei *et al*.,1986).

Materials and Methods

This experiment was conducted at Department of Horticulture, Faculty of Agriculture, Annamalai University from December 2017 to February 2018 to find out the appropriate preservative solution for extending the vase life of gerbera. Gerbera variety Arka Krishika was used, flowers are double type with yellow in colour. Nine chemical preservative solutions were used for extending the vase life and the treatments are T_1 Citric Acid (10-ppm), T_2 Citric Acid (20-ppm), T_3 Citric Acid (30-ppm), T_4 Citric Acid, (40-ppm), T_5 Silver nitrate (10-ppm), T_6 Silver nitrate (20-ppm), T_7 Silver nitrate (30-ppm), T_8 Silver nitrate (40-ppm) and T_9 Distilled water were used in Completely Randomized Design with three replications. Data were recorded at 6th day of the experiment on stem bending, days taken for first petal shriveling, solution uptake, and vase life.

Results and Discussion

The obtained results from the studies indicated that the application of various chemicals with antimicrobial and hormonal effects could alter the postharvest life of cut flowers (Prashanth et al., 2010). It is stated that microbial contamination is a main cause of limiting the vase life of cut flowers (Kazemi et al., 2011). Flower longevity and quality of cut flowers in vase solution depend on number of factors like genetical constituents, pre-harvest conditions, harvesting technique, packaging, post-harvest handling and storage. Among the various treatments the stem diameter of gerbera flowers showed variation among different vase solutions at different days after treating. Maximum stem diameter was found in T_8 (5.46 mm) followed by T_7 (5.18m) while minimum stem diameter was recorded in T_9 (1.52 mm) at 6th day. Freshness of gerbera flower showed variation among the vase solution at different days after treating. Petal shriveling conditions wrinkle and contract, especially due to loss of moisture where found late in T_8 (10.95 days) followed by T_7 (10.86 days) at 6th days after placing in vase solutions. Early Petal shriveling was recorded in T_9 (4.92 days). Days to first stem bending varied among the different vase solutions used. Late stem bending was found from T_8 (10.61 days) followed by T_7 (10.19 days) while early stem bending was found in T_9 (5.31 days). Vase life of gerbera also varied among the vase solutions used. Maximum vase life was found in T_8 (9.14 days) followed by T_7 (8.99 days) while minimum days flowers remain fresh in vase was in T_9 (4.59 days).

For the post harvesting storage, different chemicals influences the vase life and floral quality of cut flowers (Accati & Jona, 1989), (Da Silva, 2003). The application of silver nitrate led to the promoted longevity of gerbera cut flowers was more effective and results in positive effects on the vase life of cut flowers. From the current study silver nitrate 40-ppm was found the best treatment for all of the studied parameters which was closely followed by Silver nitrate 30-ppm. The vase life of Gerbera is mostly depends on "bent neck." The slowest stem bending was found in the gerbera kept in the treatment solution of silver nitrate 40-ppm. The hypertonic solutions inside the cells allow water to enter the cells by osmosis and thus make them turgid. This turgidity gives the stem a rigid, upright structure. The longest vase life was found in the treatment silver nitrate (40-ppm). Microorganisms, especially bacteria and fungi which grow in preservative solutions have a main adverse effect on the longevity of cut flowers (Ichimura & Hisamatsu 1999). These microorganisms and their products plug the stem ends and restrict the water absorption, which reduce the longevity of cut flowers (van Doorn et al., 1997; Alaey et al., 2011). Microbes can also produce ethylene and secrete toxic compounds, also pectinase and accelerated senescence. Ethylene is major plant growth regulator related to senescence and its external application causes accelerated senescence (Reid and Wu, 1992). Several agents have been used in cut flower vase solution to extend vase life by improving water uptake (Lü et al., 2010). Microbial contamination is a main limiting factor in postharvest life of cut flowers (Kazemi et al., 2011). It seems that antimicrobial effects of the applied beneficial treatments led to the declined vascular blockage, higher solution uptake, soluble solid contents and fresh weight in treated cut flowers by which the senescence process was delayed. The decreased microbial infection and silver-inhibited action of ethylene could be resulted in the alleviated senescence and declined degradation rates of compounds like anthocyanin. Based on the obtained results it is thought that senescence and vase life of cut flowers is closely correlated with the petal carbohydrate contents (Van Doorn 2004; Singh et al. 2008; Zargarani et al., 2012) and solution uptake (Nazari Deljou et al. 2011).

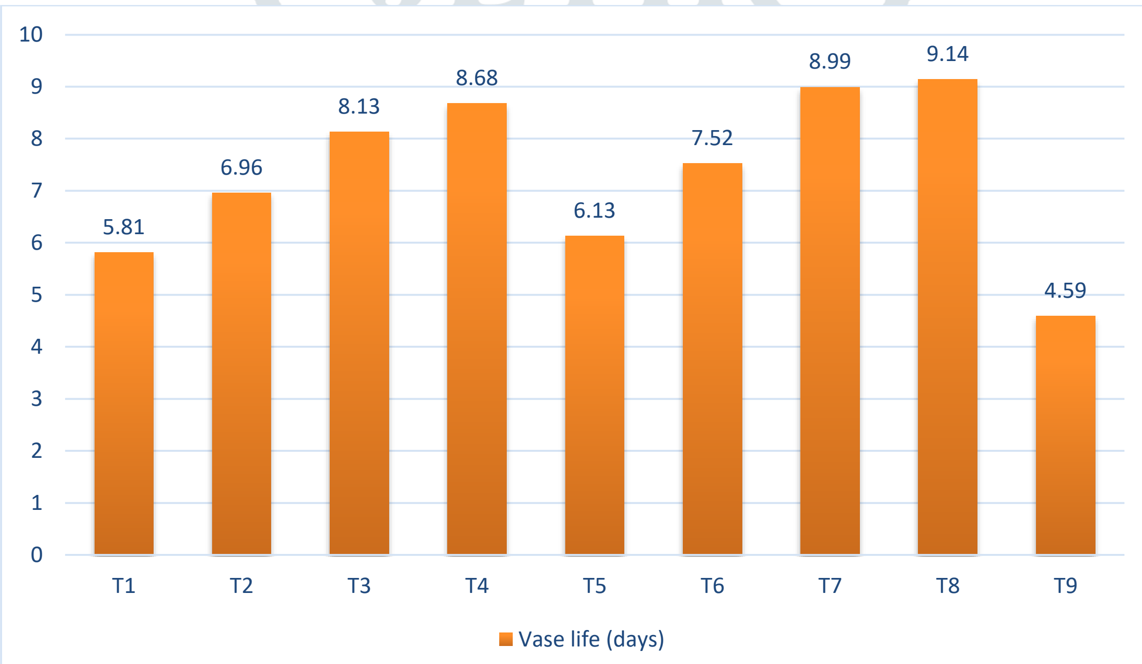
Low carbohydrate levels in stem will reduce vase life (Hashemabadi and Gholampour, 2006) while Sugars are essential precursors for cut flower respiration. Longevity of many cut flowers is negatively influenced by the presence of ethylene by inducing various physiological responses like abscission and wilting of leaves, petals and sepals. Pathogens also affect vase life due to vascular blockage (Van Dome et al., 1994). The fungal infection was present in this optimum treatment solution as well, contrary to the theory that microbes are a major determinant of vase life (Marandi *et al*., 2011).

In conclusion, the found results from the present research indicated that silver nitrate 40-ppm positively influenced the cut flowers in vase solution by providing food and also minimised the antimicrobial activity in the holding solution and also reduced the bacterial population in the vase solution, as a result increase the vessels conductivity, water uptake and had desirable effects on postharvest life of gerbera cut flowers.

Table. 1: Postharvest treatment of gerbera var. Arka krishika using different vase solutions.

Vase solutions	Days taken for stem bending	Days taken for petel shriveling	Solution uptake (ml)	Stem diameter (mm)
T_1	6.69	7.23	36.13	2.95
T_2	8.14	8.74	39.82	3.92
T_3	9.05	9.26	41.93	4.24
T_4	9.28	9.98	44.48	4.98
T_5	7.28	8.15	37.29	3.24
T_6	8.46	9.03	41.91	4.23
T_7	10.19	10.86	47.54	5.18
T_8	10.61	10.95	49.79	5.46
T_9	5.31	4.92	30.46	1.52
CD (p=0.05)	0.30	0.23	0.83	0.16
SE (d)	0.15	0.13	0.43	0.07

Table. 2 : Vase life analysis of gerbera var. Arka krishika using different vase solutions.



References

Abdel-Kader, H. & Rogers, M. N. 1986. Postharvest treatment of Gerbera jamesonii. Acta Horticulturae, 181: 169–176. DOI: 10.17660/ActaHortic.1986.181.20.

Accati, E. G. & Jona, R. 1989. Parameters influencing gerbera cut flower longevity. Acta Horticulturae, 261: 63–68. DOI: 10.17660/ActaHortic.1989.261.7.

Alaey M., Babalar M., Naderi R., Kafi M. 2011. Effect of pre- and postharvest salicylic acid treatment on physiochemical attributes in relation to vase life of rose cut flowers. Postharvest Biol. Technol. 61: 91-94.

Alaey, M., Babalar, M., Naderi, R. & Kafi, M. 2011. Effect of pre- and post-harvest salicylic acid treatment on physio-chemical attributes in relation to vase-life of rose cut flowers. Postharvest Biology and Technology, 61: 91-94.

Amariutei, A., Burzo, I. & Alexe, C. 1986. Researches concerning some metabolism aspects of cut gerbera flowers. Acta Horticulturae, 181: 331–337. DOI: 10.17660/ActaHortic.1986.181.41.

Choudhary ML and Prasad KV.2000 . Protected cultivation of ornamental crops-An insight. Indian Hort.,45 (1): 49 -53 .

Da Silva, J. A. T. 2003. The cut flower: Postharvest considerations. J. Biol. Sci., 3: 406-442.

Hashemabadi, D. & Gholampour, A. (2006). The effective factors on postharvest life of cut flowers (Carnation). In: Papers of National Symposium for Improving Ornamental Plant and Flower Production and Export Development of Iran. Iran, 131-139.

Ichimura, K. & Hisamatsu, T. 1999. Effects of continuous treatments with sucrose on the vase life, soluble carbohydrate concentrations, and ethylene production of cut snapdragon flowers. Journal of the Japanese Society for Horticultural Science, 68: 61-66.

Kazemi M, Zamani S, Aran M. 2011. Effect of some treatment chemicals on keeping quality and vase life of cut flowers. AM. J Plant Physiol. 6: 99-10.

Liu J, He S, Zhang Z, Cao J, Lv P, He S, Cheng G, Joyce D C. 2009. Nano-silver pulse treatments inhibit stem-end bacteria on cut gerbera cv. Ruikou flowers. Postharvest Biol Technol. 54:59-62.

Lü P., Cao J., He S., Liu J., Li H., Cheng G., Ding Y., Joyce D.C. 2010. Nano-silver pulse treatments improve water relations of cut rose cv. Movie Star flowers. Postharvest Biol. Technol. 57: 196-202.

Marandi, R., Hassani, A., Abdollahiand, A. & Hanafi, S. 2011. Improvement of the vase life of cut gladiolus flowers by essential oils, salicylic acid and silver thiosulphate. Journal of Medicinal Plants Research, 5(20): 5039-5043.

Mehraj, H., Mahasen, M., Taufique, T., Shiam, I. H. and Jamal Uddin, A. F. M. 2013. Vase life analysis of yellow gladiolus using different vase solution. Journal of Experimental Biosciences, 4(2): 23-26.

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

Prashanth, P., Chandra Sekhar, R. & Chandra Sekhar Reddy, K. (2010). Influence of floral preservatives on scape bending, biochemical changes and post harvest vase life of cut gerbera (Gerbera jamesonii bolus ex. Hook.). Asian Journal of Horticulture, 5(1): 1-6.

Redman, P. B, Dole, J. M, Maness, N. O. & Anderson, J. A. (2002). Postharvest Handling of Nine Specialty Cut Flower Species. Scientia Horticulturae, 92(3-4): 293-303. DOI: 10.1016/S0304- 4238(01)00294-1.

Reid M. S., Wu M. J. 1992. Ethylene and flower senescence. Plant Growth Regulation. 11, 373.

Singh A, Kumar J, Kumar P. 2008. Effects of plant growth regulators and sucrose on post harvest physiology, membrane stability and vase life of cut spikes of gladiolus. Plant Growth Regul. 55: 221–229.

Van Doorn WG. 2004. Is petal senescence due to sugar starvation? Plant Physiol 134: 35–42.

vanDoorn W. G. 1997. Water relations of cut flowers. Hortic. Rev. 18: 1-85.

Zargarani R, Oraghi Ardebili Z, Abdossi V. 2012. Effects of geranyldiphosphate and its analog on postharvest life of gerbera cut flowers. Intl Res J Appl Basic Sci. 3 (9): 1974-1977.