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Review Article

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A Review on Sugar and Citric Acid as Chemical Preservatives for Cut Flower

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Abstract

Maintaining good quality of cut flowers and extending the vase life, are considered important and practical for having acceptable products for the markets. For this reason, a considerable number of studies have been undertaken for this purpose. Vase life of cut flowers is affected by many factors. The prevalent method for maintaining the vase life of cut flowers is the use of moderately low temperatures. An alternative is the use of chemical preservatives. Such a solution can affect vase life, ethylene production, and regulation of sugar accumulation in floral organs. Treatment of cut flowers with sucrose and citric acid is found to be beneficial in delaying senescence processes.
Keywords:Cut flowers, Chemical preservatives, Sugar, Citric acid.

Introduction

Cut flowers are precious products of horticulture. The post-harvest longevity of cut flowers is of critical importance in determining the value of the crop. Maintaining good quality of cut flowers and extending the vase life, are considered important and practical for having acceptable products for the markets. For this reason, a considerable number of studies have been undertaken for this

purpose. (Macnish*et al.*, 2008 and Solgi*et al.*, 2009, Zencirkiran, 2010).Many investigations on the longevity and quality of cut flowers have been conducted by adding various preservatives to the vase water (Reid, 2012), resulting in cut flowers senescence being delayed considerably. In cut flowers, the processes of flower bud opening and colour development require substrates and energy for their satisfactory development (Uthaichay*et al.*, 2007).

Factors affecting vas life

According to Kelegama (2001) Factors such as the mode of transportation, condition during transport, storage at the distributors and time lag from shipment to ultimate sale are very important factors in the maintain the quality and extending the shelf life.Vase life of cut flowers is mainly affected by two main factors, namely ethylene which accelerates the senescence of many flowers and microorganisms which cause vascular blockage and thus reduce the vase life of cut flowers (Van Doorn, 1994, Zencirkiran, 2010).As described by Wilberg (1973), flower wilting can be considered as one of the main postharvest disorders which may lead to stem break that occurs 10 cm below capitulum. As well as this, blockage of xylem vessels due to bacterial or microorganisms accumulation is another contributing factor leading to quality loss (JaliliMarandi, *et al.*, 2011). This blockage can be culminated in water uptake deficiency and water loss (Hassan, 2005).

Role of preservatives

A floral preservative usually is a complex mixture of sucrose (sugar), acidifier, an inhibitor of microorganisms and also an ethylene action or synthesis inhibitor like STS and SA (Tehranifar*et al.*, 2013). The prevalent method for maintaining the vase life of cut flowers is the use of moderately low temperatures. An alternative is the use of chemical preservatives. Such a solution can affect vase life, ethylene production, and regulation of sugar accumulation in floral organs (Ichimura and Hisamatsu, 1999).

Sucrose: Ichimura and Hiraya (1999) reported that the pulse treatment with 100 g L-1 sucrose in combination with 200 mg L-1 HQS for 16 h had a significant effect on extending the vase life of cut sweet pea flowers.Aarts (1957) also suggested that exogenous sucrose in some way maintains the structure and semi-permeability of the plasma membrane. Furthermore, treatment of cut flowers with sucrose is found to be beneficial in delaying senescence processes (Chung *et al.*, 1997).Many studies have reported on the application of sucrose in extending the vase life of cut flowers. For example, Paulin and Jamain (1982) and Kaltaler and Steponkus (1976) demonstrated the vase life of cut carnations and roses, respectively, increased following sucrose treatment. Similar results

were found in cut flowers of Chrysanthemum(Patel *et al.,* 2016a) and Tithonia (Patel *et al.,* 2016b). In our study, the increase in vase life by the pulse treatment with sucrose was significant in comparison to water controls.Meir et al. (1995) reported that mini-gladiolus cut spikes, together with sucrose plus STS pulsing, offered potential advantages of extending their vase life and maintaining flower quality. Moreover, Han (1998) also reported that the postharvest quality of cut *Heucherasanguinea* was significantly improved and its vase life significantly increased by pulsing the inflorescence with STS for 4 h followed by placing the stems in a sucrose solution containing cntdotL-1 8-hydroxyquinoline citrate.

Citric acid:It is a widespread organic acid in the plant kingdom and makes a weak acid in water. Citric acid is used to adjust water pH and to control the growth of microorganisms. Citric acid is commercially advised for a number of cut flowers like chrysanthemum (Dole and Wilkins, 1998). Also, it reduces the risk of vascular blockage in cut flowers through its anti- embolism trait. Citric acidtreatments extended vase life in association with inhibition of ethylene production (Srivastava, 2000). Citric acid is also known as an acidifier which inhibits the growth of microorganisms and is commercially advised for a number of cut flowers including chrysanthemum (Dole and Wilkins, 1998). It can alleviate water uptake and extend vase life due to its anti-embolism trait (Bhattacharjee *et al.*, 993). Water constitutes a large proportion of horticultural products weight. In addition to water, carbohydrates are the other major constituent of these products. These products commonly take water and other materials from the mother plant, but when cut off, they rapidly move into senescence and death which take place of water loss and weight reduction. This reduction is much higher in stress conditions.

Conclusion

The vase life of cut flowers and foliage is often shortened by vascular occlusions that constrict vase solution supply. Cut flower and foliage longevity can be greatly affected by the chemical composition of the vase solution. External sugars can be provided to cut flowers by dissolving a known amount of sugar, along with a biocide, into the vase solution. Most flowers benefit from a continuous supply of 2% sugar in the vase solution. Citric acid is used to lower the pH. It has been shown that low pH water (pH=3.5) travels faster in the water-conducting system (xylem), thereby preventing or reducing wilting that frequently occurs in field-grown flowers.

References

Aarts, J.F.T. (1957): On the capability of cut flowers. Meded.Landbouwhogesch.Wageningen

57: 1-62.

Bhattacharjee, S. K., Singh, V., and Saxena, N. K. (1993): Studies on Vegetative Growth, Flowering, Flower Quality and Vase Life of Roses. Singapore J. of Primary Industries. 21 (2): 67-71.

Chung, B.C., S.Y. Lee, S.A. Oh, T.H. Rhew, H.G. Nam, and C.H. Lee. (1997): The promoter activity of sen 1, a senescence-associated gene of Arabidopsis, is repressed by sugars. J. Plant Physiol. 151: 339-345.

Dole, J. M., F. Harold and P. Wilkins. (1998): Floriculture Principles and Species. Prentice Hall Inc, Upper Saddle River, New Jersey. 613P.

Han, S.S. (1998): Postharvest handling of cut HeucherasanguineaEngelm. flowers: Effects of sucrose and silver thiosulfate. HortScience 33: 731-733.

Hassan, F., (2005): Postharvest studies on some important flower crops. Ph.D. Thesis, Faculty of Horticultural Sciences, Corvinus University of Budapest, Hungary.

Ichimura, K. and T. Hiraya (1999): Effect of siver thiosulfate complex (STS) in combination with sucrose on the vase life of cut sweet pea flowers. J. Japan. Soc. Hort. Sci. 68: 23-27.

Ichimura, K. and T. Hisamatsu (1999): Effects of continuous treatments with sucrose on the vase life, soluble carbohydrate concentrations, and ethylene production of cut snapdragon flowers. J. Japan. Soc. Hort. Sci. 68: 61-66.

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

Kaltaler, R.E.L. and P.L. Steponkus, (1974): Uptake and metabolism of sucrose in cut roses. J. Amer. Soc Hort. Sci., 99: 490-493.

Kelegama, S. (2001): Agriculture and the new trade agenda in the WTO 2000 negotiations: Economic analysis of interests and policy option for Sri Lanka. (www.unctad.org/trade_env/test1/meetings/standards/shrilanka.doc)

Macnish, A. J., Leonard, R. T and Nell, T. A. (2008): Treatment with Chlorine Dioxide Extends the Vase Life of elected Cut Flowers. Postharvest Biol. Technolo.50: 197-207.

Meir, S., S. Philosoph-Hadas, R. Michaeli, and H. Davidson (1995): Improvement of the keeping quality of mini-gladiolus spikes during prolonged storage by sucrose pulsing and modified atmosphere packaging. Acta Hort. 405: 335- 342.

Patel, R., Parmar, M., Bhatt, M. and Mathur, M., (2016a): Effect of chemical preservatives on shelf life of *Cosmos sulphreus* cav. Cut flower, International Journal of Advanced Research, 4(11), 1467-1471.

Patel, R., Thakkar A, and Mankad A., (2016b): Effect of chemical preservative on water relation and vase-life of *Tithonia rotundifolia* Blake Cut flower, Annals of biological Research, 7 (1):27-30.

Paulin, A. and C. Jamain. (1982): Development of flowers and changes in various sugars during opening of cut carnations. J. Amer. Soc. Hort. Sci. 107: 258-261.

Reid, M.S.,(2012): Handling of cut flowers for air transport. http://ucce.ucdavis.edu/file/datastore/234 1373.pdf. 05/09/12.

Solgi, M., Kafi, M., Taghavi T. S and Naderi, R. (2009): Essential Oils and Silver Nanoparticles (SNP) as Novel Agents to Extend Vase-Life of Gerbera (*Gerbera jamesonii* cv. 'Dune') Flowers. Postharvest Biol. Technol.53: 155-158.

Srivastava, M. K. and Dwivedi, U. N. 2000.Delayed Ripening of Banana Fruit by Salicylic Acid.Plant Science, 158: 87-96.

Tehranifar A, Vahdati N, Selahvarz Y, Bayat H, (2013):Treatment with salicylic acid extends the vase life of important commercial cut flowers, Advanced Crop Science, 3 (6): 405–413.

Uthaichay, N., S. Ketsa and W.G. Van Doorn (2007): 1-MCP pretreatment prevents bud and flower abscission in Dendrobium orchids. Postharv.Bio.and Techno., 43: 374-380.

Van Doorn W.G., Zagory, D., Witte, Y.D. and Harkema H. (1994): Effect of Vase-water Bacteria on the Senescence of Cut Carnation Flowers. Postharvest Biol. Technol., 1:161-168.

Wilberg, B., (1973): PhysiologischeUntersuchungenzumknickert-problem alsVoraussetzungfür die selektionhaltbar Gerbera-Schnittblumen. Z. Pflanzenzucht. 69, 107-114.

Zencirkiran, M. (2010): Effect of 1-MCP (1- Methyl Cyclopropene) and STS (Silver thiosulphate) on the Vase Life of Cut Freesia Flowers. Sci. Res. Essay.5 (17): 2409-2412

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