POST HARVEST PERFORMANCE OF ANTHURIUM CUT FLOWERS ON CITRIC ACID AND SUCROSE CONCENTRATIONS

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ABSTRACT

Anthurium is the largest genus of the Araceae family and very popular with flower arrangers because of lasting qualities of flower. For prolonging the vase life of cut flowers chemical preservatives are used in the holding solutions. The present experiment was conducted to find out the appropriate preservative solution for extending the vase life of anthurium cut flowers. Citric acid and sucrose solution were used in different concentrations to find out best concentration that enhances and prolongs the better flower quality and longevity. Eleven preservative solutions were used for extending the vase life and the experiment was conducted in Completely Randomized Design with three replications. Maximum days taken for spadix necrosis, Days taken for spathe blueing, Physiological loss in weight and Solution uptake were recorded in Citric acid 125 ppm + 8% sucrose. The treatment T_8 – (Citric acid 125 ppm + 8% sucrose) recorded maximum of 29.19 days vase life and flower quality was also superior.

Keywords: Anthurium, vase life

INTRODUCTION

Anthuriums are tropical plants grown for their showy cut flowers and attractive foliage. Highly organic, well aerated medium with good water retention capacity and drainage is needed for its growth and development. The plant produces blooms throughout the year, one bloom emerging from the axil of every leaf. Vase life of cut flowers can be prolonged by the addition of chemical preservatives (Nowak and Rudnicki, 1990). Different factors affect the vase life of cut flowers are chemical and physiological factors such as the content of stored foods of flower, humidity, light, and temperature of the place where vase is kept. Cut flowers are forced to continue living with reserved carbohydrates, proteins and fat for their longevity. Factors affecting water uptake such as air embolism and duration of vascular occlusion contribute to cut flower senescence in Anthurium flowers. 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 (Gerailoo & Ghasemnezhad, 2011). Ethylene serves as a hormone in plants by stimulating and regulating the opening of flowers and the shedding of flowers. By applying various chemicals the post-harvest life of cut flowers can be extended. Wilting is the main cause in the termination of the vase life of cut flowers.

Cut flowers will decay if they are not able to draw water from the vase solution. Senescence of cut flower is due to low water uptake due to xylem vessel blockage by air and microorganism (Elgimabi & Ahmed, 2009). 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 value of Anthurium cut flowers. Among all the different types of sugars, sucrose has been found to be the most commonly used sugar in prolonging vase life of cut flowers. Sugar has an important role in the longevity of flowers, especially cut flowers, because after harvest they receive no nutritional and hormonal support from the mother plant (Van Doorn & Meerteren, 2003). Therefore, the present experiment was conducted to find out the appropriate preservative solution for extending the vase life, quality and postharvest behaviour of flowers.

MATERIAL AND METHODS

The experiment was conducted at Flora-tech floriculture unit at Kottarakara, kollam Dist, kerala state, India on October 2015 to find out the performance chemical preservative solution for extending the vase life of anthurium cut flowers, the variety used for the study is Tropical. Eleven treatments were used and the treatments are T_1 Citric acid 50 ppm, T_2 Citric acid 50 ppm + 8% sucrose, T_3 Citric acid 75 ppm, T_4 Citric acid 75 ppm + 8% sucrose, T_5 Citric acid 100 ppm, T_6 Citric acid 100 ppm + 8% sucrose and T_7 Citric acid 125 ppm, T_8 Citric acid 125 ppm + 8% sucrose , T_9 – Citric acid 150 ppm, T_{10} - Citric acid 150 ppm + 8% sucrose , T_{11} – Distilled water (control). The experiment was carried out in Completely Randomized Design with three replications. Each treatment have three flowers with each flower as one replication. Observations on various parameters of postharvest life were recorded on Days taken for spadix necrosis, Spadix blackening, Days taken for spathe blueing, Physiological loss in weight, Solution uptake and Vase life.

RESULTS AND DISCUSSION

Preservative solutions significantly influenced all the treatments and its performances on prolonging the vase life and quality of cut Anthurium flowers. Among the different chemical preservative solutions (T_8) Citric acid 125 ppm + 8% sucrose recorded the maximum results by delaying the Days taken for gloss loss (21.83 days), Days taken for spadix necrosis (19.21 days), Days taken for spathe blueing (24.18 days), Spadix blackening (23.68 days) and enhanced the postharvest life of Anthurium cut flowers (Table 1). Citric acid 125 ppm + 8% sucrose delayed flower senescence compared to flowers held in other treatments. Vase life was significantly increased to 29.19 days (Table 1). Citric acid reduced bacterial population in vase solution and increased the water conductance in xylem of cut flowers (van Doorn, 2003). Similarly, Citric acid significantly transported iron in plants (Hell & Stephan, 2003, Darandeh & Hadavi, 2012). Organic acids such as citric acid were reported as the source of carbon and energy for cells and used in the respiratory cycle and some other biochemical pathway (Da Silva, 2003; Darandeh & Hadavi, 2012).

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 of cut flowers. Sucrose can act as a source of nutrition for tissues approaching carbohydrate starvation, flower opening and subsequent water relations (Kuiper *et al*., 1995), similar finding were obtained by Lalonde *et al*., (1999), Nichols (1973) and Ichimura, 1998). Sucrose act as a source of energy required for the continuation of the vase life of the cut flowers (Halevy and mayak, 1981) and may also act as osmotically active molecule, thereby lead to the promoting of subsequent water relations and lengthening their vase life.

Water uptake was reduced by the xylem vessel blockage due to presence of microbes and air accumulation in vase solution (Hardenburg, 1968; Hussein, 1994). Similar finding was reported by Luo *et al*. (2003) in cut carnation flowers. Carbohydrate and sucrose requires for the development of flower bud to open flower (Pun and Ichimura, 2003) which supply essential substrate for respiration, structural material and carbon skeletons for bud opening (Mayak *et al*., 1973). Similarly, conversion of polysaccharide to monosaccharide is also responsible for flower opening or closure (Van Doorn & Van Meeteren, 2003). It is reported that sucrose enhanced the effect of cytokinin in delaying senescence of flowers and also reduced the effect of ethylene which increasing the vase life of the flowers (Mayak &

Dilley, 1976).

Table. 1 Post harvest performance of anthurium cut flowers on citric acid and sucrose concentrations

Treatments	Days taken for gloss loss	Days taken for spadix necrosis	Days taken for spathe blueing	Solution uptake (ml)	Water loss (ml)	Spadix blackening (days)	Vase life (days)
T_1 - Citric acid 50 ppm	18.49	17.67	19.67	2.81	19.46	19.81	24.17
T_2 - Citric acid 50 ppm + 8% sucrose	19.51	17.93	19.98	3.13	21.81	19.83	24.94
T_3 - Citric acid 75 ppm	20.42	18.02	20.34	2.59	20.83	19.04	25.18
T_4 - Citric acid 75 ppm +8% sucrose	19.12	19.13	20.57	2.93	21.04	20.82	27.92
T_5 - Citric acid 100 ppm	19.45	19.10	21.67	2.85	21.82	19.81	26.82
T_6 - Citric acid 100 ppm + 8% sucrose	19.15	18.65	21.12	2.76	24.18	21.12	27.81
T_7 - Citric acid 125 ppm	19.67	18.34	22.34	3.56	22.11	20.34	28.01
T_8 - Citric acid 125 ppm + 8% sucrose	21.83	19.21	24.18	3.96	21.32	23.68	29.19
T_9 - Citric acid 150 ppm	20.67	21.81	19.93	2.19	21.04	22.81	27.81
T_{10} - Citric acid 150 ppm + 8% sucrose	19.02	18.29	19.63	2.68	22.29	21.83	26.49
T_{11} - Distilled water	14.41	13.56	13.67	1.29	14.97	14.14	13.29
SE (d)	1.09	0.71	1.11	0.10	1.19	1.07	1.79
CD (p=0.05)	2.18	1.42	2.23	0.21	2.32	2.14	2.58

Table 2. Relative fresh weight of cut flowers as affected by preservative solutions during experiment

	Days1	**3**	**6**	**9**	**12**	**15**	**18**	**21**	**24**	**27**	**30**
T_1	36.13	35.23	33.87	32.46	31.02	28.78	26.46	25.12	23.87	21.12	18.67
T_2	36.23	35.93	34.81	33.02	31.56	29.83	27.56	26.67	24.71	22.81	19.48
T_3	36.13	37.13	35.23	33.23	32.21	30.81	28.91	27.03	25.67	23.41	19.91
T_4	36.57	35.57	34.24	32.36	31.67	30.15	29.43	27.45	25.32	23.13	20.02
T_5	36.98	36.58	34.84	34.98	32.76	31.82	29.87	27.65	25.03	22.23	19.97
T_6	36.91	36.91	35.56	34.89	32.71	30.59	28.67	26.83	24.39	22.56	20.82
T_7	36.92	36.12	36.23	35.12	32.98	31.01	28.46	27.12	25.34	23.16	21.89
T_8	36.45	36.15	36.01	35.28	33.56	31.09	28.15	26.85	24.58	23.02	21.08
T_9	36.73	36.23	36.02	34.98	34.03	33.67	31.23	28.65	24.28	21.56	19.03
T_{10}	36.01	35.91	35.74	33.82	33.02	32.56	31.01	27.89	23.34	20.72	18.93
T_{11}	36.34	35.24	31.57	28.45	25.63	21.57	19.65	15.57	14.67	13.98	12.46

Considering the experimental results it can be concluded that (T_8) Citric acid 125 ppm + 8% sucrose recorded significant improvement in the quality and vase life of anthurium cut flowers which attained the best result compared to other treatments. Days taken for spadix necrosis as well as Days taken for spathe blueing has been increased during the postharvest life as the result of using this combination treatment.

REFERENCES

Da Silva, J. A. T. 2003. The cut flower: postharvest considerations. *Online Journal of Biological Science*, *3*, 406-442.

Darandeh, N and E. Hadavi. 2012. Effect of pre-harvest foliar application of citric acid and malic acid on chlorophyll content and post-harvest vase life of *Lilium* cv. Brunello. *Frontiers in Plant Science*, *2*, 1-3.

Elgimabi, M. N andO.K. Ahmed. 2009. Effects of bactericides and sucrose-pulsing on vase life ofrose cut flowers (Rosa hybirda). *Botany Research International*, *2*(3), 164- 168.

Gerailoo, S and M. Ghasemnezhad. 2011. Effect of salicylic acid on antioxidant enzyme activityandpetal senescence in „Yellow Island‟ cut rose flowers. *Journal of Fruit and Ornamental Plant Research*, *19*(1), 183-193.

Halevy, A.H. and S. Mayak, 1981. Senescence and postharvest physiology of cut flowers, part 2. *Hort. Rev*., 3: 59-143.

Hardenburg, R. E. 1968. The commercial storage of fruits, vegetables and florist and nursery stock. In: Lutz, J.M. (Ed.), Agricultural Handbook No. 66. Department of Agriculture. Agricultural Research Service, United State, p. 130.

Hell, R., and U.V. Stephan. 2003. Iron uptake, trafficking and homeostasis in plants. *Planta*, *216*, 541–551.

Hussein, H. A. A. 1994. Varietal responses of cut flowers to different antimicrobial agents of bacterial contamination and keeping quality. *Acta Horticulture*, 368, 106–116.

Ichimura, K., Kawabata, Y., Kishimoto, M., Goto, R and K. Yamada. 2003. Shortage of soluble carbohydrates is largely responsible for short vase life of cut „Sonia" rose flowers. *Journal of Japanese Society of Horticulture Science*, *72*, 292–298

Kuiper, D., S. Ribots, H.S. Van Reen and N. Marissenn, 1995. The effect of sucrose on the flower bud ripening of "Madelon: Cut roses. *Sci. Hort*., 60: 325-336.

Lalonde, S., E. Boles. H. Hellmann, L. Barker and J.W. Patrick. 1999. The dual function of sugar carriers: Transport and sugar sensing. *Plant Cell*, 11: 707-726.

Luo, H. Y., Jing, H. J., Li, J. R andS.R. Luo. 2003. Effect of different preservatives on freshness of cut carnation flowers. *Plant Physiology Communications*, *39*(1), 27-28.

Mayak, S., and Dilley, D. R. 1976. Effect of sucrose on response of cut carnation to kinetin, ethylene and abscisic acid. *Journal of American Society of Horticultural Science*, *101*, 583-585.

Mayak, S., Bravdo, B., Guilli, A., and A.H. Halvey. 1973. Improvement of opening of cut galadioli flower by pre-treatment with high sucrose concentrations. *Scientia Horticulture*, *1*, 357-365.

Nichols, R., 1973. Senescence of cut carnation flowers: respiration and sugar status. *J. Hort. Sci*., 8: 111-121.

Nowak, J. and R.M. Rudnicki, 1990. Postharvest Handling and Storage of Cut Flowers, Florist, Greens and Potted Plants. 1st Edn., Timber Press, Inc., ISBN-10: 0881921564, pp: 210.

Pun, U.K and K. Ichimura. 2003. Role of sugars in senescence and biosynthesis of ethylene in cutflowers. *Japan Agricultural Research Quarterly*, *4*,219-224.

Van Doorn, W. G and U.V. Meerteren. 2003. Flower opening and closure: a review.