Effect of Pulsing and Different Holding Solutions on Flower quality and Vase life of Tuberose (*Polianthes tuberose* Linn) cv. Calcutta Double

Madhumita Choudhury Talukdar and Luna Barooah

Introduction

Tuberose (*Polianthes tuberose* Linn) belongs to the family Amaryllidacease, is one of the most popular cut flower grown in India. The white, sweet scented flowers are valued as cut flower, used in bouquets for making garlands, veins and as a source of essential oils for perfumery industries. The flowers are highly perishable and therefore need to be treated with suitable chemicals, to enhance their vase life and improve quality. The vase life of tuberose in tap water under good environmental conditions is only a few days. Extension of vase life and improvement of flower quality are highly desirable characters. It has been reported that pulsing treatments prevent vascular infections and inhibit ethylene production and thereby result in prolong storage period and higher quality flowers with increased vase life (Vidhya Sankar and Bhattacharjee 2002). Moreover, investigations pertaining to extend the vase life of tuberose flowers by chemical treatments have been carried out with varying success. Several chemicals *i.e.* silver nitrate, aluminium sulphate, cobalt sulphate, 8-hydroxyquinoline sulphate, boric acid, citric acid, ascorbic acid, sucrose etc. have been used in different formulations and combinations to enhance the vase life of tuberose (Reddy *et al*. 1995). Therefore, the present investigation was undertaken to study the combined influence of pulsing and holding solutions on vase life and quality of tuberose spikes.

Key words : Pulsing solution, holding solution, tuberose, vase life.

Materials and methods

The experiment was conducted in completely randomized block design with factorial concept in the laboratory of Department of Horticulture, Assam Agricultural University; Jorhat during the month of June to July, 2009 at ambient temperature of 26-35ºC. Each flower was harvested with uniform length between 8.00 am to 8.30 am at a stage when the first 1-2 florets start opening. Immediately after harvest, the flowers are put in thiosulphate solution for 1 hr and then they are stored in different holding solutions. Treatment details of holding solutions used in the experiment consists of : T_1: 2% sucrose, T_2: 4% sucrose, T_3: 2% citric acid, T_4: 4% citric acid, T_5: 20 ppm $AgNO_3$, T_6: 30 ppm $AgNO_3$, T_7: 2% sucrose + 2% citric acid + 20 ppm $AgNO_3$, T_8: 2% sucrose + 4% citric acid + 30 ppm $AgNO_3$, T_9: 4% sucrose + 2% citric acid + 20 ppm $AgNO_3$, T_{10}: 4% sucrose + 4% citric acid + 30 ppm $AgNO_3$, T_{11}: Control. Observations were recorded on initial fresh weight of spikes, days to senescence, total water uptake by spikes, percent open florets and fresh weight after every alternate day.

Department of Horticulture, Assam Agricultural University, Jorhat – 785 013

Results and discussions

The results of the experiment revealed that fresh weight of flowers on 3rd day increased significantly over control (Table 1). Among the treatments, maximum fresh weight on 3rd day was recorded in T_9 followed by T_7. The gain in fresh weight of flowers was significantly different among various treatments at 5th and 7th day. This might be due to maximum uptake of water by the flowers as influenced by pulsing with sodium thiosulphate which helped in increased uptake of water and germicidal properties of $AgNO_3$ in addition to inhibition of ethylene biosynthesis which resulted in gain in fresh weight. The fresh weight of the flowers at senescence also decreased profoundly and varied significantly over control. The maximum vase life, water uptake and percent floret opening was observed under the treatment T_9 (4% sucrose + 2% citric acid + 20 ppm $AgNO_3$) followed by T_7 (2% sucrose + 2% citric acid + 20ppm $AgNO_3$). This might be due to the presence of sucrose in the solution that had acted as a food source or respiratory substrate and delayed the degradation of proteins and improved water balance of cult flowers. Steinitz (1982) opined that addition of sucrose to the solution increased the mechanical rigidity of the stem inducing cell wall thickening and lignifications of vascular tissues.

Sucrose antagonized the effect of ABA, which promoted senescence. Sugars alone however tend to promote microbial growth, therefore, the combination of 20ppm $AgNO_3$ improved the vase life of cut flowers as $AgNO_3$ was a very effective biocide, which completely inhibited the microbial growth. This was in conformity with the findings of Ketsa *et al*. 1995. Microbial contamination was one of the most important factors causing vascular occlusion of cut flower (Zagory and Reid 1986). $AgNO_3$ has been reported to act as an inhibitor of ethylene biosynthesis (Beyer 1976). The results indicated that the chemical played a vital role in enhancing the vase life, turgidity and other spike characteristics. However, dilute solution of sucrose provided ideal media for microbial growth. The microbes entered into the vascular bundles and might block the water uptake, thus affecting the keeping quality of cut spikes in vase solution. Chemicals like silver nitrate, citric acid might have decreased microbial growth and prevented vascular blockage, thereby helped in increasing vase life and improving turgidity and other spike characteristics recorded in the present investigation. Similar results had been recorded by several workers (Murali 1990, Gowda & Gowda 1990, Singh *et al.* 2000). Citric acid showed results comparable to that of silver nitrate, so it could be used effectively for enhancing the post harvest life of cut gladiolus spikes. Improvement in vase life of spikes with citric acid was due to acidification of the solution, improvement in water balance and reduction in stem plugging (Durkin 1979). In the present investigation, it had been found that all the chemicals effectively increased water uptake, precent floret opening and vase life over control. Thus, it could be concluded that pulsing with sodium thiosulphate for 1 hr along with holding solution of 4% sucrose + 2% citric acid + 20ppm $AgNO_3$ (T_9) was the best treatment for increasing significantly higher water uptake, percent floret opening, diameter of fully opened florets and vase life of flowers, T_9 was followed by 2% sucrose+ 2% citric acid + 20ppm $AgNO_3$ (T_7) and 4% sucrose+ 4% citric acid+ 30ppm $AgNO_3$ (T_{10}).

References

Beyer EM Jr (1976). Silver ion: a potent antiethylene action in plants. Plant Physiology 58: 268-271.

Durkin DJ (1979). Effect of Millipore filtration citric acid and sucrose on peduncle water potential of cut rose flowers. Journal of American Society of Horticultural Science 104: 860-863.

Gowda NJV and Gowda NN (1990). Effect of calcium, alluminium and source on vase life of cut gladiolus. Crop Research 3: 105-106.

Ketsa S, Piyasaengthong Y and Parthuangwong, S (1995). Mode of action of $AgNO_3$ in maximizing vase life of *Dendrobium pompodour* flowers. Post-harvest physiology research on cut flowers. Hort Science 8:189-194.

Murali TP (1990). Mode of action of metal slats and sucrose in enhancing vase life of cut gladiolus. Acta Horticulturae 266: 307-316.

Reddy BS, Singh K, Gupta AK, Singh A, Sathyanarayana RB, Singh K and Singh A (1995). Advances in Agricultural Research I India, 3, pp.208-214.

Singh K, Singh PJ, Arora JS and Mann RPS (2000). Studies on post harvest management of gladiolus. Journal of Ornamental Horticulture 3: 107-110.

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

Vidhya Sankar and Bhattacharjee SK (2002). Floriculture Research Trend in India. Ind Soc. Ornamental Hort. New Delhi, pp.83-86.

Zagory D and MS Reid (1986). Evaluation of the role of vase micro-organisms in the post harvest life of cut flowers. Acta Horticulturae 181: 207-216.

Table 1: Effect of different holding solution on the vase life of cut tuberose spikes

Treatments	Gain or loss in fresh weight (g)				Total water uptake (ml)	Floret opening (%)	Diameter of 1st fully opened floret	Vase life (days)
	3rd day	5th day	7th day	At senescence				
T_1: 2% sucrose	2.33	1.12	0.52	-0.44	45.50	62.68	2.49	6.15
T_2: 4% sucrose	2.87	1.78	1.15	0.36	48.50	66.32	2.38	6.75
T_3: 2% citric acid	2.38	1.23	0.82	0.75	46.85	65.45	2.56	7.44
T_4: 4% citric acid	2.56	1.64	1.26	1.17	44.70	64.93	2.42	7.25
T_5: 20ppm $AgNO_3$	2.43	1.48	0.83	0.76	52.82	63.31	2.66	7.80
T_6: 30ppm $AgNO_3$	2.98	1.92	1.15	1.07	45.90	64.76	2.83	6.96
T_7: 2% sucrose + 2% citric acid + 20ppm $AgNO_3$	3.03	2.28	1.62	1.53	54.04	68.46	2.76	9.83
T_8: 2% sucrose + 4% citric acid + 30ppm $AgNO_3$	3.76	2.48	1.92	1.84	50.61	71.36	2.92	8.25
T_9: 4% sucrose+ 2% citric acid + 20ppm $AgNO_3$	4.43	2.91	2.39	2.30	55.71	75.22	3.02	10.75
T_{10}: 4% sucrose+ 4% citric acid + 30 ppm $AgNO_3$	3.84	2.51	2.02	1.94	53.20	72.67	2.85	8.50
T_{11}: Control	1.47	0.52	0.36	-1.05	42.76	35.24	2.17	5.00
CD (P= 0.05)	1.26	0.13	0.038	0.044	3.27	6.02	0.83	2.42