Research Paper | *The Asian Journal of Horticulture,* (June, 2010) Vol. 5 No. 1 : 7- 10

Vase life studies in tuberose (*Polianthes tuberosa)* cv. SHRINGAR as affected by post harvest handling treatments

ADARSH KUMAR, SANJEEV KUMAR AND SUDHIR CHANDRA

Revised : *October, 2009*
Accepted : ***January, 2010***

See end of the article for authors' affiliations

Correspondence to:
ADARSH KUMAR
Department of Horticulture, Sh. F.H. (P.G.) College, Nidhauli Kalan, ETAH (U.P.) INDIA

ABSTRACT

During the present study conducted on 'Shringar' tuberose, the treatment of 4% sucrose + 300 ppm $Al_2 (SO_4)_3$ tended to increase the maximum opened florets (26.00), percentage of opened florets (77.02 %), solution uptake (51.00 ml) and longer vase life (10.00 days) while the change in fresh weight of spikes on 3rd day (13.69 g) and diameter of florets (4.40 cm) was registered to be the highest in spikes treated with 4 % sucrose + 25 ppm $AgNo_3$. The longest vase life (10.67 days) was observed in vase solution of 4 % sucrose + 300ppm citric acid.Spikes wrapped in news paper stored for 24 hours at 4^0C had maximum opened florets (22.23), per cent opened florets (74.00%) and longest vase life (7.00 day) where as the spikes wrapped in polythene sheet and stored for 24 hours at 4^0C temperature resulted in enhanced floral diameter (4.22 cm) and water uptake (40.33 ml) at senescence.

Key words : Tuberose, Post harvest handling, Cut flower

Tuberose (*Polianthes tuberosa* L.) an ornamental bulbous plant, is native of Mexico and belongs to family Amaryllidaceae. Ornamental plants have prime importance in maintaining ecological balance and checking pollution in surroundings. About 45% of world trade in floriculture products goes to cut flower. In India, it occupies a prime position in the floriculture industry. Waxy white flowering spikes of single as well as double flower tuberose impregnate the atmosphere with their sweet lingering fragrance and are in great demand for making floral arrangement and bouquets in major cities of India. It is widely grown as specimen for exhibition and cut flowers. The standardized product of post harvest handling of cut flowers such as harvesting at optimum stage, conditioning, pre-cooling, impregnation, pulsing, bud opening, standard vase solutions, storage and control of vase microbes are useful for lengthening quality and life of cut flowers. The vase life of cut flower is influenced by constant water supply, microbial growth, ethylene formation and energy source used to preserve the flower quality and extending post-harvest longevity of cut flowers. The ideal preservatives should contain energy source sucrose and chemical germicidal and germistatal effects. The vase life of cut flower is influenced by variety of factors like climate, crop variety, harvesting time and post-harvest handling etc. Packing plays an important role in extending freshness, value addition and reducing damage. For very delicate flowers, news paper or tissue paper can be used to wrap before putting them into conditioning bottle. The present study was undertaken with the objective to find out the effect of various chemicals in extending the vase life of cut spikes and best packaging material duration transit for tuberose cultivar 'Shringar'

MATERIALS AND METHODS

The experiment was conducted in Horticulture Department of Sh. F.H. (P.G.) College, Nidhauli Kalan, Etah (U.P.) to study the effect of packaging and chemical treatments on keeping quality of cut tuberose spikes. Immediately after harvesting, spikes were placed into bucket containing distilled water and brought to the laboratory. The length of all spikes was kept constant (40cm) from the cut end of the base to the tip of the spike. The cut end of the spikes were dipped in disinfectant *i.e.*, $HgCl_2$ (1%) to remove outside infection. Then, the rachis base of each spike was slantingly cut with the help of sharp blade to increase absorption area and kept under distilled water to prevent the entry of air bubbles. After recording the fresh weight and length of spikes, these were placed in 300 ml glass bottle as vase containing 200 ml aqueous solution of various preservative such as sodium hypochloride (100 ppm), aluminium sulphate (300 ppm), citric acid (300 ppm), cobalt chloride (100 ppm) and silver nitrate (25 ppm) were used with sucrose (4%) and distilled water as control to study their effect on vase life and other quality parameters of cut tuberose flower. The neck of each bottle was covered with the help of aluminium foil to check evaporation of the solution or distilled water. For studying the effect of packing material and simulated transit on the vase life of cut tuberose spikes: the spikes were made into bundles

after harvesting and wrapped in wrapping materials and packed in box of 80 x 40 x 20 cm^3 size. The box was pre-cooled at low temperature (4^0C) in refrigerator for 24 and 48 hours subsequently. The spikes were held in distilled water. Use of polythene sheet for 24 hours, polythene sheet for 48 hours, newspaper for 24 hours and newspaper for 48 hours, brown paper for 24 hours, brown paper for 48 hours and control were used as packaging materials. The floral diameter was recorded in cm by measuring the size of N-S and E-W directions at 3rd day and last day in vase and average diameter was expressed in cm. The total quantity of aqueous solution consumed by the cut spikes up to senescence (50 % floret wilting stage) was measured in ml by measuring cylinder. Total number of open florets was recorded at senescence stage by counting the florets in each spike. The duration between the first basal floret and wilting of 50 % floret from the base of the spike was taken as actual vase life and presented in days. Fresh weight of spike was recorded on first, third and last day in vase. Change in fresh weight of spike was calculated (g) in relation to initial weight of 3rd day and last day in vase. The number of fully opened florets was counted at last day of experiment and the percentage of total number of opened florets was calculated as:

$$\text{Percentage of open floret} = \frac{\text{Total open florets}}{\text{Total floret}} \text{x100}$$

The data were statistically analyzed with the help of computer using Completely Randomized Design. The significance of variance among the treatments was observed by applying 'F' test and critical difference at 5% level of probability.

RESULTS AND DISCUSSION

The different chemicals showed the significant effect on floral diameter (Table 1) and it was found maximum (4.40 cm) in the solution of 4% sucrose supplemented with 25 ppm $AgNO_3$ which might be due to the presence of sugars along with salt which maintained the osmotic potential of the petal cell and thus improving their water balance and quality of cut flower spikes (Halevy, 1976; De and Barman, 1998 a).

Maximum opened florets (26.00) were observed with 4% sucrose combined with 300 ppm $Al_2(SO_4)_3$ solution. This might be due to its anti-microbial nature preventing vascular blockage and finally increase water uptake retention of solution. Similar, results were also reported by Gowda and Gowda (1990) and Bhaskar *et al.* (1999). The minimum opened florets (21.33) were recorded in spikes kept in 4 % sucrose supplemented with 25 ppm $AgNO_3$ solution. Bhaskar *et al*. (1999) also reported reduced number of opened florets in vase solution combined with $AgNO_3$ solution.

The perusal of results exhibits the significant difference in solution uptake among various treatments. The maximum solution uptake on 3rd day (43.33ml) was recorded in 4 % sucrose (25 ppm) $AgNO_3$. Bhaskar *et al*. (1999) also recorded significantly more solution uptake

Table 1 : Effect of chemical treatments on floral diameter, maximum opened florets, per cent opened florets, solution uptake, fresh weight of spikes and vase life in tuberose cv. SHRINGAR at senescence

Treatments	Floral diameter (cm)	Maximum opened florets at senescence	Per cent opened florets	Solution uptake (ml)		Fresh weight of spikes (g)			Vase life (days)
				3rd day	At senescence	Initial weight of spike (g)	3rd day	At senescence	
Control	3.65	22.67	56.40	30.30	37.00	29.24	35.41 (+6.17)	21.60 (-7.64)	9.66
Sucrose (4 %) + NaOCl (100 ppm)	4.30	22.00	64.75	27.00	43.00	28.32	34.85 (+6.53)	20.65 (-7.67)	7.00
Sucrose (4 %) +Al_2 $(SO_4)_3$ (300 ppm)	4.35	26.00	77.02	25.66	51.00	28.52	35.80 (+7.28)	18.76 (-9.76)	10.00
Sucrose (4 %) + citric acid (300 ppm)	3.97	25.67	54.35	23.00	50.66	28.21	36.37(+8.16)	19.99 (-8.22)	10.67
Sucrose (4 %) + $CoCl_2$ (100 ppm)	4.30	23.67	59.95	24.33	47.33	25.48	31.29 (+5.81)	19.33 (-6.15)	9.67
Sucrose (4%) + $AgNO_3$(25ppm)	4.40	21.33	50.52	43.33	50.00	37.48	51.17 (+13.69)	24.66 (-12.82)	8.00
S.E.±	0.36	1.25	3.27	0.505	4.09	2.58	3.29 (0.6528)	1.76 (2.8645)	0.235
C.D. (P=0.05)	0.11	4.12	10.30	1.52	10.61	7.95	10.14 (1.9853)	4.42 (5.75)	0.742

in vase solution added with $AgNO_3$ (10.0 %). Maximum uptake of solution (50.66 ml) at senescence was found in 4% sucrose supplemented with 300 ppm $AgNO_3$ which might be attributed to the antimicrobial affect of aluminium sulphate (Mukhopadhyay, 1982) resulted into reduced plugging of xylem and improved the solution uptake there by maintaining the fresh weight (Halevey and Mayak, 1979).

The perusal of results clearly indicates that the maximum weight of spike (13.69 g) at 3rd day with the vase solution of 4% sucrose supplemented with 25 ppm $AgNO_3$ whereas, minimum weight of spike (5.81 g) was observed in vase solution of 4% sucrose + 100 ppm $CoCl_2$ (Table 1). The beneficial effect of silver nitrate on spike weight improvement might be attributed to the fact that silver nitrate reduces the severity of physiological stem plugging (Aarts, 1957). The maximum weight loss (12.85 g) at senescence was observed in 4% sucrose fortified with 25 ppm $AgNO_3$. The minimum loss in weight of spikes at senescence in vase solution of $AgNO_3$ (0.01 %) was also observed by Tiwari (2001) and Bhaskar *et al.* (1999).

It is clear from the data (Table 1) that 4% sucrose combined with 300 ppm $Al_2(SO_4)_3$ significantly increased the per cent opened florets (77.02 %). The increased percentage of opened florets in aluminium sulphate might be due to its nature and oxidizable respiratory substrate (Larsen and Frolich, 1969). The lower percentage of opened florets (50.52 %) was found in 4% sucrose combined + $AgNO_3$ due to browning of stem in the dipped portion of $AgNO_3$. Similar, findings was also reported by Halevey and Mayak (1971) and Bravdo *et al*. (1974).

The data presented in Table 1 show the longest vase life of spike (10.67 days) in case of spikes kept in 4% sucrose + 300 ppm citric acid which was significantly higher than control (9.66 days) but was at par with those kept in 4% sucrose + 300 ppm $Al_2(SO_4)_3$ solution (10.00 days). The longest vase life in citric acid supplemented with 4 % sucrose (10.67 days) might be due to the effect of citric acid on preventing the vascular blockage (Aarts, 1957; Marousky, 1971; Bhaskar *et al.,* 1999 and Reddy *et al*., 1996).

Different packaging materials significantly affected the floral diameter (Table 2). Among all the treatments, polythene sheet packing of spikes for 24 hours resulted in longest diameter of florets (4.22 cm) which could be attributed to the maintenance of relative humidity with high CO_2 and low O_2 levels (Bhattacharjee, 1997; Anonymous, 2001). Among all the treatments, the maximum opened florets (22.33) were found in spikes wrapped in newspaper for 24 hours. The results of the present investigation are in agreement with those of the maximum opened florets wrapped with newspaper for 24 hours and stored at 4^0C temperature (Anonymous, 2001).

Among all the treatments, the maximum opened florets (22.33) were found in spikes wrapped in newspaper for 24 hours. The results of the present investigation are in agreement with those of the maximum opened florets wrapped with news paper for 24 hours and stored at 4^0C temperature (Anonymous, 2001).

The maximum percentage of opened florets per spike (74%) was recorded in case of spikes wrapped with newspaper for 24 hours at 4^0C.This result is in the line of the observation reported from Kalyani in the cultivar Shringar in which per cent opened florets was found maximum (88.33%) when the spikes were wrapped in newspaper for 28 hours (Anonymous, 2001).

The water uptake at 3rd day was found maximum (33.66 mm) in spikes wrapped in polythene sheets stored for 48 hours at 4^0C temperature which might be due to the fact that polythene sheet helps to maintain relative humidity, high CO_2 and low O_2 level. The results are in

Table 2 : Effect of packaging materials and pre-cooling duration on floral diameter, maximum opened florets, per cent opened florets, water uptake and vase life of tuberose cultivar 'Shringar'

Treatments	24 hours (wrapping + storage at 4^0C)						48 hours (wrapping + storage at 4^0C)					
	Floral diameter (cm)	Maximum opened florets at senescence	Per cent opened florets	Water uptake (ml)		Vase life (days)	Floral diameter (cm)	Maximum opened florets at senescence	Per cent opened florets	Water uptake(ml)		Vase life (days)
				3rd day	At senescence					3rd day	At senescence	
Control	3.76	15.33	54.74	19.33	25.66	6.00	3.76	15.33	54.75	19.33	25.66	6.00
Polythene sheets	4.22	21.03	63.27	22.66	40.33	6.33	4.00	17.33	59.75	18.33	23.00	5.66
News paper	4.12	22.23	74.00	20.66	35.66	7.00	4.10	19.66	72.81	23.66	30.66	6.33
Brown paper	3.96	20.66	67.00	17.00	33.66	6.66	3.80	17.66	51.96	20.00	25.33	6.00
S.E..±	0.58	0.58	3.81	0.58	0.99	0.94	0.12	0.51	1.77	0.59	0.76	0.87
C.D. (P=0.05)	1.03	1.89	11.48	1.89	3.22	0.06	0.19	1.65	5.8	0.90	2.48	0.12

conformity with the findings of Anonymous (2001) and Katwate *et al*. (1995).

The maximum vase life (7.0 days) was recorded in spikes packed in newspaper for 24 hours at 4^0C temperature. The packaging of cut spikes on news paper for 24 hours was found most suitable since recorded the highest vase life (7.46 days) (Anonymous, 2001).

Conclusion :

Cut spikes of tuberose cv. 'SHRINGAR' held in vase solution of aluminium sulphate (300 ppm) combined with 4 % sucrose extended the vase life as well as opened florets. Cut spikes wrapped in newspaper with storage duration of 24 hours had the longest vase life and maximum opened floret as compared to other packing materials.

Authors' affiliations:
SANJEEV KUMAR AND SUDHIR CHANDRA, Department of Horticulture, Sh. F.H. (P.G.) College, Nidhauli Kalan, ETAH (U.P.) INDIA

REFERENCES

Aarts, J.F.T.H. (1957). Over de haudaarheidvan, Ssnijboloemon (On the keep ability of cut flower). Meded van de land Bauwhoge School te Wagningen, **57**: 1-62.

Anonymous (2001). All India Coordinator Research Project on Floriculture, Technical Bulletin, Np. 10 ICAR Publication, New Delhi, 291 p.

Bhaskar, V.V., Rao, P.V. and Reddy, Y.N. (1999). Effect of organic acids on the post-harvest vase life of cut tuberose (*Polianthes tuberosa* L.) cv. DOUBLE. *J. Res. ANGRAU*, **27** (4): 18-25.

Bhattacharjee, S.K. (1997). Packing fresh cut flowers. *Indian Hort*., **42** (1): 36-37.

Bravdo, B., Mayak, S. and Graveti, Y. (1974). Sucrose and water uptake from concentrated solution by gladiolus shoots and effect of these treatments on floret life. *Canadian J. Bot*., **52** : 1271-1281.

De, L.C. and Barman, D. (1998a). Post harvest behaviour of cut tuberose spikes as affected by chemicals. *J. Ornam. Hort. New Series*, **1**: 66-68.

Gowda, J.V.N. and Gowda, V.N. (1990). Effect of aluminium, calcium and sucrose on vase life of gladiolus. *Crop Res.*, **31** (1): 105-106.

Halevy, A.H. (1976). Treatment of improve water balance of cut flower. *Acta Hort*., **64** : 223-230.

Halevy, A.H. and Mayak, S. (1971). Senescence and post-harvest physiology of cut flowers-Part I. In: ed. Janik, *J. Hort. Rev*., **1**: 204-235.

Halevy, A.H. and Mayak, S. (1979). Senescence and post-harvest physiology of cut flowers-Part II. *Hort. Rev*., **3**: 50-143.

Katwate, S.M., Patil, M.T. and Singh, B.R. (1995). Influence of low temperature storage on longevity of cut spikes of tuberose. *J. Maharashtra Agric. Univ*., **20** (2): 239-290.

Larsen, F.E. and Frolich, M. (1969). The influence of 8-HQC, N-dimethylamino-succinamic acid and sucrose on respiration and water flow in 'Red Sim' cut carnation's in relation to flower senescence. *J. American Soc. Hort. Sci.,* **94** : 289-292.

Marousky, F.J. (1971). Inhibition of vascular blockage land increased moisture retention in cut roses induced by pH, 8-hydroxy quinoline citrate and sucrose. *J. American Soc. Hort. Sci*., **96** : 38-41.

Mukhopadhyay, T.P. (1982). Effect of chemicals on the floral development and vase life of tuberose (*Polianthes tuberosa* L.) cv. SINGLE. *South Indian J. Hort.*, **30**: 281-284.

Reddy, S., Singh, B.K., Singh, A. and Saini, A. (1996). Role of cobalt in post-harvest physiology of tuberose cv. SINGLE. *Adv. Agric. Res. India*, **6**: 39-46.

Tiwari, A.K. (2001). Effect of chemical preservatives on post harvest life of rose. Ph.D. Thesis, G.B. Pant University of Agriculture and Technology, Pantnagar. 187p.

****