Journal of Ornamental Plants
Available online on: www.jornamental.com
ISSN (Print): 2251-6433 ISSN (Online): 2251-6441

Keeping Quality and Vase life of Carnation cv. 'Eskimo' as Influenced by Different Chemicals

Malik Abid Mahmood[1], Ahmad Sattar Khan[2], Naveed Ahmad[1*] and Misha Arshad[3]
[1] Directorate of Floriculture (T&R) Punjab, 21-Davis Road, Lahore, Pakistan
[2] Institute of Horticultural Sciences, University of Agriculture, Faisalabad, Pakistan
[3] Institute of Agricultural Sciences, Punjab University, Lahore, Pakistan

Received: 25 January 2015 Accepted: 13 March 2015
*Corresponding author's email: nahmad57@gmail.com

Abstract

Present experiment was carried out to check the effect of different concentrations of sucrose (2, 4, 6%), GA_3 (25, 50, 75 ppm) and combination of sucrose and $CuSO_4$ (2% + 200, 4% + 300, 6% + 400 ppm), sucrose and GA_3 (2% + 25 ppm), (4%+50 ppm), (6%+75 ppm) on keeping quality and vase life of carnation cv. 'Eskimo'. Some postharvest characteristics such as vase life, total soluble solids (TSS), water uptake and quality change were evaluated. The experiment was laid out according to RCD (Randomized Complete Design) with three replications while for quality change it was two factor factorial. Maximum vase life in term of days was recorded in treatment T_6 and T_{13} (8 days) followed by T_4 (7.7 days). T_5 & T_{12} were at par (7 days). Maximum water uptake was also observed in T_{13} (56.7 ml) followed by T6 (49.7 ml) and T8 (45 ml). Maximum TSS were found in T_{13} (8.3 %) followed by T_6, T_{11} and T_{12}. Keeping quality characteristic of T_6 was deteriorated slowly as compared to other treatments. Hence, T_6 was found superior in overall respects.

Keywords: Carnation, $CuSO_4$, Eskimo, GA_3, Sucrose, Vase life.

INTRODUCTION

Carnation a native to Mediterranean region (Salehi, 2006) is an important flower crop having great commercial value as a cut flower due to its excellent keeping quality, wide range of colors and forms (Pralhad, 2009). Carnation flowers are sold as cut flowers round the year throughout the world and it is on the top three cut flowers traded in the international market. The demand for carnation as cut flower is gaining momentum with increasing socio-economic standards of the people.

The greatest interest of a florist is to prolong the vase life of the flowers. The appearance of bent neck, wilting of outer petals and yellowing of the leaves indicate the end of the useful vase life of cut flowers (Ketsa and Narkbua, 2001; Reid, 2002). Longevity of vase life is an important factor for consumer preference. Short vase life is one of the most problems of the cut flowers (Kader, 2003). Senescence of cut flowers is induced by several factors e.g water stress (Sankat and Mujaffar, 1994), microorganisms and ethylene effects (Han and Miller, 2003). In cut flowers, poor water availability has been reported as a result of increased stem resistance to water flow resulting from microbial growth and high pH of vase solutions. This problem has been overcome in various cut flowers by the use of bactericide and low pH vase solutions (Nowak and Rundnicki, 1990).

As carnation is one of the most important cut flower nowadays as well. Therefore it is important to ensure the longest vase life of the flowers. The postharvest performance and vase life of cut flowers is influenced by flower handling (Pizano, 2009), carbohydrate content, blockage of xylem vessels, ethylene, the composition of the atmosphere, and the chemical solutions of the preservatives.

Tap water solution containing low concentration of copper sulphate (50 µM), calcium chloride (0.7 mM) and $NaHCO_3$ (1.5 mM) is appropriate as standardized vase solution as copper ions act as biocide (Halevy and Mayak, 1981; Van Doorn, 1997) and a wound reaction enzyme inhibitor (Vaslier and Van Doorn, 2003). Adding sucrose to the vase solutions improved bud opening and further extended vase life of inflorescences (Van Doorn and Reid, 1992) and sucrose supplies the energy and carbon skeletons required for bud opening. Steinitz and Cohen (1982) found that gibberilic acid was effective in promoting petal expansion.

Therefore, this experiment was conducted to check the effect of different chemicals on the enhancement of vase life of carnation. The main objective of the study was to investigate the effect of various concentrations of sucrose, copper sulphate and growth regulators e.g. gibberellic acid on carnation cut flower longevity and quality.

MATERIALS AND METHODS

The present investigation was carried out to study the effect of chemicals on keeping quality and vase life of carnation. Fresh cut flowers of carnation cv. 'Eskimo' were harvested from a private cut flower farm and were transported to postharvest laboratory, Directorate of Floriculture, Punjab, Lahore, during March 2014. The experiment was conducted in a completely randomized design. There were 12 treatments (Table 1) and each treatment was consisted of ten flowers and each experiment was repeated twice. Prior to treatment, carnation cut flowers were trimmed to equal length and the lower most leaves were discarded.

The data on vase life (days), total soluble solids (%), water uptake (ml) and quality change were recorded. Flowers were observed daily till they were found unfit for containing in vase. The vase life was expressed in terms of days from the date of harvesting to final observation (wilting of one third of petals in each flower). In order to measure petal total soluble solids, one cut flower was picked up from each experimental unit and its petals were grinded into a powder. Few drops of petal extract were taken in to a multi-range analyzer Refractometer (ATAGO, RS-5000 Atago, Japan) and TSS value was recorded in °Brix. The water uptake was measured in the vases containing 250 ml of solution after eight days. The average of 3 replication values was used in order

Table 1: Treatment detail of holding solutions.

Sr. No.	Treatment	Details
1	T_0	Control (tap water)
2	T_1	2% sucrose
3	T_2	4% sucrose
4	T_3	6% sucrose
5	T_4	2% sucrose+$CuSo_4$ 200 ppm
6	T_5	4% sucrose+$CuSo_4$ 300 ppm
7	T_6	6% sucrose+$CuSo_4$ 400 ppm
8	T_7	25 ppm GA_3
9	T_8	50 ppm GA_3
10	T_9	75 ppm GA_3
11	T_{10}	2% sucrose + 25 ppm GA_3
12	T_{11}	4% sucrose + 50 ppm GA_3
13	T_{12}	6% sucrose + 75 ppm GA_3

to establish evaporation value. Simultaneously the water deficiency was measured in control vase. For each experimental unit water uptake was calculated by subtracting the two above values with each other. Flower quality change was assessed by visual inspection using a 4 grade system (0 = absent, 1 = little, 2 = moderate and 3 = severe). Quality inspection was carried daily and grades were assigned to each treatment.

The experimental data were subjected to analysis of variance (ANOVA) using Statistix 9 for windows software. The effects of treatments were determined from the least significant differences test (Fisher's LSD) at $P < 0.05$, where the F test was significant (Steel *et al.*, 1997). All the assumptions of analysis were checked to ensure validity of statistical analysis. All graphs were drawn using Excel software.

RESULTS AND DISCUSSION

Vase life (Days)

Statistical analysis showed that the treatments responded positively for the enhancement of vase life. Mean comparison showed that T_6 (4% sucrose+$CuSO_4$ 300 ppm) and T_{13} (6% sucrose + 75 ppm GA_3) had maximum vase life (8 days) followed by T_4, T_5 and T_{12} while minimum vase life was recorded in T_1 (3.7) (Fig. 1). Edrisi *et al*. (2012) observed $CuSO_4$ as effective chemical to control microbial growth in vase solution. Mahmood *et al*. (2014) observed same vase life in carnation cv. 'Tempo'. Vase life can be determined by the availability of carbohydrates to carry on physiological activities to assimilate food for keeping the cut flower fresh and long lived. The more are food reserves, the better and longer the days to loose freshness. $CuSO_4$ (300 ppm) was most effective for maintaining quality of carnation flowers. This could be due to the reason that the fungal activities were slower down at this concentration.

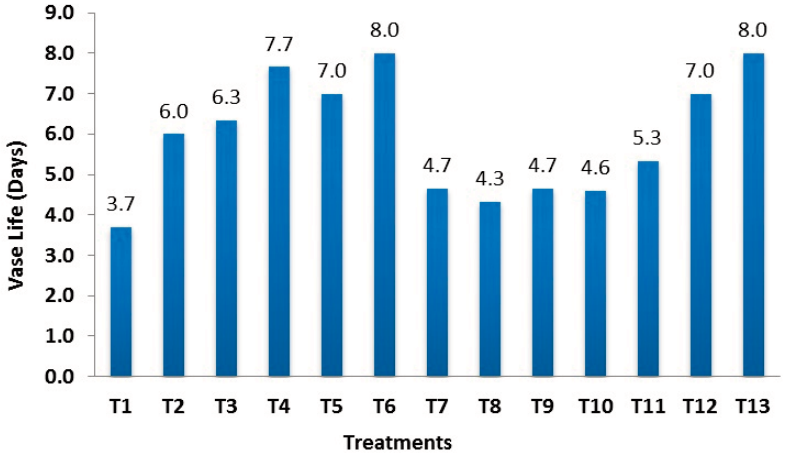

Fig. 1. Vase life of Carnation Cv. 'Eskimo' as Influenced by Different Chemicals .

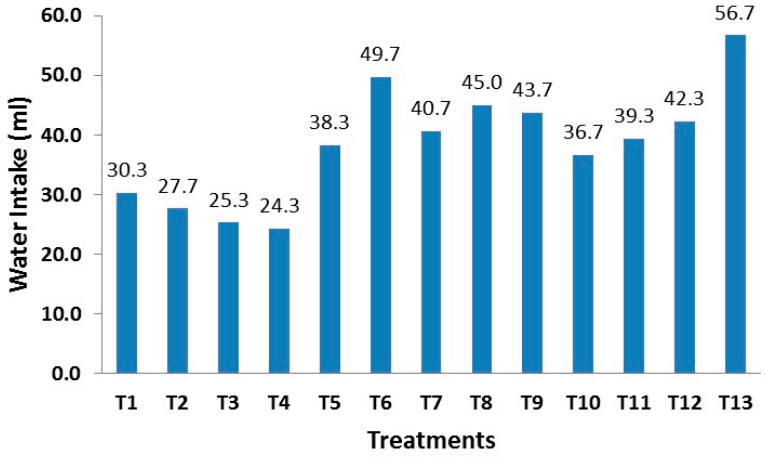

Fig. 2. Water intake of Carnation Cv. 'Eskimo' as Influenced by different Chemicals.

Water uptake

Maximum solution uptake was observed for flower kept in T_{13} (56.7 ml), T6 (49.7 ml) and T_8 (45.0 ml), minimum uptake was recorded in T_4 (24.3 ml) followed by T_3 (25.3 ml) and T_2 (27.7 ml) (Fig. 2). It is observed that $CuSO_4$ and GA_3 play effective role in water uptake. Gibberellic acid causes the conversion of starch to sucrose, fructose, and glucose. The accumulation of these reduced sugars produces a lower water potential within the cells and consequently increases WI capability (Mutui *et al*., 2006). It seems that silver compounds and particles transport throughout stem vascular system and removes pathogenesis infection inside the vascular system and promote WI potential of plants (Ketsa *et al.*, 1981).

Total soluble solids

In our study maximum soluble solids were observed in T_{13} (8.3%) followed by T_6 (8%), T_{11} (8%) and T_{12} (8%). Minimum total soluble solids were observed in T_4 (5%) and T_5 (4%) (Fig. 3). According to a research, CKs cause assimilates transfer from leaves to developing flower organs and result in TSS increment of flower petals. In *Gladiolus* cut flowers it was found that treating flowers with100 mg L^{-1} GA_3 increased sugar content in the petals and leaves until 10 days after harvest. Gibberellins could maintain photosynthesis system in cut flower leaves until their yellowing and abscission (Hassanpour-Asil and Karimi, 2010).

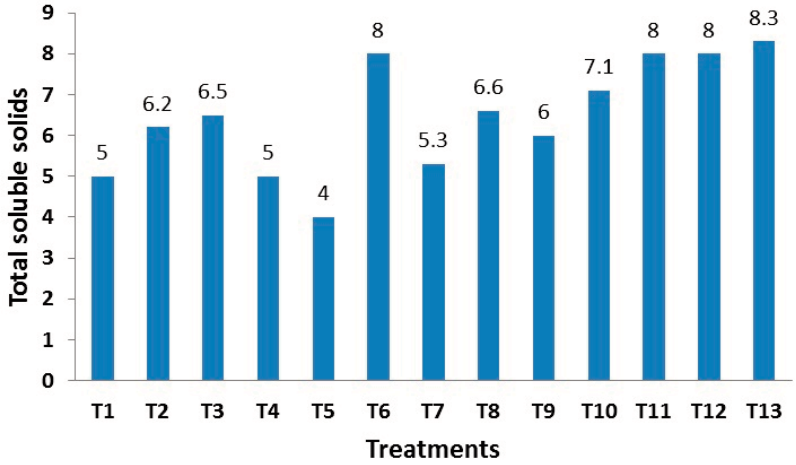

Fig. 3. Total soluble solids of Carnation Cv. 'Eskimo' as Influenced by Different Chemicals.

Table 2: Keeping Quality of Carnation Cv. 'Eskimo' as Influenced by Different Chemicals .

Treatments	Days								Means
	1	2	3	4	5	6	7	8	
T1	0.66 D	2.00 B	2.00 B	3.00 A	3.00 A	3.00 A	3.00 A	3.00 A	2.45 A
T2	0.00 E	0.00 E	1.00 C	1.00 C	2.00 B	2.00 B	3.00 A	3.00 A	1.50 E
T3	0.00 E	1.00 C	2.00 B	2.00 B	2.00 B	3.00 A	3.00 A	3.00 A	2.00 B
T4	0.00 E	1.00 C	1.00 C	2.00 B	3.00 A	3.00 A	3.00 A	3.00 A	2.00 B
T5	0.00 E	1.00 C	1.00 C	2.00 B	2.00 B	3.00 A	3.00 A	3.00 A	1.87 C
T6	0.00 E	0.00 E	0.00 E	1.00 C	1.00 C	1.00 C	2.00 B	2.00 B	0.87 H
T7	0.00 E	0.00 E	1.00 C	1.00 C	1.00 C	2.00 B	2.00 B	3.00 A	1.25 G
T8	0.00 E	0.00 E	1.00 C	1.00 C	2.00 B	2.00 B	2.00 B	3.00 A	1.37 F
T9	0.00 E	0.00 E	1.00 C	1.00 C	2.00 B	2.00 B	2.00 B	3.00 A	1.37 F
T10	0.00 E	0.00 E	1.00 C	2.00 B	2.00 B	2.00 B	3.00 A	3.00 A	1.62 D
T11	0.00 E	0.00 E	2.00 B	2.00 B	3.00 A	3.00 A	3.00 A	3.00 A	2.00 B
T12	0.00 E	0.00 E	2.00 B	2.00 B	2.00 B	3.00 A	3.00 A	3.00 A	1.87 C
T13	0.00 E	0.00 E	2.00 B	2.00 B	2.00 B	3.00 A	3.00 A	3.00 A	1.87 C
Means	0.051H	0.38 G	1.30 F	1.69 E	2.07 D	2.46 C	2.69 B	2.92 A	

Means in the same column followed by the same letter are not significantly different by LSD test.

Quality change

As the food reserves are exhausted, symptoms like discoloration and deterioration of quality appear, there are many other factors which also contribute towards quality change like temperature, humidity and the post-harvest handling of flowers. Table 2 depicted that during first day of experiment change of quality only in T_1 was observed. Severe change in quality of T_1 was observed on fourth day of experiment. Quality of flowers in T_6 deteriorated slowly and there was no change in quality was observed up third day in T_6. Moderate quality change was observed on 8^{th} day of experiment in T_6. Edrisi *et al*. (2012) observed that proper dose $CuSO_4$ delayed wilting by inhibiting microbial growth.

CONCLUSION

The above mentioned findings indicated that considering the important characteristics, T_6 and T_{13} are more effective for prolonging vase life and maintaining quality of carnation cut flowers.

Literature Cited

Edrisi1, B., Sadrpoor, A. and Saffari, V.R. 2012. Effects of chemicals on vase life of cut carnation (*Dianthus caryophyllus* L. 'Delphi') and microorganisms population in solution. Journal of Ornamental and Horticultural Plants, 2 (1): 1-11.

Halevy, A.H. and Mayak, S. 1981. Senescence and postharvest physiology of cut flowers Part 2. Horticultural Review, 3: 59–141.

Han, S.S. and Miller, J.A. 2003. Role of ethylene in postharvest quality of cut oriental lily 'Stargazer'. Plant Growth Regulation, 40: 213-222.

Hassanpour-Asil, M. and Karimi. M. 2010. Efficiency of benzyladenine reduced ethylene production and extended vase life of cut *Eustoma* flowers. Plant Omics Journal. 5:199-203.

Kader, A.A. 2003. A perspective on postharvest horticulture. Journal of Horticaltural Science, 38: 1004-1008.

Ketsa, S. and Narkbua, N. 2001. Effects of amino oxyacetic acid and sucrose on vase life of cut roses. Acta Horticulturae. 543: 227-234.

Ketsa, S., Tongumpai, P. and Siripanich. T. 1981. Effect of silver thiosulfate pretreatment on vase life of cut carnation flowers. Kasetsart Journal. 21: 207-213.

Mahmood, M.A., Khan, M. S. A. and Ahmad, N. 2014. Growth, yield and quality of carnation (*Dianthus caryophyllus* L.) cultivars under lath house conditions. Journal of Ornamental Plants, Volume 4, Number 1: 27-32.

Mutui, T.M., Emongor, V.E. and Hutchinson. M.J. 2006. Effect of gibberellin on the vase life and

flower quality of *Alstroemeria* cut flowers. Plant Growth Regulation. 48(3): 207-214.
Nowak, J. and Rudnicki, R. 1990. Postharvest and storage of cut flowers, florist green and potted plants. P. 210. Timber Press, Inc., Oregon USA.
Pizano, M. 2009. Research show the way for postharvest treatment roses. Flower Technology, 12(6): 1-13.
Pralhad, G.C. 2009. Evaluation of carnation (*Dianthus caryophyllus* L.) varieties under greenhouse condition. M.Sc. Thesis, Dept. Horti., Univ. Agri. Sci., Dharwad.
Reid, M.S. 2002. Non metabolized cytokinins as growth regulators in postharvest performance of ornamentals. Journal of American Society of Horticultural Sciences, 469: 201-205.
Salehi, H. 2006. Can a general shoot proliferation and rooting medium be used for a number of carnation cultivars? African Journal of Biotechnology, 5(1): 25-30.
Sankat, C. K. and Mujaffar, S. 1994. Water balance in cut anthorium flowers in storage and its effect on quality. Acta Horticalturae, 368: 723-732.
Steel, R.G.D., Tomle, J.H. and Dickey, D.A. 1997. Principles and procedures of statistics a biochemical approach. 3th Ed. McGraw Hill Book Co., Inc., USA.
Steinitz, B. and Cohen, A. 1982. Gibberellic acid promotes flower bud opening on detached flower stalks of statice (*Limonium sinuatum* L.). Hort Science, 17:903–904.
Van Doorn, W.G. 1997. Water relations of cut flowers. Horticultural Review, 18: 1–85.
Van Doorn, W.G. and Reid, M.S. 1992. Role of ethylene in flower senescence of *Gypsophila paniculata* L. Postharvest Biology and Technology, 1:265–272.
Vaslier, N. and van Doorn, W.G. 2003. Xylem occlusion in *Bouvardia* flowers: Evidence for a role of peroxidase and cathechol oxidase. Postharvest Biology and Technology, 28: 231–237.