

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

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### Abstract

Present experiment was carried out to check the effect of different concentrations of sucrose (2, 4, 6%), GA<sub>3</sub> (25, 50, 75 ppm) and combination of sucrose and CuSO<sub>4</sub> (2% + 200, 4% + 300, 6% + 400 ppm), sucrose and GA<sub>3</sub> (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<sub>6</sub> and T<sub>13</sub> (8 days) followed by T<sub>4</sub> (7.7 days). T<sub>5</sub> & T<sub>12</sub> were at par (7 days). Maximum water uptake was also observed in T<sub>13</sub> (56.7 ml) followed by T<sub>6</sub> (49.7 ml) and T<sub>8</sub> (45 ml). Maximum TSS were found in T<sub>13</sub> (8.3 %) followed by T<sub>6</sub>, T<sub>11</sub> and T<sub>12</sub>. Keeping quality characteristic of T<sub>6</sub> was deteriorated slowly as compared to other treatments. Hence, T<sub>6</sub> was found superior in overall respects.

**Keywords:** Carnation, CuSO<sub>4</sub>, Eskimo, GA<sub>3</sub>, 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  $\mu$ M), calcium chloride (0.7 mM) and  $\text{NaHCO}_3$  (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  $^{\circ}$ 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 <sub>0</sub>	Control (tap water)
2	T <sub>1</sub>	2% sucrose
3	T <sub>2</sub>	4% sucrose
4	T <sub>3</sub>	6% sucrose
5	T <sub>4</sub>	2% sucrose+CuSO <sub>4</sub> 200 ppm
6	T <sub>5</sub>	4% sucrose+CuSO <sub>4</sub> 300 ppm
7	T <sub>6</sub>	6% sucrose+CuSO <sub>4</sub> 400 ppm
8	T <sub>7</sub>	25 ppm GA <sub>3</sub>
9	T <sub>8</sub>	50 ppm GA <sub>3</sub>
10	T <sub>9</sub>	75 ppm GA <sub>3</sub>
11	T <sub>10</sub>	2% sucrose + 25 ppm GA <sub>3</sub>
12	T <sub>11</sub>	4% sucrose + 50 ppm GA <sub>3</sub>
13	T <sub>12</sub>	6% sucrose + 75 ppm GA <sub>3</sub>

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<sub>6</sub> (4% sucrose+CuSO<sub>4</sub> 300 ppm) and T<sub>13</sub> (6% sucrose + 75 ppm GA<sub>3</sub>) had maximum vase life (8 days) followed by T<sub>4</sub>, T<sub>5</sub> and T<sub>12</sub> while minimum vase life was recorded in T<sub>1</sub> (3.7) (Fig. 1). Edrisi *et al.* (2012) observed CuSO<sub>4</sub> 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<sub>4</sub> (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.

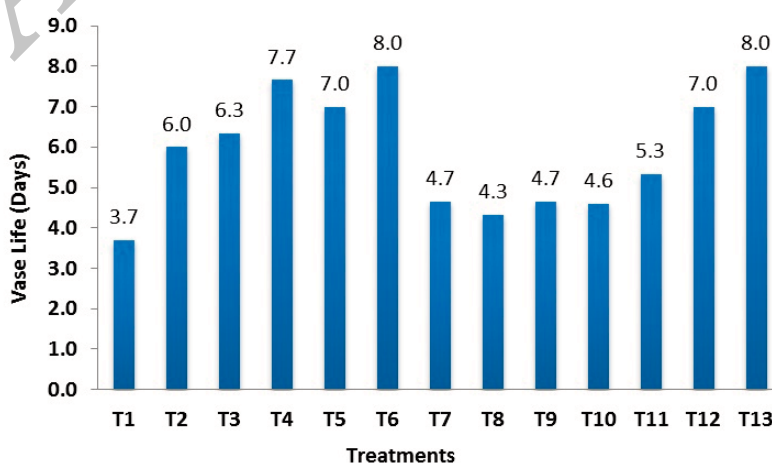


Fig. 1. Vase life of Carnation Cv. 'Eskimo' as Influenced by Different Chemicals .

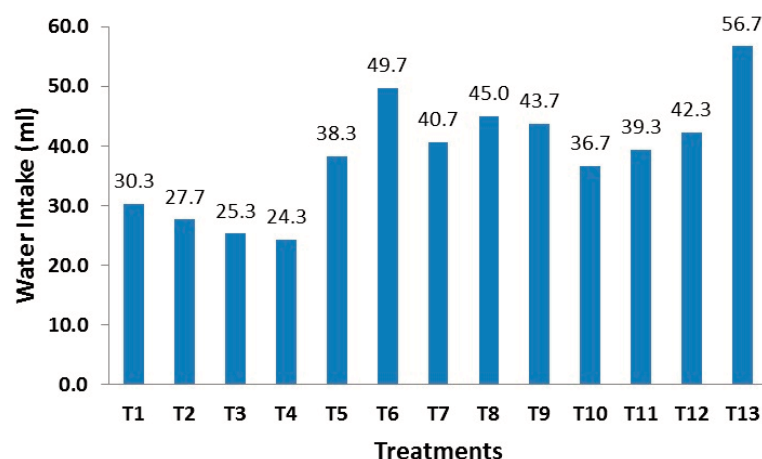


Fig. 2. Water intake of Carnation Cv. 'Eskimo' as Influenced by different Chemicals.

### Water uptake

Maximum solution uptake was observed for flower kept in T<sub>13</sub> (56.7 ml), T<sub>6</sub> (49.7 ml) and T<sub>8</sub> (45.0 ml), minimum uptake was recorded in T<sub>4</sub> (24.3 ml) followed by T<sub>3</sub> (25.3 ml) and T<sub>2</sub> (27.7 ml) (Fig. 2). It is observed that CuSO<sub>4</sub> and GA<sub>3</sub> 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<sub>13</sub> (8.3%) followed by T<sub>6</sub> (8%), T<sub>11</sub> (8%) and T<sub>12</sub> (8%). Minimum total soluble solids were observed in T<sub>4</sub> (5%) and T<sub>5</sub> (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 with 100 mg L<sup>-1</sup> GA<sub>3</sub> 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).

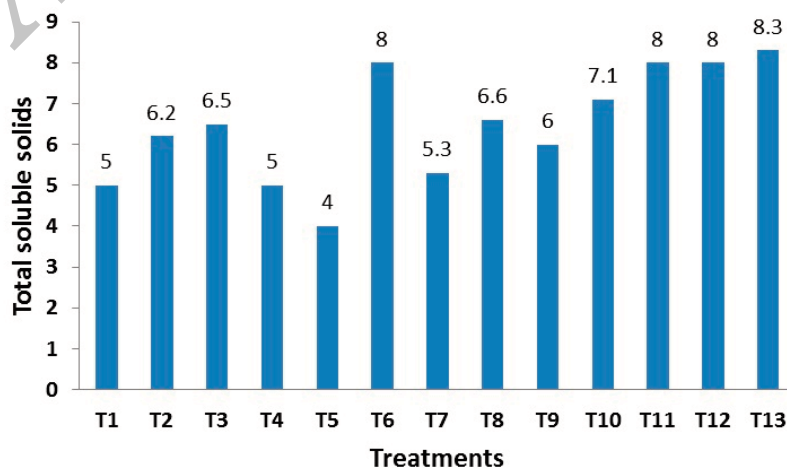


Fig. 3. Total soluble solids of Carnation Cv. 'Eskimo' as Influenced by Different Chemicals.

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<sub>1</sub> was observed. Severe change in quality of T<sub>1</sub> was observed on fourth day of experiment. Quality of flowers in T<sub>6</sub> deteriorated slowly and there was no change in quality was observed up third day in T<sub>6</sub>. Moderate quality change was observed on 8<sup>th</sup> day of experiment in T<sub>6</sub>. Edrisi *et al.* (2012) observed that proper dose CuSO<sub>4</sub> delayed wilting by inhibiting microbial growth.

### CONCLUSION

The above mentioned findings indicated that considering the important characteristics, T<sub>6</sub> and T<sub>13</sub> are more effective for prolonging vase life and maintaining quality of carnation cut flowers.

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# حفظ کیفیت و افزایش عمر گلجایی میخک رقم 'اسکیمو' به کمک مواد شیمیایی مختلف

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این مطالعه با هدف بررسی تاثیر غلظت‌های مختلف ساکارز (۲، ۴ و ۶ درصد)،  $GA_3$  (۲۵، ۵۰ و ۷۵ میلی گرم در لیتر)، ترکیب ساکارز با سولفات مس (۲٪ + ۲۰۰، ۴٪ + ۳۰۰ و ۶٪ + ۴۰۰ میلی گرم در لیتر) و ساکارز با  $GA_3$  (۲٪ + ۲۵، ۴٪ + ۵۰ و ۶٪ + ۷۵ میلی گرم در لیتر) روی کیفیت و عمر گلجایی میخک رقم 'اسکیمو' انجام شد. خصوصیات پس از برداشت مانند عمر گلجایی، مواد جامد محلول (TSS)، جذب آب و تغییر کیفیت ارزیابی شدند. آزمایش بر پایه طرح کاملاً تصادفی با ۳ تکرار و در مورد تغییر کیفیت به صورت فاکتوریل ۲ عاملی انجام شد. حداکثر عمر گلجایی در تیمار  $T_{13}$  و  $T_6$  (۸ روز) و  $T_4$  (۷/۷ روز) به ثبت رسید. تیمارهای  $T_5$  و  $T_{12}$  در مراتب بعدی با ۷ روز قرار گرفتند. حداکثر جذب آب نیز در تیمار  $T_{13}$  (۵۶/۷ میلی لیتر) و سپس تیمار  $T_6$  (۴۹/۷ میلی لیتر) و  $T_8$  (۴۵ میلی لیتر) مشاهده شد. بیشترین TSS در تیمار  $T_{13}$  (۸/۳ درصد) و سپس تیمارهای  $T_6$ ،  $T_{11}$  و  $T_{12}$  حاصل شد. کیفیت تیمار  $T_6$  نسبت به سایر تیمارها با روند آهسته‌تری کاهش یافت. بنابراین  $T_6$  نسبت به سایر تیمارها برتری داشت.

**کلید واژگان:** اسکیمو، ساکارز، سولفات مس، عمر گلجایی، میخک،  $GA_3$ .