

EFFECT OF POSTHARVEST TREATMENTS ON THE VASE LIFE AND QUALITY OF CUT CHRYSANTHEMUM

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ABSTRACT

An investigation was carried out to study the effect of preservative solutions on vase life, fresh weight, flower diameter and chlorophyll content of spray chrysanthemum (*Dendranthema morifolium*) cvs Clarence and Streamer. Distilled water (control), sucrose 2%+ cobalt chloride 50 ppm or + 8-HQS 500 ppm or + sodium benzoate 50 ppm or + ascorbic acid 50 ppm were used in the experiment.

Sucrose 2% + 8-HQS 500 ppm and sucrose 2% + cobalt chloride 50 ppm resulted the longest vase life in the two cultivars. The highest fresh weight were obtained with sucrose 2% + cobalt chloride and sucrose 2% + 8-HQS 500 ppm respectively. The greatest flower diameter of cv. Clarence were obtained with sucrose 2% + cobalt chloride treatments while the greatest flower diameter of cv. Streamer were obtained with sucrose 2% + cobalt chloride and sucrose 2%+ 8-HQS 500 ppm respectively. Control treatment gave the lowest content of chlorophyll in cv. Clarence, but cv. Streamer was not affected.

INTRODUCTION

Chrysanthemum (*Dendranthema morifolium*) is one of the most important cut flower in the world. Addition of floral preservative can extend vase life and improve flower quality.

Different chemicals with different roles were used, cobalt chloride considered as mineral element and is known with its role in increasing cytoplasmic osmotic pressure and increase the percentage of stomatal closure (Nadia Gad, 1989). 8-HQS used as germicide. 8-HQS + sucrose 2% increased flower diameter of *Dendranthema grandiflora* cut flower Brachman *et al* (2000). Sodium benzoate is considered as organic salt and has activity as an antioxidant. Ascorbic acid known also as an antioxidant.

The addition of sucrose is very important as a source of energy to the flower.

MATERIALS AND METHODS

This study was carried out in the lab. Of Hort. Dept., Faculty of Agriculture, Ain Shams Univ. Cairo, Egypt, for the two successive seasons 2006 and 2007, to investigate the effect of preservative solutions on the vase life, fresh weight, flower diameter and changes in chlorophyll content of (*Dendranthema morifolium*) cv. Clarence cut flowers (yellow orange petals) and cv. Streamer (pink ray flowers and yellow disk flowers) cv. Clarence is sensitive to yellowing but cv. Streamer is non-yellowing.

Cut chrysanthemum flowers were obtained from private farm at 15th of March 2006 and 2007. The flowers were cut at the commercial maturity, half of the petals began to open in cv. Clarence and half opening in cv.

Streamer. Lower leaves were removed up to about 35 cm. from the cut stem base. Then the flowers were cut to 50 cm long, and placed in bases contain a recently prepared (1000 cm³) of the following solutions:

- | | |
|---|----------|
| 1- Control (distilled water) | pH 7.1. |
| 2- Sucrose 2% + cobalt chloride 50 ppm | pH 7.05. |
| 3- Sucrose 2% + 8-Hydroxyquinoline sulphate 500 ppm | pH 6.72. |
| 4- Sucrose 2% + sodium benzoate 50 pm | pH 7.14. |
| 5- Sucrose 2% + ascorbic acid 50 ppm | pH 6.64. |

The experiment were performed in laboratory its temperature averaged $21 \pm 2^{\circ}\text{C}$. and relative humidity 50-60 and under light intensity of 1000 lux from cool white fluorescent 12h a day.

The following data were recorded :

- Vase life (days): Vase life was terminated when the edges of the petals curled and wilted or yellowing of green leaves.
- Maximum fresh weight (%)
- Flower diameter (%)
- Chlorophyll reading in leaves (%) after 3, 6 and 9 days of the experiment.

Chlorophyll was measured by using chlorophyll Meter Minolta, SPAD 502. It measures the relative amount of chlorophyll present by measuring the transmittance of the leaf in two wave bands 600-700 and 400-500 nm.

The youngest fully expanded mature leaves is used. The design of the experiment was a randomized complete with 3 replicates and every replicate have 5 flowers. The differences between treatments were determined by using LSD test according to Snedecor and Cochran 1980.

RESULTS

I.CV. Clarence

Vase life:

Data presented in Table (1) Fig. (1) revealed that preservative solution containing sucrose 2% and 8-HQS 500 ppm resulted significantly the maximum vase life in the two seasons of cv. Clarence. All treatments enhanced the vase life than control.

Maximum fresh weight (%):

Most of the treatments significantly enhanced the maximum fresh weight than control treatment in the two seasons Table (1) and (Fig. 1). The maximum fresh weight obtained significantly from sucrose 2% and cobalt chloride 50 ppm treatment in the two seasons (Table 1) (Fig. 1).

Flower diameter (%)

The maximum flower diameter noticed from sucrose 2% + 8-HQS 500 ppm treatment in the two seasons Table (1) Fig. (1).

Rate of chlorophyll decreasing (%):

Data presented in Table (2) showed that after 3 days from the beginning of the experiment the highest significant decreasing of chlorophyll in leaves of cv. Clarence occurred in distilled water treatment than the other treatments.

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After 6 and 9 days of the experiment the same trend was noticed in the two years. Also yellowing appeared on the green leaves after at the 6th day and increased after 9 days. Yellowing did not appear in the other treatments during all the experiment.

Table (1): Effect of preservative solutions on vase life, fresh weight and flower diameter in chrysanthemum cv. Clarence in the two seasons of 2006 and 2007

Treatments	First Season		
	Vase life (days)	Fresh weight %	Flower diameter %
1-Distilled water (control)	8.00	21.76	18.86
2-Sucrose 2% + cobalt chloride 50 ppm	13.53	33.50	28.53
3-Sucrose 2% + 8-HQS 500 ppm	16.26	31.33	34.66
4-Sucrose 2% + sodium benzoate 50 ppm	12.33	22.03	21.50
5-Sucrose 2%+Ascorbic acid 50 ppm.	11.66	29.16	18.16
LSD 5%	1.02	2.39	3.35
Treatments	Second Season		
	Vase life (days)	Fresh weight %	Flower diameter %
1-Distilled water (control)	10.06	16.8	17.13
2-Sucrose 2% + cobalt chloride 50 ppm	14.13	48.60	29.63
3-Sucrose 2% + 8-HQS 500 ppm	16.13	45.36	30.26
4-Sucrose 2% + sodium benzoate 50 ppm	12.13	25.00	18.69
5-Sucrose 2%+Ascorbic acid 50 ppm.	10.73	30.33	17.40
LSD 5%	0.89	1.49	1.82

Table (2): Effect of preservative solutions on the rate of decreasing of chlorophyll(%) in leaves of chrysanthemum cv. Streamer in the two seasons of 2006 and 2007.

Treatments	First Season (Chlorophyll%)		
	After 3 days	After 6 days	After 9 days
1-Distilled water (control)	2.42	3.14	4.82
2-Sucrose 2% + cobalt chloride 50 ppm	1.59	2.96	4.20
3-Sucrose 2% + 8-HQS 500 ppm	2.40	2.83	4.93
4-Sucrose 2% + sodium benzoate 50 ppm	2.24	2.72	4.70
5-Sucrose 2%+Ascorbic acid 50 ppm.	2.54	3.07	5.13
LSD 5%	0.19	1.16	0.33
Treatments	Second Season (Chlorophyll %)		
	After 3 days	After 6 days	After 9 days
1-Distilled water (control)	2.80	3.20	4.20
2-Sucrose 2% + cobalt chloride 50 ppm	1.93	2.83	4.93
3-Sucrose 2% + 8-HQS 500 ppm	2.23	3.16	5.10
4-Sucrose 2% + sodium benzoate 50 ppm	2.4	3.20	4.60
5-Sucrose 2%+Ascorbic acid 50 ppm.	2.63	3.50	4.86
LSD 5%	0.28	0.50	0.32

II. CV. Streamer

Vase life:

Data presented in Table (3) Fig. (2) showed that sucrose 2% and 8-HQS 500 ppm treatment resulted significantly the maximum vase life in the two seasons of cv. Streamer. All treatments enhanced the vase life than control.

Table (3): Effect of preservative solutions on vase life, fresh weight and flower diameter in chrysanthemum cv. streamer in the two seasons of 2006 and 2007

Treatments	First Season		
	Vase life (days)	Fresh weight %	Flower diameter %
1-Distilled water (control)	9.46	16.43	21.13
2-Sucrose 2% + cobalt chloride 50 ppm	12.40	32.63	42.26
3-Sucrose 2% + 8-HQS 500 ppm	14.46	31.10	40.06
4-Sucrose 2% + sodium benzoate 50 ppm	11.33	21.86	27.6
5-Sucrose 2%+Ascorbic acid 50 ppm.	10.13	24.66	21.13
LSD 5%	0.94	1.56	3.00
Treatments	Second Season		
	Vase life (days)	Fresh weight %	Flower diameter %
1-Distilled water (control)	9.26	17.73	18.00
2-Sucrose 2% + cobalt chloride 50 ppm	12.13	41.60	40.26
3-Sucrose 2% + 8-HQS 500 ppm	15.26	32.43	39.33
4-Sucrose 2% + sodium benzoate 50 ppm	11.73	23.40	25.93
5-Sucrose 2%+Ascorbic acid 50 ppm.	10.40	30.16	21.12
LSD 5%	0.87	1.88	2.95

Maximum fresh weight (%):

All treatments enhanced significantly the maximum fresh weight than control treatment in the two seasons Table (2) Fig. (2)

Flower diameter (%)

The maximum flower diameter noticed significantly from sucrose 2% + cobalt chloride 50 pm treatment in the two season. Table 2 Fig. (2).

Rate of chlorophyll decreasing (%):

Data presented in Table (4) showed that after 3 days there were little differences between all treatments and sucrose 2% + ascorbic acid gave the highest decrease of chlorophyll. The same trend was noticed after 6 and 9 days. Yellowing did not appear in all treatments in the two seasons.

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Table (4): Effect of preservative solutions on the rate of decreasing of chlorophyll(%) in leaves of chrysanthemum cv. Clarence in the two years of 2006 and 2007.

Treatments	First Season (Chlorophyll%)		
	After 3 days	After 6 days	After 9 days
1-Distilled water (control)	4.34	18.33	18.81
2-Sucrose 2% + cobalt chloride 50 ppm	1.28	3.53	4.34
3-Sucrose 2% + 8-HQS 500 ppm	2.66	2.93	4.33
4-Sucrose 2% + sodium benzoate 50 ppm	2.25	3.43	5.23
5-Sucrose 2%+Ascorbic acid 50 ppm.	2.32	3.76	4.85
LSD 5%	0.40	1.03	0.53
Treatments	Second Season (Chlorophyll %)		
	After 3 days	After 6 days	After 9 days
1-Distilled water (control)	3.8	16.83	19.06
2-Sucrose 2% + cobalt chloride 50 ppm	1.33	3.90	4.73
3-Sucrose 2% + 8-HQS 500 ppm	2.20	3.30	4.16
4-Sucrose 2% + sodium benzoate 50 ppm	2.40	3.56	5.03
5-Sucrose 2%+Ascorbic acid 50 ppm.	2.53	3.66	4.96
LSD 5%	0.31	0.87	0.39

DISCUSSION

Preservative solutions are chemicals given to flowers to increase its vase life and quality. Optimal formula should be examined for each flower. From the results in this experiment it is very clear that treatment 8-HQS 500 ppm + sucrose 2% and treatment cobalt chloride 50 ppm + sucrose 2% are the best treatments for extending vase life and quality of chrysanthemum flowers. 8-HQS is a germicide and cobalt chloride is a mineral element. Many researchers had done many experiments in this field confirm these results.

Marousky (1972), stated that the high absorption rate might be due to inhibition of vascular blockage by HQC. The effectiveness of 8-HQC as a biocide in the vase solution of cut flowers like rose has been demonstrated (Gao and Wu, 1990).

Gupta, *et al* (2006), showed that sucrose 2% + 8-HQC 500 ppm were the best holding solution for bud opening and increased vase life in chrysanthemum. Nabigol *et al* (2006), mentioned that 8-HQC gave the best results on cut chrysanthemum.

Brackman *et al* (2000) stated that sucrose + 8-HQ increased flower diameter of *Dendranthema grandiflora* cut flower.

Saradhi and Ram (1989), found that the long vase-life obtained with CoCl_2 + sucrose. Sreerama and Reddy (2000) showed that 50 ppm cobalt chloride appeared to be superior in improving the quality of chrysanthemum flowers.

Also cobalt nitrate gave good results on cut chrysanthemum (Avnika and Archana) (2002).

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تأثير معاملات ما بعد الحصاد على عمر الفازة والجودة لإزهار الكريزانتيم المقطوفة

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أجريت هذه التجربة في كلية الزراعة - جامعة عين شمس - قسم البساتين - معمل الزينة في ١٥ مارس موسم ٢٠٠٦، ٢٠٠٧ على أزهار الكريزانتيم المقطوفة لدراسة تأثير المحاليل الحافظة المختلفة على عمر الزهرة في الفازة والوزن الطازج وقطر الزهرة والمحتوى من الكلورفيل على صنفى الكريزانتيم (كلارنس) و(إستريم) وكانت المعاملات كالتالى :

- 1 - ماء مقطر (كونترول).
 - 2 - سكروز ٢ % + كلوريد كوبالت ٥٠ جزء فى المليون .
 - 3 - سكروز ٢ % + ٨ - هيدروكسى كينولين سلفات ٥٠٠ جزء فى المليون.
 - 4 - سكروز ٢ % + بنزوات صوديوم ٥٠ جزء فى المليون.
 - 5 - سكروز ٢ % + حمض أسكوربيك ٥٠ جزء فى المليون.
- وكانت أهم النتائج :
- أولاً : الصنف (كلارنس) :

- 1 - أعطت المعاملة بـ ٨ - هيدروكسى كينولين ٥٠٠ جزء فى المليون + سكروز ٢ % أطول عمر زهرة عن باقى المعاملات وكان الفرق معنوياً.
- 2 - كان أعلى وزن طازج ناتج عن معاملة كلوريد الكوبالت ٥٠ جزء فى المليون - سكروز ٢ % يليها معاملة ٨ - هيدروكسى كينولين سلفات ٥٠٠ جزء فى المليون + سكروز ٢ % ولم تكن الفروق بين المعاملتين معنوية.
- 3 - أعطت المعاملة بـ ٨ هيدروكسى كينولين سلفات ٥٠٠ جزء فى المليون + سكروز ٢٠ % أكبر قطر زهرة يليها المعاملة بكلوريد الكوبالت ٥٠ جزء فى المليون + سكروز ٢ % وكان الفرق بينهما معنوياً.
- 4 - كان أكبر معدل لتناقص الكلورفيل فى معاملة الكونترول وكان ذلك بعد ٦ يوم من المعاملة وازداد التناقص حتى تحولت الأوراق إلى اللون الأصفر بعد ٩ يوم ولم تتأثر باقى المعاملات واحتفظت باللون الأخضر حتى نهاية التجربة.

ثانياً : الصنف (إستريم) :

- 1 - كان أطول عمر زهرة ناتج من المعاملة بـ ٨ - هيدروكسى كينولين سلفات ٥٠٠ جزء فى المليون + سكروز ٢ % وكان الفرق معنوياً.
- 2 - كان أعلى وزن طازج ناتج من معاملة كلوريد الكوبالت ٥٠ جزء فى المليون + سكروز ٢ % يليها معاملة ٨ - هيدروكسى كينولين سلفات ٥٠٠ جزء فى المليون + سكروز ٢ % وكان الفرق غير معنوى فى السنة الأولى ومعنوياً فى السنة الثانية.
- 3 - كان أكبر قطر زهرة تم الحصول عليه من معاملة كلوريد الكوبالت ٥٠ جزء فى المليون + سكروز ٢ % وكان الفرق معنوياً عن المعاملات الأخرى.
- 4 - كان معدل تناقص الكلورفيل قليلاً ولم يحدث اصفرار للأوراق فى أى معاملة وعموماً قل الكورفيل بازدياد عمر الزهرة فى الفازة.

الخلاصة :

أحسن معاملتين هما معاملة ٨ - هيدروكسى كينولين سلفات ٥٠٠ جزء فى المليون + سكروز ٢ % ومعاملة كلوريد الكوبالت ٥٠ جزء فى المليون + سكروز ٢ % وقد أعطيا أطول عمر زهرة وأكبر وزن طازج وأكبر قطر زهرة عن باقى المعاملات وقللا تحلل الكلورفيل فى الأوراق. أى أن المعاملة التى احتوت على مبيد جرثومى - والتى احتوت على عنصر معدنى هما أحسن المعاملات.