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RESPONSE OF GERBERA CUT FLOWER HEADS TO SOME PRESERVATIVE SELUTION TREATMENTS

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ABSTRACT

An investigation was consummated at Post-Harvest Lab. of Floriculture Dep., Hort. Res. Inst., Giza ,Egypt during 2008 and 2009 seasons to study the effect of some preservative solutions, viz. distilled water (control), 10% sucrose + 0.1 g citric acid/l (T1), 100 ppm pix +T1, 200 ppm pix +T1, 300 ppm pix +T1, 100 ppm GA_3 +T1, 200 ppm GA_3 +T1, 300 ppm GA_3 +T1, and STS + T1 on flower heads quality, longevity, bent-neck phenomenon, water relation and stems and petal chemical composition of *Gerbera jamesonii*, Hook.cv. Deliana cut flowers.

The obtained data exhibited that all preservative solutions, even distilled water caused a marked increment in the percent of flower heads fresh weight after 2 days from picking, whereas a significant decrement was observed afterwards up to 12 days after cut. Flower heads diameter was progressively declined with prolonging the vase life period, but significantly improved by most of the used holding solutions. Longevity and fresh and dry weights of flower heads were also improved. The bent-neck phenomenon % was cumulatively increased with elongating the holding period to reach the maximum (100%) in the flowers kept in solutions containing pix at any concentration, while the least percent was recorded by solutions containing GA_3 at either 100 or 200 ppm concentrations. Most preservative solutions used in this study reduced both water uptake and water loss, while others caused a reduction in water uptake accompanied with a pronounced increase in water loss. So, water balance means in these solutions were mostly negative, especially after 4 days from cut . However ,the best means of water balance were obtained from holding in either100 ppm pix +T1 or 100 ppm GA_3 +T1 solutions, which gave positive means throughout the different stages of

shelf life . The content of chlorophylls a and b in the stems, as well as carotenoids and soluble sugars contents in the stems and petals were increased in response to all the used preservative solutions with few exceptions. However, the superiority in most previous parameters was ascribed to the solution of 100 ppm GA_3 + T1.

Hence, it could be recommended to use the holding solution of 100 ppm GA_3+10 %sucrose + 0.1g citric acid/l for longer vase- life, less bent-neck and good colour of *Gerbera jamesonii*, Hook.cv.Deliana cut flower heads.

Key words: *Gerbera jamesonii*, pix, GA_3, STS, flower heads quality, longevity, bent-neck phenomenon, water relation and stems and petal chemical composition.

INTRODUCTION

Gerbera jamesonii,Hook. (Fam. Compositae) is a small group of temperate and tropical Asiatic and African perennial herbs grown for their yellow, pink or orange flower heads .The mature leaves very woolly beneath, numerous ,with long petiole up to 6-8 inch. Heads solitary, the showy orange –flame-colored rays strap-shaped could be grown outdoors around the collections of botanic gardens. They should be grown in the temperate regions , in a rich compost of sandy loam and peat for decoration or cut-flowers. Prop. by seeds or by cuttings of side shoots (Bailey, 1976).

Failure of some cut flowers to open, accompanied by bent-neck and wilting , seriously reduce their vase life (Zieslen *et al.* 1978). Following harvest and during the vase life of cut flowers, there is a rapid decline in respiration rate .Addition of a floral preservative can reduce this decline so that the flowers have a comparatively higher respiration rate than the controls (Kaltaler and Steponkus, 1976). In this regard, Ronghua and Sufang (2006) found that the solution of 50 ppm $AgNO_3$+ 150 ppm citric acid + 5% sucrose gave the best longevity and the least neck bending in *Gerbera jamesonii* cut flowers. Meman and Dabhi (2007) mentioned that the vase solution of sucrose 4% +8 –HQC 250 ppm +citric acid 250 ppm increased fresh weight of *Gerbera jamesonii* cv.Savana Red flowers by promoting solution uptake, improving the vase life and useful life of flowers, opening of disc florets, with bright, shining red colour and freshness for a longer duration. Likewise, Amiri *et al*. (2009) reported that vase life of *Gerbera jamesonii cv.* Pags flowers was significantly

extended from 12.0 days (control) to 24.5 days by using a combination of aluminum sulfate at 300 ppm and sucrose at 30 ppm, while 30 ppm sucrose +250 ppm $AgNO_3$ +250 ppm citric acid combination improved water uptake and consequently extended vase life, delayed scape bending, wilting and the curvature of the stem in the end of vase life.

Similar observations were also gained by Mencarelli *et al*. (1995),Amariutei *et al*. (1995),Nagaraja *et al*. (2000) and Emongor (2004) on gerbera, as well as Celikel and Karaaly (1995) on carnation, ShengGen *et al.* (1997) on rose , Reyes-Arribas *et al*. (2000) on Chrysanthemum cvs. Tara and Boaldi,Singh and Tiwari (2002) on rose cv. Dorris, Abd El-Moneim (2004) on rose cvs. First Red, Golden Get and Tinike, and Skutnik *et al*. (2007) who postulated that pulsing for 24 h or dipping for a few seconds with either GA_3 (250 ppm) or BA (100 ppm) prolonged the vase life of cut asparagus greens and kept chlorophyll, content at high means. On the other side, Cutting *et al.* (1990) stated that the growth regulator pix (mepiquat chloride) seems to increase Ca levels in Citrus and has shown to increase IAA levels in tomato and apple .So, it is believed that this may be an important way to improve postharvest fruit quality.

This trial aims to examine the effect of some preservative solutions which contained either of pix ,GA_3 and STS amended with sucrose and citric acid on quality, longevity ,bent-neck phenomenon , water relations and stem and petal chemical composition of cut gerbera flower heads.

MATERIALS AND METHODS

A study was conducted at Post-Harvest Lab. of Floriculture Dept., Hort. Res. Inst., Giza, Egypt, during 2008 and 2009 seasons in order to find out the best post harvest treatment suitable for delaying bent-neck phenomenon, improving the flowers keeping quality and detecting some morphological and physiological changes occurring during the vase life period of the cut Gerbera flowers.

Flower heads of *Gerbera jamesonii*, Hook. cv. Deliana were freshly obtained on December,20^{th} for both seasons from Floramix Farm (El-Mansouria, Giza) grown under standard cultural practices in a commercial greenhouse. The flower heads were picked in the early morning at the mature stage with a uniform length averages and without leaves. Immediately following harvest, they were pulsed in a solution which consisted of sucrose at 10% + citric acid at 0.1% during transport

to the laboratory (2h). The scapes (or stems) were recut to a length of 35 cm and placed in graduated cylinders (3 flower heads/cylinder) containing one of the following preservative solutions:

1- Distilled water (referred to as control)
2- Sucrose(10%) +citric acid (0.1 g./l) solution (referred to as T1)
3- Mepiquat chloride or Pix (1,1-dimethylpiperidinium chloride, DMPC) solution at concentrations of 100,200 and 300 ppm plus T1,which was added to each concentration.
4- Gibberellic acid (GA_3) solution at concentrations of 100,200 and 300 ppm plus T1,which was also added to each concentration.
5- Silver thiosulphate (STS) solution, which prepared by dissolving of 0.34 g $AgNO_3$ in 125 ml distilled water (solution A) and 0.632g of sodium thiosulphate in 125 ml distilled water (solution B). Solution A was then added to solution B(not reverse) with shaking to get 250 ml of STS solution. The bases of flower scapes (or stems) were immersed in STS solution for 5 min . only and then held in T1 solution.

A drop of xylene was added on the surfaces of the previous solutions to prevent evaporation throughout the vase life period. The flower heads were held under a 24 h photoperiod (fluorescent light of 1000 lux) at 18-20°C and approx 55 % relative humidity .The layout of the experiment in both seasons was a complete randomized design (Mead *et al.* 1993) with three replicates, as each replicate contained three flower heads.

During the vase life period, some data were recorded every two days for six times as follows: the change in flower heads fresh weight (%), flower heads diameter (cm) , bent-neck phenomenon (%), as well as water uptake, water loss and water balance (ml/ flower head), while at the end of vase life period, flower head fresh and dry weights, dry weight (%) using the equation of: D.W.%= dry weight /fresh weight x100, and flower head longevity (days) were assessed. The content of chlorophyll a, b and carotenoids (mg/g f.w.) was determined in fresh stem samples according to the method of Moran (1982),while in fresh petal samples, carotenoids content only was evaluated. In fresh stems and petal samples, however, total soluble sugars (g/100g D.W.) were measured as described by Dubois *et al* (1966).

Data were then tabulated and statistically analyzed(except the chemical measurements) according to SAS Program (1994), using

Dancan's Multiple Range Test (1955) to compare among means of the different preservative solution treatments.

RESULTS AND DISCUSSION

Effect of preservative solutions on:

1- Cut flower heads parameters:

Data in Table (1) show that all preservative solutions, even the distilled water caused a positive increment in fresh weight % after 2 days from the cut in both seasons, whereas a negative decrement was observed afterwards up to 12 days after cut. In general , the highest increase in this parameter in both seasons was induced by 300 ppm GA_3 +T1, followed by the solution of 100 ppm GA_3 + T1 while the least decrease was found due to holding in 100 ppm GA_3 +T1 solution in most cases of the two seasons, followed by STS +T1 solution.

As shown in Table (2), flower head diameter (cm) was progressively declined with prolonging the vase life period to reach minimum values at the end of vase life period (12 days after cut) in the two seasons. On the other hand, most of holding solutions used in this study significantly improved such trait throughout the different stages of vase period, with the superiority of 100 ppm GA_3 +T1 treatment ,which gave the widest diameter in both seasons. Preservative solution treatment of STS + T1 also improved this character, but at certain stages of the vase period.

Fresh and dry weights (g) of gerbera flower heads (Table, 3) were significantly increased due to holding in all preservative solutions employed in the current work except for the solution which contained pix at the concentration of 100 ppm as recorded the highest fresh and dry weights in the two seasons. The heaviest fresh weight, on the other hand was obtained in both seasons when the flower heads were held either in 200 ppm pix +T1 or in 100 ppm GA_3 +T1 solutions. That was true for dry weight parameter when the flower heads were preserved either in T1 solution alone or in T1 solution

Table (1) Effect of preservative treatments on the change in fresh weight percentage of *Gerbera jamesonii* ,Hook. flower heads during the shelf life period of (2008 and 2009) seasons .

Treatments	2day after cut		4day after cut		6day after cut		8day after cut		10 day after cut		12day after cut	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
D.W.Control	+0.72C	+0.45 C	-8.64C	-10.77B	-29.56C	-21.64B	-33.92B	-31.03C	-50.11C	-39.41BA	-67.60D	-61.52C
10%S.+o.1g/LC.A.(T1)	+0.91C	+0.56C	-7.50C	-9.28B	-19.73B	-14.45AB	-25.23A	-23.10A	-40.55BA	-34.11AB	-48.10C	-34.73B
Pix100ppm+T1	+5.18BC	+3.19BC	-8.00C	-9.37B	-25.00CB	-17.70BA	-27.90AB	-27.17B	-43.20BA	-38.57BA	-	-
Pix200ppm+T1	+4.86CB	+2.92BC	-6.10CB	-7.52AB	-26.32CB	-19.64B	-29.81BA	-28.41B	- 52.50 C	-46.91B	-	-
Pix300ppm+T1	+5.77BC	+3.70BC	-7.21C	-8.93 BA	-27.30C	-20.41B	-36.30C	-30.33C	-51.00 C	-40.20BA	-	-
$GA_3$100ppm+T1	+8.72B	+8.35B	-1.50A	-5.96 A	- 21.67B	-16.21BA	-25.50A	-24.16A	-33.80A	-29.77A	-14.56A	-13.18A
$GA_3$200ppm+T1	+5.50BC	+3.43BC	-4.33B	-6.01 A	-28.46C	-21.75B	-30.48BA	28.36B	-37.76BA	-32.80A	-40.70B	-37.80B
$GA_3$300ppm+T1	+19.70A	+16.08A	1.51A	5.67A	-29.67C	-22.21B	-34.00B	-32.07C	46.01B	-37.92AB	-	-
STS+T1	+7.67B	+4.80BC	-3.89B	-4.99A	-13.85A	-10.33A	-21.26A	-19.41A	-38.39AB	-31.55A	-41.00B	-36.67B

D.W.=Distilled water, S.=Sucrose, C.A.=Citric acid,GA_3=Gibberellic acid and STS=Silver thiosulphate.

Means within a column having the same letters are not significantly different according to Duncan 's multiple range test (DMRT) at 5%level.

Table (2) Effect of preservative treatments on diameter of *Gerbera jamesonii* ,Hook. flower heads(cm) during the shelf life period of (2008and 2009) seasons .

Treatments	2day after cut		4day after cut		6day after cut		8day after cut		10 day after cut		12day after cut	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
D.W.Control	11.11Ab	10.72BA	10.81BA	10.44 AB	9.46C	9.11C	8.49C	8.18C	8.21B	7.91AB	3.71B	4.88B
10%S.+o.1g/L.C.A.(T1)	10.57B	10.94A	10.88AB	10.50 AB	9.95 B	9.63AB	8.62 B C	8.36BC	8.18B	7.93AB	3.90B	3.77C
Pix100ppm+T1	11.21B	10.75AB	10.76BA	10.39BA	9.67BC	9.26B	8.57 C	8.22C	8.09C	7.75B	-	-
Pix200ppm+T1	11.12AB	10.70BA	1058AB	10.16B	9.48C	9.10C	8.60 C B	8.22C	8.23BA	7.83B	-	-
Pix300ppm+T1	10. 67B	11.00A	10.46B	10.05 B	10.18BA	9.83AB	8.67BC	8.27CB	8.10C	7.69B	-	-
$GA_3$100ppm+T1	11.35A	11.12A	11.27A	10.88A	10.65A	10.27A	9.50A	9.33A	8.42A	8.33A	7.00A	6.91A
$GA_3$200ppm+T1	11.35A	10.83AB	11.20A	10.83A	9.62 BC	9.33B	8.83B	8.56B	8.26BA	7.96AB	7.15A	6.89A
$GA_3$300ppm+T1	11.34A	10.76AB	10.93AB	10.27B	10.24 AB	9.62AB	8.81B	8.27CB	8.20CB	7.75B	-	-
STS+T1	11.20B	10.66B	10.87AB	10.21B	10.35A B	9.72 AB	9.47A	9.36A	8.51A	8.67A	3.52C	3.11D

D.W.=Distilled water, S.=Sucrose, C.A.=Citric acid,GA_3=Gibberellic acid and STS=Silver thiosulphate.

Means within a column having the same letters are not significantly different according to Duncan 's multiple range test (DMRT) at 5%level.

Table (3) Effect of preservative treatments on diameter of *Gerbera jamesonii* ,Hook. flower heads(cm) during the shelf life period of (2008 and 2009) seasons .

Treatments	Fresh weight(gm)		Dry weight (gm)		Dry weight%	
	2008	2009	2008	2009	2008	2009
D.W.Control	47.86B	45.81BC	12.61B	12.04 B C	26.35 A	26.28 A
10%S.+o.1g/L.C.A.(T1)	49.76AB	47.67B	14.83 A	14.21A	29.80 A	29.81 A
Pix100ppm+T1	42.90C	43.68 C	10.98 C	11.16 C	25.59 A	25.55 A
Pix200ppm+T1	52.48A	51.50 A	12.93B	12.68B	24.64 A	24.62 A
Pix300ppm+T1	46.33BC	45.10 B C	12. 30B	12. 00 B C	26.55 A	26.61 A
$GA_3$100ppm+T1	52.28A	51.33 A	15.33 A	15.04 A	29.32 A	29.30 A
$GA_3$200ppm+T1	50.79AB	47.76 B	14.71 A	13.83AB	28.96 A	28.96 A
$GA_3$300ppm+T1	46.00BC	43.70 C	12.72B	12.08BC	27.65 A	27.64 A
STS+T1	48.46B	44.08 C	14.10 A B	12.84B	29.10 A	29.13 A

D.W.=Distilled water, S.=Sucrose, C.A.=Citric acid,GA_3=Gibberellic acid and STS=Silver thiosulphate.
Means within a column having the same letters are not significantly different according to Duncan 's multiple range test (DMRT) at 5%level.

combined with 100 ppm GA_3. Dry weight (%) was also improved, but without any significant differences among various treatments and control. However, the highest percentages of D.W. were registered by the individual T1 treatment and T1 combined with either 100 ppm GA_3 or STS.

As for longevity of flower heads (days),data in Table (4) exhibit that it was significantly increased in the two seasons by holding the flowers in T1 solution or T1 plus either GA_3 at 100 and 200 ppm concentrations or STS solution. The prevalence, however was for 100 ppm GA_3 +T1 solution, which gave the best longevity in both seasons. This may indicate the role of GA_3 on delaying flowers senescence by increasing the number of disc florets open, and delaying petal fading and abscission (Emongor,2004).

The bent-neck phenomenon in gerbera flower heads occurred in the present study after 6 days from picking, as shown in Table (4), except for flower heads held in T1 solution and in 100 ppm GA_3 +T1, as such phenomenon appeared in these two solutions after 8 days from picking, while in the solution of 200 ppm + T1, this phenomenon delayed up to 10 days after cut. In this regard, Emongor (2004) revealed that gerbera cut flowers held in GA_3 had significantly higher water content in the flower heads and stems, hence maintaining flower turgidity, and showed a reduction in bent-neck and flower senescence as this increased flower quality after 14 days of treatment compared to flowers maintained in distilled water. In addition, Amariutei *et al.* (1995) found that cells from ligulae of cut gerbera inflorescence cv. Red Marleen held in distilled water had a low cytoplasm content, small mitochondria, elongated chromoplasts and higher dead cells than cells of those held in 2.5 %sucrose + 150 ppm 8-HQS or GA_3solutions after 8 days of vase life .Moreover, Mencarelli *et al.* (1995) concluded that stem break in cut gerbera flowers thought to be caused by water imbalances and ethylene evolution which was higher in bent scapes than in straight ones. So, the occurrence of stem break in gerberas could be ethylene- controlled and associated with early senescence which might be accelerated by water stress.

In general, the percent of neck-bending was cumulatively increased with increasing the vase life period to reach maximum in the holding solutions containing pix at any concentration after 10 days from cut. After 12 days from cut, this percent ranged between 77-88 % in control solution and 55-66% in T1 and STS+ T1 solutions. The least percent, however

was recorded by solutions contained GA_3 at 100 and 200 ppm concentrations.

The previous findings are coincide with those postulated by Ronghua and Sufang (2006),Meman and Dabhi (2007) and Amiri *et al* (2009) on Gerbera, Celikel and Karaaly (1995) on carnation, Reyes-Arribas *et al* (2000) on chrysanthemum and Singh and Tiwari (2002) on rose.

2-Water relations of cut flower heads:

According to data presented in Table (5), it is clear that most holding solutions used in this work reduced both water uptake and water loss (ml/fl.) with various significant differences when compared to control in both seasons. That was true for solutions of T1, 200 ppm pix +T1, 200 ppm GA_3 +T1,300 ppm GA_3 +T1 and STS+T1, as they caused higher reduction in water uptake than in water loss. So, water balance means were negative in most stages of holding period in the two seasons. The solution of 300 ppm pix +T1, induced a normal reduction in water uptake, but a great increase in water loss. Hence, water balance means were also negative in most cases of both seasons. The best water balance in the two seasons, was however accomplished by the solutions of 100 ppm pix +T1, and 100 ppm GA_3 +T1 that caused a significant increase in water uptake versus a great decrease in water loss. Therefore, the means of water balance were mostly positive throughout the various stages of holding period.

This may indicate the role of pix and GA_3 at low level in raising water content in flower heads and stems, hence maintaining flower turgidity (Emongor,2004 and Cutting *et al* , 1990). In this concern, Durkin (1979) stated that water balance, a central consideration in the longevity of cut flowers, depends on the relationship between solution uptake and transpiration. Solution uptake depends on transpiration, temperature, light, solution pH, microbial populations, leaf removal, sucrose level and mineral content .Growth regulators modify transpiration rates, and hence affect solution uptake (Kaltaler and Steponkus,1976).Vascular occlusions due to gum deposition may decrease water uptake and therefore, cause a disturbance in water balance (Lineberger and Steponkus,1976). On the same line, were those results attained by Amariutei *et al*.(1995), Nagaraja *et al* (2000) and Amiri *et al* (2009) on *Gerbera jamesonii.*

3- Chemical composition of stem and petal:

From data registered in Table (6), it could be concluded that chlorophyll a and b content in the stems (mg/g f.w.) was increased in response to all the used preservative solutions comparing with control in the two seasons. The mastery, however was attributed to holding in 100 ppm GA_3 +T1 solution. A similar trend was also obtained concerning carotenoids content (mg/g f.w.) in the stems and petals, as the solution of 100 ppm GA_3 combined with T1 gave the utmost high content in the most cases of both seasons.

A slight reduction was observed in only petals of flower heads held in solutions which contained pix at either 200 or 300 ppm levels. In this connection, Amariutei *et al*.(1995) revealed that anthocyanin and carotenoid pigment contents were intensified in ligulas of cut *Gerbera jamesonii* cv.Red Marleen inflorescences due to holding in 2.5% sucrose + 150 ppm 8-HQS or GA_3 solution . Likewise, ShengGen *et al*. (1997) pointed out that a solution of 2% sucrose +500mg citric acid/l+250 ppm GA_3 or 25 mg $AgNO_3$ /l enhanced anthocyanidin content in the petals of *Rosa shinensis* cv. Shenzhenhong. Similarly, were those results of Mencarelli *et al*. (1995) and Nagaraja *et al* (2000) on gerbera, and Skutnik *et al.* (2007) on asparagus greens. With regard to soluble sugars content (mg/100g D.W.) in the stems and petals, data in Table (6) show that all preservative solutions accomplished in this study caused a marked increment in such constituent, with the exception of solutions which contained pix at any level, as they slightly decreased such parameter in the petals in both seasons. These results, however are in parallel with those recoded by Amariutei *et al.*(1995) on gerbera and ShengGen *et al* .(1997) on *Rosa shinensis* cv. Shenzhenhong.

According to the aforementioned results , it could be recommended to use the preservative solution of 100 ppm GA_3+10% sucrose + 0.1g citric acid /l for keeping quality, longer vase life, less bent-neck and good colour of *Gerbera jamesonii*, Hook cv.Deliana cut flower heads.

Table (4) Effect of preservative treatments on Longevity and Bent-neck phenomenon%of *Gerbera jamesonii* ,Hook. flower heads(cm) during (2008 and 2009) seasons .

Treatments	Longevity (days)at the end of the shelf life		Bent-neck phenomenon% during the shelf life period							
			6day after cut		8day after cut		10 day after cut		12day after cut	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
D.W.Control	9.33CB	9.00C	33.33A	44.45A	44.45A	44.45B	66.67C	55.56B	88.90A	77.78A
10%S.+o.1g/LC.A.(T1)	11.00A	10.76BA	-	-	11.11C	11.11D	44.45D	44.45C	55.56C	55.56B
Pix100ppm+T1	9.00C	9.00C	22.22AB	33.33AB	33.33 AB	44.45B	77.78B	100.00A	-	-
Pix200ppm+T1	9.00C	9.00C	33.33A	33.33AB	33.33 AB	44.45B	77.78B	100.00A	-	-
Pix300ppm+T1	9.00C	9.00C	33.33A	44.45A	44.45A	55.56A	100.00A	100.00A	-	-
$GA_3$100ppm+T1	11.67A	12.00A	-	-	22.22B	11.11D	33.33E	33.33D	33.33D	44.45C
$GA_3$200ppm+T1	11.00A	11.33AB	-	-	-	-	22.22F	11.11E	33.33D	22.22D
$GA_3$300ppm+T1	10.00B	9.67B	11.11B	11.11B	22.22B	22.22C	44.45D	55.56B	-	-
STS+T1	11.00A	11.00AB	11.11B	11.11B	22.22B	22.22C	44.45D	44.45C	66.67B	55.56B

D.W.=Distilled water, S.=Sucrose, C.A.=Citric acid,GA_3=Gibberellic acid and STS=Silver thiosulphate.
Means within a column having the same letters are not significantly different according to Duncan 's multiple range test (DMRT) at 5%level.

Table (5) Effect of preservative treatments on Longevity and Bent-neck phenomenon%of *Gerbera jamesonii* ,Hook. flower heads(cm) during (2008 and 2009) seasons .

Treatments	Water uptake						Water Loss						Water balance					
	2days fter cut	4days after cut	6days after cut	8days after cut	10days after Cut	12days after cut	2days after cut	4days after cut	6days after cut	8days after cut	10days after cut	12days after cut	2days after cut	4days after cut	6days after cut	8days after cut	10days after cut	12days after cut
	First seasons (2008)																	
D.W.Control	24.11 AB	33.66 BA	49.80 B	52.83B	63.18 B	67.51 A	21.31 A	43.71 A	62.00 A	71.87 A	83.47 A	106.71 A	+ 2.8DE	-10.05D	-12.21C	-19.04D	-20.29D	-39.20D
10%S.+o.1g/L.C.A.(T1)	20.43 C	28.48C	46.91 B	51.08B	57.51 B	30.60 C	14.11 B	41.42 A	56.33 AB	72. 00 A	68.15 A B	38.11 C	+6.37C	-12.94E	-9.42CB	-20.92D	-10.64C	-7.51B
Pix100ppm+T1	28.18 A	39.34A	67.98 A	71.81 A	90.64 A	-	17.98 A	35.26 AB	63.50 A	67.10 A	89.30 A	-	+10.20B	+4.08A	+4.48A	+4.71B	+1.34B	-
Pix200ppm+T1	22.70 B	31.95B	40.33 C	43.50 C	45.00 C	-	19.16 A	41.67 A	67.11 A	56.94 AB	68.76 AB	-	+3.54D	-9.72D	-26.78d	-13.44C	23.76D-	-
Pix300ppm+T1	20.56 C	30.21B	41.00 C	47.76B	46.76 C	-	20.11 A	47.21 A	63.00 A	69.36 A	76.81 A	-	+0.45E	-17.00F	-22.00D	-21.60D	-30.05E	-
$GA_3$100ppm+T1	27.90 A	38.40A	47.56 B	50.47B	50.00 CB	36.41 B	12.87 B	32.96 B	56.23 AB	38.51 B	36.73 B	33.00 C	+15.03A	+5.44A	+8.67B	+11.96A	+13.27A	+3.41A
$GA_3$200ppm+T1	23.11 BA	29.78B	45.63 B	49.71B	48.24 C	53.55 AB	19.28 A	33.41 B	51.78 B	63.78 A	42.21 B	81.17 B	+3.83D	-3.63B	-6.15B	-14.07C	+6.03BA	-27.62C
$GA_3$300ppm+T1	21.72 BC	27.96C	43.00 CB	51.34B	49.10 CB	-	21.18 A	34.70 AB	59.42 AB	71.00 A	56.89 BA	-	+0.54E	-6.74C	-16.42DC	-19.66D	-7.799C	-
STS+T1	23.38 BA	28.33C	48.10B	59.47B	54.68 BC	39.46 B	25.13 A	37.65 AB	61.38 A	76.89 A	75.10 A	81.3 B	-1.75F	-9.32D	-13.28C	-17.42CD	-20.42D	-41.87D
	Second seasons (2009)																	
D.W.Control	22.84 B	30.37 B	43.65 B	52.16B	70.19 B	73.91 A	19.96 A	33.74AB	48.29AB	73.61A	88.07A	124.14A	+ 2.93C	-3.37C	-4.64C	-21.45B	-17.88CD	-50.33D
10%S.+o.1g/L.C.A.(T1)	20.54 BC	29.26 B	42.72 B	50.33B	63.89 B	33.75 C	21.09 B	40.98 A	55.83 A	71.71 A	73.92 A B	35.63 C	+0.55E	-11.72E	-13.11CD	-21.38B	-10.03C	-1.88B
Pix100ppm+T1	26.76 A	41.20 A	86.26 A	91.50 A	99.66 A	-	21.67 A	39.48 A	67.70 A	83.74 A	97.01 A	-	+5.09B	+1.72B	+18.56A	+7.76A	+2.64B	-
Pix200ppm+T1	21.52 B	28.53 C	33.82 B	41.00B	48.10 C	-	20.65 A	36.51 A	51.13 A	65.93 AB	84.88 A	-	+0.87D	-7.98D	-17.31dE	-24.93BC	-36.78D	-
Pix300ppm+T1	19.53 C	27.34 C	33.31 B	39.85B	50.54 C	-	17.48 AB	32.07 AB	54.16 A	70.18 AB	91.16 A	-	+2.05C	-4.73C	-20.85E	-30.33C	-40.62D	-
$GA_3$100ppm+T1	26.55 A	30.78 B	40.71 B	44.92B	55.38 CB	39.90 B	11.74 B	27.06 B	31.75 B	41.10 B	42.39 B	33.67C	+14.81A	+3.72A	+8.96B	+3.82A	+12.99A	+6.23A
$GA_3$200ppm+T1	21.90 B	28.37 C	38.10 B	42.10B	58.61 CB	59.11 AB	17.72 AB	28.55 B	44.02 AB	68.01 AB	45.56 B	97.41A	+4.18B	-0.18B	-5.92C	-25.91BC	+8.05AB	-27.62C
$GA_3$300ppm+T1	19.40 C	25.16 D	35.50 B	45.27B	54.38 CB	-	19.28A	30.82 BA	51.44 A	74.02 A	61.71 BA	-	+0.12D	5.66 -CD	-15.94D	-28.75C	-7.33C	-
STS+T1+T1	21.46 B	25.67 D	41.67 B	53.71B	65.81 B	43.74 B	26.17A	32.95 AB	57.13 A	75.10 A	86.06 A	80.45 B	-4.71E	-7.28D	-15.46D	-21.39B	-20.25DC	-36.71C

D.W.=Distilled water, S.=Sucrose, C.A.=Citric acid,GA_3=Gibberellic acid and STS=Silver thiosulphate.

Means within a column having the same letters are not significantly different according to Duncan 's multiple range test (DMRT) at 5%level.

Table (6) Effect of preservative treatments on chemical composition of *Gerbera jamesonii* ,Hook. Stem and petals during (2008 and 2009) seasons .

Treatments	Chlorophyll A (mg/g)		Chlorophyll B (mg/g)		Carotenoids (mg/g)				Soluble sugar (gm/100gm).			
	In the stems				In the stems		In the petals		In the stems		In the petals	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
D.W.Control	0.305	0.321	0.220	0.252	0.275	0.371	0.691	0.799	1.782	2.052	2.171	1.328
10%S.+o.1g/L.C.A.(T1)	0.327	0.346	0.297	0.392	0.297	0.414	0.994	0.893	2.128	2.29	2.193	2.063
Pix100ppm+T1	0.320	0.330	0.276	0.327	0.283	0.392	0.702	0.810	1.926	2.084	1.955	1.08
Pix200ppm+T1	0.349	0.341	0.319	0.338	0.289	0.383	0.659	0.767	2.030	2.126	2.14	1.112
Pix300ppm+T1	0.336	0.337	0.308	0.360	0.280	0.376	0.643	0.756	2.036	2.163	2.136	1.069
$GA_3$100ppm+T1	0.382	0.385	0.429	0.425	0.319	0.423	1.750	1.541	2.16	2.279	2.30	2.344
$GA_3$200ppm+T1	0.360	0.396	0.393	0.371	0.288	0.512	0.725	0.843	2.203	2.57	2.225	2.321
$GA_3$300ppm+T1	0.316	0.358	0.265	0.330	0.280	0.403	0.756	0.850	2.16	2.484	2.192	1.836
STS+T1	0.331	0.352	0.308	0.358	0.352	0.380	0.940	0.869	1.545	1.879	2.214	2.268

D.W.=Distilled water, S.=Sucrose, C.A.=Citric acid,GA_3=Gibberellic acid and STS=Silver thiosulphate.
Means within a column having the same letters are not significantly different according to Duncan 's multiple range test (DMRT) at 5%level.

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استجابة أزهار الجيربيرا المقطوفة لبعض معاملات محاليل الحفظ

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اجري هذا البحث بمعمل معاملات مابعد القطف، بقسم بحوث الزينة، معهد بحوث البساتين، الجيزة، مصر خلال موسمي ٢٠٠٨ ، ٢٠٠٩ وذلك لدراسة تأثير بعض محاليل الحفظ: الماء المقطر (مقارنة)، ١٠%سكروز+ ٠,١ جم حمض ستريك/ لتر(T1)، البيكس (Pix) بتركيزات:١٠٠، ٢٠٠، ٣٠٠ جزء في المليون + T1 (لكل تركيز علي حدة)، حمض الجبريليك (GA_3) بتركيزات:١٠٠، ٢٠٠، ٣٠٠ جزء في المليون + T1 (لكل تركيز علي حدة)،وكذلك محلول ثيوسلفات الفضة (STS) + T1 علي جودة الأزهار، مدة البقاء في الفازة، ظاهرة انحناء العنق،العلاقات المائية والتركيب الكيميائي لسوق وبتلات أزهار الجيربيرا- صنف ديليانا،*Gerbera jamesonii* Hook cv. Deliana

ولقد أوضحت النتائج المتحصل عليها أن جميع محاليل الحفظ ، حتى الماء المقطر قد أحدثت زيادة ملحوظة في النسبة المئوية للتغير في الوزن الطازج لأزهار الجيربيرا بعد يومين من القطف،بينما حدث انخفاض معنوي بعد ذلك حتى ١٢ يوم بعد القطف. ولقد انخفض قطر الأزهار تدريجيا بإطالة فترة الحفظ، لكنه تحسن معنويا باستخدام معظم محاليل الحفظ موضع الدراسة.كما زاد أيضا عمر الأزهار والوزن الطازج والجاف لها باستخدام هذه المحاليل. أما النسبة المئوية لظاهرة انحناء العنق فقد زادت تدريجيا كلما طالت مدة الحفظ لتصل إلي أقصاها (١٠٠%) في الأزهار التي حفظت بالمحاليل المحتوية علي البيكس أيا كان تركيزه، بينما تحققت اقل نسبة مئوية لهذه الظاهرة باستخدام المحاليل المحتوية علي حمض الجبريليك بتركيز: ١٠٠، ٢٠٠ جزء في المليون. ولقد أحدثت معظم محاليل الحفظ المستخدمة انخفاضا متوازناً في كل من الماء الممتص والماء المفقود، بينما احدث البعض الآخر انخفاضا نسبيا في الماء الممتص مصحوبا بزيادة واضحة في الماء المفقود. ولذلك فان متوسطات الاتزان المائي في هذه المحاليل كانت غالبا سالبة، خاصة بعد ٤ أيام من القطف.إلا إن أفضل متوسطات للاتزان المائي في أزهار الجيربيرا أمكن الحصول عليها من الحفظ في محلولي البيكس بتركيز ١٠٠ جزء في المليون و حمض الجبريليك بنفس التركيز السابق، حيث أعطي هذين المحلولين متوسطات موجبة للاتزان المائي خلال المراحل المختلفة لفترة الحفظ. و لقد أوضحت النتائج أيضا حدوث زيادة في محتوي السوق من كلوروفيللي ا،ب وكذلك محتوي السوق والبتلات من الكاروتينويدات والسكريات الذائبة نتيجة للحفظ في المحاليل موضع الدراسة مع بعض الاستثناءات البسيطة. وكانت الأفضلية في معظم القياسات السابقة للحفظ في المحلول المكون من : ١٠٠ جزء في المليون حمض الجبريليك +١٠%سكروز+١,٠جم حمض ستريك/ لتر.

وعلية، يمكن التوصية باستخدام محلول الحفظ المحتوي علي١٠٠ جزء في المليون حمض الجبريليك +١٠% سكروز+١,٠ جم حمض ستريك/ لتر للحصول علي أفضل جودة و أطول عمر واقل نسبة انحناء في العنق مصحوبة بأفضل علاقات مائية وأفضل محتوي كيميائي لأزهار الجيربيرا- صنف ديليانا (*Gerbera jamesonii*, Hook cv. Deliana).