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EFFECT OF SUCROSE PULSING, HARVESTING STAGE AND PRESERVATIVE SOLUTIONS ON POST HARVEST LIFE OF CUT-TUBEROSE (*Polianthes tuberosa* L.) SPIKES.

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ABSTRACT

The effect of sucrose pulsing, three harvesting stage and preservative solutions on the post harvest of cut- tuberose spikes were investigated twice in September of 2001 and 2002. Vase life was assessed daily under laboratory conditions 25°±2 °C, 65 ± 5% relative humidity and 12 h light under cool white fluorescent lamps (500 ± 100 Lux). The maximum open florets % was recorded at (300 ppm 8HQC +3 % sucrose) after pulse pre-treatment in 20 % sucrose solution for 24 h in the third harvest stage (five open florets) in the second and first seasons respectively. The minimum open florets % was recorded in the control treatment of un-pulsed pre-treatment in the first harvest stage (1 open floret) in the first and second seasons respectively. The maximum shattered florets % was recorded in the treatment of (300 ppm 8HQC +3 % sucrose + 1% clorox) of un-pulsed pre- treatment in the first harvest stage (1 open floret) in the first and second seasons respectively, followed by the control treatment of un-pulsed pre- treatment in the first harvest stage (1 open floret) in the second and first seasons respectively. The minimum shattered florets % was recorded in the treatment of (300 ppm 8HQC +3 % sucrose) followed by 3 % sucrose of the pulsed pre- treatment in the third harvest stage (5 open florets) in the second season. The maximum vase life (14.3, 13.8 days) were recorded in the treatments of (300 ppm 8HQC +3 % sucrose + 1% clorox) of the pulsed pre- treatment in the third harvest stage (5 open florets) in the second and first seasons respectively, followed by the treatment of (300 ppm 8HQC +3 % sucrose), closely followed by 3 % sucrose of the pulsed pre- treatment in the third harvest stage (5 open florets) in the second season. The minimum vase life was noted in the control treatment of un-pulsed pre-treatment in the first harvest stage (1 open floret) in the first and second seasons respectively. Solution uptake of tuberose spikes were improved by all treatments, however, the differences among treatments were not significant. It is suggested that the spikes should be cut in the third harvest stage (5 open florets), pre- treated with 20% sucrose for 24 h and followed by a treatment of 300 ppm 8HQC + 3 % sucrose + 1% Clorox. These conditions can improve tuberose vase life and floret opening through improving the water balance.

INTRODUCTION

Tuberose (*Polianthes tuberosa* L., family Agavaceae) native to Mexico, has long been cherished for the aromatic oils extracted from its fragrant white flowers. It is also a popular cut flower, not only for use in arrangements, but also for the individual florets that can provide fragrance to bouquets and boutonnieres. Tuberose inflorescences (spikes) bear 10 to 20 pairs of florets which open from the base upward. Commercially, spikes 60 to 90 cm long are harvested when the basal florets are open. Normally, fewer than 50% of the remaining buds open after harvest, and florets and buds usually shatter (fall from the spike) after few days in the vase (Reid, 1996).

The customer requires cut- spikes which is attractive in form and freshness and not prone to rapid wilting. The most common cause of the termination of vase life in cut flowers is water stress (Halevy, 1976). The rapid proliferation of microorganisms in vase water is thought to result in xylem blockage, water stress and a subsequent reduction in cut flower longevity (Van Doorn and Perik, 1990). A variety of germicides have been used to solve this problem. However, the response of many cut flowers to germicides is highly variable among species and varieties.Several preservatives/ chemicals i.e. silver nitrate, aluminium sulphate,cobalt sulphate, 8-hydroxyquinoline sulphate, boric acid, citric acid, ascorbic acid, sucrose etc. have been used in different formulations and combinations to enhance the vase life of tuberose (Saini *et al.* 1994, Reddy *et al.* 1995, Reddy and Singh 1996, Sathyanarayana *et al.* 1996, Reddy *et al.* 1997, De and Barman, 1998). Among the other differently used chemicals of special concern are growth regulators i.e. benzyladenine, gibberellic acid, napthaleneacetic acid, maleic hydazide etc. (Bhaskar and Rao 1998, Hutchinson *et al.*, 2003). Use of floral preservative is the most economical and practicable method for extending the post-harvest life of cut flowers (Salunkhe *et al.*, 1990 and Anjum *et al.*, 2001). Flowers remain fresh longer if they are placed in a suitable floral preservative (Nowak and Rundnicki, 1990). The quality and postharvest life of many flowers can be improved by supplying flowers with sucrose in the vase solution especially when the flowers are harvested at bud stage. Sucrose can be applied as pre-treatment (pulsing) or as a continuous supply in the vase solution. The effect of pulsing varies considerably, depending on plant species. Pulsing with high concentrations of sucrose solutions improved the vase life of gladioli and *Liatris spicata,* whereas it had no effect on *Brodiaea* (Han ,1992).The vase life of sucrose-pulsed flowers was double that of controls and floret opening was more than doubled in a sucrose-containing vase preservative (Reid, 1996). The developmental stage of the florets at the time of harvest greatly influenced the longevity of cut- flowers (Nowak and Mynett, 1985 and Van der Meulen *et al.*, 1992).

The main objective of the present study was to find out the best solutions for enhancing the vase life of tuberose cut spikes at three developmental stages using a 24 hours sucrose pulse treatment before using some floral preservatives so that the spikes can be kept for longer period in the flower arrangements.

MATERIALS AND METHODS

Spikes of *Polianthes tuberosa* with an approximate length of 70 cm *were* harvested in the morning and transferred to the laboratory within 1 hour after harvest. Half of the spikes were placed in large containers containing 20 % sucrose solution for 24 hours (pulsed), whereas, the rest of spikes was kept in tap water for the same time (un-pulsed). Next morning, the experiment was started. Three stages of development were used with one, three or five opened basal florets. The details of the treatment solutions used is given in Table 1. Vase life was assessed daily under laboratory conditions 25 ± 2°C, 65 ± 5% relative humidity and 12 h light under cool white fluorescent lamps

(500 ± 100 Lux). Vase life was considered terminated when cut spikes lost their turgidity, leaves showed discoloration or when florets drop were more than 50 %. The water uptake by the cut spikes was estimated by subtracting the amount of water at the end of the experiment from the initial volume (1 liter). The experiment was conducted twice in September of 2001 and 2002 in the form of Factorial in Completely Randomized Block Design with three replications. Factors used were: The pulsing treatment (two levels), preservatives solutions (five levels) and the stage of development (three levels). Five spikes were used as experimental unit. Data were recorded on; percentage of opened florets, percentage of shattered (dropped) florets, vase life (days) and water uptake (ml). The data were analyzed statistically and Least Significant Difference test was applied to compare the differences among the treatments means at 5 % probability level (Steel and Torrie, 1980).

Table 1: The pre- treatments and preservative solutions used in 2001 and 2002 experiments.

Pre-Treatments	Preservative solutions
Un-pulsed (tap water for 24 h)	Control (Tap water)
	300 ppm 8Hydroxy Quinoline Citrate (8-HQC)
	3% sucrose
	300 ppm 8HQC+ 3 % sucrose
	300 ppm 8HQC+ 3 % sucrose + 1 %Clorox
Pulsed (in 20% sucrose for 24 h)	Control (Tap water)
	300 ppm 8Hydroxy Quinoline Citrate (8-HQC)
	3% sucrose
	300 ppm 8HQC+ 3 % sucrose
	300 ppm 8HQC+ 3 % sucrose + 1 %Clorox

RESULTS AND DISCUSSION

Opened florets

Opened florets were highly significantly influenced by the pre-treatments, preservative solutions and harvest stage. Results presented in (Table 2 and Figure 1) show that the maximum opened florets % was recorded in spikes held in (300 ppm 8HQC +3 % sucrose) preservative solution after the pulse pre-treatment in 20 % sucrose solution for 24 h and harvested at the third harvest stage (five open florets) in the second and first seasons respectively. The minimum opened florets % was recorded at the control treatment of un-pulsed pre- treatment in the first harvest stage (1 open floret) in the first and second seasons respectively. It seems in the pulse pre-treatment that sucrose improved water balance in cut-spikes and maintained their turgidity, thus more florets were opened than in the un-pulsed ones (Halvey, 1976). The reason of best florets opening can be attributed to the role of 8HQC which might act as an enzyme inhibitor in reducing physiological plugging and to the effect of sucrose on the closure of stomata and reduction of water loss (Marousky, 1971).

These results are similar to those reported by Bakr and Hassan (1972) on Gladiolus and Amaryllis, Singh and Arora (2000) Wei *et al.* (2001) and Hutchinson *et al.* (2003) on tuberose.

Table 2: Opened florets % of *Pollanthes tuberosa* as affected by pulse treatment, preservative solutions and harvest stage in 2001 and 2002.

Pre-treatment	Preservative solution	opened florets % First season				opened florets % Second season			
		Harvest stage			Mean	Harvest stage			Mean
		1	3	5		1	3	5	
Unpulsed (tap water)	Control (Tap water)	10.6	18.9	38.4	22.63	11.5	19.9	37.9	23.10
	8HQC 300ppm	12.4	24.5	40.3	25.73	14.9	26.1	43.4	28.13
	3% sucrose	17.8	29.2	50.7	32.57	19.6	30.4	56.1	35.37
	8HQC+ sucrose	18.4	34.6	66.8	39.93	20.1	36.2	68.9	41.73
	HQC+sucr.+1% Clorox	14.9	35.1	57.3	35.77	18.0	34.9	56.7	36.53
mean unpulsed		14.8	28.5	50.7	31.33	16.8	29.5	52.6	32.97
Pulsed in 20% sucrose (24 h)	Control (Tap water)	18.7	29.5	51.9	33.37	21.5	31.7	53.7	35.63
	8HQC 300ppm	19.3	36.9	64.5	40.23	26.0	34.7	66.1	42.27
	3% sucrose	19.8	37.1	59.2	38.70	24.9	40.7	69.3	44.97
	8HQC+ sucrose	22.7	40.3	68.3	43.77	25.2	41.3	70.6	45.70
	HQC+sucr.+1% Clorox	20.2	34.9	60.4	38.5	23.1	32.8	64.1	40.00
mean pulsed		20.1	35.7	60.9	38.91	24.1	36.2	64.8	41.71
Total Mean		17.5	32.1	55.8	35.12	20.5	32.9	56.7	37.34
L.S.D. 0.05 for :									
A- pulse treat		2.71				3.16			
B- preservatives		4.36				2.68			
C- harvest stage		6.87				4.57			
A x B		1.34				2.09			
A x C		3.86				4.95			
B x C		4.31				2.33			
A x B x C		1.37				2.01			

The maximum shattered florets % was recorded in the treatment of (300 ppm 8HQC +3 % sucrose + 1% clorox) of un-pulsed pre- treatment in the first harvest stage (1 open floret) in the first and second seasons respectively, followed by the control treatment of un-pulsed pre- treatment in the first harvest stage (1 open floret) in the second and first seasons respectively. The minimum shattered florets % was recorded in the treatment of (300 ppm 8HQC +3 % sucrose) followed by 3 % sucrose of the pulsed pre- treatment in the third harvest stage (5 open florets) in the second season (Table 3 and Figure 2). These results were due to the effect of Clorox in increasing the florets shattering which might be due to chlorine sensitivity especially in the early harvest stage. Although Clorox is a very effective bactericide, and was

tested and found to be effective by many flowers (Marousky, 1971 and Jones and Hill, 1993), but it gave opposite results with tuberose.

The results of 8-HQC + sucrose or sucrose only agree with those reported by Spikman (1989) on freesia Van der Meulen (1992) on lily and Hutchinson *et al.* (2003) on tuberose.

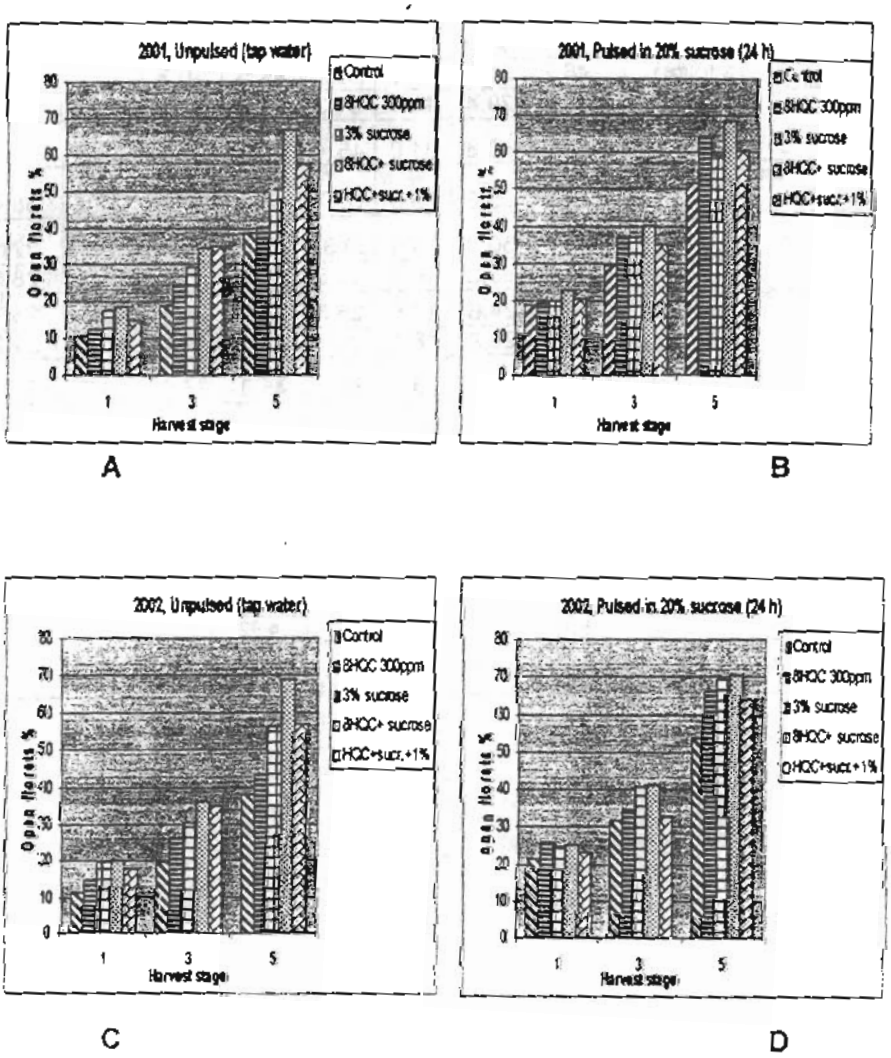

Figure 1: Opened florets% of *Polianthes tuberosa* as affected by unpulsed (A and C) and pulsed (B and D) treatments, preservative solutions and harvest stage in 2001 and 2002.

Table 3: Shattered florets % of *Polianthes tuberosa* as affected by pulse Shattered (dropped) florets treatment, preservative solutions and harvest stage in 2001 and 2002.

Pre-treatments	Preservative Solution	Shattered florets %				Shattered florets %			
		First season				Second season			
		Harvest stage			Mean	Harvest stage			Mean
		1	3	5		1	3	5	
Un-pulsed (tap water)	Control (Tap water)	61.4	42.7	32.6	46.7	63.7	44.8	30.1	46.2
	8HQC 300ppm	58.6	34.9	27.4	40.3	57.3	35.3	27.9	40.2
	3% sucrose	46.2	31.1	23.8	33.7	44.5	30.7	21.7	32.3
	8HQC+ sucrose	44.9	29.4	19.6	31.3	42.7	27.3	16.8	28.9
	HQC+sucr.+1%Clorox	67.9	40.8	31.0	46. 6	65.8	42.0	32.7	46.8
mean un-pulsed		55.8	35.8	26.9	57.7	54.8	36.0	25.8	38.4
Pulsed in 20% sucrose (24 h)	Control (Tap water)	46.7	30.3	24.6	33.87	47.9	28.8	19.5	32.1
	8HQC 300ppm	43.8	28.8	19.2	30.6	41.7	25.9	17.9	28.5
	3% sucrose	37.1	24.6	17.8	26.5	35.6	24.1	15.8	25.2
	8HQC+ sucrose	28.8	20.9	16.1	21.9	29.1	19.4	15.1	21.2
	HQC+sucr.+1% Clorox	48.1	32	23.9	34. 7	45.9	33.6	24.7	34.7
mean pulsed		40.9	27.3	20.3	29.5	40.0	26.3	18.6	28.3
Total Mean		48.3	31.5	23.6	43.6	47.4	31.1	22.2	33.6
L.S.D. 0.05 for :									
A- pulse treat		3.07				6.41			
B- preservatives		2.43				3.27			
C- harvest stage		4.67				4.91			
A x B		1.36				2.88			
A x C		6.09				4.62			
B x C		2.78				1.37			
A x B x C		1.42				2.04			

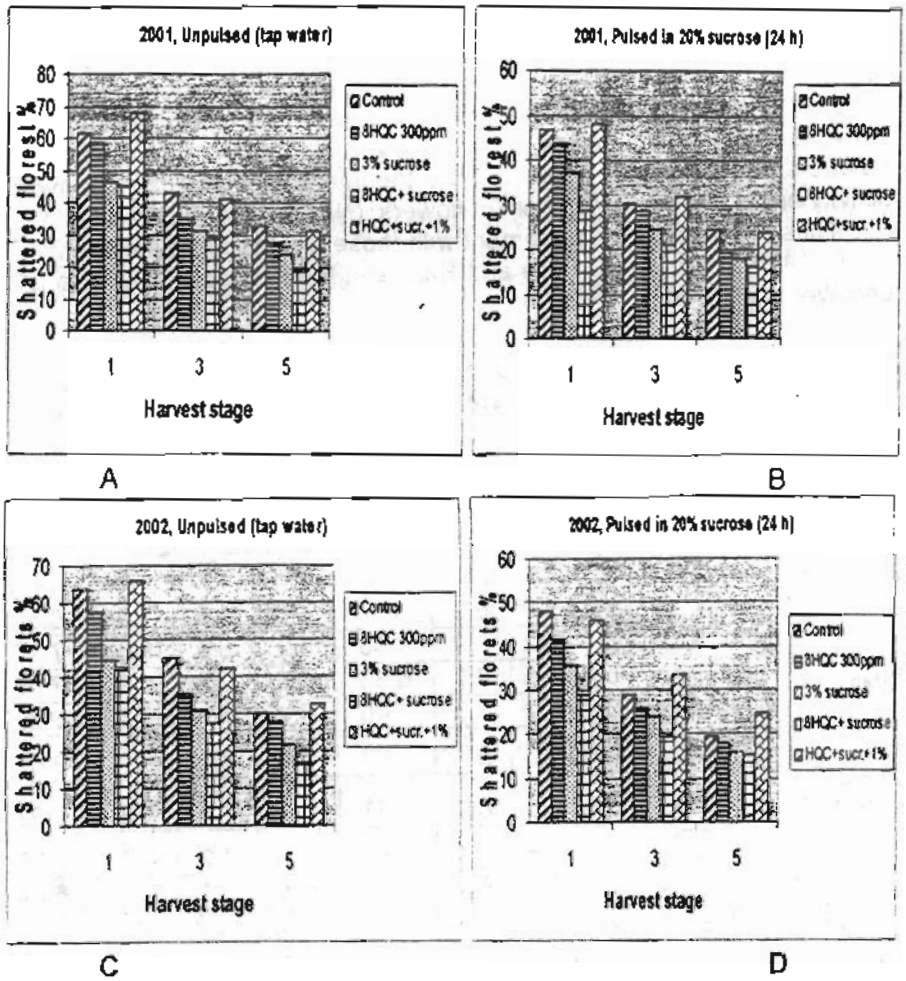

Figure 2: Shattered florets % of *Pollanthes tuberosa* as affected by un-pulsed (A and C) and pulsed (B and D) treatments, preservative solutions and harvest stage in 2001 and 2002.

Vase life

Vase life of tuberose spikes were significantly influenced by the pre-treatments, preservative solutions and harvest stage. Data presented in (Table 4 anf Figure 3) show that the maximum vase life (14.3, 13.8 days) were recorded in the treatments of (300 ppm 8HQC +3 % sucrose + 1% clorox) of the pulsed pre- treatment in the third harvest stage (5 open florets) in the second and first seasons respectively, followed by the treatment of (300 ppm 8HQC +3 % sucrose), closely followed by 3 % sucrose of the pulsed pre- treatment in the third harvest stage (5 open florets) in the second season. The minimum vase life was noted in the control treatment of un-pulsed pre- treatment in the first harvest stage (1 open floret) in the first and second seasons respectively. It is interesting that pulsed pre-treatment only resulted in vase life of 5.8 days in the control treatment compared to 5.4 days in control of un-pulsed pre- treatment in the first harvest stage (1 open floret)

in the first season. The use of all preservatives increased the vase life regardless the stage of harvest, however, in the third stage (5 open florets) the treatment of (300 ppm 8HQC +3 % sucrose + 1% clorox) almost doubled the vase life of the cut-spikes of the pulsed pre- treatment. These results may be due to the synergetic effect of these treatments in controlling the microbial activity or control the metabolism in flowers (Nowak and Rundnicki, 1990).

These results are in agreement with those reported on tuberose by Saini *et al.* (1994), Reid (1996), De and Barman (1998), Singh and Arora (2000) and Wei et al. (2001).

Table 4: Vase life (days) of *Polianthes tuberosa* as affected by pulse treatments, preservative solutions and harvest stage in 2001 and 2002.

Pre-treatments	Preservative Solution	Vase life (days) First season				Vase life (days) Second season			
		Harvest stage			Mean	Harvest stage			Mean
		1	3	5		1	3	5	
Un-pulsed (tap water)	Control (Tap water)	5.4	5.9	6.6	5.97	5.8	6.5	7.3	6.53
	8HQC 300ppm	5.7	6.3	6.9	6.30	6.2	6.9	8.5	7.20
	3% sucrose	5.8	6.5	8.2	6.83	6.5	7.3	8.9	7.57
	8HQC+ sucrose	6.2	7.2	8.8	7.40	7.4	7.9	9.3	8.20
	HQC+sucr.+1% Clorox	6.5	7.3	9.7	7.83	7.8	8.1	10.1	8.67
mean un-pulsed		5.9	6.6	8.0	6.87	6.7	7.3	8.8	7.63
Pulsed in 20% sucrose (24 h)	Control (Tap water)	5.8	6.8	7.4	6.67	6.2	7.2	8.6	7.33
	8HQC 300ppm	6.1	7.5	8.9	7.50	6.6	8.1	10.4	8.37
	3% sucrose	6.6	7.7	10.4	8.23	7.2	10.2	11.3	9.57
	8HQC+ sucrose	7.1	8.9	11.7	9.23	7.4	11.0	12.8	10.40
	HQC+sucr.+1% Clorox	7.7	9.4	13.8	10.30	8.0	12.6	14.3	11.63
mean pulsed		6.7	8.1	10.4	8.39	7.1	9.8	11.4	9.46
Total Mean		6.3	7.4	9.2	7.63	6.9	8.6	10.2	8.55
L.S.D. 0.05 for :									
A- pulse treat		2.47				4.19			
B- preservatives		1.79				2.31			
C- harvest stage		3.38				348			
A x B		1.98				209			
A x C		264				372			
B x C		3.49				2.68			
A x B x C		1.58				1.97			

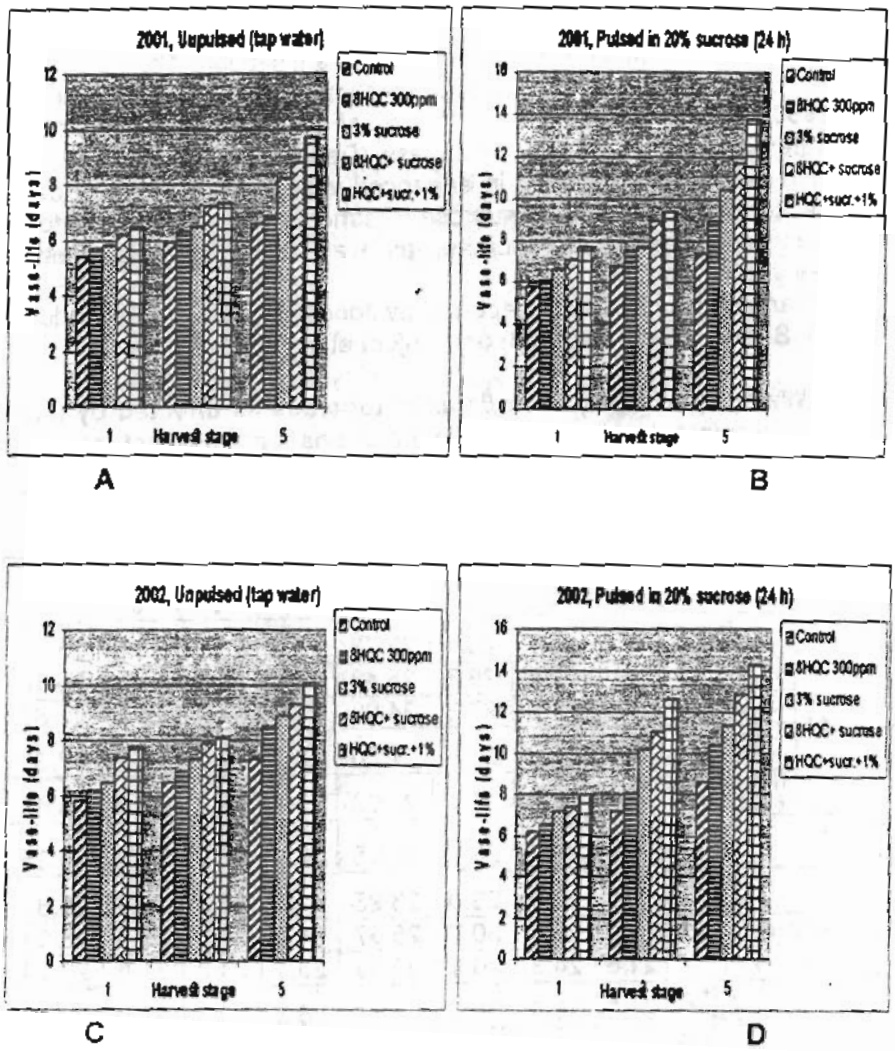

Figure 3: Vase life (days) of *Polianthes tuberosa* as affected by un-pulsed (A and C) and pulsed (B and D) treatments, preservative solutions and harvest stage in 2001 and 2002.

Water uptake

Solution uptake of tuberose spikes were improved by all treatments, however, the differences among treatments were not significant. Spikes held in the control treatment of un-pulsed pre- treatment in the first harvest stage (1 open floret) gave the least water uptake, followed by the control treatment of the pulsed pre- treatment in the first harvest stage in the first and second seasons respectively. The maximum water uptake was obtained by the treatments of (300 ppm 8HQC + 3 % sucrose + 1% clorox) in the third harvest stage (5 open florets) in the second and first seasons respectively (Table 5 and Figure 4). The presence of open florets on the spikes was positively related with increased solution uptake (Naidu and Reid, 1989).

Overall results can be explained as when flowers are detached from the plant, water loss from these continues through transpiration. The ideal flower preservative is that which allows water absorption in flower tissues (Salunkhe *et al.*, 1990). Water absorption from the preservative solution maintains a better water balance and flower freshness (Reddy and Singh 1996), and saves from early wilting resulting in enhanced vase life. It was also noticed that the water uptake was low in sucrose treatments; this may be due to the stomata closure exerted by sucrose, as well as to osmotic pressure (Marousky, 1971).

Similar findings have been reported by Jones and Hill (1993), Reddy *et al.* (1995), Bhaskar and Rao (1998) and Anjum et al. (2001).

Table 5: **Water uptake (ml) of *Polianthes tuberosa* as affected by pulse treatments, preservative solutions and harvest stage in 2001and 2002.**

Pre-treatments	Preservative solution	Water uptake (ml) First season				Water uptake (ml) Second season			
		Harvest stage			Mean	Harvest stage			Mean
		1	3	5		1	3	5	
Un-pulsed (tap water)	Control (Tap water)	19.4	23.7	25.1	22.73	18.9	25.1	25.9	23.30
	8HQC 300ppm	25.1	22.6	28.6	25.43	24.6	22.4	28.3	25.10
	3% sucrose	22.4	21.9	27.8	24.03	21.6	21.1	25.2	22.63
	8HQC+ sucrose	24.9	25.2	30.9	27.00	26.7	27.2	28	27.30
	HQC+sucr.+1 % Clorox	27.4	28.0	31.7	29.03	25.4	29.4	30.4	28.40
mean un-pulsed		23.8	24.3	28.8	25.65	23.4	25.0	27. 6	25.35
Pulsed in 20% sucrose (24 h)	Control (Tap water)	19.9	22.9	29.0	23.93	21.3	25.2	31.1	25.87
	8HQC 300ppm	23.6	25.4	30.7	26.57	24.5	27.1	32.5	28.03
	3% sucrose	21.6	24.3	30.1	25.33	23.1	24.2	31.6	26.30
	8HQC+ sucrose	21.9	29.5	31.9	27.77	28.3	28.9	34.9	30.70
	HQC+sucr.+1 % Clorox	25.8	31.9	34.1	30.60	26.8	32	37.7	32.17
mean pulsed		22. 6	26.8	31.2	26.84	24.8	27.5	33. 6	28.61
Total Mean		23.2	25.5	29.9	26.24	24.1	26.3	30. 6	26.98
L.S.D. 0.05 for :									
A- pulse treat		N.S.				N.S.			
B- preservatives		N.S.				N.S.			
C- harvest stage		N.S.				N.S.			
A x B		N.S.				N.S.			
A x C		N.S.				N.S.			
B x C		N.S.				N.S.			
A x B x C		N.S.				N.S.			

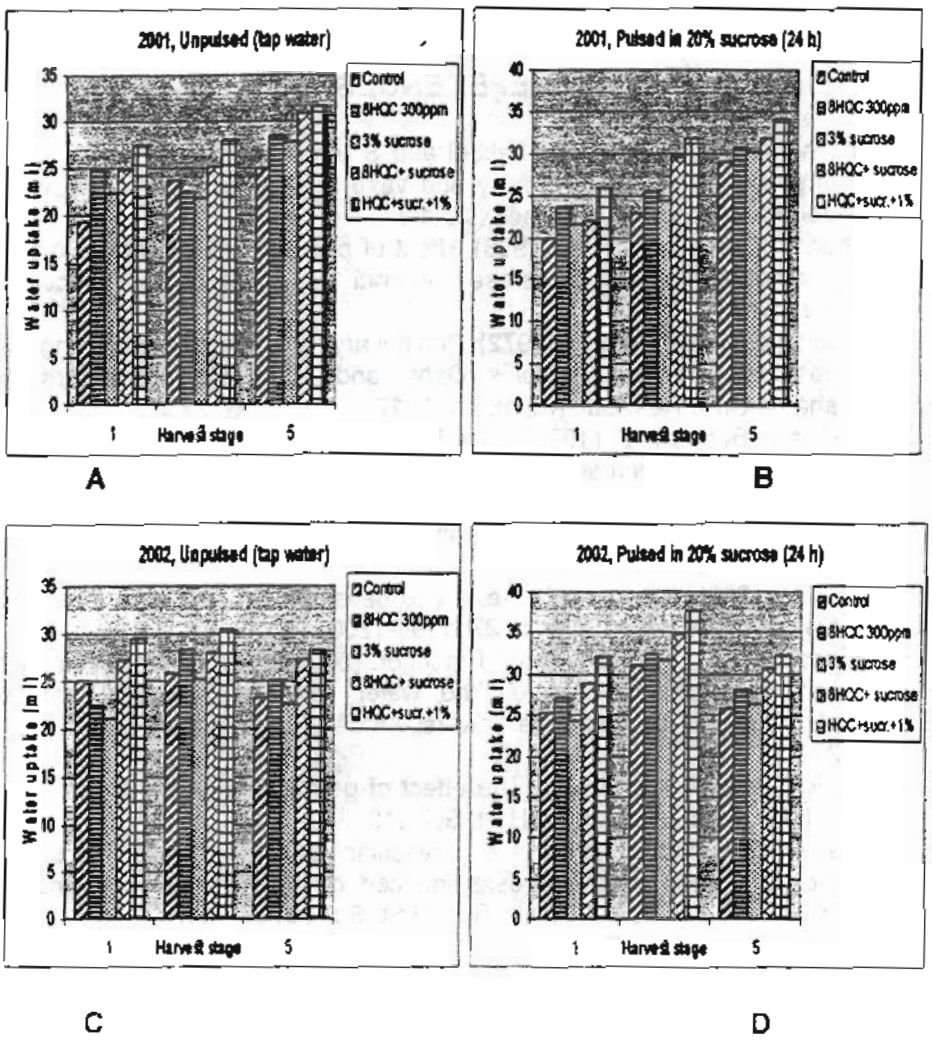

Figure 4: Water uptake (ml) of *Pollanthes tuberosa* as affected by unpulsed (A and C) and pulsed (B and D) treatments, preservative solutions and harvest stage in 2001

Conclusion

The results demonstrated the importance of sucrose pulse pre-treatment, harvest stage (5 open florets) as well as adequate biocides in vase solutions and their importance for the post-harvest handling of cut tuberose spikes. It is suggested that the spikes should be cut in the third harvest stage (5 open florets), pre- treated in 20% sucrose solution pulse for 24 h then kept in solution of 300 ppm 8HQC + 3 % sucrose alone or + 1% Clorox . These conditions can prolong tuberose vase life and floret opening through improving the water balance.

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تأثير كل من المعاملة بالسكروز وطور القطف والمحاليل الحافظة علـى اطالـة عمر نورات التبروز المقطوفة.

علا عبد العزيز الشناوى
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تم اجراء هذا البحث لدراسة تأثير المعاملة بالسكروز ٢٠ % (لمدة ٢٤ ساعة) قبل نقل نورات التبروز المقطوفة فى ثلاثة اطوار (زهيرة او ثلاث او خمس زهيرات متفتحة من قاعدة النورة) الى المحاليل الحافظة. أجريت التجربة مرتين بمعمل قسم الزهور ونباتات الزينة بالشاطبى عامى ٢٠٠١ و٢٠٠٢ تحت الظروف المعملية الآتية: درجة الحرارة ٢٥ درجة مئوية و رطوبة نسبية ٦٥ % واضاءة لمدة ١٢ ساعة.

ويمكن تلخيص النتائج فيما يلى:

- سجلت أعلى قيمة لعدد الزهيرات المتفتحة عند المعاملة ٣٠٠ جزء فى المليون ٨ -سترات هيدروكسى الكينولين + ٣ % سكروز. وذلك بعد وضع النورات المقطوفة فى طور القطف الثالث (٥ زهيرات متفتحة) فى محلول السكروز ٢٠ % لمدة ٢٤ ساعة بينما سجلت أقل قيمة لعدد الزهيرات المتفتحة عند معاملة المقارنة فى طور القطف الأول (زهيرة واحدة متفتحة).
- تسببت المعاملة ٣٠٠ جزء فى المليون ٨ - سترات هيدروكسى الكينولين + ٣ % سكروز+ ١ % كلوراكس فى احداث أعلى نسبة تساقط فى عدد الزهيرات فى النورات المقطوفة فى طور القطف الأول (زهيرة واحدة متفتحة). بينما سجلت أقل قيمة لعدد الزهيرات المتساقطة عند المعاملة ٣٠٠ جزء فى المليون ٨ - سترات هيدروكسى الكينولين + ٣ % سكروز وذلك بعد وضع النورات المقطوفة فى طور القطف الثالث (٥ زهيرات متفتحة) فى محلول السكروز ٢٠ % لمدة ٢٤ ساعة.
- كانت المعاملة ٣٠٠ جزء فى المليون ٨ - سترات هيدروكسى الكينولين + ٣ % سكروز+ ١ % كلوراكس هى افضل المعاملات فى اطالة عمر النورات٢٠ % المقطوفة فى طور القطف الثالث (٥ زهيرات متفتحة) و بعد نقع النورات المقطوفة فى السكروز ٢٠ % لمدة ٢٤ ساعة حيث بقيت النورات فى حالةجيدة لمدة ١٤,٣و ١٣,٨ يوما فى الموسم الثانى و الأول على الترتيب .
- أدت كل المعاملات الى زيادة فى كمية المحاليل الممتصة وان كانت الفروق بين المعاملات غير معنوية.
- مما سبق يتضح أنه يمكن التوصية بقطف نورات التبروز فى طور القطف الثالث (٥ زهيرات متفتحة) ووضع النورات المقطوفة فى ٢٠ % من محلول السكروز لمدة ٢٤ ساعة ثم وضعها فى محلول حفظ يتكون من ٣٠٠ جزء فى المليون ٨ - سترات هيدروكسى الكينولين + ٣ % سكروز بدون أو باضافة ١ % كلوراكس لاطالة عمر النورات المقطوفة و للحصول على أعلى نسبة تفتح فى عدد الزهيرات على النورة.