RESULTS AND DISCUSSION

IV.RESULTS AND DISCUSSION

PART (1)

1.1.Part I: The first experiment: (growth regulators and storage periods of *Polianthes tuberosa*)

1.1.Effect of some growth regulators on:

1.1.a.- Vegetative growth measurements:

According to data presented in Table (1) on some vegetative growth measurements of tuberose plants as affected by some growth regulators treatments i.e., GA_3 at 200 and 300ppm, BA at 25 and 50ppm and kinetin at 50 and 100ppm, it could be concluded that all tested growth regulators treatments were succeeded in increasing all the studied vegetative growth parameters in both seasons of this study. However, 50ppm BA-treated plants showed to be the most effective treatment for inducing the greatest number of leaves/plant, whereas the tallest plant was recorded by treated the plants with kinetin at 100ppm. While, the heaviest fresh and dry weight of leaves/plant were registered by 300ppm GA_3 treated plants.

The aforementioned results of GA_3 are in parallel with those attained by **Desouky (1994)** on *Strelitzia reginae*, **El-Sallami (1997)** on *Narcissus tazetta* , **Zaky (1998)** on *Strelitzia reginae*, **Devendra *et al.* (1999)** on tuberose, **Tawila (2000)** on *Polianthes tuberose*, **Dantuluri *et al.* (2002)** on *Lilium moculatum*, **Salama (2003)** *on Strelitzia reginae*, **Padaganur *et. al.*, (2005)** on tuberose, **Panwar *et. al.*, (2006)** on tuberose and **Devadanam *et. al.*, (2007)** on tuberose who stated that

Table (1): Effect of some growth regulators on Number of leaves / plant & plant height /cm and fresh weight of leaves/g of *Polianthes tuberosa* L. during the two seasons of 2007-2008/2008-2009

Treatments		No. of leaves / plant	Plant height / cm	f.w. of leaves / g
1st season				
Control		64.00	54.00	213.80
GA_3 200ppm		96.00	66.33	340.20
GA_3 300ppm		86.33	67.00	430.60
BA 25 ppm		138.30	62.33	333.20
BA 50 ppm		197.70	64.67	263.90
Kin 50 ppm		141.30	65.33	390.70
Kin 100 ppm		147.20	67.67	420.70
L.S.D at	5 %	7.55	N.S.	4.79
	1%	10.58	N.S.	6.72
2nd season				
Control		97.70	57.33	220.90
GA_3 200ppm		153.70	66.00	560.70
GA_3 300ppm		169.00	69.30	590.70
BA 25 ppm		173.30	65.67	390.70
BA 50 ppm		214.00	69.00	410.90
Kin 50 ppm		193.00	71.00	580.90
Kin 100 ppm		196.00	73.33	586.30
L.S.D at	5 %	10.72	6.11	5.68
	1%	15.03	8.57	7.96

Table (3): Effect of some growth regulators on dry weights /g of *Polianthes tuberosa* L. during the two seasons of 2007-2008/2008-2009

Treatments		Dry weight of leaves/g	dry weight of total flower stalk /g	dry weight of flower stalk with floret /g	dry weight of flower stalk without floret /g	dry weight of third floret /g
1st season						
Control		28.64	12.07	5.60	3.50	0.160
GA_3 200ppm		52.43	16.50	7.80	6.00	0.320
GA_3 300ppm		66.90	18.50	9.53	6.37	0.373
BA 25 ppm		37.00	14.97	6.80	4.20	0.223
BA 50 ppm		44.20	15.63	7.07	4.87	0.283
Kin 50 ppm		49.53	16.37	7.67	5.67	0.277
Kin 100 ppm		60.40	17.10	8.30	6.50	0.317
L.S.D at	5 %	7.07	1.36	1.70	1.23	0.080
	1%	9.91	1.91	2.39	1.72	0.112
2nd season						
Control		56.40	14.13	7.07	4.20	0.167
GA_3 200ppm		98.83	18.63	8.90	6.80	0.360
GA_3 300ppm		104.70	20.80	10.33	7.83	0.427
BA 25 ppm		71.80	16.67	7.23	5.27	0.223
BA 50 ppm		92.97	17.30	8.20	6.03	0.287
Kin 50 ppm		99.53	19.43	9.30	6.63	0.307
Kin 100 ppm		102.37	20.80	9.43	7.30	0.363
L.S.D at	5 %	4.98	1.12	0.76	0.71	0.056
	1%	6.99	1.57	1.07	0.99	0.079

flower stalk without floret were recorded by using the treatments of GA_3 at 300ppm and Kin at 100ppm, respectively].

The heaviest dry weight of flower stalk without floret and fresh weight of the third floret were recorded by using the treatment of GA_3 at 300ppm as an average of both seasons of this study. Whereas, the heaviest fresh weight of flower stalk without floret was obtained by using the treatment of kinetin at 100ppm as an average of both seasons of this

study. Additionally, the greatest values of number of floret/stalk and length of flower stalk were recorded by using the treatment of kinetin at 100ppm as an average of both seasons.

The principal role of GA_3 upon flowering stimulation in many plants has been recommended to be manly due to its effect upon increasing the length of flower stalk (bolting), the process that strictly must proceeded flowering appearance process (**Devlin and Witham, 1983).** Moreover, the effects of GA_3 on flower growth measurements may be due to the fact that gibberellins play a role in flowering, probably it is further elaborated into florigen by the plant. Hence, gibberellins can not be the same substance as florigen but at least it may act as its precursor. The propounder of (Florigen concept) florigen but made up of two substances, namely gibberellins and anthesins. The latter are considered to be nitrogen rich compounds **(Macleod and Millar, 1962).**

The aforementioned results of flowering growth measurements i.e., flowering start, number of flowers, length and diameter of flower stalk, fresh and dry weights of flower,

duration of flower on plant and flower vase life are in conformity with those obtained by **Abdel Wahid (1995)** on *Strelitzia reginae*, **Zaky (1998)** on *Strelitzia reginae*, **Devendra *et al.* (1999)** and **Tawila (2000)** on *Polianthes tuberosa*, **Wankhede *et al.* (2002)** on *Polianthes tuberosa* ,**Dantuluri *et al.*, (2002)** and **Tiwari and Singh (2002)** on *Lilium maculatum*, **Wankhede *et al.*, (2002)** on *Polianthes tuberosa*, **Gomaa (2003)** on *Dahlia pinnata*, **Salama (2003)**on *Strelitzia reginae* and **Youssef (2004)** who mentioned that treated *Strelitzia reginae* plants with GA_3 at 100 or 200 ppm increased number of flowers/plant, length and diameter of flower, diameter of flower (cm), fresh weight of flower/plant, duration of flower on plant and vase life of flower as well as inducing early flowering .

Davadanam *et. al.*, (2007) and **Tyagi and Singh (2008)** on tuberose GA_3 at 150 ppm resulted in the greatest number of florets per spike), flower yield/ha, and number of spikes/ha and the most effective for days emergence of spikes, florets

These results might be explained according to the role of kinetin on promoting protein synthesis, cell division and enlargement **(Cheema and Sharma, 1982)**.Also, these results might be explained according to the role of kinetin on promoting proteins, soluble and non-soluble sugars synthesis, or may be due to the ability of kinetin for making the treated area to act as a sink into which nutrients from other parts of the plant are drawn **(Salisbury and Ross, 1974).**

The exogenous cytokinins effectively induced floral initiation and development, especially at the early floral

initiation and flower development stages. Endogenous cytokinins were higher in early floral initiation and development stages in comparison to the vegetative stage. These results indicate that cytokinins seem to promote the development of flower buds rather than inducing flowering in tuberose **(Shuo-Tsang Chang *et. al.*, (1999)**

These results might be interpreted according to the direct role of cytokinins on flowering induction processes in the flowering meristems and their ability to overcome the dominance of the main flowering shoot. Also, these results might explain the role of kinetin in inducing cell division **(Cheema and Sharma, 1982)** and its ability to overcome the apical dominance of many plants and hence, stimulate the lateral buds to develop into an entire new plant **(Salisbury and Ross, 1974).** The abovementioned results of kinetin are in harmony with those attained by **Tjia (1986)** on *Zantedeschia elliotiana*, **Auda (1992)** on *Hippeastrum vittatum*, **Khalafalla *et al.* (1995)** on *Dahlia pinnata*, **Shuo-Tsang Chang *et. al.*, (1999)** on *Polianthes tuberosa*, **Lee-Aekyung (2005)** on *Iris hollandica*, mentioned that kinetin treatments significantly increased the length and thickness of flower stalk as well as their fresh and dry weights.

1.1.c.-Chemical composition determinations:

Data in Table (4) demonstrate that all tested pre-harvest growth regulators treatments increased leaves Chlorophyll a, Chlorophyll b, caroteniods, total nitrogen, phosphorus and potassium content in both seasons. However, the richest leaves

Table (4): Effect of some growth regulators on Chlorophyll ,a, &b and Coroteniods (mg/g f. w.) & total nitrogen , phosphorus and potassium percentage in leaves of *Polianthes tuberosa* L. during the two seasons of 2007-2008/2008-2009

Treatments		Chlorophyll, a, (mg/g f. w.)	Chlorophyll, b, (mg/g f. w.)	Carotenoids (mg/g f.w.)	Total nitrogen percentage	phosphorus percentage	potassium percentage
1st season							
Control		0.507	0.309	0.208	2.743	0.681	2.780
GA_3 200ppm		0.560	0.540	0.307	3.430	0.758	2.927
GA_3 300ppm		1.107	0.823	0.258	4.700	0.965	3.260
BA 25 ppm		0.606	0.408	0.205	3.680	0.972	2.847
BA 50 ppm		0.711	0.496	0.236	4.283	0.880	3.100
Kin 50 ppm		0.672	0.427	0.246	4.247	0.747	3.137
Kin 100 ppm		0.918	0.618	0.312	5.220	0.956	3.200
L.S.D at	5 %	0.323	0.032	0.032	0.432	0.169	0.149
	1%	N.S.	0.045	0.045	0.606	0.237	0.209
2nd season							
Control		0.554	0.333	0.231	2.933	0.722	2.907
GA_3 200ppm		0.864	0.567	0.310	3.630	0.892	3.000
GA_3 300ppm		1.083	0.826	0.270	4.900	0.945	3.267
BA 25 ppm		0.621	0.419	0.218	3.930	0.982	3.01
BA 50 ppm		0.765	0.513	0.259	4.773	0.982	3.197
Kin 50 ppm		0.683	0.427	0.259	4.583	0.757	3.283
Kin 100 ppm		0.957	0.667	0.310	4.920	0.990	3.370
L.S.D at	5 %	0.056	0.056	0.056	0.551	0.149	0.211
	1%	0.079	0.079	N.S.	0.773	0.209	0.295

Chlorophyll a and Chlorophyll b were recorded by using the treatment of GA_3 at 300ppm, followed descendingly by using 100ppm Kinetin-treated plants in both seasons. Whereas, the highest values of leaves carotenoids, nitrogen, phosphorus and potassium contents were recorded by using the treatments of kinetin at 100ppm and GA_3 at 300ppm in most cases as an average of both seasons.

The aforementioned results of GA_3 are in conformity with those obtained by **El-Sayed (1987)** on *tuberose*, **El-Maadawy (1988)** on *polianthes tuberosa*, **Abdel-whahid (1995)** on strelitzia, **Reddy *et. al.*, (1997)** on *tuberose*, **Goma (2000)** on *polianthes tuberosa*, **Youssef (2000)** on *S. reginae*, **Tawila (2000)** on *Polianthes tuberose*, **Gomaa (2003)** on *Dahlia* and **Salama (2003)** on *Strelitzia reginae reveal that* GA_3 treatments increased leaf chlorophylls (a, b), carotenoids content and the P and K contents compared to the untreated plants.

The aforementioned results of cytokinins are in parallel with those attained by **Reddy *et. al.*, (1997)** on tuberose, **Shahin (1998)** on *Crinum longiflorum* and **Youssef (2000)** reported that treated *S. reginae* plant with kinetin levels (50, 100 and 200 ppm) increased leaf N, P, K, total carbohydrates, chlorophyll a, b and carotenoids contents, but decreased total phenols content in leaves.

2.1.Effect of some growth regulators as pre-treatments and storage periods on:

2.1.Flower post harvest characters:

2.1.a.-Vase life (day) or longevity of tuberose:

Data presented in Table (5) indicate that all the pre-harvest treatments prolonged the vase life of tuberose cut flower spikes when compared to control in the two seasons. The treatments of GA_3 at 300ppm and kinetin at 100ppm showed to be the most effective treatments for inducing the highest values of highly significant vase life of tuberose cut flower spikes when compared to control and other treatments in both seasons. The lowest means of values of vase life by tuberose cut flower spikes was registered by using the treatment of BA at 25ppm in the two seasons. The rest treatments occupied an intermediate position between the aforesaid treatments in both seasons of this study.

The aforementioned results of GA_3 are in harmony with those attained by **Dalal *et al.* (1999)** indicated that spraying *Polianthes tuberosa* plants with GA_3 at 40 ppm increased vase life,

Dantuluri *et al.*, (2002) and **Tiwari and Singh (2002)** on *Lilium maculatum*, **Wankhede *et al.*, (2002)** on *Polianthes tuberosa* , **Gomaa (2003)** on *Dahlia pinnata* and **Youssef (2004)** who mentioned that treated *Strelitzia reginae* plants with GA_3 at 100 or 200 ppm increased vase life of flower as well as inducing early flowering . **Tyagi and Singh (2006)** on tuberose GA_3 rates (40, 80, 120 and 160ppm) and four IBA rates (20, 40, 60 and 80ppm) significantly minimum days to flowering (80, 12

Table (5): Effect of some growth regulators, Storage periods (Days) and their interaction on vase life (days) of *Polianthes tuberosa* L. cut flower spike during the two seasons 2007-2008/2008-2009.

Treatments	Vase life (days) 1st season					Vase life (days) 2nd season				
	Storage periods (days)				mean	Storage periods (days)				mean
Growth regulators	0	7	14	21		0	7	14	21	
Control	11.90	8.70	7.20	6.70	8.63	11.60	10.00	9.17	8.30	9.77
GA3 (200ppm)	14.80	11.60	8.60	7.30	10.58	14.40	11.00	10.33	8.67	11.10
GA3 (300ppm)	19.80	12.50	10.20	7.80	12.58	20.10	12.30	10.70	9.00	13.00
BA 25 ppm	14.20	11.10	9.40	4.41	10.53	14.70	11.00	9.70	8.60	11.00
BA 50 ppm	14.40	11.30	9.20	9.00	10.98	18.70	11.30	10.00	8.60	12.15
Kin 50 ppm	18.60	11.30	8.50	7.00	11.35	16.30	12.00	11.30	8.70	12.58
Kin 100 ppm	20.30	12.20	10.30	7.30	12.53	20.20	12.30	10.33	9.70	13.13
mean	16.29	11.24	9.06	7.50		16.86	11.40	10.22	8.80	

L.S.D at	Growth regulators		Storage periods		Interaction		Growth regulators		Storage periods		Interaction	
	5 %	1 %	5 %	1 %	5 %	1 %	5 %	1 %	5 %	1 %	5 %	1 %
	0.195	0.260	0.148	0.197	0.391	0.520	0.374	0.498	0.283	0.377	0.748	0.997

day), and vase life (13, 85 days). **Devahanam *et. al.*, (2007)**on tuberose Foliar application was conducted at 30, 60 and 90 days after planting. GA_3 at 150 ppm gave the earliest number of days required for spike emergence (43.48) and longest vase life (11, 35 days).

These results may explain the role of cytokinins on promoting proteins and pigments synthesis and their ability to delay senescence and withdraw sugars and other solutes from older parts of a plant to the new organs **(Salisbury and Ross, 1974).** In the same line **Leopol and Kawase (1964)** stated that cytokinins stimulate the movement of sugars, starch, amino acids and many other solutes from mature organs to primary tissues of other ones. Nevertheless, the means by which cytokinins exert their beneficial effect on cut flowers was not yet certain, but the application of these materials has been shown to reduce water stress damage in carnation **(Paulin and Muloway, 1979),** improved water uptake and maintained water turgidity in roses **(Mayak and Halevy, 1977),** reduced respiration rates in carnation, Anthurium and chrysanthemum **(Shirakawa *et al.*, 1964)** and inhibited ethylene production and reduced sensitivity to ethylene in carnation **(Eisinger, 1977).** These results are in parallel with those of **Auda (1992)** on *Hippeastrum vittatum*, **Nagaraja and Gowda (1998)** on tuberose, and **Shahin (1998)** who found that treated Crinum and Hemerocallis plants with kinetin at 50 and 75ppm increased the vase life of flower.

As for the effect of storage periods on vase life (days) (longevity), it is clear from data in Table (5) that there were gradual decrease in vase life (days) of tuberose cut flower spikes

with extending storage periods at 4 ± 1°C for different days (0-time, 7, 14 and 21 days). However, tuberose cut flower spikes were stored at 4 ± 1°C for 21 days recorded highly significant decrease in vase life as compared to other different storage periods in both seasons. Moreover, storage periods at 4± 1°C for 0-time treatment showed highly significant increase in vase life of tuberose cut flower spikes when compared to the other ones under study in the two seasons. These results agreed with those found by **Song et al., (1992)** on gladiolus cut flower spikes and **Abd El-Sadek (2005)** on gypsophila cut flowers. Such effect could be attributed to one or more of the following: dry packed flowers were stored at 4 °C at 70 – 75% RH for 4 and 5 days storage enhanced postharvest life and quality **Palanikumar et al., (2000)** on cut roses. Also, **Hettiarachchi and Balas (2005)** stated that cold storage at 4 °C for 7days has the potential to be used for delaying inflorescence senescence, prolonging vase life and postharvest quality of *Gloriosa superba* (Glory lily) cut flowers . Referring to the effect of interaction between growth regulators and storage periods on Vase life (day), data in Table (5) reveal that the interaction treatment between growth regulators of kinetin at 100ppm and storage periods at 4 ± 1°C for 0-time were recorded highly significant increase in vase life of tuberose cut flower spike compared to other treatment under study in both seasons. Regardless control, the lowest means of values of vase life of tuberose cut flower spikes were noticed by using the interaction between spraying BA at 25ppm and storage period for 21 day when compared to the other ones treatment under study in both seasons. Moreover GA_3 at 300ppm resulted

highly significant increased in vase life of tuberose cut flower spike compared to control and other treatments in both seasons. The rest treatments occupied an intermediate position between the abovementioned treatments in both seasons of this study.

2.1.b.-Change percentages in fresh weight of tuberose cut flower spikes

From the recorded data in Table (6) it can be concluded that the change percentage in spike fresh weight of tuberose cut flower spike was decreased as flower cut spikes advanced in age after 3 days to the end of longevity in the two seasons. It could be concluded that all pre-harvest treatments succeeded in increasing change percentage in fresh weight of tuberose cut flower spikes as compared with control in both seasons of this study. Moreover, using the treatments of GA_3 at 300ppm and kinetin at 100ppm resulted in highly significant increases in change percentage of fresh weight of tuberose cut flower spikes compared to the control and the other treatments under this study. The differences between the abovementioned two treatments were not significant in both seasons. The remained treatments occupied an intermediate position between the abovementioned treatments and control in the two seasons.

Regarding to the effect of storage periods on the change percentage in fresh weight data in Table (7) reveal that the change percentage in fresh weight of tuberose cut flower spikes was increased as flower cut spikes advanced in age till 6 days and then decreased after that down to the end of longevity by using 0-time storage periods at 4 ± 1°C in both season. However storage periods at 4 ± 1°C for 7, 14 and 21 days the change

Table (6): Effect of some growth regulators treatments, on Change percentage in fresh weight, Floret opening percentage and Floret wilting percentage of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Change percentage in fresh weight of cut flower spike					Floret opening percentage					Floret wilting percentage			
		Shelf life periods (days)					Shelf life periods (days)					Shelf life periods (days)			
		3	6	9	12	15	3	6	9	12	15	6	9	12	15
1st season															
Growth Regulators	Control	10.62	7.82	0.26	-10.42	-9.00	9.67	15.71	22.52	32.21	36.53	47.08	82.86	96.86	-
	GA_3 200ppm	5.31	2.85	-3.11	-11.57	-7.26	11.02	18.60	24.71	33.54	39.72	33.13	66.86	82.23	96.60
	GA3 300ppm	9.79	7.92	0.98	-6.87	-4.78	12.20	20.08	26.49	35.86	41.61	28.80	55.57	75.74	90.33
	BA 25 ppm	8.55	5.30	-2.82	-12.51	-7.35	10.89	16.21	23.75	33.44	39.04	41.00	66.27	84.60	98.36
	BA 50 ppm	7.26	4.15	-2.24	-9.41	-7.16	11.36	17.98	24.42	32.41	38.62	36.18	64.43	85.06	98.60
	Kin 50 ppm	9.49	6.60	0.24	-8.20	-4.99	10.43	16.79	23.20	32.23	38.22	39.31	68.51	83.55	97.60
	Kin 100 ppm	9.88	6.81	-1.84	-7.99	-3.65	11.93	17.48	24.73	34.38	40.36	28.82	62.92	77.06	92.60
L.S.D at	5 %	0.986	1.108	2.751	1.474	1.399	1.466	2.204	2.941	2.915	3.559	5.477	7.976	5.443	7.874
	1%	1.313	1.476	3.663	1.963	1.862	1.952	2.935	3.916	3.883	4.738	7.294	10.62	7.249	10.556
2nd season															
Growth Regulatos	Control	10.09	6.39	0.14	-10.59	-10.01	12.61	21.44	27.69	31.80	36.46	34.89	72.38	92.36	-
	GA_3 200ppm	5.38	2.37	-3.95	-11.26	-7.29	13.79	23.65	29.05	36.01	39.62	27.56	58.74	80.80	95.60
	GA3 300ppm	9.05	7.67	0.58	-6.96	-5.38	15.09	25.36	31.42	38.85	42.97	24.93	51.81	75.13	90.05
	BA 25 ppm	8.54	5.47	-2.24	-11.72	-7.68	13.34	24.03	28.81	36.23	42.46	28.34	56.99	85.49	98.66
	BA 50 ppm	7.16	4.52	-2.41	-9.46	-8.32	13.76	24.31	30.07	35.43	41.98	27.79	56.15	81.70	96.68
	Kin 50 ppm	8.91	6.36	0.05	-8.24	-5.42	13.77	24.49	30.31	35.85	40.69	27.88	54.68	81.25	96.95
	Kin 100 ppm	9.41	7.13	0.11	-7.14	-5.29	15.42	25.67	32.36	38.17	43.04	24.47	49.96	75.77	91.30
L.S.D at	5 %	1.034	1.218	1.329	1.557	0.962	1.121	1.554	2.045	2.523	2.524	4.495	6.563	8.453	9.656
	1%	1.377	1.623	1.770	2.074	1.281	1.493	2.070	2.724	3.361	3.362	5.986	8.740	11.26	10.665

Table (7): Effect of Storage periods (Days)treatments on Change percentage in fresh weight of cut flower spike , Floret opening percentage and Floret wilting percentage of *Polianthes tuberosa L.* cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Change percentage in fresh weight of cut flower spike					Floret opening percentage					Floret wilting percentage			
		Shelf life periods (days)					Shelf life periods (days)					Shelf life periods (days)			
		3	6	9	12	15	3	6	9	12	15	6	9	12	15
1st season															
Storage periods (Days)	0	15.06	17.13	7.52	1.28	-6.36	13.95	24.80	34.65	42.66	48.30	16.31	39.75	60.91	77.53
	7	8.03	6.40	0.07	-9.08	-18.88	11.71	17.08	23.63	34.20	37.80	30.44	59.51	79.16	82.07
	14	6.59	2.23	-4.49	-12.84	-	10.27	15.04	20.49	29.71	38.38	43.21	77.73	93.91	-
	21	5.12	-2.07	-7.98	-17.62	-	8.35	13.29	18.27	27.19	32.15	55.37	90.11	83.77	-
L.S.D at	5 %	0.745	0.838	2.079	1.114	1.058	1.108	1.666	2.223	2.204	2.690	4.140	6.026	4.115	3.651
	1%	0.993	1.116	2.769	1.484	1.408	1.476	2.219	2.960	2.935	3.582	5.513	8.029	5.479	4.862
2nd season															
Storage periods (Days	0	14.38	15.80	8.30	0.84	-8.16	17.81	31.39	39.22	47.53	54.34	14.46	37.20	60.92	75.74
	7	7.56	6.23	-0.41	-8.88	-20.06	14.54	24.17	28.47	37.23	39.79	26.41	50.23	77.10	81.04
	14	6.32	1.88	-4.85	-12.90	-	12.13	21.38	27.03	31.27	37.06	30.5	59.6	90.55	-
	21	5.19	-1.11	-7.45	-16.42	-	11.39	19.60	25.12	28.16	32.93	40.55	77.92	98.57	-
L.S.D at	5 %	0.781	0.921	1.005	1.177	0.727	0.847	1.175	1.546	1.908	1.908	3.398	4.961	6.390	8.858
	1%	1.034	1.227	1.338	1.568	0.969	1.129	1.565	2.059	2.540	2.541	4.525	6.607	8.509	11.80

percentage of fresh weight decreased after 3 days from the treatment till the end of age of longevity in the two seasons. The lowest mean of values of change percentage in fresh weight was gained by using 21 days storage periods at 4±1°C from the treatment till the end of longevity in the two seasons. Moreover, storage periods at 4±1°C for 0-time treatment showed highly significant increase in change percentage in spike fresh weight of tuberose cut flower spikes when compared with the different storage periods under study in the two seasons, Similar results by using storage periods were reported by **Hettiarachchi and Balas (2005)** on *Gloriosa superba* (Glory lily) cut flowers. **Gendy (2007)** on gladiolus cut flower spikes.

With respect to the effect of interaction between growth regulators and storage periods on the change percentage in fresh weight Data presented in Table (8) indicate that the interactions treatments between growth regulators of (GA_3 at 300ppm or kinetin at 100ppm) and storage periods at 4± 1°C for 0 time recorded the highly significant increase in the change percentage in fresh weight of tuberose cut flower spikes after 3,6,9,12 and 15 days from the treatment as compared to control in the two seasons. However, the interaction treatments between GA_3 at 300ppm and storage periods at 4± 1°C for O.time at the first season, or the interaction treatment between kinetin at 100ppm and storage periods at 4±1°C for 0 time at the second season resulted the highest significant increase after 3, 6, 9, 12 and 15 days from the treatment in this parameter as compared to control. On contrary, the lowest values of change percentage in fresh weight of tuberose cut flower spikes under all the

Table (8) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Change percentage in fresh weight of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Change percentage in fresh weight of cut flower spike 1st season					Change percentage in fresh weight of cut flower spike 2nd season				
Growth regulators	Storage periods (days)	Shelf life periods (days)					Shelf life periods (days)				
		3	6	9	12	15	3	6	9	12	15
Control	0	14.44	15.42	4.97	-4.11	-17.56	14.02	14.01	5.80	-4.84	-19.55
	7	11.54	9.93	2.63	-7.44	-18.44	11.53	8.87	1.92	-6.50	-20.47
	14	9.69	5.70	-1.11	-9.83	-	8.39	3.13	-0.95	-11.01	-
	21	6.81	0.25	-6.47	-20.30	-	6.43	-0.46	-6.21	-20.03	-
GA_3 200ppm	0	14.29	17.12	10.44	2.50	-4.95	13.77	15.46	9.18	2.75	-10.45
	7	2.28	1.27	-3.53	-12.18	-24.09	1.91	0.52	-4.11	-12.53	-20.28
	14	1.87	-1.36	-9.96	-18.67	-	3.33	-0.99	-10.50	-17.32	-
	21	2.80	-5.62	-9.40	-17.92	-	2.49	-5.51	-10.38	-17.92	-
GA_3 300ppm	0	16.17	17.87	10.00	3.28	-2.53	14.76	14.88	9.03	2.04	-8.31
	7	10.89	9.97	2.18	-8.22	-16.58	9.94	10.32	1.62	-7.25	-24.98
	14	6.69	2.89	-4.54	-12.75	-	6.10	3.14	-4.48	-13.33	-
	21	5.39	0.96	-3.74	-9.80	-	5.38	2.35	-3.85	-9.29	-
BA 25 ppm	0	14.92	17.34	6.88	-1.88	-9.98	14.24	16.04	6.12	-2.14	-6.4
	7	7.18	5.31	-1.57	-10.48	-19.41	6.77	6.16	-1.54	-10.50	-22.90
	14	7.37	2.03	-4.33	-12.69	-	8.22	2.08	-3.01	-12.14	-
	21	4.74	-3.51	-12.26	-25.02	-	4.91	-2.41	-10.53	-22.09	-
BA 50 ppm	0	15.79	17.49	8.74	3.38	-6.20	15.03	17.17	8.11	2.62	-4.09
	7	4.25	2.08	-3.81	-11.60	-22.44	4.17	2.67	-3.63	-10.98	-17.44
	14	4.73	0.52	-5.13	-12.50	-	4.49	1.01	-5.05	-12.52	-
	21	4.26	-3.49	-8.76	-16.93	-	4.97	-2.78	-9.08	-16.95	-
Kin 50 ppm	0	14.66	16.83	10.45	2.80	-4.53	14.46	16.15	10.33	3.00	-4.60
	7	10.4	8.14	1.97	-6.90	-15.41	9.80	8.13	1.14	-7.43	-17.06
	14	7.35	2.85	-4.28	-12.20	-	6.20	2.05	-4.89	-12.24	-
	21	5.47	-1.43	-7.18	-16.49	-	5.19	-0.89	-6.39	-16.30	-
Kin 100 ppm	0	15.10	17.81	10.12	2.97	1.20	14.41	16.91	9.56	2.49	-3.86
	7	9.60	8.12	2.63	-6.75	-15.77	8.78	6.94	1.71	-6.95	-17.31
	14	8.45	2.96	-3.11	-11.27	-	7.49	2.73	-5.09	-11.73	-
	21	6.36	-1.64	-8.02	-16.91	-	6.93	1.94	-5.73	-12.35	-
L.S.D at	5%	1.972	2.216	5.502	2.948	2.798	2.067	2.437	2.658	3.115	1.927
	1%	2.626	2.952	7.327	3.926	3.727	2.753	3.245	3.540	4.148	2.563

interaction treatments between growth regulators and storage periods was registered by the combined treatment between BA at 25ppm and storage periods at 4±1°C for 21 days after 3, 6, 9 and 12days from the treatment when compared to the other ones under this study in the two seasons.

2.1.c.-Floret opening percentage:

Data presented in Table (6) indicate that all pre-harvest treatments highly significant increased the floret opening percentage of tuberose cutflower spikes when compared to the untreated spikes after 3, 6, 9, 12 and 15 days from treatment in the two seasons. Moreover, the treatment of GA_3 at 300ppm and kinetin at 100ppm gave the highest values of floret opening percentage of tuberose cut flower spikes after 6, 9, 12 and 15 days from the treatment when compared to the other ones in the two seasons.Referring the effect of storage periods on floret opening percentage Data in Table (7) demonstrate that there were gradual decrease in floret opening percentage of tuberose cut flower spikes with extending storage periods at 4±1°C for the different days (0-time, 7, 14 and 21days) after 3, 6, 9, 12 and 15 days from the treatment in the two seasons. However, the floret opening percentage of tuberose cut flower spikes was increased as flower cut spikes advanced in age after 3 day till the end of longevity by using storage periods at 4±1°C for 0, 7, 14 and 21day in both seasons under study. Moreover, tuberose cut flower spikes were stored at 4±1°C for 21 day treatment showed a highly significant decrease in floret opening percentage of cut flower spikes when compared to the different storage periods in

the two seasons. Furthermore, storage periods at 4±1°C for 0-time resulted highly significant increase in floret opening percentage as compared to the other ones treatment under study in both seasons. These results are in harmony with those stated by **Gendy (2007)** on gladiolus cut flower spikes.

With regard to the interaction effect between growth regulators and storage periods, data in Table (9) indicate that all the interactions between growth regulators and storage periods resulted increases of the change percentage in fresh weight of tuberose cut flower spikes as compared to control in the two seasons. However, the interactions treatments between (GA_3 at 300ppm or kinetin at 100ppm) and different storage periods at 4±1°C for (0, 7, 14 and 21days) recorded the highest increases values of this parameter, especially, the interaction between GA_3 at 300ppm and storage period at 4±1°C for 0 time after 3,6,9,12 and 15days from the treatment during the two seasons under this study.

2.1.d.-Floret wilting percentage:

Data presented in Table (6) reveal that floret wilting percentage of tuberose cut flower spikes was decreased by using all pre-harvest treatments in both seasons. However, using the treatment of GA_3 at 300ppm and kinetin at 100ppm recorded the lowest values of floret wilting percentage compared to control and other treatments under study. Irrespective control, the highest mean values of floret wilting percentage of tuberose cut flower spikes was registered by using the treatment of BA at 25ppm during the most shelf wide periods 6, 9, 12 and 15 day

Table (9) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Floret opening percentage of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Floret opening percentage 1st season					Floret opening percentage 2nd season				
Growth regulators	Storage periods	Shelf life periods (days)					Shelf life periods (days)				
		3	6	9	12	15	3	6	9	12	15
Control	0	11.08	17.79	27.80	38.81	43.44	14.56	26.90	33.89	39.01	47.92
	7	10.75	16.73	23.90	33.54	38.23	12.94	21.63	26.89	32.41	35.52
	14	8.86	14.49	20.02	28.91	32.25	12.22	20.00	26.67	28.89	32.22
	21	7.99	13.84	18.37	27.60	32.21	10.73	17.22	23.64	26.90	30.16
GA_3 200ppm	0	13.49	27.04	35.76	42.49	49.28	16.77	30.44	37.53	45.44	50.63
	7	11.90	17.79	24.69	34.65	39.65	14.56	24.01	28.14	39.64	39.64
	14	10.11	16.20	20.28	30.32	38.44	12.19	20.40	26.31	31.67	35.83
	21	8.58	13.37	18.13	26.6	31.50	11.62	19.74	24.20	27.29	32.37
GA_3 300ppm	0	16.58	27.60	40.50	46.02	50.57	20.40	34.60	42.82	53.33	58.55
	7	11.91	19.29	23.87	36.74	38.56	15.16	24.32	29.28	40.40	40.43
	14	12.06	18.77	23.22	34.06	45.19	12.66	22.27	27.34	32.41	38.54
	21	8.26	14.67	18.34	26.63	32.11	12.13	20.25	26.25	29.28	34.36
BA 25 ppm	0	12.99	24.1	30.02	44.24	49.18	16.13	29.03	35.48	48.39	54.84
	7	12.33	15.39	24.50	33.82	37.96	14.48	25.70	28.90	36.93	42.50
	14	10.12	13.16	21.32	28.41	37.71	11.86	21.56	26.89	31.41	39.02
	21	8.12	12.13	19.17	27.29	31.30	10.90	19.84	23.95	28.20	33.48
BA 50 ppm	0	13.43	25.94	34.55	40.32	47.05	17.75	32.31	40.72	47.98	56.32
	7	11.81	17.76	23.73	33.70	36.67	14.14	23.74	27.27	34.34	39.39
	14	11.09	15.13	20.15	28.30	38.32	11.68	20.86	26.31	30.66	37.76
	21	9.11	13.10	19.26	27.32	32.44	11.46	20.33	25.98	28.72	34.47
Kin 50 ppm	0	12.94	25.00	36.14	42.63	48.20	18.31	32.44	41.90	47.98	55.42
	7	11.44	16.20	21.97	32.43	36.21	14.67	24.78	28.30	36.39	39.48
	14	9.62	13.49	18.34	26.95	36.71	11.30	21.62	26.53	31.56	36.47
	21	7.73	1247	16.34	26.91	31.75	10.78	19.12	24.51	27.45	31.37
Kin 100 ppm	0	17.17	26.11	37.81	44.09	50.38	20.73	34.02	42.53	50.57	56.71
	7	11.84	16.37	22.76	34.55	37.28	15.79	25.03	30.47	40.52	41.55
	14	10.05	14.01	20.08	30.99	40.03	13.02	22.92	29.17	32.29	39.58
	21	8.67	13.43	18.28	27.87	33.74	12.13	20.74	27.29	29.28	34.30
L.S.D at	5%	2.932	4.408	5.882	5.831	7.116	2.242	3.109	4.091	5.047	5.049
	1%	3.905	5.871	7.833	7.765	9.477	2.986	4.140	5.448	6.721	6.724

from the treatment in the two seasons. The rest treatments occupied an intermediate position between the abovementioned treatments in both seasons under this study.

As for the effect of storage periods on floret wilting percentage Data of two seasons presented in Table (7) reveal that floret wilting percentage of tuberose cut flower spikes was increased with extending storage periods at 4±1°C for different days (0, 7, 14 and 21 days). However, storage periods at 4±1°C for 0-time treatment induced the lowest values in floret wilting percentage of tuberose cut flower spikes when compared to the other ones under study in both seasons. Moreover, tuberose cut flower spikes were stored at 4±1°C for 21 days recorded highly significant increase in floret wilting percentage as compared to other different storage periods in the two seasons.

Regarding to the interaction effect between growth regulators and storage periods, data in Table (10) demonstrate that all the combinations between growth regulators and storage periods succeeded in decreasing the floret wilting percentage of tuberose cut flower spikes when compared to control in the two seasons. However, the combinations between (GA_3 at 300ppm or kinetin at 100ppm) and storage periods at 4±1°C for (0,7,14 and 21days) recorded the highest decreases of floret wilting percentage of tuberose cut flower spikes, especially the interaction between (GA_3 at 300ppm or kinetin at 100ppm) and storage period at 4±1°C for 0 time after 3,6,9,12 and 15days from the treatment as compared to control in the two seasons.

Table (10) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Floret wilting percentage of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Floret wilting percentage 1st season				Floret wilting percentage 2nd season			
		Shelf life periods (days)				Shelf life periods (days)			
Growth regulators	Storage periods	6	9	12	15	6	9	12	15
Control	0	30.83	61.16	76.39	98.81	20.50	49.66	77.53	95.56
	7	41.33	77.06	96.67	-	30.16	59.26	90.98	-
	14	53.67	93.33	98.29	-	38.89	71.03	98.61	-
	21	62.50	99.89	-	-	50.00	81.55	-	-
GA_3 200ppm	0	14.29	37.91	61.79	77.44	13.10	39.34	63.60	77.94
	7	30.10	55.98	77.27	93.86	26.19	50.00	71.72	98.93
	14	36.11	81.39	91.00	97.29	30.16	60.65	87.88	-
	21	52.00	92.14	98.85	-	40.78	77.98	100.00	-
GA_3 300ppm	0	13.15	29.57	52.54	68.51	12.17	35.84	53.17	66.96
	7	24.70	50.93	67.86	90.33	25.27	52.32	70.15	93.86
	14	33.78	69.94	88.24	95.24	27.38	57.87	84.24	73.21
	21	43.56	71.8	94.33	-	34.92	78.57	92.96	-
BA 25 ppm	0	17.79	45.39	59.86	78.69	14.54	37.82	60.32	76.54
	7	37.22	56.96	81.47	100.00	26.19	51.85	82.02	99.41
	14	49.00	72.42	97.06	-	30.56	63.43	95.91	-
	21	60.00	90.32	100.00	-	42.06	81.88	-	-
BA 50 ppm	0	15.60	37.18	62.94	78.91	14.55	31.87	58.89	72.47
	7	30.83	58.06	79.55	99.04	25.70	44.82	79.55	72.95
	14	41.11	73.69	97.74	-	29.70	55.56	90.30	-
	21	57.17	88.89	100.00	-	41.21	75.00	98.05	-
Kin 50 ppm	0	15.52	35.51	58.08	73.30	14.55	37.92	58.89	73.64
	7	35.56	63.39	79.55	98.83	26.71	50.00	77.78	96.54
	14	45.50	79.37	97.74	-	29.46	55.56	88.33	-
	21	60.67	95.78	98.82	-	40.78	78.24	100.00	-
Kin 100 ppm	0	6.96	31.55	54.80	67.01	11.79	30.95	54.04	67.06
	7	13.33	54.17	71.78	91.58	24.63	43.33	67.52	91.58
	14	43.33	74.17	87.27	98.33	27.38	53.33	88.55	-
	21	51.67	91.91	94.37	-	34.07	72.22	92.96	-
L.S.D at	5%	10.95	15.95	10.89	9.659	8.990	13.13	16.91	23.44
	1%	14.59	21.24	14.50	12.362	11.97	17.48	22.51	31.21

2.2. -Water relations characters:

2.2.a-Water uptake (g) spike:

It is clear from Table (11) that the absorbed solution by tuberose cut flower spikes increased as cut flower spike advanced in age after 3 days from the treatment till 12 days then decreased till the end of longevity in the two season under this study. The treatment of GA_3 at 300ppm and kinetin at 100ppm is being the best treatments for increasing the water uptake of tuberose cut flower spike when compared to control and other treatments in both seasons. Regardless control, the lowest mean values of water uptake by tuberose cut flower spikes was registered by using the treatment of BA at 25ppm during all tested shelf life periods in the two seasons. The rest treatments occupied an intermediate position between the abovementioned treatments in both seasons of this study. Concerning the effect of storage periods on Water uptake (g) spike ,data presented in Table (12) that the absorbed solution by tuberose cut flower spikes increased as cut flower spike advanced in age after 3 days from the treatment till the end of longevity in the two seasons under storage periods treatments at 4±1°C under study. It is clear that, water uptake by tuberose cut flower spikes was greatly influenced by storage periods at 4±1°C in both seasons. The lowest water uptake value was recorded when storage periods were increased. The highest water uptake was with those stored at 4±1°C for 0-time storage period compared with those stored for 7, 14 and 21 days respectively in both seasons. The reduction of water uptake value recorded with the increase of storage periods at low temperature may be due the lowest efficiency of absorption by stem cells. Similar results by using storage

Table (11): Effect of some growth regulators treatments, on Water uptake, Water loss and Water balance (g)/spike of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Water uptake (g)/spike Shelf life periods (days)					Water loss (g)/spike Shelf life periods (days)					Water balance (g)/spike Shelf life periods (days)				
		3	6	9	12	15	3	6	9	12	15	3	6	9	12	15
1st season																
Growth Regulators	Control	54.26	87.81	116.73	135.73	97.43	47.41	82.69	116.76	142.03	103.03	6.84	5.12	-0.03	-6.29	-5.60
	GA_3 200ppm	61.08	105.43	127.47	150.43	106.78	53.49	100.82	126.73	155.13	108.90	7.59	4.62	0.73	-4.70	-2.13
	GA3 300ppm	67.52	111.49	137.18	164.23	115.83	58.55	104.2	134.78	167.13	118.83	8.96	7.25	2.39	-2.90	-3.01
	BA 25 ppm	60.87	96.72	126.48	148.90	105.03	54.15	92.11	127.75	155.53	109.61	6.72	4.61	-1.27	-6.63	-4.58
	BA 50 ppm	63.51	101.07	133.70	155.40	109.55	56.45	95.84	133.52	160.22	113.28	7.06	5.23	0.18	-4.82	-3.73
	Kin 50 ppm	64.27	105.73	133.41	157.49	110.86	56.21	99.56	131.88	159.82	114.32	8.06	6.18	1.53	-2.33	-3.46
	Kin 100 ppm	68.21	110.20	137.99	165.33	115.90	59.86	10358	136.08	169.28	118.93	8.35	6.62	1.91	-3.94	-3.03
L.S.D at	5 %	0.652	0.879	0.857	0.780	0.507	1.689	0.959	0.898	2.375	0.541	1.671	0.226	0.308	2.178	0.217
	1%	0.869	1.160	1.142	1.039	0.676	2.249	1.278	1.196	3.162	0.721	2.225	0.301	0.411	2.901	0.288
2nd season																
Growth Regulatos	Control	57.22	89.98	118.46	138.68	98.68	50.93	85.53	119.13	145.54	104.88	6.29	4.44	-0.67	-6.86	-6.20
	GA_3 200ppm	62.64	99.85	128.34	152.83	107.93	59.50	94.93	127.47	158.33	112.23	3.14	4.93	0.88	-5.51	-4.31
	GA3 300ppm	69.87	111.27	136.74	166.73	117.10	61.14	103.66	135.05	169.31	120.15	8.73	7.61	1.69	-2.58	-3.05
	BA 25 ppm	62.64	99.20	126.76	149.04	106.68	55.70	93.68	126.66	146.52	111.37	6.95	5.52	0.10	-2.53	-4.69
	BA 50 ppm	64.50	102.89	132.87	157.56	110.99	59.47	97.25	132.11	162.29	115.26	5.03	5.64	0.76	-4.73	-4.23
	Kin 50 ppm	65.93	104.34	133.68	159.24	111.79	56.61	98.23	13238	163.95	115.62	9.33	6.11	1.30	-4.71	-3.83
	Kin 100 ppm	70.31	111.48	138.14	167.79	117.38	61.72	105.00	137.17	171.53	119.38	8.40	6.48	0.98	-3.74	-2.00
L.S.D at	5 %	1.261	1.416	1.083	1.350	1.116	3.139	1.448	1.493	9.950	1.217	3.408	0.209	0.994	8.976	0.204
	1%	1.679	1.885	1.443	1.798	1.486	4.180	1.928	1.989	13.25	1.621	4.538	0.278	1.324	11.95	0.271

Table (12): Effect of Storage periods (Days) treatments on Water uptake, Water loss and Water balance (g)/spike of *Polianthes tuberosa L.*. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Water uptake (g)/spike					Water loss (g)/spike					Water balance (g)/spike				
		Shelf life periods (days)					Shelf life periods (days)					Shelf life periods (days)				
		3	6	9	12	15	3	6	9	12	15	3	6	9	12	15
1st season																
Storage periods (Days)	0	77.71	138.54	181.08	212.84	234.80	64.51	123.65	173.68	210.58	238.74	13.20	14.89	7.41	2.26	-3.94
	7	71.91	121.38	154.88	177.36	200.28	63.64	115.46	154.44	181.90	210.20	8.26	5.92	0.43	-4.54	-10.64
	14	54.91	81.28	103.95	124.11	-	49.31	78.88	104.66	130.56	-	5.59	2.40	-0.71	-6.44	-
	21	46.73	69.34	81.79	101.41	-	43.18	69.91	85.80	110.76	-	3.56	-0.57	-4.01	-9.34	-
L.S.D at	5 %	0.493	0.658	0.648	0.589	0.383	1.277	0.725	0.679	1.795	0.409	1.263	0.171	0.233	1.647	0.164
	1%	0.657	0.877	0.863	0.785	0.511	1.700	0.966	0.904	2.391	0.548	1.682	0.227	0.311	2.193	0.218
2nd season																
Storage periods (Days)	0	79.31	139.52	182.33	215.55	237.84	66.53	124.96	175.17	209.89	242.45	12.78	14.56	7.16	5.66	-4.61
	7	73.43	119.71	153.08	178.72	202.46	66.38	112.81	152.16	183.81	214.03	7.05	6.90	0.92	-5.10	-11.57
	14	57.00	81.16	104.59	126.05	-	52.64	79.43	106.22	132.01	-	4.36	1.73	-1.63	-5.95	-
	21	49.07	70.47	82.84	103.60	-	45.91	70.39	86.42	112.85	-	3.16	0.08	-3.58	-9.25	-
L.S.D at	5 %	0.953	1.070	0.819	1.021	0.843	2.373	1.094	1.129	7.522	0.920	2.576	0.518	0.751	6.785	0.154
	1%	1.270	1.425	1.091	1.359	1.123	3.160	1.458	1.503	10.02	1.225	3.430	0.210	1.00	9.036	0.205

periods were reported by **Diab (2007)** on tuberose spikes. **Gendy (2007)** on gladiolus cut flower spikes storage tuberose spikes for two weeks highly significantly decreased preservative solution uptake .

Concerning the interaction effect between growth regulators and storage periods, data in Table (13) reveal that all the interaction between growth regulators and storage periods of tuberose cut flower spikes resulted increases of water uptake as compared to control in the two seasons. However, the interaction treatments between kinetin at 100ppm or GA_3 at 300ppm and storage periods at 4±1°C for 0,7,14 and 21days recorded the highest significant increase of this parameter, especially the interaction between kinetin at 100ppm and storage period at 4±1°C for 0-time after 3,6,9,12 and 15days from the treatment when compared to the other ones and study in the two seasons.

Furthermore, water uptake of tuberose cut flower spikes by using all the interaction treatments between growth regulators and storage periods at 4±1°C for (0,7,14 and 21days) was increased as flower cut spikes advanced in age after 3days from the treatment till the end of age of longevity in the two seasons.

2.2.b.-Water loss g/spike:

Data in Table (11) clear that water loss by tuberose cut flower spikes increased as cut flower spikes prolonged in longevity after 3, 6, 9 and 12 days then decreased after this day to the end of longevity. The treatments of kinetin at 100ppm and GA_3 300ppm approved to be the most effective treatments for inducing the greatest increases in water loss of tuberose cut

Table (14) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Water loss (g)/spike of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Water loss (g)/spike 1st season					Water loss (g)/spike 2nd season				
Growth regulators	Storage periods	Shelf life periods (days)					Shelf life periods (days)				
		3	6	9	12	15	3	6	9	12	15
Control	0	60.57	114.23	161.37	191.20	220.87	63.90	118.53	164.70	196.30	225.03
	7	57.43	99.67	139.27	164.57	191.27	58.73	96.37	140.90	166.47	194.50
	14	36.67	62.40	93.00	114.37	-	42.57	67.93	95.97	118.60	-
	21	35.00	54.47	73.40	97.97	-	38.53	59.30	74.93	100.80	-
GA_3 200ppm	0	62.97	124.87	170.23	207.23	225.00	65.63	122.53	171.73	209.33	236.50
	7	59.57	121.20	151.97	177.63	210.60	66.20	111.63	150.93	181.37	212.43
	14	48.53	84.13	102.50	128.20	-	50.90	76.57	104.93	131.73	-
	21	42.88	73.07	82.23	107.47	-	45.33	68.97	82.27	110.90	-
GA_3 300ppm	0	66.50	130.43	179.30	223.03	253.80	68.60	132.27	180.63	227.30	256.43
	7	67.17	123.20	159.47	191.97	221.53	70.00	119.63	156.47	194.53	224.17
	14	54.25	87.93	108.70	138.87	-	56.93	86.80	110.83	137.13	-
	21	46.30	75.40	91.67	114.67	-	49.03	75.93	92.27	118.27	-
BA 25 ppm	0	63.70	120.17	168.73	205.43	232.97	65.63	121.47	171.30	204.80	236.77
	7	63.03	112.47	157.00	180.33	205.47	63.65	111.33	150.20	177.00	208.70
	14	48.23	71.10	101.50	126.67	-	49.23	75.03	101.67	127.40	-
	21	41.63	64.70	83.77	109.70	-	44.27	66.90	83.47	107.73	-
BA 50 ppm	0	63.17	120.87	177.17	215.67	240.83	65.60	124.03	178.37	216.50	244.73
	7	67.13	115.90	161.77	183.13	212.27	69.23	115.17	153.87	185.90	216.17
	14	51.50	77.30	108.07	132.13	-	53.93	78.67	107.73	132.97	-
	21	44.00	69.30	87.07	109.93	-	49.10	71.13	88.47	113.80	-
Kin 50 ppm	0	65.43	124.93	177.83	207.57	243.07	66.30	124.83	177.10	217.70	245.73
	7	63.17	115.77	153.57	183.70	214.20	66.03	114.10	154.00	186.10	216.73
	14	51.13	82.67	107.77	133.10	-	47.70	81.70	109.03	134.43	-
	21	45.10	74.87	88.33	114.90	-	46.40	72.30	89.37	117.57	-
Kin 100 ppm	0	69.23	130.07	181.10	223.90	254.63	70.03	131.03	182.37	228.17	251.97
	7	68.00	120.03	158.07	191.97	221.10	70.83	121.47	158.73	195.33	225.53
	14	54.87	86.63	111.07	140.57	-	57.27	89.33	113.40	141.77	-
	21	47.33	77.60	94.10	120.67	-	48.73	78.17	94.17	120.87	-
L.S.D at	5%	3.377	1.919	1.795	4.749	1.082	6.277	2.896	2.987	19.90	2.435
	1%	4.498	2.555	2.391	6.325	1.441	8.360	3.856	3.978	26.50	3.242

period at 4±1°C for 0-time after 3,6,9,12 and 15days from the treatment as compared to control in the two seasons.

Anyhow, water loss of tuberose cut flower spikes by using all interaction treatments between growth regulators and different storage period at 4±1°C was increased as flower cut spikes prolonged in age after 3days from the treatment to the end of age of longevity in both seasons.

22.2.c.-Water balance (g)/spike:

According to data presented in Table (11) it could be concluded that all studied pre-harvest treatments significantly increased water balance of tuberose cut flower spikes as compared to control in both seasons, with the exception of GA_3 at 200ppm after 3 days of shelf life periods in second season. However, the treatments of GA_3 at 300ppm and kinetin at 100ppm recorded the highest records of water balance of tuberose cut flower spikes compared to the other ones of treatments under study in the two seasons (water balance by tuberose cut flower spikes decreased after 3 day from the treatment in the two seasons).

As for the effect of storage periods on Water balance Data presented in Table (12) showed that tuberose cut flower spikes stored at 4±1°C for different periods (0, 7, 14 and 21 days) recorded an decreases in water balance after 3, 6, 9, 12 and 15 day from the treatment under study in both seasons. However, the highest value of water balance was recorded by using 0-time storage period, whereas the lowest value of water balance was

gained by using 21 days storage periods after 3, 6, 9, 12 and 15 days from the treatment in both seasons under study.

Moreover, tuberose cut flower spikes stored at 4±1°C for 0-time storage period recorded an enhancement in water balance until 6 days then gradually decreased after that day. While storage periods at 4±1°C for 7, 14 and 21 days by tuberose cut flower spike resulted an decreases in water balance after 3 day from the treatment till the end of longevity in the two seasons under study. Similar results by using storage periods were reported by **Abd El-Sadek (2005)** on gypsophila cut flowers, **Palanikumar et al., (2000)** on cut roses and **Hettiarachchi and Balas (2005)** on Gloriosa superba (Glory lily) cut flowers. **Gendy (2007)** on gladiolus cut flower spikes.

Referring to the interaction effect between growth regulators and storage periods on water balance, data in Table (15) reveal that all the interaction treatments between growth regulators and storage periods at 4±1°C for (0,7,14 and 21days) succeeded in increasing water balance of tuberose cut flower spikes as compared with control in the two seasons. However, the combinations between (GA_3 at 300ppm or kinetin at 100ppm) and storage periods at 4±1°C for (0,7,14 and 12days) recorded the highest increases of water balance values of tuberose cut flower spikes, especially the combined treatment between GA_3 at 300ppm and storage period at 4±1°c for 0-time after 3,6,g,12 and 15days from the treatment as compared to control in both seasons under this study. Irrespective control, the lowest mean values of water balance of tuberose cut flower spikes was registered by the interaction between BA at 25ppm

Table (15) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Water balance (g)/spike of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Water balance (g)/spike 1st season					Water balance (g)/spike 2nd season				
Growth regulators	Storage periods	Shelf life periods (days)					Shelf life periods (days)				
		3	6	9	12	15	3	6	9	12	15
Control	0	9.90	11.40	3.43	-3.40	-10.40	9.87	10.50	3.20	-3.37	-11.60
	7	7.57	6.93	0.97	-5.00	-12.00	7.07	6.80	0.70	-6.00	-13.20
	14	6.70	2.70	-0.20	-6.27	-	5.15	1.07	-1.80	-7.13	-
	21	3.20	-0.57	-4.30	-10.50	-	3.07	-0.60	-4.77	-10.93	-
GA_3 200ppm	0	13.47	16.03	9.70	2.27	3.43	13.00	14.27	7.23	2.13	-4.83
	7	10.90	2.73	-1.50	-4.30	-11.93	4.50	5.80	0.73	-5.87	-12.40
	14	3.40	1.30	-1.93	-7.07	-	2.80	0.87	-2.87	-8.23	-
	21	2.59	-1.60	-3.33	-9.70	-	2.20	-1.23	-1.60	-10.07	-
GA_3 300ppm	0	15.97	16.90	9.27	3.47	-2.33	15.53	15.77	9.07	2.20	-2.23
	7	9.37	7.90	2.00	-4.07	-9.70	9.60	9.70	1.90	-4.47	-9.97
	14	6.45	3.33	0.20	-5.90	-	5.90	3.23	-1.30	-1.87	-
	21	4.07	0.87	-1.90	-5.10	-	3.87	1.73	-2.90	-6.20	-
BA 25 ppm	0	11.97	13.67	5.06	-1.90	-7.07	12.03	14.10	5.27	1.23	-7.30
	7	6.50	4.73	-1.6	-5.43	-11.23	6.75	6.87	0.90	-4.90	-11.47
	14	5.23	1.70	-1.50	-7.20	-	5.50	1.50	-1.20	-6.80	-
	21	3.17	-1.67	-4.01	-12.00	-	3.50	-0.40	-4.57	-10.30	-
BA 50 ppm	0	14.37	15.47	6.46	1.50	-4.43	11.50	15.73	7.63	1.90	-4.97
	7	5.77	4.57	-0.87	-4.30	-10.47	4.80	5.20	0.50	-5.07	-11.97
	14	4.57	1.93	-0.93	-6.97	-	3.53	1.83	-1.23	-5.90	-
	21	3.53	-1.07	-3.94	-9.50	-	0.30	-0.20	-3.87	-9.87	-
Kin 50 ppm	0	12.80	14.97	8.90	10.80	-4.07	13.30	14.87	9.20	2.13	-4.07
	7	9.50	7.27	1.67	-4.60	-9.77	8.70	7.90	0.93	-5.07	-11.23
	14	6.20	2.73	-0.57	-6.10	-	11.50	1.90	-1.07	-6.03	-
	21	3.73	-0.27	-3.87	-9.40	-	3.80	-0.23	-3.87	-9.87	-
Kin 100 ppm	0	13.97	15.80	9.00	3.10	-2.73	14.23	16.70	8.53	2.53	2.77
	7	8.23	7.30	2.40	-4.07	-9.70	7.93	6.03	0.80	-4.30	-10.77
	14	6.60	3.07	-0.03	-5.60	-	6.07	1.70	-1.97	-5.70	-
	21	4.60	0.30	-3.73	-9.20	-	5.37	1.50	-3.47	-7.50	-
L.S.D at	5%	3.341	0.451	0.617	4.356	0.433	6.815	0.417	1.988	17.95	0.407
	1%	4.450	0.601	0.822	5.882	0.577	9.076	0.556	2.648	23.91	0.543

and storage period at 4±1°C for 21days after 3,6,g and 12days from the treatment when compared with control in the two seasons.

2.3.Effect of some growth regulators as pre-treatments and storage periods on:

2.3.Chemical constituent determinations:

2.3.1-Chlorophyll "a", chlorophyll "b" and Carotenoids in leaves /spike (mg/gf.w.):

Data presented in Table (16) reveal that all growth regulators treatments succeeded in increasing chlorophyll a and chlorophyll b in leaves/spike (mg/g f.w.) of tuberose cut flower spikes as compared to control in the two seasons. However the highest significant increase of these parameter were recorded by using GA_3 at 300ppm as compared to control in the two seasons, followed descendingly by kinetin at 100ppm and BA at 50ppm in the two seasons. On contrary, the lowest values of these parameter of tuberose cut flower spikes was registered by using control in the two seasons under this study.

Furthermore, Data in Table (16) indicate that, all growth regulators treatments increased carotenoids in leaves/spike (mg/g f.w.) of tuberose cut flower spikes as compared to control in the two seasons. However, using the treatment of kinetin at 100ppm of tuberose cut flower spikes exhibited to be the most effective one for inducing the highest significant increase in this parameter as compared to control in the two seasons, followed descendingly by GA_3 at 300ppm and BA at 50ppm in the two seasons. On the reserve the lowest values of this parameter of

Table (16): Effect of some growth regulators treatments on Total phenols percentage, Total nitrogen percentage , Total protein percentage , Total phosphorus percentage and Total potassium percentage in petals and flower stalk of *Polianthes tuberosa* L.cut flower spike during the two seasons of 2007-2008/2008-2009 .

Treatments		Total phenols percentage in petals		Total phenols percentage in flower stalk		Total nitrogen percentage in petals		Total protein percentage in petals		Total nitrogen percentage in flower stalk		Total protein percentage in flower stalk		Phosphorus percentage in petals		Phosphorus percentage in flower stalk		Potassium percentage in petals		Potassium percentage in flower stalk	
		1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Growth Regulators	Control	0.248	0.220	0.242	0.228	3.539	3.566	22.12	22.29	3.305	3.313	20.66	20.71	0.825	0.825	0.739	0.737	2.909	2.918	2.279	2.305
	GA_3 200ppm	0.185	0.176	0.162	0.145	3.320	3.750	20.75	23.44	3.679	3.653	23.00	22.83	0.900	0.907	0.767	0.768	3.077	3.113	2.357	2.367
	GA_3 300ppm	0.173	0.152	0.154	0.165	3.879	3.852	24.25	24.08	3.801	3.816	23.76	23.85	0.928	0.920	0.815	0.820	3.243	3.273	2.409	2.421
	BA 25 ppm	0.198	0.176	0.192	0.170	3.670	3.621	22.94	22.63	3.523	3.543	22.02	22.15	0.887	0.893	0.782	0.772	2.979	3.010	2.327	2.345
	BA 50 ppm	0.190	0.167	0.178	0.181	3.793	3.823	23.71	23.90	3.687	3.677	23.04	22.98	0.913	0.918	0.804	0.807	3.129	3.148	2.393	2.399
	Kin 50 ppm	0.214	0.212	0.171	0.161	3.706	3.698	23.16	23.11	3.588	3.607	22.43	23.55	0.899	0.906	0.786	0.777	3.086	3.153	2.380	2.397
	Kin 100 ppm	0.185	0.161	0.166	0.164	3.888	3.840	24.30	24.00	3.797	3.774	23.73	23.59	0.948	0.954	0.835	0.836	3.233	3.275	2.420	2.427
L.S.D at	5 %	0.012	0.012	0.010	0.012	0.097	0.052	0.615	0.319	0.052	0.073	0.324	0.449	0.045	0.324	0.056	0.016	0.037	0.026	0.014	0.009
	1%	0.015	0.165	0.013	0.015	0.129	0.069	0.819	0.425	0.069	0.097	0.432	0.598	0.059	0.432	0.075	0.022	0.049	0.034	0.018	0.012

tuberose cut flower spikes was registered by control in both seasons under study.

As for the effect of storage periods on Chlorophyll a, chlorophyll b and carotenoids (mg/g f.w.). It is quite clear from the data in Table (17) that there were gradual decrease in chlorophyll a, chlorophyll b and carotenoids in leaves/spike (mg/g f.w) of tuberose cut flower spikes with extending storage periods at 4±1°C for different days (0-time, 7, 14 and 21 days). However, storage periods at 4±1°C for 0-time treatment showed the highest significant increase in these parameters of tuberose cut flowers spikes when compared to the other ones under study in the two seasons. On the reverse the lowest values of these parameters of tuberose cut flower spikes was registered by storage periods at 4±1°C for 21days as compared to different storage periods in both seasons.

Regarding to the effect of interaction between growth regulators and storage periods on Chlorophyll "a" and caroteniods content (mg/g f.w.), Data in Table (18) reveal that all the combinations treatments between growth regulators and storage periods (0-time, 7, 14 and 21days) at 4±1°C increased chlorophyll and carotenoids in leaves/spikes (mg/g f.w.) of tuberose cut flower spikes as compared to control in the two seasons. However, the combinations treatments between kinetin at 100ppm and different storage periods at 4±1°C for (0-time, 7, 14 and 21days) showed to be the most effective one for inducing the highest values of these parameters of tuberose cut flower spikes as compared to control in the two seasons in most cases, especially the combined treatment between kinetin at 100ppm

Table (17): Effect of storage periods (Days) treatments on Chlorophyll ,a,b, Carotenoids in leaves /spike (mg /g f.w.) ,Total sugars percentage , Reducing sugars percentage and Non-Reducing sugars percentage in petals and flower stalk of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Chlorophyll ,a, in leaves/ spike (mg/g f. w.)		Chlorophyll ,b, leaves/ spike (mg/g f. w.)		Carotenoids in leaves/ spike (mg/g f. w.)		Total sugars percentage in petals		Reducing sugars percentage in petals		Non-Reducing sugars percentage in petals		Total sugars percentage in flower stalk		Reducing sugars percentage in flower stalk		Non -Reducing sugars percentage in flower stalk	
		1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Storage periods (days)	0	0.798	0.800	0.432	0.431	0.406	0.408	5.874	5.892	2.726	2.753	3.139	3.139	6.559	6.562	3.276	3.250	3.283	3.313
	7	0.787	0.790	0.422	0.429	0.392	0.392	3.649	3.811	1.729	1.717	1.820	2.096	3.973	4.011	1.983	1.978	1.990	2.033
	14	0.580	0.594	0.327	0.329	0.319	0.320	2.418	2.951	1.211	1.225	1.207	1.366	2.797	2.847	1.326	1.368	1.471	1.480
	21	0.490	0.495	0.250	0.246	0.234	0.235	1.467	1.468	0.875	0.862	0.502	0.606	1.836	1.890	1.043	1.050	0.793	0.841
L.S.D at	5 %	0.012	0.009	0.008	0.006	0.007	0.007	0.039	0.020	0.039	0.039	0.055	0.205	0.092	0.098	0.071	0.345	0.104	0.145
	1%	0.016	0.012	0.010	0.008	0.010	0.009	0.052	0.271	0.052	0.052	0.074	0.273	0.122	0.130	0.094	0.459	0.138	0.193

Table (18): Effect of interaction between some growth regulators and Storage periods (Days) treatments on Chlorophyll, a, Chlorophyll ,b, and Carotenoids in leaves/ spike(mg/g f. w.) of *Polianthes tuberosa* L during the two seasons of 2007-2008/2008-2009 .

Treatments		Chlorophyll ,a, in leaves/ spike (mg/g f. w.)				Chlorophyll ,b, leaves/ spike (mg/g f. w.)				Carotenoids in leaves/ spike (mg/g f. w.)			
Growth regulators		Storage periods (days)				Storage periods (days)				Storage periods (days)			
		0	7	14	21	0	7	14	21	0	7	14	21
		1st season											
Control		0.733	0.697	0.520	0.430	0.400	0.390	0.323	0.243	0.373	0.367	0.297	0.233
GA_3 200ppm		0.797	0.763	0.587	0.490	0.430	0.410	0.313	0.247	0.417	0.400	0.310	0.227
GA_3 300ppm		0.823	0.837	0.650	0.523	0.457	0.453	0.337	0.267	0.437	0.417	0.337	0.237
BA 25 ppm		0.763	0.767	0.550	0.470	0.423	0.433	0.323	0.243	0.383	0.360	0.310	0.233
BA 50 ppm		0.820	0.820	0.600	0.497	0.450	0.440	0.333	0.250	0.400	0.300	0.330	0.240
Kin 50 ppm		0.800	0.763	0.580	0.490	0.413	0.403	0.320	0.240	0.397	0.390	0.310	0.230
Kin 100 ppm		0.840	0.820	0.637	0.530	0.450	0.427	0.337	0.260	0.437	0.423	0.340	0.237
L.S.D at	5%	0.033				0.020				0.019			
	1%	0.044				0.027				0.026			
		2nd season											
Control		0.730	0.703	0.523	0.440	0.393	0.397	0.323	0.240	0.377	0.357	0.293	0.227
GA_3 200ppm		0.790	0.793	0.600	0.497	0.430	0.420	0.320	0.243	0.413	0.403	0.313	0.233
GA_3 300ppm		0.830	0.837	0.640	0.520	0.457	0.453	0.340	0.257	0.427	0.417	0.337	0.237
BA 25 ppm		0.777	0.763	0.550	0.470	0.420	0.440	0.330	0.243	0.387	0.363	0.310	0.233
BA 50 ppm		0.823	0.820	0.613	0.510	0.447	0.447	0.337	0.247	0.400	0.390	0.330	0.243
Kin 50 ppm		0.810	0.800	0.590	0.490	0.417	0.407	0.317	0.230	0.407	0.393	0.313	0.233
Kin 100 ppm		0.837	0.817	0.640	0.540	0.453	0.437	0.337	0.263	0.443	0.420	0.340	0.240
L.S.D at	5%	0.023				0.016				0.019			
	1%	0.031				0.022				0.025			

and storage periods at 4±1°C for 0-time in the two seasons of this study. Moreover, the combination treatments between GA_3 at 300ppm or BA at 50ppm and storage periods at 4±1°C for 0-time and 7days resulted highly significant increase in chlorophyll a and carotenoids in leaves/spike of tuberose cut flower spikes as compared to control in both seasons. Irrespective control, the lowest values of these parameters of tuberose cut flower spikes was recorded by using the combined treatments between BA at 25ppm and different storage periods at 4±1°C for O-time, 7, 14 and 21days in most cases in the two seasons under this study.

Furthermore, Data in Table (18) indicate that all the combinations treatments between growth regulators and storage periods at 4±1°C for (0-time, 7, 14 and 21days) increased chlorophyll "b" in leaves/spikes (mg/g f.w) of tuberose cut flower spikes as compared to control in the two seasons. However the highest values of this parameter of tuberose cut flower spikes was registered by using the combinations treatments between GA_3 at 300ppm and different storage periods at 4±1°C for (0-time, 7, 14 and 21days) as compared to control in the two seasons, especially the combined treatment between GA_3 at 300ppm and storage periods at 4±1°C for 0-time in the two seasons of this study. Moreover, using the combinations treatments between kinetin at 100ppm or BA at 50ppm and storage periods at 4±1°C for (0-time and 7days) recorded highly increases in this parameter of tuberose cut flower spikes as compared to control in both seasons. On the other side, the lowest values of this parameter of tuberose cut flower spikes

was recorded by using the combined treatment between kinetin at 50ppm and storage periods at 4±1°C for 21days as compared to the other ones under study in the two seasons.

2.2.2.-Total sugars percentages:

Data in Table (16) reveal that all growth regulators treatments increased total sugars percentage in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, the highest values of these parameter of tuberose cut flower spikes was registered by using kinetin at 100ppm as compared to control in the two seasons in most cases, followed descendingly by GA_3 at 300ppm in both seasons under this study. On the reverse, the lowest values of these parameter was recorded by using control in the two seasons. The rest treatment between the abovementioned treatments occupied an intermediate position in this concern in the two seasons.

Concerning the effect of storage periods on Total sugars percentages, Data listed in Table (17) demonstrate that there were gradual decrease in total sugars percentage in petals and flower stalks of tuberose cut flower spikes with extending storage periods at 4±1°C for different days (O-time, 7, 14 and 21days) in the two seasons. However, tuberose cut flower spikes were stored at 4±1°C for O-time recorded the highest significant increase of these parameters as compared to different storage periods in both seasons, followed descendingly by storage periods at 4±1°C for 7 days. Moreover storage periods at 4±1°C for 21 days treatment recorded highly significant decrease in total sugars percentage in petals and flower stalks of tuberose

cut flower spikes when compared to the other ones under study in the two seasons. Similar results by using storage periods were reported by **Diab (2007)** reported that Storing tuberose spikes for two weeks significantly decreased soluble, non soluble and total carbohydrates in the petals. Also decreasing storage period to 5 or 10 days showed similar significant reduction in carbohydrates percentage.

As for the effect of interaction between growth regulators and storage periods on total sugars percentages, Data in Tables (19&20) demonstrate that all the combinations treatments between growth regulators and storage periods at 4±1°C for 0-time, 7, 14 and 21days increased total sugars percentage in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, the highest significant increments of these parameters was registered by using the combinations treatments between kinetin at 100ppm and different storage periods at 4±1°C for 0-time, 7, 14 and 21days as compared to control in the two seasons in most cases, especially the combined treatment between kinetin at 100ppm and storage periods at 4±1°C for 0-time as compared to the other ones of this study in the two seasons. Moreover the combinations treatments between GA_3 at 300ppm and storage periods at 4±1°C for 0-time resulted highly increases in total sugars percentage in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons.

Table (19): Effect of interaction between some growth regulators and Storage periods(Days) treatments on Total sugars percentage, Reducing sugars percentage and non reducing sugars percentage in petals of *Polianthes tuberosa* L cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Total sugars percentage in petals				Reducing sugars percentage in petals				Non-Reducing sugars percentage in petals			
Growth regulators		Storage periods (days)				Storage periods (days)				Storage periods (days)			
		0	7	14	21	0	7	14	21	0	7	14	21
		1st season											
Control		5.73	3.51	2.33	1.37	2.63	1.59	0.99	0.60	3.10	1.92	1.34	0.77
GA_3 200ppm		5.84	3.65	2.42	1.40	2.76	1.73	1.26	0.91	3.08	1.92	1.16	0.49
GA_3 300ppm		5.99	3.78	2.49	1.62	2.77	1.79	1.34	1.05	3.22	1.99	1.16	0.57
BA 25 ppm		5.84	3.57	2.37	1.41	2.76	1.74	1.16	0.79	3.08	1.83	1.22	0.62
BA 50 ppm		5.87	3.63	2.42	1.45	2.82	1.76	1.19	0.84	3.06	1.87	1.23	0.61
Kin 50 ppm		5.78	3.60	2.40	1.38	2.66	1.70	1.25	0.91	3.12	1.90	1.15	0.47
Kin 100 ppm		6.07	3.80	2.49	1.64	2.75	1.79	1.30	1.03	3.32	2.00	1.19	0.61
L.S.D at	5%	0.104				0.104				0.146			
	1%	0.138				0.138				0.195			
		2nd season											
Control		5.81	3.51	2.34	1.37	2.68	1.57	1.03	0.64	3.15	1.94	1.31	0.73
GA_3 200ppm		5.85	3.71	2.42	1.39	2.82	1.73	1.25	0.85	3.03	1.98	1.17	0.54
GA_3 300ppm		6.00	3.77	2.59	1.62	2.78	1.78	1.36	1.06	3.23	1.99	1.23	0.56
BA 25 ppm		5.87	3.58	2.44	1.42	2.76	1.71	1.15	0.75	3.11	1.87	1.26	0.67
BA 50 ppm		5.86	3.70	3.45	1.46	2.86	1.74	1.22	0.84	3.00	1.96	2.23	0.62
Kin 50 ppm		5.78	4.62	2.41	1.38	2.65	1.70	1.26	0.89	3.12	2.92	1.15	0.49
Kin 100 ppm		6.08	3.79	2.52	1.63	2.74	1.78	1.31	1.00	3.33	2.01	1.22	0.63
L.S.D at	5%	0.538				0.104				0.543			
	1%	0.716				0.138				0.723			

Table (20): Effect of interaction between some growth regulators and Storage periods(Days) treatments on Total sugars percentage, Reducing sugars percentage , Non reducing sugars percentage in flower stalk and Total phenols percentage in petals and flower stalk of *Polianthes tuberosa* L cut flower spike during the two seasons of 2007-2008/2008-009.

Treatments		Total sugars percentage in flower stalk				Reducing sugars percentage in flower stalk				Non -Reducing sugars percentage in flower stalk				Total phenols percentage in petals				Total phenols percentage in flower stalk			
Growth regulators		Storage periods (days)				Storage periods (days)				Storage periods (days)				Storage periods (days)				Storage periods (days)			
		0	7	14	21	0	7	14	21	0	7	14	21	0	7	14	21	0	7	14	21
		1st season																			
Control		6.14	3.73	2.63	1.65	2.95	1.84	1.15	0.76	3.19	1.89	1.48	0.89	0.347	0.260	0.220	0.167	0.377	0.297	0.160	0.137
GA_3 200ppm		6.62	4.04	2.85	1.94	3.27	1.95	1.32	1.07	3.35	2.09	1.53	0.87	0.273	0.207	0.150	0.110	0.260	0.180	0.120	0.087
GA_3 300ppm		6.81	4.10	2.83	1.95	3.38	2.08	1.41	1.11	3.44	2.02	1.42	0.83	0.250	0.200	0.143	0.100	0.250	0.173	0.117	0.077
BA 25 ppm		6.41	3.84	2.73	1.82	3.20	1.97	1.32	1.10	3.21	1.87	1.41	0.72	0.300	0.220	0.160	0.110	0.290	0.220	0.140	0.120
BA 50 ppm		6.52	4.06	2.83	1.91	3.32	1.95	1.40	1.15	3.20	2.12	1.43	0.77	0.270	0.203	0.160	0.127	0.280	0.190	0.130	0.110
Kin 50 ppm		6.51	4.06	2.83	1.74	3.33	2.02	1.40	1.06	3.19	2.03	1.43	0.69	0.287	0.250	0.190	0.130	0.293	0.160	0.127	0.103
Kin 100 ppm		6.89	3.99	2.88	1.84	3.49	2.07	1.28	1.05	3.40	1.91	1.60	0.79	0.287	0.207	0.143	0.103	0.260	0.170	0.133	0.100
L.S.D at	5%	0.243				0.187				0.274				0.023				0.020			
	1%	0.323				0.249				0.365				0.030				0.027			
		2nd season																			
Control		6.13	3.74	2.95	1.72	2.88	1.82	1.16	0.73	3.25	1.92	1.79	0.98	0.310	0.250	0.190	0.130	0.340	0.290	0.150	0.130
GA_3 200ppm		6.63	4.02	2.87	1.95	3.22	1.96	1.26	1.08	3.41	2.06	1.61	0.87	0.270	0.197	0.130	0.107	0.250	0.157	0.097	0.077
GA_3 300ppm		6.82	4.12	2.83	2.00	3.34	2.08	1.38	1.09	3.48	2.04	1.46	0.90	0.237	0.180	0.120	0.073	0.257	0.197	0.120	0.087
BA 25 ppm		6.42	3.83	2.75	1.83	3.21	1.98	1.34	1.11	3.21	1.86	1.41	0.72	0.270	0.207	0.130	0.097	0.270	0.190	0.120	0.100
BA 50 ppm		6.48	4.10	2.85	1.94	3.33	1.95	1.35	1.14	3.15	2.16	1.50	0.80	0.243	0.197	0.137	0.100	0.283	0.190	0.150	0.100
Kin 50 ppm		6.52	4.06	2.83	1.82	3.34	1.99	1.78	1.08	3.19	2.08	1.05	0.74	0.303	0.260	0.177	0.107	0.283	0.153	0.110	0.097
Kin 100 ppm		6.95	4.20	2.85	1.98	3.44	2.08	1.31	1.10	3.51	2.12	1.54	0.87	0.270	0.170	0.127	0.077	0.250	0.177	0.137	0.093
L.S.D at	5%	0.259				0.911				0.384				0.025				0.023			
	1%	0.345				1.214				0.511				0.033				0.031			

2.3.3.-Reducing sugars percentages:

Data in Table (16) demonstrate that all growth regulators treatments increased Reducing sugars percentage in petals and flower stalks of the tuberose cut flower spikes as compared to control in the two seasons. However, using the treatment of GA_3 at 300ppm resulted the highest significant increment of this parameter of tuberose cut flower spikes as compared to control in the two seasons in most cases, followed descendingly by kinetin at 100ppm in the two seasons. Moreover using the treatment of kinetin at 50ppm and BA at 50ppm recorded highly increases in these parameter as compared to control in the two seasons under this study. **Diab (2007)** reported that Storing tuberose spikes for two weeks significantly decreased soluble, non soluble and total carbohydrates in the petals. Also decreasing storage period to 5 or 10 days showed similar significant reduction in carbohydrates percentage. **Abd El-Sadek (2005)** on gypsophila stored at 5°C for (0 - 5) day showed increase in total and reducing sugars percentage compared to storage at 5°C for 15 days treatment.

With respect to the effect of storage periods on Reducing sugars percentages.

Data presented in Table (17) indicate that there were gradual decrease in reducing sugars percentage in petals and flower stalks of tuberose cut flower spikes with extending storage periods at 4±1°C for different days (0-time, 7, 14 and 21days) in the two seasons. However, tuberose cut flower spikes were stored at 4±1°C for 0-time recorded the highest significant

increase of these parameters as compared to different storage periods in both seasons, followed descendingly by storage periods at 4±1°C for 7 days. Moreover storage periods at 4±1°C for 21 days treatment recorded highly significant decrease in reducing sugars percentage in petals and flower stalks of tuberose cut flower spikes when compared to the other ones under study in the two seasons. Similar results by using storage periods were reported by **Abd El- Sadek (2005)** on gypsophila stored at 5°C for (0 - 5) day showed increase in total and reducing sugars percentage compared to storage at 5 °C for 15 days treatment. **Diab (2007)** reported that Storing tuberose spikes for two weeks significantly decreased soluble, non soluble and total carbohydrates in the petals. Also decreasing storage period to 5 or 10 days showed similar significant reduction in carbohydrates percentage.

With regard to the effect of interaction between growth regulators and storage periods on Reducing sugars percentages, Data in Table (19) demonstrate that most the combinations treatments between growth regulators and storage periods (at 4±1°C) succeeded in increasing reducing sugars percentage in petals of tuberose cut flower spikes as compared to control in the two seasons. However, the combinations treatments between GA_3 at 300ppm and different storage periods at 4±1°C for 0-time, 7, 14 and 21days showed to be the most effective one for inducing the highest values of this parameter of tuberose cut flower spikes as compared to control in both season, especially the combined treatment between GA_3 at 300ppm and storage periods at 4±1°C for 0-time in the two seasons. Moreover, the

combinations treatments between kinetin at 100ppm storage periods at 4±1°C for (0-time, 7, 14 and 21days) recorded highly increases in reducing sugars in petals of tuberose cut flower spikes as compared to control in both seasons. Regardless control, the lowest values of this parameters of tuberose cut flower spikes was recorded by using the combined treatment between BA at 25ppm and storage periods at 4±1°C for 21days in the two seasons.

Furthermore, Data in Table (19) reveal that, most the combinations treatments between growth regulators and storage periods (at 4±1°C) succeeded in increasing reducing sugars percentage in flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, the combinations treatments between kinetin at 100ppm and storage periods at 4±1°C for 0-time showed to be the most effective one for inducing the highest values of this parameter of tuberose cut flower spikes as compared to control in both seasons. Moreover, the combinations treatments between GA_3 at 300ppm storage periods at 4±1°C for (0-time, 7, 14 and 21days) recorded highly increases in reducing sugars in flower stalks of tuberose cut flower spikes as compared to control in both seasons. Regardless control, the lowest values of this parameters of tuberose cut flower spikes was recorded by using the combined treatment between BA at 25ppm and storage periods at 4±1°C for 21days in the two seasons.

2.3.4.-Non- Reducing sugars percentages:

Data in Table (16) reveal that, all growth regulators treatments increased Non-Reducing sugars percentage in petals and flower stalks of tuberose cut flower spike as compared to control in the two seasons. However, the highest values of this parameter was recorded by using kinetin at 100ppm as compared to control in the two seasons in most cases, followed descendingly by GA_3 at 300ppm in the two seasons.

Moreover using the treatments of BA at 50ppm and GA_3 at 200ppm of Non-Reducing sugars percentage in petals and flower stalks respectively recorded highly increases in these parameter of tuberose cut flower spikes as compared to control in the two seasons. **Diab (2007)** reported that Storing tuberose spikes for two weeks significantly decreased soluble, non soluble and total carbohydrates in the petals. Also, decreasing storage period to 5 or 10 days showed similar significant reduction in carbohydrates percentage.

Referring to the effect of storage periods on Non-Reducing sugars percentags, Data in Table (17) reveal that there were gradual decrease in Non-Reducing sugars percentage in petals and flower stalks of tuberose cut flower spikes with extending storage periods at 4±1°C for different days (O-time, 7, 14 and 21days) in the two seasons. However, tuberose cut flower spikes were stored at 4±1°C for 0-time recorded the highest significant increase of these parameters as compared to different storage periods in both seasons, followed descendingly by storage periods at 4±1°C for 7 days. Moreover storage

periods at 4±1°C for 21 days treatment recorded highly significant decrease in Non-Reducing sugars percentage in petals and flower stalks of tuberose cut flower spikes when compared to the other ones under study in the two seasons.

Concerning the effect of interaction between growth regulators and storage periods on Non-reducing sugars percentages, Data in Tables (19&20) demonstrate that all the combinations treatments between growth regulators and storage periods at 4±1°C for 0-time, 7, 14 and 21days increased non-reducing sugars percentage in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However the highest significant increments of these parameters was registered by using the combinations treatments between kinetin at 100ppm and different storage periods at 4±1°C for 0-time, 7, 14 and 21days as compared to control in the two seasons in most cases, especially the combined treatment between kinetin at 100ppm and storage periods at 4±1°C for 0-time as compared to the other ones of this study in the two seasons. Moreover, the combinations treatments between GA_3 at 300ppm or BA at 50ppm and different storage periods at 4±1°C for 0-time, 7, 14 and 21days resulted highly increases in non-reducing sugars percentage in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons.

2.3.5.-Total phenols percentages:

Data in Table (21) reveal that all growth regulators treatments decreased total phenols percentage in petals and

Table (21): Effect of some growth regulators treatments on Chlorophyll ,a,b, Carotenoids in leaves /spike (mg /g f.w.) ,Total sugars percentage , Reducing sugars percentage and Non-Reducing sugars percentage in petals and flower stalk of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009 .

Treatments		Chlorophyll, a, in leaves/ spike (mg/g f. w.)		Chlorophyll ,b, leaves/ spike (mg/g f. w.)		Carotenoids in leaves/ spike (mg/g f. w.)		Total sugars percentage in petals		Reducing sugars percentage in petals		Non-Reducing sugars percentage in petals		Total sugars percentage in flower stalk		Reducing sugars percentage in flower stalk		Non - Reducing sugars percentage in flower stalk	
		1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Growth Regulators	Control	0.595	0.599	0.339	0.338	0.318	0.313	3.235	3.260	1.453	1.478	1.782	1.782	3.538	3.364	1.674	1.647	1.864	1.987
	GA_3 200ppm	0.662	0.670	0.350	0.353	0.338	0.341	3.328	3.342	1.665	1.662	1.663	1.680	3.861	3.867	1.902	1.879	1.959	1.988
	GA_3 300ppm	0.708	0.707	0.379	0.377	0.357	0.354	3.472	3.494	1.738	1.742	1.733	1.752	3.923	3.941	1.996	1.972	1.927	1.968
	BA 25 ppm	0.643	0.640	0.356	0.358	0.322	0.323	3.298	3.320	1.611	1.593	1.687	1.727	3.700	3.708	1.897	1.910	1.803	1.798
	BA 50 ppm	0.684	0.692	0.368	0.369	0.340	0.341	3.343	3.617	1.649	1.665	1.694	1.952	3.832	3.843	1.953	1.941	1.878	1.902
	Kin 50 ppm	0.663	0.673	0.344	0.342	0.332	0.337	3.289	3.546	1.630	1.626	1.659	1.920	3.787	3.809	1.953	2.046	1.834	1.763
	Kin 100 ppm	0.707	0.708	0.368	0.372	0.359	0.361	3.499	3.505	1.718	1.709	1.781	1.796	3.898	3.993	1.973	1.983	1.926	2.011
L.S.D at	5 %	0.016	0.012	0.010	0.008	0.010	0.009	0.052	0.269	0.052	0.052	0.073	0.272	0.121	0.129	0.093	0.456	0.137	0.192
	1%	0.022	0.015	0.013	0.011	0.013	0.012	0.069	0.358	0.069	0.069	0.097	0.362	0.162	0.172	0.124	0.607	0.182	0.256

flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, the highest significant reduce of these parameter was recorded by using GA_3 at 300ppm as compared to control in the two seasons in most cases, followed descendingly by kinetin at 100ppm in the two seasons. Moreover, using the treatment of GA_3 at 200ppm of tuberose cut flower spikes recorded highly decreases of total phenols percentage in petals and flower stalks as compared to control in the two seasons. On the reverse, the highest values of these parameter was registered by using control in the two seasons under this study.

The aforementioned results of kinetin are in agreement with those obtained by **Maximoos (1993)** on *Gerbera jamesonii* who mentioned that treated the plants with kinetin at 25, 50 and 100 ppm significantly decreased leaf total phenols content. Similar results were obtained by **Auda (1992)** on *Hippeastrum vittatum* and **Shahin (1998)** on Crinum and Hemerocallis

With regard to the effect of storage periods on Total phenols percentages, Data in Table (22) reveal that there were gradual decrease in total phenols in petals and flower stalks of tuberose cut flower spikes with extending storage periods at 4±1°C for different days (0-time, 7, 14 and 21 days) in the two seasons. However, tuberose cut flower spikes were stored at 4±1°C for 21days resulted the highest significant decrease of these parameters as compared to different storage periods in both seasons. Moreover, storage periods at 4±1°C for O-time treatment gave the highest values total phenols in petals and

Table (22): Effect of storage periods (Days) treatments on Total phenols percentages, Total nitrogen percentage , Total protein percentage , phosphorus percentage and potassium percentage in petals and flower stalk of *Polianthes tuberosa* L.cut flower spike during the two seasons of 2007-2008/2008-2009 .

Treatments		Total phenols percentage in petals		Total phenols percentage in flower stalk		Total nitrogen percentage in petals		Total protein percentage in petals		Total nitrogen percentage in flower stalk		Total protein percentage in flower stalk		Phosphorus percentage in petals		Phosphorus percentage in flower stalk		Potassium percentage in petals		Potassium percentage in flower stalk	
		1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Storage periods (days)	0	0.288	0.272	0.287	0.276	3.757	3.749	23.48	23.43	3.640	3.645	22.75	22.78	0.895	0.899	0.799	0.799	3.073	3.108	2.360	2.377
	7	0.221	0.207	0.199	0.193	3.643	3.750	22.77	23.44	3.639	3.626	22.74	22.66	0.905	0.909	0.790	0.790	3.119	3.158	2.373	2.383
	14	0.167	0.144	0.132	0.126	3.620	3.741	22.63	23.38	3.634	3.636	22.71	22.73	0.926	0.908	0.789	0.784	3.099	3.135	2.371	2.387
	21	0.121	0.099	0.105	0.098	3.720	3.703	23.25	23.15	3.590	3.599	22.44	22.49	0.894	0.898	0.781	0.780	3.085	3.112	2.361	2.373
L.S.D at	5 %	0.009	0.009	0.008	0.009	0.073	0.039	0.465	0.241	0.039	0.055	0.245	0.340	0.034	0.245	0.042	0.012	0.028	0.020	0.010	0.007
	1%	0.012	0.013	0.010	0.012	0.097	0.052	0.619	0.321	0.052	0.074	0.327	0.452	0.045	0.327	0.056	0.016	0.037	0.026	0.014	0.009

flower stalks of tuberose cut flower spikes when compared to the other ones under study in the two seasons.

Referring to the effect of interaction between growth regulators and storage periods on Total phenols percentages, Data in Table (20) reveal that, all the combinations treatments between growth regulators and different storage periods at 4±1°C for (0-time, 7, 14 and 21days) decreased total phenols percentage in petals of tuberose cut flower spikes as compared to control in the two seasons. However, the combinations treatments between GA_3 at 300ppm and different storage periods at 4±1°C for (0-time, 7, 14 and 21days) recorded the lowest values of this parameter of tuberose cut flower spikes as compared to control in the two seasons, especially the combined treatment between GA_3 at 300ppm and storage periods at 4±1°C for 21days in the two seasons. Moreover, using the combinations treatments between kinetin at 100ppm and storage periods at 4±1°C for (0-time, 7, 14 and 21days) recorded highly decreases in total phenols percentage in petals of tuberose cut flower spikes as compared to control in both seasons, especially the combined treatment between kinetin at 100ppm and storage periods at 4±1°C for 21days. On the reverse, the highest values of this parameter of tuberose cut flower spikes was recorded by the combinations between control (distilled water) storage periods at 4±1°C for 0-time in both seasons of this study.

Furthermore, Data presented in Table (20) indicate that all the combinations treatments between growth regulators and different storage periods at 4±1°C 0-time,7, 14 and 21days

decreased total phenols percentage in flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, using the combinations between GA_3 at 300ppm or GA_3 200ppm in the first and second season respectively and different storage periods at 4±1°C for O-time, 7, 14 and 21days resulted the lowest values in this parameter when compared to control of this study, especially the combined treatment between GA_3 at 300ppm or GA_3 200ppm and storage periods at 4±1°C for 21day as compared to control in the first and second seasons, respectively. Moreover, using the combined treatment between kinetin at 100ppm and storage periods at 4±1°C for 21days resulted highly decreases in this parameter of tuberose cut flower spikes as compared to control in both seasons. On the reverse, the highest values of total phenols percentage in flower stalks of tuberose cut flower spikes was registered by using the combinations treatments between control and storage periods at 4±1°C for 0-time as compared to the other ones of this study in the two seasons.

2.3.6.-Total nitrogen and total protein percentages:

Data in Table (21) reveal that most growth regulators treatments increased total nitrogen and total protein percentage in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, using the treatment of GA_3 at 300ppm of tuberose cut flower spikes showed to be the most effective one for producing the highest values of these parameter as compared to control in the two seasons in most cases, followed descendingly by kinetin at 100ppm in the two seasons. Moreover, using the treatment of

BA at 50ppm recorded highly significant increments of theses parameters as compared to control in the two seasons. On the opposite, the lowest values of total nitrogen and total protein percentage in petals and flower stalks of tuberose cut flower spikes was recorded by control in the two seasons.

With regard to the effect of storage periods on Total nitrogen and total protein percentages, Data listed in Table (22) demonstrate that there were gradual decrease in total nitrogen and total protein percentage in petals and flower stalks of tuberose cut flower spikes with extending storage periods at 4±1°C for different days (0-time, 7, 14 and 21days) in the two seasons. However, tuberose cut flower spikes were stored at 4±1°C for 0-time recorded the highest significant increase of these parameters as compared to different storage periods in both seasons, followed in descending order by storage periods at 4±1°C for 7 days. Moreover, storage periods at 4±1°C for 21 days treatment recorded highly significant decrease in total nitrogen and total protein percentage in petals and flower stalks of tuberose cut flower spikes when compared to the other ones under study in the two seasons.

Referring to the interaction effect between growth regulators treatments and storage periods treatments on Total nitrogen and total protein percentages, data in Table (23) indicate that all the combinations treatments between growth regulators and storage periods succeeded in increasing total nitrogen and total protein in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, the combinations treatments of GA_3 at 300ppm

Table (23): Effect of interaction between some growth regulators and Storage periods(Days) treatments on Total nitrogen percentage and Total protein percentage in petals and flower stalk of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Total nitrogen percentage in petals				Total protein percentage in petals				Total nitrogen percentage in flower stalk				Total protein percentage in flower stalk			
Growth regulators		Storage periods (days)				Storage periods (days)				Storage periods (days)				Storage periods (days)			
		0	7	14	21	0	7	14	21	0	7	14	21	0	7	14	21
		1st season															
Control		3.55	3.53	3.57	3.50	22.21	22.08	22.29	21.89	3.32	3.30	3.34	3.26	20.75	20.63	20.88	20.38
GA_3 200ppm		3.73	3.07	2.77	3.70	23.33	19.21	17.33	23.13	3.66	3.69	3.71	3.65	22.89	23.04	23.21	22.83
GA_3 300ppm		3.91	3.87	3.89	3.84	24.46	24.17	24.33	24.02	3.82	3.83	3.81	3.75	23.86	23.92	23.79	23.46
BA 25 ppm		3.57	3.67	3.69	3.68	22.29	22.96	23.04	23.02	3.53	3.52	3.54	3.50	22.08	22.00	22.14	21.86
BA 50 ppm		3.84	3.80	3.81	3.73	23.98	23.73	23.81	23.31	3.71	3.72	3.67	3.66	23.17	23.23	22.92	22.86
Kin 50 ppm		3.69	3.70	3.71	3.72	23.06	23.11	23.21	23.27	3.61	3.60	3.57	3.57	22.56	22.50	22.33	22.31
Kin 100 ppm		3.91	3.86	3.90	3.88	24.46	24.14	24.36	24.23	3.83	3.82	3.80	3.74	23.92	23.89	23.73	23.39
L.S.D at	5%	0.194				1.229				0.104				0.649			
	1%	0.258				1.637				0.138				0.864			
		2nd season															
Control		3.59	3.58	3.56	3.53	22.27	22.38	22.27	22.08	3.34	3.31	3.37	3.23	20.89	20.69	21.04	20.21
GA_3 200ppm		3.76	3.75	3.77	3.72	23.50	23.46	23.56	23.23	3.66	3.65	3.66	3.64	22.88	22.83	22.86	22.77
GA_3 300ppm		3.87	3.88	3.85	3.81	24.17	24.27	24.08	23.79	3.83	3.82	3.81	3.80	23.94	23.89	23.83	23.73
BA 25 ppm		3.63	3.64	3.65	3.56	22.71	22.73	22.81	22.27	3.57	3.54	3.53	3.53	22.31	22.14	22.08	22.04
BA 50 ppm		3.85	3.85	3.81	3.78	24.08	24.04	23.81	23.64	3.69	3.68	3.69	3.65	23.06	22.98	23.06	22.83
Kin 50 ppm		3.68	3.70	3.72	3.69	22.98	23.14	23.25	23.06	3.62	3.59	3.62	3.60	22.64	22.46	22.61	22.48
Kin 100 ppm		3.86	3.85	3.82	3.83	24.14	24.04	23.88	23.94	3.80	3.78	3.78	3.74	23.73	23.63	23.61	23.39
L.S.D at	5%	0.104				0.638				0.146				0.898			
	1%	0.138				0.850				0.195				1.196			

showed to be the most effective one for producing the highest significant increase of these parameters, especially the combined treatment between GA_3 at 300ppm and storage periods at 4±1°C for 0-time and 7days as compared to control in the two seasons of this study. Moreover, the combined treatment between kinetin at 100pm and different storage periods at 4±1°C for (0-time, 7, 14 and 21days) particularly storage periods for 0-time of tuberose cut flower spikes recorded highly significant increase of these parameters in the two seasons. Regardless control, the lowest values of these parameters was recorded by using the combinations treatments between BA 25ppm and different storage periods at 4±1°C (0-time, 7, 14 and 21days) as compared to the other ones under study in the two seasons.

2.3.7.-Phosphorus percentages:

Data in Table (21) reveal that all growth regulators treatments succeeded in increasing phosphorus percentage in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, the highest significant increase of these parameters was registered by using kinetin at 100ppm as compared to control in the two seasons, followed in descending order by GA_3 at 300ppm and BA at 50ppm in the two seasons. On the reverse, the lowest values of these parameters of tuberose cut flower spikes was recorded by using control in the two seasons. Furthermore, the remained treatments occupied an intermediate position between the abovementioned treatments in both seasons of this study.

Concerning the effect of storage periods on Phosphorus percentages, Data in Table (22) reveal that tuberose cut flower spikes were stored at 4±1°C for 14days treatment showed to be most effective one for inducing the highest values of phosphorus percentage in petals as compared to different storage periods (0-time, 7 and 21days) in the two seasons, followed in descending order by stored periods at 4±1°C for 7days and 0-time. On the reverse, the lowest values of this parameter of tuberose cut flower spikes was registered by stored periods at 4±1°C for 21days as compared to different storage periods in both seasons of this study.

Furthermore ,Data presented in Table (22) reveal that there were gradual decrease in phosphorus percentage in flower stalks of tuberose cut flower spikes with extending storage periods at 4±1°C for different days (0-time, 7, 14 and 21days) in the two seasons. However, tuberose cut flower spikes were stored at 4±1°C for 0-time recorded the highest significant increase of this parameters as compared to different storage periods in both seasons, followed in descending order by storage periods at 4±1°C for 7 days. Moreover storage periods at 4±1°C for 21 days treatment recorded highly significant decrease in phosphorus percentage in flower stalks of tuberose cut flower spikes when compared to the other ones under study in the two seasons.

As for the interaction effect between growth regulators and storage periods treatments on Phosphorus percentages, data in Table (24) reveal that all the combinations treatments between growth regulators and storage periods at 4±1°C for

Table (24): Effect of interaction between some growth regulators and Storage periods(Days) treatments on phosphorus percentage and potassium percentage in petals and flower stalk of *Polianthes tuberosa* L. t. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Phosphorus percentage in petals				Phosphorus percentage in flower stalk				Potassium percentage in petals				Potassium percentage in flower stalk			
Growth regulators		Storage periods (days)				Storage periods (days)				Storage periods (days)				Storage periods (days)			
		0	7	14	21	0	7	14	21	0	7	14	21	0	7	14	21
		1st season															
Control		0.830	0.823	0.833	0.813	0.760	0.723	0.743	0.730	2.900	2.913	2.910	2.913	2.257	2.290	2.287	2.283
GA_3 200ppm		0.897	0.900	0.903	0.900	0.787	0.780	0.753	0.747	3.043	3.057	3.137	3.073	2.340	2.363	2.370	2.357
GA_3 300ppm		0.923	0.937	0.933	0.920	0.823	0.827	0.807	0.803	3.203	3.270	3.250	3.250	2.413	2.417	2.400	2.407
BA 25 ppm		0.880	0.893	0.887	0.887	0.783	0.770	0.797	0.780	2.947	3.010	2.983	2.977	2.330	2.327	2.333	2.320
BA 50 ppm		0.900	0.920	0.923	0.910	0.823	0.797	0.807	0.790	3.103	3.160	3.143	3.110	2.387	2.393	2.407	2.387
Kin 50 ppm		0.897	0.910	0.903	0.887	0.773	0.787	0.790	0.793	3.100	3.133	3.037	3.073	2.380	2.393	2.377	2.370
Kin 100 ppm		0.940	0.953	0.957	0.943	0.843	0.843	0.827	0.827	3.217	3.267	3.230	3.200	2.417	2.430	2.427	2.407
L.S.D at	5%	0.089				0.111				0.073				0.027			
	1%	0.119				0.148				0.097				0.036			
		2nd season															
Control		0.830	0.830	0.823	0.817	0.760	0.740	0.727	0.720	2.913	2.923	2.920	2.917	2.297	2.300	2.317	2.307
GA_3 200ppm		0.900	0.910	0.910	0.907	0.783	0.770	0.763	0.757	3.073	3.137	3.120	3.123	2.367	2.367	2.373	2.360
GA_3 300ppm		0.913	0.923	0.930	0.913	0.837	0.827	0.810	0.807	3.247	3.303	3.277	3.267	2.427	2.430	2.417	2.410
BA 25 ppm		0.803	0.897	0.900	0.883	0.773	0.767	0.780	0.770	2.977	3.050	3.037	2.977	2.337	2.347	2.357	2.340
BA 50 ppm		0.910	0.927	0.923	0.913	0.823	0.807	803.000	0.793	3.107	3.190	3.160	3.133	2.393	2.400	2.407	2.397
Kin 50 ppm		0.903	0.917	0.907	0.897	0.777	0.780	0.770	0.783	3.150	3.200	3.150	3.113	2.387	2.400	2.410	2.390
Kin 100 ppm		0.940	0.960	0.963	0.953	0.837	0.843	0.833	0.830	3.257	3.303	3.283	3.257	2.430	2.440	2.430	2.497
L.S.D at	5%	0.693				0.033				0.52				0.019			
	1%	0.864				0.044				0.069				0.025			

different storage periods (0-time – 7, 14 and 21days) increased phosphorus percentage in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, the combinations treatments between kinetin at 100ppm and different storage periods at 4±1°C (0-time- 7, 14 and 21days) recorded the highest increases in these parameters of tuberose cut flower spikes as compared to control in the two seasons, especially the combined treatment between kinetin at 100ppm and storage periods at 4±1°C for 14 and 7days in petals and flower stalks respectively, in the two seasons of this study. Moreover, the combinations treatments between GA_3 at 300ppm or BA at 50ppm and different periods at 4±1°C (0-time- 7, 14 and 21days) resulted highly increases in phosphorus in petals and flowers stalks of tuberose cut flower spikes as compared to control in the two seasons. Irrespective control, the lowest values of these parameters was registered by using the combinations treatments between BA at 25ppm and different storage periods at 4±1°C for different storage periods (0-time, 7, 14 and 21days) in the two seasons.

2.3.8.-Potassium percentages:

Data in Table (21) demonstrate that all growth regulators treatments increased potassium percentage in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, using the treatment of kinetin at 100ppm recorded the highest significant increase in these parameters as compared to control in the two seasons in most cases, followed in descending order by GA_3 at 300ppm in the two seasons.

Moreover, using the treatments of BA at 50ppm and kinetin at 50ppm of tuberose cut flower spikes resulted highly increases in these parameters as compared to control in the two seasons. On the reverse, the lowest values of these parameters of tuberose cut flower spikes was registered by using control in both seasons of this study.

Regarding to the effect of storage periods on Potassium percentages, Data presented in Table (22) indicate that tuberose cut flower spikes were stored at 4±1°C for 7days resulted the highest significant increase in potassium percentage in petals as compared to different storage periods (0-time, 14 and 21days) in the two seasons, followed in descending order by stored periods at 4±1°C for 14days and 21days. On the reverse, the lowest values of this parameter of tuberose cut flower spikes was recorded by stored periods at 4±1°C for 0-time as compared to the other ones under study in the two seasons.

Additionally, data in Table (22) indicate that storage periods at 4±1°C for 14days of tuberose cut flower spikes is being the most effective one for inducing the highest values of potassium percentage in flower stalks as compared to different storage periods in the two seasons. However, storage periods at 4±1°C for 7days of tuberose cut flower spikes recorded highly increases of this parameter as compared to different storage periods (0-time and 21days) in the two seasons.

Concerning the effect of interaction between growth regulators and storage periods on Potassium percentages, Data presented in Table (24) indicate that all the combinations

treatments between growth regulators and different storage periods increased potassium percentage in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, the highest significant increase in these parameters of tuberose cut flower spikes was recorded by using the combinations treatments between kinetin at 100ppm different storage periods at 4±1°C (0-time, 7, 14 and 21days) as compared to control in the two seasons in most cases, followed in descending order by the combinations treatments between GA_3 at 300ppm and different storage periods at 4±1°C (0-time, 7, 14 and 21days) in the two seasons of this study. Moreover, the combinations treatments between BA at 50ppm and different storage periods at 4±1°C for (0-time, 7, 14 and 21days) recorded highly increases in potassium percentage in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons. Regardless control, the lowest values of these parameters of tuberose cut flower spikes was registered by using the combinations treatments between BA at 25ppm and storage periods (0-time, 7, 14 and 21days) at 4±1°C in both seasons under this study.

Part I: The second experiment:(pulsing solutions and holding solutions treatments of *Polianthes tuberosa*)

3.1. Effect of pulsing solutions and holding solutions treatments on:

3.1. Flower post harvest characters :

3.1.a.-Vase life (days):

Data presented in Table (25) indicate that the treatment of STS at 1:4mM for 15 minutes recorded the highest number of days of vase life of tuberose cut flower spikes when compared to control or the other ones under study in the two seasons. Furthermore, the treatments could be arranged descendingly as follows: STS at 1:4mM > benzyladenine at 10ppm > kinetin at 20ppm > sucrose at 10% > control (distilled water) in the first season only, while in the second season, arranged as follows: STS at 1:4 mM for 15 minutes > kinetin at 200ppm > benzyladenine at 10ppm > control (distilled water) > sucrose at 10%. These results were recorded in the two seasons, as shown in Table (25). However, the increase in vase life due to (STS, BA and S) treatment was also found by **Anju et al., (1999)** on chrysanthemum and **kwon (2000)** on freesia. Such increase in tuberose cut flower spikes longevity caused by (STS and benzyladenine) treatment might be attributed to that STS inhibited the action of ethylene and leading to a decrease in lip oxygenease (Lox) activity as well as served as an antibacterial component **Kwon et al. , (2000)** on fressia , **Nowak and RudnicKin, (1990)** on many cut flowers. In addition, benzyladenine (BA) delayed senescence by its effect on ethylene

Table (25): Effect of pulsing solutions , Holding solutions treatments and their interaction of vase life (days) of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments	Vase life (days) 1st season						Vase life (days) 2nd season					
	Holding solutions						Holding solutions					
Pulsing solutions	D.W	Sucrose 4 %	Sucrose 4% +CA 200 ppm	Sucrose 4 % + 8HQS 200 ppm	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	mean	D.W	Sucrose 4 %	Sucrose 4% +CA 200 ppm	Sucrose 4 % + 8HQS 200 ppm	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	mean
D.W	12.80	13.70	18.50	18.90	20.50	16.880	13.00	14.20	18.30	14.80	19.90	16.040
Kin.20 ppm	13.50	14.50	20.80	21.40	22.10	18.460	13.60	14.30	21.50	19.10	21.90	18.080
BA 10 ppm	13.90	14.80	20.90	21.70	22.40	18.740	13.90	14.40	20.50	19.70	20.70	17.840
Sucrose 10 %	13.20	13.90	18.90	19.77	21.30	17.413	12.70	14.00	18.30	14.40	20.00	15.880
STS 1:4 ml	14.40	18.60	22.40	22.90	23.80	20.420	14.80	18.60	22.30	21.00	24.10	20.180
mean	13.560	15.100	20.300	20.933	22.020		13.600	15.100	20.180	17.820	21.320	
L.S.D at	Pulsing solutions		Holding solutions	interaction			Pulsing solutions		Holding solutions		interaction	
	5 %	1 %	5 %	1 %	5 %	1 %	5 %	1 %	5 %	1 %	5 %	1 %
	0.175	0.234	0.175	0.234	0.392	0.523	0.360	0.479	0.360	0.479	0.804	1.073

synthesis processes in the tissue of carnation flowers **Cook et al., (1985), Sacalis and Lee , (1985) and Van Staden et al., (1987),** the decrease of ethylene production within the flowers carnation flowers **Bosse and Van Staden, (1989).** Sucrose inhibited ethylene synthesis as well as promoting bud opening and inhibiting flower senescence, **Ichimura and Hisamatsu, (1999).**

The aforementioned results of sucrose are in parallel with those obtained by **Reid and Nell (2000)** and **Pruthi et. al., (2001)on gladiolus. Reid et. al., (2001)** on tuberose found that the vase life was improved by pulsing with 5 and 8% sucrose.

The aforementioned results of cytokinins are in parallel with those obtained by **El-Saka (1992)** on bird of paradise, **Gendy (2000)** on gladiolus, **Chikkasubbanna and Suma (2002)** on alstroemeria, **Alka *et. al.*, (2006)** and **Alka *et. al.*, (2008)**on gladiolus indicate that the vase life increased by pulsing with cytokinins. The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992), Hutchinson *et. al.*, (2003)** on tuberose, **Kushal *et. al.*, (2007)** on *Dianthes caryophyllus* and **Kuroshima *et. al.*, (2008)**on Delphinium Cultivars demonstrate that Silver thiosulfate gave the greatest improvement of vase life.

Concerning the effect holding solution treatments on vase life (days), Data in Table (25) reveal that, all holding solution treatments prolonged the vase life of tuberose cut flower spikes when compared to control in the two seasons. However, the treatment of holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) recorded the highest significant increase in vase life of tuberose cut flower spikes

when compared to control and the other ones in both seasons. Moreover, holding tuberose cut flower spikes bases contained (sucrose at 4% + citric acid at 200ppm) and (sucrose at 4% + 8-HQS at 200ppm) resulted highly significant increase in flower vase life longevity as compared to control (D.W. treatment) in both seasons. Regardless control, the lowest value of vase life (days) of tuberose cut flower spikes was recorded by using the holding solution contained (sucrose at 10%) in the two seasons. Anyhow, 8-hydroxy quinoline salts (8-HQ) delayed senescence and eliminated bacterial growth which was the principal reason for reduced water uptake and transport of gerbera flower, Abdel **Kader, (1987).** 8-HQS prevented the growth of microorganism in the xylem and thus maintained water uptake by flower stems **Kwon et al., (2000)** on fressia. The aforementioned results of (sucrose) are in parallel with those obtained by **Naidu and Reid (1989)** on tuberose, **El-Saka (1992)** on tuberose, **Gendy (2000)** on gladiolus and Jitendra- kumar and **Daljcct-Singh (2004)** on tuberose stated that sucrose treatment increased longevity. The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **El-Saka (1992)** on tuberose, **Gendy (2000)** on gladiolus, **Dias-Tagliacozzo *et. al.*, (2005)** on *lillium longiflorum* and **Padaganur *et. al.*, (2005)** on tuberose stated that (sucrose + citric acid) treatment increased longevity. The aforementioned results of (sucrose +8-HQS) are in parallel with those obtained by **El-Saka (1992)** on tuberose, **Song *et. al.*, (1992)** on cut gladiolus, **Reddy *et. al.*, (1995)** on tuberose, **Gendy (2000)** on gladiolus, **Gargi and Devi (2005)** on tuberose and **Alka *et. al.*, (2007)** on gladiolus reported that (sucrose + 8-HQS) treatment as holding solution increased the longevity. The

aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **El-Saka (1992)** on tuberose, **Gendy (2000)** on gladiolus, **El Bouhy (2002)** on tuberose, **Gendy (2007)** on gladiolus and **Bayogan *et. al.*, (2008)** on bird of paradise flower stated that the treatment of cut flower spikes bases in holding solution contained (sucrose + 8-HQS + citric acid) record highly significant increase in flower longevity.

Referring to the effect of interaction between pulsing solution and holding solution treatments on vase life (days), Data in Table (25) reveal that all interaction treatments between pulsing solution and holding solution succeeded in increasing of flower longevity of tuberose cut flower spikes as compared to control (distilled water) in the two seasons. However, the interaction treatments between pulsing solution of STS at 1:4mM for 15 minutes and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) resulted the highest significant increase in vase life of tuberose cut flower spikes when compared to control (distilled water) in the two seasons. Furthermore, the interaction treatments between pulsing solution of (STS at 1:4 mM for 15 minutes, benzyladenine at 10ppm for 24 hours and kinetin at 20ppm for 24 hours) and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm, sucrose at 4% + citric acid at 200ppm and sucrose 4% + 8-HQS at 200ppm) succeeded in extending vase life of tuberose cut flower spikes compared to control (distilled water) in both seasons. Irrespective control, the lowest value of vase life of tuberose cut flower spike was registered by using interaction treatment between pulsing solution of sucrose at 10% for 24 hours and holding solution

contained (sucrose at 4%) as compared to the other ones under study in the two seasons. These results agreed with those found by **El-Saka (1992)** on bird of paradise , **Hwang and Kinm (1995)** on gladiolus and **Gendy (2000)** on gladiolus showed that (STS) or (Kin) treatments as pulsing solutions then holding solutions contained (S +8 HQS +CA) increased longevity.

3.1.b.-Change percentage in spike fresh weight :

Data in Table (26) show that the change percentage in spike fresh weight of tuberose cut flower spike was increased as flower cut spikes advanced in age until 6 days from the treatment to the end of longevity in both seasons under study. It could be indicate that, all pulsing solutions treatments i.e., (kinetin at 200ppm, Benzyl adenine at 10ppm, sucrose at 10ppm for 24 hours) and silver thiosulphate at 1:4MM for 15 minutes succeeded in increasing change percentage in fresh weigh of tuberose cut flower spikes compared with control (distilled water) in both seasons under this study. However, pulsing tuberose cut flower spikes bases in silver thiosulphate (STS) (1:4MM) for 30 minutes recorded the highest significant increase in change percentage in fresh weight of cut flower spikes compared to other treatments under study. Regardless control the lowest mean values of change percentage in fresh weight of tuberose cut flower spikes was registered by using sucrose at 10% for 24 hours after 3, 6, g, 12 and 15 days from the treatment to the end of longevity in both seasons. The remained pulsing solutions treatments occupied an intermediate position between the abovementioned treatments in both seasons of this study.

Table (26): Effect of pulsing solutions treatments, on Change percentage in fresh weight, Floret opening percentage and Floret wilting percentage of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Change percentage in fresh weight of cut flower spike					Floret opening percentage					Floret wilting percentage			
		Shelf life periods (days)					Shelf life periods (days)					Shelf life periods (days)			
		3	6	9	12	15	3	6	9	12	15	6	9	12	15
1st season															
Pulsing solutions	D.W	17.49	17.83	7.02	-1.12	-9.87	12.78	20.77	34.56	48.40	53.73	17.11	35.27	49.32	76.15
	Kin.20 ppm	19.48	19.79	10.22	3.75	-4.40	14.79	22.13	39.41	52.25	57.04	12.91	28.64	44.56	70.00
	BA 10 ppm	20.81	21.36	12.04	7.00	-1.77	15.15	22.49	40.53	53.25	57.87	8.77	27.09	42.87	68.77
	Sucrose 10 %	17.27	18.87	7.44	1.22	-6.76	13.90	21.66	37.87	49.82	54.79	14.11	31.78	47.65	74.03
	STS 1:4 ml	22.05	22.59	14.62	9.51	1.45	16.81	23.41	41.42	54.85	60.18	8.36	25.33	40.99	65.20
L.S.D at	5 %	0.468	0.408	0.574	0.692	0.848	0.258	0.225	0.304	0.393	0.492	1.106	0.664	0.643	0.837
	1%	0.624	0.544	0.766	0.923	1.131	0.345	0.300	0.405	0.525	0.565	1.476	0.886	0.857	1.116
2nd season															
Pulsing solutions	D.W	15.37	16.81	6.03	-3.15	-10.59	11.89	20.66	34.31	49.51	54.39	16.88	36.83	48.64	76.87
	Kin.20 ppm	17.38	18.40	8.10	1.68	-6.02	15.60	22.03	39.57	52.44	57.70	13.28	30.01	46.32	71.57
	BA 10 ppm	17.89	18.64	10.25	4.58	-4.62	14.43	21.25	39.81	52.24	57.12	7.99	31.57	47.78	71.75
	Sucrose 10 %	16.58	17.15	6.94	-0.18	-7.94	14.04	22.22	39.18	50.29	54.97	13.19	33.37	48.94	77.9
	STS 1:4 ml	19.91	21.27	12.42	7.34	-0.46	16.18	23.00	39.8	54.78	60.23	9.96	28.50	41.39	66.24
L.S.D at	5 %	0.906	1.205	0.574	0.580	0.824	1.840	2.633	4.295	3.925	3.686	2.458	5.325	4.861	5.728
	1%	1.208	1.608	0.766	0.774	1.099	2.455	3.512	5.730	5.236	4.917	3.279	7.103	6.785	7.641

The aforementioned results of cytokinins are in parallel with those obtained by **El-Saka (1992)** on bird of paradise. **Gendy (2000)** on gladiolus, **Alka *et. al.*, (2006)** and **Alka *et. al.*, (2008)** on gladiolus indicate that the changes percentage of fresh weights of cut flower spikes increased by pulsing with cytokinins.

The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise, **Gendy (2000)** on gladiolus, **Qadri *et. al.*, (2000)** on *I. hollandica* ,**Hutchinson *et. al.*, (2003)** on tuberose and **Kushal *et. al.*, (2007)** on *Dianthes caryophyllus* indicated that (STS) treatment increased the changes percentage in spikes fresh weight of cut flower spikes.

With respect to the effect holding solution treatments on change percentage in fresh weight, Data presented in Table (27) reveal that, all holding solution treatments highly significant increased the change percentage of fresh weight of tuberose cut flower spikes after 3, 6, g, 12 and 15 days from the treatment compared to the control (D.W.) in both seasons, with the exception of holding solution of sucrose at 4% which scored the lowest value in this concern compared to control in the two season. However, the holding solution of (sucrose at 4% + 8-HQS200ppm + citric acid 200ppm) after 3, 6, g, 12 and 15 days from the treatment was more effective in this regard compared with the other ones and control in both seasons. Moreover, using holding solution contained (sucrose at 4% + 8-HQS at 200ppm) and (sucrose 4% + citric acid at 200ppm), respectively succeeded to increased the change percentage in fresh weight of tuberose cut flower spikes compared to control in the two

Table (27): Effect of Holding solutions treatments, on Change percentage in fresh weight of cut flower spike , Floret opening percentage and Floret wilting percentage of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Change percentage in fresh weight of cut flower spike					Floret opening percentage					Floret wilting percentage			
		Shelf life periods(days)					Shelf life periods(days)					Shelf life periods(days)			
		3	6	9	12	15	3	6	9	12	15	6	9	12	15
1st season															
Holding solutions	D.W	15.78	14.87	3.66	-2.480	-12.22	10.53	18.11	28.88	44.85	49.35	21.02	46.79	60.93	83.21
	Sucrose 4 %	12.40	11.24	-0.92	-8.59	-19.24	13.31	19.70	34.14	47.46	52.07	16.01	35.95	52.80	77.86
	Sucrose 4% +CA 200 ppm	22.36	24.25	14.81	8.73	1.20	16.04	23.73	42.43	54.38	59.11	9.40	24.68	39.27	66.83
	Sucrose 4 % + 8HQS 200 ppm	22.19	24.06	15.30	9.83	3.00	16.39	24.08	43.20	54.97	60.24	7.84	22.45	38.27	64.76
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	24.37	26.03	18.48	12.86	5.91	17.16	24.83	45.15	56.92	62.85	7.01	18.24	34.11	61.49
L.S.D at	5 %	0.468	0.408	0.574	0.692	0.848	0.258	0.225	0.304	0.393	0.492	1.106	0.664	0.643	0.837
	1%	0.624	0.544	0.766	0.923	1.131	0.345	0.300	0.405	0.525	0.565	1.476	0.886	0.857	1.116
2nd season															
Holding solutions	D.W	13.23	13.71	2.70	-3.69	-14.57	10.53	18.32	28.85	45.42	50.29	20.30	48.88	62.29	83.37
	Sucrose 4 %	10.55	9.70	-1.94	-10.52	-20.81	13.45	20.27	33.92	48.54	53.22	14.90	39.13	54.45	78.06
	Sucrose 4% +CA 200 ppm	19.88	21.96	12.80	6.18	-0.10	16.57	23.59	43.28	54.97	59.45	7.82	25.68	40.50	67.52
	Sucrose 4 % + 8HQS 200 ppm	21.36	22.85	13.77	7.44	1.63	15.01	22.42	40.55	53.41	59.26	11.66	26.27	41.02	71.59
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	22.11	24.05	16.40	10.86	4.23	16.57	24.56	44.83	56.92	62.18	6.63	20.31	34.83	63.79
L.S.D at	5 %	0.906	1.205	0.574	0.580	0.824	1.840	2.633	4.295	3.925	3.686	2.458	5.325	4.861	5.728
	1%	1.208	1.608	0.766	0.774	1.099	2.455	3.512	5.730	5.236	4.917	3.279	7.103	6.785	7.641

seasons. The aforementioned results of sucrose are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise, **Gendy (2000)** on gladiolus and **Jitendra- kumar and Daljcct-Singh (2004)** on tuberose stated that sucrose treatment increased the changes percentage of fresh weight of cut flowers. The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **El-Saka (1992)** on tuberose and **Gendy (2000)** on gladiolus stated that (sucrose + citric acid) treatment increased the changes percentage of fresh weight of cut flowers. The aforementioned results of (sucrose +8-HQS) are in parallel with those obtained by **El-Saka (1992)** on tuberose, **Song *et. al.*, (1992)** on cut gladiolus, and **Gendy (2000)** on gladiolus reported that (sucrose + 8-HQS) treatment as holding solution increased the changes percentage of fresh weight of cut flowers. The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **El-Saka (1992)** on tuberose, **Gendy (2000)** on gladiolus, **El Bouhy (2002)** on tuberose and **Gendy (2007)** on gladiolus stated that the treatment of cut flower spikes bases in holding solution contained (sucrose + 8-HQS + citric acid) record highly significant increase the changes percentage of fresh weight of cut flowers.

Referring to the interaction effect between pulsing solution and holding solutions treatments on change percentage in fresh weight, data in Table (28) reveal that most the interactions between pulsing solutions and holding solutions resulted increases in change percentage in fresh weight of tuberose cut flower spikes as compared to control during the two

Table (28) Effect of interaction between pulsing solutions and holding solutions treatments of change percentage of fresh weight of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Change percentage in fresh weight of cut flower spike									
		1st season					2nd season				
Pulsing solution	Holding Solution	Shelf life periods (days)									
		3	6	9	12	15	3	6	9	12	15
D.W	D.W	14.28	12.52	1.04	-8.33	-17.73	10.56	13.38	-0.31	-9.99	-21.18
	Sucrose 4 %	11.49	9.16	-4.54	-13.55	-25.41	8.77	7.31	-4.47	-15.31	-27.51
	Sucrose 4% +CA 200 ppm	20.23	22.95	12.52	4.35	-4.13	18.56	21.11	10.49	2.24	-3.85
	Sucrose 4 % + 8HQS 200 ppm	18.95	20.23	11.20	4.61	-2.60	18.83	20.27	11.92	2.70	-1.59
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	22.48	24.29	14.86	7.33	0.50	20.11	21.98	12.53	4.62	1.17
Kin.20 ppm	D.W	15.71	14.82	3.67	-4.54	-12.31	13.20	12.87	1.98	5.34-	-13.81
	Sucrose 4 %	12.35	11.12	-1.78	-9.70	-20.29	10.42	10.20	-3.28	-11.78	-20.58
	Sucrose 4% +CA 200 ppm	22.56	23.08	15.32	8.73	1.08	20.31	22.57	12.73	4.98	-0.50
	Sucrose 4 % + 8HQS 200 ppm	22.34	23.94	15.88	10.39	3.25	21.11	22.94	13.47	8.13	0.92
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	24.42	25.97	18.03	13.88	6.30	21.87	23.40	15.62	12.43	3.90
BA 10 ppm	D.W	16.30	15.65	5.85	0.64	-9.45	14.93	13.89	4.42	-0.67	-11.63
	Sucrose 4 %	13.50	12.12	0.55	-5.19	-16.84	11.85	10.25	-0.63	-6.99	-19.25
	Sucrose 4% +CA 200 ppm	23.52	25.72	16.04	11.12	3.63	17.56	20.21	14.21	8.61	0.70
	Sucrose 4 % + 8HQS 200 ppm	24.79	26.22	17.16	12.63	5.44	22.30	23.61	14.89	8.80	2.20
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	25.92	27.09	20.61	15.78	8.35	22.80	25.26	18.35	13.14	4.89
Sucrose 10 %	D.W	14.85	13.81	-0.86	5.12-	-15.29	11.54	11.34	0.47	4.47-	-17.40
	Sucrose 4 %	10.39	9.72	-3.15	-12.14	-22.65	9.35	8.4	-3.29	-14.04	-24.15
	Sucrose 4% +CA 200 ppm	19.88	22.70	12.52	5.93	-0.11	19.77	20.84	10.92	3.57	-0.76
	Sucrose 4 % + 8HQS 200 ppm	18.71	23.06	12.91	7.30	1.08	20.70	22.03	12.40	4.82	0.66
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	22.53	25.05	15.78	10.13	3.15	21.52	23.01	14.19	9.24	1.95
STS 1:4 ml	D.W	17.75	17.54	8.62	4.95	-6.32	15.93	17.10	6.93	2.02	-8.84
	Sucrose 4 %	14.28	14.05	4.31	-2.36	-11.00	12.36	12.19	1.99	-4.47	-12.57
	Sucrose 4% +CA 200 ppm	25.59	26.79	17.66	13.53	2.25	23.22	25.09	15.66	11.51	3.89
	Sucrose 4 % + 8HQS 200 ppm	26.17	26.82	19.35	14.25	7.84	23.84	25.38	16.18	12.77	5.97
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	26.47	27.77	23.14	17.19	11.23	24.22	26.60	21.33	14.89	9.24
L.S.D at	5%	1.046	0.911	1.283	1.547	1.895	2.025	2.696	1.283	1.298	1.841
	1%	1.395	1.215	1.712	2.064	2.528	2.701	3.596	1.712	1.731	2.456

seasons. However, the combinations of holding solution contained (sucrose at 4% + citric acid 200ppm + 8-HQS at 200ppm) showed to be the most effective one for inducing the highest values of this parameter, especially the interaction treatment between pulsing solution of STS at 1:4mM for 30 minutes and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) showed the highest significant increase in change percentage in fresh weight after 3 days from the treatment till the end of longevity when compared with control (distilled water) in two seasons under this study. Moreover, using the interaction between pulsing solution of Benzyl adenine at 10ppm for 24hours and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) or the interaction between pulsing solution of STS at 1:4mM for 30 minutes and holding solution contained (sucrose at 4% + 8-HQS at 200ppm) recorded highly significant increase in this parameter after 3,6,g,12 and 15 days from the treatment as compared to control in the two seasons. On the reverse, the combined treatments of D.W and sucrose at 4% and BA at 10ppm and sucrose at 4% recorded the lowest values of this parameter during all longevity periods in both seasons of this study.

These results agreed with those found by **El-Saka (1992)** on bird of paradise, **Gendy (2000)** on gladiolus and **El Bouhy (2002)** on tuberose showed that (STS) or (Kin) treatments as pulsing solutions then holding solutions contained (S +8 HQS +CA) increased longevity.

3.1.c.-Floret opening percentage:

Data presented in Table (26) indicate that all pulsing solutions treatments succeeded in increasing floret opening percentage of tuberose cut flower spikes when compared to control (distilled water (D.W.)) after 3, 6, g, 12 and 15 days from the treatment in both seasons. However, pulsing tuberose cut flower spikes bases in silver thiosulphate (STS) (1:4 mM) for 30 minutes showed the greatest significant increase in floret opening percentage of cut flower spikes after 3, 6, g, 12 and 15 days from the treatment as compared to the other ones in the two seasons. Moreover, pulsing tuberose cut flower spike in benzyladenine at 10ppm and kinetin at 20ppm recorded significant increases in floret opening percentage of cut flower spikes compared to control (distilled water) in both seasons. The differences between the aforementioned two treatments were not significant in the two seasons. Irrespective control, the lowest floret opening percentage value was registered by using pulsing solution of sucrose at 10% for 24 hours after 3, 6, g, 12 and 15 days from the treatment to the end of longevity in both seasons.

The aforementioned results of sucrose are in parallel with those obtained **Seemann and Huber (1995)** on gladiolus, **Finger *et. al.*, (1999)** on bird of paradise, **Parmar *et. al.*, (2002)** on gladiolus, **Hutchinson *et. al.*, (2003)** on tuberose, **Whitehead *et. al.*, (2003)** on freesia and **Yamane *et. al.*, (2005)** on gladiolus recorded that pulsing with sucrose 20% for 24 hrs. at room temperature, markedly increased the number of open florets in the inflorescence.

The aforementioned results of cytokinins are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise. **Gendy (2000)** on gladiolus, **Hutchinson *et. al.*, (2003)** on tuberose, **Alka *et. al.*, (2006)** and **Alka *et. al.*, (2008)**on gladiolus indicate that the floret opening percentage increased by pulsing with cytokinins. The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise, **Gendy (2000)** on gladiolus, **Han and Miller (2003)** on lily flowers, **Hutchinson *et. al.*, (2003)** on tuberose indicated that (STS) treatment increased floret opening percentage.

Regarding to the effect holding solution treatments on Floret opening percentage, data presented in Table (27) reveal that, all holding solution treatment of tuberose cut flower spikes were resulted increased in floret opening percentage compared to control in both seasons. However, the treatment of tuberose cut flower spikes bases in holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) recorded the highest significant increase in floret opening percentage as compared to control. Moreover, the holding solution treatments contained (sucrose at 4% + citric acid at 200ppm and (Sucrose at 4% + 8-HQS at 200ppm) were resulted the highly significant increase in floret opening percentages of tuberose cut flower spikes compared to control in the two seasons.

These results are in agreement with that recorded by **Reid et al., (2001)** on tuberose cut flowers, regarding (S + 8-HQS). The aforementioned results of (sucrose) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of

paradise, **Gendy (2000)** on gladiolus, **Jitendra- kumar and Daljcct-Singh (2004)** on tuberose stated that sucrose treatment increased floret opening percentage . The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **El-Saka (1992)** on tuberose, **Gendy (2000)** on gladiolus, **Satendra *et. al.*, (2006)** on tuberose stated that (sucrose + citric acid) treatment increased floret opening percentage. The aforementioned results of (sucrose +8-HQS) are in parallel with those obtained by **El-Saka (1992)** on tuberose, **Song *et. al.*, (1992)** on cut gladiolus, **Gendy (2000)** on gladiolus, **Gargi and Devi (2005)** on tuberose and **Alka *et. al.*, (2007)** on gladiolus reported that (sucrose + 8-HQS) treatment as holding solution increased the floret opening percentage. The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **El-Saka (1992)** on tuberose, **Gendy (2000)** on gladiolus, **El Bouhy (2002)** on tuberose, **Gendy (2007)** on gladiolus and **Bayogan *et. al.*, (2008)** on bird of paradise stated that the treatment of cut flower spikes bases in holding solution contained (sucrose + 8-HQS + citric acid) recorded highly significant increase of floret opening percentage .

As for the interaction effect between pulsing solution and holding solution treatments on floret opening percentage, data in Table (29) indicate that of tuberose cut flower spikes was greatly increased by using all the combinations between pulsing solutions and holding solutions treatments when compared with control (distilled water) during the two seasons. However, the combination of pulsing solution of STS at 1:4mM for 30minutes recorded the highest values of this parameter, especially the

Table (29) Effect of interaction between pulsing solutions and holding solutions treatments of Floret opening percentage of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Floret opening percentage									
		1st season					2nd season				
Pulsing solution	Holding Solution	Shelf life periods (days)									
		3	6	9	12	15	3	6	9	12	15
D.W	D.W	10.06	17.16	28.11	43.20	47.34	9.75	17.54	28.27	43.86	48.73
	Sucrose 4 %	11.24	18.94	32.54	44.97	49.70	11.70	19.49	33.14	45.81	50.68
	Sucrose 4% +CA 200 ppm	13.61	22.19	34.91	49.70	55.03	14.62	22.42	35.09	51.66	55.56
	Sucrose 4 % + 8HQS 200 ppm	14.20	22.49	36.39	50.30	56.21	10.72	20.47	34.11	50.68	56.53
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	14.79	23.08	40.83	53.85	60.36	12.67	23.39	40.94	55.56	60.43
Kin.20 ppm	D.W	10.36	18.05	28.99	44.38	49.11	10.72	18.52	29.24	44.83	49.71
	Sucrose 4 %	14.20	19.53	34.02	46.75	52.37	15.60	19.49	34.11	47.76	53.61
	Sucrose 4% +CA 200 ppm	15.98	23.67	43.79	55.62	60.06	16.57	24.37	44.83	56.53	62.38
	Sucrose 4 % + 8HQS 200 ppm	16.27	24.26	44.38	56.21	60.95	16.57	22.42	43.86	53.61	59.45
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	17.16	25.15	45.86	58.28	62.72	18.52	25.34	45.81	59.45	63.35
BA 10 ppm	D.W	10.65	18.64	29.29	45.56	50.00	10.72	18.52	28.27	44.83	50.68
	Sucrose 4 %	14.50	19.82	34.91	47.34	52.96	13.65	19.49	34.11	47.76	52.63
	Sucrose 4% +CA 200 ppm	16.27	24.26	45.56	57.10	60.65	15.60	22.42	45.81	57.51	59.45
	Sucrose 4 % + 8HQS 200 ppm	16.57	24.26	46.15	57.40	61.83	14.62	20.47	41.91	55.56	61.40
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	17.75	25.44	46.75	58.88	63.91	17.54	25.34	45.81	55.56	61.40
Sucrose 10 %	D.W	10.36	17.75	28.40	43.79	48.52	9.75	18.52	29.24	43.86	49.71
	Sucrose 4 %	11.83	19.53	33.73	46.15	50.30	12.67	21.44	35.09	47.76	53.61
	Sucrose 4% +CA 200 ppm	15.39	23.08	41.12	51.78	55.92	16.57	22.42	45.81	51.66	55.56
	Sucrose 4 % + 8HQS 200 ppm	15.68	23.67	41.72	52.66	57.6	15.60	24.37	41.91	51.66	56.53
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	16.27	24.26	44.38	54.73	61.54	15.60	24.36	43.86	56.53	59.45
STS 1:4 ml	D.W	11.24	18.94	29.59	47.34	51.78	11.60	18.52	29.24	49.71	52.63
	Sucrose 4 %	14.79	20.71	35.50	52.07	55.03	13.65	21.44	33.14	53.61	55.56
	Sucrose 4% +CA 200 ppm	18.94	25.44	46.75	57.69	63.91	19.49	26.32	44.83	57.51	64.33
	Sucrose 4 % + 8HQS 200 ppm	19.23	25.74	47.34	58.28	64.50	17.54	24.37	40.94	55.56	62.38
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	19.82	26.23	47.93	58.88	65.68	18.52	24.37	47.76	57.51	66.28
L.S.D at	5%	0.579	0.503	0.679	0.880	1.100	4.115	5.887	9.604	8.776	8.241
	1%	0.772	0.671	0.906	1.173	1.467	5.490	7.853	12.81	11.71	10.99

interaction treatment between pulsing solution of STS at 1:4mM for 30 minutes and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) after 3, 6, 9, 12 and 15 days from the treatment in the two seasons. Moreover, the interaction of pulsing solution of STS at 1:4mM for 30minutes and holding solution contained (sucrose at 4% + 8-HQS at 200ppm) at the first season and interaction between pulsing solution of STS at 1:4mM for minutes and holding solution contained (sucrose at 4% + citric acid at 200ppm) at the second season of tuberose cut flower spikes resulted highly increases of floret opening percentage as compared to control in the two seasons. On the opposite, the lowest values of floret opening percentage of tuberose cut flower spike was gained by using the combinations of distilled water as a holding solution, especially the combined treatment between D.W as pulsing solution and D.W as holding solution as it gave the lowest floret opening percentage in both seasons during all longevity periods of this study.

These results agreed with those found by **El-Saka (1992)** on bird of paradise, **Gendy (2000)** on gladiolus and **El Bouhy (2002)** on tuberose showed that (STS) or (Kin) treatments as pulsing solutions then holding solutions contained (S +8 HQS +CA) increased floret opening percentage of tuberose.

3.1.d.-Floret wilting percentage:

Data in Table (26) reveal that, pulsing tuberose cut flower spikes bases in silver thiosulphate (STS) (1:4mM) for 15 minutes gave the highest significant decrease of floret witling

percentage compared to the other treatments under study in both seasons. Moreover, pulsing solutions of BA at 10ppm for 24 hours and kinetin at 20ppm for 24 hours succeeded in decreasing the floret wilting percentage of tuberose cut flower spikes compared to control "distilled water" in the two seasons.

Concerning the effect holding solution treatments on Floret wilting percentage, Data in Table (27) concluded that, floret wilting percentage of tuberose cut flower spikes was decreased by using all holding solution treatments. However, the treatment of tuberose cut flower spikes bases in holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) recorded the highest significant decrease in floret wilting percentage as compared to control (D.W. treatment) in both seasons. Regardless control, using the treatment of tuberose cut flower spikes bases in holding solution contained (sucrose at 4%) registered highly significant increase in floret wilting percentage as compared to the other treatments under study in the two seasons. The remained treatment occupied an intermediate position between the aforementioned treatments in the two seasons under this study.

With regard to the interaction effect between pulsing solution and holding solution treatments on Floret wilting percentage, Data in Table (30) indicate that, all the interaction between pulsing solution and holding solution succeeded in decreasing the floret wilting percentage of tuberose cut flower spikes as compared to control during the two seasons. However, the combinations of pulsing solution of STS at 1:4mM for 30 minutes recorded the highest significant decrease of this

Table (30) Effect of interaction between pulsing solutions and holding solutions treatments of Floret wilting percentage of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Floret wilting percentage							
		1st season				2nd season			
		Shelf life periods (days)							
Pulsing solution	Holding Solution	6	9	12	15	6	9	12	15
D.W	D.W	25.92	52.64	65.07	88.75	27.30	55.56	64.64	86.15
	Sucrose 4 %	20.26	39.09	56.59	82.15	20.36	38.74	55.32	79.22
	Sucrose 4% +CA 200 ppm	16.01	32.20	44.65	73.12	13.43	33.97	44.02	74.59
	Sucrose 4 % + 8HQS 200 ppm	13.16	29.27	42.94	71.05	14.48	31.37	42.22	76.41
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	10.22	23.18	37.36	65.69	8.84	24.50	37.01	67.99
Kin.20 ppm	D.W	19.62	45.90	61.33	83.13	20.64	48.54	62.27	83.82
	Sucrose 4 %	18.19	35.64	53.17	77.42	19.84	38.23	55.91	78.82
	Sucrose 4% +CA 200 ppm	9.98	23.53	37.24	65.03	8.58	23.87	38.11	62.86
	Sucrose 4 % + 8HQS 200 ppm	8.54	21.33	37.90	63.11	9.26	22.20	42.17	70.62
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	8.24	16.77	33.17	61.32	8.10	17.19	33.17	61.72
BA 10 ppm	D.W	15.88	44.44	58.45	81.06	11.11	48.79	64.19	81.18
	Sucrose 4 %	11.93	33.90	51.88	75.98	10.56	37.69	55.79	77.94
	Sucrose 4% +CA 200 ppm	6.09	22.07	36.28	64.39	4.31	23.74	39.63	65.69
	Sucrose 4 % + 8HQS 200 ppm	5.29	19.23	35.56	62.21	10.14	28.33	42.19	68.66
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.65	15.82	32.16	60.23	3.82	19.28	37.12	65.29
Sucrose 10 %	D.W	23.33	48.95	63.53	85.37	21.67	46.33	65.44	89.53
	Sucrose 4 %	19.67	37.79	55.7/	81.18	14.02	39.68	59.49	80.34
	Sucrose 4% +CA 200 ppm	10.25	26.62	42.29	71.43	9.40	26.00	45.21	73.72
	Sucrose 4 % + 8HQS 200 ppm	8.75	25.55	40.45	68.73	12.26	30.50	39.94	78.07
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	8.54	20.00	36.21	63.47	8.58	24.37	34.60	67.85
STS 1:4 ml	D.W	20.33	42.00	56.25	77.73	20.78	45.20	54.92	76.18
	Sucrose 4 %	10.00	33.34	46.62	72.58	9.72	41.31	45.72	74.01
	Sucrose 4% +CA 200 ppm	4.65	18.99	35.90	60.19	3.36	20.83	35.52	60.76
	Sucrose 4 % + 8HQS 200 ppm	3.45	16.88	34.52	58.73	12.17	18.94	38.58	64.18
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.38	15.43	31.66	56.76	3.78	16.20	32.24	56.08
L.S.D at	5%	2.473	1.485	1.437	1.871	5.497	11.91	10.87	12.81
	1%	3.300	1.981	1.917	2.496	7.332	15.88	14.50	17.09

parameter, especially the combined treatment between pulsing solution of STS at 1:4mM for 30 minutes and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) after 6, 9, 12 and 15 days from the treatment in the two seasons under this study. Furthermore, the floret wilting percentage of tuberose cut flower spikes under all the combinations between pulsing solution and holding solution was increased as flower cut spikes advanced in age after 6 days from the treatment till the end of age of longevity in the two seasons.

3.2.a.-Water uptake (g)/spike:

It is clear from Table (31) that the absorbed solution by tuberose cut flower spikes increased as cut flower spike advanced in age after 3, 6, g, 12 and 15 days from the treatment in both seasons. However, pulsing tuberose cut flower spikes bases in silver thiosulphate (STS) (1:4 mM) for 15 minutes recorded the highest increase in water uptake as compared to the ones and control (D.W.) in the two seasons. Regardless control, the lowest water uptake value of tuberose cut flower spikes was registered by using pulsing treatment of sucrose at 10% for 24 hours in the first season, while in the second season sucrose at 10% for 24 hours the lowest water uptake value compared to control and other treatments under study. The aforementioned results of (sucrose) are in parallel with those obtained by **Naidu and Reid (1989)** on tuberose, **El- Bouhy (2002) Nagaraja *et. al.*, (2002)** on tuberose stated that using sucrose at 20% as pulsing solution treatment increased water uptake and water balance compared to control. The aforementioned results of

Table (31): Effect of pulsing solutions treatments, on Water uptake, Water loss and Water balance (g)/spike of of *Polianthes tuberosa* L.cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Water uptake (g)/spike Shelf life periods (days)					Water loss (g)/spike Shelf life periods (days)					Water balance (g)/spike Shelf life periods (days)				
		3	6	9	12	15	3	6	9	12	15	3	6	9	12	15
1st season																
Pulsing solutions	D.W	67.83	114.93	152.88	179.23	212.98	52.92	98.81	147.17	179.95	219.26	14.91	16.11	5.71	-0.73	-6.28
	Kin.20 ppm	73.85	124.35	168.45	193.68	219.42	56.16	106.19	160.01	190.37	223.41	17.69	18.17	8.43	3.31	-3.99
	BA 10 ppm	75.74	126.25	172.51	201.63	223.05	56.65	106.43	162.30	195.93	223.98	19.09	19.82	10.21	5.69	-0.93
	Sucrose 10%	68.74	117.35	155.79	180.69	207.33	53.93	100.45	149.32	179.35	211.32	14.81	16.90	6.47	1.33	-3.99
	STS 1:4 ml	79.64	130.90	175.97	206.45	231.21	59.01	109.81	163.55	198.45	230.26	20.63	21.09	12.43	8.00	1.05
L.S.D at	5 %	0.686	1.297	1.133	1.387	0.873	1.049	1.337	1.139	1.392	0.886	0.815	0.249	0.147	0.141	0.320
	1%	0.916	1.730	1.512	1.850	1.165	1.400	1.783	1.519	1.857	1.187	1.087	0.332	0.196	0.188	0.427
2nd season																
Pulsing solutions	D.W	66.79	11.15	145.73	176.37	197.47	52.98	96.83	141.01	178.30	204.74	13.81	14.32	4.71	-1.93	-7.27
	Kin.20 ppm	72.01	118.37	158.32	191.69	203.64	55.70	101.43	151.21	183.37	208.41	16.31	16.94	7.11	8.33	-4.77
	BA 10 ppm	72.38	116.92	159.70	188.07	206.19	54.78	98.86	150.65	174.04	209.07	17.60	18.06	9.05	14.03	-2.87
	Sucrose 10%	66.75	107.19	139.81	168.41	187.65	50.24	92.01	133.80	169.17	192.63	16.51	15.18	6.01	-0.77	-4.97
	STS 1:4 ml	75.77	124.55	165.44	198.93	218.89	57.29	103.63	154.31	193.52	219.19	18.47	20.92	11.13	5.41	-0.30
L.S.D at	5 %	2.194	2.324	2.347	2.456	2.676	1.483	2.259	2.242	2.420	2.719	1.726	0.944	0.491	0.250	1.091
	1%	2.927	3.100	3.131	3.276	3.569	1.978	3.014	2.991	3.229	3.627	2.302	1.259	0.655	0.334	1.456

cytokinins are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise, **Gendy (2000)** on gladiolus, **El- Bouhy (2002)** on tuberose cleared that (kin) treatment increased water uptake, water loss and water balance of cut flower spikes. The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise, **El-Hindi (1999)** on dahlia, **Gendy (2000)** on gladiolus, **El- Bouhy (2002)** on tuberose showed that dipping of cut flower spike bases in the treatment of STS at 1-4 mM for 10 minutes increased absorbed solution, water loss and water balance compared to control.

As for the effect holding solution treatments on water uptake (g)/spike, it is clear from Table (32) that the absorbed solution by tuberose cut flower spike increased as cut flower spike advanced in age after 3 days from the treatment till the end of longevity in the two seasons under the solution treatments of this study. However, holding tuberose cut flower spikes bases in holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) induced the highest significant increase in water uptake as compared to control (D.W) and other treatment in the first season only, but in the second season using holding solution contained (sucrose at 4% + citric acid at 200ppm) by tuberose cut flower spikes recorded the highest significant increase in water uptake compared to control and other holding solution treatments in this concern. The lowest values of water uptake by tuberose cut flower spikes was registered by using holding solution contained (sucrose at 4%) after 3 days as cut flower spikes and till the end of age of

Table (32): Effect of Holding solutions treatments, on Water uptake, Water loss and Water balance (g)/spike of of *Polianthes tuberosa* L.cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Water uptake (g)/spike Shelf life periods(days)					Water loss (g)/spike Shelf life periods(days)					Water balance (g)/spike Shelf life periods(days)				
		3	6	9	12	15	3	6	9	12	15	3	6	9	12	15
1st season																
Holding solutions	D.W	72.48	102.75	135.78	169.66	191.82	58.98	90.91	132.77	171.75	199.71	13.50	11.85	3.01	-2.09	-7.89
	Sucrose 4 %	60.57	92.73	128.04	165.14	184.38	51.39	83.48	129.01	170.93	196.21	9.18	9.25	-0.97	-5.79	-11.83
	Sucrose 4% +CA 200 ppm	75.98	137.51	185.49	207.74	235.53	55.37	114.62	173.25	201.01	235.06	20.61	22.89	12.25	6.74	0.47
	Sucrose 4 % + 8HQS 200 ppm	77.47	137.63	186.44	207.97	238.68	56.84	114.66	173.61	200.13	237.51	20.63	22.97	12.83	7.83	1.17
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	79.29	143.16	189.84	211.16	243.68	56.09	118.03	173.72	200.23	239.73	23.21	25.13	16.12	10.93	3.95
L.S.D at	5 %	0.686	1.297	1.133	1.387	0.873	1.049	1.337	1.139	1.392	0.886	0.815	0.249	0.147	0.141	0.320
	1%	0.916	1.730	1.512	1.850	1.165	1.400	1.783	1.519	1.857	1.187	1.087	0.332	0.196	0.188	0.427
2nd season																
Holding solutions	D.W	72.79	102.87	136.17	169.69	190.85	61.47	91.77	134.00	172.41	201.11	11.33	11.09	2.17	-2.73	-10.27
	Sucrose 4 %	53.83	92.43	125.99	157.83	179.41	43.89	85.00	127.80	166.13	192.35	9.95	7.43	-1.81	-8.30	-12.94
	Sucrose 4% +CA 200 ppm	77.35	139.11	184.35	212.19	233.49	57.69	117.31	173.48	200.89	233.88	19.67	21.80	10.87	11.31	-0.39
	Sucrose 4 % + 8HQS 200 ppm	73.81	106.70	144.84	183.85	196.33	53.39	84.90	132.99	171.37	196.07	20.41	21.80	11.85	12.49	0.26
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	75.91	137.07	177.63	199.93	213.77	54.56	113.78	162.71	187.61	210.63	21.35	23.29	14.93	12.32	3.15
L.S.D at	5 %	2.194	2.324	2.347	2.456	2.676	1.483	2.259	2.242	2.420	2.719	1.726	0.944	0.491	0.250	1.091
	1%	2.927	3.100	3.131	3.276	3.569	1.978	3.014	2.991	3.229	3.627	2.302	1.259	0.655	0.334	1.456

longevity from the treatment in both seasons. Moreover, the treatments of tuberose cut flower spikes bases in holding solution contained (sucrose at 4% citric acid at 200ppm) and (sucrose at 4% + 8-HQS at 200ppm) recorded increases in water uptake as compared to control (distilled water) in the two seasons. Furthermore, 8-hydroxy quinoline salts (8-HQ) delayed senescence and eliminated bacterial growth which was the principal reason for reduced water uptake and transport of gerbera flower, **Abdel Kader, (1987).** 8-HQS prevented the growth of microorganism in the xylem and thus maintained water uptake by flower stems **Kwon et al., (2000)** on fressia. The aforementioned results of (sucrose) are in parallel with those obtained by **El-Saka (1992)** suggested that sucrose at 10% treatment decreased absorbed solution of tuberose and bird of paradise cut flowers, **El-Zohairy (1999)** mentioned that sucrose at 3 and 5% treatments increased water balance and water loss but decreased water uptake, by rose flowers and **Gendy (2000)** indicated that sucrose treatment decreased absorbed solution, water loss and water balance on gladiolus cut flowers.

The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **El-Saka (1992)** found that (sucrose +citric acid) treatment increased absorbed solution by tuberose and bird of paradise cut flowers, **El-Hindi (1999)** reported that (sucrose +citric acid) treatment increased absorbed solution and water balance in dahlia cut flowers. **Gendy (2000)** indicated that (sucrose +citric acid) treatment decreased absorbed solution, water loss and water balance on gladiolus cut flowers. The aforementioned results of (sucrose +8-HQS) are in

parallel with those obtained by **El-Saka (1992)** found that sucrose + 8 HQS treatment increased absorbed solution percentage of tuberose and bird of paradise cut flowers, **El-Hindi (1999)** stated that 8-HQS treatment increased absorbed solution and water balance of dahlia cut flowers. **El-Zohairy (1999)** mentioned that (8-HQS) improved water uptake and water balance but, this treatment decreased water loss of rose cut flowers. **Gendy (2000)** showed that sucrose +8- HQS treatments as holding solutions increased water uptake and water loss, but decreased water balance of gladiolus cut flowers. The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **El-Saka (1992)** found that (S + 8-HQS + CA) treatment increased absorbed solution percentage of tuberose and bird of paradise cut flowers. **Gendy (2000)** showed that (S + 8-HQS + CA) treatments as holding solutions increased water uptake and water loss, but decreased water balance of gladiolus cut flowers, **El Bouhy (2002)** on tuberose, **Gendy (2007)** stated that the treatment of gladiolus cut flower spikes bases in holding solution contained (sucrose + 8-HQS +citric acid) record highly significant increase in water uptake, water loss and water balance as compared to control (D.W. treatment)

Concerning the effect of interaction between pulsing solution and holding solution treatments on Water uptake (g) spike, Data presented in Table (33) reveal that most the interaction treatments between pulsing solutions and holding solutions succeeded in increasing the water uptake of tuberose cut flower spikes as compared to control (distilled water) in the

Table (33) Effect of interaction between pulsing solutions and holding solutions treatments of Water uptake (g)/spike of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Water uptake (g)/spike									
		1st season					2nd season				
Pulsing solution	Holding Solution	Shelf life periods (days)									
		3	6	9	12	15	3	6	9	12	15
D.W	D.W	67.10	97.67	132.73	167.10	186.50	69.63	101.30	135.20	169.53	190.67
	Sucrose 4 %	56.33	88.87	120.73	155.37	178.47	49.80	88.80	117.70	151.93	174.2
	Sucrose 4% +CA 200 ppm	70.43	127.57	168.43	191.50	230.63	72.60	133.13	170.50	196.63	232.73
	Sucrose 4 % + 8HQS 200 ppm	72.47	129.30	169.77	192.03	231.53	69.70	103.10	141.97	177.17	193.00
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	72.80	131.23	172.50	190.13	237.77	72.23	129.40	163.27	186.60	196.70
Kin.20 ppm	D.W	74.00	102.73	136.33	170.70	191.17	75.97	104.13	138.57	171.43	195.10
	Sucrose 4 %	58.67	91.87	129.10	166.33	183.40	51.07	94.77	129.53	161.40	179.70
	Sucrose 4% +CA 200 ppm	77.33	136.50	193.27	207.80	138.43	79.23	142.40	195.57	219.03	238.90
	Sucrose 4 % + 8HQS 200 ppm	78.90	142.33	190.03	209.83	241.33	76.10	107.93	146.57	177.0	196.80
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	80.33	148.33	193.50	213.73	242.77	77.67	142.63	181.37	196.27	207.70
BA 10 ppm	D.W	75.40	106.07	140.37	174.57	195.63	72.60	103.40	138.20	176.17	199.00
	Sucrose 4 %	62.80	94.23	132.73	171.40	187.43	53.13	93.33	129.07	160.57	180.17
	Sucrose 4% +CA 200 ppm	78.47	143.13	196.10	217.83	24303	80.50	139.53	194.23	222.20	239.43
	Sucrose 4 % + 8HQS 200 ppm	80.37	141.60	195.33	220.80	242.80	77.80	109.40	148.30	180.23	199.03
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	81.67	146.23	198.00	223.53	246.33	77.87	138.93	188.70	201.20	213.33
Sucrose 10 %	D.W	69.20	99.43	128.03	160.70	190.10	68.23	96.10	122.33	152.97	175.34
	Sucrose 4 %	57.30	90.97	121.27	157.70	181.03	55.33	87.97	118.17	145.80	176.30
	Sucrose 4% +CA 200 ppm	70.47	131.67	171.67	193.47	212.80	71.13	128.87	162.77	188.17	198.87
	Sucrose 4 % + 8HQS 200 ppm	71.80	129.67	179.17	193.80	223.17	67.83	98.13	137.07	169.97	190.50
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	74.93	135.00	181.80	197.77	229.53	71.23	124.90	158.70	185.17	197.23
STS 1:4 ml	D.W	76.70	107.87	141.43	175.23	195.70	77.53	109.40	146.57	178.33	194.10
	Sucrose 4 %	67.77	97.73	136.13	174.90	191.57	59.83	97.30	135.50	169.43	186.67
	Sucrose 4% +CA 200 ppm	83.20	148.67	198.00	228.13	252.73	83.30	151.60	198.70	234.93	257.50
	Sucrose 4 % + 8HQS 200 ppm	83.80	145.23	200.90	223.37	254.57	77.60	114.93	150.30	181.57	202.30
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	86.73	155.00	203.40	230.63	262.00	80.57	149.50	196.13	230.40	253.90
L.S.D at	5%	1.353	2.900	2.534	3.101	1.952	4.907	5.196	5.249	5.491	5.983
	1%	2.047	3.860	3.380	4.136	2.604	6.546	6.932	7.002	7.326	7.981

two seasons. However, the combinations of STS at 1:4mM for 30 minutes induced the highest values of this parameter, especially the combined treatment between pulsing solution of STS at 1:4mM for 15 minutes and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) at the first season, moreover the interaction treatment between pulsing solution of STS at 1:4mM for 30 minutes and holding solution contained (sucrose at 4% + citric acid at 200ppm) at the second season after 3, 6, 9, 12 and 15 days from the treatment. Furthermore, the absorbed solution of tuberose cut flower spikes by using all interaction treatments between pulsing solution and holding solution was increased as flower cut spikes prolonged in age after 3 days from the treatment till the end of longevity in the two seasons. On the reverse, the lowest values of water uptake / spike of tuberose cut flower spike was registered by using the combinations of sucrose at 4% as holding solution, with the exception of the combined treatment between STS 1:4ml and sucrose at 4% In general, the lowest values of this parameter was recorded by using the combined treatment between D.W and sucrose at 4% during all longevity periods in both seasons. These results agreed with those found by **El- Saka (1992)** stated that (STS) or (Kin) treatments then holding solution of (S +8 HQS +CA) increased absorbed solution of tuberose and bird of paradise cut flower spikes, **Gendy (2000)** cleared that the treatments of interaction between (STS) or (Kin) as pulsing solutions and holding solution of (S+8HQS +CA) increased absorbed solution, water loss and water balance of gladiolus cut flower spikes. and **El Bouhy (2002)** on tuberose

the interaction treatment between STS as pulsing solution and holding solution of S + 8 HQS + CA recorded highly significant increase in both absorbed solution and water balance and decrease in water loss of tuberose cut flower spikes compared to control, Also, he observed that the combination treatment of BA as pulsing solution and holding solution of (S + 8HQS + CA) recorded highly significant increase in absorbed solution and water balance as well as decrease in water loss of tuberose cut flower compared to control or the other ones under study.

3.2.b.-Water loss (g)/spike:

Data in Table (31) reveal that pulsing tuberose cut flower spikes bases in silver thiosulphate (STS) (1:4mM) for 15 minutes recorded highly significant increase in water loss as compared the other ones and control (D.W.) in both seasons. However, pulsing solutions of BA at 10ppm for 24 hours and kinetin at 20ppm for 24 hours succeeded in increased water loss of tuberose cut flower spikes compared to distilled water (control) in both seasons.

The aforementioned results of sucrose are in parallel with those obtained by **El- Bouhy (2002) Nagaraja *et. al.*, (2002)** on tuberose stated that using sucrose at 20% as pulsing solution treatment increased water uptake and water balance compared to control. The aforementioned results of (cytokinins) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise, **Gendy (2000)** on gladiolus, **El- Bouhy (2002)** on tuberose cleared that (kin) treatment increased water uptake, water loss and water balance of cut flower spikes.

The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise, **El-Hindi (1999)** on dahlia, **Gendy (2000)** on gladiolus, **El- Bouhy (2002)** on tuberose showed that dipping cut flower spike bases in the treatment of STS at 1- 4 mM for 10 minutes increased absorbed solution, water loss and water balance compared to control.

With respect to the effect holding solution treatments on Water loss (g)/spike, data in Table (32) reveal that, the treatment of tuberose cut flower spikes bases in holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) and (sucrose at 4% + citric acid at 200ppm) resulted highly significant increase in water loss as compared to control (distilled water) in both seasons. However, the treatment of holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) gave the highest significant increase of water loss in the first seasons, while in the second season, holding solution contained (sucrose at 4% + citric acid at 200ppm) resulted the highest significant increase in water loss as compared to control (D.W.) in the second season. Moreover, using the treatment of holding solution contained (sucrose at 4% + 8-HQS at 200ppm) by tuberose cut flower spikes bases recorded increases in water loss compared to control in both seasons. The lowest mean values of water loss by tuberose cut flower spikes was registered by using the treatment of holding solution contained (sucrose at 4%) after 3, 6, g, 12 and 15 day from the treatment till the end of age of longevity in the two seasons.

The aforementioned results of (sucrose) are in parallel with those obtained by **El-Zohairy (1999)** mentioned that sucrose at 3 and 5% treatments increased water balance and water loss but decreased water uptake, by rose flowers and **Gendy (2000)** indicated that sucrose treatment decreased absorbed solution, water loss and water balance on gladiolus cut flowers. The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **El-Saka (1992)** found that (sucrose +citric acid) treatment increased absorbed solution by tuberose and bird of paradise cut flowers, **El-Hindi (1999)** on reported that (sucrose +citric acid) treatment increased absorbed solution and water balance in dahlia cut flowers. **Gendy (2000)** indicated that (sucrose +citric acid) treatment decreased absorbed solution, water loss and water balance on gladiolus cut flowers.

The aforementioned results of (sucrose +8-HQS) are in parallel with those obtained by **El-Saka (1992)** found that sucrose + 8 HQS treatment increased absorbed solution percentage of tuberose and bird of paradise cut flowers, **El-Hindi (1999)** stated that 8-HQS treatment increased absorbed solution and water balance of dahlia cut flowers. **El-Zohairy (1999)** mentioned that (8-HQS) improved water uptake and water balance but, this treatment decreased water loss of rose cut flowers. **Gendy (2000)** showed that sucrose +8- HQS treatments as holding solutions increased water uptake and water loss, but decreased water balance of gladiolus cut flowers. The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **El-Saka (1992)** found that (S +

8-HQS + CA) treatment increased absorbed solution percentage of tuberose and bird of paradise cut flowers. **Gendy (2000)** showed that (S + 8-HQS + CA) treatments as holding solutions increased water uptake and water loss , but decreased water balance of gladiolus cut flowers, **El Bouhy (2002)** on tuberose, **Gendy (2007)** stated that the treatment of gladiolus cut flower spikes bases in holding solution contained (sucrose + 8-HQS +citric acid) record highly significant increase in water uptake, water loss and water balance as compared to control .

Concerning the effect of interaction between pulsing solution and holding solution treatments on Water loss (g) / spike, Data Table (34) indicate that, most the interaction treatments between pulsing solution and holding solution recorded increased of water loss of tuberose cut flower spikes after 3, 6, 9, 12 and 15 day from the treatment when compared with control in the two seasons. However, most the combinations of pulsing solution of STS at 1:4mm for 15 minutes recorded highly significant increase of water loss as compared to control in the two seasons. Moreover, the interaction between pulsing of (STS at 1:4mM for 30 minutes) and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) in the first season, while the interaction between pulsing solution of STS and holding solution contained (sucrose at 4% + citric acid at 200ppm) in the second season respectively, after 3,6,g,12 and 15 days from the treatment recorded the highest significant increase of water loss of tuberose cut flower spikes as compared to control. Anyhow, water loss of tuberose cut flower spikes by using all the

Table (34) Effect of interaction between pulsing solutions and holding solutions treatments of Water loss (g)/spike of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Water loss (g)/spike									
		1st season					2nd season				
Pulsing solution	Holding Solution	Shelf life periods (days)									
		3	6	9	12	15	3	6	9	12	15
D.W	D.W	55.73	88.17	131.53	173.30	196.67	61.13	92.93	134.70	176.97	204.03
	Sucrose 4 %	47.60	81.07	123.87	164.93	193.73	42.30	85.97	122.93	161.63	190.57
	Sucrose 4% +CA 200 ppm	53.27	106.27	158.67	188.77	233.93	55.53	113.50	162.10	195.23	236.13
	Sucrose 4 % + 8HQS 200 ppm	56.03	110.03	160.97	188.33	233.97	52.30	83.80	132.57	174.53	197.80
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	51.97	108.53	160.80	184.43	238.00	53.36	107.93	152.77	183.13	195.17
Kin.20 ppm	D.W	60.60	90.93	133.60	173.77	199.40	64.57	93.77	136.93	174.57	207.83
	Sucrose 4 %	48.87	82.47	130.50	172.53	195.90	42.23	86.33	132.03	169.47	192.93
	Sucrose 4% +CA 200 ppm	56.23	114.17	180.97	201.23	238.97	59.83	120.93	185.03	215.43	239.40
	Sucrose 4 % + 8HQS 200 ppm	58.07	119.80	176.77	202.07	243.27	55.50	85.60	135.07	171.07	196.57
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	57.03	123.57	178.23	202.23	239.50	56.37	120.53	166.97	186.30	205.33
BA 10 ppm	D.W	61.00	93.13	135.83	174.80	201.97	58.97	91.73	134.77	176.67	206.20
	Sucrose 4 %	52.00	84.43	133.03	175.53	197.90	43.57	84.70	129.63	165.27	192.33
	Sucrose 4% +CA 200 ppm	55.87	118.70	182.37	208.90	240.33	59.30	117.00	181.80	215.70	239.13
	Sucrose 4 % + 8HQS 200 ppm	56.97	116.47	180.83	210.20	239.10	56.63	87.50	134.80	172.83	197.73
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	57.43	119.43	179.43	210.23	240.60	55.43	113.37	172.23	189.5	209.93
Sucrose 10 %	D.W	56.43	88.87	128.23	165.13	200.10	58.53	86.67	122.63	156.70	186.67
	Sucrose 4 %	52.43	83.10	123.77	165.70	194.33	41.07	81.33	120.40	158.43	190.67
	Sucrose 4% +CA 200 ppm	52.63	110.67	161.00	188.77	213.07	52.63	109.07	153.27	185.87	199.67
	Sucrose 4 % + 8HQS 200 ppm	54.40	108.00	165.37	188.10	222.37	48.23	78.00	126.43	167.00	190.17
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	53.77	111.60	168.23	189.07	226.73	50.73	105.00	146.27	177.87	195.97
STS 1:4 ml	D.W	61.13	93.43	134.63	171.77	200.40	64.13	93.77	140.97	177.17	200.83
	Sucrose 4 %	56.07	86.33	133.87	175.97	199.20	50.27	86.67	134.00	175.83	195.27
	Sucrose 4% +CA 200 ppm	58.87	123.30	183.23	217.37	249.00	61.13	126.03	185.20	225.53	255.07
	Sucrose 4 % + 8HQS 200 ppm	58.73	119.00	184.10	211.97	248.87	54.30	89.60	136.07	171.40	198.07
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	60.23	127.00	181.90	215.20	253.83	56.63	122.07	175.30	217.67	246.73
L.S.D at	5%	2.347	2.989	2.546	3.113	1.989	3.316	5.052	5.014	5.412	6.080
	1%	3.130	3.987	3.396	4.153	2.653	4.424	6.739	6.688	7.220	8.111

combinations between pulsing solutions and holding solutions was increased as flower cut spikes advanced in age after 3 days from the treatment till the end of age of longevity in the two seasons. On the other side, the lower values of water loss / spike of tuberose cut flower spike was recorded by using the combination of sucrose at 4% as solution, particularly the combined treatment between D.W and sucrose at 4% during all longevity periods in both seasons. These results agreed with those found by **El- Saka (1992)** stated that (STS) or (Kin) treatments then holding solution of (S +8 HQS +CA) increased absorbed solution of tuberose and bird of paradise cut flower spikes, **Gendy (2000)** cleared that the treatments of interaction between (STS) or (Kin) as pulsing solutions and holding solution of (S+8HQS +CA) increased absorbed solution, water loss and water balance of gladiolus cut flower spikes. and **El-Bouhy (2002)** on tuberose the interaction treatment between STS as pulsing solution and holding solution of S + 8 HQS + CA recorded highly significant increase in both absorbed solution and water balance and decrease in water loss of tuberose cut flower spikes compared to control , Also, he observed that the combination treatment of BA as pulsing solution and holding solution of (S + 8HQS + CA) recorded highly significant increase in absorbed solution and water balance as well as decrease in water loss of tuberose cut flower compared to control or the other ones under study.

3.2.c.-Water balance (g) spike:

Data in Table (31) demonstrated that water balance of tuberose cut flower spikes was increased after 3 days and 6 days then decreased after that day in both seasons, with the exception of pulsing of sucrose at 10% for 24 hours in the second season which decreased water balance value after 3 days from the treatment in this concern. Generally, all pulsing solutions treatments highly significant increased the water balance of tuberose cut flower spikes after 3, 6, g, 12 and 15 days from the treatment compared to control in the two season. Furthermore, the treatment of (STS) at 1:4mM for 15 minutes after 3, 6, g, 12 and 15days from the treatment was more effective in this regard compared with the others in the two seasons.

The aforementioned results of sucrose are in parallel with those obtained by **El- Bouhy (2002) Nagaraja *et. al.*, (2002)** on tuberose stated that using sucrose at 20% as pulsing solution treatment increased water uptake and water balance compared to control. The aforementioned results of cytokinins are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise, **Gendy (2000)** on gladiolus, **El- Bouhy (2002)** on tuberose cleared that (kin) treatment increased water uptake, water loss and water balance of cut flower spikes.

The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise, **El-Hindi (1999)** on dahlia, **Gendy (2000)** on gladiolus, **El- Bouhy (2002)** on tuberose showed that dipping of cut flower spike bases in the treatment of STS at 1- 4

mM for 10 minutes increased absorbed solution, water loss and water balance compared to control.

As for the effect holding solution treatments on Water balance (g)/spike, According to data in Table (32) it is obvious that, the treatment of tuberose cut flower spikes bases in holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) resulted the highest significant increase of water balance as compared to control (distilled water) in the two seasons. However, holding solution contained (sucrose at 4% + citric acid at 200ppm) and (sucrose at 4% + 8-HQS at 200ppm) by tuberose cut flower spikes bases recorded highly significant increase in water balance as compared to control in both seasons. On contrary, the lowest mean of value of water balance by tuberose cut flower spikes was registered by using holding solution contained (sucrose at 4%) compared to control (D.W.) and other treatments in the two seasons.

The aforementioned results of (sucrose) are in parallel with those obtained by **El-Zohairy (1999)** mentioned that sucrose at 3 and 5% treatments increased water balance and water loss but decreased water uptake, by rose flowers and **Gendy (2000)** indicated that sucrose treatment decreased absorbed solution, water loss and water balance on gladiolus cut flowers. The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **El-Saka (1992)** found that (sucrose +citric acid) treatment increased absorbed solution by tuberose and bird of paradise cut flowers, **El-Hindi (1999)** on reported that (sucrose +citric acid) treatment increased absorbed solution and water balance in dahlia cut flowers. **Gendy (2000)**

indicated that (sucrose +citric acid) treatment decreased absorbed solution, water loss and water balance on gladiolus cut flowers. The aforementioned results of (sucrose +8-HQS) are in parallel with those obtained by **El-Saka (1992)** found that sucrose + 8 HQS treatment increased absorbed solution percentage of tuberose and bird of paradise cut flowers, **El-Hindi (1999)** stated that 8-HQS treatment increased absorbed solution and water balance of dahlia cut flowers. **El-Zohairy (1999)** mentioned that (8-HQS) improved water uptake and water balance but, this treatment decreased water loss of rose cut flowers. **Gendy (2000)** showed that sucrose +8- HQS treatments as holding solutions increased water uptake and water loss, but decreased water balance of gladiolus cut flowers.

The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **El-Saka (1992)** found that (S + 8-HQS + CA) treatment increased absorbed solution percentage of tuberose and bird of paradise cut flowers, **Gendy (2000)** showed that (S + 8-HQS + CA) treatments as holding solutions increased water uptake and water loss, but decreased water balance of gladiolus cut flowers, **El-Bouhy (2002)** on tuberose, **Gendy (2007)** stated that the treatment of gladiolus cut flower spikes bases in holding solution contained (sucrose + 8-HQS +citric acid) record highly significant increase in water uptake, water loss and water balance as compared to control (D.W. treatment)

Concerning the effect of interaction between pulsing solution and holding solution treatments on Water balance (g) / spike, data presented Table (35) reveal that all the combinations

Table (35) Effect of interaction between pulsing solutions and holding solutions treatments of Water balance (g)/spike of *Polianthes tuberosa* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Treatments		Water balance (g)/spike									
		1st season					2nd season				
Pulsing solution	Holding Solution	Shelf life periods (days)									
		3	6	9	12	15	3	6	9	12	15
D.W	D.W	11.37	9.50	1.20	-6.20	-10.17	8.50	8.37	0.50	-7.43	-13.37
	Sucrose 4 %	8.73	7.80	-2.90	-9.57	-15.27	7.50	2.83	-5.23	-9.70	-16.33
	Sucrose 4% +CA 200 ppm	17.17	21.30	9.77	2.73	-3.30	17.07	19.63	8.40	1.40	-3.40
	Sucrose 4 % + 8HQS 200 ppm	16.43	19.27	8.80	3.70	-2.43	17.40	19.30	9.40	2.63	-4.80
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	20.83	22.70	11.70	5.70	-0.23	18.60	21.47	10.50	3.47	1.53
Kin.20 ppm	D.W	13.40	11.80	2.73	-3.07	-8.23	11.40	10.37	10.50	-3.13	-12.73
	Sucrose 4 %	9.80	9.40	-1.40	-6.20	-12.50	8.83	8.43	1.63	-8.07	-13.23
	Sucrose 4% +CA 200 ppm	21.10	22.33	12.30	6.57	-0.53	19.40	21.47	-2.50	3.60	-0.50
	Sucrose 4 % + 8HQS 200 ppm	20.83	22.53	13.27	7.77	-1.93	20.60	22.33	10.53	5.93	0.23
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	23.30	24.77	15.27	11.50	3.27	21.30	22.10	14.40	9.97	2.37
BA 10 ppm	D.W	14.40	12.93	4.53	-0.23	-6.33	13.63	11.67	3.43	0.50-	7.20-
	Sucrose 4 %	10.80	9.80	-0.30	-4.13	-10.47	9.57	8.63	-0.57	-4.70	-12.17
	Sucrose 4% +CA 200 ppm	22.60	24.43	13.73	8.93	2.70	21.20	22.53	12.43	6.50	0.30
	Sucrose 4 % + 8HQS 200 ppm	23.40	25.13	14.50	10.60	3.70	21.17	21.90	13.50	7.40	1.30
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	24.23	26.80	18.57	13.30	5.73	22.43	25.57	16.47	11.67	3.40
Sucrose 10 %	D.W	12.77	10.57	-0.20	-4.43	10.00-	9.70	9.43	-0.30	-3.73	-11.30
	Sucrose 4 %	4.87	7.87	-2.50	-8.00	-13.30	14.27	6.63	-2.23	-12.63	-14.37
	Sucrose 4% +CA 200 ppm	17.83	21.00	10.67	4.70	-0.27	18.50	19.80	9.50	2.30	-0.80
	Sucrose 4 % + 8HQS 200 ppm	17.40	21.67	10.80	5.70	0.80	19.60	20.13	10.63	2.97	0.33
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	21.17	23.40	13.57	8.70	2.80	20.50	19.90	12.43	7.30	1.27
STS 1:4 ml	D.W	15.57	14.43	6.80	3.47	-4.70	13.40	15.63	5.60	1.17	-6.73
	Sucrose 4 %	11.70	11.40	2.27	-1.07	-7.63	9.57	10.63	1.50	-6.40	-8.60
	Sucrose 4% +CA 200 ppm	24.33	25.37	14.77	10.77	3.73	22.17	25.57	13.50	9.40	2.43
	Sucrose 4 % + 8HQS 200 ppm	25.07	26.23	16.80	11.40	5.70	23.30	25.33	14.23	10.17	4.23
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	26.50	28.00	21.50	15.43	8.17	23.93	27.43	20.83	12.73	7.17
L.S.D at	5%	1.821	0.557	0.329	0.316	0.716	3.358	2.111	1.098	0.559	2.441
	1%	2.430	0.743	0.438	0.421	0.955	5.147	2.816	1.464	0.746	3.256

between pulsing solution and holding solution treatments succeeded in increasing water balance of tuberose cut flower spikes during the two seasons as compared with control (distilled water). However, the combinations of pulsing solution of STS at 1:4mM for 30 minutes recorded the highest significant increase of this parameter, especially the combined treatment of pulsing solution of (STS at 1:4mM for 30 minutes) and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) after 3,6,g, 12 and 15 days from the treatment in the two seasons. These results agreed with those found by **El-Saka (1992)** stated that (STS) or (Kin) treatments then holding solution of (S +8 HQS +CA) increased absorbed solution of tuberose and bird of paradise cut flower spikes, **Gendy (2000)** cleared that the treatments of interaction between (STS) or (Kin) as pulsing solutions and holding solution of (S+8HQS +CA) increased absorbed solution, water loss and water balance of gladiolus cut flower spikes. and **El Bouhy (2002)** on tuberose the interaction treatment between STS as pulsing solution and holding solution of S + 8 HQS + CA recorded highly significant increase in both absorbed solution and water balance and decrease in water loss of tuberose cut flower spikes compared to control, Also, he observed that the combination treatment of BA as pulsing solution and holding solution of (S + 8HQS + CA) recorded highly significant increase in absorbed solution and water balance as well as decrease in water loss of tuberose cut flower compared to control or the other ones under study.

3.3.Effect of pulsing solutions and holding solutions treatments on :

3.3.Chemical constituent determinations:

3.3.1.-Chlorophyll "a", chlorophyll "b" and caroteniods in leaves / spike (mg/g f. w)

Data in Table (36) reveal that pulsing tuberose cut flower spikes bases in STS at 1:4mM for 15minutes recorded the highest significant increase of chlorophyll "a" chlorophyll "b" and caroteniods in leaves / spike (mg/g.f.w) after (initial, 8 and end days) from the treatment as compared to control (D.W) in the two seasons, followed descendingly by kinetin at 20ppm for 24hours and Benzyl adenine at 10ppm for 24hours in the two seasons. Regardless control, the lowest values of this parameter was registered by using pulsing solution of sucrose at 10% for 24hours after (8 and the end the longevity) in most cases of tuberose cut flower spikes in the two seasons. Furthermore, chlorophyll "a" chlorophyll "b" and carotenoids in leaves / spike (mg/g.f.w) of tuberose cut flower spikes under all pulsing solution treatments were decreased as flower cut spikes prolonged in age after initial from the treatment till the end of age of longevity in both seasons under this study.

The aforementioned results of cytokinins are in parallel with those obtained by **Gendy (2000)** stated that kinetin treatment increased chlorophyll "B", but decreased chlorophyll "A", carotenoids and non reducing sugars percentage of gladiolus cut flowers. The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **Gendy**

Table (36): Effect of pulsing solutions treatments on Chlorophyll a, b, Carotenoids in leaves/ spike (mg/g f. w.) and Total, Reducing , Non-Reducing sugars percentage in petals of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009 .

Treatments		Chlorophyll ,a, in leaves/ spike (mg/g f. w.)			Chlorophyll ,b, leaves/ spike (mg/g f. w.)			Carotenoids in leaves/ spike (mg/g f. w.)			Total sugars percentage in petals			Reducing sugars percentage in petals			Non-Reducing sugars percentage in petals		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
1st season																			
Pulsing solutions	D.W	0.793	0.545	0.328	0.410	0.279	0.233	0.377	0.304	0.229	6.153	4.108	2.141	3.100	1.715	0.868	3.053	2.393	1.224
	Kin.20 ppm	0.793	0.595	0.342	0.410	0.293	0.243	0.377	0.313	0.229	6.153	4.679	2.328	3.100	1.963	1.141	3.053	2.717	1.215
	BA 10 ppm	0.793	0.591	0.331	0.410	0.284	0.236	0.377	0.306	0.224	6.153	4.715	2.269	3.100	1.916	1.269	3.053	2.799	1.211
	Sucrose 10 %	0.793	0.565	0.329	0.410	0.275	0.233	0.377	0.304	0.227	6.153	4.943	2.427	3.100	2.271	1.133	3.053	2.672	1.156
	STS 1:4 ml	0.793	0.607	0.355	0.410	0.297	0.251	0.377	0.320	0.235	6.153	4.933	2.545	3.100	2.297	1.337	3.053	2.636	1.157
L.S.D at	5 %	-	0.013	0.006	-	0.008	0.005	-	0.007	0.006	-	0.090	0.066	-	0.123	0.066	-	0.159	0.099
	1%	-	0.017	0.007	-	0.011	0.006	-	0.010	0.007	-	0.120	0.088	-	0.164	0.088	-	0.212	0.131
2nd season																			
Pulsing solutions	D.W	0.817	0.545	0.327	0.427	0.280	0.235	0.373	0.307	0.231	6.103	4.118	2.159	3.073	1.699	0.940	3.030	2.419	1.219
	Kin.20 ppm	0.817	0.595	0.341	0.427	0.295	0.245	0.373	0.313	0.230	6.103	4.845	2.362	3.073	1.997	1.103	3.030	2.849	1.259
	BA 10 ppm	0.817	0.588	0.331	0.427	0.287	0.237	0.373	0.307	0.227	6.103	4.568	2.277	3.073	1.995	1.069	3.030	2.573	1.209
	Sucrose 10 %	0.817	0.569	0.328	0.427	0.283	0.233	0.373	0.305	0.225	6.103	4.961	2.403	3.073	2.239	1.280	3.030	2.722	1.123
	STS 1:4 ml	0.817	0.609	0.351	0.427	0.299	0.250	0.373	0.320	0.236	6.103	4.918	2.573	3.073	2.314	1.419	3.030	2.604	1.153
L.S.D at	5 %	-	0.011	0.006	-	0.007	0.006	-	0.007	0.006	-	0.084	0.061	-	0.084	0.061	-	0.113	0.087
	1%	-	0.014	0.007	-	0.010	0.007	-	0.010	0.007	-	0.112	0.082	-	0.112	0.082	-	0.152	0.116

(2000) indicated that (STS) treatment decreased chlorophyll 'A', 'B' and carotenoids contents of gladiolus cut flower spike petals, **Khenizy (2000)** found that (STS) treatment increased chlorophyll A,B, carotene contents of Dianthus caryophyllus and **El- Bouhy (2002)** showed that dipping of cut flower spike bases of tuberose in the treatment of STS at 1- 4 mM for 10 minutes increased the contents of chlorophyll "a" and "b" after 5 days from the treatment as the end of longevity compared to control or those the other under study.

Regarding to the effect holding solution treatments on chlorophyll "a" chlorophyll "b" and caroteniods (mg/g.f.w),Data in Table (37) demonstrate that holding tuberose cut flower spikes bases in holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) exhibited to be the most effective one for inducing the highest significant increase of chlorophyll "a", chlorophyll "b" and carotenoids in leaves / spike (mg/g.f.w) after (initial, 8 and end days) from the treatment as compared to control (D.W) in the two seasons, followed descendingly by holding solution contained (sucrose 4% + CA 200ppm) and (sucrose 4% + 8-HQS 200ppm) in both seasons under this study. Furthermore, chlorophyll "a", chlorophyll "b" and carotenoids in leaves / spike (mg/gf.w) of tuberose cut flower spikes were decreased as flower cut spike advanced in age after initial till the end of age of longevity in the two seasons.

The aforementioned results of (sucrose) are in parallel with those obtained by **Gendy (2000)** found that sucrose

Table (37): Effect of Holding solutions treatments on Chlorophyll a, b, Carotenoids in leaves/ spike (mg/g f. w.) and Total, Reducing , Non-Reducing sugars percentage in petals of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009 .

Treatments		Chlorophyll ,a, in leaves/ spike (mg/g f. w.)			Chlorophyll ,b, leaves/ spike (mg/g f. w.)			Carotenoids in leaves/ spike (mg/g f. w.)			Total sugars percentage in petals			Reducing sugars percentage in petals			Non-Reducing sugars percentage in petals		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
1st season																			
Holding solutions	D.W	0.793	0.547	0.313	0.410	0.273	0.225	0.377	0.303	0.226	6.153	3.789	1.894	3.100	1.685	0.868	3.053	2.105	1.026
	Sucrose 4 %	0.793	0.547	0.319	0.410	0.265	0.229	0.377	0.297	0.221	6.153	4.819	2.389	3.100	2.010	1.141	3.053	2.809	1.249
	Sucrose 4% +CA 200 ppm	0.793	0.601	0.352	0.410	0.297	0.246	0.377	0.317	0.234	6.153	4.974	2.519	3.100	2.135	1.269	3.053	2.839	1.251
	Sucrose 4 % + 8HQS 200 ppm	0.793	0.587	0.341	0.410	0.287	0.241	0.377	0.309	0.228	6.153	4.799	2.341	3.100	2.075	1.133	3.053	2.723	1.207
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.793	0.619	0.359	0.410	0.307	0.256	0.377	0.321	0.236	6.153	4.997	2.567	3.100	2.256	1.337	3.053	2.741	1.230
L.S.D at	5 %	-	0.013	0.006	-	0.008	0.005	-	0.007	0.006	-	0.090	0.066	-	0.123	0.066	-	0.159	0.099
	1%	-	0.017	0.007	-	0.011	0.006	-	0.010	0.007	-	0.120	0.088	-	0.164	0.088	-	0.212	0.131
2nd season																			
Holding solutions	D.W	0.817	0.550	0.314	0.427	0.276	0.227	0.373	0.303	0.225	6.103	4.025	1.923	3.073	1.661	0.903	3.030	2.363	1.020
	Sucrose 4 %	0.817	0.547	0.318	0.427	0.269	0.229	0.373	0.298	0.218	6.103	4.740	2.396	3.073	1.969	1.157	3.030	2.771	1.239
	Sucrose 4% +CA 200 ppm	0.817	0.602	0.351	0.427	0.298	0.245	0.373	0.318	0.237	6.103	4.922	2.511	3.073	2.205	1.287	3.030	2.717	1.223
	Sucrose 4 % + 8HQS 200 ppm	0.817	0.589	0.340	0.427	0.291	0.243	0.373	0.310	0.230	6.103	4.748	2.362	3.073	2.096	1.109	3.030	2.652	1.253
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.817	0.618	0.355	0.427	0.310	0.256	0.373	0.322	0.239	6.103	4.975	2.581	3.073	2.313	1.353	3.030	2.663	1.228
L.S.D at	5 %	-	0.011	0.006	-	0.007	0.006	-	0.007	0.006	-	0.084	0.061	-	0.084	0.061	-	0.113	0.087
	1%	-	0.014	0.007	-	0.010	0.007	-	0.010	0.007	-	0.112	0.082	-	0.112	0.082	-	0.152	0.116

treatment (at 10%) decreased chlorophyll "A, B" and carotenoids of gladiolus cut flowers. The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **Gendy (2000)** suggested that (sucrose+ citric acid) treatment increased decreased chlorophyll "A, B" and carotenoids of gladiolus cut flowers. The aforementioned results of (sucrose +8-HQS) are in parallel with those obtained by **Gendy (2000)** indicated that sucrose+8-HQS treatments as holding solutions decreased chlorophyll "A, B" and carotenoids contents of gladiolus cut flowers and **Alka *et. al.*, (2007)** on gladiolus found that the treatment of 300ppm 8.HQ.with 5% sucrose recorded higher recorded carotene in the petals of the cut spikes on the fourth day after treatment (DAT). The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **Gendy (2000)** indicated that (S + 8-HQS + CA) treatments as holding solutions decreased chlorophyll "A, B" and carotenoids contents of gladiolus cut flowers.

As for the in interaction effective between pulsing and holding solution treatments on chlorophyll a, chlorophyll b and carotenoids (mg/g f.w.), data in Tables (38 & 39) reveal that, most the combinations treatments between pulsing and holding solutions increased chlorophyll a, chlorophyll b and carotenoids in leaves / spikes (mg/g f.w.) of tuberose cut flower spikes as compared to control (D.W) in the two seasons. However, the combinations treatments of STS at 1:4mM for 30 minutes recorded the highest significant increase in this parameter, especially the combined treatment between STS and (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or (sucrose 4% + CA

Table (38): Effect of interaction between pulsing solutions and holding solutions treatments on Chlorophyll a, b, in leaves/ spike (mg/g f. w.) of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Pulsing solutions	Holding Solutions	Chlorophyll ,a, in leaves/ spike (mg/g f. w.)						Chlorophyll ,b, in leaves/ spike (mg/g f. w.)					
		1st season			2nd season			1st season			2nd season		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
D.W	D.W	0.793	0.513	0.310	0.817	0.517	0.303	0.410	0.273	0.220	0.427	0.270	0.227
	Sucrose 4 %	0.793	0.533	0.320	0.817	0.530	0.320	0.410	0.277	0.227	0.427	0.273	0.227
	Sucrose 4% +CA 200 ppm	0.793	0.553	0.340	0.817	0.553	0.337	0.410	0.290	0.240	0.427	0.293	0.240
	Sucrose 4 % + 8HQS 200 ppm	0.793	0.540	0.327	0.817	0.540	0.327	0.410	0.270	0.233	0.427	0.277	0.233
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.793	0.583	0.343	0.817	0.583	0.347	0.410	0.287	0.247	0.427	0.287	0.247
Kin.20 ppm	D.W	0.793	0.550	0.310	0.817	0.547	0.313	0.410	0.273	0.227	0.427	0.280	0.227
	Sucrose 4 %	0.793	0.583	0.323	0.817	0.580	0.323	0.410	0.257	0.233	0.427	0.283	0.237
	Sucrose 4% +CA 200 ppm	0.793	0.613	0.363	0.817	0.613	0.360	0.410	0.300	0.253	0.427	0.300	0.250
	Sucrose 4 % + 8HQS 200 ppm	0.793	0.590	0.343	0.817	0.590	0.347	0.410	0.290	0.243	0.427	0.293	0.247
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.793	0.640	0.370	0.817	0.643	0.363	0.410	0.317	0.257	0.427	0.317	0.263
BA 10 ppm	D.W	0.793	0.547	0.310	0.817	0.547	0.310	0.410	0.260	0.223	0.427	0.263	0.227
	Sucrose 4 %	0.793	0.567	0.327	0.817	0.567	0.320	0.410	0.267	0.233	0.427	0.273	0.233
	Sucrose 4% +CA 200 ppm	0.793	0.610	0.337	0.817	0.607	0.343	0.410	0.297	0.237	0.427	0.297	0.237
	Sucrose 4 % + 8HQS 200 ppm	0.793	0.600	0.330	0.817	0.600	0.333	0.410	0.283	0.237	0.427	0.287	0.240
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.793	0.630	0.350	0.817	0.620	0.350	0.410	0.313	0.250	0.427	0.317	0.250
Sucrose 10 %	D.W	0.793	0.537	0.307	0.817	0.547	0.310	0.410	0.273	0.227	0.427	0.280	0.220
	Sucrose 4 %	0.793	0.513	0.300	0.817	0.513	0.300	0.410	0.243	0.223	0.427	0.257	0.223
	Sucrose 4% +CA 200 ppm	0.793	0.593	0.340	0.817	0.593	0.343	0.410	0.280	0.233	0.427	0.280	0.237
	Sucrose 4 % + 8HQS 200 ppm	0.793	0.583	0.343	0.817	0.593	0.337	0.410	0.290	0.230	0.427	0.297	0.233
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.793	0.593	0.353	0.817	0.597	0.350	0.410	0.290	0.253	0.427	0.300	0.253
STS 1:4 ml	D.W	0.793	0.587	0.330	0.817	0.593	0.333	0.410	0.287	0.230	0.427	0.287	0.233
	Sucrose 4 %	0.793	0.540	0.327	0.817	0.543	0.327	0.410	0.253	0.227	0.427	0.257	0.227
	Sucrose 4% +CA 200 ppm	0.793	0.637	0.380	0.817	0.643	0.370	0.410	0.317	0.267	0.427	0.320	0.263
	Sucrose 4 % + 8HQS 200 ppm	0.793	0.620	0.363	0.817	0.620	0.357	0.410	0.300	0.260	0.427	0.300	0.260
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.793	0.650	0.377	0.817	0.647	0.367	0.410	0.330	0.273	0.427	0.330	0.267
L.S.D at	5%	-	0.028	0.013	-	0.024	0.013	-	0.018	0.011	-	0.017	0.013
	1%	-	0.037	0.017	-	0.032	0.017	-	0.025	0.014	-	0.022	0.017

Table (39): Effect of interaction between pulsing solutions and holding solutions treatments on Carotenoids percentage in petals in petals of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Pulsing solutions	Holding Solutions	Carotenoids in leaves/ spike(mg/g f. w.)					
		1st season			2nd season		
		Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End
D.W	D.W	0.377	0.300	0.227	0.373	0.300	0.220
	Sucrose 4 %	0.377	0.300	0.223	0.373	0.307	0.227
	Sucrose 4% +CA 200 ppm	0.377	0.313	0.233	0.373	0.317	0.237
	Sucrose 4 % + 8HQS 200 ppm	0.377	0.300	0.227	0.373	0.300	0.230
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.377	0.307	0.237	0.373	0.310	0.240
Kin.20 ppm	D.W	0.377	0.313	0.227	0.373	0.310	0.230
	Sucrose 4 %	0.377	0.297	0.217	0.373	0.297	0.213
	Sucrose 4% +CA 200 ppm	0.377	0.320	0.233	0.373	0.320	0.237
	Sucrose 4 % + 8HQS 200 ppm	0.377	0.307	0.227	0.373	0.307	0.227
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.377	0.330	0.241	0.373	0.330	0.243
BA 10 ppm	D.W	0.377	0.297	0.220	0.373	0.300	0.220
	Sucrose 4 %	0.377	0.297	0.217	0.373	0.297	0.217
	Sucrose 4% +CA 200 ppm	0.377	0.317	0.230	0.373	0.317	0.233
	Sucrose 4 % + 8HQS 200 ppm	0.377	0.303	0.227	0.373	0.307	0.230
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.377	0.317	0.227	0.373	0.317	0.233
Sucrose 10 %	D.W	0.377	0.300	0.227	0.373	0.300	0.223
	Sucrose 4 %	0.377	0.287	0.223	0.373	0.287	0.213
	Sucrose 4% +CA 200 ppm	0.377	0.303	0.230	0.373	0.303	0.230
	Sucrose 4 % + 8HQS 200 ppm	0.377	0.317	0.227	0.373	0.317	0.227
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.377	0.313	0.230	0.373	0.317	0.230
STS 1:4 ml	D.W	0.377	0.307	0.230	0.373	0.307	0.230
	Sucrose 4 %	0.377	0.303	0.223	0.373	.303	0.220
	Sucrose 4% +CA 200 ppm	0.377	0.333	0.243	0.373	0.333	0.247
	Sucrose 4 % + 8HQS 200 ppm	0.377	0.320	0.233	0.373	0.320	0.237
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.377	0.337	0.247	0.373	0.337	0.247
L.S.D at	5%	-	0.167	0.013	-	0.167	0.013
	1%	-	0.022	0.017	-	0.022	0.017

200ppm) after (8 and end days) from the treatment as compared to control (D.W) in both seasons. Moreover, the combined treatment between kinetin at 20ppm for 24hours and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS200ppm) or (sucrose 4% + CA 200ppm) resulted highly significant increase in chlorophyll a, chlorophyll b and carotenoids in leaves / spike (mg/g f.w.) of tuberose cut flower spikes as compared to control (D.W) in the two seasons under this study. Furthermore, chlorophyll a, chlorophyll b and coroteniods in leaves / spike (mg/g f.w.) under all the combinations treatments between pulsing solution and holding solution of tuberose cut flower spikes was decreased after (initial) from the treatment till the end of age of longevity as flower cut spike prolonged in age in the two seasons. The aforementioned results are in parallel with those obtained by **Gendy (2000)** cleared that the interaction of treatments between (STS) or (Kin) as pulsing solutions and holding solution contained (S +8 HQS +CA) decreased chlorophyll a, b and carotenoids content of gladiolus cut flower spike florets and **El Bouhy (2002)** noticed that the combination treatment of sucrose (25%) as pusling solution and that o holding solution of (S + 8-HQS + CA) increased chlorophyll "a" content, total chlorophylls content of tuberose cut flower spike compared to control.

3.3.2.-Total sugars content (%):

Data in Table (36&43) reveal that, all pulsing solution treatments of tuberose cut flower spikes succeeded in increasing total sugars content (%) in petals and flower stalks after (initial,

Table (43): Effect of pulsing solutions treatments on Total, Reducing , Non-Reducing sugars percentage in flower stalk of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009 .

Treatments		Total sugars percentage in flower stalk			Reducing sugars percentage in flower stalk			Non -Reducing sugars percentage in flower stalk		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End
1st season										
Pulsing solutions	D.W	6.687	4.257	2.189	3.133	2.115	1.029	3.553	2.142	1.161
	Kin.20 ppm	6.687	4.825	2.453	3.133	2.552	1.193	3.553	2.273	1.261
	BA 10 ppm	6.687	4.819	2.381	3.133	2.410	1.153	3.553	2.409	1.227
	Sucrose 10 %	6.687	5.326	2.578	3.133	2.487	1.283	3.553	2.839	1.295
	STS 1:4 ml	6.687	5.420	2.550	3.133	2.593	1.289	3.553	2.827	1.261
L.S.D at	5 %	-	0.158	0.052	-	0.158	0.090	-	0.511	0.127
	1%	-	0.210	0.069	-	0.210	0.120	-	0.201	0.170
2nd season										
Pulsing solutions	D.W	6.743	4.291	2.251	3.237	2.126	1.045	3.507	2.165	1.205
	Kin.20 ppm	6.743	4.849	2.493	3.237	2.592	1.239	3.507	2.257	1.254
	BA 10 ppm	6.743	4.807	2.397	3.237	2.429	1.218	3.507	2.378	1.179
	Sucrose 10 %	6.743	5.360	2.677	3.237	2.479	1.299	3.507	2.881	1.378
	STS 1:4 ml	6.743	5.463	2.597	3.237	2.628	1.357	3.507	2.835	1.240
L.S.D at	5 %	-	0.171	0.133	-	0.118	0.073	-	0.181	0.152
	1%	-	0.228	0.178	-	0.158	0.098	-	0.242	0.203

8, end days) from the treatment as compared to control (distilled water) in the two seasons. However, pulsing tuberose cut flower spikes bases in STS at 1:4mM for 30 minutes showed to be the most effective one for inducing the highest values of this parameter in the two seasons, followed descendingly by sucrose at 10% for 24hours and kinetin at 20 ppm for 24 hours in both seasons. Moreover the lowest values of total sugars content (%) in petals was registered by using control (distilled water) for 24hours in the two seasons.

The remained treatments occupied an intermediate position between the abovementioned treatments and control in the two seasons under this study.

The aforementioned results of (sucrose) are in parallel with those obtained by **Mayak et. al., (1973)** on gladiolus, **El-Bouhy (2002)** indicated that the treatment of sucrose at 25% as pulsing solution increased total and non reducing sugars percentage and contents in the florets of tuberose cut flower spikes compare to control. and **Yamane *et. al.*, (2005)** noticed that pretreatment with sucrose increased sugar contents on cut gladiolus spikes.

The aforementioned results of cytokinins are in parallel with those obtained by **El-Saka (1992)** found that (kin) at 5ppm treatment increased total soluble sugars percentages in the florets, but decreased non - reducing sugars percentage tuberose and bird-of –paradise, **Gendy (2000)** stated that kinetin treatment increased total sugars percentage and reducing sugars percentage but, decreased chlorophyll "A", and carotenoids

petals and flower stalks of tuberose cut flower spikes was decreased as flower cut spikes prolonged in age after (initial) till the end of age of longevity in the two seasons.

The aforementioned results of (sucrose) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise indicated that sucrose at 10% treatment increased total sugars percentage of tuberose cut flower spikes and **Gendy (2000)** found that sucrose treatment (at 10%) increased total sugars percentage of gladiolus cut flowers. The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **El-Saka (1992)** stated that (sucrose +citric acid) treatment increased total sugars percentages of tuberose and bird of paradise cut flowers and **Gendy (2000)** suggested that (sucrose+ citric acid) treatment increased total sugars percentages of gladiolus cut flowers. The aforementioned results of (sucrose +8-HQS) are in parallel with those obtained by **El-Saka (1992)** found that sucrose + 8-HQS treatment increased total sugars percentages of tuberose and bird of paradise petals and **Gendy (2000)** indicated that sucrose+8-HQS treatments as holding solutions increased total sugars percentages of gladiolus cut flowers. The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **Gendy (2000)** indicated that (S + 8-HQS + CA) treatments as holding solutions increased total sugars percentages of gladiolus cut flowers, **El Bouhy (2002)** indicated that holding solution treatment of S + 8HQS + CA increased total sugars contents of tuberose cut flowers spikes comparing to control or that of the other one

under study. **Gendy (2007)** stated that the treatment of gladiolus cut flower spikes bases in holding solution contained (sucrose + 8-HQS +citric acid) record highly significant increase the percentage of total sugars in the flowers as compared to control .

As for the interaction effect between pulsing solution and holding solution treatments on Total sugars percentage, data in Table (40) reveal that, all the combination treatments between pulsing solution and holding solution increased total sugars percentage in petals and flower stalks of tuberose cut flower spikes as compared to control (D.W) in the two seasons. However, the combinations treatments of STS at 1:4mM for 15 minutes is being the most effective one for inducing the highest significant increase of this parameter, especially the combined treatment between STS and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) followed descendingly by the combined treatment between STS and (sucrose 4% + CA 200ppm) and STS and (sucrose 4%) after (initial, 8 and end days) from the treatment as compared to control in the two seasons. Moreover, using the combined treatment of sucrose at 10% for 24hours and holding solution contained (sucrose 4% + CA 200ppm) 8-HQS 200ppm) or (sucrose 4% + CA 200ppm) in the petals of this parameter and the combined treatment between sucrose 4% and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or (sucrose 4%) in the flower stalks recorded highly increases of this parameter as compared to control in the two seasons. Furthermore, the percentage of total sugars in petals and flower stalks of tuberose cut flower spikes was decreased as flower cut spikes prolonged in age (after

Table (40): Effect of interaction between pulsing solutions and holding solutions treatments on Total sugars percentage in petals and flower stalk of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Pulsing solutions	Holding Solutions	Total sugars percentage in petals						Total sugars percentage in flower stalks					
		1st season			2nd season			1st season			2nd season		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
D.W	D.W	6.153	3.477	1.750	6.103	3.467	1.740	6.687	3.590	1.923	6.743	3.743	1.950
	Sucrose 4 %	6.153	4.217	2.167	6.103	4.183	2.187	6.687	4.633	2.357	6.743	4.640	2.367
	Sucrose 4% +CA 200 ppm	6.153	4.440	2.283	6.103	4.450	2.327	6.687	4.430	2.303	6.743	4.453	2.557
	Sucrose 4 % + 8HQS 200 ppm	6.153	4.103	2.160	6.103	4.117	2.177	6.687	4.220	2.117	6.743	3.930	2.147
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	6.153	4.303	2.347	6.103	4.373	2.363	6.687	4.413	2.247	6.743	4.690	2.233
Kin.20 ppm	D.W	6.153	3.750	1.860	6.103	4.797	1.900	6.687	3.967	1.950	6.743	4.007	1.937
	Sucrose 4 %	6.153	4.817	2.420	6.103	4.727	2.413	6.687	5.033	2.690	6.743	5.053	2.600
	Sucrose 4% +CA 200 ppm	6.153	4.947	2.497	6.103	4.867	2.533	6.687	5.000	2.683	6.743	5.013	2.643
	Sucrose 4 % + 8HQS 200 ppm	6.153	4.820	2.330	6.103	4.750	2.370	6.687	4.907	2.487	6.743	4.933	2.510
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	6.153	5.063	2.533	6.103	5.087	2.593	6.687	5.220	2.457	6.743	5.237	2.777
BA 10 ppm	D.W	6.153	3.580	1.867	6.103	3.687	1.877	6.687	3.767	1.747	6.743	3.757	1.663
	Sucrose 4 %	6.153	4.850	2.380	6.103	4.557	2.340	6.687	5.037	2.350	6.743	4.997	2.313
	Sucrose 4% +CA 200 ppm	6.153	5.073	2.433	6.103	4.903	2.463	6.687	5.150	2.550	6.743	5.060	2.497
	Sucrose 4 % + 8HQS 200 ppm	6.153	4.950	2.237	6.103	4.743	2.260	6.687	5.110	2.720	6.743	5.123	2.693
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	6.153	5.120	2.430	6.103	4.950	2.447	6.687	5.033	2.537	6.743	5.097	2.820
Sucrose 10 %	D.W	6.153	4.217	1.997	6.103	4.243	2.017	6.687	4.350	2.130	6.743	4.390	2.230
	Sucrose 4 %	6.153	5.073	2.530	6.103	5.097	2.507	6.687	5.717	2.720	6.743	5.720	2.857
	Sucrose 4% +CA 200 ppm	6.153	5.160	2.570	6.103	5.170	2.417	6.687	5.383	2.693	6.743	5.403	2.737
	Sucrose 4 % + 8HQS 200 ppm	6.153	5.083	2.423	6.103	5.097	2.400	6.687	5.177	2.530	6.743	5.267	2.547
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	6.153	5.180	2.613	6.103	5.197	2.673	6.687	6.003	2.817	6.743	6.020	3.017
STS 1:4 ml	D.W	6.153	3.923	1.997	6.103	3.930	2.083	6.687	4.097	1.950	6.743	4.087	1.990
	Sucrose 4 %	6.153	5.137	2.450	6.103	5.137	2.533	6.687	5.403	2.253	6.743	5.423	1.990
	Sucrose 4% +CA 200 ppm	6.153	5.250	2.813	6.103	5.220	2.813	6.687	6.057	2.867	6.743	6.100	3.040
	Sucrose 4 % + 8HQS 200 ppm	6.153	5.037	2.553	6.103	5.033	2.603	6.687	5.310	2.597	6.743	3.350	2.803
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	6.153	5.317	2.910	6.103	5.270	2.830	6.687	6.233	3.083	6.743	6.353	3.160
L.S.D at	5%	-	0.201	0.147	-	0.187	0137	-	0.352	0.116	-	0.380	0.298
	1%	-	0.268	0.196	-	0.250	0.183	-	0.470	0.155	-	0.509	0.398

initial) till the end of age of longevity in the two seasons. The aforementioned results are in parallel with those obtained by **El-Saka (1992)** found that (Kin) treatment as pulsing solution followed by holding solution of (S +8 HQS +CA) increased the percentage of total, sugars percentages of tuberose and bird of paradise cut flower spike florets, **Gendy (2000)** cleared that the interaction of treatments between (STS) or (Kin) as pulsing solutions and holding solution contained (S +8 HQS +CA) increased total sugars percentage of gladiolus cut flower spike florets and **El Bouhy (2002)** noticed that the treatment of interaction between BA as pulsing solution and holding solution of (S + 8HQS + CA) increased the percentage and content of total sugars in the florets of tuberose cut flower spike compared to control or the other ones.

3.3.3.-Reducing sugars content (%):

Data in Tables (36&43) indicate that, pulsing tuberose cut flower spikes bases in STS at 1:4 mM for 30 minutes gained the highest significant increase in reducing sugars content (%) in petals and flower stalks after (8 and end days) from the treatment as compared to control (distilled water) in the two seasons. However, pulsing solution of sucrose at 10% for 24 hours recorded highly significant increase in this parameter as compared to control in the two seasons. Anyhow, Reducing sugars content (%)in petals and flower stalks under all tested treatments was decreased as flower cut spikes advanced in age after (initial) from the treatment till the end of longevity in the two seasons. The aforementioned results of (sucrose) are in

parallel with those obtained by **Mayak et. al., (1973)** on gladiolus, **El-Bouhy (2002)** indicated that the treatment of sucrose at 25% as pulsing solution increased total and non reducing sugars percentage and contents in the florets of tuberose cut flower spikes compare to control, and **Yamane *et. al.*, (2005)** noticed that pretreatment with sucrose increased sugar contents on cut gladiolus spikes. The aforementioned results of cytokinins are in parallel with those obtained by **El-Saka (1992)** on found that (kin) at 5ppm treatment increased total soluble sugars percentages in the florets, but decreased non - reducing sugars percentage tuberose and bird-of –paradise, **Gendy (2000)** stated that kinetin treatment increased total sugars percentage and reducing sugars percentage but, decreased chlorophyll "A", and carotenoids gladiolus cut flowers. **El-Bouhy (2002)** stated that pulsing tuberose cut flower spikes in BA increased the contents of total sugars and reducing sugars of tuberose cut flowers compared to control and the other ones under study.

Alka *et. al.*, (2008) on gladiolus found that effect of benzyladenine significantly enhanced the concentration of reducing and non reducing sugars in gladioli petals 4 days after treatment. The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise, **Gendy (2000)** indicated that (STS) treatment increase reducing sugars percentage of gladiolus cut flower spike petals.

Referring to the effect holding solution treatments on Reducing sugars content (%), data in Tables (37 & 44) reveal

that all holding solution treatments increased the percentage of reducing sugars in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, using holding solution contained (sucrose at 4% + citric acid 200ppm + 8- HQS at 200ppm) exhibited to be the most effective treatment for producing the highest values of this parameter as compared to the other treatments of this study in the two seasons, followed in descending order by holding solution contained (sucrose at 4% + citric acid at 200ppm) after (8 and end days) in both seasons. On the reverse, the lowest value of the percentage of reducing sugars in petals and flower stalks of tuberose cut flower spikes was recorded by using control in the two season. Anyhow, the percentage of reducing sugars in petals and flower stalks of tuberose cut flower spikes was decreased as flower cut spikes advanced age after (initial) from the treatment till the end of age of longevity in the two seasons. The aforementioned results of (sucrose) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise indicated that sucrose at 10% treatment increased reducing sugars percentage of tuberose cut flower spikes and **Gendy (2000)** found that sucrose treatment (at 10%) increased reducing sugars percentage of gladiolus cut flowers. The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **El-Saka (1992)** stated that (sucrose +citric acid) treatment increased reducing sugars percentages of tuberose and bird of paradise cut flowers and **Gendy (2000)** suggested that (sucrose+ citric acid) treatment increased reducing sugars percentages of gladiolus cut flowers. The

aforementioned results of (sucrose +8-HQS) are in parallel with those obtained by **El-Saka (1992)** found that sucrose + 8-HQS treatment increased reducing sugars percentages of tuberose and bird of paradise petals. **Gendy (2000)** indicated that sucrose+8-HQS treatments as holding solutions increased reducing sugars percentages of gladiolus cut flowers and **Alka *et. al.*, (2007)** on gladiolus found that the treatment of 300ppm 8.HQ.with 5% sucrose recorded higher recorded higher reducing sugar content in the petals of the cut spikes on the fourth day after treatment (DAT). The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **Gendy (2000)** indicated that (S + 8-HQS + CA) treatments as holding solutions increased reducing sugars percentages of gladiolus cut flowers and **El Bouhy (2002)** indicated that holding solution treatment of S + 8HQS + CA increased reducing sugars contents of the other one under study.

Concerning the effect of interaction between pulsing solution and holding solution treatments on Reducing sugars percentage, data presented in Table (41) reveal that, all the combinations treatments between pulsing solution and holding solution increased reducing sugars percentage in petals and flower stalks of tuberose cut flower spikes after (initial, 8 and end days) from the treatment as compared to control (D.W) in the two seasons. However, the combinations treatments of STS at 1:4mM for 15minutes obtained the highest values of this parameter, particularly the combined treatment between STS and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or (sucrose 4% + CA 200ppm) after (8 and end

Table (41): Effect of interaction between pulsing solutions and holding solutions treatments on Reducing sugars percentage in petals and flower stalk of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Pulsing solutions	Holding Solutions	Reducing sugars percentage in petals						Reducing sugars percentage in flower stalks					
		1st season			2nd season			1st season			2nd season		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
D.W	D.W	3.100	1.393	0.643	3.073	1.297	0.670	3.133	1.823	0.840	3.237	1.800	0.863
	Sucrose 4 %	3.100	1.587	0.930	3.073	1.523	0.913	3.133	2.150	1.060	3.237	2.117	1.077
	Sucrose 4% +CA 200 ppm	3.100	1.817	1.013	3.073	1.800	1.080	3.133	2.273	1.060	3.237	2.297	1.103
	Sucrose 4 % + 8HQS 200 ppm	3.100	1.830	0.923	3.073	1.830	0.863	3.133	2.087	1.033	3.237	2.163	1.047
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.100	1.947	1.077	3.073	2.047	1.173	3.133	2.243	1.150	3.237	2.253	1.137
Kin.20 ppm	D.W	3.100	1.507	0.830	3.073	1.540	0.823	3.133	1.967	0.873	3.237	2.010	0.900
	Sucrose 4 %	3.100	2.060	1.090	3.073	1.970	1.090	3.133	2.790	1.343	3.237	2.793	1.337
	Sucrose 4% +CA 200 ppm	3.100	2.073	1.250	3.073	2.150	1.253	3.133	2.523	1.233	3.237	2.513	1.287
	Sucrose 4 % + 8HQS 200 ppm	3.100	2.027	1.080	3.073	2.090	1.067	3.133	2.717	1.273	3.237	2.820	1.240
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.100	2.147	1.317	3.073	2.233	1.280	3.133	2.763	1.240	3.237	2.823	1.433
BA 10 ppm	D.W	3.100	1.510	0.850	3.073	1.553	0.910	3.133	1.867	0.850	3.237	1.983	0.840
	Sucrose 4 %	3.100	2.000	1.060	3.073	1.920	1.090	3.133	2.677	1.223	3.237	2.527	1.243
	Sucrose 4% +CA 200 ppm	3.100	2.003	1.057	3.073	2.160	1.090	3.133	2.767	1.217	3.237	2.770	1.263
	Sucrose 4 % + 8HQS 200 ppm	3.100	1.970	1.047	3.073	2.080	1.017	3.133	2.300	1.197	3.237	2.423	1.260
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.100	2.097	1.277	3.073	2.263	1.237	3.133	2.440	1.280	3.237	2.440	1.483
Sucrose 10 %	D.W	3.100	2.070	0.967	3.073	1.943	1.010	3.133	2.063	0.987	3.237	2.090	1.003
	Sucrose 4 %	3.100	2.273	1.283	3.073	2.273	1.290	3.133	2.520	1.447	3.237	2.273	1.437
	Sucrose 4% +CA 200 ppm	3.100	2.313	1.397	3.073	2.357	1.367	3.133	2.663	1.337	3.237	2.680	1.347
	Sucrose 4 % + 8HQS 200 ppm	3.100	2.247	1.280	3.073	2.220	1.273	3.133	2.313	1.257	3.237	2.423	1.293
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.100	2.450	1.427	3.073	2.400	1.460	3.133	2.873	1.387	3.237	2.927	1.417
STS 1:4 ml	D.W	3.100	1.943	1.050	3.073	1.973	1.103	3.133	2.070	0.950	3.237	2.120	0.957
	Sucrose 4 %	3.100	2.130	1.340	3.073	2.160	1.403	3.133	2.197	1.193	3.237	2.210	1.270
	Sucrose 4% +CA 200 ppm	3.100	2.467	1.627	3.073	2.557	1.647	3.133	2.983	1.523	3.237	3.027	1.613
	Sucrose 4 % + 8HQS 200 ppm	3.100	2.303	1.337	3.073	2.260	1.327	3.133	2.680	1.240	3.237	2.743	1.320
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.100	2.640	1.587	3.073	2.620	1.617	3.133	3.037	1.537	3.237	3.040	1.623
L.S.D at	5%	-	0.275	0.147	-	0.084	0137	-	0.352	0.201	-	0.265	0.164
	1%	-	0.367	0.196	-	0.113	0.183	-	0.470	0.268	-	0.353	0219

days) from the treatment as compared to control in the two seasons. Moreover, using the combined treatment between sucrose 10% for 24hours and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or (sucrose 4% + CA 200ppm) resulted highly significant increase of the percentage of reducing sugars in petals and flower stalks of tuberose cut flower spikes as compared control in both seasons. On the other hand, the lowest values of this parameter was registered by using the combined treatment of control and holding solution contained (distilled water) as control in the two seasons in this study. The aforementioned results are in parallel with those obtained by **El-Saka (1992)** found that (Kin) treatment as pulsing solution followed by holding solution of (S +8 HQS +CA) increased the percentage of reducing sugars percentages of tuberose and bird of paradise cut flower spike florets. **Gendy (2000)** cleared that the interaction of treatments between (STS) or (Kin) as pulsing solutions and holding solution contained (S +8 HQS +CA) increased reducing sugars percentage, of gladiolus cut flower spike florets.and **El Bouhy (2002)** noticed the treatment of interaction between BA as pulsing solution and holding solution of (S + 8HQS + CA) increased the percentage and content of reducing sugars of tuberose cut flower spike compared to control or the other ones.

3.3.4.-Non reducing sugars content (%):

Data in Table (36&43) reveal that all pulsing solution treatment tuberose cut flower spikes bases scored increases of non reducing sugars content (%) in petals after (8days and end

days) from the treatment as compared to control in the two seasons. However, pulsing solution of kinetin at 20 ppm for 24 hours gave the highest significant increase in this parameter after (8 and end days) from the treatment as compared to control in the two seasons in most cases. The aforementioned results of (sucrose) are in parallel with those obtained by **Mayak et. al., (1973)** on gladiolus, **El- Bouhy (2002)** indicated that The treatment of sucrose at 25% as pulsing solution increased total and non reducing sugars percentage and contents in the florets of tuberose cut flower spikes compare to control and **Yamane *et. al.*, (2005)** noticed that pretreatment with sucrose increased sugar contents on cut gladiolus spikes. The aforementioned results of cytokinins are in parallel with those obtained by **El-Saka (1992)** on found that (kin) at 5 ppm treatment increased total soluble sugars percentages in the florets, but decreased non - reducing sugars percentage tuberose and bird-of –paradise, **Gendy (2000)** stated that kinetin treatment increased total sugars percentage and reducing sugars percentage but, decreased chlorophyll "A", and carotenoids gladiolus cut flowers. **El-Bouhy (2002)** stated that pulsing tuberose cut flower spikes in BA increased the contents of total sugars and reducing sugars of tuberose cut flowers compared to control and the other ones under study. **Alka *et. al.*, (2008)** on gladiolus found that effect of benzyladenine significantly enhanced the concentration of reducing and non reducing sugars in gladioli petals 4 days after treatment. The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird- of paradise, **Gendy (2000)** indicated that

(STS) treatment decreased non reducing sugars of gladiolus cut flower spike petals.

Additionally, Data in Table (43) reveal that, pulsing tuberose cut flower spikes bases in sucrose at 10% for 24 hours appeared to be the most effective treatment for inducing the highest values of the percentage of non-reducing sugars in flower stalks after (initial, 8 and end days) from the treatment as compared to control in the two seasons. However, using the treatment of pulsing solution of STS at 1:4mM for 30 minutes resulted highly increases after (8 and end days) when compared to control in both seasons. Moreover using the treatment of control (D.W) resulted the lowest of values of this parameter in the two seasons in most cases. The aforementioned results of (sucrose) are in parallel with those obtained by **Mayak et. al., (1973)** on gladiolus, **El- Bouhy (2002)** indicated that The treatment of sucrose at 25% as pulsing solution increased total and non reducing sugars percentage and contents in the florets of tuberose cut flower spikes compare to control. and **Yamane *et. al.*, (2005)** noticed that pretreatment with sucrose increased sugar contents on cut gladiolus spikes. The aforementioned results of (cytokinins) are in parallel with those obtained by **El-Saka (1992)** on found that (kin) at 5 ppm treatment increased total soluble sugars percentages in the florets, but decreased non - reducing sugars percentage tuberose and bird of paradise, **Gendy (2000)** stated that kinetin treatment increased total sugars percentage and reducing sugars percentage but, decreased chlorophyll "A", and carotenoids gladiolus cut flowers. **El-Bouhy (2002)** stated that pulsing tuberose cut flower spikes in

BA increased the contents of total sugars and reducing sugars of tuberose cut flowers compared to control and the other ones under study. **Alka *et. al.*, (2008)** on gladiolus found that effect of benzyladenine significantly enhanced the concentration of reducing and non reducing sugars in gladioli petals 4 days after treatment. The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird- of paradise, **Gendy (2000)** indicated that (STS) treatment decreased non reducing sugars of gladiolus cut flower spike petals.

Referring to the effect holding solution treatments on Non-Reducing sugars content (%), data in Table (37&44) reveal that all holding solution treatments increased the percentage of non-reducing sugars in petals of tuberose cut flower spikes as compared to control in the two seasons. However, the greatest values of this parameter was registered by using holding solution contained (sucrose at 4% + citric acid at 200ppm) and (sucrose 4%) as compared to control in the first and second seasons respectively. Moreover, the lowest values of this parameter was registered by using holding solution contained (D.W) as control after (initial, 8 and end days) from the treatment in both seasons under this study.

Furthermore, Data in Table (44) reveal that, all holding solution treatments increased the percentage of non-reducing sugars in flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, the highest values of this parameter was registered by using holding solution contained (sucrose at 4% + citric acid at 200ppm + 8- HQS at

200ppm) as compared to control in the two seasons. Moreover, the lowest values of this parameter was registered by using holding solution contained (D.W) as control after (initial, 8 and end days) from the treatment in both seasons under this study. The aforementioned results of (sucrose) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise indicated that sucrose at 10% treatment decreased non reducing sugars percentage of tuberose cut flower spikes and **Gendy (2000)** found that sucrose treatment (at 10%) increased non reducing percentage of gladiolus cut flowers. The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **El-Saka (1992)** stated that (sucrose +citric acid) treatment increased non reducing sugars percentages of tuberose and bird of paradise cut flowers and **Gendy (2000)** suggested that (sucrose +citric acid) treatment increased non reducing sugars percentages of gladiolus cut flowers. The aforementioned results of (sucrose +8-HQS) are in parallel with those obtained by **El-Saka (1992)** found that sucrose + 8-HQS treatment increased decreased non, reducing sugars of tuberose and bird of paradise petals. **Gendy (2000)** indicated that sucrose+8-HQS treatments as holding solutions increased non reducing sugars percentages of gladiolus cut flowers and **Alka *et. al.*, (2007)** on gladiolus found that the treatment of 300ppm 8.HQ.with 5% sucrose recorded higher recorded higher non. reducing sugar content in the petals of the cut spikes on the fourth day after treatment (DAT). The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **Gendy (2000)** indicated that (S

+ 8-HQS + CA) treatments as holding solutions increased non reducing sugars percentages of gladiolus cut flowers and **El-Bouhy (2002)** indicated that holding solution treatment of S + 8HQS + CA increased non reducing sugars contents of tuberose cut flowers spikes comparing to control or that of the other one under study.

Concerning the effect of interaction between pulsing solution and holding solution treatments on Non- Reducing sugars percentage, Data in Table (42) indicate that most the combinations treatments between pulsing solution and holding solution increased the percentage of non-Reducing sugars in petals and flowers stalks of tuberose cut flower spikes as compared to control (D.W) in the two seasons. However, the combinations treatment between STS at 1:4mM for 15minutes or sucrose at 10% for 24hours and holding solution contained (sucrose 4% + CA 200pm + 8-HQS 200ppm) or (sucrose 4%) recoded the highest values of this parameter after (8 and end days) from the treatment as compared to control (D.W) in the two seasons in most cases. The aforementioned results are in parallel with those obtained by **El-Saka (1992)** stated that (Kin) treatment as pulsing solution followed by holding solution of (S +8 HQS +CA) increased the percentage of non reducing sugars percentages of tuberose and bird of paradise cut flower spike florets, **Gendy (2000)** cleared that the interaction of treatments between (STS) or (Kin) as pulsing solutions and holding solution contained (S +8 HQS +CA) increased non reducing sugars percentage of gladiolus cut flower spike florets and **El Bouhy (2002)** noticed that the combination treatment of sucrose

Table (42): Effect of interaction between pulsing solutions and holding solutions treatments on Non-Reducing sugars percentage in petals and flower stalk of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Pulsing solutions	Holding Solutions	Non-Reducing sugars percentage in petals						Non -Reducing sugars percentage in flower stalks					
		1st season			2nd season			1st season			2nd season		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
D.W	D.W	3.053	2.083	1.107	3.030	2.170	1.070	3.553	1.767	1.083	3.507	1.943	1.087
	Sucrose 4 %	3.053	2.630	1.237	3.030	2.660	1.273	3.553	2.483	1.297	3.507	2.523	1.290
	Sucrose 4% +CA 200 ppm	3.053	2.623	1.270	3.030	2.650	1.247	3.553	2.157	1.243	3.507	2.157	1.453
	Sucrose 4 % + 8HQS 200 ppm	3.053	2.273	1.237	3.030	2.287	1.313	3.553	2.133	1.083	3.507	1.767	1.100
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.053	2.357	1.270	3.030	2.327	1.190	3.553	2.170	1.097	3.507	2.437	1.097
Kin.20 ppm	D.W	3.053	2.243	1.030	3.030	2.257	1.077	3.553	2.000	1.077	3.507	1.997	1.037
	Sucrose 4 %	3.053	2.757	1.330	3.030	2.757	1.323	3.553	2.243	1.347	3.507	2.260	1.263
	Sucrose 4% +CA 200 ppm	3.053	2.873	1.247	3.030	2.717	1.280	3.553	2.477	1.450	3.507	2.500	1.357
	Sucrose 4 % + 8HQS 200 ppm	3.053	2.793	1.250	3.030	2.660	1.303	3.553	2.190	1.213	3.507	2.113	1.270
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.053	2.917	1.217	3.030	2.853	1.313	3.553	2.457	1.217	3.507	2.413	1.343
BA 10 ppm	D.W	3.053	2.070	1.017	3.030	2.133	0.967	3.553	1.900	0.897	3.507	1.773	0.823
	Sucrose 4 %	3.053	2.850	1.320	3.030	2.637	1.250	3.553	2.360	1.127	3.507	2.470	1.070
	Sucrose 4% +CA 200 ppm	3.053	3.070	1.377	3.030	2.743	1.373	3.553	2.383	1.333	3.507	2.290	1.233
	Sucrose 4 % + 8HQS 200 ppm	3.053	2.980	1.190	3.030	2.663	1.243	3.553	2.810	1.523	3.507	2.700	1.433
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.053	3.023	1.153	3.030	2.687	1.210	3.553	2.593	1.257	3.507	2.657	1.337
Sucrose 10 %	D.W	3.053	2.147	1.030	3.030	2.300	1.007	3.553	2.287	1.143	3.507	2.300	1.227
	Sucrose 4 %	3.053	2.800	1.247	3.030	2.823	1.217	3.553	3.197	1.273	3.507	3.447	1.420
	Sucrose 4% +CA 200 ppm	3.053	2.847	1.173	3.030	2.817	1.050	3.553	2.720	1.357	3.507	2.723	1.390
	Sucrose 4 % + 8HQS 200 ppm	3.053	2.837	1.143	3.030	2.877	1.127	3.553	2.863	1.273	3.507	2.843	1.253
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.053	2.730	1.187	3.030	2.797	1.213	3.553	3.130	1.430	3.507	3.093	1.600
STS 1:4 ml	D.W	3.053	1.980	0.947	3.030	1.957	0.980	3.553	2.027	1.000	3.507	1.967	1.033
	Sucrose 4 %	3.053	3.007	1.110	3.030	2.977	1.130	3.553	3.207	1.060	3.507	3.213	0.720
	Sucrose 4% +CA 200 ppm	3.053	2.783	1.187	3.030	2.663	1.167	3.553	3.073	1.343	3.507	3.073	1.427
	Sucrose 4 % + 8HQS 200 ppm	3.053	2.733	1217	3.030	2.773	1.277	3.553	2.630	1.357	3.507	2.607	1.483
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.053	2.677	1.323	3.030	2.650	1.213	3.553	3.197	1.547	3.507	3.313	1.537
L.S.D at	5%	-	0.356	0.220	-	0.254	0.194	-	0.336	0.284	-	0.406	0.340
	1%	-	0.475	0.294	-	0.339	0.259	-	0.449	0.379	-	0.541	0.454

(25%) as pulsing solution and that holding solution of (S + 8-HQS + CA) increased and non reducing sugars percentage of tuberose cut flower spike compared to control. And added that the treatment of interaction between BA as pulsing solution and holding solution of (S + 8HQS + CA) increased the percentage and content of non reducing sugars of tuberose cut flower spike compared to control or the other ones.

3.3.5.-Total nitrogen and total protein percentage:

Data presented in Table (45) indicate that most pulsing solution treatments recorded increases of the percentage of total nitrogen and total protein in petals of tuberose cut flower spikes as compared to control in the two seasons. However, pulsing tuberose cut flower spikes bases in STS at 1:4mM for 30 minutes approved to be the most effective treatment for inducing the greatest values of this parameter, followed descending by kinetin at 20ppm for 24hours after (initial, 8 and end days) from the treatment in the two seasons. On the reverse, the lowest values of the percentage of total nitrogen and total protein in petals of tuberose cut flower spikes was registered by using the treatment of control in two seasons of this study. The aforementioned results of cytokinins are in parallel with those obtained by **El- Bouhy (2002)** stated that pulsing tuberose cut flower spikes in BA increased the contents of total nitrogen, total protein, in the florets of tuberose cut flowers compared to control and the other ones under study. The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird- of paradise,

Table (45): Effect of pulsing solutions treatments on Total nitrogen percentage and Total protein percentage in petals and flower stalk of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009 .

Treatments		Total nitrogen percentage in petals			Total protein percentage in petals			Total nitrogen percentage in flower stalk			Total protein percentage in flower stalk		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
1st season													
Pulsing solutions	D.W	3.727	3.473	3.458	23.29	21.70	21.61	3.253	3.094	3.161	20.33	19.34	19.76
	Kin.20 ppm	3.727	3.585	3.599	23.29	22.40	22.50	3.253	3.079	3.111	20.33	19.25	19.44
	BA 10 ppm	3.727	3.523	3.545	23.29	22.02	22.15	3.253	3.059	2.993	20.33	19.12	18.70
	Sucrose 10 %	3.727	3.440	3.463	23.29	21.50	21.64	3.253	2.951	2.903	20.33	18.45	18.14
	STS 1:4 ml	3.727	3.853	3.862	23.29	24.08	24.14	3.253	3.045	3.257	20.33	19.03	20.36
L.S.D at	5 %	-	0.096	0.096	-	0.605	0.598	-	0.127	0.178	-	0.795	1.114
	1%	-	0.128	0.128	-	0.807	0.798	-	0.170	0.238	-	1.061	1.486
2nd season													
Pulsing solutions	D.W	3.863	3.653	3.634	24.15	22.83	22.71	3.223	3.111	3.081	20.15	19.47	19.25
	Kin.20 ppm	3.863	3.712	3.671	24.15	23.20	22.94	3.223	3.138	3.104	20.15	19.61	19.40
	BA 10 ppm	3.863	3.763	3.753	24.15	23.52	23.46	3.223	3.156	3.136	20.15	19.73	19.60
	Sucrose 10 %	3.863	3.753	3.699	24.15	23.45	23.12	3.223	3.019	3.042	20.15	18.87	19.01
	STS 1:4 ml	3.863	3.844	3.805	24.15	24.03	23.78	3.223	3.253	3.184	20.15	20.33	19.90
L.S.D at	5 %	-	0.066	0.061	-	0.413	0.384	-	0.109	0.090	-	0.683	0.555
	1%	-	0.088	0.082	-	0.551	0.513	-	0.145	0.120	-	0.911	0.741

Gendy (2000) indicated that (STS) treatment increase total nitrogen percentage, total protein percentage of gladiolus cut flower spike petals.

Additionally, Data in Table (45) reveal that the greatest values of total nitrogen and total protein percentage in flower stalks of tuberose cut flower spikes was recoded by using pulsing solution of STS at 1:4mM for 30 minutes after (initial, 8 and end days) as compared to control in the two seasons. Furthermore, the lowest values of these parameters was registered by using sucrose at 10% for 24 hours in the two seasons in most cases. The aforementioned results of cytokinins are in parallel with those obtained by **El- Bouhy (2002)** stated that pulsing tuberose cut flower spikes in BA increased the contents of total nitrogen, total protein, in the florets of tuberose cut flowers compared to control and the other ones under study. The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird- of paradise, **Gendy (2000)** indicated that (STS) treatment increase total nitrogen percentage, total protein percentage of gladiolus cut flower spike petals.

As for the effect holding solution treatments on Total nitrogen and total protein content (%),Data in Table (46) reveal that holding tuberose cut flower spikes bases in holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) appeared to be the most effective for producing the highest values of the percentage of total nitrogen and total protein in petals after (initial, 8 and end days) from the treatment as

Table (46): Effect of Holding solutions treatments on Total nitrogen percentage and Total protein percentage in petals and flower stalk of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009 .

Treatments		Total nitrogen percentage in petals			Total protein percentage in petals			Total nitrogen percentage in flower stalk			Total protein percentage in flower stalk		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
1st season													
Holding solutions	D.W	3.727	3.447	3.452	23.29	21.54	21.58	3.253	2.917	2.904	20.33	18.23	18.15
	Sucrose 4 %	3.727	3.519	3.549	23.29	21.99	22.18	3.253	2.957	3.060	20.33	18.48	19.13
	Sucrose 4% +CA 200 ppm	3.727	3.678	3.679	23.29	22.99	22.99	3.253	3.085	3.088	20.33	19.28	19.30
	Sucrose 4 % + 8HQS 200 ppm	3.727	3.513	3.517	23.29	21.96	21.98	3.253	3.069	3.092	20.33	19.18	19.33
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.727	3.716	3.730	23.29	23.23	23.31	3.253	3.200	3.281	20.33	20.00	20.50
L.S.D at	5 %	-	0.096	0.096	-	0.605	0.598	-	0.127	0.178	-	0.795	1.114
	1%	-	0.128	0.128	-	0.807	0.798	-	0.170	0.238	-	1.061	1.486
2nd season													
Holding solutions	D.W	3.863	3.703	3.643	24.15	23.15	22.77	3.223	3.021	3.001	20.15	18.88	18.76
	Sucrose 4 %	3.863	3.708	3.681	24.15	23.18	23.01	3.223	3.072	3.017	20.15	19.20	18.86
	Sucrose 4% +CA 200 ppm	3.863	3.800	3.774	24.15	23.75	23.59	3.223	3.193	3.183	20.15	19.96	19.89
	Sucrose 4 % + 8HQS 200 ppm	3.863	3.633	3.636	24.15	22.71	22.73	3.223	3.097	3.094	20.15	19.36	19.34
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.863	3.881	3.827	24.15	24.25	23.92	3.223	3.293	3.251	20.15	20.58	20.32
L.S.D at	5 %	-	0.066	0.061	-	0.413	0.384	-	0.109	0.090	-	0.683	0.555
	1%	-	0.088	0.082	-	0.551	0.513	-	0.145	0.120	-	0.911	0.741

compared to control in the two seasons, followed descendingly by (sucrose 4% + CA 200ppm) in both seasons. In addition, the lowest values of the percentage of total nitrogen and total protein in petals of tuberose cut flower spikes was registered by using holding solution contained (distilled water) as control in the two seasons after (8 and end days) from the treatment in this study in most cases.

Furthermore, Data presented in Table (46) indicate that all holding solution treatments succeeded in increasing the percentage of total nitrogen and total protein in flower stalks of tuberose cut flower spikes as compared to control (D.W) in the two seasons. However, the highest values of these parameters was recorded by using holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) when compared to control (D.W) in the two seasons. Moreover, using the treatment of holding solution contained (sucrose 4% + CA at 200ppm) resulted highly increments of this parameter of tuberose cut flower spikes as compared to control (D.W) in the two seasons. On the reverse, the lowest values of the percentage of total nitrogen and total protein in flower stalk of tuberose cut flower spikes was recorded by holding solution contained (distilled water) as control respectively after (14 and end days) from the treatment in both seasons in this study.

The aforementioned results of (sucrose) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise indicated that sucrose at 10% treatment increased N-protein percentages of tuberose cut flower spikes and **Gendy**

(2000) found that sucrose treatment (at 10%) decreased total nitrogen percentage and protein percentage of gladiolus cut flowers. The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **El-Saka (1992)** stated that (sucrose +citric acid) treatment increased decreased N- protein of tuberose and bird of paradise cut flowers and **Gendy (2000)** suggested that (sucrose + citric acid) treatment increased total nitrogen, N- protein of gladiolus cut flowers. The aforementioned results of (sucrose +8-HQS) are in parallel with those obtained by **El-Saka (1992)** found that sucrose + 8-HQS treatment increased N- protein percentages of tuberose and bird of paradise petals and **Gendy (2000)** indicated that sucrose+8-HQS treatments as holding solutions increased total nitrogen, N-protein percentages of gladiolus cut flowers. The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **Gendy (2000)** indicated that (S + 8-HQS + CA) treatments as holding solutions increased total nitrogen, N-protein percentages of gladiolus cut flowers and **El-Bouhy (2002)** indicated that holding solution treatment of S + 8HQS + CA increased total nitrogen, total protein in the florets of tuberose cut flowers spikes.

Concerning the effect of interaction between pulsing solution and holding solution treatments on Total nitrogen and total protein percentage, Data in Table (47) indicate that most the combinations treatments between pulsing and holding solution increased total nitrogen and total protein percentage in petals of tuberose cut flower spikes as compared to control in the two seasons. However, the combinations treatments of STS at

Table (47): Effect of interaction between pulsing solutions and holding solutions treatments on Total nitrogen percentage and Total protein percentage in petals of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Pulsing solutions	Holding Solutions	Total nitrogen percentage in petals						Total protein percentage in petals					
		1st season			2nd season			1st season			2nd season		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
D.W	D.W	3.727	3.567	3.513	3.863	3.613	3.560	23.29	22.29	21.96	24.15	22.58	22.25
	Sucrose 4 %	3.727	3.487	3.493	3.863	3.597	3.580	23.29	21.79	21.83	24.15	22.48	22.38
	Sucrose 4% +CA 200 ppm	3.727	3.537	3.497	3.863	3.727	3.697	23.29	22.10	21.85	24.15	23.29	23.10
	Sucrose 4 % + 8HQS 200 ppm	3.727	3.223	3.213	3.863	3.520	3.533	23.29	20.15	20.08	24.15	22.00	22.08
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.727	3.550	3.573	3.863	3.810	3.800	23.29	22.19	22.33	24.15	23.81	23.75
Kin.20 ppm	D.W	3.727	3.223	3.260	3.863	3.750	3.620	23.29	20.15	20.38	24.15	23.44	22.63
	Sucrose 4 %	3.727	3.490	3.550	3.863	3.657	3.623	23.29	21.81	22.19	24.15	22.85	22.65
	Sucrose 4% +CA 200 ppm	3.727	3.800	3.810	3.863	3.767	3.740	23.29	23.75	23.81	24.15	23.54	23.38
	Sucrose 4 % + 8HQS 200 ppm	3.727	3.700	3.650	3.863	3.540	3.577	23.29	23.13	22.81	24.15	22.13	22.35
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.727	3.710	3.727	3.863	3.847	3.793	23.29	23.19	23.29	24.15	24.04	23.71
BA 10 ppm	D.W	3.727	3.300	3.327	3.863	3.720	3.707	23.29	20.63	20.79	24.15	23.25	23.17
	Sucrose 4 %	3.727	3.530	3.560	3.863	3.690	3.737	23.29	22.06	22.25	24.15	23.06	23.35
	Sucrose 4% +CA 200 ppm	3.727	3.607	3.633	3.863	3.847	3.810	23.29	22.54	22.71	24.15	24.04	23.81
	Sucrose 4 % + 8HQS 200 ppm	3.727	3.380	3.420	3.863	3.640	3.637	23.29	21.13	21.38	24.15	22.75	22.73
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.727	3.797	3.783	3.863	3.920	3.877	23.29	23.73	23.65	24.15	24.50	24.23
Sucrose 10 %	D.W	3.727	3.277	3.307	3.863	3.630	3.587	23.29	20.48	20.67	24.15	22.69	22.42
	Sucrose 4 %	3.727	3.257	3.307	3.863	3.717	3.647	23.29	20.35	20.67	24.15	23.23	22.79
	Sucrose 4% +CA 200 ppm	3.727	3.547	3.533	3.863	3.813	3.777	23.29	22.17	22.08	24.15	23.83	23.60
	Sucrose 4 % + 8HQS 200 ppm	3.727	3.463	3.480	3.863	3.707	3.687	23.29	21.65	21.75	24.15	23.17	23.04
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.727	3.657	3.687	3.863	3.897	3.800	23.29	22.85	23.04	24.15	24.35	23.75
STS 1:4 ml	D.W	3.727	3.867	3.853	3.863	3.803	3.743	23.29	24.17	24.08	24.15	23.77	23.40
	Sucrose 4 %	3.727	3.830	3.833	3.863	3.880	3.820	23.29	23.94	23.96	24.15	24.25	23.88
	Sucrose 4% +CA 200 ppm	3.727	3.900	3.920	3.863	3.847	3.847	23.29	24.38	24.50	24.15	24.04	24.04
	Sucrose 4 % + 8HQS 200 ppm	3.727	3.800	3.823	3.863	3.760	3.747	23.29	23.75	23.90	24.15	23.50	23.42
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.727	3.867	3.880	3.863	3.930	3.867	23.29	24.17	24.25	24.15	24.56	24.17
L.S.D at	5%	-	0.214	0.214	-	0.147	0137	-	1.353	1.337	-	0.923	0.859
	1%	-	0.286	0.286	-	0.196	0.183	-	1.805	1.783	-	1.231	1.146

1:4mM for 15 minutes resulted the highest values of this parameter, especially the combined treatment between STS and holding solution contained (sucrose 4% + CA 200ppm) or (sucrose 4% + CA 200ppm + 8-HQS 200ppm) after (8 and end days) from the treatment at the first and second season respectively, with the exception of the combined treatment of BA at 10ppm for 24hours and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) at the end of longevity of the percentage of total nitrogen protein in petals in the second season only. Moreover, using the combined treatment between kinetin at 20ppm for 24hours and holding solution contained (sucrose 4% + CA 200ppm) at the first season, and the combined treatment between Benzyl adenine at 10ppm for 24hours and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) at the second season recorded highly increases of this parameter in petals as compared to control under this study.

Furthermore, Data presented in Table (48) reveal that the combined treatment between STS at 1:4mM for 30minutes and holding solution contained (sucrose 4%) in the first season and the combined treatment between STS and holding solution contained (sucrose 4% + CA 200ppm) in the second season gave the highest values of the percentage of total nitrogen and total protein in flower stalks of tuberose cut flower spikes as compared to control in the two seasons under study. The aforementioned results are in parallel with those obtained by **El-Saka (1992)** found that (STS) treatment then (S +8 HQS + CA)

Table (48): Effect of interaction between pulsing solutions and holding solutions treatments on Total nitrogen percentage and Total protein percentage in flower stalk of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Pulsing solutions	Holding Solutions	Total nitrogen percentage in flower stalk						Total protein percentage in flower stalks					
		1st season			2nd season			1st season			2nd season		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
D.W	D.W	3.253	2.920	2.897	3.223	2.963	2.920	20.33	18.25	18.10	20.15	18.52	18.25
	Sucrose 4 %	3.253	2.990	3.167	3.223	3.000	2.990	20.33	18.69	19.79	20.15	18.75	18.69
	Sucrose 4% +CA 200 ppm	3.253	2.957	2.950	3.223	3.023	3.010	20.33	18.48	18.44	20.15	18.90	18.81
	Sucrose 4 % + 8HQS 200 ppm	3.253	3.147	3.327	3.223	3.167	3.140	20.33	19.67	20.79	20.15	19.79	19.63
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.253	3.457	3.467	3.223	3.403	3.343	20.33	21.60	21.67	20.15	21.27	20.90
Kin.20 ppm	D.W	3.253	2.957	2.817	3.223	3.093	3.000	20.33	18.48	17.60	20.15	19.33	18.75
	Sucrose 4 %	3.253	2.890	3.057	3.223	2.973	2.933	20.33	18.06	19.10	20.15	18.58	18.33
	Sucrose 4% +CA 200 ppm	3.253	3.217	3.347	3.223	3.200	3.187	20.33	20.10	20.92	20.15	20.00	19.92
	Sucrose 4 % + 8HQS 200 ppm	3.253	3.253	3.147	3.223	3.113	3.107	20.33	20.33	19.67	20.15	1.46	19.42
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.253	3.080	3.187	3.223	3.310	3.293	20.33	19.25	19.92	20.15	20.69	20.58
BA 10 ppm	D.W	3.253	2.780	2.713	3.223	3.007	2.977	20.33	17.38	16.96	20.15	18.79	18.60
	Sucrose 4 %	3.253	2.910	2.953	3.223	3.100	3.003	20.33	18.19	18.46	20.15	19.38	18.77
	Sucrose 4% +CA 200 ppm	3.253	3.333	3.087	3.223	3.337	3.383	20.33	20.83	19.29	20.15	20.85	21.15
	Sucrose 4 % + 8HQS 200 ppm	3.253	3.010	2.997	3.223	3.060	3.083	20.33	18.81	18.73	20.15	19.13	19.27
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.253	3.263	3.213	3.223	3.277	3.233	20.33	20.40	20.08	20.15	20.48	20.21
Sucrose 10 %	D.W	3.253	2.917	2.923	3.223	2.867	2.993	20.33	18.23	18.27	20.15	17.90	18.71
	Sucrose 4 %	3.253	2.777	2.553	3.223	3.107	3.033	20.33	17.35	15.96	20.15	19.42	18.96
	Sucrose 4% +CA 200 ppm	3.253	2.960	3.037	3.223	2.877	2.900	20.33	18.50	18.98	20.15	17.98	18.13
	Sucrose 4 % + 8HQS 200 ppm	3.253	2.927	2.940	3.223	3.007	3.067	20.33	18.29	18.38	20.15	18.79	19.17
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.253	3.177	3.060	3.223	3.243	3.217	20.33	19.85	19.13	20.15	20.27	20.10
STS 1:4 ml	D.W	3.253	3.013	3.170	3.223	3.180	3.117	20.33	18.83	19.81	20.15	19.88	19.48
	Sucrose 4 %	3.253	3.220	3.570	3.223	3.180	3.127	20.33	20.13	22.31	20.15	19.88	19.54
	Sucrose 4% +CA 200 ppm	3.253	2.960	3.020	3.223	3.530	3.433	20.33	18.50	18.88	20.15	22.06	21.46
	Sucrose 4 % + 8HQS 200 ppm	3.253	3.007	3.050	3.223	3.140	3.073	20.33	18.79	19.06	20.15	19.63	19.21
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.253	3.023	3.477	3.223	3.233	3.170	20.33	18.90	21.73	20.15	20.21	19.81
L.S.D at	5%	-	0.284	0.399	-	0.244	0.201	-	1.778	2.490	-	1.528	1.242
	1%	-	0.379	0.532	-	0.325	0.268	-	2.372	3.332	-	2.038	1.656

treatment increased N- protein percentage after 8 days from the treatment in the florets of tuberose cut flower spike, **Gendy (2000)** cleared that the interaction of treatments between (STS) or (Kin) as pulsing solutions and holding solution contained (S +8 HQS +CA) decreased total nitrogen, total protein, percentage of gladiolus cut flower spike florets and **El Bouhy (2002)** noticed that the treatment of interaction between BA as pulsing solution and holding solution of (S + 8HQS + CA) increased the percentage and content of total nitrogen and total protein in the florets of tuberose cut flower spike compared to control or the other ones.

3.3.6.-Total phenols content (%):

It is obvious from data presented in Table (49) that all pulsing treatments of tuberose cut flower spikes bases decreased total phenols content (%) in petals and flower stalks when compared to control with the exception of pulsing solution of sucrose at 10% for 24hours after (8days and the end) from the treatment in the two seasons in most cases. However, the highest significant decrease of total phenols content (%) in petals and flower stakes of tuberose cut flower spikes was registered by using pulsing treatment of STS at 1:4mM for 15minutes after (8days and end days) from the treatment as compared to control in the two seasons, followed descendingly by kinetin at 20ppm for 24hours and benzyl adenine at 10 ppm for 24hours in both seasons. Anyhow, total phenols contents (%) in petals and flower stalks of tuberose cut flower spikes under all pulsing treatments was decreased after (initial days) from the treatment

Table (49): Effect of pulsing solutions treatments on Total phenols percentage, phosphorus percentage and potassium percentage in petals and flower stalk of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009 .

Treatments		Total phenols percentage in petals			Total phenols percentage in flower stalk			Phosphorus percentage in petals			Phosphorus percentage in flower stalk			Potassium percentage in petals			Potassium percentage in flower stalk		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
1st season																			
Pulsing solutions	D.W	0.320	0.262	0.154	0.377	0.263	0.147	0.867	0.853	0.844	0.810	0.765	0.782	2.997	2.949	2.697	2.327	2.308	2.119
	Kin.20 ppm	0.320	0.239	0.131	0.377	0.238	0.136	0.867	0.853	0.864	0.810	0.841	0.855	2.997	3.018	2.703	2.327	2.343	2.197
	BA 10 ppm	0.320	0.241	0.137	0.377	0.253	0.137	0.867	0.837	0.849	0.810	0.783	0.783	2.997	2.992	2.676	2.327	2.314	2.145
	Sucrose 10 %	0.320	0.265	0.149	0.377	0.276	0.152	0.867	0.849	0.854	0.810	0.758	0.777	2.997	2.982	2.696	2.327	2.314	2.122
	STS 1:4 ml	0.320	0.220	0.119	0.377	0.232	0.119	0.867	0.873	0.880	0.810	0.833	0.849	2.997	3.077	2.722	2.327	2.352	2.225
L.S.D at	5 %	-	0.009	0.008	-	0.011	0.009	-	0.033	0.033	-	0.03	0.023	-	0.052	0.023	-	0.015	0.033
	1%	-	0.012	0.011	-	0.014	0.012	-	0.044	0.044	-	0.044	0.031	-	0.069	0.031	-	0.019	0.044
2nd season																			
Pulsing solutions	D.W	0.320	0.263	0.137	0.360	0.245	0.141	0.840	0.837	0.831	0.823	0.730	0.725	3.157	3.033	2.689	2.350	2.317	2.108
	Kin.20 ppm	0.320	0.238	0.127	0.360	0.242	0.129	0.840	0.843	0.834	0.823	0.765	0.753	3.157	3.087	2.718	2.350	2.363	2.199
	BA 10 ppm	0.320	0.250	0.131	0.360	0.262	0.123	0.840	0.835	0.839	0.823	0.753	0.741	3.157	3.149	2.710	2.350	2.341	2.155
	Sucrose 10 %	0.320	0.262	0.129	0.360	0.267	0.132	0.840	0.832	0.840	0.823	0.740	0.727	3.157	3.089	2.724	2.350	2.335	2.133
	STS 1:4 ml	0.320	0.227	0.102	0.360	0.220	0.107	0.840	0.863	0.857	0.823	0.785	0.778	3.157	3.170	2.743	2.350	2392	2.216
L.S.D at	5 %	-	0.013	0.011	-	0.014	0.011	-	0.023	0.023	-	0.023	0.023	-	0.093	0.023	-	0.016	0.040
	1%	-	0.017	0.014	-	0.018	0.014	-	0.030	0.031	-	0.030	0.031	-	0.124	0.031	-	0.020	0.054

as flower cut spikes prolonged in age till the end of longevity in the two seasons.

As for the effect holding solution treatments on Total phenols content (%), data in Table (50) reveal that, all holding solution treatments succeeded in decreasing the percentage of total phenols in petals and flower stalks of tuberose cut flower spikes as compared to control in two seasons, especially, holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm), followed descendingly by (sucrose at 4% + citric acid at 200ppm) in two seasons. On the reverse, the highest values of the percentage of total phenols in petals and flower stalks was recorded by using the treatment of holding solution contained (sucrose at 4%), followed descendingly by control (D.W) in the two seasons in most cases. Furthermore, the percentage of total phenols in petals and flower stalks of tuberose cut of flower spikes was decreased as flower cut spikes advanced in age after (initial) from the treatment till the end of age of longevity in the two seasons.

Concerning the effect of interaction between pulsing solution and holding solution treatments on Total phenols percentage, Data in Table (51) reveal that, most the combinations treatments between pulsing solution and holding solution decreased of the percentage of total phenols in petals and flower stalks of tuberose cut flower spikes as compared to control (D.W) in the two seasons. However, the lowest values of this parameter was registered by using the combinations treatments of STS at 1:4mM for 30 minutes, especially the

Table (50): Effect of Holding solutions treatments on Total phenols percentage, phosphorus percentage and potassium percentage in petals and flower stalk of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009 .

Treatments		Total phenols percentage in petals			Total phenols percentage in flower stalk			Phosphorus percentage in petals			Phosphorus percentage in flower stalk			potassium percentage in petals			Potassium percentage in flower stalk		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
1st season																			
Holding solutions	D.W	0.320	0.265	0.160	0.377	0.299	0.163	0.867	0.833	0.839	0.810	0.744	0.756	2.997	2.951	2.661	2.327	2.314	2.149
	Sucrose 4 %	0.320	0.275	0.169	0.377	0.294	0.167	0.867	0.849	0.848	0.810	0.766	0.773	2.997	2.913	2.639	2.327	2.289	2.096
	Sucrose 4% +CA 200 ppm	0.320	0.232	0.121	0.377	0.231	0.125	0.867	0.874	0.881	0.810	0.815	0.833	2.997	3.053	2.734	2.327	2.343	2.197
	Sucrose 4 % + 8HQS 200 ppm	0.320	0.239	0.129	0.377	0.235	0.127	0.867	0.835	0.843	0.810	0.789	0.800	2.997	3.008	2.715	2.327	2.325	2.145
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.320	0.215	0.111	0.377	0.202	0.108	0.867	0.874	0.880	0.810	0.865	0.884	2.997	3.093	2.746	2.327	2.360	2.221
L.S.D at	5 %	-	0.009	0.008	-	0.011	0.009	-	0.033	0.033	-	0.03	0.023	-	0.052	0.023	-	0.015	0.033
	1%	-	0.012	0.011	-	0.014	0.012	-	0.044	0.044	-	0.044	0.031	-	0.069	0.031	-	0.019	0.044
2nd season																			
Holding solutions	D.W	0.320	0.267	0.143	0.360	0.289	0.137	0.840	0.826	0.825	0.823	0.727	0.726	3.157	3.097	2.677	2.350	2.332	2.141
	Sucrose 4 %	0.320	0.280	0.150	0.360	0.288	0.155	0.840	0.829	0.829	0.823	0.735	0.727	3.157	2.959	2.659	2.350	2.313	2.023
	Sucrose 4% +CA 200 ppm	0.320	0.230	0.116	0.360	0.225	0.116	0.840	0.857	0.850	0.823	0.775	0.763	3.157	3.159	2.753	2.350	2.377	2.216
	Sucrose 4 % + 8HQS 200 ppm	0.320	0.241	0.120	0.360	0.229	0.121	0.840	0.828	0.838	0.823	0.738	0.727	3.157	3.137	2.739	2.350	2.341	2.192
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.320	0.221	0.097	0.360	0.206	0.103	0.840	0.870	0.859	0.823	0.797	0.782	3.157	3.176	2.757	2.350	2.386	2.239
L.S.D at	5 %	-	0.013	0.011	-	0.014	0.011	-	0.023	0.023	-	0.023	0.023	-	0.093	0.023	-	0.016	0.040
	1%	-	0.017	0.014	-	0.018	0.014	-	0.030	0.031	-	0.030	0.031	-	0.124	0.031	-	0.020	0.054

Table (51): Effect of interaction between pulsing solutions and holding solutions treatments on Total phenols percentage in petals and flower stalk of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Pulsing solutions	Holding Solutions	Total phenols percentage in petals						Total phenols percentage in flower stalks					
		1st season			2nd season			1st season			2nd season		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
D.W	D.W	0.320	0.273	0.177	0.320	0.260	0.160	0.377	0.303	0.170	0.360	0.303	0.157
	Sucrose 4 %	0.320	0.290	0.190	0.320	0.290	0.143	0.377	0.307	0.173	0.360	0.300	0.157
	Sucrose 4% +CA 200 ppm	0.320	0.260	0.133	0.320	0.260	0.123	0.377	0.247	0.140	0.360	0.223	0.133
	Sucrose 4 % + 8HQS 200 ppm	0.320	0.257	0.140	0.320	0.263	0.140	0.377	0.247	0.130	0.360	0.220	0.137
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.320	0.230	0.130	0.320	0.240	0.120	0.377	0.210	0.120	0.360	0.180	0.120
Kin.20 ppm	D.W	0.320	0.250	0.150	0.320	0.257	0.140	0.377	0.287	0.160	0.360	0.290	0.130
	Sucrose 4 %	0.320	0.270	0.160	0.320	0.267	0.150	0.377	0.287	0.170	0.360	0.283	0.160
	Sucrose 4% +CA 200 ppm	0.320	0.223	0.117	0.320	0.223	0.120	0.377	0.203	0.120	0.360	0.200	0.117
	Sucrose 4 % + 8HQS 200 ppm	0.320	0.240	0.127	0.320	0.233	0.123	0.377	0.223	0.130	0.360	0.220	0.130
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.320	0.210	0.103	0.320	0.210	0.100	0.377	0.190	0.100	0.360	0.217	0.107
BA 10 ppm	D.W	0.320	0.267	0.150	0.320	0.260	0.137	0.377	0.290	0.157	0.360	0.307	0.137
	Sucrose 4 %	0.320	0.260	0.157	0.320	0.280	0.160	0.377	0.290	0.153	0.360	0.303	0.153
	Sucrose 4% +CA 200 ppm	0.320	0.227	0.130	0.320	0.227	0.130	0.377	0.240	0.130	0.360	0.253	0.107
	Sucrose 4 % + 8HQS 200 ppm	0.320	0.243	0.133	0.320	0.243	0.127	0.377	0.240	0.137	0.360	0.233	0.127
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.320	0.207	0.113	0.320	0.240	0.100	0.377	0.207	0.110	0.360	0.213	0.093
Sucrose 10 %	D.W	0.320	0.300	0.170	0.320	0.293	0.163	0.377	0.330	0.180	0.360	0.297	0.140
	Sucrose 4 %	0.320	0.307	0.183	0.320	0.290	0.167	0.377	0.307	0.193	0.360	0.293	0.163
	Sucrose 4% +CA 200 ppm	0.320	0.250	0.133	0.320	0.250	0.123	0.377	0.263	0.133	0.360	0.253	0.130
	Sucrose 4 % + 8HQS 200 ppm	0.320	0.237	0.137	0.320	0.250	0.107	0.377	0.250	0.130	0.360	0.250	0.120
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.320	0.230	0.120	0.320	0.227	0.087	0.377	0.230	0.123	0.360	0.243	0.107
STS 1:4 ml	D.W	0.320	0.237	0.153	0.320	0.263	0.117	0.377	0.287	0.150	0.360	0.250	0.120
	Sucrose 4 %	0.320	0.250	0.157	0.320	0.273	0.130	0.377	0.280	0.143	0.360	0.260	0.140
	Sucrose 4% +CA 200 ppm	0.320	0.200	0.090	0.320	0.190	0.083	0.377	0.203	0.103	0.360	0.193	0.093
	Sucrose 4 % + 8HQS 200 ppm	0.320	0.217	0.107	0.320	0.217	0.103	0.377	0.217	0.110	0.360	0.220	0.93
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.320	0.197	0.090	0.320	0.190	0.077	0.377	0.173	0.087	0.360	0.177	0.87
L.S.D at	5%	-	0.020	0.018	-	0.028	0.024	-	0.024	0.020	-	0.031	0.024
	1%	-	0.026	0.025	-	0.037	0.032	-	0.032	0.026	-	0.041	0.032

combines treatment of STS and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or (sucrose 4% + CA 200ppm) as compared to control (D.W) after (initial, 8, end days) from the treatment in the two seasons under this study. In addition, the combined treatment between kinetin at 20ppm for 24hours or Benzyl adenine at 10ppm for 24hours and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or (sucrose 4% + CA 200ppm) recorded highly decreases in this parameter as compared to control (D.W) in the two seasons. On the reverse, the highest values ofthe percentage of total phenols in petals and flower stalk of tuberose cut flower spikes was recorded at 10% for 24hours, especially the combined treatment between sucrose 10% and holding solution contained (sucrose 4%) or (distilled water) as compared to control in the two seasons. Generally, the percentage of total phenols in petals and flower stalks of tuberose cut flower spikes was decreased as flower cut spikes advanced in age after initial till the end of age of longevity in both season in this study.

3.3.7.-Phosphorus content (%):

Data presented in Table (49) reveal that most pulsing solution treatments of tuberose cut flower spikes bases increased of potassium content (%) in petals and flower stalks after (8 and end days) from the treatment as compared to control in the seasons. However, pulsing tuberose cut flower spikes bases in STS at 1:4mM for 30 minutes caused the highest significant increase of this parameter as compared to control in the two seasons in most cases. Moreover, pulsing solution of kinetin at

20ppm for 24hours resulted highly increase in this concern in the two seasons when compared to control. The aforementioned results of cytokinins are in parallel with those obtained by **Gendy (2000)** stated that kinetin treatment increased phosphorus percentage of gladiolus cut flowers and **El- Bouhy (2002)** stated that pulsing tuberose cut flower spikes in BA increased the contents of phosphorus in the florets of tuberose cut flowers compared to control and the other ones under study. The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird- of paradise, **Gendy (2000)** indicated that (STS) treatment increase phosphorus percentage of gladiolus cut flower spike petals. The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **Gendy (2000)** indicated that (S + 8-HQS + CA) treatments as holding solutions increased total, reducing and non reducing sugars percentages, but, decreased chlorophyll "A,B" and carotenoids contents as well as total nitrogen, N-protein, phosphorus and potassium percentages of gladiolus cut flowers. **El-Bouhy (2002)** indicated that holding solution treatment of S + 8HQS + CA increased total, reducing and non reducing sugars as well as the contents of total nitrogen, total protein, phosphorus and potassium in the florets of tuberose cut flowers spikes comparing to control or that of the other one under study. **Gendy (2007)** stated that the treatment of gladiolus cut flower spikes bases in holding solution contained (sucrose + 8-HQS +citric acid) record highly significant increase the percentage of total sugars in the flowers as compared to control (D.W. treatment)

Regarding to the effect holding solution treatments on Phosphorus content (%), data in Table (50) reveal that all holding solution treatments increased the percentage of phosphorus in petals and flower stalks of tuberose cut flower spikes as compared to control in the two seasons. However, the treatment of holding solution contained (sucrose 4% + CA at 200ppm + 8- HQS 200ppm) gave the greatest significant increase in the percentage of phosphorus in petals and flower stalk of tuberose cut flower spikes as compared to control (D.W) in the two seasons, followed in descending order by (sucrose 4% + CA at 200ppm) and (sucrose 4% + 8-HQS at 200ppm) after (8 and end days) from the treatment in the two seasons in most cases. On the reverse, the lowest values of this parameter was registered by using control in the two seasons.

The aforementioned results of sucrose are in parallel with those obtained by **Gendy (2000)** found that sucrose treatment (at 10%) decreased phosphorus percentage of gladiolus cut flowers. The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **Gendy (2000)** suggested that (sucrose+ citric acid) treatment increased decreased phosphorus percentages of gladiolus cut flowers. The aforementioned results of (sucrose +8-HQS) are in parallel with those obtained by **Gendy (2000)** indicated that sucrose+8-HQS treatments as holding solutions decreased phosphorus percentages of gladiolus cut flowers. The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **Gendy (2000)** indicated that (S + 8-HQS + CA) treatments as holding solutions decreased phosphorus percentages of gladiolus

cut flowers and El **Bouhy (2002)** indicated that holding solution treatment of S + 8HQS + CA increased the contents of phosphorus in the florets of tuberose cut flowers spikes comparing to control or that of the other one under study.

Concerning the effect of interaction between pulsing solution and holding solution treatments on Phosphorus percentage, Data in Table (52) reveal that the combinations treatments between STS at 1:4mM for 15 minutes and holding solution contained (sucrose 4% + CA 200ppm +8-HQS 200ppm) is being the most effective one for inducing the highest values of phosphorus percentage in petals and flower stalk of tuberose cut flower spikes after (initial, 8 and end days) from the treatment as compared to control (D.W) in the two seasons in most cases. Moreover, using the combined treatment between kinetin at 20ppm for 24hours and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or (sucrose 4% + CA 200ppm) recorded highly increases in this parameter after (8 and the end of longevity) as compared to control (D.W) in both season under this study. The aforementioned results are in parallel with those obtained by **Gendy (2000)** cleared that the interaction of treatments between (STS) or (Kin) as pulsing solutions and holding solution contained (S +8 HQS +CA) decreased phosphorus percentage of gladiolus cut flower spike florets and **El Bouhy (2002)** noticed that the treatment of interaction between BA as pulsing solution and holding solution

Table (52): Effect of interaction between pulsing solutions and holding solutions treatments on phosphorus percentage in petals and flower stalk of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Pulsing solutions	Holding Solutions	Phosphorus percentage in petals						Phosphorus percentage in flower stalks					
		1st season			2nd season			1st season			2nd season		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
D.W	D.W	0.867	0.857	0.837	0.840	0.830	0.813	0.810	0.707	0.730	0.823	0.700	0.713
	Sucrose 4 %	0.867	0.867	0.823	0.840	0.830	0.830	0.810	0.713	0.740	0.823	0.710	0.703
	Sucrose 4% +CA 200 ppm	0.867	0.873	0.883	0.840	0.843	0.847	0.810	0.790	0.810	0.823	0.737	0.727
	Sucrose 4 % + 8HQS 200 ppm	0.867	0.823	0.827	0.840	0.823	0.823	0.810	0.770	0.787	0.823	0.720	0.713
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.867	0.847	0.850	0.840	0.860	0.840	0.810	0.843	0.843	0.823	0.783	0.770
Kin.20 ppm	D.W	0.867	0.827	0.840	0.840	0.827	0.823	0.810	0.803	0.813	0.823	0.740	0.740
	Sucrose 4 %	0.867	0.840	0.840	0.840	0.820	0.817	0.810	0.830	0.837	0.823	0.757	0.733
	Sucrose 4% +CA 200 ppm	0.867	0.867	0.907	0.840	0.857	0.843	0.810	0.860	0.873	0.823	0.780	0.777
	Sucrose 4 % + 8HQS 200 ppm	0.867	0.840	0.843	0.840	0.827	0.827	0.810	0.817	0.843	0.823	0.743	0.730
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.867	0.890	0.890	0.840	0.883	0.860	0.810	0.897	0.910	0.823	0807	0.787
BA 10 ppm	D.W	0.867	0.817	0.823	0.840	0.810	0.820	0.810	0.723	0.733	0.823	0.710	0.707
	Sucrose 4 %	0.867	0.830	0.840	0.840	0.817	0.823	0.810	0.787	0.767	0.823	0.737	0.730
	Sucrose 4% +CA 200 ppm	0.867	0.833	0.850	0.840	0.850	0.840	0.810	0.790	0.780	0.823	0.793	0.773
	Sucrose 4 % + 8HQS 200 ppm	0.867	0.847	0.857	0.840	0.833	0.850	0.810	0.777	0.760	0.823	0.720	0.703
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.867	0.860	0.877	0.840	0.867	0.863	0.810	0.837	0.877	0.823	0.807	0.793
Sucrose 10 %	D.W	0.867	0.837	0.857	0.840	0.830	0.830	0.810	0.720	0.743	0.823	0.730	0.720
	Sucrose 4 %	0.867	0.850	0.870	0.840	0.823	0.837	0.810	0.697	0.717	0.823	0.727	0.727
	Sucrose 4% +CA 200 ppm	0.867	0.890	0.863	0.840	0.837	0.830	0.810	0.757	0.793	0.823	0.753	0.730
	Sucrose 4 % + 8HQS 200 ppm	0.867	0.833	0.837	0.840	0.817	0.843	0.810	0.750	0.760	0.823	0.723	0.707
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.867	0.833	0.843	0.840	0.853	0.860	0.810	0.867	0.873	0.823	0.767	0.750
STS 1:4 ml	D.W	0.867	0.830	0.840	0.840	0.833	0.837	0.810	0.767	0.760	0.823	0.757	0.750
	Sucrose 4 %	0.867	0.860	0.867	0.840	0.857	0.840	0.810	0.803	0.807	0.823	0.747	0.743
	Sucrose 4% +CA 200 ppm	0.867	0.907	0.900	0.840	0.897	0.890	0.810	0.877	0.910	0.823	0.813	0.807
	Sucrose 4 % + 8HQS 200 ppm	0.867	0.830	0.853	0.840	0.840	0.847	0.810	0.833	0.850	0.823	0.783	0.780
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.867	0.940	0.940	0.840	0.887	0.873	0.810	0.883	0.917	0.823	0.823	0.810
L.S.D at	5%	-	0.073	0.073	-	0.052	0.052	-	0.073	0.052	-	0.052	0.052
	1%	-	0.098	0.098	-	0.069	0.069	-	0.098	0.069	-	0.069	0.069

of (S + 8HQS + CA) increased the percentage and content total nitrogen, total protein and potassium in the florets of tuberose cut flower spike compared to control or the other ones.

3.3.8.-Potassium content (%):

Data in Table (49) demonstrate that most pulsing solution treatments of tuberose cut flower spikes bases increased potassium content (%) in petals and flower stalks after (8 and end days) from the treatment as compared to control in the seasons. However, pulsing tuberose cut flower spikes bases in STS at 1:4mM for 30 minutes caused the highest significant increase of this parameter as compared to control in the two seasons. Moreover, pulsing solution of kinetin at 20ppm for 24hours resulted highly increase in this concern in the two seasons when compared to control. The aforementioned results of cytokinins are in parallel with those obtained by **El- Bouhy (2002)** stated that pulsing tuberose cut flower spikes in BA increased the contents of potassium in the florets of tuberose cut flowers compared to control and the other ones under study.

The aforementioned results of silver thiosulphate (STS) are in parallel with those obtained by **El-Saka (1992)** on tuberose and bird of paradise, **Gendy (2000)** indicated that (STS) treatment decreased potassium percentage of gladiolus cut flower spike petals.

Referring to the effect holding solution treatments on Potassium content (%), Data in Table (50) reveal that most holding solution treatments increased the percentage of potassium in petals and flower stalks of tuberose cut flower

spikes after (initial, 8 and end days) from the treatment as compared to control in the two seasons. However, the treatment of holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) approved to be the most effective treatment for inducing the highest values of the percentage of potassium in petals and flower stalks in the two seasons, followed in descending order by holding solution contained (sucrose at 4% + citric acid at 200ppm)and (sucrose at 4% + 8- HQS 200ppm). On the reserve, the lowest values of this parameter was registered by using holding solution contained (sucrose 4%) after (initial, 8 and end days) from the treatment in both seasons under this study.

The aforementioned results of (sucrose) are in parallel with those obtained by **Gendy (2000)** found that sucrose treatment (at 10%) decreased potassium of gladiolus cut flowers. The aforementioned results of (sucrose +citric acid) are in parallel with those obtained by **Gendy (2000)** suggested that (sucrose + citric acid) treatment decreased potassium percentages of gladiolus cut flowers. The aforementioned results of (sucrose +8-HQS) are in parallel with those obtained by **Gendy (2000)** indicated that sucrose+8-HQS treatments as holding solutions decreased potassium percentages of gladiolus cut flowers. The aforementioned results of (sucrose + citric acid +8-HQS) are in parallel with those obtained by **Gendy (2000)** indicated that (S + 8-HQS + CA) treatments as holding solutions, decreased potassium percentages of gladiolus cut flowers and **El Bouhy (2002)** indicated that holding solution treatment of S + 8HQS + CA increased the contents of

potassium in the florets of tuberose cut flowers spikes comparing to control or that of the other one under study

As for the effect of interaction between pulsing solution and holding solution treatments on Potassium percentage in petals and flower stalks, Data in Table (53) demonstrate that the highest values of potassium percentage in petals and flower stalks of tuberose cut flower spikes were recorded by using the combinations treatments of STS at 1:4mM for 15 minutes, especially the combined treatment between STS and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) followed descending by holding solution contained (sucrose 4% + CA 200ppm) after (initial, 8 and end days) from the treatment as compared to control (D.W) in the two seasons. Moreover, the combined treatment between kinetin at 20ppm for 24hours and holding solution contained (sucrose 4% + CA 200ppm) resulted highly increases of the percentage of potassium in petals and flower stalks of tuberose cut flower spikes as compared to control (D.W) in the two seasons. The aforementioned results are in parallel with those obtained by **Gendy (2000)** cleared that the interaction of treatments between (STS) or (Kin) as pulsing solutions and holding solution contained (S +8 HQS +CA) decreased potassium percentage of gladiolus cut flower spike florets and **El Bouhy (2002)** noticed that the treatment of interaction between BA as pulsing solution and holding solution of (S + 8HQS + CA) increased the percentage and content of potassium in the florets of tuberose cut flower spike compared to control or the other ones.

Table (53): Effect of interaction between pulsing solutions and holding solutions treatments on potassium percentage in petals and flower stalk of *Polianthes tuberose* L. cut flower spike during the two seasons of 2007-2008/2008-2009.

Pulsing solutions	Holding Solutions	Potassium percentage in petals						Potassium percentage in flower stalks					
		1st season			2nd season			1st season			2nd season		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	8	End	Initial	8	End	Initial	8	End	Initial	8	End
D.W	D.W	2.997	2.850	2.650	3.157	2.923	2.633	2.327	2.257	2.027	2.350	2.287	2.047
	Sucrose 4 %	2.997	2.903	2.670	3.157	2.900	2.610	2.327	2.297	2.123	2.350	2.290	2.020
	Sucrose 4% +CA 200 ppm	2.997	2.963	2.710	3.157	3.100	2.727	2.327	2.323	2.150	2.350	2.353	2.157
	Sucrose 4 % + 8HQS 200 ppm	2.997	2.950	2.667	3.157	2.083	2.717	2.327	2.29	2.100	2.350	2.297	2.143
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.997	3.077	2.790	3.157	3.160	2.760	2.327	2.370	2.197	2.350	2.360	2.173
Kin.20 ppm	D.W	2.997	2.990	2.653	3.157	3.067	2.657	2.327	2.343	2.183	2.350	2.337	2.170
	Sucrose 4 %	2.997	2.927	2.640	3.157	2.950	2.633	2.327	2.290	2.147	2.350	2.317	2.083
	Sucrose 4% +CA 200 ppm	2.997	3.117	2.743	3.157	3.177	2.783	2.327	2.370	2.240	2.350	2.397	2.227
	Sucrose 4 % + 8HQS 200 ppm	2.997	2.997	2.760	3.157	3.117	2.760	2.327	2.340	2.170	2.350	2.363	2.233
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.997	3.060	2.720	3.157	3.127	2.757	2.327	2.373	2.243	2.350	2.400	2.280
BA 10 ppm	D.W	2.997	2.937	2.653	3.157	3.400	2.697	2.327	2.313	2.133	2.350	2.317	2.150
	Sucrose 4 %	2.997	2.903	2.607	3.157	2.977	2.673	2.327	2.280	2.060	2.350	2.307	2.017
	Sucrose 4% +CA 200 ppm	2.997	2.993	2.700	3.157	3.100	2.717	2.327	2.323	2.177	2.350	2.367	2.217
	Sucrose 4 % + 8HQS 200 ppm	2.997	3.063	2.710	3.157	3.130	2.720	2.327	2.327	2.166	2.350	2.330	2.157
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.997	3.063	2.710	3.157	3.137	2.743	2.327	2.327	2.193	2.350	2.383	2.237
Sucrose 10 %	D.W	2.997	2.960	2.650	3.157	3.023	2.700	2.327	2.327	2.177	2.350	2.337	2.133
	Sucrose 4 %	2.997	2.900	2.617	3.157	2.950	2.677	2.327	2.263	1.983	2.350	2.297	1.927
	Sucrose 4% +CA 200 ppm	2.997	3.043	2.763	3.157	3.133	2.753	2.327	2.327	2.153	2.350	2.353	2.207
	Sucrose 4 % + 8HQS 200 ppm	2.997	2.937	2.700	3.157	3.163	2.753	2.327	2.323	2.103	2.350	2.330	2.173
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.997	3.070	2.750	3.157	3.177	2.737	2.327	2.330	2.193	2.350	2.360	2.223
STS 1:4 ml	D.W	2.997	3.017	2.697	3.157	3.073	2.700	2.327	2.330	2.223	2.350	2.383	2.203
	Sucrose 4 %	2.997	2.933	2.663	3.157	3.020	2.703	2.327	2.317	2.167	2.350	2.353	2.067
	Sucrose 4% +CA 200 ppm	2.997	3.150	2.753	3.157	3.283	2.783	2.327	2.373	2.267	2.350	2.413	2.273
	Sucrose 4 % + 8HQS 200 ppm	2.997	3.093	2.737	3.157	3.193	2.743	2.327	3.340	2.190	2.350	2.383	2.253
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.997	3.193	2.760	3.157	3.280	2.787	2.327	2.400	2.277	2.350	2.427	2.283
L.S.D at	5%	-	0.116	0.052	-	0.208	0.052	-	0.033	0.073	-	0.033	0.090
	1%	-	0.155	0.069	-	0.277	0.069	-	0.044	0.098	-	0.044	0.120

PART (2)

Part II:The first experiment:(growth regulators and storage periods of *Strelitzia reginae)*

4.1.Effect of some growth regulators on:

4.1.a.- Vegetative growth measurements:

According to data presented in Table (54) on some vegetative growth measurements of bird of paradise plant as affected by some pre-harvest growth regulators treatments i.e., GA_3 at 200 and 300ppm, BA at 25 and 50ppm and kinetin at 50 and 100ppm, it could be concluded that all tested growth regulators treatments succeeded in increasing all the studied vegetative growth parameters in both seasons of this study. However, 100ppm kinetin- treated plants showed to be the most effective treatment for inducing the greatest number of leaves/plant, whereas the tallest plant was recorded by treated the plants with kinetin at 100ppm. While, the heaviest fresh and dry weight of one leaf/plant were registered by 300ppm GA_3 treated plants. Regardless control, the lowest means values of all abovementioned parameters by bird of paradise cut flower stalks was registered by using the treatment of BA at 25ppm in the two seasons.

4.1.b.- Flowering growth measurements:

Data in Tables (55 & 56) reveal that all tested pre-harvest treatments improved all the studied flowering parameters in both seasons of this study. However, the highest values of fresh weight of flower stalk with spathe, fresh weight of flower stalk without spathe, fresh weight of spathe, fresh weight of one floret

Table (54): Effect of some growth regulators on Number of leaves / plant & plant height /cm and fresh weight of one leaf /g of *Strelitzia reginae* Ait. during the two seasons of 2007-2008/2008-2009

Treatments		No. of leaves / plant	Plant height / cm	f. w. of one leaf / g
1st season				
Control		55.67	91.33	43.07
GA_3 200ppm		145.67	140.0	70.83
GA_3 300ppm		160.0	143.67	80.97
BA 25 ppm		118.33	113.67	55.77
BA 50 ppm		132.0	131.33	60.93
Kin 50 ppm		156.33	137.67	66.73
Kin 100 ppm		169.33	141.33	76.73
L.S.D at	5 %	13.3	8.371	7.851
	1%	18.41	11.74	11.01
2nd season				
Control		60.67	96.33	47.40
GA_3 200ppm		155.0	146.33	81.17
GA_3 300ppm		160.67	151.67	91.43
BA 25 ppm		122.67	128.33	65.63
BA 50 ppm		143.0	136.0	72.0
Kin 50 ppm		169.0	145.33	76.50
Kin 100 ppm		181.0	154.33	79.93
L.S.D at	5 %	11.24	8.91	7.618
	1%	15.75	12.49	10.68

Table (55): Effect of some growth regulators on some flowering parameters of *Strelitzia reginae* Ait. During the two seasons of 2007-2008/2008-2009

Treatments		fresh weight of flower stalk with spathe / g	fresh weight of flower stalk without spathe / g	fresh weight of spathe / g	fresh weight of One floret / g	Length of flower stalk / (cm)	Thickness of flower stalk / (cm)	Spathe length / (cm)	Spathe width / (cm)	Spathe Thickness / (cm)
1st season										
Control		84.70	57.13	27.57	3.53	77.67	0.700	18.33	1.97	1.23
GA_3 200ppm		130.43	89.53	40.90	4.60	126.67	0.833	24.33	2.43	1.53
GA_3 300ppm		151.50	101.93	49.57	5.03	135.67	0.933	24.00	2.60	1.57
BA 25 ppm		98.03	65.63	32.40	4.03	94.67	1.000	19.67	2.70	1.53
BA 50 ppm		109.83	73.23	36.60	4.30	103.0	1.200	22.00	2.90	1.90
Kin 50 ppm		123.13	83.27	39.87	4.23	120.00	1.033	21.33	2.80	1.90
Kin 100 ppm		126.80	86.47	40.33	4.47	131.67	1.067	23.00	3.10	2.07
L.S.D at	5 %	7.039	5.203	3.305	0.406	6.091	0.159	2.072	0.264	0.308
	1%	9.868	7.295	4.633	0.569	8.539	0.223	2.905	0.370	0.432
2nd season										
Control		93.97	62.33	31.63	3.60	84.00	0.767	19.33	2.10	1.30
GA_3 200ppm		135.90	93.97	41.93	4.93	137.67	0.867	24.33	2.60	1.70
GA_3 300ppm		156.60	103.97	52.63	5.13	149.00	0.933	24.67	2.70	1.73
BA 25 ppm		105.00	68.40	36.60	4.20	104.33	1.267	20.00	2.93	1.80
BA 50 ppm		117.13	76.93	40.20	4.60	110.67	1.300	22.33	3.07	1.93
Kin 50 ppm		125.67	85.03	40.63	4.53	130.00	1.067	22.00	3.13	1.93
Kin 100 ppm		134.83	90.40	44.43	4.83	136.67	1.133	23.33	3.27	2.20
L.S.D at	5 %	6.647	5.971	3.619	0.308	8.519	0.232	2.628	0.270	0.323
	1%	9.318	8.370	5.073	0.432	11.940	0.325	3.685	0.378	0.453

Table (56): Effect of some growth regulators on some Dry weight /g of *Strelitzia reginae* Ait. during the two seasons of 2007-2008/2008-2009

Treatments		Dry weight of one leaf / g	Dry weight of flower stalk with spathe / g	Dry weight of flower stalk without spathe / g	Dry weight of spathe / g	Dry weight of One floret / g
1st season						
Control		8.00	13.70	9.20	4.50	0.373
GA_3 200ppm		13.20	19.27	13.00	6.27	0.500
GA_3 300ppm		14.17	23.23	14.67	7.75	0.613
BA 25 ppm		11.37	14.70	9.83	4.87	0.437
BA 50 ppm		11.87	16.03	10.53	5.50	0.477
Kin 50 ppm		11.67	17.03	10.40	6.63	0.480
Kin 100 ppm		12.90	17.23	10.80	6.43	0.517
L.S.D at	5 %	1.146	1.486	1.353	1.553	0.032
	1%	1.607	2.084	1.896	NS	0.045
2nd season						
Control		9.87	15.07	9.37	5.70	0.417
GA_3 200ppm		13.40	21.33	14.00	7.33	0.543
GA_3 300ppm		14.70	25.47	16.27	9.20	0.683
BA 25 ppm		11.97	16.27	9.87	6.40	0.470
BA 50 ppm		12.20	17.63	11.20	6.43	0.517
Kin 50 ppm		12.17	18.80	11.67	7.13	0.500
Kin 100 ppm		13.27	19.03	11.83	7.20	0.553
L.S.D at	5 %	1.494	1.843	1.167	0.983	0.036
	1%	2.094	2.583	1.653	1.377	0.051

length of flower stalk, dry weight of flower stalk with spathe, dry weight of flower stalk without spathe, dry weight of spathe and dry weight of one floret were recorded by using the treatment of GA_3 at 300ppm in both seasons. Also, using the treatments of GA_3 at 200ppm and kinetin at 100ppm resulted highly increments of these parameters in both seasons. However, the thickness flower stalk was gained by using 50ppm BA-treated plants, followed descendingly by using the treatment of BA at 25ppm in both seasons. While, the highest values of spathe width and spathe thickness were recorded by using the treatments of Kinetin at 100ppm and BA at 50ppm, respectively in both seasons.

The greatest values of spathe length was recorded by using the treatment of GA_3 at 300ppm and GA_3 at 200ppm as compared to control of both seasons. Irrespective control, The lowest means values of most the aforementioned parameters of bird of paradise cut flower stalks was registered by using the treatment of BA at 25ppm in the two seasons.

4.1.c.-Chemical composition determinations:

Data in Table (57) demonstrate that all tested pre-harvest growth regulators treatments increased leaves Chlorophyll a, chlorophyll b, caroteniods, total nitrogen, phosphorus and potassium content in both seasons. However, the richest leaves Chlorophyll a, Chlorophyll b, carotenoids and potassium percentage were recorded by using the treatment of GA_3 at 300ppm, followed descendingly by using 100ppm Kinetin-treated plants in both seasons. Whereas, the highest values of

Table (57): Effect of some growth regulators on Chlorophyll ,a,&b and Carotenoids (mg/g f. w.) & total nitrogen , phosphorus and potassium percentage in leaves of *Strelitzia reginae* Ait. During the two seasons of 2007-2008/2008-2009

Treatments		Chlorophyll ,a, (mg/g f. w.)	Chlorophyll ,b, (mg/g f. w.)	Carotenoids (mg/g f. w.)	Total nitrogen percentage	Phosphorus percentage	potassium percentage
1st season							
Control		1.047	0.780	0.243	2.503	0.323	2.760
GA_3 200ppm		1.160	0.843	0.322	2.370	0.384	3.370
GA_3 300ppm		1.307	0.918	0.429	3.707	0.407	3.460
BA 25 ppm		1.130	0.848	0.290	2.863	0.340	3.220
BA 50 ppm		1.113	0.847	0.277	3.107	0.371	3.280
Kin 50 ppm		1.090	0.823	0.287	3.153	0.340	3.200
Kin 100 ppm		1.207	0.875	0.336	3.553	0.390	3.440
L.S.D at	5 %	0.056	N.S.	0.097	0.178	0.056	NS
	1%	0.079	N.S.	N.S.	0.249	0.079	NS
2nd season							
Control		1.097	0.832	0.294	3.340	0.329	2.790
GA_3 200ppm		1.173	0.855	0.331	2.573	0.451	3.400
GA_3 300ppm		1.330	0.913	0.390	3.640	0.365	3.450
BA 25 ppm		1.143	0.840	0.340	3.103	0.298	3.220
BA 50 ppm		1.183	0.814	0.352	3.533	0.387	3.330
Kin 50 ppm		1.120	0.912	0.227	3.107	0.350	3.220
Kin 100 ppm		1.257	0.903	0.357	4.303	0.402	3.460
L.S.D at	5 %	0.056	0.056	N.S.	0.406	0.056	0.258
	1%	0.079	N.S.	N.S.	0.569	0.079	0.361

to control in the two seasons. The lowest mean values of vase life (days) by bird of paradise cut flower stalks were registered by using the treatments of BA at 25ppm in the first season and BA at 50ppm in the second season.

As for the effect of storage periods on vase life (days) (longevity), it is quite clear from the data in Table (58) that there were gradual decrease in vase life (days) of bird of paradise cut flower stalks with extending storage periods at 7 ±1°C for different days (0-time, 7, 14, 21, 28, 35 and 42 days). However, bird of paradise cut flower stalks were stored at 7 ±1°C for 42 days recorded highly significant decrease in vase life as compared to other different storage periods in both seasons. Moreover, storage periods at 7 ±1°C for 0-time treatment showed the greatest values in vase life of bird of paradise cut flower stalks when compared to the other ones under study in the two seasons.

Regarding to the effect of interaction between growth regulators and storage periods on Vase life (day), data in Table (58) reveal that the interaction treatment between growth regulators of GA_3 300ppm or kinetin at 100ppm and storage periods at 7 ±1°C for 0 or 7 days record highly significant increase in longevity of bird of paradise cut flower stalks compared to other treatments under study in both seasons.

Data resulted that the highest values in vase life in the first season but in the second season the highest values in vase life of bird of paradise cut flower stalks by using the interaction between of kinetin at 100ppm and storage periods for 0, 7 days.

Moreover, regardless control the lowest values of vase life of bird of paradise cut flower stalks by using the interaction between BA at 25ppm and storage period for 42 days when compared to other treatments under study.

5.1.b.-Change percentage in fresh weight of cut flower stalks:

According to data presented in Table (59) on change percentage in fresh weight of bird of paradise cut flower stalks as affected by some pre harvest treatments as (growth regulators) i.e., gibberellic acid (GA_3) at 200 and 300ppm, Benzyladenine (BA) at 25 and 50ppm and Kinetin (kin) at 50 and 100ppm, it could be concluded that all pre harvest treatments succeeded in increasing change percentage in fresh weight of cut flower stalks as compared with control in both seasons of this study. However, GA_3 at 300ppm spraying plants showed to be the most effective treatment for producing the highest values of the parameter as compared with control and the other treatments in both seasons. Moreover, using the treatments of kinetin at 100ppm and Benzyladenine at 50ppm resulted in highly significant increases in this parameter. The differences between the aforesaid two treatments were not significant in both seasons. The remained treatments occupied an intermediate position between the abovementioned treatments in both seasons. Anyway, it is worthy to notice that the change percentage in fresh weight of cut flower stalks was increased as flower cut stalks advanced in age till 8 days of shelf life periods then decreased after that down to the end of shelf life periods in the two seasons.

Table (59): Effect of some growth regulators treatments, on Change percentage in fresh weight and Water balance (g)/stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Change percentage in fresh weight of cut flower stalk							Water balance (g)/stalk						
		Shelf life periods (days)							Shelf life periods (days)						
		4	8	12	16	20	24	28	4	8	12	16	20	24	28
		1st season													
Growth Regulators	Control	4.195	1.626	-4.950	-12.99	-21.62	-16.02	-16.42	3.381	1.605	-1.995	-7.505	-12.68	-10.63	-5.51
	GA_3 200ppm	7.895	8.939	8.440	3.16	-2.05	-1.55	-2.77	6.214	7.767	6.962	3.105	-1.08	-1.16	-0.75
	GA3 300ppm	8.707	10.87	10.670	6.73	1.58	0.77	0.18	7.971	10.01	9.686	6.624	2.96	0.85	0.89
	BA 25 ppm	6.046	5.119	0.612	-4.32	-10.55	-8.01	-8.38	4.729	4.138	1.962	-3.067	-6.73	-5.14	-3.08
	BA 50 ppm	8.062	8.475	6.176	0.83	-5.59	-4.31	-5.38	6.067	7.267	4.06	1.167	-3.90	-3.07	-1.79
	Kin 50 ppm	7.221	9.961	6.240	0.22	-5.63	-4.43	-4.93	6.067	7.886	6.495	1.538	-2.70	-2.51	-1.43
	Kin 100 ppm	8.502	10.37	8.841	4.47	-1.45	-1.07	-2.23	7.395	8.424	8.310	4.419	-0.05	-0.22	-0.03
	5 %	0.681	0.585	1.324	0.685	0.763	1.067	0.606	0.516	0.471	4.678	0.309	0.745	0.307	1.612
	1%	0.901	0.775	1.753	0.907	1.011	1.413	0.802	0.816	0.622	6.192	0.409	0.986	0.406	2.135
		2nd season													
Growth Regulators	Control	3.613	1.105	-5.661	-13.96	-22.60	-17.90	-16.48	3.143	1.224	-3.462	-8.914	-13.04	-10.74	-7.30
	GA_3 200ppm	7.687	9.009	8.273	3.88	-0.733	-1.24	-2.75	6.129	8.124	7.995	3.595	-0.09	-0.14	-1.15
	GA3 300ppm	8.310	10.68	11.071	7.27	1.86	0.45	-0.37	8.943	9.738	10.052	7.229	2.63	1.00	0.66
	BA 25 ppm	5.761	5.566	2.294	-3.76	-8.24	-6.98	-7.99	4.700	4.552	2.329	-2.119	-6.22	-5.01	-2.71
	BA 50 ppm	7.017	8.245	5.816	2.14	-5.58	-3.93	-5.54	5.867	7.329	5.324	0.586	-3.64	-2.99	-2.07
	Kin 50 ppm	7.040	8.565	6.230	1.99	-5.00	-4.10	-4.66	5.510	7.295	5.962	1.443	-3.02	-4.50	-1.49
	Kin 100 ppm	8.072	9.946	8.692	4.34	-0.52	-0.96	-2.33	5.271	8.948	9.314	4.305	0.03	-0.29	-0.41
L.S.D at	5 %	0.612	0.624	0.657	1.796	1.108	0.790	0.679	2.075	0.337	1.512	0.475	0.318	1.188	0.577
	1%	0.811	0.826	0.870	2.378	1.467	1.057	0.899	2.747	0.446	2.002	0.629	0.421	1.467	0.764

Referring to the effect of storage periods on the change percentage in fresh weight data in Table (60) reveal that the change percentage in stalks fresh weight of Bird of paradise cut flower stalks was increased as flower cut stalks advanced in age till 12 days of 0-time and 7-time but till 8 days of 14, 21 time on reverse 28, 35, 42-time till 4 day and then decreased after that down to the end of longevity in the two seasons. Moreover, storage periods at 7 ± 1°C for 0-time treatment showed highly significant increase in change percentage in stalks fresh weight of Bird of paradise cut flower stalks when compared to the other ones under study in the two season. Whereas, the lowest value of change percentage in fresh weight was gained by using 42 days storage periods. This trend was true during all tested shell life periods in both seasons of this study.

As for the interaction effect between growth regulators and storage life periods on the change percentage in fresh weight data in Tables (61 & 62) reseal that all the combinations between growth regulators and storage life periods succeeded in increasing the change percentage in fresh weight of bird paradise cut flower stalks during the two seasons as compared with control. However, the combinations of GA_3 at 300ppm showed to be the most effective one for inducing the highest values of this parameter, especially the combined treatment between GA_3 at 300ppm and storage life periods at 0-time during all the tented shelf life periods in two seasons of this study. Anyhow, in most cases the values of the combinations between growth regulators and storage life periods was increased as flower cut stalks prolonged in age till 12 days of shelf life periods then decreased

Table (60): Effect of Storage periods (Days) treatments on Change percentage in fresh weight and Water balance (g)/stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Change percentage in fresh weight of cut flower stalk							Water balance (g)/stalk						
		Shelf life periods(days)							Shelf life periods(days)						
		4	8	12	16	20	24	28	4	8	12	16	20	24	28
		1st season													
Storage periods (Days)	0	12.23	16.64	16.116	14.29	10.24	5.69	0.90	11.43	16.33	16.57	13.895	9.60	5.36	1.06
	7	10.24	12.49	12.049	8.64	3.30	-2.14	-7.96	8.857	11.31	11.00	7.186	3.48	-1.16	-5.23
	14	10.04	10.98	9.594	4.57	-0.58	-6.03	-12.71	7.714	8.829	8.41	4.271	-0.44	-4.83	-7.51
	21	7.035	7.738	4.833	-0.09	-6.58	-12.80	-20.16	5.519	6.538	7.65	0.276	-4.31	-8.84	-
	28	5.105	4.263	0.995	-6.01	-12.62	-19.34	-	3.814	3.486	11.24	-4.124	-8.12	-12.40	-
	35	3.628	1.815	-2.703	-10.18	-18.39	-	-	2.786	1.376	4.67	-6.567	-11.49	-	-
	42	2.348	0.439	-4.855	-13.14	-20.69	-	-	1.705	-0.781	-3.97	-8.657	-12.88	-	-
L.S.D at	5 %	0.681	0.585	1.324	0.685	0.763	1.067	0.606	0.516	0.471	4.678	0.309	0.745	0.307	1.612
	1%	0.901	0.775	1.753	0.907	1.011	1.413	0.802	0.816	0.622	6.192	0.409	0.986	0.406	2.135
		2nd season													
Storage periods (Days)	0	11.44	15.87	16.251	13.71	10.15	5.34	0.48	9.567	16.10	17.70	13.838	9.74	3.92	0.85
	7	9.793	11.83	12.254	8.30	4.56	-2.19	-7.89	8.614	10.99	11.47	7.767	3.11	-1.70	-5.80
	14	8.480	10.59	9.661	5.29	-0.65	-6.95	-13.42	7.295	8.957	8.49	3.867	-0.53	-5.43	-9.51
	21	6.902	7.759	5.241	0.44	-5.59	-11.84	-19.30	5.490	6.457	4.23	0.114	-3.99	-8.28	-
	28	5.099	4.478	0.960	-5.25	-11.79	-19.03	-	3.719	3.367	0.56	-4.124	-7.80	-11.18	-
	35	3.320	2.067	-2.591	-7.98	-17.21	-	-	3.671	1.238	-1.98	-6.176	-10.85	0.00	-
	42	2.464	0.527	-5.061	-12.61	-20.28	-	-	1.405	0.100	-2.95	-9.162	-13.05	0.00	-
L.S.D at	5 %	0.612	0.624	0.657	1.796	1.108	0.790	0.679	2.075	0.337	1.512	0.475	0.318	1.188	0.577
	1%	0.811	0.826	0.870	2.378	1.467	1.057	0.899	2.747	0.446	2.002	0.629	0.421	1.467	0.764

Table (61) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Change percentage in fresh weight of *Strelitzia reginae Ait* cut flower stalk during the first season of 2007-2008.

Treatments		Change percentage in fresh weight of cut flower stalk						
		1st season						
Growth regulators	Storage periods	Shelf life periods (days)						
		4	8	12	16	20	24	28
Control	0	10.098	12.852	10.570	6.68	-0.564	-7.667	-14.464
	7	7.184	4.588	-0.304	-7.10	-15.227	-24.689	-33.028
	14	5.848	3.159	-1.734	-8.13	-16.473	-23.130	-30.017
	21	4.454	2.176	-5.520	-11.62	-18.227	-26.865	-37.406
	28	3.251	-0.978	-8.605	-18.94	-26.795	-29.804	-
	35	0.512	-4.360	-14.000	-24.66	-35.754	-	-
	42	-1.980	-6.059	-15.055	-27.21	-38.188	-	-
GA_3 200ppm	0	11.382	15.505	17.667	14.95	11.200	7.434	2.455
	7	10.332	13.036	13.246	10.30	5.029	0.807	-3.806
	14	10.328	13.450	13.262	8.72	3.748	-0.976	-5.406
	21	8.356	9.689	8.421	3.94	-1.376	-6.554	-12.608
	28	6.402	6.051	5.103	-0.35	-5.591	-11.587	-
	35	5.083	4.046	1.552	-3.93	-10.806	-	-
	42	3.385	0.799	-0.168	-11.58	-16.546	-	-
GA_3 300ppm	0	14.757	20.629	21.335	20.15	17.671	14.196	9.784
	7	11.228	14.649	17.049	14.88	10.883	6.309	1.947
	14	10.935	14.342	14.370	10.44	6.346	2.064	-2.765
	21	8.981	11.202	10.741	7.72	2.355	-2.655	-7.730
	28	5.896	6.817	5.934	-0.51	-6.829	-14.501	-
	35	5.430	5.428	4.657	-0.52	-7.667	-	-
	42	3.723	3.036	0.605	-5.03	-11.713	-	-
BA 25 ppm	0	12.163	15.915	10.372	13.92	10.119	5.130	-0.122
	7	9.219	10.809	9.939	6.18	1.811	-3.430	-10.581
	14	7.409	7.552	5.555	0.42	-3.870	-9.657	-17.284
	21	5.105	3.318	-0.960	-6.46	-13.090	-21.739	-30.649
	28	4.653	1.427	-3.087	-9.50	-16.683	-26.373	-
	35	1.838	-1.974	-8.166	-17.58	-26.543	-	-
	42	1.938	-1.218	-9.367	-17.22	-25.622	-	-
BA 50 ppm	0	12.696	17.247	17.787	14.61	11.460	7.274	3.072
	7	10.158	13.759	13.299	11.87	4.062	-1.004	-5.930
	14	15.825	12.169	11.057	6.79	1.564	-3.825	-15.365
	21	6.503	8.070	5.906	0.55	-5.745	-12.720	-19.461
	28	5.098	7.943	1.897	-5.92	-13.072	-19.892	-
	35	3.833	2.603	-1.971	-10.08	-19.102	-	-
	42	2.321	0.532	-4.745	-12.02	-18.308	-	-
Kin 50 ppm	0	12.413	17.123	16.868	13.64	9.633	5.026	1.201
	7	12.046	15.843	15.189	10.91	6.865	2.195	-4.303
	14	9.287	12.397	10.789	4.12	-0.046	-5.704	-12.368
	21	6.947	8.686	5.712	-0.39	-6.454	-12.866	-19.025
	28	4.210	4.878	1.817	-5.79	-12.358	-19.668	-
	35	2.881	2.512	-3.531	-11.01	-17.807	-	-
	42	2.761	1.290	-3.164	-9.96	-19.239	-	-
Kin100ppm	0	12.121	17.175	18.211	16.10	12.154	8.422	4.395
	7	11.521	14.765	15.926	13.45	9.640	4.826	-0.001
	14	10.638	13.768	13.862	9.36	4.705	-0.961	-5.746
	21	8.897	11.025	9.529	5.59	-3.405	-6.206	-14.264
	28	6.223	6.703	3.909	-1.04	-7.008	-13.567	-
	35	5.821	4.453	2.539	-3.48	-11.034	-	-
	42	4.289	4.690	-2.088	-8.94	-15.182	-	-
L.S.D at	5%	1.801	1.549	3.504	1.812	2.020	2.823	1.603
	1%	2.385	2.050	4.639	2.399	2.674	3.738	2.122

Table (62) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Change percentage in fresh weight of *Strelitzia reginae Ait* cut flower stalk during the second season of 2008-2009.

Treatments		Change percentage in fresh weight of cut flower stalk						
		2nd season						
		Shelf life periods (days)						
Growth regulators	Storage periods	4	8	12	16	20	24	28
Control	0	9.645	12.182	10.190	5.48	-1.475	-8.211	-12.437
	7	5.915	2.883	-0.600	-7.90	-14.905	-26.422	-32.248
	14	4.349	2.825	-1.143	-9.37	-14.012	-25.642	-31.558
	21	3.863	1.051	-5.312	-13.17	-20.403	-27 .816	-39.143
	28	2.977	-1.199	-9.170	-19.13	-29.467	-37.234	-
	35	0.227	-4.283	-15.120	-25.74	-35.950	-	-
	42	-1.684	-5.722	-18.472	-27.92	-41.825	-	-
GA_3 200ppm	0	11.521	16.032	17.359	16.57	10.958	8.372	2.064
	7	10.057	12.628	13.829	11.60	6.139	1.029	-2.313
	14	9.346	12.626	13.031	8.44	3.362	-2.344	-7.972
	21	7.926	10.207	8.582	3.89	-0.894	-4.958	-11.044
	28	6.127	6.889	4.838	0.08	-3.018	-10.755	-
	35	5.454	4.068	3.141	-2.8	-6.829	-	-
	42	3.373	0.616	-2.867	-10.56	-14.851	-	-
GA_3 300ppm	0	12.901	18.818	20.689	18.57	16.096	12.349	6.829
	7	10.352	12.599	17.302	14.45	10.323	6.351	1.710
	14	10.090	13.530	13.978	10.32	5.543	-0.283	-3.756
	21	9.345	11.858	11.634	8.30	2.808	-2.551	-7.353
	28	6.616	7.226	6.106	1.11	-5.460	-12.750	-
	35	4.268	5.371	5.033	0.37	-6.692	-	-
	42	4.596	5.335	2.757	-2.20	-9.573	-	-
BA 25 ppm	0	11.769	15.419	16.922	13.33	13.714	5.210	-0.365
	7	8.862	11.395	10.570	6.50	9.790	-2.809	-10.853
	14	7.301	7.149	5.578	1.73	-4.099	-9.712	-16.506
	21	4.900	3.215	0.426	-6.25	-11.493	-19.798	-28.222
	28	4.505	2.710	-3.114	-8.13	-16.093	-21.776	-
	35	1.737	-0.776	-7.205	-14.81	-24.754	-	-
	42	1.255	-0.147	-7.116	-18.66	-24.709	-	-
BA 50 ppm	0	12.007	16.719	15.897	13.40	11.243	6.353	2.431
	7	10.078	13.581	13.367	8.16	4.899	-0.575	-6.534
	14	9.674	11.480	10.437	6.27	0.076	-4.958	-16.059
	21	7.658	8.365	5.575	4.26	-4.924	-9.596	-18.603
	28	4.736	4.920	2.680	-5.90	-11.850	-18.706	-
	35	3.107	2.692	-2.580	0.71	-19.786	-	-
	42	1.862	-0.045	-4.667	-11.91	-18.706	-	-
Kin 50 ppm	0	10.743	15.390	15.941	13.73	8.959	5.326	0.640
	7	11.786	15.257	14.993	11.78	5.814	1.642	-4.387
	14	8.699	12.628	11.824	10.48	0.565	-5.211	-11.254
	21	6.450	8.065	6.194	0.41	-5.051	-11.565	-17.637
	28	4.836	4.455	2.069	-3.70	-10.662	-18.923	-
	35	3.387	2.987	-4.585	-9.95	-16.253	-	-
	42	3.380	1.181	-2.824	-8.82	-18.360	-	-
Kin 100 ppm	0	11.513	16.498	16.760	14.90	11.522	7.988	4.228
	7	11.499	14.468	16.319	13.53	9.849	5.432	-0.602
	14	9.902	13.885	13.920	9.17	4.047	-0.488	-6.831
	21	8.170	11.550	9.588	5.65	0.859	-6.613	-13.084
	28	5.896	6.343	3.311	-1.10	-5.796	-13.052	-
	35	5.060	4.407	3.182	-3.58	-10.216	-	-
	42	4.464	2.473	-2.235	-8.18	-13.910	-	-
L.S.D at	5%	1.620	1.550	1.739	4.752	2.933	2.113	1.797
	1%	2.145	2.184	2.302	6.291	3.883	2.797	2.379

after that down to the end of shelf life periods in the two seasons.

5.1.c.-Water balance (g)/stalks:

Data of both seasons presented in Table (59) reveal that all studied pre-harvest treatments significantly increased water balance (g)/stalks of bird of paradise cut flower stalks as compared with control. Water balance by Bird of paradise cut flower stalks increased until 8 day then gradually decreased after that day in two seasons. Irrespective control, decreased after 4 day of shelf life periods of cut flower stalks in both season and kinetin 100ppm recorded an enhancement in water balance until 21 day then gradually decreased after that day. However, the treatment of GA_3 300ppm showed to be the most effective treatment for producing the highest values of this parameter as compared with control and other treatments in both seasons. Moreover, using the treatments of kinetin at 100ppm and GA_3 200ppm resulted in highly significant increases in this parameter. The differences between the aforesaid two treatments were not significant in both seasons. The rest treatments occupied an intermediate position between the above-mentioned treatments in both seasons. The lowest mean values of water balance by Bird of paradise cut flower stalks was registered by using the treatment of Benzyladenine at 25ppm during all tested shelf like periods in the two seasons.

Referring to the effect of storage periods on water balance, data presented in Table (60) show that Bird of paradise cut flower stalks stored at 7 ± 1°C for different periods (0- days

,7,14,21,28,35 and 42 days) recorded an decreases in water balance during all shelf life periods in both seasons. On the other side, there was a negative relationship between the values of water balance of Bird of paradise cut flower stalks and storage periods, hence the water balance values of Bird of paradise cut flower stalks decreased as the storage periods advanced.

Thereupon, the highest value of water balance was recorded by using 0-time storage periods, whereas the lowest value of water balance was gained by using 42 days storage periods. This trend was true during all tested shelf life periods in both seasons of this study.

Regarding the interaction effect between growth regulators and storage periods on water balance, data in Tables (63 & 64) indicate that all the interaction treatments between growth regulators and storage periods recorded increases of water balance of bird of paradise cut flower stalks during the two seasons when compared to control. However, the interactions of GA_3 at 300ppm showed to be the most effective one for inducing the highest values of this parameter, especially the combined treatment between GA_3 at 300ppm and storage period for 0-time after 4,8,12,16,20,24 and 28 days from the treatment in the two seasons.

5.1.d.-Floret opening percentage.

Data in Table (65) reveal that all studied pre harvest treatments significantly increased floret opening percentage of Bird of paradise cut flower stalks when compared with control after 4, 8, 12, 16, 20, 24, 28 days of shelf life periods in the two

Table (63) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Water balance (g)/stalk of *Strelitzia reginae Ait* cut flower stalk during the first season of 2007-2008.

Treatments		Water balance (g)/stalk						
		1st season						
Growth regulators	Storage periods	Shelf life periods (days)						
		4	8	12	16	20	24	28
Control	0	8.867	11.533	9.433	5.200	-0.43	-4.967	-9.900
	7	5.533	3.733	0.767	-3.867	-10.33	-15.267	-18.200
	14	4.533	2.600	-0.767	-5.067	-11.20	-16.400	-10.433
	21	3.533	1.533	-2.500	-6.93	-12.73	-18.067	-
	28	1.867	-0.200	-2.867	-11.167	-15.37	-19.700	-
	35	0.700	-3.067	-8.200	-14.667	-20.04	-	-
	42	-1.367	-4.900	-9.833	-16.033	-18.63	-	-
GA_3 200ppm	0	11.200	15.567	16.367	14.133	10.33	6.267	2.400
	7	9.433	11.533	12.533	8.800	4.10	0.467	-3.233
	14	8.533	11.333	11.767	6.967	3.20	-1.467	-4.400
	21	4.000	8.333	7.000	3.233	-1.43	-4.633	-
	28	4.467	4.867	3.300	-0.500	-4.47	-8.733	-
	35	3.967	3.067	1.067	-2.933	-7.77	-	-
	42	1.900	-0.333	-3.300	-7.967	-11.50	-	-
GA_3 300ppm	0	14.533	22.067	23.367	21.133	18.47	13.200	8.767
	7	10.533	14.233	15.233	14.233	12.70	4.367	1.400
	14	11.367	12.067	13.067	9.267	4.53	0.567	-3.933
	21	7.900	10.067	9.000	5.867	1.57	-3.333	-
	28	4.767	5.800	4.400	-0.200	-4.50	-8.867	-
	35	4.300	4.400	3.200	-0.300	-4.67	-	-
	42	2.400	1.433	-0.467	-3.633	-7.37	-	-
BA 25 ppm	0	10.500	14.367	16.033	12.300	8.33	4.567	-1.767
	7	7.600	9.833	8.600	2.933	1.47	-3.567	-8.333
	14	5.533	5.133	4.200	0.600	-2.40	-7.700	-11.433
	21	4.367	2.600	-0.300	-5.467	-9.57	-13.933	-
	28	2.900	1.200	-2.000	-8.100	-11.43	-15.333	-
	35	1.133	-2.167	-6.200	-11.533	-16.53	-	-
	42	1.067	-2.000	-6.600	-12.200	-17.00	-	-
BA 50 ppm	0	11.633	17.133	16.133	14.733	10.03	5.633	2.333
	7	9.333	12.333	11.667	6.733	2.73	-1.200	-5.300
	14	8.000	10.933	9.200	6.133	-0.40	-3.267	-9.567
	21	5.700	6.100	4.10	0.733	-4.10	-9.367	-
	28	3.767	3.200	1.60	-4.367	-8.20	-13.300	-
	35	2.333	1.767	-2.38	-7.200	-13.07	-	-
	42	1.700	-0.600	-4.267	-8.600	-14.27	-	-
Kin 50 ppm	0	11.900	16.600	16.400	13.567	9.13	4.067	1.200
	7	9.533	13.733	13.933	9.933	5.93	3.267	-2.733
	14	6.600	10.467	9.267	4.267	-0.20	-4.367	-8.467
	21	5.767	7.933	5.100	0.333	-3.23	-8.333	-
	28	3.700	4.500	1.300	-3.767	-8.37	-12.200	-
	35	2.767	2.333	2.100	-6.767	-10.43	-	-
	42	2.200	-0.367	-2.633	-6.800	-11.70	-	-
Kin100 ppm	0	11.367	17.067	18.233	16.200	11.30	8.733	4.367
	7	10.033	13.800	14.233	11.533	7.73	3.800	-0.200
	14	9.433	9.267	12.100	7.733	3.73	-1.200	-4.367
	21	7.367	9.200	8.167	4.167	-0.67	-4.233	-
	28	5.233	5.033	3.067	-0.767	-4.53	-8.633	-
	35	4.300	3.300	3.067	-2.567	-7.93	-	-
	42	4.033	1.300	-0.700	-5.367	-9.70	-	-
L.S.D at	5%	1.630	1.244	12.37	0.817	1.970	0.812	4.266
	1%	2.159	1.647	16.38	1.081	2.608	1.075	5.647

Table (64) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Water balance (g)/stalk of *Strelitzia reginae Ait* cut flower stalk during the second season of 2008-2009.

Treatments		Water balance (g)/stalk						
		2nd season						
		Shelf life periods (days)						
Growth regulators	Storage periods	4	8	12	16	20	24	28
Control	0	8.667	10.967	8.600	4.733	-0.13	-4.900	-8.600
	7	4.867	2.967	0.600	-6.400	-9.70	-15.733	-22.267
	14	4267	1.467	-0.800	-7.267	-10.33	-16.867	-20.233
	21	2.600	0.533	-3.933	-8.833	-12.43	-17.200	-
	28	2.200	-0.600	-6.733	-12.700	-16.80	-20.467	-
	35	0.200	-3.333	-10.200	-15.000	-20.47	-	-
	42	-0.800	-3.433	-11.633	-16.933	-21.43	-	-
GA_3 200ppm	0	11.433	16.433	17.300	16.567	10.63	7.267	1.400
	7	8.433	11.833	13.500	10.733	4.73	0.567	-3.033
	14	7.367	10.933	11.167	7.033	2.80	-2.433	-6.433
	21	6.200	9.300	7.333	3.267	-1.00	-4.500	-
	28	4.100	5.100	3.367	-0.767	-2.73	-1.900	-
	35	3.700	3.067	2.133	-2.867	-4.40	-	-
	42	1.667	0.200	1.167	-8.800	-10.63	-	-
GA_3 300ppm	0	13.267	21.133	23.433	21.133	17.13	12.333	6.333
	7	10.200	12.100	16.533	14.767	9.20	5.033	1.133
	14	9.033	12.067	12.000	9.500	4.07	-0.800	-2.867
	21	8.200	10.700	9.567	7.400	2.23	-2.367	-
	28	5.533	6.000	4.533	0.633	-2.30	-7.200	-
	35	13.367	3.467	3.100	-0.533	-4.47	-	-
	42	3.000	2.700	1.200	-2.300	-7.47	-	-
BA 25 ppm	0	10.567	14.233	16.633	12.467	8.43	3.367	0.367
	7	7.500	9.700	9.200	5.433	0.40	-2.567	-7.833
	14	6.200	5.433	4.400	1.400	-2.73	-7.700	-11.467
	21	3.800	2.600	-0.267	-5.200	-8.20	-13.267	-
	28	3.167	1.500	-3.167	-6.333	-11.43	-14.900	-
	35	1.033	-0.700	-4.933	-9.900	-14.47	-	-
	42	0.633	-0.900	-5.567	-12.700	-15.53	-	-
BA 50 ppm	0	11.433	17.700	15.600	12.933	11.13	6.00	1.600
	7	9.100	12.867	11.700	7.033	3.47	-1.000	-5.100
	14	8.100	9.867	9.533	5.067	-0.40	-4.467	-10.967
	21	6.100	6.333	4.300	-0.467	-4.60	-8.867	-
	28	3.600	3.367	2.300	-5.533	-8.70	-12.600	-
	35	1.933	1.567	-2.600	-6.300	-12.87	-	-
	42	0.800	-0.400	-3.567	-8.633	-13.53	-	-
Kin 50 ppm	0	10.267	15.167	16.100	14.133	8.97	-4.667	0.767
	7	9.800	14.200	13.600	10.200	5.20	-2.633	-2.967
	14	7.533	10.333	9.867	3.567	0.47	-4.433	-8.200
	21	5.333	5.667	4.200	0.433	-3.50	-7.400	-
	28	3.233	2.933	1.433	-2.467	-7.90	-12.333	-
	35	2.200	2.067	-3.100	-7.667	-11.67	-	-
	42	1.600	0.700	-0.367	-8.100	-12.73	-	-
Kin 100 ppm	0	1.333	17.067	26.233	14.900	12.00	8.067	4.067
	7	10.400	13.267	15.133	12.600	8.47	4.467	-0.533
	14	8.567	12.600	13.233	7.767	2.43	-1.300	-6.367
	21	6.200	10.067	8.433	4.200	-0.43	-4.367	-
	28	4.200	5.267	2.200	-1.700	-4.70	-8.867	-
	35	3.267	2.533	1.733	-0.967	-7.60	-	-
	42	2.933	1.833	-1.767	-6.667	-9.97	-	-
L.S.D at	5%	5.489	0.892	4.000	1.256	0.842	2.931	1.527
	1%	7.268	1.181	5.296	1.663	1.115	3881	2.022

Table (65): Effect of some growth regulators treatments, on Floret opening percentage and Floret wilting percentage of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Floret opening percentage							Floret wilting percentage							
		Shelf life periods (days)							Shelf life periods (days)							
		4	8	12	16	20	24	28	4	8	12	16	20	24	28	32
		1st season														
Growth Regulators	Control	22.57	26.00	30.67	34.76	38.19	42.48	53.24	33.00	57.08	67.20	80.56	88.56	97.36	-	-
	GA_3 200ppm	29.14	32.67	38.00	46.29	54.29	60.86	64.57	25.49	41.08	59.60	66.12	81.62	89.74	96.90	-
	GA3 300ppm	28.86	36.57	44.29	50.86	59.14	64.57	68.57	22.93	37.95	53.74	60.05	76.16	85.26	92.30	98.60
	BA 25 ppm	24.76	27.24	34.48	40.00	45.71	50.19	56.67	28.54	50.49	66.47	79.80	83.83	93.60	-	-
	BA 50 ppm	27.43	31.91	38.57	46.00	53.24	58.86	62.19	30.77	44.02	60.69	70.88	81.99	90.66	97.90	-
	Kin 50 ppm	26.57	31.14	38.57	47.43	52.00	57.62	62.00	25.77	41.83	62.07	69.20	81.73	89.79	96.30	-
	Kin 100 ppm	27.81	34.76	42.29	49.14	55.14	62.00	66.29	24.83	38.46	54.83	62.05	76.96	87.66	93.26	99.31
L.S.D at	5 %	1.546	1.977	1.716	1.949	1.915	1.866	1.679	4.279	4.128	5.674	3.713	3.294	2.765	1.784	1.100
	1%	2.047	2.617	2.272	2.580	2.536	2.470	2.22	5.665	5.465	7.512	4.915	4.361	3.660	2.362	1.456
		2nd season														
Growth Regulators	Control	22.38	27.14	31.43	36.67	40.00	44.76	56.10	42.22	63.68	73.96	82.38	89.56	98.53	-	-
	GA_3 200ppm	28.57	35.24	42.38	49.05	55.71	61.91	66.19	29.37	45.77	60.44	65.85	80.76	88.65	96.36	-
	GA3 300ppm	30.95	39.52	46.67	55.24	60.95	69.05	71.91	22.70	42.38	55.04	60.32	76.64	84.65	92.35	98.69
	BA 25 ppm	25.24	29.05	36.67	43.81	50.00	58.10	60.67	36.84	56.48	70.76	78.95	84.15	94.60	-	-
	BA 50 ppm	30.00	36.19	43.33	51.91	57.62	65.24	68.29	30.62	46.61	69.15	76.46	83.86	91.77	98.67	-
	Kin 50 ppm	29.05	35.71	43.33	50.29	56.19	63.81	67.62	25.78	45.93	61.22	65.70	81.83	89.60	96.56	-
	Kin 100 ppm	30.48	37.62	45.24	52.86	57.62	66.19	69.14	25.30	43.18	56.57	60.33	75.91	86.70	93.66	99.60
L.S.D at	5 %	3.025	3.292	3.357	3.730	3.386	3.373	3.316	6.220	7.881	8.832	6.745	5.011	4.349	2.683	2.586
	1%	4.005	4.359	4.444	4.939	4.483	4.465	4.390	8.235	10.43	11.69	8.930	6.635	5.578	3.552	3.424

seasons. However, the treatment of GA_3 at 300ppm approved to be the greatest treatment for inducing the highest floret opening percentage as compared with the control during the studied shelf life periods in both seasons, with the exception of GA_3 at 200ppm after 4 days of shelf life period in the first season which scored the highest value in this concern. On the other hand, using the treatments of kinetin at 100ppm and BA at 50ppm gave highly significant increments of this parameter in both seasons.

Referring the effect of storage periods on floret opening percentage data listed in Table (66) demonstrate that there were gradual decrease in floret opening percentage of Bird of paradise cut flower stalks with extending storage periods at 7 ±1°C for different days (0-time, 7, 14, 21, 28, 35 and 32 days after 4, 8, 12, 16, 20, 24, 28 and 32 days of shelf life days in the two seasons. However, Bird of paradise cut flower stalks were stored at 7 ±1°C for 0-time treatment showed the greatest significant increase in floret opening percentage of cut flower stalks when compared to the other ones under study in the two seasons. Moreover, storage periods at 7 ±1°C for 42 days recorded highly significant decrease in floret opening percentage as compared to other different storage periods of Bird of paradise cut flower stalks in both seasons.

Regarding to the interaction effect between growth regulators and storage periods on floret opening percentage, data in Tables (67 & 68) reveal that all the combinations between growth regulators (GA_3 at 200ppm, GA_3 at 30ppm, BA at

Table (66): Effect of Storage periods (Days) treatments on Floret opening percentage and Floret wilting percentage of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Floret opening percentage Shelf life periods(days)							Floret wilting percentage Shelf life periods(days)							
		4	8	12	16	20	24	28	4	8	12	16	20	24	28	32
		1st season														
Storage periods (Days)	0	35.43	44.00	56.00	64.86	71.24	77.14	82.10	-	15.38	32.80	41.75	49.91	65.55	78.78	86.77
	7	32.10	39.62	48.00	59.62	64.29	69.71	74.00	-	27.18	40.75	49.91	64.14	76.63	89.93	-
	14	28.48	33.62	42.48	49.62	55.62	63.14	67.43	25.07	38.45	50.13	65.25	75.57	88.09	-	-
	21	25.43	29.14	36.48	43.81	50.00	54.86	63.05	30.62	47.29	61.43	76.85	87.69	-	-	-
	28	23.43	26.29	31.43	37.14	44.00	48.19	54.57	39.72	55.23	72.15	87.95	-	-	-	-
	35	21.71	24.67	27.33	31.43	40.00	44.00	48.67	44.13	56.32	76.72	-	-	-	-	-
	42	20.57	22.95	25.14	28.00	32.57	39.52	43.71	51.80	71.07	90.60	-	-	-	-	-
L.S.D at	5 %	1.546	1.977	1.716	1.949	1.915	1.866	1.679	4.279	4.128	5.674	3.713	3.294	2.765	1.784	1.100
	1%	2.047	2.617	2.272	2.580	2.536	2.470	2.22	5.665	5.465	7.512	4.915	4.361	3.660	2.362	1.456
		2nd season														
Storage periods (Days)	0	37.14	48.57	60.48	69.52	74.76	81.91	85.62	-	19.42	33.31	43.28	52.68	66.41	78.88	86.02
	7	33.33	42.38	51.43	62.86	67.62	72.38	78.57	-	32.08	44.24	52.07	66.77	78.90	90.63	-
	14	30.95	38.10	46.19	54.57	58.57	65.71	72.38	27.76	41.39	52.66	64.16	80.80	94.11	-	-
	21	27.62	32.86	38.57	47.62	53.33	60.95	67.62	35.79	50.00	63.10	77.10	89.17	-	-	-
	28	24.76	28.57	35.24	40.95	47.14	52.86	58.10	43.68	58.54	71.46	85.01	-	-	-	-
	35	22.86	26.19	30.00	33.33	41.91	50.00	52.38	47.02	63.08	82.51	-	-	-	-	-
	42	20.00	23.81	27.14	30.95	34.76	45.24	45.24	58.57	79.48	97.86	-	-	-	-	-
L.S.D at	5 %	3.025	3.292	3.357	3.730	3.386	3.373	3.316	6.220	7.881	8.832	6.745	5.011	4.349	2.683	2.586
	1%	4.005	4.359	4.444	4.939	4.483	4.465	4.390	8.235	10.43	11.69	8.930	6.635	5.578	3.552	3.424

Table (67): Effect of interaction between some growth regulators and Storage periods (Days) treatments on Floret opening percentage of *Strelitzia reginae Ait* cut flower stalk during the first season of 2007-2008.

Treatments		Floret opening percentage						
		1st season						
Growth regulators	Storage periods	Shelf life periods (days)						
		4	8	12	16	20	24	28
Control	0	26.00	32.00	46.00	52.00	54.67	60.00	70.67
	7	26.00	30.00	36.00	43.33	48.00	50.67	60.00
	14	24.00	30.00	32.00	40.00	45.33	50.00	56.00
	21	22.00	26.00	29.33	30.00	34.67	38.00	54.00
	28	20.00	22.00	26.00	28.00	30.00	36.00	50.00
	35	20.00	22.00	23.33	26.00	28.67	32.00	44.00
	42	20.00	20.00	22.00	24.00	26.00	30.67	38.00
GA_3 200ppm	0	38.00	48.00	60.00	68.00	76.00	80.00	86.00
	7	34.00	43.33	48.00	62.00	68.00	74.00	78.00
	14	32.00	36.00	44.00	50.00	58.00	68.00	72.00
	21	28.00	28.00	34.00	48.00	54.00	60.00	68.00
	28	26.00	26.00	30.00	36.00	46.00	52.00	54.00
	35	24.00	24.00	26.00	32.00	44.00	48.00	48.00
	42	22.00	23.33	24.00	28.00	34.00	44.00	46.00
GA_3 300ppm	0	44.00	52.00	64.00	72.00	80.00	86.00	90.00
	7	36.00	48.00	56.00	68.00	72.00	78.00	84.00
	14	30.00	40.00	48.00	52.00	64.00	70.00	76.00
	21	26.00	34.00	46.00	50.00	58.00	66.00	70.00
	28	24.00	30.00	36.00	44.00	52.00	54.00	60.00
	35	22.00	28.00	32.00	38.00	48.00	52.00	52.00
	42	20.00	24.00	28.00	32.00	40.00	46.00	48.00
BA 25 ppm	0	30.00	34.00	50.00	58.00	66.00	72.00	76.00
	7	30.00	32.00	40.00	54.00	60.00	66.00	70.00
	14	27.33	28.00	36.00	46.00	50.00	54.00	58.00
	21	24.00	26.00	34.00	36.00	46.00	46.00	54.00
	28	22.00	24.00	30.00	32.00	38.00	43.33	52.00
	35	20.00	23.33	26.00	28.00	32.00	36.00	46.67
	42	20.00	23.33	25.33	26.00	28.00	34.00	40.00
BA 50 ppm	0	36.00	46.00	56.00	66.00	74.00	80.00	84.00
	7	32.00	40.00	50.00	60.00	66.00	72.00	72.00
	14	30.00	31.33	43.33	51.33	56.00	66.00	66.00
	21	26.00	30.00	34.00	46.67	53.33	58.00	63.33
	28	24.00	27.33	32.00	38.00	48.00	50.00	56.00
	35	22.00	25.33	28.00	32.00	43.33	46.00	50.00
	42	22.00	23.33	26.67	28.00	32.00	40.00	44.00
Kin 50 ppm	0	34.00	46.00	54.00	68.00	72.00	78.00	80.00
	7	32.00	38.00	52.00	64.00	66.00	71.33	74.00
	14	28.00	32.00	46.00	54.00	58.00	66.00	70.00
	21	26.00	28.00	36.00	48.00	50.00	54.00	64.00
	28	24.00	26.67	32.00	40.00	46.00	50.00	54.00
	35	22.00	24.00	26.00	30.00	40.00	46.00	48.00
	42	20.00	23.33	24.00	28.00	32.00	38.00	44.00
Kin 100 ppm	0	40.00	50.00	62.00	70.00	76.00	84.00	88.00
	7	34.00	46.00	54.00	66.00	70.00	76.00	80.00
	14	28.00	38.00	48.00	54.00	58.00	68.00	74.00
	21	26.00	32.00	42.00	48.00	54.00	62.00	68.00
	28	24.00	28.00	34.00	42.00	48.00	52.00	56.00
	35	22.00	26.00	30.00	34.00	44.00	48.00	52.00
	42	20.00	23.33	26.00	30.00	36.00	44.00	46.00
L.S.D at	5%	4.091	5.230	4.541	5.156	5.067	4.937	4.443
	1%	5.416	6.924	6.012	6.826	6.708	6.537	5.883

Table (68) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Floret opening percentage of *Strelitzia reginae Ait* cut flower stalk during the second season of 2008-2009.

Treatments		Floret opening percentage						
		2nd season						
Growth regulators	Storage periods	Shelf life periods (days)						
		4	8	12	16	20	24	28
Control	0	26.67	33.33	46.67	53.33	56.67	63.33	72.67
	7	26.67	30.00	36.67	46.67	50.00	53.33	63.33
	14	23.33	30.00	33.33	43.33	46.67	50.00	60.00
	21	20.00	26.67	30.00	33.33	36.67	40.00	56.67
	28	20.00	23.33	26.67	30.00	33.33	36.67	53.33
	35	20.00	23.33	23.33	26.67	30.00	33.33	46.67
	42	20.00	23.33	23.33	23.33	26.67	36.67	40.00
GA_3 200ppm	0	36.67	53.33	66.67	73.33	76.67	83.33	90.00
	7	33.33	46.67	53.33	63.33	70.00	73.33	80.00
	14	33.33	40.00	50.00	53.33	60.00	66.67	73.33
	21	26.67	30.00	36.67	50.00	56.67	63.33	70.00
	28	26.67	26.67	33.33	40.00	50.00	53.33	56.67
	35	23.33	26.67	30.00	33.33	43.33	50.00	50.00
	42	20.00	23.33	26.67	30.00	33.33	43.33	43.33
GA_3 300ppm	0	46.67	56.67	66.67	76.67	83.33	90.00	93.33
	7	36.67	50.00	60.00	70.00	76.67	80.00	86.67
	14	33.33	43.33	50.00	60.00	63.33	70.00	80.00
	21	30.00	36.67	43.33	53.33	60.00	70.00	73.33
	28	26.67	33.33	40.00	50.00	53.33	60.00	63.33
	35	23.33	30.00	36.67	40.00	50.00	56.67	56.67
	42	20.00	26.67	30.00	36.67	40.00	56.67	50.00
BA 25 ppm	0	30.00	36.67	53.33	63.33	70.00	76.67	78.00
	7	30.00	33.33	40.00	56.67	63.33	73.33	73.33
	14	30.00	30.00	40.00	50.00	53.33	60.00	63.33
	21	26.67	30.00	36.67	43.33	50.00	53.33	60.00
	28	20.00	26.67	33.33	33.33	43.33	50.00	56.67
	35	20.00	23.33	26.67	30.00	36.67	50.00	50.00
	42	20.00	23.33	26.67	30.00	33.33	43.33	43.33
BA 50 ppm	0	40.00	53.33	63.33	73.33	80.00	86.67	88.00
	7	36.67	46.67	56.67	66.67	70.0	76.67	83.33
	14	33.33	40.00	46.67	56.67	63.33	70.00	76.67
	21	30.00	33.33	40.00	53.33	56.67	66.67	70.00
	28	26.67	30.00	36.67	43.33	50.00	56.67	60.00
	35	23.33	26.67	30.00	36.67	46.67	53.33	53.33
	42	20.00	23.33	30.00	33.33	36.67	46.67	46.67
Kin 50 ppm	0	36.67	50.00	60.00	73.33	76.67	83.33	86.67
	7	33.33	43.33	56.67	66.67	70.00	73.33	80.00
	14	30.00	40.00	53.33	62.00	63.33	73.33	76.67
	21	30.00	36.67	40.00	46.67	56.67	66.67	70.00
	28	26.67	30.00	36.67	43.33	50.00	56.67	60.00
	35	26.67	26.67	30.00	30.00	40.00	50.00	53.33
	42	20.00	23.33	26.67	30.00	36.67	43.33	46.67
Kin 100 ppm	0	43.33	56.67	66.67	73.33	80.00	90.00	90.67
	7	36.67	46.67	56.67	70.00	73.33	76.67	83.33
	14	33.33	43.33	50.00	56.67	60.00	70.00	76.67
	21	30.00	36.67	43.33	53.33	56.67	66.67	73.33
	28	26.67	30.00	40.00	46.67	50.00	56.67	56.67
	35	23.33	26.67	33.33	36.67	46.67	56.67	56.67
	42	20.00	23.33	26.67	33.33	36.67	46.67	46.67
L.S.D at	5%	8.003	8.710	8.882	9.869	8.959	8.924	8.773
	1%	10.59	11.53	11.76	13.07	11.86	11.81	11.62

25ppm, BA at 50ppm, Kin at 50ppm and Kin at 100ppm) and storage periods at 7± 1°C for 0, 7, 14, 21, 28, 35 and 42 days succeeded in increasing the floret opening percentage of Bird paradise cut flower stalks after 4,8,12,16,20,24 and 28 days from the treatment during the two seasons as compared to control. However, the combinations of GA_3 at 300ppm recorded the greatest values of this parameter, especially the combined between of GA_3 at 300ppm and storage periods at 7± 1°C for 0-time after 4,8,12,16,20,24 and 28 days from the treatment in the two seasons. Moreover, the interaction between kinetin at 100ppm and storage periods at 7± 1°C for 0-.time resulted highly significant increase of floret opening percentage of tuberose cut flower stalks as compared to control in the two seasons. Regardless control, the lowest mean values of floret opening percentage was registered by using the interaction between Benzyladenine at 25ppm and storage periods at 7± 1°C for 42 days after 4,8,12,16,20,24 and 28 days from the treatment in the two seasons.

5.1.e.-Floret wilting percentage:

Data in Table (65) reveal that all studied pre-harvest treatments significantly decreased floret wilting percentage of Bird of paradise cut flower stalks when compared with control after 4, 8, 12 and 16 days of shelf life periods after that till the end of longer when compared with control in the two seasons. However, GA_3 at 300ppm and kinetin at 100ppm scored the lowest values in this parameter. The differences between the aforesaid two treatments were not significant in both seasons.

Referring to the effect of storage periods on floret witling percentage data of both seasons presented in Table (66) reveal that floret witling percentage of Bird of paradise cut flower stalks was increased with extending storage periods at 7 ±1°C for different days (0-time) 7, 14, 21, 28, 35 and 42 days. However, Bird of paradise cut flower stalks were stored at 7 ±1°C for 42 days recorded the highest increases in floret wilting percentage as compared to other different storage periods in both seasons. Moreover, storage periods at 7 ±1°C for 0-time treatment showed the lowest values in floret wilting percentage of Bird of paradise cut flower stalks when compared to the other ones under study in the two seasons.

As for the interaction effect between growth regulators and storage periods on floret opening percentage, data in Tables (69 & 70) indicate that all the interaction treatments between growth regulators and storage periods decreased floret wilting percentage of Bird paradise cut flower stalks after 4,8,12,16,20,24,28 and 32 days from the treatment during the two seasons as compared to control. However, the interaction of GA_3 at 300ppm resulted the highest effective decrease of floret wilting percentage, especially the combined treatment of GA_3 at 300ppm and storage periods at 7± 1°C for 0-time after 4,8,12,16,20,24,28 and 32 days from the treatment in the two seasons under this study. Moreover, the interaction treatment between kinetin at 100ppm and storage periods at 7±1°C for 0-time resulted highly decreased of floret wilting percentage of Bird paradise cut flower stalks as compared to control in both seasons. Furthermore, the floret wilting percentage of tuberose

Table (69) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Floret wilting percentage of *Strelitzia reginae Ait* cut flower stalk during the first season of 2007-2008.

Treatments		Floret wilting percentage							
		1st season							
Growth regulators	Storage periods	Shelf life periods (days)							
		4	8	12	16	20	24	28	32
Control	0	-	25.34	52.18	53.95	65.93	83.33	90.63	98.17
	7	-	42.22	49.91	66.83	75.20	94.87	100.00	-
	14	33.85	46.81	62.66	80.00	83.86	96.32	-	-
	21	37.17	54.06	68.70	93.33	98.38	-	-	-
	28	50.00	67.98	76.86	-	-	-	-	-
	35	50.00	73.13	63.03	-	-	-	-	-
	42	60.00	90.00	97.02	-	-	-	-	-
GA_3 200ppm	0	-	12.33	26.60	39.18	48.68	62.50	75.72	81.55
	7	-	23.22	37.44	45.33	61.68	70.36	84.68	94.86
	14	22.64	33.84	49.72	60.04	75.79	85.26	94.43	-
	21	29.35	43.75	59.37	64.65	85.41	100.00	-	-
	28	34.83	50.63	73.01	89.21	96.76	-	-	-
	35	41.61	58.49	78.17	94.44	-	-	-	-
	42	50.00	65.28	92.86	-	-	-	-	-
GA_3 300ppm	0	-	11.48	25.00	37.93	43.75	56.04	71.17	80.04
	7	-	20.70	39.25	44.16	58.45	66.52	81.00	90.46
	14	19.90	30.00	41.40	61.68	68.99	80.28	94.73	-
	21	25.80	38.93	48.58	68.18	79.29	91.41	-	-
	28	34.37	46.89	66.81	77.58	88.61	-	-	-
	35	35.46	50.30	68.95	81.82	96.05	-	-	-
	42	45.00	67.38	86.21	-	-	-	-	-
BA 25 ppm	0	-	20.76	39.94	45.30	51.52	69.64	89.73	94.83
	7	-	34.26	50.34	55.52	72.00	85.15	97.25	-
	14	24.36	42.76	61.24	73.89	80.09	96.30	-	-
	21	29.30	54.06	68.62	89.44	94.39	-	-	-
	28	41.14	62.79	73.55	94.21	99.82	-	-	-
	35	50.00	60.73	84.59	-	-	-	-	-
	42	55.00	78.08	86.97	-	-	-	-	-
BA 50 ppm	0	00.00	12.85	28.59	39.43	48.58	65.00	76.18	80.91
	7	00.00	22.50	36.06	46.67	60.76	77.83	97.52	-
	14	26.15	41.63	46.46	62.44	71.91	88.17	-	-
	21	34.39	46.21	65.38	73.85	90.87	100.00	-	-
	28	50.23	55.36	69.48	92.09	98.79	-	-	-
	35	50.00	55.64	84.01	97.67	-	-	-	-
	42	54.60	73.95	94.89	-	-	-	-	-
Kin 50 ppm	0	-	12.97	29.65	39.13	47.27	64.17	77.50	90.00
	7	-	25.77	38.46	45.50	63.73	73.04	86.57	-
	14	25.09	37.37	47.77	61.24	75.79	88.03	100.00	-
	21	30.89	50.01	66.99	75.58	84.00	-	-	-
	28	33.49	52.78	75.06	85.00	96.25	-	-	-
	35	40.91	49.77	84.95	93.94		-	-	-
	42	50.00	64.14	91.63	-	-	-	-	-
Kin 100 ppm	0	-	11.91	27.64	37.33	43.67	58.14	70.55	81.88
	7	-	21.61	33.82	45.34	57.14	68.65	82.50	92.50
	14	23.50	36.74	41.67	57.44	72.57	82.29	94.68	-
	21	27.41	43.98	52.40	72.92	81.48	93.88	-	-
	28	33.97	50.17	70.31	76.19	92.26	-	-	-
	35	40.91	46.15	73.33	82.08	-	-	-	-
	42	48.00	58.67	84.62	-	-	-	-	-
L.S.D at	5%	11.32	10.92	15.01	9.832	8.715	7.315	4.719	2.909
	1%	14.99	14.46	19.87	13.01	11.54	9.684	6.248	3.852

Table (70) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Floret wilting percentage of *Strelitzia reginae Ait* cut flower stalk during the second season of 2008-2009.

Treatments		Floret wilting percentage							
		2nd season							
Growth regulators	Storage periods	Shelf life periods (days)							
		4	8	12	16	20	24	28	32
Control	0	-	35.06	53.06	62.78	74.76	85.87	96.49	99.12
	7	-	50.00	64.56	73.56	82.22	98.44	-	-
	14	45.56	55.56	72.78	79.33	91.00	11.89	-	-
	21	60.00	61.11	74.67	92.78	105.56	-	-	-
	28	60.00	70.00	84.44	-	-	-	-	-
	35	60.00	80.67	94.44	-	-	-	-	-
	42	70.00	93.33	101.78	-	-	-	-	-
GA_3 200ppm	0	-	16.13	28.54	39.61	49.52	63.83	74.26	85.00
	7	-	26.33	40.89	47.14	62.86	73.69	83.25	97.50
	14	23.33	35.00	48.00	60.00	80.98	93.33	98.45	-
	21	36.67	46.67	60.56	71.78	87.78	100.25	-	-
	28	40.00	56.89	70.67	78.00	95.56	-	-	-
	35	47.56	62.22	73.33	94.44	-	-	-	-
	42	58.00	77.11	101.11	-	-	-	-	-
GA_3 300ppm	0	-	12.44	27.14	36.79	44.49	58.24	70.96	82.56
	7	-	29.67	38.89	45.71	59.88	72.50	81.11	90.37
	14	21.11	34.83	44.44	56.67	74.86	89.41	95.00	-
	21	22.00	45.00	54.00	70.56	80.00	88.57	-	-
	28	32.22	50.00	62.50	74.00	90.22	-	-	-
	35	33.56	53.33	65.00	82.50	96.00	-	-	-
	42	50.00	71.11	93.33	-	-	-	-	-
BA 25 ppm	0	-	25.39	37.78	47.62	57.14	70.60	85.41	91.05
	7	-	39.56	54.44	62.02	73.97	88.79	95.71	101.55
	14	28.00	51.33	60.00	74.33	87.64	94.33	-	-
	21	43.89	56.67	73.33	81.17	97.89	-	-	-
	28	60.00	69.56	80.56	-	101.33	-	-	-
	35	60.00	68.89	94.22	-	-	-	-	-
	42	66.00	84.00	102.00	-	-	-	-	-
BA 50 ppm	0	-	15.33	28.41	38.10	50.00	63.75	75.88	81.86
	7	-	24.00	35.56	45.24	6405	73.85	86.57	93.80
	14	27.67	37.50	48.00	63.33	80.87	90.29	97.92	-
	21	33.33	48.33	60.00	71.56	89.33	100.43	-	-
	28	44.00	56.67	70.39	81.97	85.78	-	-	-
	35	49.33	62.22	98.00	-	-	-	-	-
	42	60.00	82.22	94.67	-	-	-	-	-
Kin 50 ppm	0	-	16.22	31.11	39.17	47.26	62.87	76.11	81.39
	7	-	28.67	39.78	46.51	62.86	73.69	83.65	95.82
	14	25.33	37.50	47.42	56.57	75.87	90.36	99.29	-
	21	28.00	47.78	60.00	79.33	82.84	95.49	-	-
	28	33.33	53.33	66.67	78.67	90.00	-	-	-
	35	37.78	57.78	82.00	93.33	-	-	-	-
	42	56.00	80.22	-	-	-	-	-	-
Kin 100 ppm	0	-	15.33	27.14	38.89	45.57	59.69	73.01	81.17
	7	-	26.33	35.56	44.29	61.55	71.35	80.01	91.30
	14	23.33	38.00	48.00	58.89	74.33	87.14	96.7	-
	21	26.67	44.44	59.17	72.50	80.80	95.05	-	-
	28	36.22	53.33	65.00	74.53	92.49	-	-	-
	35	40.89	56.44	70.56	88.67	96.33	-	-	-
	42	50.00	68.33	90.56	-	-	-	-	-
L.S.D at	5%	16.46	20.85	23.37	17.85	13.26	11.51	7.098	6.843
	1%	21.79	27.61	30.94	23.63	17.55	15.23	9.398	9.059

cut flower stalks by using all the interaction treatments between growth regulators and storage periods was increased as flower cut stalks advanced in age after 4 days from the treatment till the end of age of longevity in the two seasons.

5.1.f.-Water uptake (g)/stalks.

As shown in Table (71) it is obvious that water uptake by Bird of paradise cut flower stalks increased as cut flower stalks prolonged in age after 4 days from the beginning of the treatment till the end of shelf life periods in the two seasons under the tested pre harvest treatments . However , all used pre harvest treatments succeeded increasing the water uptake by Bird of paradise cut flower stalks, especially the treatment of kinetin at 100ppm which induced the highest value in this parameter during all tested shelf life periods, with the exception of GA_3 at 300ppm in the first season which recorded the highest value in this respect at 20 days at shelf life periods. Moreover, using the treatments of GA_3 at 300ppm and 200ppm resulted in highly significant in this parameter during all tested shelf life periods in the two seasons of this study . Irrespective control, the lowest mean value of water uptake by Bird of paradise cut flower stalks was registered by using the treatment of BA at 25ppm during all tested shelf life periods in the two seasons.

The rest treatments occupied an intermediate position between the abovementioned treatments in both seasons of this study.

Regarding to the effect of storage periods on water uptake, it is clear from Table (72) that the absorbed solution by Bird of paradise cut flower stalks increased as cut flower stalks

Table (71): Effect of some growth regulators treatments, on Water uptake and Water loss (g)/stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Water uptake (g)/stalk Shelf life periods (days)							Water loss (g)/stalk Shelf life periods (days)						
		4	8	12	16	20	24	28	4	8	12	16	20	24	28
		1st season													
Growth Regulators	Control	40.21	57.06	71.94	85.08	101.16	93.18	66.22	36.82	55.45	73.94	92.58	113.83	103.81	71.72
	GA_3 200ppm	45.23	61.81	80.07	92.58	112.00	98.61	69.63	39.01	54.05	73.11	89.47	113.08	99.76	70.38
	GA3 300ppm	47.37	63.88	82.16	94.03	114.17	101.09	71.88	39.40	53.87	72.48	87.41	111.21	100.24	70.99
	BA 25 ppm	42.09	59.51	77.40	89.60	106.36	95.33	66.08	37.36	55.38	75.44	92.67	113.09	100.47	69.16
	BA 50 ppm	43.39	60.65	78.99	91.14	107.98	96.61	68.46	37.32	53.39	74.93	89.97	111.87	99.68	70.25
	Kin 50 ppm	45.65	62.55	79.45	92.46	111.37	97.88	69.77	39.59	54.66	72.96	90.92	114.07	100.39	71.20
	Kin 100 ppm	49.12	65.83	83.60	95.93	112.59	101..38	72.28	41.72	57.41	75.29	91.51	112.64	101.60	72.31
L.S.D at	5 %	0.354	0.364	0.436	0.356	0.810	0.434	0.330	0.678	0.577	4.676	0.478	0.541	0.513	1.617
	1%	0.476	0.482	0.578	0.472	1.073	0.574	0437	0.894	0.764	6.191	0.633	0.716	0.680	2.140
		2nd season													
Growth Regulators	Control	42.79	59.47	74.94	87.63	103.55	95.13	67.31	39.65	58.24	78.40	96.55	116.60	105.87	74.61
	GA_3 200ppm	47.62	63.86	82.36	94.65	113.39	103.67	70.00	41.49	55.73	74.37	91.05	113.48	100.84	71.65
	GA3 300ppm	49.84	66.48	84.56	96.30	115.71	102.74	72.69	40.90	56.74	74.51	89.07	113.08	101.74	72.03
	BA 25 ppm	44.42	61.45	79.91	91.95	109.38	97.81	67.59	39.72	56.90	77.59	94.07	115.60	102.81	70.30
	BA 50 ppm	45.49	62.57	80.32	92.84	109.51	98.21	69.50	39.62	55.24	75.00	92.26	113.15	101.20	71.56
	Kin 50 ppm	48.38	64.74	82.70	94.66	113.37	99.78	70.92	42.63	57.44	76.73	93.21	116.39	104.28	72.41
	Kin 100 ppm	52.07	68.38	86.42	98.65	116.47	103.67	73.53	46.80	59.43	77.11	94.34	116.43	103.95	73.94
L.S.D at	5 %	0.681	0.728	1.035	0.803	1.009	1.321	0.598	2.237	0.723	1.676	0.887	1.045	0.724	0.748
	1%	0.901	0.964	1.371	1.063	1.335	1.748	0.793	2.962	0.957	2.219	1.174	1.383	0.959	0.991

Table (72): Effect of Storage periods (Days)treatments on Water uptake and Water loss (g)/stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Water uptake (g)/stalk Shelf life periods(days)							Water loss (g)/stalk Shelf life periods(days)						
		4	8	12	16	20	24	28	4	8	12	16	20	24	28
		1st season													
Storage periods (Days)	0	52.93	73.88	96.84	113.03	132.93	151.49	168.63	41.51	57.55	80.27	99.13	123.34	146.13	167.57
	7	49.21	69.50	91.21	108.38	127.51	146.81	162.36	40.36	58.18	80.21	101.19	124.03	147.97	167.59
	14	47.06	67.48	85.52	97.56	120.18	140.27	153.34	39.34	58.65	77.11	93.29	120.61	145.10	160.85
	21	44.91	64.60	79.64	91.49	110.89	132.19	-	39.40	58.06	71.99	91.21	115.20	141.03	-
	28	42.96	57.92	74.69	86.17	103.23	113.32	-	39.14	54.44	63.45	90.29	111.35	125.72	-
	35	39.79	51.72	67.16	77.30	90.79	-	-	37.00	50.34	62.49	83.86	102.28	-	-
	42	36.19	46.21	58.56	66.90	80.09	-	-	34.48	46.99	62.53	75.55	92.97	-	-
L.S.D at	5 %	0.354	0.364	0.436	0.356	0.810	0.434	0.330	0.678	0.577	4.676	0.478	0.541	0.513	1.617
	1%	0.476	0.482	0.578	0.472	1.073	0.574	0437	0.894	0.764	6.191	0.633	0.716	0.680	2.140
		2nd season													
Storage periods (Days)	0	55.88	76.26	98.76	115.13	133.50	153.67	171.42	46.31	60.16	81.06	101.30	123.76	149.74	170.57
	7	51.97	71.83	93.41	110.05	129.48	149.11	164.62	43.36	60.84	81.95	102.28	126.37	150.80	170.42
	14	49.54	69.54	87.95	100.54	122.69	142.91	156.00	42.24	60.59	79.46	96.68	123.22	148.34	165.51
	21	46.86	66.18	81.90	93.62	114.92	135.11	-	41.37	59.72	77.66	93.51	118.92	143.39	-
	28	45.67	60.39	77.34	88.26	106.05	117.24	-	41.95	56.97	76.78	92.39	113.84	128.42	-
	35	42.07	54.28	69.95	79.76	93.01	-	-	38.40	53.04	71.93	85.93	103.85	-	-
	42	38.59	48.51	61.90	69.32	81.73	-	-	37.18	48.41	64.85	78.48	94.77	-	-
L.S.D at	5 %	0.681	0.728	1.035	0.803	1.009	1.321	0.598	2.237	0.723	1.676	0.887	1.045	0.724	0.748
	1%	0.901	0.964	1.371	1.063	1.335	1.748	0.793	2.962	0.957	2.219	1.174	1.383	0.959	0.991

advanced in age after 4 days from the treatment till the end of longevity in the two seasons under storage periods treatments under study in most cases. It is clear that water uptake by Bird of paradise cut flower stalks as affected by storage periods at 7±1°C in both seasons. The lowest water uptake value was recorded when storage periods were increased. The highest water uptake was with those stored at 7 ±1°C for 0-time period compared with those stored for 7, 14, 21, 28, 35 and 42 days respectively, in both seasons. Whereas the values of water uptake was recorded highly significant by stored for 7day and 14 days storage periods compared with stored 21, 28, 35 and 42 days in the two seasons.

With regard to the interaction effect between growth regulators and storage periods on water uptake, data presented in Tables (73 & 74) demonstrate that all the interaction treatments between growth regulators and storage periods increased water uptake of bird of paradise cut flower stalks when compared to control in the two seasons. However, the combinations of kinetin at 100ppm and GA_3 at 300ppm recorded the highest significant increase in this parameter, especially the interaction between (kinetin at 100ppm and storage period of 0-time) and (GA_3 at 300ppm storage period of 0-time) after 4,8,12,16,20,24 and 28 days from the treatment from the treatment as compared to control in the two seasons. Irrespective control, the lowest mean values of water uptake of Bird of paradise cut flower stalks under all the interaction treatments was registered by using the interaction between BA at 25ppm and storage periods for 0-time after 4,8,12,16 and 20 days from the treatment in the two

Table (73) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Water uptake (g)/stalk of *Strelitzia reginae Ait* cut flower stalk during the first season of 2007-2008.

Treatments		Water uptake (g)/stalk						
		1st season						
		Shelf life periods (days)						
Growth regulators	Storage periods	4	8	12	16	20	24	28
Control	0	46.37	70.00	88.20	107.87	126.70	149.23	163.47
	7	44.93	65.07	84.20	102.53	120.57	143.43	153.07
	14	43.73	63.50	80.50	92.80	114.60	135.07	147.00
	21	42.17	59.67	73.73	85.87	102.03	122.57	-
	28	38.37	53.40	68.50	80.63	92.87	101.93	-
	35	35.37	47.23	58.17	68.67	80.97	-	-
	42	30.50	40.53	50.30	57.17	70.37	-	-
GA_3 200ppm	0	53.60	71.30	97.03	113.83	135.67	153.20	168.87
	7	49.17	68.87	91.77	108.40	129.00	146.37	164.30
	14	46.47	68.20	86.73	98.03	122.33	140.90	154.27
	21	45.10	65.57	80.37	92.43	115.27	133.70	-
	28	43.93	58.83	76.40	87.13	106.33	116.07	-
	35	41.27	52.37	69.20	79.33	92.73	-	-
	42	37.07	47.57	59.00	68.87	82.73	-	-
GA_3 300ppm	0	57.43	75.40	98.87	113.73	134.53	156.10	175.43
	7	52.73	70.77	93.50	110.37	132.93	149.87	168.90
	14	49.10	69.20	88.50	99.50	123.20	143.90	158.83
	21	46.93	67.13	82.77	94.67	116.57	138.80	-
	28	44.13	60.73	76.27	89.37	109.17	118.97	-
	35	41.93	54.87	71.27	81.00	96.90	-	-
	42	39.30	49.03	63.97	69.60	85.87	-	-
BA 25 ppm	0	48.00	72.20	97.17	113.20	135.13	148.93	158.50
	7	45.83	69.13	89.67	105.20	125.17	145.37	155.87
	14	44.73	66.07	84.27	95.20	117.30	137.37	148.20
	21	43.60	61.83	77.93	87.97	107.23	127.47	-
	28	41.67	55.50	72.47	84.47	97.53	108.200	-
	35	36.70	48.67	64.13	75.37	86.77	-	-
	42	34.07	43.20	56.17	65.80	75.37	-	-
BA 50 ppm	0	48.83	70.73	97.10	112.40	133.00	148.53	166.37
	7	47.73	68.67	91.73	106.67	126.50	145.17	160.83
	14	45.37	67.67	85.07	96.73	116.87	138.53	152.03
	21	43.53	64.13	79.50	90.63	109.70	130.93	-
	28	42.67	57.33	74.80	86.60	101.93	113.10	-
	35	39.10	51.00	67.27	76.33	89.97	-	-
	42	36.50	45.03	57.47	68.60	77.87	-	-
Kin 50 ppm	0	55.77	76.07	97.17	113.03	132.43	151.23	170.90
	7	48.00	68.87	91.13	111.80	128.90	146.07	164.00
	14	48.17	68.10	85.10	96.10	121.13	138.70	153.47
	21	45.57	65.60	78.93	92.00	116.57	133.70	-
	28	43.87	59.50	75.53	86.10	105.83	115.47	-
	35	41.27	51.17	69.50	79.47	92.17	-	-
	42	36.93	48.53	58.80	68.73	82.53	-	-
Kin 100 ppm	0	60.53	81.47	102.33	117.13	133.07	153.20	176.87
	7	56.10	75.10	96.47	113.67	129.47	151.37	169.53
	14	51.83	69.60	88.47	104.57	125.83	147.40	159.57
	21	47.50	68.23	84.23	96.87	108.87	138.17	-
	28	46.07	60.17	78.86	88.87	108.93	119.53	-
	35	42.87	56.73	70.57	80.90	96.10	-	-
	42	38.93	49.53	64.23	65.50	85.87	-	-
L.S.D at	5%	0.851	0.963	1.154	0.942	2.144	1.147	0.873
	1%	1.259	1.275	1.528	1.248	2.839	1.519	1.156

Table (74) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Water uptake (g)/stalk of *Strelitzia reginae Ait* cut flower stalk during the second season of 2008-2009.

Treatments		Water uptake (g)/stalk						
		2nd season						
Growth regulators	Storage periods	Shelf life periods (days)						
		4	8	12	16	20	24	28
Control	0	48.60	73.63	91.33	110.13	129.20	151.87	165.47
	7	47.60	67.90	86.63	104.83	124.43	145.13	156.40
	14	47.20	66.60	83.33	95.90	118.00	137.90	149.33
	21	44.53	61.07	77.47	88.17	104.97	125.03	-
	28	41.67	55.13	71.30	82.77	95.57	105.97	-
	35	37.33	49.13	61.83	71.93	83.30	-	-
	42	32.60	42.80	52.67	59.70	69.40	-	-
GA_3 200ppm	0	56.70	73.03	97.10	115.60	134.47	152.37	171.57
	7	51.83	70.73	93.53	110.43	130.47	148.43	165.40
	14	48.70	70.10	88.37	100.40	123.23	143.10	156.53
	21	47.00	67.07	82.37	94.30	117.07	136.37	-
	28	46.60	61.10	78.77	89.37	108.67	124.63	-
	35	43.23	55.73	71.60	81.33	94.57	-	-
	42	39.47	49.23	64.80	71.10	85.27	-	-
GA_3 300ppm	0	59.97	77.83	100.87	115.87	136.13	159.10	178.10
	7	55.90	73.43	95.60	111.97	131.77	152.53	170.37
	14	51.37	71.13	90.43	102.87	125.27	145.43	160.33
	21	48.50	69.37	84.63	96.57	119.57	140.63	-
	28	47.30	63.93	80.37	91.13	111.43	121.50	-
	35	44.67	57.63	73.87	83.03	98.57	-	-
	42	41.20	52.03	66.17	72.67	87.23	-	-
BA 25 ppm	0	49.83	73.50	100.63	115.27	137.10	152.87	163.47
	7	48.23	71.10	92.43	107.37	129.53	148.23	158.13
	14	47.37	68.27	86.23	97.93	120.27	140.37	151.53
	21	44.90	62.77	80.23	90.93	110.00	131.70	-
	28	43.80	57.17	74.87	85.97	101.90	111.47	-
	35	39.73	51.47	66.63	77.97	89.57	-	-
	42	37.10	45.87	58.37	68.23	77.30	-	-
BA 50 ppm	0	51.00	71.87	95.40	112.97	128.87	149.87	168.60
	7	49.87	70.40	93.03	108.70	127.13	146.93	163.07
	14	47.93	69.43	86.27	100.10	120.60	141.90	154.80
	21	45.53	65.63	80.83	91.97	112.63	133.73	-
	28	44.47	59.60	77.47	87.23	104.53	115.03	-
	35	41.23	5357	69.40	78.93	92.40	-	-
	42	38.40	47.50	59.83	70.00	80.37	-	-
Kin 50 ppm	0	57.83	79.53	100.97	115.70	134.13	153.80	173.30
	7	51.93	72.03	93.60	110.93	130.33	148.87	166.00
	14	50.47	69.13	88.20	99.50	123.07	142.23	157.13
	21	47.70	67.50	81.67	94.30	118.37	135.93	-
	28	47.47	61.67	77.90	89.47	107.97	117.63	-
	35	43.57	53.97	71.70	81.37	94.60	-	-
	42	39.40	49.33	64.83	71.33	85.10	-	-
Kin 100 ppm	0	67.23	84.40	105.00	120.40	134.57	155.80	179.43
	7	58.43	77.23	99.07	116.10	132.67	153.60	172.97
	14	53.73	72.13	92.80	107.10	128.40	149.47	162.33
	21	49.83	69.83	86.07	99.10	121.87	142.33	-
	28	48.60	63.77	80.73	91.90	112.27	124.47	-
	35	44.70	58.47	74.63	83.73	98.03	-	-
	42	41.93	52.83	66.63	72.20	87.43	-	-
L.S.D at	5%	1.301	1.927	2.739	2.124	2.669	3.494	1.583
	1%	2.385	2.551	3.627	2.812	3.353	4.626	2.096

seasons. Furthermore, water uptake of Bird of paradise cut flower stalks by using all the interaction treatments between growth regulators and storage periods was increased as flower cut stalks advanced in age after 4 days from the treatment till the end of age of longevity in the two seasons.

5.1.g.-Water loss (g)/stalks:

As shown in Table (71) it is obvious that all tested pre-harvest treatments succeeded in decreasing water loss of bird of paradise cut flowers stalks as compared with control in both seasons water loss by bird of paradise cut flower stalks increased as cut flower stalks prolonged in longevity of 4, 8, 12, 16 and 20 day then decreased after 20 days of shelf life periods. Moreover, GA_3 300ppm and BA 50ppm recorded the lowest values of water loss as compared to control and other treatments under study.

Regarding to the effect of storage periods on water loss, Data shown in Table (72) reveal that water loss was increased as cut flower stalks advanced in age after 4 days from the treatment till the end of longevity in the two seasons under storage periods treatments under study. The lowest water loss value was recorded when storage periods were increased. The lowest water loss was those stored at 0-time and 7-time periods compared with those stored 14, 21, 28, 35 and 42 day respectively, in both seasons. The differences between the aforesaid two storage periods as 7-time and 14 days were not significant in both seasons. As for the interaction effect between growth regulators and storage periods on water loss, data in Tables (75 & 76) reveal that

Table (75) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Water loss (g)/stalk of *Strelitzia reginae Ait* cut flower stalk during the first season of 2007-2008.

Treatments		Water loss (g)/stalk						
		1st season						
Growth regulators	Storage periods	Shelf life periods (days)						
		4	8	12	16	20	24	28
Control	0	37.50	58.47	78.77	102.67	127.13	154.20	173.37
	7	39.40	61.33	83.43	106.40	130.90	158.70	171.27
	14	39.20	60.90	81.27	97.87	125.80	151.47	157.43
	21	38.63	58.13	76.23	92.80	114.77	140.63	-
	28	36.50	53.60	71.37	91.80	108.23	121.63	-
	35	34.67	50.30	66.37	83.33	101.00	-	-
	42	31.87	45.43	60.13	73.20	89.00	-	-
GA_3 200ppm	0	42.40	55.73	80.67	99.70	125.33	146.93	166.47
	7	39.73	57.33	79.23	99.60	124.90	145.90	167.53
	14	37.93	56.87	74.97	91.07	119.13	142.37	158.67
	21	41.10	57.23	73.37	89.20	116.70	138.33	-
	28	39.47	53.97	73.10	87.63	110.80	124.80	-
	35	37.30	49.30	68.13	82.27	100.43	-	-
	42	35.17	47.90	62.30	76.83	94.23	-	-
GA_3 300ppm	0	42.90	53.33	75.50	92.60	116.07	142.90	166.67
	7	42.20	56.53	78.27	96.13	120.23	145.50	167.50
	14	37.73	57.13	75.43	90.23	118.67	143.33	162.77
	21	39.03	57.07	73.77	88.80	115.00	142.13	-
	28	39.37	54.93	71.7	89.57	113.67	127.83	-
	35	37.63	50.47	68.07	81.30	101.57	-	-
	42	36.90	47.60	64.43	73.23	93.23	-	-
BA 25 ppm	0	37.50	57.83	81.13	100.90	126.80	144.37	160.27
	7	38.23	59.30	81.07	102.27	123.70	148.93	164.20
	14	39.20	60.93	80.07	94.60	119.70	145.07	159.63
	21	39.23	59.23	78.23	93.43	116.80	141.40	-
	28	38.77	54.30	74.47	92.57	108.97	123.53	-
	35	35.57	50.83	70.33	86.90	103.30	-	-
	42	33.00	45.20	62.77	78.00	92.37	-	-
BA 50 ppm	0	37.20	53.60	80.97	97.67	122.97	142.90	164.03
	7	38.40	56.33	80.07	99.93	123.77	146.37	166.13
	14	37.37	56.73	75.87	90.60	117.27	141.80	161.60
	21	37.83	58.03	75.40	89.90	113.80	140.30	-
	28	38.90	54.13	73.20	90.97	110.13	126.40	-
	35	36.77	49.23	69.65	83.53	103.03	-	-
	42	34.80	45.63	61.73	77.20	92.13	-	-
Kin 50 ppm	0	43.87	59.47	80.77	99.47	123.30	147.17	169.70
	7	38.47	55.13	77.20	101.87	122.97	142.80	166.73
	14	41.57	57.63	75.83	91.83	121.33	143.07	161.93
	21	39.80	57.67	73.83	91.67	119.80	142.03	-
	28	40.17	55.00	74.23	89.87	114.20	127.67	-
	35	38.50	48.83	67.40	86.23	102.60	-	-
	42	34.73	48.90	61.43	75.53	94.23	-	-
Kin 100 ppm	0	49.17	64.40	84.10	100.93	121.77	144.47	172.50
	7	46.07	61.30	82.23	102.13	121.73	147.57	169.73
	14	42.40	60.33	76.37	96.83	122.40	148.60	163.93
	21	40.13	59.03	76.07	92.70	109.53	142.40	-
	28	40.83	55.13	75.80	89.63	113.47	128.17	-
	35	38.57	53.43	67.50	83.47	104.03	-	-
	42	34.90	48.23	64.93	74.87	95.57	-	-
L.S.D at	5%	1.786	1.527	12.37	1.265	1.431	1.358	4.277
	1%	2.364	2.022	16.38	1.675	1.895	1.798	5.663

Table (76) Effect of interaction between some growth regulators and Storage periods (Days) treatments on Water loss (g)/stalk of *Strelitzia reginae Ait* cut flower stalk during the second season of 2008-2009.

Treatments		Water loss (g)/stalk						
		2nd season						
		Shelf life periods (days)						
Growth regulators	Storage periods	4	8	12	16	20	24	28
Control	0	39.93	62.67	82.73	105.40	129.33	157.77	174.07
	7	42.73	64.93	86.03	111.23	134.13	160.87	178.67
	14	42.93	65.13	84.13	103.17	128.33	154.77	169.57
	21	41.93	60.53	81.40	97.00	117.40	142.23	-
	28	39.47	55.73	78.03	95.47	112.37	126.43	-
	35	37.13	52.47	72.03	86.93	103.77	-	-
	42	33.40	4623	64.43	76.63	90.83	-	-
GA_3 200ppm	0	45.27	56.60	79.80	99.03	123.83	145.10	170.17
	7	43.40	58.90	80.03	99.70	125.73	147.87	168.43
	14	41.33	59.17	77.20	93.37	120.43	145.53	162.97
	21	40.80	57.77	75.03	91.03	118.07	140.87	-
	28	42.30	56.00	75.40	90.13	111.40	126.53	-
	35	39.53	52.67	69.47	84.20	98.97	-	-
	42	37.80	49.03	63.63	79.90	95.90	-	-
GA_3 300ppm	0	46.70	56.70	77.43	94.73	119.00	146.77	171.77
	7	45.70	61.33	79.07	97.20	122.57	147.50	169.23
	14	42.33	59.07	78.43	93.37	121.20	146.23	163.20
	21	40.30	58.67	75.07	89.17	117.33	143.00	-
	28	41.77	57.93	75.83	90.50	113.73	128.70	-
	35	31.30	54.17	70.77	83.57	103.03	-	-
	42	38.20	49.33	64.97	74.97	94.70	-	-
BA 25 ppm	0	39.27	59.27	84.00	102.80	128.67	149.50	163.10
	7	40.73	61.40	83.23	101.93	129.13	150.80	165.97
	14	41.17	62.83	81.83	96.53	123.00	148.07	163.00
	21	41.10	60.17	80.50	96.13	118.20	144.97	-
	28	40.63	55.67	78.03	92.30	113.33	126.37	-
	35	38.70	52.17	71.57	87.87	104.03	-	-
	42	36.47	46.77	63.93	80.93	92.83	-	-
BA 50 ppm	0	39.57	54.17	79.80	100.03	117.73	143.87	167.00
	7	40.77	57.53	81.33	101.67	123.67	147.93	168.17
	14	39.83	59.57	76.73	95.03	121.00	146.37	165.77
	21	39.43	59.30	76.53	92.43	117.23	142.60	-
	28	40.87	56.23	75.17	92.77	113.23	127.63	-
	35	39.30	52.00	72.00	85.23	105.27	-	-
	42	37.60	47.90	63.40	78.63	93.90	-	-
Kin 50 ppm	0	47.57	64.37	84.87	101.57	125.17	158.47	172.53
	7	42.13	57.83	80.00	100.73	125.13	151.50	168.97
	14	42.93	58.80	78.33	95.93	122.60	146.67	165.33
	21	42.37	61.83	77.47	93.87	121.87	143.33	-
	28	44.23	58.73	76.67	91.93	115.87	129.97	-
	35	41.37	51.90	74.80	89.03	106.27	-	-
	42	37.80	48.63	65.20	79.43	97.83	-	-
Kin 100 ppm	0	65.90	67.33	78.77	105.50	122.57	147.73	175.37
	7	48.03	63.97	83.93	103.50	124.20	149.13	173.50
	14	45.17	59.53	79.57	99.33	125.97	150.77	168.70
	21	43.63	59.77	77.63	94.90	122.30	146.70	-
	28	44.40	58.50	78.53	93.60	116.97	133.33	-
	35	41.43	55.93	72.90	84.70	105.63	-	-
	42	39.00	51.00	68.40	78.87	97.40	-	-
L.S.D at	5%	5.519	1.912	4.434	2.347	2.746	1.916	1.980
	1%	7.863	2.531	5.870	3.107	3.659	2.536	2.621

all the interaction treatments between growth regulators and storage periods increased water loss of Bird of paradise cut flower stalks during the two seasons when compared to control. However, the interactions of kinetin at 100ppm recorded the highest increases of water loss, especially the interaction between kinetin at 100ppm and storage period for 0-time after 4,8,12,16,20,24 and 28 days from the treatment as compared with control in the two seasons. Moreover, the interaction of (kinetin at 50ppm or GA3 at 300ppm) and storage periods for 0-time resulted highly increases of water loss of Bird of paradise cut flower stalks when compared to control in the two seasons.

6.1.Effect of some growth regulators as pre-treatments and storage periods on:

6.1.Chemical constituent determinations:

6.1.1.-Carotenoids percentage in petals:

Data in Table (77) indicate that all growth regulators treatments increased carotenoids in leaves/stalks (mg/g f.w.) of Bird of paradise cut flower stalks as compared to control in the two seasons. However, using the treatment of GA3 at 300ppm of Bird of paradise cut flower stalks exhibited to be the **most** effective one for inducing the highest significant increase in this parameter as compared to control in the two seasons, followed descendingly by kinetin at 100ppm and kinetin at 100ppm in the two seasons. On the reserve the lowest values of this parameter of tuberose cut flower stalks was registered by control in both seasons under study.

Table (77): Effect of some growth regulators treatments on Carotenoids percentage in petals , Total phenols percentage ,Total sugars percentage , Reducing sugars percentage and Non-Reducing sugars percentage in petals and flower stalk of *Strelitzia reginae* Ait cut flower stalk during the two seasons of 2007-2008/2008-2009 .

Treatments		Carotenoids percentage in petals		Total phenols percentage in petals		Total phenols percentage in flower stalk		Total sugars percentage in petals		Reducing sugars percentage in petals		Non-Reducing sugars percentage in petals		Total sugars percentage in flower stalk		Reducing sugars percentage in flower stalk		Non -Reducing sugars percentage in flower stalk	
		1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Growth Regulators	Control	2.548	2.615	0.241	0.230	0.242	0.248	2.625	2.640	1.212	1.272	1.413	1.367	2.807	2.817	1.289	1.369	1.518	1.448
	GA_3 200ppm	2.963	3.075	0.181	0.187	0.194	0.206	3.180	3.337	1.585	1.549	1.615	1.788	3.210	3.260	1.553	1.574	1.658	1.686
	GA_3 300ppm	3.348	3.624	0.163	0.174	0.180	0.194	3.388	3.417	1.645	1.674	1.743	1.743	3.638	3.650	1.761	1.761	1.876	1.890
	BA 25 ppm	2.814	2.932	0.195	0.206	0.214	0.225	2.795	2.814	1.391	1.388	1.404	1.426	2.950	2.953	1.425	1.436	1.525	1.518
	BA 50 ppm	2.901	3.052	0.204	0.193	0.227	0.210	2.990	2.986	1.446	1.465	1.544	1.521	3.154	3.170	1.535	1.534	1.619	1.636
	Kin 50 ppm	3.170	3.066	0.191	0.191	0.218	0.213	3.200	3.208	1.552	1.560	1.648	1.648	3.212	3.224	1.555	1.554	1.657	1.670
	Kin100ppm	3.255	3.662	0.162	0.172	0.178	0.190	3.370	3.381	1.629	1.680	1.741	1.701	3.662	3.680	1.728	1.725	1.934	1.955
L.S.D at	5 %	0.051	0.082	0.027	0.006	0.007	0.006	0.019	0.034	0.019	0.027	0.027	0.039	0.034	0.061	0.027	0.019	0.034	0.061
	1%	0.068	0.109	0.036	0.008	0.009	0.007	0.026	0.044	0.026	0.036	0.036	0.051	0.044	0.081	0.036	0.026	0.044	0.081

Regarding to the effect of storage periods on Carotenoids percentage in petals .It is quite clear from the data in Table (78) that there were gradual decrease in Carotenoids percentage in petals of bird of paradise cut flower stalks with extending storage periods at 7±1°C for different days (0-time, 7, 14, 21, 28, 35 and 42 days). However, storage periods at 7±1°C for 0-time treatment showed the highest significant increase in this parameter of bird of paradise cut flowers stalks when compared to the other ones under study in the two seasons. On the reverse the lowest values of these parameters of Bird of paradise cut flower stalks was registered by storage periods at 7±1°C for 42days as compared to different storage periods in both seasons.

Referring to the interaction effect between growth regulators and storage periods on Carotenoids percentage in petals Data in Table (79) reveal that all the combinations treatments between growth regulators and storage periods (0-time,7,14,21,28,35 and 42 days) at 7±1°C increased Coroteniods percentage in petals of Bird of paradise cut flower stalks as compared to control in the two seasons. However, the combinations treatments between GA_3 at 300ppm and different storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days) showed to be the most effective one for inducing the highest values of these parameters of Bird of paradise cut flower stalks as compared to control in the two seasons in most cases, especially the combined treatment between GA_3 at 300ppm and storage periods at 7±1°C for 0-time in the two seasons of this study. Moreover, the combination treatments between kinetin at 100ppm or kinetin at 50ppm and storage periods at 4±1°C for 0-

Table (78): Effect of Storage periods (Days) treatments on Carotenoids percentage in petals, Total phenols percentage, Total sugars percentage, Reducing sugars percentage and Non-Reducing sugars percentage in petals and flower stalk of *Strelitzia reginae* Ait cut flower stalk during the two seasons of 2007-2008/2008-2009 .

Treatments		Carotenoid percentage in petals		Total phenols percentage in petals		Total phenols percentage in flower stalk		Total sugars percentage in petals		Reducing sugars percentage in petals		Non-Reducing sugars percentage in petals		Total sugars percentage in flower stalk		Reducing sugars percentage in flower stalk		Non -Reducing sugars percentage in flower stalk	
		1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Storage periods (Days)	0	4.368	4.430	0.354	0.358	0.371	0.380	4.626	4.629	2.301	2.286	2.325	2.342	4.892	4.898	2.426	2.430	2.466	2.468
	7	3.480	3.684	0.300	0.284	0.319	0.304	4.120	4.156	2.024	2.025	2.096	2.131	4.080	4.080	2.017	1.997	2.062	2.083
	14	3.275	3.432	0.241	0.233	0.257	0.253	3.551	3.356	1.666	1.754	1.886	1.807	3.629	3.652	1.740	1.775	1.890	1.877
	21	2.976	3.151	0.179	0.182	0.207	0.201	3.051	3.058	1.480	1.508	1.591	1.550	3.227	3.252	1.513	1.550	1.714	1.693
	28	2.570	2.703	0.127	0.145	0.144	0.166	2.515	2.679	1.233	1.239	1.282	1.440	2.729	2.730	1.258	1.255	1.470	1.475
	35	2.313	2.440	0.080	0.095	0.099	0.114	1.953	1.952	0.939	0.950	1.014	1.002	2.197	2.249	1.026	1.047	1.170	1.202
	42	2.008	2.187	0.057	0.056	0.058	0.067	1.730	1.748	0.817	0.828	0.913	0.920	1.880	1.893	0.866	0.890	1.014	1.003
L.S.D at	5 %	0.051	0.082	0.027	0.006	0.007	0.006	0.019	0.034	0.019	0.027	0.027	0.039	0.034	0.061	0.027	0.019	0.034	0.061
	1%	0.068	0.109	0.036	0.008	0.009	0.007	0.026	0.044	0.026	0.036	0.036	0.051	0.044	0.081	0.036	0.026	0.044	0.081

Table (79): Effect of interaction between some growth regulators and Storage periods(Days) treatments on Carotenoids percentage and Total phenols percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

TREATMENTS		Carotenoids percentage in petals							Total phenols percentage in petals							Total phenols percentage in flower stalk						
Growth regulators		Storage periods(days)							Storage periods(days)							Storage periods(days)						
		0	7	14	21	28	35	42	0	7	14	21	28	35	42	0	7	14	21	28	35	42
		1st season																				
Control		3.99	3.16	2.98	2.56	2.11	1.81	1.22	0.417	0.330	0.270	0.210	0.160	0.100	0.200	0.440	0.373	0.287	0.230	0.177	0.117	0.073
GA_3 200ppm		4.30	3.42	3.28	2.95	2.47	2.26	2.05	0.330	0.290	0.233	0.180	0.123	0.067	0.043	0.343	0.300	0.250	0.197	0.133	0.090	0.047
GA_3 300ppm		4.86	3.77	3.51	3.28	2.95	2.69	2.37	0.303	0.273	0.217	0.160	0.103	0.067	0.030	0.320	0.283	0.230	0.183	0.113	0.087	0.040
BA 25 ppm		4.13	3.37	3.12	2.76	2.35	2.12	1.83	0.383	0.310	0.250	0.183	0.130	0.080	0.030	0.390	0.330	0.283	0.210	0.150	0.090	0.067
BA 50 ppm		4.24	3.40	3.19	2.81	2.43	2.21	2.02	0.377	0.320	0.257	0.197	0.143	0.103	0.030	0.393	0.337	0.277	0.227	0.167	0.120	0.070
Kin 50 ppm		4.20	3.64	3.80	3.22	3.88	2.60	2.27	0.360	0.310	0.253	0.173	0.130	0.073	0.040	0.383	0.327	0.270	0.227	0.157	0.097	0.067
Kin 100 ppm		4.85	3.65	3.46	3.25	2.79	2.51	2.29	0.307	0.263	0.207	0.150	0.100	0.080	0.027	0.327	0.280	0.223	0.173	0.110	0.090	0.043
L.S.D at	5%	0.136							0.072							0.018						
	1%	0.180							0.096							0.024						
		2nd season																				
Control		4.06	3.19	3.07	2.59	2.17	1.90	1.32	0.407	0.333	0.273	0.220	0.170	0.117	0.087	0.427	0.353	0.293	0.237	0.190	0.137	0.100
GA_3 200ppm		4.08	3.59	3.34	3.17	2.59	2.38	2.37	0.343	0.277	0.223	0..170	0.143	0.097	0.053	0.363	0.290	0.247	0.190	0.170	0.117	0.063
GA_3 300ppm		5.01	4.18	3.83	3.58	3.24	2.89	2.64	0.333	0.250	0.213	0.163	0.130	87.000	0.040	0.360	0.270	0.237	0.180	0.153	0.107	0.053
BA 25 ppm		4.32	3.48	3.28	2.83	2.42	2.22	1.97	0.373	0.307	0.250	0.200	0.150	0.097	0.067	0.400	0.330	0.270	0.220	0.170	0.113	0.073
BA 50 ppm		4.39	3.52	3.32	3.07	2.57	2.34	2.16	0.360	0.287	0.233	0.180	0.150	0.090	0.050	0.380	0.307	0.250	0.203	0.163	0.107	0.057
Kin 50 ppm		4.08	3.60	3.37	3.20	2.93	2.39	2.19	0.360	0.283	0.223	0.183	0.143	0.093	0.050	0.380	0.300	0.247	0.200	0.170	0.117	0.077
Kin 100 ppm		5.06	4.22	3.82	3.62	3.29	2.95	2.67	0.330	0.250	0.213	0.157	0.130	0.083	0.043	0.350	0.277	0.230	0.177	0.147	0.100	0.047
L.S.D at	5%	0.217							0.016							0.015						
	1%	0.288							0.021							0.020						

time and 7days resulted highly significant increase Carotenoids percentage in petals of Bird of paradise cut flower stalks as compared to control in both seasons. Irrespective control, the lowest values of these parameters of Bird of paradise cut flower stalks was recorded by using the combined treatments between BA at 25ppm and storage periods at 7±1°C for 42days in the two seasons under this study.

6.1.2.-Total phenols percentage in petals and flower stalks :

Data in Table (77) reveal that all growth regulators treatments decreased total phenols percentage in petals and flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. However, the highest significant reduce of these parameter was recorded by using kinetin at 100ppm as compared to control in the two seasons, followed descendingly by GA_3 at 300ppm in the two seasons. Moreover, using the treatment of GA_3 at 200ppm of Bird of paradise cut flower stalks recorded highly decreases of total phenols percentage in petals and flower stalks as compared to control in the two seasons. On the reverse, the highest values of these parameter was registered by using control in the two seasons under this study.

Regarding to the effect of storage periods on total phenols in petals and flower stalks data in Table (78) reveal that there were gradual decrease in total phenols in petals and flower stalks of Bird of paradise cut flower stalks with extending storage periods at 7±1°C for different days (0-time,7,14,21,28,35 and 42 days) in the two seasons. However, Bird of paradise cut flower

stalks were stored at 7±1°C for 42days resulted the highest significant decrease of these parameters as compared to different storage periods in both seasons. Moreover, storage periods at 7±1°C for 0-time treatment gave the highest values total phenols in petals and flower stalks of Bird of paradise cut flower stalks when compared to the other ones under study in the two seasons.

Referring to the interaction effect between growth regulators and storage periods on total phenols percentage in petals and flower data in Table (79) reveal that all the combinations treatments between growth regulators and different storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days) decreased total phenols percentage in petals and flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. However, the combinations treatments between kinetin at 100ppm and different storage periods at 7±1°C for (0-time, 7, 14, 21, 28, 35 and 42 days) recorded the lowest values of this parameter of Bird of paradise cut flower stalks as compared to control in the two seasons in most cases, especially the combined treatment between kinetin at 100ppm and storage periods at 7±1°C for 42days in the two seasons. Moreover using the combinations treatments between GA_3 at 300ppm and storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days)recorded highly decreases in total phenols percentage in petals and flower stalks of Bird of paradise cut flower stalks as compared to control in both seasons, especially the combined treatment between GA_3 at 300ppm and storage periods at 7±1°C for 42days. On the reverse, the highest values of this parameter of Bird of paradise

Table (80): Effect of interaction between some growth regulators and Storage periods(Days) treatments on Total sugars percentage, Reducing sugars percentage and non reducing sugars percentage in petals of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

TREATMENTS		Total sugars percentage in petals							Reducing sugars percentage in petals							Non-Reducing sugars percentage in petals						
Growth regulators		Storage periods(days)							Storage periods(days)							Storage periods(days)						
		0	7	14	21	28	35	42	0	7	14	21	28	35	42	0	7	14	21	28	35	42
		1st season																				
Control		4.33	3.69	3.15	2.62	1.97	1.41	1.20	2.15	1.80	1.03	1.31	0.95	0.67	0.58	2.18	1.89	2.11	1.32	1.02	0.74	0.62
GA_3 200ppm		4.65	4.22	3.61	3.12	2.68	2.07	1.90	2.33	2.12	1.81	1.49	1.32	0.98	0.90	2.32	2.10	1.80	1.63	1.36	1.09	1.00
GA_3 300ppm		4.89	4.39	3.84	3.39	2.88	2.25	2.07	2.40	2.16	1.85	1.61	1.39	1.12	0.98	2.48	2.23	1.99	1.78	1.49	1.14	1.09
BA 25 ppm		4.49	3.88	3.26	2.74	2.19	1.66	1.34	2.25	1.90	1.66	1.31	1.11	0.83	0.67	2.24	1.98	1.60	1.43	1.08	0.83	0.66
BA 50 ppm		4.58	4.08	3.49	2.91	2.42	1.85	1.62	2.30	1.95	1.73	1.36	1.20	0.85	0.73	2.28	2.13	1.76	1.55	1.21	0.99	0.90
Kin 50 ppm		4.63	4.21	3.68	3.17	2.64	2.17	1.91	2.29	2.07	1.79	1.54	1.29	1.00	0.88	2.34	2.14	1.89	1.62	1.35	1.17	1.02
Kin 100 ppm		4.82	4.39	3.83	3.40	2.83	2.26	2.07	2.38	2.17	1.78	1.60	1.37	1.12	0.98	2.43	2.22	2.04	1.80	1.46	1.14	1.09
L.S.D at	5%	0.051							0.051							0.068						
	1%	0.068							0.068							0.096						
		2nd season																				
Control		4.32	3.40	3.16	2.68	1.97	1.41	1.25	2.11	1.78	1.56	1.35	0.86	0.69	0.56	2.22	1.62	1.59	1.33	1.11	0.72	0.69
GA_3 200ppm		4.63	4.25	3.62	3.14	3.69	2.09	1.94	2.31	2.07	1.80	1.51	1.33	0.98	0.85	2.32	2.18	1.83	1.63	2.36	1.11	1.09
GA_3 300ppm		4.88	4.57	3.82	3.39	2.90	2.28	2.08	2.41	2.18	1.90	1.69	1.42	1.14	0.99	2.47	2.39	1.92	1.70	1.48	1.14	1.10
BA 25 ppm		4.53	3.88	3.31	2.72	2.28	1.65	1.31	2.20	1.90	1.67	1.33	1.14	0.80	0.67	2.33	1.98	1.64	1.39	1.15	0.85	0.64
BA 50 ppm		4.59	4.07	3.50	2.90	2.39	1.83	1.63	2.29	1.93	1.74	1.41	1.19	0.90	0.80	2.30	2.14	1.76	1.49	1.20	0.92	0.83
Kin 50 ppm		4.62	4.23	3.70	3.19	2.64	2.16	1.93	2.29	2.12	1.72	1.53	1.31	1.02	0.93	2.32	2.11	1.98	1.65	1.33	1.13	1.00
Kin 100 ppm		4.83	4.40	3.81	3.40	2.89	2.26	2.09	2.39	2.20	1.88	1.74	1.43	1.12	1.01	2.44	2.20	1.93	1.66	1.46	1.14	1.08
L.S.D at	5%	0.089							0.072							0.103						
	1%	0.118							0.096							0.136						

As for the effect of interaction between growth regulators and storage periods on total sugars percentage in flower stalks, data in Table (81) demonstrate that all the combinations treatments between growth regulators and storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days) increased total sugars percentage in flower stalks of bird of paradise cut flower stalks as compared to control in the two seasons. However the highest significant increments of this parameter was registered by using the combinations treatments between kinetin at 100ppm and different storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days) as compared to control in the two seasons in most cases, especially the combined treatment between kinetin at 100ppm and storage periods at 7±1°C for 0-time as compared to the other ones of this study in the two seasons. Moreover the combinations treatments between GA_3 at 300ppm and storage periods at 7±1°C for 0-time resulted highly increases in total sugars percentage in flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. Any how, the lowest values of this parameters of Bird of paradise cut flower stalks was recorded by using the combined treatments between control or BA at 25ppm and storage periods at 7±1°C for 42days in the two seasons under this study.

6.1.4.-Reducing sugar percentage in petals and flower stalks

Data in Table (77) demonstrate that all growth regulators treatments increased reducing sugars percentage in petals and flower stalks of the Bird of paradise cut flower stalks as

Table (81): Effect of interaction between some growth regulators and Storage periods(Days) treatments on Total sugars percentage, Reducing sugars percentage and non reducing sugars percentage in flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

TREATMENTS		Total sugars percentage in flower stalk							Reducing sugars percentage in flower stalk							Non -Reducing sugars percentage in flower stalk						
Growth regulators		Storage periods(days)							Storage periods(days)							Storage periods(days)						
		0	7	14	21	28	35	42	0	7	14	21	28	35	42	0	7	14	21	28	35	42
		1st season																				
Control		4.65	3.80	3.30	2.77	2.18	1.65	1.31	2.26	1.77	1.40	1.17	1.06	0.76	0.60	2.40	2.03	1.90	1.60	1.11	0.89	0.70
GA_3 200ppm		4.76	4.05	3.62	3.21	2.71	2.18	1.94	2.41	2.06	1.78	1.53	1.29	0.87	0.83	2.35	1.99	1.84	1.68	1.42	1.32	1.11
GA_3 300ppm		5.26	4.43	3.94	3.62	3.20	2.72	2.29	2.56	2.20	1.93	1.72	1.54	1.31	1.07	2.70	2.23	2.01	1.90	1.66	1.41	1.21
BA 25 ppm		4.70	3.84	3.39	2.99	2.36	1.82	1.56	2.32	1.90	1.62	1.38	1.18	0.85	0.72	2.38	1.94	1.77	1.60	1.17	0.97	0.84
BA 50 ppm		4.75	4.00	3.58	3.13	2.67	2.07	1.87	2.40	1.99	1.76	1.52	1.29	0.88	0.82	2.35	2.01	1.83	1.61	1.38	1.19	1.05
Kin 50 ppm		4.74	3.96	3.62	3.25	2.78	2.21	1.91	2.41	1.98	1.75	1.52	1.33	1.02	0.90	2.33	1.98	1.88	1.74	1.45	1.19	1.02
Kin 100 ppm		5.37	4.48	3.95	3.62	3.21	2.72	2.29	2.62	2.24	1.94	1.75	1.11	1.31	1.12	2.75	2.24	2.01	1.87	2.09	1.41	1.17
L.S.D at	5%	0.089							0.072							0.089						
	1%	0.118							0.096							0.118						
		2nd season																				
Control		4.61	3.81	3.31	2.77	2.21	1.68	1.33	2.25	1.85	1.54	1.38	1.11	0.78	0.67	2.36	1.96	1.77	1.39	1.10	0.90	0.65
GA_3 200ppm		4.76	4.01	3.63	3.24	2.69	2.52	1.97	2.39	1.93	1.86	1.59	1.30	1.03	0.92	2.37	2.08	1.77	1.65	1.39	1.49	1.06
GA_3 300ppm		5.28	4.41	3.99	3.66	3.21	2.72	2.28	2.60	2.19	1.90	1.73	1.53	1.31	1.07	2.68	2.22	2.09	1.93	1.68	1.42	1.21
BA 25 ppm		4.72	3.84	3.39	2.97	2.35	1.83	1.59	2.34	1.80	1.69	1.42	1.17	0.83	0.71	2.38	2.04	1.70	1.55	1.18	1.00	0.87
BA 50 ppm		4.77	4.04	3.62	3.17	3.69	2.04	1.87	2.41	1.96	1.73	1.51	1.30	0.97	0.85	2.36	2.08	1.88	1.66	2.39	1.07	1.01
Kin 50 ppm		4.74	3.96	3.95	3.31	2.76	2.24	1.92	2.38	1.90	1.77	1.54	1.31	1.08	0.90	2.35	2.06	2.18	1.77	1.45	1.16	1.02
Kin 100 ppm		5.41	4.49	3.98	3.65	3.21	2.72	2.30	2.64	2.25	1.93	1.74	1.07	1.34	1.10	2.77	2.24	2.05	1.91	2.15	1.38	1.19
L.S.D at	5%	0.162							0.051							0.162						
	1%	0.215							0.068							0.215						

compared to control in the two seasons. However, using the treatment of GA_3 at 300ppm resulted the highest significant increment of this parameter of tuberose cut flower stalks as compared to control as an average of both seasons in most cases, followed descendingly by kinetin at 100ppm in the two seasons. Moreover, using the treatment of kinetin at 50ppm and BA at 50ppm recorded highly increases in these parameter as compared to control in the two seasons under this study.

Concerning the effect of storage periods on reducing sugars percentage in petals and flower stalks, data presented in Table (78) indicate that there were gradual decrease in reducing sugars percentage in petals and flower stalks of Bird of paradise cut flower stalks with extending storage periods at 7±1°C for different days (0-time,7,14,21,28,35 and 42 days) in the two seasons. However, Bird of paradise cut flower stalks were stored at 7±1°C for 0-time recorded the highest significant increase of these parameters as compared to different storage periods in both seasons, followed descendingly by storage periods at 7±1°C for 7 days. Moreover storage periods at 7±1°C for 42 days treatment recorded highly significant decrease in Reducing sugars percentage in petals and flower stalks of Bird of paradise cut flower stalks when compared to the other ones under study in the two seasons.

With respect to the effect of interaction between growth regulators and storage periods on Reducing sugars percentage in flower stalks, data in Table (80) demonstrate that all the combinations treatments between growth regulators and storage

periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days) increased reducing sugars percentage in petals of Bird of paradise cut flower stalks as compared to control in the two seasons. However the highest significant increments of this parameter was registered by using the combinations treatments between GA_3 at 300ppm and different storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days) as compared to control in the two seasons in most cases, especially the combined treatment between GA_3 at 300ppm and storage periods at 7±1°C for 0-time as compared to the other ones of this study in the two seasons. Moreover the combinations treatments between kinetin at 100ppm and storage periods at 7±1°C for 0-time resulted highly increases in reducing sugars percentage in petals and flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. Furthermore, the lowest values of this parameters of Bird of paradise cut flower stalks was recorded by using the combined treatments between control or BA at 25ppm and storage periods at 7±1°C for 42days in the two seasons under this study.

With regard to the effect of interaction between growth regulators and storage periods on reducing sugars percentage in flower stalks, data in Table (81) demonstrate that all the combinations treatments between growth regulators and storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days) increased reducing sugars percentage in flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. However, the highest significant increments of this parameter was registered by using the combinations treatments

between kinetin at 100ppm and different storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days) as compared to control in the two seasons in most cases, especially the combined treatment between kinetin at 100ppm and storage periods at 7±1°C for 0-time as compared to the other ones of this study in the two seasons. Moreover the combinations treatments between GA_3 at 300ppm and storage periods at 7±1°C for 0-time resulted highly increases in reducing sugars percentage in flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. Anyhow, the lowest values of this parameters of Bird of paradise cut flower stalks was recorded by using the combined treatments between control or BA at 25ppm and storage periods at 7±1°C for 42days in the two seasons under this study.

6.1.5.-Non- reducing sugars percentage in petals and flower stalks

Data in Table (77) reveal that all growth regulators treatments increased Non-Reducing sugars percentage in petals and flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. However, the highest values of this parameter was recorded by using kinetin at 100ppm as compared to control in the two seasons in most cases, followed descendingly by GA_3 at 300ppm in the two seasons. Moreover using the treatments of GA_3 at 200ppm and kinetin at 50ppm of non-reducing sugars percentage in petals and flower stalks respectively recorded highly increases in these parameter of tuberose cut flower stalks as compared to control in the two seasons.

Concerning the effect of storage periods on non-reducing sugars percentage in petals and flower stalks, data in Table (78) reveal that there were gradual decrease in Non-Reducing sugars percentage in petals and flower stalks of Bird of paradise cut flower stalks with extending storage periods at 7±1°C for different days (0-time,7,14,21,28,35 and 42 days)in the two seasons. However, Bird of paradise cut flower stalks were stored at 7±1°C for 0-time recorded the highest significant increase of these parameters as compared to different storage periods in both seasons, followed descendingly by storage periods at 7±1°C for 7 days. Moreover storage periods at 7±1°C for 42 days treatment recorded highly significant decrease in non-reducing sugars percentage in petals and flower stalks of Bird of paradise cut flower stalks when compared to the other ones under study in the two seasons.

As for the effect of interaction between growth regulators and storage periods on Non-Reducing sugars percentage in petals, data in Table (80) demonstrate that all the combinations treatments between growth regulators and storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days) increased non-reducing sugars percentage in petals of Bird of paradise cut flower stalks as compared to control in the two seasons. However the highest significant increments of this parameter was registered by using the combinations treatments between GA_3 at 300ppm and different storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days) as compared to control in the two seasons in most cases, especially the combined treatment between GA_3 at 300ppm and storage periods at 7±1°C for 0-time

as compared to the other ones of this study in the two seasons. Moreover the combinations treatments between kinetin at 100ppm and storage periods at 7±1°C for 0-time resulted highly increases in non-reducing sugars percentage in petals and flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. Furthermore, the lowest values of this parameters of bird of paradise cut flower stalks was recorded by using the combined treatments between control or BA at 25ppm and storage periods at 7±1°C for 42days in the two seasons under this study.

Referring to the effect of interaction between growth regulators and storage periods on non-reducing sugars percentage in flower stalks, data in Table (81) demonstrate that all the combinations treatments between growth regulators and storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days) increased non-reducing sugars percentage in flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. However the highest significant increments of this parameter was registered by using the combinations treatments between kinetin at 100ppm and different storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42 days) as compared to control in the two seasons in most cases, especially the combined treatment between kinetin at 100ppm and storage periods at 7±1°C for 0-time as compared to the other ones of this study in the two seasons. Moreover the combinations treatments between GA_3 at 300ppm and storage periods at 7±1°C for 0-time resulted highly increases in non-reducing sugars percentage in flower stalks of Bird of paradise cut flower stalks as compared

to control in the two seasons. Any how, the lowest values of this parameters of Bird of paradise cut flower stalks was recorded by using the combined treatments between control or BA at 25ppm and storage periods at 7±1°C for 42days in the two seasons under this study.

6.1.6.-Total nitrogen and total protein percentage in petals and flower stalks:

Data in Table (82) reveal that all growth regulators treatments increased total nitrogen and total protein percentage in petals of Bird of paradise cut flower stalks as compared to control in the two seasons. However, using the treatment of kinetin at 100ppm of Bird of paradise cut flower stalks exhibited to be the most effective one for producing the highest values of these parameters as compared to control in the two seasons in most cases, followed descendingly by BA at 50ppm in the two seasons. Moreover, using the treatment of GA_3 at 300ppm recorded highly significant increments of theses parameters as compared to control in the two seasons. On the opposite, the lowest values of total nitrogen and total protein percentage in petals of Bird of paradise cut flower stalks was recorded by control in the two seasons. Furthermore, data in Table (82) reveal that all growth regulators treatments increased total nitrogen and total protein percentage in flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. However, using the treatment of kinetin at 100ppm of Bird of paradise cut flower stalks appeared to be the most effective one for producing the highest values of these parameters as compared to control in the two seasons in most

Table (82): Effect of some growth regulators treatments on Total nitrogen percentage, Total protein percentage, phosphorus percentage and potassium percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009 .

Treatments		Total nitrogen percentage in petals		Total protein percentage in petals		Total nitrogen percentage in flower stalk		Total protein percentage in flower stalk		Phosphorus percentage in petals		Phosphorus percentage in flower stalk		Potassium percentage in petals		Potassium percentage in flower stalk	
		1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Growth Regulators	Control	2.273	2.694	17.02	16.84	2.403	2.414	15.02	15.09	0.373	0.371	0.260	0.259	2.675	2.680	1.900	1.908
	GA_3 200ppm	2.963	2.910	18.52	18.17	2.491	2.487	15.57	15.54	0.398	0.392	0.276	0.284	2.741	2.755	2.120	2.148
	GA_3 300ppm	3.075	2.994	19.22	18.71	2.626	2.623	16.41	16.39	0.434	0.425	0.301	0.298	2.789	2.794	2.215	2.218
	BA 25 ppm	3.008	2.988	18.80	18.68	2.522	2.514	15.77	15.71	0.402	0.403	0.269	0.268	2.738	2.721	2.014	2.028
	BA 50 ppm	3.082	2.995	19.27	18.72	2.577	2.571	16.10	16.07	0.426	0.429	0.292	0.296	2.780	2.802	2.143	2.166
	Kin 50 ppm	2.976	2.827	18.60	18.29	2.519	2.518	15.74	15.74	0.400	0.40	0.282	0.283	2.751	2.750	2.120	2.148
	Kin 100 ppm	3.091	3.076	19.32	19.22	2.673	2.636	16.71	16.47	0.443	0.440	0.292	0.293	2.791	2.805	2.202	2.210
L.S.D at	5 %	0.051	0.047	0.339	0.299	0.027	0.019	0.185	0.115	0.006	0.006	0.007	0.005	0.008	0.013	0.019	0.019
	1%	0.068	0.063	0.435	0.396	0.036	0.026	0.245	0.152	0.009	0.007	0.010	0.007	0.011	0.017	0.026	0.026

cases, followed descendingly by GA_3 at 300ppm in the two seasons. Moreover, using the treatment of BA at 50ppm recorded highly significant increments of theses parameters as compared to control in the two seasons. On the opposite, the lowest values of total nitrogen and total

protein percentage in flower stalks of Bird of paradise cut flower stalks was recorded by control in the two seasons.

With respect to the effect of storage periods on total nitrogen and total protein percentage in petals and flower stalks, data listed in Table (83) demonstrate that there were gradual decrease in Total nitrogen and total protein percentage in petals and flower stalks of Bird of paradise cut flower stalks with extending storage periods at 7±1°C for different days (0-time,7, 14,21,28,35 and 42days) in the two seasons. However, Bird of paradise cut flower stalks were stored at 7±1°C for 0-time recorded the highest significant increase of these parameters as compared to different storage periods in both seasons, followed descendingly by storage periods at 7±1°C for 7 days. Moreover storage periods at 7±1°C for 42 days treatment recorded the lowest mean values in Total nitrogen and total protein percentage in petals and flower stalks of Bird of paradise cut flower stalks when compared to the other ones under study in the two seasons. Referring to the interaction effect between growth regulators treatments and storage periods treatments on total nitrogen and total protein in petals and flower stalks, data in Table (84) indicate that all the combinations treatments between growth regulators and storage periods at 7±1°C for (0-

Table (83): Effect of Storage periods (Days) treatments on Total nitrogen percentage , Total protein percentage , phosphorus percentage and potassium percentage in petals and flower stalk of *Strelitzia reginae Ait.*cut flower stalk during the two seasons of 2007-2008/2008-2009 .

Treatments		Total nitrogen percentage in petals		Total protein percentage in petals		Total nitrogen percentage in flower stalk		Total protein percentage in flower stalk		Phosphorus percentage in petals		Phosphorus percentage in flower stalk		Potassium percentage in petals		Potassium percentage in flower stalk	
		1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Storage periods (days)	0	3.129	3.116	19.56	19.48	2.602	2.607	16.26	16.30	0.415	0.416	0.289	0.289	2.750	2.771	2.119	2.132
	7	3.080	3.060	19.25	19.12	2.596	2.597	16.22	16.23	0.420	0.419	0.290	0.292	2.780	2.782	2.160	2.165
	14	3.039	2.976	18.99	18.60	2.585	2.576	16.16	16.10	0.425	0.420	0.296	0.293	2.780	2.780	2.151	2.158
	21	3.003	2.911	18.77	18.20	2.582	2.542	16.01	15.89	0.418	0.414	0.286	0.288	2.764	2.775	2.124	2.132
	28	2.936	2.884	18.35	18.02	2.524	2.513	15.77	15.71	0.408	0.405	0.277	0.279	2.745	2.754	2.094	2.104
	35	2.892	2.839	18.08	17.74	2.484	2.480	15.52	15.50	0.399	0.399	0.267	0.272	2.724	2.733	2.043	2.081
	42	2.839	2.798	17.74	17.49	2.459	2.449	15.37	15.30	0.392	0.391	0.266	0.268	2.712	2.720	2.025	2.052
L.S.D at	5 %	0.051	0.047	0.339	0.299	0.027	0.019	0.185	0.115	0.006	0.006	0.007	0.005	0.008	0.013	0.019	0.019
	1%	0.068	0.063	0.435	0.396	0.036	0.026	0.245	0.152	0.009	0.007	0.010	0.007	0.011	0.017	0.026	0.026

Table (84): Effect of interaction between some growth regulators and Storage periods(Days) treatments on Total nitrogen percentage and Total protein percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

TREATMENTS		Total nitrogen percentage in petals							Total protein percentage in petals							Total nitrogen percentage in flower stalk							Total protein percentage in flower stalk						
Growth regulators		Storage periods(days)							Storage periods(days)							Storage periods(days)							Storage periods(days)						
		0	7	14	21	28	35	42	0	7	14	21	28	35	42	0	7	14	21	28	35	42	0	7	14	21	28	35	42
		1st season																											
Control		2.79	2.76	2.75	2.74	2.71	2.67	2.64	17.4	17.3	17.2	17.1	16.9	16.7	16.5	2.45	2.46	2.46	2.42	2.37	2.35	2.31	15.3	15.4	15.4	15.1	14.8	14.7	14.5
GA_3 200ppm		3.08	3.08	3.99	2.98	2.91	2.88	2.84	19.3	19.3	24.9	18.6	18.2	18.0	17.7	2.57	2.54	2.52	2.51	2.45	2.42	2.43	16.1	15.9	15.7	15.7	15.3	15.1	15.2
GA_3 300ppm		3.27	3.19	3.15	3.03	3.00	2.95	2.93	20.5	19.9	19.7	18.9	18.8	18.5	18.3	2.71	2.66	2.66	2.66	2.63	2.55	2.51	16.9	16.6	16.6	16.6	16.5	15.9	15.7
BA 25 ppm		3.11	3.08	3.10	3.04	2.98	2.90	2.84	19.5	19.3	19.4	19.0	18.6	18.1	17.8	2.58	2.55	2.54	2.53	2.50	2.48	2.48	16.1	15.9	15.9	15.8	15.6	15.5	15.5
BA 50 ppm		3.22	3.17	3.08	3.10	3.04	3.01	2.94	20.1	19.8	19.2	19.4	19.0	18.8	18.4	2.62	2.66	2.64	2.56	2.54	2.51	2.50	16.4	16.6	16.5	16.0	15.9	15.7	15.6
Kin 50 ppm		3.08	3.02	3.05	3.00	2.95	2.93	2.82	19.3	18.9	19.1	18.8	18.4	18.3	17.6	2.55	2.56	2.55	2.56	2.53	2.47	2.41	16.0	16.0	15.9	16.0	15.8	15.4	15.1
Kin 100 ppm		3.36	3.27	3.15	3.13	2.97	2.90	2.86	21.0	20.5	19.7	19.5	18.6	18.1	17.9	2.73	2.74	2.73	2.70	2.64	2.61	2.56	17.1	17.1	17.1	16.9	16.5	16.3	16.0
L.S.D at	5%	0.136							0.869							0.072							0.489						
	1%	0.180							1.152							0.096							0.647						
		2nd season																											
Control		2.81	2.76	2.73	2.68	2.68	2.62	2.58	17.6	17.3	17.0	16.8	16.8	16.4	16.1	2.45	2.46	2.47	2.44	2.40	2.35	2.34	15.3	15.4	15.4	15.3	15.0	14.7	14.6
GA_3 200ppm		3.04	3.08	2.94	2.87	2.91	2.77	2.77	19.0	19.3	18.4	17.9	18.2	17.3	17.3	2.58	2.57	2.54	2.48	2.43	2.41	2.38	16.1	16.1	15.9	15.5	15.2	15.1	14.9
GA_3 300ppm		3.21	3.12	3.02	2.98	2.94	2.85	2.84	20.1	19.5	18.9	18.6	18.4	17.8	17.8	2.70	2.69	2.65	2.63	2.60	2.57	2.52	16.9	16.8	16.6	16.5	16.2	16.0	15.8
BA 25 ppm		3.15	3.11	3.05	2.99	2.91	2.88	2.83	19.7	19.4	19.1	18.7	18.2	18.0	17.7	2.58	2.56	2.54	2.52	2.51	2.46	2.43	16.1	16.0	15.9	15.8	15.7	15.4	15.2
BA 50 ppm		3.15	3.12	2.98	2.96	2.90	2.97	2.88	19.7	19.5	18.6	18.5	18.1	18.6	18.0	2.64	2.64	2.60	2.56	2.55	2.52	2.49	16.5	16.5	16.3	16.0	15.9	15.8	15.6
Kin 50 ppm		3.07	3.00	2.96	2.80	2.87	2.88	2.81	19.2	18.8	18.5	17.5	18.0	18.0	17.6	2.57	2.55	2.55	2.52	2.51	2.48	2.45	16.1	16.0	15.9	15.7	15.7	15.5	15.3
Kin 100 ppm		3.37	3.25	3.15	3.02	2.97	2.91	2.86	21.0	20.3	19.7	18.9	18.6	18.2	17.9	2.72	2.71	2.68	2.64	2.60	2.57	2.53	17.0	16.9	16.7	16.5	16.3	16.1	15.8
L.S.D at	5%	0.125							0.790							0.051							0.303						
	1%	0.166							1.047							0.068							0.401						

time,7,14,21,28,35 and 42days) succeeded in increasing total nitrogen and total protein in petals and flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. However, the combinations treatments of kinetin at 100pm showed to be the most effective one for producing the highest significant increase of these parameters, especially the combined treatment between kinetin at 100pm and storage periods at 7±1°C for 0-time and 7days as compared to control in the two seasons of this study. Moreover, the combined treatment between GA_3 at 300ppm and different storage periods at 7±1°C C for (0-time,7,14,21,28,35 and 42days) particularly storage periods for 0-time of Bird of paradise cut flower stalks recorded highly significant increase of these parameters in the two seasons.

Anyhow the lowest values of these parameters was recorded by using the combinations treatments between control and different storage periods at 7±1°C (0-time,7,14,21,28,35 and 42days) as compared to the other ones under study in the two seasons.

6.1.7.-Phosphorus percentage in petals and flower stalks :

Data in Table (82) reveal that all growth regulators treatments increased phosphorus percentage in petals of Bird of paradise cut flower stalks as compared to control in the two seasons. However, using the treatment of kinetin at 100ppm of Bird of paradise cut flower stalks gave the highest values of these parameters as compared to control in the two seasons in most cases, followed descendingly by GA_3 at 300ppm as

an average of both seasons. Moreover, using the treatment of BA at 50ppm recorded highly significant increments of theses parameters as compared to control in the two seasons. On the reserve, the lowest values of phosphorus percentage in petals of Bird of paradise cut flower stalks was recorded by control in the two seasons. Furthermore, data in Table (82) reveal that all growth regulators treatments increased phosphorus percentage in flower stalks of bird of paradise cut flower stalks as compared to control in the two seasons. However, using the treatment of GA_3 at 300ppm of Bird of paradise cut flower stalks recorded the highest values of these parameters as compared to control in the two seasons in most cases, followed descendingly by BA at 50ppm as an average of both seasons. Moreover, using the treatment of kinetin at 100ppm recorded highly significant increments of theses parameters as compared to control in the two seasons.

On the reserve, the lowest values of phosphorus percentage in flower stalks of Bird of paradise cut flower stalks was recorded by control in the two seasons.

As for the effect of storage periods on phosphorus percentage in petals and flower stalks, data listed in Table (83) demonstrate that there were gradual increase in phosphorus percentage in petals and flower stalks of Bird of paradise cut flower stalks with extending storage periods at 7±1°C till 14 days and then deceased to the end of storage periods at 7±1°C for 42 days in the two seasons. However, Bird of paradise cut flower stalks were stored at 7±1°C for 14 days recorded the highest significant increase of these parameters as compared to

different storage periods at 7±1°C for (0-time,7,21,28,35 and 42days) in both seasons, followed descendingly by storage periods at 7±1°C for 7 days. Moreover storage periods at 7±1°C for 42 days treatment recorded the lowest mean values in Phosphorus percentage in petals and flower stalks of Bird of paradise cut flower stalks when compared to the other ones under study in the two seasons.

As for the interaction effect between growth regulators treatments and storage periods treatments on Phosphorus percentage in petals and flower stalks, data in Table (85) reveal that all the combinations treatments between growth regulators and storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42days) increased Phosphorus percentage in petals and flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. However, the combinations treatments of kinetin at 100pm or GA_3 at 300ppm approved to be the most effective one for producing the highest significant increase of these parameters, especially the combined treatment between kinetin at 100pm or GA_3 at 300ppm and storage periods at 7±1°C for 7days and 14days as compared to control in the two seasons of this study. Moreover, the combined treatment between BA at 50ppm and different storage periods at 7±1°C C for (0-time, 7, 14, 21, 28, 35 and 42days) particularly storage periods for 14days of Bird of paradise cut flower stalks recorded highly significant increase of these parameters in the two seasons.

Table (85): Effect of interaction between some growth regulators and Storage periods(days) treatments on phosphorus percentage and potassium percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

TREATMENTS		Phosphorus percentage in petals							Phosphorus percentage in flower stalk							Potassium percentage in petals							Potassium percentage in flower stalk						
Growth regulators		Storage periods(days)							Storage periods(days)							Storage periods(days)							Storage periods(days)						
		0	7	14	21	28	35	42	0	7	14	21	28	35	42	0	7	14	21	28	35	42	0	7	14	21	28	35	42
		1st season																											
Control		0.37	0.38	0.38	0.38	0.37	0.36	0.36	0.27	0.28	0.28	0.26	0.25	0.23	0.24	2.69	2.69	2.71	2.69	2.69	2.64	2.61	1.92	1.93	1.93	1.91	1.88	1.87	1.86
GA_3 200ppm		0.40	0.40	0.41	0.40	0.40	0.40	0.38	0.28	0.28	0.29	0.28	0.27	0.26	0.26	2.76	2.78	2.77	2.75	2.73	2.71	2.70	2.13	2.18	2.20	2.17	2.13	2.02	2.00
GA_3 300ppm		0.44	0.45	0.45	0.45	0.43	0.42	0.41	0.30	0.31	0.32	0.31	0.30	0.28	0.29	2.79	2.81	2.82	2.80	2.70	2.76	2.76	2.22	2.26	2.25	2.23	2.20	2.18	2.15
BA 25 ppm		0.40	0.41	0.41	0.40	0.40	0.40	0.39	0.28	0.29	0.29	0.27	0.25	0.25	0.25	2.72	2.78	2.77	2.76	2.73	2.71	2.70	2.03	2.10	2.06	2.02	1.98	1.96	1.95
BA 50 ppm		0.43	0.44	0.44	0.43	0.42	0.41	0.40	0.30	0.30	0.31	0.30	0.29	0.28	0.27	2.78	2.80	2.82	2.79	2.77	2.75	2.74	2.15	2.03	2.19	2.16	2.14	2.08	2.07
Kin 50 ppm		0.41	0.41	0.42	0.40	0.40	0.39	0.38	0.28	0.29	0.29	0.28	0.27	0.28	0.28	2.77	2.78	2.77	2.76	2.74	2.73	2.72	2.15	2.18	2.18	2.16	2.14	2.03	2.01
Kin 100 ppm		0.45	0.46	0.46	0.45	0.44	0.42	0.42	0.31	0.28	0.30	0.30	0.29	0.28	0.28	2.81	2.83	2.81	2.80	2.78	2.76	2.75	2.23	2.26	2.25	2.21	2.18	2.15	2.13
L.S.D at	5%	0.017							0.019							0.021							0.051						
	1%	0.023							0.025							0.028							0.068						
		2nd season																											
Control		0.38	0.38	0.37	0.37	0.37	0.36	0.36	0.26	0.28	0.27	0.26	0.25	0.25	0.24	2.69	2.70	2.71	2.69	2.68	2.66	2.64	1.93	1.95	1.94	1.91	1.90	1.88	1.86
GA_3 200ppm		0.40	0.40	0.40	0.40	0.39	0.38	0.37	0.29	0.29	0.30	0.29	0.28	0.28	0.27	2.78	2.79	2.78	2.76	2.74	2.72	2.70	2.14	2.19	2.19	2.16	2.14	2.12	2.10
GA_3 300ppm		0.43	0.44	0.44	0.43	0.42	0.41	0.40	0.30	0.30	0.31	0.31	0.30	0.29	0.28	2.81	2.82	2.81	2.81	2.79	2.77	2.76	2.23	2.27	2.25	2.23	2.21	2.18	2.16
BA 25 ppm		0.40	0.41	0.41	0.41	0.40	0.40	0.39	0.28	0.29	0.28	0.27	0.26	0.24	0.25	2.72	2.74	2.74	2.73	2.71	2.70	2.70	2.06	2.10	2.11	2.05	1.98	1.96	1.94
BA 50 ppm		0.43	0.44	0.44	0.44	0.43	0.42	0.41	0.30	0.30	0.31	0.31	0.29	0.28	0.27	2.82	2.82	2.81	2.88	2.80	2.76	2.75	2.17	2.21	2.20	2.18	2.16	2.13	2.11
Kin 50 ppm		0.41	0.41	0.42	0.41	0.40	0.40	0.39	0.29	0.29	0.29	0.28	0.27	0.28	0.28	2.78	2.78	2.79	2.77	2.76	2.73	2.72	2.16	2.19	2.18	2.16	2.15	2.13	2.05
Kin 100 ppm		0.45	0.45	0.45	0.44	0.43	0.42	0.42	0.30	0.30	0.30	0.29	0.29	0.28	0.29	2.81	2.83	2.83	2.81	2.80	2.79	2.77	2.23	2.25	2.24	2.23	2.20	2.17	2.15
L.S.D at	5%	0.015							0.014							0.034							0.051						
	1%	0.020							0.018							0.046							0.068						

6.1.8.-Potassium percentage in petals and flower stalks:

Data in Table (82) reveal that all growth regulators treatments increased Potassium percentage in petals of Bird of paradise cut flower stalks as compared to control in the two seasons. However, using the treatment of kinetin at 100ppm of Bird of paradise cut flower stalks showed to be the most effective one for producing the highest values of these parameters as compared to control in the two seasons in most cases, followed descendingly by GA_3 at 300ppm and BA at 50ppm as an average of both seasons. On the reserve, the lowest values of Potassium percentage in petals of bird of paradise cut flower stalks was recorded by control in the two seasons. Furthermore, data in Table (82) reveal that all growth regulators treatments increased Potassium percentage in petals of Bird of paradise cut flower stalks as compared to control in the two seasons. However, using the treatment of GA_3 at 300ppm of Bird of paradise cut flower stalks approved to be the most effective one for producing the highest values of these parameters as compared to control in the two seasons in most cases, followed descendingly by kinetin at 100ppm as an average of both seasons. On the reserve, the lowest values of Potassium percentage in petals of bird of paradise cut flower stalks was recorded by control in the two seasons.

With respect to the effect of storage periods on potassium percentage in petals and flower stalks, data presented in Table (83) demonstrate that Bird of paradise cut flower stalks were stored at 7±1°C for 7 days recorded the highest significant

increase of potassium percentage in petals and flower stalks as compared to different storage periods at 7±1°C for (0-time,14,21,28,35 and 42days) in both seasons, followed descendingly by storage periods at 7±1°C for 14 days. Moreover, storage periods at 7±1°C for 42 days treatment recorded the highest significant decrease in potassium percentage in petals and flower stalks of Bird of paradise cut flower stalks when compared to the other ones under study in the two seasons.

Regarding to the interaction effect between growth regulators treatments and storage periods treatments on potassium percentage in petals and flower stalks, data in Table (85) reveal that all the combinations treatments between growth regulators and storage periods at 7±1°C for (0-time,7,14,21,28,35 and 42days) increased potassium percentage in petals and flower stalks of bird of paradise cut flower stalks as compared to control in the two seasons. However, the combinations treatments of kinetin at 100pm or GA_3 at 300ppm approved to be the most effective one for producing the highest significant increase of these parameters, especially the combined treatment between kinetin at 100pm or GA_3 at 300ppm and storage periods at 7±1°C for 7days and 14days as compared to control in the two seasons of this study. Moreover, the combined treatment between BA at 50ppm and different storage periods at 7±1°C C for (0-time,7,14,21,28,35 and 42days) particularly storage periods for 7and14days of Bird of paradise cut flower stalks recorded highly significant increase of these parameters in the two seasons.

Part II: The second experiment: :(pulsing and holding solutions of*(Strelitzia reginae)*

7.1.Effect of pulsing solutions and holding solutions treatments on:

7.1.a.-Vase life (days) or longevity:

Data presented in Table (86) reveal that all pulsing solution treatments prolonged the vase life of Bird of paradise cut flower stalks when compared to control in the two seasons. The treatment of STS at 1:4mM for 30 minutes showed the highest significant increase in vase life of bird of paradise cut flower stalks as compared to control (distilled water) or the other ones under study in the two seasons. Furthermore, the treatments could be arranged descendingly as follows: STS ay 1:4mM for 30 minutes > Benzyladenine at 10ppm for 24 hours > kinetin at 20ppm for 24 hours > sucrose at 10% for 24 hours > control (distilled water) or 24 hours in the two seasons.

Regarding to the effect holding solution treatments on vase life data shown in Table (86) indicate that all holding solution treatments prolonged vase life of Bird of paradise cut flower stalks as compared to control in both seasons. However, holding Bird of paradise cut flower stalks base in holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) recorded that highest significant increase in flower longevity when compared to control in the two season. Furthermore, regardless control the lowest value of vase life of Bird of paradise cut flower stalks was registered by using holding solution contained (sucrose at 4%) in the two seasons.

Table (86): Effect of pulsing solutions, Holding solutions treatments and their interaction of vase life(days) of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments	Vase life (days) 1st season						Vase life (days) 2nd season					
	Holding solutions					mean	Holding solutions					mean
Pulsing solutions	D.W	Sucrose 4 %	Sucrose 4% +CA 200 ppm	Sucrose 4 % + 8HQS 200 ppm	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm		D.W	Sucrose 4 %	Sucrose 4% +CA 200 ppm	Sucrose 4 % + 8HQS 200 ppm	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	
D.W	16.50	22.10	25.97	28.50	29.10	24.433	18.10	21.80	26.30	27.50	28.40	24.420
Kin.20 ppm	21.90	25.50	30.00	33.90	34.20	29.100	20.70	26.80	29.80	30.60	32.50	28.080
BA 10 ppm	23.70	27.20	31.70	25.60	35.90	30.820	22.50	27.00	32.50	33.20	33.50	29.740
Sucrose 10 %	19.00	24.10	27.60	29.90	33.20	26.760	20.70	24.90	28.10	29.60	30.40	26.740
STS 1:4 ml	24.40	31.80	32.80	35.90	36.80	32.340	23.90	30.80	32.90	33.60	34.80	31.200
mean	21.100	26.140	29.613	32.760	33.840		21.180	26.260	29.920	30.900	31.920	

L.S.D at	Pulsing solutions		Holding solutions		interaction		Pulsing solutions		Holding solutions		interaction	
	5 %	1 %	5 %	1 %	5 %	1 %	5 %	1 %	5 %	1 %	5 %	1 %
	0.529	0.706	0.529	0.706	1.184	1.579	0.315	0.420	0.315	0.420	0.704	0.939

Moreover, the treatment of holding solution contained (sucrose at 4% + 8-HQS at 200ppm) and (sucrose at 4% + citric acid at 200ppm) respectively resulted highly significant increase in vase life of Bird of paradise cut flower stalks when compared to control in the two seasons.

As for the effect of interaction between pulsing solution and holding solution treatments on vase life, data in Table (86) reveal that all interaction between pulsing solution and holding solution treatments of bird of paradise cut flower stalks recorded increases in vase life as compared to control in the two season, especially the treatment of pulsing solution of STS at 1:4mM for 30 minutes and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) resulted the highest significant increase vase life of Bird of paradise cut flower stalks as compared to control or other ones under study in the two seasons. Furthermore, the treatment of interaction between (pulsing solution of STS at 1:4 mM for 30 minutes and holding solution contained sucrose at 4% + 8-HQS at 200ppm) and interaction treatment between (pulsing solution of BA at 10ppm for 24 hours and holding solution contained sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) resulted highly significant increase vase life as compared to control (D.W. treatment) in the two seasons. The differences between the aforesaid two treatments were not significant in both seasons.

7.1.b.-Change percentage in fresh weight of cut flower stalks:

Data in Table (87) reveal that all tested pulsing solutions treatments statistically increased changes percentage in fresh weight of cut flower stalks in both seasons. However, pulsing bird of paradise cut flower stalks bases in silver thiosulphate (STS) (1:4mM) for 30 minutes recorded the highest significant increase in change percentage in fresh weight of cut flower stalks after 4, 8, 12, 16, 20, 24, 28, 32 days from the treatment until the end of longevity compared to other treatments under study in the two seasons.

Moreover, using pulsing solution of Benzyladenine at 10ppm for 24 hours succeeded in increasing in change percentage in fresh weight of Bird of paradise cut flower stalks as compared to control (distilled water (D.W.)) in both seasons. Irrespective control (distilled water), the lowest value of change percentage in fresh weight of Bird of Paradise cur flower stalks was registered by using pulsing treatment of sucrose at 10% for 24 hours in most cases during all longevity in the two seasons.

Regarding to the effect of holding solution treatments on the change percentage in fresh weight Data in Table (88) indicate that, change percentage in fresh weight of Bird of Paradise cut flower stalks was devised after 4 days from the treatment until the end of longevity 32days in both seasons. However, the treatment of Bird of Paradise cut flower stalks bases in holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) recorded the highest significant

Table (87): Effect of pulsing solutions treatments, on Change percentage in fresh weight and Water balance (g)/stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Change percentage in fresh weight of cut flower stalk								Water balance (g)/stalk						
		Shelf life periods(days)								Shelf life periods(days)						
		4	8	12	16	20	24	28	32	4	8	12	16	20	24	28
1st season																
Pulsing solutions	D.W	8.91	7.42	4.10	1.11	-4.40	-11.65	-18.03	-22.84	7.99	7.05	5.72	1.05	-1.51	-7.85	-11.41
	Kin.20 ppm	10.18	9.01	6.45	3.36	-0.54	-5.36	-11.94	-17.87	9.43	8.72	6.94	3.51	0.09	-4.02	-8.12
	BA 10 ppm	11.55	10.51	7.25	4.68	-0.05	-4.32	-10.85	-15.66	11.26	10.27	7.39	4.81	0.79	-3.29	-2.84
	Sucrose 10 %	9.06	7.44	5.36	1.90	-3.19	-7.69	-15.18	-19.86	9.03	7.97	5.63	3.05	-0.62	-4.89	-10.33
	STS 1:4 ml	12.31	11.72	8.35	5.82	1.72	-2.98	-7.90	-13.34	12.22	10.89	8.35	5.01	1.80	-2.17	-4.72
L.S.D at	5 %	0.973	0.456	0.617	0.496	0.553	0.636	0.722	0.644	0.171	0.318	1.038	0.947	0.274	1.027	1.254
	1%	1.298	0.609	0.834	1.110	0.738	0.848	0.963	0.859	0.228	0.425	1.384	1.263	0.365	1.370	1.637
2nd season																
Pulsing solutions	D.W	10.29	8.52	5.17	1.92	-3.41	-10.37	-14.72	-21.99	9.73	8.50	6.20	-3.13	-1.21	-7.05	-10.48
	Kin.20 ppm	11.22	10.27	7.03	4.14	-0.67	-5.53	-11.31	-16.63	10.39	9.97	7.23	4.45	0.64	-3.21	-6.64
	BA 10 ppm	12.13	10.59	7.28	4.42	0.09	-4.47	-10.18	-15.49	12.00	10.95	7.91	5.22	2.53	-2.25	-5.66
	Sucrose 10 %	9.91	8.58	5.18	1.55	-2.82	-8.10	-13.35	-19.13	10.60	5.57	6.23	2.89	-0.27	-5.54	-8.99
	STS 1:4 ml	13.19	11.88	8.29	5.61	1.34	-3.15	-8.52	-13.99	12.63	11.09	8.75	5.94	2.25	-1.53	-5.59
L.S.D at	5 %	1.172	1.133	1.299	1.364	1.391	1.764	2.975	2.022	0.956	1.032	0.506	0.828	1.860	0.491	0.668
	1%	1.564	1.512	1.733	1.819	1.856	2.353	3.969	2.697	1.275	1.377	0.674	1.105	2.481	0.655	0.891

Table (88): Effect of holding solutions treatments, on Change percentage in fresh weight and Water balance (g)/stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Change percentage in fresh weight of cut flower stalk								Water balance (g)/stalk						
		Shelf life periods (days)								Shelf life periods (days)						
		4	8	12	16	20	24	28	32	4	8	12	16	20	24	28
1st season																
holding solutions	D.W	8.30	6.28	2.68	0.42	-5.17	-11.33	-18.31	-23.80	7.91	6.29	3.69	0.75	-3.25	-8.48	-7.78
	Sucrose 4 %	4.99	3.78	0.32	-3.24	-7.73	-14.49	-21.86	-27.38	4.87	4.27	1.34	-2.19	-5.20	-10.53	-15.14
	Sucrose 4% +CA 200 ppm	11.36	10.91	8.33	5.77	0.84	-3.03	-8.71	-13.96	11.17	10.32	8.53	5.55	2.05	-1.93	-5.87
	Sucrose 4 % + 8HQS 200 ppm	11.12	10.37	8.16	4.71	0.72	-3.37	-9.41	-14.44	11.02	10.13	8.85	5.27	2.17	-1.87	-5.13
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	16.24	14.76	12.01	9.22	4.89	0.21	-5.62	-9.97	14.97	13.89	11.63	8.06	4.77	0.59	-3.52
L.S.D at	5 %	0.973	0.456	0.617	0.496	0.553	0.636	0.722	0.644	0.171	0.318	1.038	0.947	0.274	1.027	1.254
	1%	1.298	0.609	0.834	1.110	0.738	0.848	0.963	0.859	0.228	0.425	1.384	1.263	0.365	1.370	1.637
2nd season																
holding solutions	D.W	9.17	7.98	4.25	0.99	-3.62	-9.53	-13.89	-21.12	9.68	7.25	5.29	1.49	-2.21	-6.61	-10.58
	Sucrose 4 %	6.30	5.15	1.38	-1.95	-6.38	-12.85	-19.10	-25.02	5.65	5.37	2.15	0.24	-3.35	-9.45	-13.45
	Sucrose 4% +CA 200 ppm	13.59	12.70	9.86	6.87	2.14	-2.42	-7.41	-12.97	13.45	11.73	9.37	1.17	3.55	-1.53	-4.43
	Sucrose 4 % + 8HQS 200 ppm	10.24	8.53	5.70	2.32	-2.67	-7.41	-13.36	-18.93	10.31	9.94	7.25	3.48	1.20	-2.59	-6.57
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	17.42	15.48	11.75	9.42	5.06	0.59	-4.32	-9.18	16.26	14.78	12.25	5.99	4.75	0.61	-2.31
L.S.D at	5 %	1.172	1.133	1.299	1.364	1.391	1.764	2.975	2.022	0.956	1.032	0.506	0.828	1.860	0.491	0.668
	1%	1.564	1.512	1.733	1.819	1.856	2.353	3.969	2.697	1.275	1.377	0.674	1.105	2.481	0.655	0.891

increase in change percentage in fresh weight of cut flower stalks as compared to control (D.W.) and the other ones under study in the two seasons. Moreover, holding solution contained (sucrose at 4% + citric acid at 200ppm) + (sucrose at 4% + 8-HQS at 200ppm) of Bird of Paradise cut flower stalks bases resulted highly significant increase in change percentage in fresh weight when compared to control (distilled water) in the two seasons.

While, using the treatment of holding solution contained (sucrose at 4%) recorded the lowest values of change percentage in fresh weight of Bird of Paradise cut flower stalks when compared to control (D.W.) in the two seasons.

As for the effect of interaction between pulsing solution and holding solution treatments on change percentage in fresh weight, Data in Table (89&90) reveal that, the interaction treatments between (pulsing solution of STS at 1:4mM for 30 minutes and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) recorded the highest significant increase in change percentage in fresh weight of bird of paradise cut flower stalks as compared to control (distilled water) during the two seasons. Moreover, using the interaction between (pulsing solution of kinetin at 20ppm for 24 hours and BA at 10ppm for 24 hours respectively and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) resulted highly significant increase in change percentage in fresh weight of Bird of paradise cut flower stalks

Table (89): Effect of interaction between pulsing solutions and holding solutions treatments on change percentage in fresh weight of *Strelitzia reginae* Ait. cut flower stalk during first season 2007-2008.

Treatments		Change percentage in fresh weight of cut flower stalk							
		1st season							
		Shelf life periods (days)							
Pulsing solutions	Holding Solutions	4	8	12	16	20	24	28	32
D.W	D.W	7.09	5.08	0.53	-2.17	-6.85	-18.08	-23.05	-29.01
	Sucrose 4 %	4.10	2.50	-0.82	-5.11	-8.41	-20.98	-27.59	-31.63
	Sucrose 4% +CA 200 ppm	10.70	8.54	6.59	3.80	-3.60	-6.94	-12.96	-17.67
	Sucrose 4 % + 8HQS 200 ppm	8.92	7.82	5.32	2.43	-2.73	-6.80	-15.35	-18.47
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	13.75	13.15	8.88	6.59	-0.41	-5.47	-11.21	-17.41
Kin.20 ppm	D.W	8.03	5.91	3.05	0.69	-5.29	-10.56	-18.87	-23.85
	Sucrose 4 %	4.63	4.96	0.89	-3.51	-6.99	-13.63	-21.05	-27.13
	Sucrose 4% +CA 200 ppm	11.23	9.85	8.13	5.87	2.07	-1.87	-8.52	-15.07
	Sucrose 4 % + 8HQS 200 ppm	9.59	8.88	7.16	3.62	1.05	-2.51	-7.59	-15.34
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	17.42	15.42	13.06	10.12	6.48	1.76	-3.68	-7.93
BA 10 ppm	D.W	9.45	7.71	3.81	1.72	-4.27	-8.69	-16.99	-21.34
	Sucrose 4 %	4.74	4.03	0.69	-2.38	-6.85	-11.16	-19.05	-25.06
	Sucrose 4% +CA 200 ppm	13.33	12.24	9.19	7.02	2.39	-2.55	-7.45	-12.34
	Sucrose 4 % + 8HQS 200 ppm	13.39	12.93	9.81	6.91	2.23	-1.75	-7.31	-13.01
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	16.86	15.63	12.74	10.15	6.27	2.54	-3.47	-6.57
Sucrose 10 %	D.W	6.49	4.18	1.57	1.13-	-6.99	-12.90	-20.80	-26.22
	Sucrose 4 %	3.35	1.72	-0.29	-4.39	-10.91	-16.46	-24.68	-29.55
	Sucrose 4% +CA 200 ppm	10.64	9.88	6.59	4.63	-0.29	-3.99	-10.51	-15.51
	Sucrose 4 % + 8HQS 200 ppm	9.52	8.57	8.08	2.73	-0.58	-3.96	-11.82	-16.45
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	15.31	12.84	10.87	7.68	2.81	-1.16	-8.08	-11.56
STS 1:4 ml	D.W	10.45	8.54	4.48	3.01	-2.47	-6.43	-11.82	-18.58
	Sucrose 4 %	8.13	5.66	1.17	-0.82	-5.47	-10.21	-16.94	-23.54
	Sucrose 4% +CA 200 ppm	10.89	14.03	11.13	7.51	3.62	0.20	-4.13	-9.23
	Sucrose 4 % + 8HQS 200 ppm	14.20	13.64	10.45	7.89	3.62	-1.83	-4.96	-8.95
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	17.86	16.75	14.51	11.55	9.29	3.39	-1.67	-6.38
L.S.D at	5%	2.176	1.020	1.380	1.110	1.237	1.422	1.615	1.440
	1%	2.903	1.361	1.841	1.480	1.651	1.897	2.155	1.920

Table (90): Effect of interaction between pulsing solutions and holding solutions treatments on change percentage in fresh weight of *Strelitzia reginae* Ait. cut flower stalk during the second season 2008-2009.

Treatments		Change percentage in fresh weight of cut flower stalk							
		2nd season							
Pulsing solutions	Holding Solutions	Shelf life periods (days)							
		4	8	12	16	20	24	28	32
D.W	D.W	8.05	6.67	2.53	-0.75	-5.80	-15.66	-12.35	-26.42
	Sucrose 4 %	5.61	3.63	0.58	-3.17	-7.12	-17.40	-24.83	-30.31
	Sucrose 4% +CA 200 ppm	12.03	10.44	7.21	5.03	-1.16	-5.50	-11.11	-16.47
	Sucrose 4 % + 8HQS 200 ppm	9.62	7.91	5.26	1.34	-3.30	-8.47	-15.05	-20.91
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	16.12	13.93	10.24	7.13	0.34	-4.84	-10.26	-15.82
Kin.20 ppm	D.W	8.69	8.36	4.63	1.96	-3.57	-8.50	-15.60	-20.67
	Sucrose 4 %	6.63	6.34	2.13	-1.14	-5.76	-11.49	-17.54	-24.11
	Sucrose 4% +CA 200 ppm	12.73	12.09	9.98	7.62	2.74	-2.15	-6.98	-12.55
	Sucrose 4 % + 8HQS 200 ppm	10.48	8.49	4.97	1.24	-4.12	-8.87	-15.04	-19.87
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	17.58	16.05	13.44	11.02	7.37	3.34	-1.39	-5.95
BA 10 ppm	D.W	10.58	8.91	4.79	1.67	-2.82	-7.26	-14.49	-19.26
	Sucrose 4 %	6.49	5.46	1.07	-1.55	-5.17	-10.38	-16.87	-22.70
	Sucrose 4% +CA 200 ppm	14.13	13.32	10.71	7.95	3.38	-1.12	-5.68	-11.37
	Sucrose 4 % + 8HQS 200 ppm	11.09	8.91	6.47	3.34	-1.52	-5.95	-11.18	-16.06
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	18.35	16.37	13.34	10.69	6.59	2.38	-2.66	-8.07
-15.51Sucrose 1-15.510 %	D.W	7.10	5.80	1.73	-1.15	-4.96	-10.17	-15.26	-21.84
	Sucrose 4 %	4.66	3.22	-0.01	-3.90	-8.92	-14.93	-20.43	-26.38
	Sucrose 4% +CA 200 ppm	14.03	12.99	9.27	4.83	0.95	-3.99	-8.91	-15.51
	Sucrose 4 % + 8HQS 200 ppm	8.23	6.78	4.27	1.07	-4.37	-9.68	-15.84	-21.62
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	15.51	14.13	10.64	6.89	3.18	-1.74	-6.32	-10.28
STS 1:4 ml	D.W	11.44	10.16	7.57	3.22	-0.97	-6.07	-11.74	-17.42
	Sucrose 4 %	8.13	7.13	3.11	-001	-4.94	-10.02	-15.84	-21.59
	Sucrose 4% +CA 200 ppm	15.05	14.63	12.15	8.92	4.79	0.67	-4.38	-8.97
	Sucrose 4 % + 8HQS 200 ppm	11.80	10.57	7.55	4.59	-0.03	-4.09	-9.70	-16.22
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	19.52	16.91	11.08	11.32	7.84	3.77	-0.96	-5.77
L.S.D at	5%	2.622	2.534	2.904	3.050	3.111	3.944	6.653	4.521
	1%	3.497	3.380	3.875	4.068	4.150	5.262	8.875	6.031

after 4, 8, 12, 16, 20, 24, 28 and 32 days from the treatment as compared to control and other ones under study in the two seasons. Furthermore, using the interaction between (pulsing solution)\ of (distilled water for 24 hours) or (pulsing solution of sucrose at 10% for 24 hours) and holding solution contained (sucrose at 4%) registered highly significant decrease in change percentage in fresh weight of Bird of paradise cut flower stalks as compared to the other treatments under this study after 4, 8, 12, 16, 20, 24, 28 and 30 days from the treatment in the two seasons.

7.1.c.-Water balance (g) stalks:

Data in Table (87) indicate that water balance of Bird of Paradise cut flower stalks was decreased after 4 days from the treatment till the end of age of longevity. Generally, most pulsing solution treatments highly significant increased the water balance of Bird of Paradise cut flower stalks after 4, 8, 12, 16, 20, 24 and 28 days from the treatment compared to control in the two seasons. Furthermore, the treatments of STS at (1:4mM) for 30 minutes after 4, 8, 12, 16, 20, 24 and 28 days from the treatment was the most effective one in this regard compared with the other ones in the two seasons.

Referring to the effect holding solution treatments on water balance, data presented in Table (88) demonstrate that water balance of Bird of Paradise cut flower stalks was decreased after 4 days from the treatment to the end of age of longevity 28days in both seasons. However, holding Bird of Paradise cut flower stalks bases in holding solution contained

(sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) resulted the highest significant increase in water balance as compared to the other ones and control (distilled water) under study in the two season. Moreover, the lowest values of water balance of Bird of Paradise cut flower stalks was registered by using holding solution contained (sucrose at 4%) after 4, 8, 12, 16, 20, 24 and 28 days from the treatment when compared to control (distilled water) and other treatment in the two seasons. The rest treatments occupied an intermediate position between the abovementioned treatments in both seasons of this study.

Concerning the interaction effect between pulsing solution and holding solution treatments on water balance, data in Tables (91 & 92) demonstrate that all the interactions between pulsing and holding solutions succeeded in increasing water balance of Bird of paradise cut flower stalks as compared to the control (distilled water) in the two seasons in most cases. However, the combinations of holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) recorded the highest significant increase of water balance, especially the combined treatment between pulsing solution of STS at 1:4mM for 30 minutes and holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) after 4 days from the treatment to the end of longevity in the two seasons.

Moreover, the combinations between pulsing solution of BA at 10ppm for 24hours or kinetin at 20ppm for 24hours respectively, and holding solution contained (sucrose at 4% +

Table (91): Effect of interaction between pulsing solutions and holding solutions treatments on Water balance (g)/stalk of *Strelitzia reginae* Ait. cut flower stalk during first season 2007-2008.

Treatments		Water balance (g)/stalk						
		1st season						
		Shelf life periods (days)						
Pulsing solutions	Holding Solutions	4	8	12	16	20	24	28
D.W	D.W	6.40	4.97	2.67	-0.80	-4.63	-12.30	-15.80
	Sucrose 4 %	3.90	3.07	0.73	-5.80	-6.87	-14.47	-17.47
	Sucrose 4% +CA 200 ppm	9.10	7.93	8.93	3.93	1.03	-4.43	-8.50
	Sucrose 4 % + 8HQS 200 ppm	8.30	7.90	6.80	2.83	0.97	-4.43	-8.50
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	12.27	11.37	9.47	5.07	1.93	-3.60	-6.80
Kin.20 ppm	D.W	7.13	5.60	3.33	0.60	-3.47	-8.33	-12.50
	Sucrose 4 %	4.60	4.60	1.23	-1.67	-5.13	-9.90	-14.30
	Sucrose 4% +CA 200 ppm	10.80	9.77	7.60	5.10	1.53	-1.47	-5.23
	Sucrose 4 % + 8HQS 200 ppm	10.00	9.50	10.80	5.00	2.10	-1.60	-5.63
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	14.60	14.13	11.73	8.50	5.43	1.20	-2.93
BA 10 ppm	D.W	9.43	7.77	4.70	1.60	2.87-	-8.47	-11.13
	Sucrose 4 %	5.10	4.93	1.80	-0.47	-4.40	-8.33	-13.37
	Sucrose 4% +CA 200 ppm	12.57	11.53	8.90	6.53	3.33	-1.07	-5.53
	Sucrose 4 % + 8HQS 200 ppm	12.73	11.63	9.07	6.80	2.77	-0.80	-5.20
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	16.47	15.50	12.50	9.60	5.13	2.20	-1.23
Sucrose 10 %	D.W	6.67	5.37	3.00	0.07-	-3.57	-9.10	-13.33
	Sucrose 4 %	3.80	3.30	1.00	-2.00	-5.90	-11.13	-18.50
	Sucrose 4% +CA 200 ppm	10.03	9.37	7.20	5.47	1.43	-2.37	-7.30
	Sucrose 4 % + 8HQS 200 ppm	10.57	9.57	7.43	4.93	1.63	-2.33	-7.10
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	14.10	12.27	9.53	6.93	3.30	0.47	-5.43
STS 1:4 ml	D.W	9.90	7.77	4.77	2.40	-1.70	-4.20	-8.37
	Sucrose 4 %	6.93	5.43	1.93	-1.00	-3.70	-8.80	-12.07
	Sucrose 4% +CA 200 ppm	13.37	13.00	10.00	6.70	2.93	-0.30	-2.80
	Sucrose 4 % + 8HQS 200 ppm	13.50	12.03	10.13	6.77	3.40	-0.20	0.80
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	17.40	16.20	14.93	10.20	8.07	2.67	-1.17
L.S.D at	5%	0.382	0.712	2.321	2.118	0.612	2.297	2.804
	1%	0.509	0.950	3.096	2.825	0.817	3.064	3.741

Table (92): Effect of interaction between pulsing solutions and holding solutions treatments on Water balance (g)/stalk of *Strelitzia reginae* Ait. cut flower stalk during the second season 2008-2009.

Treatments		Water balance (g)/stalk						
		2nd season						
Pulsing solutions	Holding Solutions	Shelf life periods (days)						
		4	8	12	16	20	24	28
D.W	D.W	7.93	6.30	4.07	0.43	-3.60	-9.90	-14.27
	Sucrose 4 %	4.87	3.97	1.17	-1.43	-5.60	-12.63	-16.83
	Sucrose 4% +CA 200 ppm	12.30	10.67	8.03	-5.73	1.43	-4.43	-6.80
	Sucrose 4 % + 8HQS 200 ppm	9.33	8.97	7.27	-2.40	-0.47	-5.17	-9.07
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	14.23	12.60	10.47	-6.53	2.17	-3.10	-5.43
Kin.20 ppm	D.W	9.67	8.20	5.10	1.57	-2.33	-6.30	-10.37
	Sucrose 4 %	3.00	5.73	2.13	0.90	-4.23	-9.13	-12.67
	Sucrose 4% +CA 200 ppm	13.13	11.67	9.40	5.13	3.30	-0.73	-3.67
	Sucrose 4 % + 8HQS 200 ppm	9.80	9.37	6.73	4.77	1.20	-1.83	-6.17
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	16.33	14.87	12.77	9.90	5.27	1.97	-0.33
BA 10 ppm	D.W	10.10	8.53	5.87	2.07	-1.93	-4.97	-9.23
	Sucrose 4 %	7.23	6.10	2.96	1.30	2.87	-7.53	-11.40
	Sucrose 4% +CA 200 ppm	14.10	13.30	10.07	7.50	4.13	-0.13	-3.00
	Sucrose 4 % + 8HQS 200 ppm	11.00	10.70	7.43	5.00	1.47	-1.17	-3.93
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	17.57	16.10	13.20	10.23	6.10	2.53	-0.73
Sucrose 10 %	D.W	9.80	6.47	4.43	0.80	-2.63	-7.87	-11.13
	Sucrose 4 %	5.30	4.43	1.37	-1.17	-4.93	-10.73	-15.30
	Sucrose 4% +CA 200 ppm	12.87	9.10	8.37	6.03	1.87	-3.10	-5.63
	Sucrose 4 % + 8HQS 200 ppm	10.00	9.37	6.10	3.30	1.53	-4.47	-8.63
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	15.03	13.47	10.87	5.47	2.80	-1.53	-4.23
STS 1:4 ml	D.W	10.90	6.73	6.97	2.57	-0.53	-4.03	-7.90
	Sucrose 4 %	7.83	6.60	3.13	1.60	-4.87	-7.20	-11.07
	Sucrose 4% +CA 200 ppm	14.87	13.93	11.00	7.90	7.00	0.77	-3.07
	Sucrose 4 % + 8HQS 200 ppm	11.40	11.30	8.70	6.73	2.27	-0.33	-5.07
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	18.13	16.87	13.93	10.90	7.40	3.17	-0.83
L.S.D at	5%	2.137	2.308	1.130	1.852	4.159	1.098	1.493
	1%	2.850	3.079	1.508	2.471	5.548	1.464	1.992

citric acid at 200ppm + 8-HQS at 200ppm) resulted highly significant increase in this parameter, also the combinations of STS at 1:4mM for 30 minutes as compared to control (distilled water) in this concern in the two seasons. Anyhow, the water balance values of Bird of paradise cut flower stalks by using all the combinations between pulsing and holding solutions was decreased as flower cut stalks prolonged in age after 4 days from the treatment to the end of longevity in the two seasons. On the contrary, the combinations of sucrose at 4% as holding solution decreased water balance stalks of *S. reginae* during all longevity periods, except for the combined treatment between sucrose at 4% and STS 1:4ml as it succeeded in increasing the water balance stalks of *Strelitzia. regine* in tow seasons.

7.1.d.-Floret opening percentage:

Data in Table (93) demonstrate that all pulsing solution treatments highly significant increased the floret opening percentage of tuberose cut flower stalks when compared to the untreated stalks (distilled water) after 12, 16, 20, 24 and 28 days from the treatment in the two seasons. However, the treatment of STS at 1:4mM for 30 minutes and BA at 10ppm for 24 hours gave the highest values of floret opening percentage of Bird of Paradise cut flower stalks after 20, 24 and 28 days from the treatment when compared to control (D.W.) in the two seasons.

As for the effect holding solution treatments on floret opening percentage, data in Table (94) indicate that holding Bird of paradise cut flower stalks bases in holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm)

Table (93): Effect of pulsing solutions treatments, on Floret opening percentage and Floret wilting percentage of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Floret opening percentage							Floret wilting percentage						
		Shelf life periods(days)							Shelf life periods(days)						
		4	8	12	16	20	24	28	8	12	16	20	24	28	32
1st season															
Pulsing solutions	D.W	27.73	39.52	50.00	53.64	61.88	69.80	77.28	21.80	34.31	46.00	56.19	74.00	91.32	-
	Kin.20 ppm	29.80	42.05	56.28	59.84	69.17	77.93	87.04	19.36	24.75	37.14	43.81	59.17	74.16	85.07
	BA 10 ppm	32.51	45.19	60.44	63.67	70.84	78.64	90.44	17.47	22.07	34.31	40.54	56.66	70.46	80.60
	Sucrose 10 %	29.04	39.80	53.96	57.07	65.60	74.28	84.36	21.70	29.16	41.24	50.15	66.03	79.77	90.96
	STS 1:4 ml	32.80	43.44	60.80	65.60	73.00	82.24	90.73	15.60	19.32	31.24	38.10	53.23	67.06	75.19
L.S.D at	5 %	2.495	3.289	3.415	4.223	4.413	4.150	3.431	5.832	5.621	6.744	5.507	6.209	4.976	4.996
	1%	3.329	4.387	4.555	5.633	5.886	5.536	4.577	7.779	7.498	8.997	7.347	8.283	6.639	6.665
2nd season															
Pulsing solutions	D.W	30.00	40.00	52.67	57.33	64.67	72.00	80.67	23.10	37.18	49.93	56.73	79.47	94.60	-
	Kin.20 ppm	32.67	44.67	59.33	62.67	71.33	78.67	88.67	19.43	30.14	42.48	46.59	63.07	77.21	86.66
	BA 10 ppm	31.33	44.00	60.40	65.73	72.67	79.73	90.53	20.17	26.29	38.73	43.37	60.49	75.38	84.68
	Sucrose 10 %	30.93	41.33	57.87	67.33	70.53	77.47	84.93	26.77	34.29	43.40	49.88	67.58	80.07	91.69
	STS 1:4 ml	33.73	44.40	61.73	68.00	77.07	87.33	92.00	16.39	24.67	35.01	42.29	54.72	69.51	77.92
L.S.D at	5 %	5.336	10.57	5.378	8.133	6.399	9.586	9.259	6.642	5.533	8.738	8.695	9.577	10.33	10.88
	1%	7.119	14.10	7.175	10.850	8.536	12.79	12.35	8.860	7.380	11.66	11.60	12.78	13.78	14.51

Table (94): Effect of holding solutions treatments, on Floret opening percentage and Floret wilting percentage of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Floret opening percentage							Floret wilting percentage						
		Shelf life periods (days)							Shelf life periods (days)						
		4	8	12	16	20	24	28	8	12	16	20	24	28	32
1st season															
Holding solutions	D.W	23.84	34.00	43.64	49.20	56.80	65.29	76.04	34.31	47.93	60.06	69.75	81.19	-	-
	Sucrose 4 %	27.13	35.60	48.92	55.13	61.64	68.96	81.84	18.79	30.93	45.20	55.19	71.22	83.59	91.07
	Sucrose 4% +CA 200 ppm	31.11	43.85	60.96	61.00	69.96	80.44	87.25	15.17	20.31	37.46	40.84	56.47	72.99	81.12
	Sucrose 4 % + 8HQS 200 ppm	33.40	46.32	62.52	64.24	72.72	83.04	91.48	14.41	16.17	25.53	34.52	52.25	66.28	73.33
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	36.40	50.23	65.44	70.24	79.37	85.16	93.24	13.24	14.26	21.69	28.49	47.96	62.07	71.79
L.S.D at	5 %	2.495	3.289	3.415	4.223	4.413	4.150	3.431	5.832	5.621	6.744	5.507	6.209	4.976	4.996
	1%	3.329	4.387	4.555	5.633	5.886	5.536	4.577	7.779	7.498	8.997	7.347	8.283	6.639	6.665
2nd season															
Holding solutions	D.W	26.27	36.40	47.33	54.67	62.67	66.67	78.00	34.59	49.51	62.56	70.80	86.56	-	-
	Sucrose 4 %	29.33	37.60	52.40	60.00	66.40	74.00	86.00	21.53	36.28	48.41	54.55	69.92	82.83	91.75
	Sucrose 4% +CA 200 ppm	33.47	45.33	62.67	67.07	74.00	84.27	90.67	17.23	24.60	38.09	42.74	58.76	71.87	80.62
	Sucrose 4 % + 8HQS 200 ppm	32.53	45.60	62.80	66.67	74.13	83.33	89.73	17.94	22.29	32.57	37.28	56.99	70.20	78.63
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	37.07	49.47	66.80	72.67	79.07	86.93	92.40	14.56	19.89	27.92	33.47	53.09	67.65	77.09
L.S.D at	5 %	5.336	10.57	5.378	8.133	6.399	9.586	9.259	6.642	5.533	8.738	8.695	9.577	10.33	10.88
	1%	7.119	14.10	7.175	10.850	8.536	12.79	12.35	8.860	7.380	11.66	11.60	12.78	13.78	14.51

resulted the highest significant increase in floret opening percentage as compared to control (distilled water) and the other ones under study in both seasons. Moreover, holding solution contained (distilled water) and the other ones under study in both seasons. Moreover, holding solution contained (sucrose at 4% + citric acid at 200ppm) + (sucrose at 4% + 8-HQS at 200ppm) recorded highly significant increase in floret opening percentage of Bird of paradise cut flower spites as compared to control (D.W.) in both seasons.

Referring to the interaction effect between pulsing solution and holding solution treatments on floret opening percentage, data in Tables (95 & 96) reveal that all the combinations between pulsing solutions and holding solutions treatments succeeded in increasing floret opening percentage of Bird of paradise cut flower stalks as compared to control "D.W" i.e distilled water during the two seasons. However, the combinations of holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) recorded the most effective one for inducing the highest values of this parameters, especially the combined treatment between pulsing solution of STS at 1:4mM for 30minutes and holding solution contained (sucrose at 4% + Citric acid at 200ppm + 8-HQS at 200ppm) after 4 days from the treatment till the end of longevity in the two seasons in most cases.

Table (95): Effect of interaction between pulsing solutions and holding solutions treatments on Floret opening percentage of *Strelitzia reginae* Ait. cut flower stalk during first season 2007-2008.

Treatments		Floret opening percentage						
		1st season						
Pulsing solutions	Holding Solutions	Shelf life periods (days)						
		4	8	12	16	20	24	28
D.W	D.W	20.00	30.00	35.00	44.00	48.80	56.00	65.00
	Sucrose 4 %	21.67	32.00	44.00	50.00	55.00	64.00	73.20
	Sucrose 4% +CA 200 ppm	30.00	44.00	55.0	55.00	64.00	75.00	80.00
	Sucrose 4 % + 8HQS 200 ppm	32.00	45.00	56.00	56.00	66.60	76.0	83.20
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	35.00	46.60	60.00	63.20	75.00	78.00	85.00
Kin.20 ppm	D.W	24.00	35.00	46.60	50.00	58.00	69.87	78.00
	Sucrose 4 %	28.00	34.00	48.80	56.00	63.20	70.00	80.00
	Sucrose 4% +CA 200 ppm	30.00	44.67	60.00	60.00	70.00	80.00	90.00
	Sucrose 4 % + 8HQS 200 ppm	32.00	46.60	62.00	63.20	72.00	83.20	93.20
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	35.00	50.00	64.00	70.00	82.67	86.60	94.00
BA 10 ppm	D.W	26.00	38.00	46.60	52.00	60.00	66.00	83.20
	Sucrose 4 %	30.00	40.00	52.00	56.33	64.00	70.00	88.00
	Sucrose 4% +CA 200 ppm	33.53	46.60	66.60	66.00	72.00	83.20	90.00
	Sucrose 4 % + 8HQS 200 ppm	35.00	48.00	68.00	70.00	75.00	86.00	95.00
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	38.00	53.33	69.00	74.00	83.20	88.00	96.00
Sucrose 10 %	D.W	23.20	31.00	40.00	48.00	53.20	66.60	74.00
	Sucrose 4 %	26.00	34.00	46.60	53.33	60.00	68.80	78.00
	Sucrose 4% +CA 200 ppm	28.00	40.00	60.00	56.00	68.80	76.00	86.60
	Sucrose 4 % + 8HQS 200 ppm	32.00	46.00	60.00	60.00	70.00	80.00	90.00
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	36.00	48.00	63.20	68.00	76.00	80.00	93.20
STS 1:4 ml	D.W	26.00	36.00	50.00	52.00	64.00	68.00	80.00
	Sucrose 4 %	30.00	38.00	53.20	60.00	66.00	72.00	90.00
	Sucrose 4% +CA 200 ppm	34.00	44.00	63.20	68.00	75.00	88.00	89.67
	Sucrose 4 % + 8HQS 200 ppm	36.00	46.00	66.60	72.00	80.00	90.00	96.00
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	38.00	53.20	71.00	76.00	80.00	93.20	98.00
L.S.D at	5%	5.579	7.354	7.636	9.442	9.867	9.280	7.672
	1%	7.443	9.810	10.19	12.60	13.16	12.38	10.23

Table (96): Effect of interaction between pulsing solutions and holding solutions treatments on Floret opening percentage of *Strelitzia reginae* Ait. cut flower stalk during the second season 2008-2009.

Treatments		Floret opening percentage 2nd season						
		Shelf life periods (days)						
Pulsing solutions	Holding Solutions	4	8	12	16	20	24	28
D.W	D.W	23.33	33.33	40.00	46.67	53.33	60.00	66.67
	Sucrose 4 %	26.67	33.33	46.67	53.33	60.00	66.67	80.00
	Sucrose 4% +CA 200 ppm	33.33	46.67	60.00	60.00	66.67	80.00	86.67
	Sucrose 4 % + 8HQS 200 ppm	30.00	40.00	53.33	60.00	66.67	73.33	83.33
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	36.67	46.67	63.33	66.67	76.67	80.00	86.67
Kin.20 ppm	D.W	26.67	40.00	50.00	53.33	63.33	66.67	83.33
	Sucrose 4 %	30.00	36.67	53.33	60.00	66.67	73.33	86.67
	Sucrose 4% +CA 200 ppm	33.33	46.67	63.3	66.67	73.33	86.67	93.33
	Sucrose 4 % + 8HQS 200 ppm	33.33	46.67	63.33	60.00	73.33	80.00	86.67
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	40.00	53.33	66.67	73.33	80.00	86.67	93.33
BA 10 ppm	D.W	26.67	40.00	46.67	53.33	63.33	66.67	80.00
	Sucrose 4 %	30.00	40.00	53.33	56.67	66.67	73.33	90.00
	Sucrose 4% +CA 200 ppm	33.33	46.67	66.67	73.33	76.67	83.33	93.33
	Sucrose 4 % + 8HQS 200 ppm	30.00	46.67	66.67	73.33	76.67	86.67	94.00
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	36.67	46.67	68.67	72.00	80.00	88.67	95.33
Sucrose 10 %	D.W	26.67	33.33	46.67	60.00	63.33	66.67	76.67
	Sucrose 4 %	26.67	40.00	53.33	66.67	66.67	73.33	83.33
	Sucrose 4% +CA 200 ppm	33.33	40.00	60.00	66.67	73.33	80.00	86.67
	Sucrose 4 % + 8HQS 200 ppm	34.00	46.67	64.00	70.00	74.00	83.33	88.00
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	34.00	46.67	65.33	73.33	75.33	84.00	90.00
STS 1:4 ml	D.W	28.00	35.33	53.33	60.00	70.00	73.33	83.33
	Sucrose 4 %	33.33	38.00	55.33	63.00	72.00	83.33	90.00
	Sucrose 4% +CA 200 ppm	34.00	46.67	63.33	68.67	80.00	91.33	93.33
	Sucrose 4 % + 8HQS 200 ppm	35.33	48.00	66.67	70.00	80.00	93.33	96.67
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	38.00	54.00	70.00	78.00	83.33	95.33	96.67
L.S.D at	5%	11.93	23.63	12.03	18.19	14.31	21.43	20.70
	1%	15.92	31.53	16.04	24.26	19.09	28.59	27.62

7.1.e.-Floret wilting percentage:

Data presented in Table (93) reveal that most pulsing solution treatments succeeded in decreased the floret wilting percentage of Bird of paradise cut flower stalks when compared to control (distilled water) in the two seasons. However, pulsing Bird of Paradise cut flower stalks bases in silver thiosulphate (STS) (1:4mM) for 30 minutes recorded the lowest values of this parameter after 12, 16, 20, 24 and 28day from the treatment in floret wilting percentage compared to the other treatments under study.

With respect to the effect holding solution treatments on floret wilting percentage, data in Table (94) reveal that all holding solution treatments of bird of paradise cut flower stalks bases highly significant decrease in floret wilting percentage as compared to control (distilled water) in both seasons. However, holding Bird of paradise cut flower stalks bases in holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) recorded the highest significant decrease in floret wilting percentage as compared to control (D.W. treatment) in the two seasons. Furthermore, using the treatment of Bird of paradise cut flower stalks bases in holding solution contained (sucrose at 4% + 8-HQS at 200ppm) recorded highly significant decrease in floret wilting percentage as compared to control in the two seasons.

Regarding the interaction effect between pulsing solution and holding solution treatments on floret wilting percentage, data in Tables (97 & 98) indicate that all the interactions

Table (97): Effect of interaction between pulsing solutions and holding solutions treatments on Floret wilting percentage of *Strelitzia reginae* Ait. cut flower stalk during first season 2007-2008.

Treatments		Floret wilting percentage						
		1st season						
Pulsing solutions	Holding Solutions	Shelf life periods (days)						
		8	12	16	20	24	28	32
D.W	D.W	44.00	68.18	74.92	90.28	98.98	-	-
	Sucrose 4 %	20.84	40.19	53.36	65.56	81.84	98.90	-
	Sucrose 4% +CA 200 ppm	15.14	26.87	44.19	48.21	66.87	86.25	92.50
	Sucrose 4 % + 8HQS 200 ppm	14.77	19..63	31.94	42.09	63.34	74.66	84.31
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	14.24	16.67	25.59	34.83	58.99	70.56	82.68
Kin.20 ppm	D.W	34.76	43.04	56.00	65.76	75.04	92.43	-
	Sucrose 4 %	19.59	30.62	42.72	54.25	68.93	83.10	93.51
	Sucrose 4% +CA 200 ppm	14.90	20.00	38.67	40.00	55.00	71.11	80.00
	Sucrose 4 % + 8HQS 200 ppm	14.32	16.03	25.48	32.28	50.69	64.42	71.45
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	13.20	14.05	22.86	26.74	46.21	59.73	70.40
BA 10 ppm	D.W	30.40	39.01	54.15	60.00	76.17	84.55	-
	Sucrose 4 %	16.50	27.41	42.52	50.13	67.70	77.40	81.95
	Sucrose 4% +CA 200 ppm	14.20	16.41	35.46	36.41	51.83	66.67	75.56
	Sucrose 4 % + 8HQS 200 ppm	13.77	14.73	20.38	32.09	46.56	63.31	67.53
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	12.47	12.81	19.02	24.06	41.03	60.40	69.10
Sucrose 10 %	D.W	43.92	55.00	62.71	79.33	80.72	100.00	-
	Sucrose 4 %	19.54	34.15	48.72	57.52	73.03	87.46	97.46
	Sucrose 4% +CA 200 ppm	16.50	22.67	41.36	44.95	63.10	76.29	83.39
	Sucrose 4 % + 8HQS 200 ppm	14.74	17.33	30.00	37.14	58.29	70.53	76.61
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	13.80	16.64	23.40	31.83	55.01	64.56	72.32
STS 1:4 ml	D.W	18.49	34.44	52.50	53.37	75.06	86.00	95.00
	Sucrose 4 %	17.47	22.30	38.67	48.48	64.60	71.11	75.56
	Sucrose 4% +CA 200 ppm	15.08	15.63	27.64	34.64	45.56	64.61	74.15
	Sucrose 4 % + 8HQS 200 ppm	14.47	13.10	19.84	29.00	42.38	58.47	66.77
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	12.48	11.12	17.58	25.00	38.58	55.11	64.47
L.S.D at	5%	13.04	12.57	15.08	12.31	13.88	11.13	11.17
	1%	17.40	16.77	20.12	16.43	18.52	14.84	14.90

Table (98): Effect of interaction between pulsing solutions and holding solutions treatments on Floret wilting percentage of *Strelitzia reginae* Ait. cut flower stalk during the second season 2008-2009.

Treatments		Floret wilting percentage 2nd season Shelf life periods (days)						
Pulsing solutions	Holding Solutions	8	12	16	20	24	28	32
D.W	D.W	44.00	66.50	76.11	86.11	100.00	-	-
	Sucrose 4 %	22.00	44.44	61.11	66.67	83.33	98.61	-
	Sucrose 4% +CA 200 ppm	14.67	28.33	45.75	51.17	71.67	80.83	88.33
	Sucrose 4 % + 8HQS 200 ppm	20.17	25.67	36.11	41.67	70.67	78.33	87.26
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	14.67	20.95	30.56	37.96	71.67	77.33	91.64
Kin.20 ppm	D.W	33.00	47.16	61.67	68.03	87.78	98.10	-
	Sucrose 4 %	18.33	38.89	46.67	52.78	68.06	79.17	88.33
	Sucrose 4% +CA 200 ppm	14.67	23.81	40.17	43.52	56.17	71.93	81.67
	Sucrose 4 % + 8HQS 200 ppm	18.33	20.95	36.11	36.11	56.67	71.83	79.50
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	12.83	19.91	27.78	32.50	46.67	65.00	75.17
BA 10 ppm	D.W	33.00	44.44	58.33	6349.	80.5	95.33	-
	Sucrose 4 %	16.50	27.78	46.00	50.79	66.39	80.00	89.43
	Sucrose 4% +CA 200 ppm	18.33	19.91	33.33	37.38	55.19	67.79	73.62
	Sucrose 4 % + 8HQS 200 ppm	18.33	19.91	27.78	33.25	50.67	67.32	72.37
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	14.67	19.41	28.22	31.25	49.63	66.64	71.34
Sucrose 10 %	D.W	44.00	51.67	63.33	73.54	88.06	-	-
	Sucrose 4 %	33.00	44.44	50.00	54.92	72.22	85.83	98.10
	Sucrose 4% +CA 200 ppm	20.17	30.00	42.00	46.63	62.50	74.33	86.50
	Sucrose 4 % + 8HQS 200 ppm	18.33	25.00	34.29	39.70	59.64	71.31	82.78
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	18.33	20.31	27.38	34.62	55.46	67.22	78.43
STS 1:4 ml	D.W	18.94	37.78	53.33	62.83	76.39	88.10	98.10
	Sucrose 4 %	17.83	2.5.84	38.25	47.58	59.56	70.56	78.43
	Sucrose 4% +CA 200 ppm	18.33	20.95	29.25	35.00	48.27	64.44	72.96
	Sucrose 4 % + 8HQS 200 ppm	14.54	19.91	28.57	35.00	47.33	62.22	71.22
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	12.30	18.86	25.68	31.02	42.04	62.22	68.89
L.S.D at	5%	14.85	12.37	19.54	19.44	21.42	13.78	24.32
	1%	19.81	16.50	26.06	25.94	28.57	30.82	32.45

between pulsing solutions and holding solution treatments resulted in highly significant decreases in floret wilting percentage of bird of paradise cut flower stalks during the two seasons as compared with control. However, the interaction of holding solution contained (sucrose at 4% + Citric acid at 200ppm + 8-HQS at 200ppm) approved to be the most effective one for inducing the lowest values of this parameter, particularly, the combined treatment between pulsing solution of STS at 1:4mM for 30 Minutes and holding solution contained (sucrose at 4% + Citric acid at 200ppm + 8-HQS at 200ppm) after 4 days from the treatment to the end of longevity in the two seasons as it induced the lowest floret wilting percentage. Furthermore, the values floret wilting percentage of the combinations between pulsing solution and holding solutions was increased as flower cut stalks prolonged in age after 4 days from the treatment till the end of age of longevity in the two seasons.

7.1.f.-Water uptake (g)/stalks:

Data in Table (99) indicate that water uptake of Bird of Paradise cut flower stalks was increased after 4 days from the treatment until the end of age of longevity in the two seasons. Generally, all pulsing solution treatments highly significant increased the water uptake of bird of paradise cut flower stalks after 4, 8, 12, 16, 20, 24 and 28days from the treatment compared to control in the two seasons. However, the highest significant increased of water uptake of bird of Paradise cut

Table (99): Effect of pulsing solutions treatments, on Water uptake and Water loss (g)/stalk *of Strelitzia reginae Ait* cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Water uptake (g)/stalk							Water loss (g)/stalk						
		Shelf life periods(days)							Shelf life periods(days)						
		4	8	12	16	20	24	28	4	8	12	16	20	24	28
1st season															
Pulsing solutions	D.W	45.27	69.99	89.48	108.25	126.67	149.39	162.72	37.27	62.94	83.76	107.21	128.18	157.24	174.13
	Kin.20 ppm	48.59	74.45	94.33	113.24	131.77	152.14	167.12	39.16	65.73	87.39	109.73	131.68	156.16	175.24
	BA 10 ppm	49.81	75.22	96.47	115.08	133.75	153.75	169.33	38.55	64.95	89.08	110.27	132.96	157.04	172.17
	Sucrose 10 %	47.96	71.86	93.13	111.63	129.54	150.65	166.19	38.93	63.89	87.50	108.58	130.17	155.54	176.52
	STS 1:4 ml	55.91	77.42	98.19	116.51	134.80	157.31	174.40	43.69	66.53	89.83	111.50	133.00	159.48	179.12
L.S.D at	5 %	0.532	0.582	0.574	0.486	0.442	0.706	0.572	0.559	0.669	1.190	1.103	0.499	1.197	1.395
	1%	0.741	0.776	0.766	0.649	0.589	0.941	0.763	0.745	0.892	1.588	1.471	0.666	1.596	1.860
2nd season															
Pulsing solutions	D.W	45.75	69.82	88.91	108.59	125.48	149.57	164.07	36.01	61.32	82.71	111.73	126.69	156.61	174.55
	Kin.20 ppm	51.49	74.93	96.58	114.20	133.01	153.29	168.29	41.10	64.97	89.35	109.67	132.37	156.50	174.93
	BA 10 ppm	51.56	73.85	98.38	115.24	134.24	154.37	170.20	39.56	62.90	90.47	110.02	131.71	156.63	175.86
	Sucrose 10 %	51.73	72.59	98.75	113.19	131.78	149.02	166.42	41.15	64.03	92.52	110.31	132.05	154.56	175.41
	STS 1:4 ml	61.11	79.49	101.80	116.49	137.31	159.37	177.98	48.48	68.40	93.05	110.55	135.06	160.90	18357
L.S.D at	5 %	1.854	1.727	1.778	1.259	1.431	1.319	1.514	2.015	2.039	1.860	1.575	2.154	1.436	1.730
	1%	2.473	2.304	2.373	1.679	1.909	1.760	2.020	2.688	2.720	2.481	2.101	2.873	1.916	2.307

flower stalks was registered by using pulsing solution of STS at 1:4mM for 30 minutes in the two seasons.

As for the effect holding solution treatments on water uptake, data in Table (100) demonstrate that water uptake of Bird of paradise cut flower stalks was increased after 4 days from the treatment to the end of age of longevity 28 days in both seasons. However, holding bird of paradise cut flower stalks bases in holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) resulted the highest significant increase in water uptake as compared to the other ones under study in both seasons. Moreover, holding solution contained (sucrose at 4% + citric acid at 200ppm) and (sucrose at 4% + 8-HQS at 200ppm) recorded highly significant increase in water uptake of Bird of paradise cut flower stalks as compared to control (distilled water) in the two seasons. Furthermore, the lowest value of water uptake of Bird of paradise cut flower stalks was registered by using holding solution contained (sucrose at 4%) when compared to control (D.W) and other treatments in the two seasons.

Concerning the interaction effect between pulsing solutions and holding solutions treatments on water uptake, data in Tables (101 & 102) demonstrate that all the combinations between pulsing solutions and holding solutions succeeded in increasing water uptake of Bird of paradise cut flower stalks as compared to control in the two seasons with the exception of the combination of sucrose at 4% as a holding solution in most

cut flower stalk

								28
								163.67
								155.83
								169.23
								162.40
								169.23
								164.20
								161.57
								174.13
								168.23
								173.33
								163.37
								161.03
								177.80
								170.17
								178.63
								159.27
								158.20
								173.10
								168.73
								172.80
								170.57
								167.70
								184.90
								178.23
								188.50
								3.386
								4.517

Table (100): Effect of holding solutions treatments, on Water uptake and Water loss (g)/stalk of *Strelitzia reginae* Ait.cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Water uptake (g)/stalk Shelf life periods (days)							Water loss (g)/stalk Shelf life periods (days)						
		4	8	12	16	20	24	28	4	8	12	16	20	24	28
1st season															
holding solutions	D.W	47.77	73.80	93.95	112.96	131.77	151.93	161.49	39.86	67.51	90.26	112.21	135.01	160.41	169.27
	Sucrose 4 %	38.30	65.95	86.11	106.57	122.67	145.41	157.06	33.43	61.69	84.77	108.85	127.87	155.94	172.20
	Sucrose 4% +CA 200 ppm	52.53	75.69	96.10	114.02	133.40	154.55	173.00	41.36	65.37	87.57	108.47	131.35	156.48	178.87
	Sucrose 4 % + 8HQS 200 ppm	52.89	75.74	96.31	114.72	133.67	154.36	17291	41.87	65.61	87.46	109.45	131.50	156.23	178.03
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	56.05	77.75	99.14	116.36	135.02	156.99	175.30	41.08	63.86	87.51	108.30	130.25	156.40	178.81
L.S.D at	5 %	0.532	0.582	0.574	0.486	0.442	0.706	0.572	0.559	0.669	1.190	1.103	0.499	1.197	1.395
	1%	0.741	0.776	0.766	0.649	0.589	0.941	0.763	0.745	0.892	1.588	1.471	0.666	1.596	1.860
2ad season															
holding solutions	D.W	51.25	74.61	98.27	113.61	134.21	151.85	164.21	41.57	67.36	92.98	112.13	136.41	158.47	174.79
	Sucrose 4 %	43.55	67.86	91.13	109.43	127.97	146.53	160.87	37.90	62.49	88.98	109.19	131.32	155.97	174.32
	Sucrose 4% +CA 200 ppm	55.20	75.42	97.89	114.97	133.77	156.54	175.83	41.75	63.69	88.51	110.80	130.22	158.07	180.27
	Sucrose 4 % + 8HQS 200 ppm	54.33	73.58	96.51	113.07	130.61	151.72	16955	44.03	63.64	89.26	109.59	129.41	154.31	176.13
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	57.32	79.21	100.63	116.56	135.28	158.99	176.67	41.06	64.43	88.38	110.57	130.53	158.38	178.81
L.S.D at	5 %	1.854	1.727	1.778	1.259	1.431	1.319	1.514	2.015	2.039	1.860	1.575	2.154	1.436	1.730
	1%	2.473	2.304	2.373	1.679	1.909	1.760	2.020	2.688	2.720	2.481	2.101	2.873	1.916	2.307

Table (101) : Effect of interaction between pulsing solutions and holding solutions treatments on Water uptake (g)/stalk of *Strelitzia reginae* Ait. cut flower stalk during first season 2007-2008.

Treatments		Water uptake (g)/stalk						
		1st season						
Pulsing solutions	Holding Solutions	Shelf life periods (days)						
		4	8	12	16	20	24	28
D.W	D.W	44.70	71.67	90.23	109.33	128.00	149.33	158.70
	Sucrose 4 %	30.33	54.43	78.87	98.30	116.73	140.33	152.63
	Sucrose 4% +CA 200 ppm	50.30	74.43	92.60	110.77	129.57	152.13	167.20
	Sucrose 4 % + 8HQS 200 ppm	48.30	74.00	91.60	110.23	128.97	150.60	166.23
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	52.70	75.40	94.10	112.63	130.07	154.57	168.83
Kin.20 ppm	D.W	46.77	73.90	93.40	112.47	131.90	152.03	161.37
	Sucrose 4 %	36.97	68.27	86.73	107.50	123.40	146.13	156.70
	Sucrose 4% +CA 200 ppm	51.97	76.00	95.27	114.10	133.57	152.93	172.03
	Sucrose 4 % + 8HQS 200 ppm	52.57	76.60	97.13	115.67	134.47	153.67	172.37
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	54.67	77.47	99.13	116.47	135.53	155.93	173.13
BA 10 ppm	D.W	48.73	75.43	96.07	115.67	133.77	152.70	162.37
	Sucrose 4 %	38.27	69.73	87.90	110.07	126.07	148.37	158.13
	Sucrose 4% +CA 200 ppm	52.37	76.13	97.47	114043	135.53	155.13	174.43
	Sucrose 4 % + 8HQS 200 ppm	53.67	76.37	98.93	116.97	136.40	155.70	175.27
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	56.00	78.43	102.00	118.27	137.00	156.83	176.47
Sucrose 10 %	D.W	46.00	71.47	92.27	111.20	129.70	150.87	159.53
	Sucrose 4 %	36.07	65.30	85.13	105.27	119.70	143.00	155.17
	Sucrose 4% +CA 200 ppm	50.90	72.90	95.47	113.13	131.87	152.33	171.77
	Sucrose 4 % + 8HQS 200 ppm	51.80	73.40	95.00	113.00	132.47	152.67	171.50
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	55.03	76.23	97.80	115.57	133.97	154.37	172.97
STS 1:4 ml	D.W	52.63	76.53	97.80	116.13	135.47	154.70	165.50
	Sucrose 4 %	49.87	72.03	91.90	112.17	127.47	149.23	162.67
	Sucrose 4% +CA 200 ppm	57.13	78.97	99.70	117.67	136.47	160.23	179.57
	Sucrose 4 % + 8HQS 200 ppm	58.10	78.33	98.87	117.73	136.07	159.17	179.17
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	61.83	81.23	102.67	118.87	138.53	163.23	185.10
L.S.D at	5%	1.197	1.301	1.284	1.088	0.988	1.578	1.279
	1%	1.597	1.736	1.713	1.451	1.318	2.105	1.706

7.1.g.-Water loss (g)/stalks:

Data shown in Table (99) reveal that all pulsing solution treatments highly significant increased the water loss of Bird of Paradise cut flower stalks after 8, 12, 16, 20, 24 and 28 days from the treatment compared to the control (distilled water) in the two seasons. However, the treatment of STS at 1:4mM for 30 minutes after 4, 8, 12, 16, 20, 24 and 28days from the treatment recorded the highest values in this regard compared with the others ones under study in the two seasons.

Regarding to the effect holding solution treatments on water loss, data presented in Table (100) demonstrate that holding Bird of paradise cut flower stalks bases in holding solutions contained (sucrose at 4%) recorded highly significant decrease in water loss after 4, 8, 12, 16, 20 and 24 day from the treatment as compared to control (distilled water) in the two seasons. Moreover, the other treatments of holding solution of Bird of paradise cut flower stalks were decreased of water loss after 8, 12, 16, 20 and 24 days from the treatment as compared to control in the two seasons, irrespective 4 and 28 day from the treatment the abovementioned treatment of holding solutions were increased of water loss as compared to control (distilled water) in both seasons.

With regard to the interaction effect between pulsing solutions and holding solutions treatments on water loss, data in Tables (103 & 104) indicate that most the combinations between pulsing solutions and holding solutions decreased water loss of bird of paradise cut flower stalks as compared to control

Table (103): Effect of interaction between pulsing solutions and holding solutions treatments on Water loss (g)/stalk of *Strelitzia reginae* Ait. cut flower stalk during first season 2007-2008.

Treatments		Water loss (g)/stalk						
		1st season						
Pulsing solutions	Holding Solutions	Shelf life periods (days)						
		4	8	12	16	20	24	28
D.W	D.W	38.30	66.70	87.57	110.13	132.63	161.63	174.50
	Sucrose 4 %	26.43	51.37	78.13	104.10	123.60	154.80	170.10
	Sucrose 4% +CA 200 ppm	41.20	66.50	83.67	106.83	128.53	156.57	175.70
	Sucrose 4 % + 8HQS 200 ppm	40.00	66.10	84.80	107.40	128.00	155.03	174.73
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	40.43	64.03	84.63	10757	128.13	158.17	175.63
Kin.20 ppm	D.W	39.63	68.30	90.07	111.87	135.37	160.37	173.87
	Sucrose 4 %	32.37	63.67	85.50	109.17	128.53	156.03	171.00
	Sucrose 4% +CA 200 ppm	41.17	66.23	87.67	109.00	132.03	154.40	177.27
	Sucrose 4 % + 8HQS 200 ppm	42.57	67.10	86.33	110.67	132.37	155.27	178.00
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	40.07	63.33	87.40	107.97	130.10	154.73	176.07
BA 10 ppm	D.W	39.30	67.67	91.37	114.07	136.63	161.17	171.23
	Sucrose 4 %	33.17	64.80	86.10	110.53	130.47	156.70	171.50
	Sucrose 4% +CA 200 ppm	39.80	64.60	88.57	107.90	132.20	156.20	179.97
	Sucrose 4 % + 8HQS 200 ppm	40.93	64.73	89.87	110.17	133.63	156.50	180.47
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	39.53	62.93	89.50	108.67	131.87	154.63	177.70
Sucrose 10 %	D.W	39.33	66.10	89.27	111.27	133.27	159.97	172.87
	Sucrose 4 %	32.27	62.00	84.13	107.27	125.60	154.13	173.67
	Sucrose 4% +CA 200 ppm	40.87	63.53	88.27	107.67	130.43	154.70	179.07
	Sucrose 4 % + 8HQS 200 ppm	41.23	63.83	87.57	108.07	130.83	155.00	178.60
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	40.93	63.97	88.27	108.63	130.67	153.90	178.40
STS 1:4 ml	D.W	42.73	68.77	93.03	113.73	137.17	158.90	173.87
	Sucrose 4 %	42.93	66.60	89.97	113.17	131.17	158.03	174.73
	Sucrose 4% +CA 200 ppm	43.77	65.97	89.70	110.97	133.53	160.53	182.37
	Sucrose 4 % + 8HQS 200 ppm	44.60	66.30	88.73	110.97	132.67	159.37	178.37
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	44.43	65.03	87.73	108.67	130.47	160.57	186.27
L.S.D at	5%	1.249	1.495	2.662	2.466	1.116	2.676	3.118
	1%	1.666	1.994	3.551	3.20	1.489	3.570	4.160

Table (104): Effect of interaction between pulsing solutions and holding solutions treatments on Water loss (g)/stalk of *Strelitzia reginae* Ait. cut flower stalk during the second season 2008-2009.

Treatments		Water loss (g)/stalk						
		2nd season						
		Shelf life periods (days)						
Pulsing solutions	Holding Solutions	4	8	12	16	20	24	28
D.W	D.W	39.27	67.97	88.00	110.03	132.67	161.53	177.93
	Sucrose 4 %	27.93	52.87	77.10	100.70	124.33	153.13	172.67
	Sucrose 4% +CA 200 ppm	42.70	64.47	85.17	117.30	126.40	159.30	176.03
	Sucrose 4 % + 8HQS 200 ppm	36.90	61.07	81.93	111.33	123.33	149.73	171.47
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	33.27	60.23	81.37	119.27	126.73	159.37	174.67
Kin.20 ppm	D.W	38.77	65.80	90.20	112.57	137.07	159.63	174.57
	Sucrose 4 %	40.20	64.93	88.93	110.90	133.20	158.10	174.23
	Sucrose 4% +CA 200 ppm	39.37	63.17	86.23	110.70	131.47	154.67	177.80
	Sucrose 4 % + 8HQS 200 ppm	47.83	65.90	93.07	108.27	130.40	154.63	174.40
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	39.33	65.03	88.33	105.90	129.73	155.47	173.67
BA 10 ppm	D.W	41.37	66.93	96.23	113.70	138.67	157.97	172.60
	Sucrose 4 %	31.23	61.57	86.30	111.03	125.53	156.63	172.43
	Sucrose 4% +CA 200 ppm	38.00	59.77	88.97	106.47	128.73	157.57	180.80
	Sucrose 4 % + 8HQS 200 ppm	45.90	62.27	89.67	109.77	132.83	153.87	174.10
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	41.30	63.97	91.20	109.13	132.80	157.100	179.37
Sucrose 10 %	D.W	38.43	64.53	96.30	112.10	135.57	153.40	170.40
	Sucrose 4 %	41.47	63.40	95.83	111.17	133.10	153.60	173.50
	Sucrose 4% +CA 200 ppm	42.00	64.40	91.13	108.73	132.90	156.07	178.73
	Sucrose 4 % + 8HQS 200 ppm	41.00	62.50	89.30	109.77	127.33	154.40	177.37
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	42.87	65.30	90.03	109.77	131.37	155.33	177.03
STS 1:4 ml	D.W	50.03	71.57	94.17	112.23	138.10	159.80	178.47
	Sucrose 4 %	48.67	69.70	91.73	112.13	140.43	158.40	178.77
	Sucrose 4% +CA 200 ppm	46.67	66.63	91.07	110.80	131.60	162.73	187.97
	Sucrose 4 % + 8HQS 200 ppm	48.50	66.47	92.33	108.83	133.13	158.93	183.30
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	48.53	67.63	90.97	108.77	132.03	164.63	189.33
L.S.D at	5%	4.506	4.559	4.159	3.521	4.816	3.211	3.868
	1%	6.011	6.082	5.549	4.697	6.425	4.284	5.159

(distilled water) in the two seasons. However the interactions of pulsing solution of sucrose at 4% recorded the highest values of this parameter. However, the combined treatment between pulsing solution of distilled water and holding solution contained gave the potent water loss after 4 days from the treatment till the end of longevity in the two seasons under study. Furthermore, the water loss values of Bird of paradise cut flower stalks under all combination between pulsing and holding solutions was increased as cut flower stalks advanced in age after 4 days from the treatment to the end of age of longevity in the two seasons.

7.2.Effect of pulsing solutions and holding solutions treatments on :

7.2.Chemical constituent determinations:

7.2.1.-Carotenoids content (%) in petals:

According to data presented in Table (105), it could be concluded that all pulsing solution treatments of Bird of paradise cut flower stalks bases succeeded in increasing carotenoids content (%) in petals after (initial, 14 and till the end of longevity) from the treatments as compared to control in the two seasons. However, pulsing Bird of paradise cut flower stalks bases in STS at 1:4mM for 30 minutes resulted the highest significant increase in this parameter as compared to control in the two seasons. Furthermore, coroteniods content (%) in petals of Bird of paradise cut flower stalks under all pulsing treatments was decreased as flower cut stalks advanced in age after initial from the treatment till the end of longevity in both seasons.

Table (105): Effect of pulsing solutions treatments on Carotenoids percentage in petals, Total phenols percentage in petals and flower stalk and Total, Reducing , Non-Reducing sugars percentage in petals of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009 .

Treatments		Carotenoids percentage in petals			Total phenols percentage in petals			Total phenols percentage in flower stalk			Total sugars percentage in petals			Reducing sugars percentage in petals			Non-Reducing sugars percentage in petals		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
1st season																			
Pulsing solutions	D.W	4.833	3.433	1.305	0.407	0.301	0.213	0.407	0.326	0.215	4.593	3.161	1.523	2.240	1.419	0.674	2.353	1.741	0.849
	Kin.20 ppm	4.833	3.662	1.573	0.407	0.277	0.195	0.407	0.295	0.210	4.593	3.255	1.584	2.240	1.479	0.718	2.353	1.776	0.866
	BA 10 ppm	4.833	3.682	1.629	0.407	0.289	0.204	0.407	0.298	0.217	4.593	3.222	1.569	2.240	1.443	0.709	2.353	1.779	0.861
	Sucrose 10 %	4.833	3.538	1.489	0.407	0.305	0.225	0.407	0.308	0.223	4.593	3.343	1.648	2.240	1.551	0.740	2.353	1.793	0.908
	STS 1:4 ml	4.833	4.025	1.815	0.407	0.270	0.184	0.407	0.283	0.193	4.593	3.374	1.688	2.240	1.583	0.754	2.353	1.791	0.934
L.S.D at	5 %	-	0.104	0.090	-	0.008	0.007	-	0.011	0.008	-	0.033	0.023	-	0.023	0.023	-	0.040	0.023
	1%	-	0.239	0.120	-	0.011	0.009	-	0.014	0.011	-	0.044	0.031	-	0.031	0.031	-	0.054	0.031
2nd season																			
Pulsing solutions	D.W	4.873	3.615	1.309	0.397	0.290	0.185	0.433	0.331	0.231	4.653	3.192	1.521	2.273	1.428	0.685	2.380	1.764	0.836
	Kin.20 ppm	4.873	3.772	1.598	0.397	0.271	0.154	0.433	0.302	0.209	4.653	3.295	1.595	2.273	1.483	0.719	2.380	1.811	0.877
	BA 10 ppm	4.873	3.741	1.696	0.397	0.278	0.166	0.433	0.303	0.223	4.653	3.070	1.578	2.273	1.451	0.711	2.380	1.619	0.867
	Sucrose 10 %	4.873	3.412	1.534	0.397	0.291	0.189	0.433	0.325	0.245	4.653	3.367	1.656	2.273	1.557	0.742	2.380	1.810	0.914
	STS 1:4 ml	4.873	4.037	1.872	0.397	0.256	0.147	0.433	0.287	0.195	4.653	3.397	1.699	2.273	1.590	0.757	2.380	1.807	0.943
L.S.D at	5 %	-	0.163	0.111	-	0.007	0.008	-	0.009	0.007	-	0.242	0.016	-	0.023	0.023	-	0.239	0.023
	1%	-	0.217	0.149	-	0.009	0.011	-	0.013	0.009	-	0.323	0.022	-	0.031	0.031	-	0.319	0.031

Concerning the effect holding solution treatments on carotenoids content (%) in petals, Data presented in Table (106) demonstrate that all holding solution treatments resulted increases in carotenoids content (%) in petals of Bird of paradise cut flower stalks after (initial, 14, and end days) as compared to control in the two seasons. However, the highest significant increase in this parameter was registered by using holding solution contained (sucrose 4% + citric acid at 200ppm + 8-HQS at 200ppm) after (14 and end days) from the treatment as compared to control in the two seasons. Irrespective control, the lowest values of the percentage in carotenoids in petals of Bird of paradise cut flower stalks was recorded by holding solution contained (sucrose at 4%) in both seasons. The rest treatments occupied on intermediate position between the abovementioned treatments in both seasons of this study.

Furthermore, the percentage of carotenoids in petals of bird of paradise cut flower stalks under all holding solution treatments decreased as flower cut stalks advanced in age after initial from the treatment till end of age of longevity in the two seasons.

According to the interaction effect between pulsing solution and holding solution treatments on carotenoids content (%) in petals, data in Table (107) reveal that all the combinations treatments between pulsing solution and holding and holding solution succeeded in increasing the percentage of carotenoids in petals of bird of paradise cut flower stalks as compared to control (D.W) in the two seasons. However the

Table (106): Effect of Holding solutions treatments on Carotenoids percentage in petals, Total phenols percentage in petals and flower stalk and Total, Reducing, Non-Reducing sugars percentage in petals of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Carotenoids percentage in petals			Total phenols percentage in petals			Total phenols percentage in flower stalk			Total sugars percentage in petals			Reducing sugars percentage in petals			Non-Reducing sugars percentage in petals		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
1st season																			
Holding solutions	D.W	4.833	2.989	1.263	0.407	0.316	0.219	0.407	0.335	0.227	4.593	2.856	1.465	2.240	1.321	0.653	2.353	1.353	0.812
	Sucrose 4 %	4.833	3.384	1.437	0.407	0.307	0.219	0.407	0.323	0.226	4.593	3.235	1.581	2.240	1.455	0.700	2.353	1.779	0.881
	Sucrose 4% +CA 200 ppm	4.833	3.844	1.627	0.407	0.277	0.195	0.407	0.28	0.196	4.593	3.437	1.679	2.240	1.583	0.757	2.353	1.855	0.923
	Sucrose 4 % + 8HQS 200 ppm	4.833	3.816	1.650	0.407	0.281	0.203	0.407	0.291	0.217	4.593	3.319	1.587	2.240	1.463	0.712	2.353	1.856	0.875
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.833	4.127	1.835	0.407	0.261	0.185	0.407	0.277	0.193	4.593	3.507	1.699	2.240	1.652	0.773	2.353	1.855	0.926
L.S.D at	5 %	-	0.104	0.090	-	0.008	0.007	-	0.011	0.008	-	0.033	0.023	-	0.023	0.023	-	0.040	0.023
	1%	-	0.239	0.120	-	0.011	0.009	-	0.014	0.011	-	0.044	0.031	-	0.031	0.031	-	0.054	0.031
2nd season																			
Holding solutions	D.W	4.873	3.075	1.297	0.397	0.297	0.193	0.433	0.345	0.233	4.653	2.965	1.468	2.273	1.331	0.669	2.380	1.534	0.799
	Sucrose 4 %	4.873	3.455	1.458	0.397	0.293	0.183	0.433	0.328	0.231	4.653	3.095	1.587	2.273	1.449	0.703	2.380	1.645	0.885
	Sucrose 4% +CA 200 ppm	4.873	3.905	1.738	0.397	0.265	0.148	0.433	0.289	0.206	4.653	3.459	1.682	2.273	1.591	0.753	2.380	1.867	0.929
	Sucrose 4 % + 8HQS 200 ppm	4.873	3.990	1.613	0.397	0.280	0.169	0.433	0.304	0.228	4.653	3.357	1.606	2.273	1.476	0.713	2.380	1.881	0.893
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.873	4.152	1.903	0.397	0.251	0.143	0.433	0.281	0.206	4.653	3.545	1.706	2.273	1.661	0.775	2.380	1.884	0.931
L.S.D at	5 %	-	0.163	0.111	-	0.007	0.008	-	0.009	0.007	-	0.242	0.016		0.023	0.023	-	0.239	0.023
	1%	-	0.217	0.149	-	0.009	0.011	-	0.013	0.009	-	0.323	0.022		0.031	0.031	-	0.319	0.031

Table (107): Effect of interaction between pulsing solutions and holding solutions treatments on Carotenoids percentage in petals in petals of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatment		Carotenoids percentage in petals					
		1st season			2nd season		
Pulsing solutions	Holding Solutions	Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End
D.W	D.W	4.833	2.840	1.110	4.873	2.977	1.133
	Sucrose 4 %	4.833	3.353	1.173	4.873	3.460	1.210
	Sucrose 4% +CA 200 ppm	4.833	3.433	1.313	4.873	3.553	1.303
	Sucrose 4 % + 8HQS 200 ppm	4.833	3.527	1.440	4.873	3.953	1.397
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.833	4.013	1.490	4.873	4.133	1.500
Kin.20 ppm	D.W	4.833	2.990	1.220	4.873	3.090	1.210
	Sucrose 4 %	4.833	3.550	1.387	4.873	3.620	1.417
	Sucrose 4% +CA 200 ppm	4.833	3.757	1.673	4.873	3.953	1.827
	Sucrose 4 % + 8HQS 200 ppm	4.833	3.953	1.667	4.873	4.073	1.623
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.833	4.060	1.920	4.873	4.123	1.913
BA 10 ppm	D.W	4.833	3.017	1.307	4.873	3.307	1.380
	Sucrose 4 %	4.833	3.187	1.537	4.873	3.237	1.600
	Sucrose 4% +CA 200 ppm	4.833	4.007	1.713	4.873	3.850	1.853
	Sucrose 4 % + 8HQS 200 ppm	4.833	4.033	1.660	4.873	4.103	1.610
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.833	4.167	1.930	4.873	4.210	2.037
Sucrose 10 %	D.W	4.833	2.890	1.237	4.873	2.880	1.250
	Sucrose 4 %	4.833	3.113	1.423	4.873	3.143	1.430
	Sucrose 4% +CA 200 ppm	4.833	3.613	1.510	4.873	3.747	1.627
	Sucrose 4 % + 8HQS 200 ppm	4.833	3.343	1.513	4.873	3.563	1.530
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.833	3.830	1.760	4.873	3.727	1.833
STS 1:4 ml	D.W	4.833	3.207	1.440	4.873	3.123	1.510
	Sucrose 4 %	4.833	3.717	1.667	4.873	3.813	1.633
	Sucrose 4% +CA 200 ppm	4.833	4.410	1.923	4.873	4.423	2.080
	Sucrose 4 % + 8HQS 200 ppm	4.833	4.223	1.970	4.873	4.257	1.907
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.833	4.567	2.073	4.873	4.567	2.230
L.S.D at	5%	-	0.232	0.201	-	0.363	0.249
	1%	-	0.310	0.268	-	0.484	0.332

combinations of pulsing solution of STS at 1:4mM for 30 minutes gained the highest values of parameter, particularly the interaction between pulsing solution of STS at 1:4mM for 30 minutes and (holding solution contained sucrose 4% + CA 200ppm + 8-HQS 200ppm) followed descendingly by holding solution contained (sucrose 4% + CA 200ppm) and (sucrose 4% + 8-HQS 200ppm) after (14 and end days) from the treatment as compared to control in the two seasons. Moreover the interaction treatment between (pulsing solution of (Benzyladenine at 10ppm for 24hours) and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) and (pulsing solution of (kinetin at 20ppm for 24hours) and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) respectively resulted highly significant increases of the percentage of carotenoids in petals of bird of paradise cut flower stalks after (14 and end days) from the treatment as compared to control in both seasons. On the reverse, the lowest values of this parameter was registered by using interaction between pulsing solution of control (D.W) for 24hours and holding solution control (D.W) and interaction between pulsing solution of sucrose at 10% for 24hours and holding solution contained (distilled water) respectively in the two seasons after (14 and end days) from the treatment and this study.

7.2.2.-Total phenols content (%) in petals and flower stalk:

It is obvious from data presented in Table (105) that all pulsing treatments of bird of paradise cut flower stalks bases decreased total phenols content (%) in petals when compared to

control with the exception of pulsing solution of sucrose at 10% for 24hours after (14days and the end) from the treatment in the two seasons. Moreover, all pulsing treatments of bird of paradise cut flower stalks decreased total phenols content (%) in flower stalk as compared to control except for pulsing treatment of sucrose at 10% for 24hours after (end) from the treatment in the two seasons and BA at 10% for 24hours in the first seasons. Furthermore, the highest significant decrease of total phenols content (%) in petals and flower stakes of Bird of paradise cut flower stalks was registered by using pulsing treatment of STS at 1:4mM for 30minutes after (14days and end days) from the treatment as compared to control in the two seasons. Anyhow, total phenols contents (%) in petals and flower stalks of paradise cut flower stalks under all pulsing treatments was decreased after the initial days from the treatment as flower cut stalks prolonged in age till the end of longevity in the two seasons.

As for the effect holding solution treatments on total phenols content (%) in petals and flower stalk, data in Table (106) reveal that all holding solution treatments succeeded in decreasing the percentage of total phenols in petals and flower stalks of Bird of paradise cut flower stalks as compared to control in two seasons, especially, holding solution contained (sucrose at 4% + citric acid at 200ppm). On the reverse, the highest values of the percentage of total phenols in petals and flower stalks was recorded by using the treatment of holding solution contained (distilled water) as control, followed descendingly by (sucrose at 4%) in the two seasons. Furthermore, the percentage of total phenols in petals and flower

stalks of Bird of paradise cut of flower stalks was decreased as flower cut stalks advanced in age after (initial) from the treatment till the end of age of longevity in the two seasons.

Regarding to the interaction effective between pulsing solution and holding solution on Total phenols contents (%) in petals, data in Table (108) indicate that most the interaction treatments between pulsing solution and holding solution resulted decreases in the percentage of total phenols in petals and flower stalks of Bird of paradise cut flower stalks as compared to control (D.W) in the two seasons. However, the interaction of pulsing solution of STS at 1:4mM for 30 minutes exhibited the most effective for inducing the lowest values of this parameter, especially the interaction between pulsing solution of STS at 1:4mM for 30 minutes and holding solution contained (sucrose at 4% + CA 200ppm + 8-HQS at 200ppm) and holding solution contained (sucrose at 4% + CA 200ppm) respectively as compared to the other ones under study in the two seasons after (14 and end days) from the treatment. Moreover, the highest values of this parameter was recorded by using the interaction treatment of pulsing solution of (sucrose at 10% for 24hours) and holding solution contained (distilled water) as control and the interaction of pulsing solution of distilled water as control and holding solution contained distilled water as control respectively in most cases after (14 and end days) from the treatment in the two seasons under this study. Any how, the percentage of total phenols in petals and flower stalks of bird of paradise cut flower stalks was decreased as flower cut stalks prolonged in age after (initial) from the

Table (108): Effect of interaction between pulsing solutions and holding solutions treatments on Total phenols percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatment		Total phenols percentage in petals						Total phenols percentage in flower stalk					
		1st season			2nd season			1st season			2nd season		
Pulsing solutions	Holding Solutions	Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
D.W	D.W	0.407	0.330	0.227	0.397	0.313	0.200	0.407	0.377	0.230	0.433	0.380	0.250
	Sucrose 4 %	0.407	0.313	0.223	0.397	0.307	0.187	0.407	0.327	0.220	0.433	0.347	0.233
	Sucrose 4% +CA 200 ppm	0.407	0.290	0.207	0.397	0.277	0.173	0.407	0.307	0.203	0.433	0.310	0.220
	Sucrose 4 % + 8HQS 200 ppm	0.407	0.297	0.210	0.397	0.293	0.193	0.407	0.320	0.223	0.433	0.317	0.243
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.407	0.277	0.200	0.397	0.260	0.170	0.407	0.300	0.200	0.433	0.300	0.210
Kin.20 ppm	D.W	0.407	0.300	0.210	0.397	0.287	0.183	0.407	0.320	0.223	0.433	0.330	0.220
	Sucrose 4 %	0.407	0.297	0.210	0.397	0.290	0.177	0.407	0.330	0.230	0.433	0.317	0.213
	Sucrose 4% +CA 200 ppm	0.407	0.273	0.180	0.397	0.253	0.130	0.407	0.280	0.193	0.433	0.287	0.190
	Sucrose 4 % + 8HQS 200 ppm	0.407	0.273	0.193	0.397	0.287	0.157	0.407	0.273	0.210	0.433	0.307	0.220
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.407	0.243	0.180	0.397	0.240	0.123	0.407	0.270	0.193	0.433	0.270	0.200
BA 10 ppm	D.W	0.407	0.310	0.217	0.397	0.297	0.193	0.407	0.323	0.230	0.433	0.337	0.233
	Sucrose 4 %	0.407	0.303	0.213	0.397	0.287	0.187	0.407	0.320	0.233	0.433	0.313	0.233
	Sucrose 4% +CA 200 ppm	0.407	0.280	0.200	0.397	0.277	0.143	0.407	0.283	0.203	0.433	0.280	0.210
	Sucrose 4 % + 8HQS 200 ppm	0.407	0.283	0.200	0.397	0.280	0.167	0.407	0.290	0.217	0.433	0.303	0.230
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.407	0.270	0.190	0.397	0.250	0.140	0.407	0.273	0.200	0.433	0.280	0.210
Sucrose 10 %	D.W	0.407	0.333	0.240	0.397	0.320	0.210	0.407	0.343	0.240	0.433	0.360	0.257
	Sucrose 4 %	0.407	0.327	0.243	0.397	0.303	0.213	0.407	0.333	0.243	0.433	0.363	0.263
	Sucrose 4% +CA 200 ppm	0.407	0.297	0.217	0.397	0.273	0.177	0.407	0.287	0.21	0.433	0.300	0.230
	Sucrose 4 % + 8HQS 200 ppm	0.407	0.290	0.220	0.397	0.283	0.180	0.407	0.293	0.223	0.433	0.307	0.343
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.407	0.277	0.203	0.397	0.273	0.163	0.407	0.283	0.200	0.433	0.293	0.230
STS 1:4 ml	D.W	0.407	0.307	0.203	0.397	0.270	0.177	0.407	0.310	0.210	0.433	0.317	0.203
	Sucrose 4 %	0.407	0.297	0.207	0.397	0.277	0.170	0.407	0.307	0.203	0.433	0.300	0.210
	Sucrose 4% +CA 200 ppm	0.407	0.247	0.170	0.397	0.243	0.117	0.407	0.257	0.170	0.433	0.270	0.180
	Sucrose 4 % + 8HQS 200 ppm	0.407	0.260	0.190	0.397	0.257	0.150	0.407	0.280	0.213	0.433	0.287	0.203
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.407	0.240	0.150	0.397	0.233	0.120	0.407	0.260	0.170	0.433	0.260	0.180
L.S.D at	5%	-	0.018	0.015	-	0.015	0.018	-	0.014	0.018	-	0.021	0.015
	1%	-	0.025	0.020	-	0.020	0.025	-	0.024	0.025	-	0.028	0.020

treatment till the end of age of longevity under all the interaction between pulsing solution and holding solution treatments in the two seasons.

7.2.3.-Total sugars content (%) in petals and flower stalks:

Data in Table (105&112) reveal that all pulsing solution treatments of Bird of paradise cut flower stalks succeeded in increasing total sugars content (%) in petals after (initial, 14, end days) from the treatment as compared to control (distilled water) in the two seasons. However, pulsing Bird of paradise cut flower stalks bases in STS at 1:4mM for 30 minutes showed to be the most effective one for inclosing the highest values of this parameter in the two seasons. Moreover the lowest values of total sugars content (%) in petals was registered by using control distilled water for 24hours in the two seasons. Furthermore, data in Table (106) indicate that all pulsing solution treatments increased the percentage of total sugars in flower stalks as compared to control in the two seasons. However, pulsing treatment of STS at 1:4mM 30 minutes exhibited the most effective one for producing the highest values of this parameter followed dissentingly sucrose at 10% for 24hours in the two seasons with the lowest values of this parameter was recorded by using control for 24hours in the two seasons.

With regard to the effect holding solution treatments on total sugars content (%) in petals and flower stalks, data presented in Tables (106 & 113) reveal that all holding solution treatments censed increments in the percentage of total sugars in

Table (112): Effect of pulsing solutions treatments on Total, Reducing, Non-Reducing sugars percentage in flower stalk and potassium percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Total sugars percentage in flower stalk			Reducing sugars percentage in flower stalk			Non -Reducing sugars percentage in flower stalk			Potassium percentage in petals			Potassium percentage in flower stalk		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
1st season																
Pulsing solutions	D.W	4.783	3.323	1.622	2.357	1.533	0.777	2.427	1.790	0.845	2.680	2.692	2.635	1.907	1.895	1.967
	Kin.20 ppm	4.783	3.466	1.678	2.357	1.631	0.799	2.427	1.835	0.879	2.680	2.728	2.677	1.907	2.133	2.029
	BA 10 ppm	4.783	3.40	1.681	2.357	1.622	0.793	2.427	1.778	0.888	2.680	2.707	2.663	1.907	2.126	2.009
	Sucrose 10 %	4.783	3.734	1.762	2.357	1.769	0.848	2.427	1.965	0.814	2.680	2.706	2.665	1.907	2.153	2.041
	STS 1:4 ml	4.783	3.913	1.859	2.357	1.829	0.903	2.427	2.085	0.956	2.680	2.747	2.695	1.907	2.197	2.078
L.S.D at	5 %	-	0.084	0.046	-	0.052	0.033	-	0.084	0.040	-	0.016	0.015	-	0.111	0.018
	1%	-	0.107	0.062	-	0.069	0.044	-	0.107	0.054	-	0.021	0.020	-	0.149	0.024
2nd season																
Pulsing solutions	D.W	4.940	3.371	1.665	2.763	1.576	0.794	2.510	1.795	0.841	2.677	2.694	2.635	1.933	2.105	2.002
	Kin.20 ppm	4.940	3.509	1.715	2.763	1.659	0.818	2.510	1.850	0.897	2.677	2.721	2.673	1.933	2.139	2.038
	BA 10 ppm	4.940	3.485	1.969	2.763	1.652	0.808	2.510	1.833	0.888	2.677	2.712	2.665	1.933	2.152	2.050
	Sucrose 10 %	4.940	3.739	1.765	2.763	1.771	0.851	2.510	1.968	0.914	2.677	2.714	2.671	1.933	2.147	2.046
	STS 1:4 ml	4.940	3.814	1.867	2.763	1.848	0.905	2.510	1.966	0.961	2.677	2.741	2.694	1.933	2.197	2.103
L.S.D at	5 %	-	0.084	0.046	-	0.040	0.023	-	0.093	0.033	-	0.013	0.012	-	0.033	0.040
	1%	-	0.111	0.062	-	0.054	0.031	-	0.124	0.044	-	0.017	0.015	-	0.044	0.054

Table (113): Effect of Holding solutions treatments on Total, Reducing , Non-Reducing sugars percentage in flower stalk and potassium percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatments		Total sugars percentage in flower stalk			Reducing sugars percentage in flower stalk			Non -Reducing sugars percentage in flower stalk			Potassium percentage in petals			Potassium percentage in flower stalk		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
1st season																
Holding solutions	D.W	4.783	3.157	1.598	2.357	1.411	0.747	2.427	1.746	0.851	2.680	2.660	2.610	1.907	2.069	1.962
	Sucrose 4 %	4.783	3.594	1.675	2.357	1.613	0.808	2.427	1.981	0.867	2.680	2.688	2.633	1.907	2.111	2.011
	Sucrose 4% +CA 200 ppm	4.783	3.728	1.795	2.357	1.833	0.883	2.427	1.895	0.912	2.680	2.742	2.696	1.907	2.195	2.082
	Sucrose 4 % + 8HQS 200 ppm	4.783	3.567	1.679	2.357	1.666	0.780	2.427	1.901	0.899	2.680	2.733	2.683	1.907	2.011	2.009
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.783	3.790	1.856	2.357	1.861	0.901	2.427	1.929	0.955	2.680	2.757	2.713	1.907	2.117	2.060
L.S.D at	5 %	-	0.084	0.046	-	0.052	0.033	-	0.084	0.040	-	0.016	0.015	-	0.111	0.018
	1%	-	0.107	0.062	-	0.069	0.044	-	0.107	0.054	-	0.021	0.020	-	0.149	0.024
2nd season																
Holding solutions	D.W	4.940	3.221	1.614	2.763	1.445	0.765	2.510	1.776	0.849	2.677	2.665	2.613	1.933	2.087	1.965
	Sucrose 4 %	4.940	3.613	1.701	2.763	1.619	0.815	2.510	1.994	0.885	2.677	2.697	2.629	1.933	2.104	1.991
	Sucrose 4% +CA 200 ppm	4.940	3.748	1.811	2.763	1.841	0.886	2.510	1.907	0.925	2.677	2.736	2.697	1.933	2.199	2.115
	Sucrose 4 % + 8HQS 200 ppm	4.940	3.610	1.722	2.763	1.707	0.806	2.510	1.903	0.916	2.677	2.727	2.687	1.933	2.143	2.040
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.940	3.726	1.861	2.763	1.893	0.905	2.510	1.833	0.956	2.677	2.757	2.711	1.933	2.207	2.127
L.S.D at	5 %	-	0.084	0.046	-	0.040	0.023	-	0.093	0.033	-	0.013	0.012	-	0.033	0.040
	1%	-	0.111	0.062	-	0.054	0.031	-	0.124	0.044	-	0.017	0.015	-	0.044	0.054

petals and flower stalks of bird of paradise cut flower stalks as compared to control in the two seasons. However, the highest values of the percentage of total sugars in petals and flower stalks was recorded by using holding solution contained (sucrose at 4% + citric acid at 200ppm + 8- HQS at 200ppm) as compared to the other treatments after (initial, 14 days, end days) from the treatment under this study in the two seasons, with the exception of (sucrose at 4% + citric acid at 200ppm) after 14 days in flower stalks in the second seasons. On the other hand, using the treatment of holding solution contained distilled water recorded the lowest values of the percentage of total sugars in petals and flower stalks after (initial, 14 and end days) from the treatment in both seasons. Furthermore, the percentage of total sugars in petals and flower stalks of Bird of paradise cut flower stalks was decreased as flower cut stalks prolonged in age after initial till the end of age of longevity in the two seasons.

As for the interaction effective between pulsing solution and holding solution treatments on total sugars content (%) in petals and flower stalks, data in Table (109) reveal that all the combinations treatments between pulsing solutions and holding solutions increased total sugars percent in petals and flower stalk of Bird of paradise cut flower stalks as compared to control in the two seasons. However, the combinations of pulsing solution of STS at 1:4mM for 30 minutes gave the most effective for producing the highest values of the percentage of total sugars in petals and flower stalks, especially the combined treatment of STS and holding solution contained (sucrose 4% + CA 200ppm

Table (109): Effect of interaction between pulsing solutions and holding solutions treatments on Total sugars percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatment		Total sugars percentage in petals						Total sugars percentage in flower stalk					
		1st season			2nd season			1st season			2nd season		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
Pulsing solutions	Holding Solutions	Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
D.W	D.W	4.593	2.773	1.393	4.653	2.780	1.397	4.783	3.087	1.573	4.940	3.153	1.597
	Sucrose 4 %	4.593	3.140	1.503	4.653	3.230	1.493	4.783	3.343	1.597	4.940	3.390	1.653
	Sucrose 4% +CA 200 ppm	4.593	3.270	1.593	4.653	3.270	1.590	4.783	3.390	1.680	4.940	3.457	1.717
	Sucrose 4 % + 8HQS 200 ppm	4.593	3.233	1.503	4.653	3.280	1.513	4.783	3.340	1.560	4.940	3.383	1.633
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.593	3.387	1.620	4.653	3.400	1.610	4.783	3.453	1.700	4.940	3.473	1.723
Kin.20 ppm	D.W	4.593	3.863	1.463	4.653	2.877	1.467	4.783	3.170	1.590	4.940	3.247	1.630
	Sucrose 4 %	4.593	3.203	1.560	4.653	3.247	1.570	4.783	3.423	1.643	4.940	3.470	1.690
	Sucrose 4% +CA 200 ppm	4.593	3.433	1.657	4.653	3.457	1.663	4.783	3.563	1.727	4.940	3.600	1.770
	Sucrose 4 % + 8HQS 200 ppm	4.593	3.317	1.547	4.653	3.360	1.577	4.783	3.523	1.650	4.940	3.553	1.693
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.593	3.457	1.693	4.653	3.533	1.700	4.783	3.650	1.780	4.940	3.673	1.793
BA 10 ppm	D.W	4.593	2.817	1.443	4.653	2.823	1.453	4.783	3.073	1.600	4.940	3.183	1.603
	Sucrose 4 %	4.593	3.170	1.537	4.653	2.240	1.540	4.783	3.387	1.683	4.940	3.437	1.680
	Sucrose 4% +CA 200 ppm	4.593	3.407	1.650	4.653	3.443	1.647	4.783	3.500	1.700	4.940	3.583	1.733
	Sucrose 4 % + 8HQS 200 ppm	4.593	3.287	1.547	4.653	3.367	1.560	4.783	3.430	1.670	4.940	3.503	1.687
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.593	3.430	1.670	4.653	3.477	1.690	4.783	3.610	1.753	4.940	3.717	1.777
Sucrose 10 %	D.W	4.593	2.910	1.490	4.653	2.923	1.487	4.783	3.230	1.617	4.940	3.270	1.627
	Sucrose 4 %	4.593	3.327	1.647	4.653	3.377	1.643	4.783	3.727	1.713	4.940	3.713	1.723
	Sucrose 4% +CA 200 ppm	4.593	3.520	1.717	4.653	3.543	1.723	4.783	3.980	1.810	4.940	3.913	1.810
	Sucrose 4 % + 8HQS 200 ppm	4.593	3.377	1.657	4.653	3.387	1.687	4.783	3.720	1.720	4.940	3.787	1.737
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.593	3.583	1.730	4.653	3.603	1.740	4.783	4.013	1.950	4.940	4.013	1.930
STS 1:4 ml	D.W	4.593	2.917	1.533	4.653	2.920	1.537	4.783	3.223	1.610	4.940	3.253	1.613
	Sucrose 4 %	4.593	3.333	1.660	4.653	3.380	1.690	4.783	4.090	1.737	4.940	4.053	1.757
	Sucrose 4% +CA 200 ppm	4.593	3.557	1.780	4.653	3.580	1.787	4.783	4.207	2.060	4.940	4.187	2.023
	Sucrose 4 % + 8HQS 200 ppm	4.593	3.383	1.683	4.653	3.390	1.693	4.783	3.823	1.793	4.940	3.823	1.860
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	4.593	3.680	1.783	4.653	3.713	1.790	4.783	4.223	2.097	4.940	3.753	2.080
L.S.D at	5%	-	0.073	0.052	-	0542	0.037	-	0.180	0.104	-	0.084	0.104
	1%	-	0.098	0.069	-	0.723	0.049	-	0.240	0.139	-	0.113	0.139

+ 8-HQS 200ppm) and holding solution contained (sucrose 4% + CA 200ppm) after (14 and end days) from the treatment as compared to control in both seasons. Moreover, the combined treatment of sucrose 10% and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or holding solution contained (sucrose 4% + CA 200ppm) recorded highly increases in this parameter after (14, and end days) from the treatment as compared to control (D.W) in the two seasons. Furthermore, the percentage of total sugars in petals and flower stalks under all the interaction treatments between pulsing solution and holding solution of Bird of paradise cut flower stalks was decreased as flower cut stalks advanced in age after initial till the end of longevity in two seasons.

7.2.4.-Reducing sugars content (%) in petals and flower stalks :

Data in Table (105&112) indicate that pulsing Bird of paradise cut flower stalks bases in STS at 1:4mm for 30 minutes gained the highest significant increase in reducing sugars content (%) in petals after (14 and end days) from the treatment as compared to control (distilled water) in the two seasons. Moreover, pulsing solution of sucrose at 10% for 24 hours recorded highly significant increase in this parameter as compared to control in the two seasons. Anyhow, Reducing sugars content (%) in petals under all tested treatments was decreased as flower cut stalks advanced in age after (initial) from the treatment till the end of longevity as well as total

sugars and non reducing sugars content (%) in petals in the two seasons.

Furthermore, data in Table (106) reveal that all pulsing solution treatments of Bird of paradise cut flower stalks recorded increases in the percentage of reducing sugars in flower stalks as compared to control in the two seasons. However, the highest of values of this parameter was registered by using pulsing solution of STS at 1:4mM for 30 minutes followed descendingly by sucrose at 10% for 24hours and kinetin at 20ppm for 24hours in the two seasons. The lowest values of this parameter was registered by using control (distilled water) for 24hours in the two seasons under this study.

As for the effect holding solution treatments on reducing sugars content (%) in petals and flower stalks, data in Tables (106 & 113) reveal that all holding solution treatments increased the percentage of reducing sugars in petals and flower stalks of bird of paradise cut flower stalks as compared to control in the two seasons. However, using holding solution contained (sucrose at 4% + citric acid 200ppm + 8-HQS at 200ppm) exhibited to be the most effective treatment for producing the highest values of this parameter as compared to the other treatments of this study in the two seasons, followed descendingly by holding solution contained (sucrose at 4% + citric acid at 200ppm) after (14 and end days) in both seasons. On the reverse, the lowest value of the percentage of reducing sugars in petals and flower stalks of Bird of paradise cut flower stalks was recorded by using control (distilled water) in the two

season. Any how, the percentage of reducing sugars in petals and flower stalks of Bird of paradise cut flower stalks was decreased as flower cut stalks advanced age after (initial) from the treatment till the end of age of longevity in the two seasons.

Referring to the interaction effective between pulsing solution and holding solution treatments on reducing sugars percentage in petals and flower stalk, data in Table (110) reveal that all the combinations treatments between pulsing solutions and holding solutions increased Reducing sugars percent in petals and flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. However, the combinations of pulsing solution of STS at 1:4mM for 30 minutes gave the most effective for producing the highest values of the percentage of Reducing sugars in petals and flower stalks, especially the combined treatment of STS and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) and holding solution contained (sucrose 4% + CA 200ppm) after (14 and end days) from the treatment as compared to control in both seasons.

Moreover, the combined treatment of sucrose 10% and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or holding solution contained (sucrose 4% + CA 200ppm) recorded highly increases in this parameter after (14, and end days) from the treatment as compared to control in the two seasons. Furthermore, the percentage of Reducing sugars in petals and flower stalks under all the interaction treatments between pulsing solution and holding solution of Bird of paradise cut flower stalks was decreased as flower cut stalks

Table (110): Effect of interaction between pulsing solutions and holding solutions treatments on Reducing sugars percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatment		Reducing sugars percentage in petals						Reducing sugars percentage in flower stalk					
		1st season			2nd season			1st season			2nd season		
Pulsing solutions	Holding Solutions	Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
D.W	D.W	2.240	1.270	0.580	2.273	1.287	0.640	2.357	1.357	0.713	2.763	1.423	0.727
	Sucrose 4 %	2.240	1.367	0.657	2.273	1.373	0.660	2.357	1.477	0.790	2.763	1.497	0.803
	Sucrose 4% +CA 200 ppm	2.240	1.493	0.713	2.273	1.490	0.707	2.357	1.670	0.817	2.763	1.690	0.823
	Sucrose 4 % + 8HQS 200 ppm	2.240	1.383	0.693	2.273	1.397	0.697	2.357	1.443	0.747	2.763	1.517	0.787
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.240	1.583	0.727	2.273	1.593	0.720	2.357	1.717	0.817	2.763	1.753	0.830
Kin.20 ppm	D.W	2.240	1.330	0.653	2.273	1.337	0.660	2.357	1.390	0.753	2.763	1.450	0.767
	Sucrose 4 %	2.240	1.413	0.690	2.273	1.407	0.697	2.357	1.530	0.803	2.763	1.530	0.817
	Sucrose 4% +CA 200 ppm	2.240	1.563	0.760	2.273	1.567	0.753	2.357	1.770	0.857	2.763	1.800	0.863
	Sucrose 4 % + 8HQS 200 ppm	2.240	1.433	0.710	2.273	1.447	0.700	2.357	1.650	0.737	2.763	1.667	0.793
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.240	1.653	0.777	2.273	1.660	0.783	2.357	1.817	0.843	2.763	1.847	0.850
BA 10 ppm	D.W	2.240	1.290	0.647	2.273	1.297	0.657	2.357	1.377	0.740	2.763	1.417	0.757
	Sucrose 4 %	2.240	1.390	0.690	2.273	1.390	0.693	2.357	1.487	0.783	2.763	1.510	0.800
	Sucrose 4% +CA 200 ppm	2.240	1.497	0.743	2.273	1.523	0.733	2.357	1.773	0.837	2.763	1.770	0.840
	Sucrose 4 % + 8HQS 200 ppm	2.240	1.423	0.700	2.273	1.427	0.703	2.357	1.677	0.743	2.763	1.683	0.777
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.240	1.613	0.763	2.273	1.617	0.770	2.357	1.797	0.863	2.763	1.880	0.867
Sucrose 10 %	D.W	2.240	1.350	0.687	2.273	1.353	0.690	2.357	1.473	0.750	2.763	1.467	0.780
	Sucrose 4 %	2.240	1.547	0.727	2.273	1.550	0.727	2.357	1.757	0.857	2.763	1.760	0.850
	Sucrose 4% +CA 200 ppm	2.240	1.643	0.773	2.273	1.650	0.770	2.357	1.907	0.907	2.763	1.897	0.897
	Sucrose 4 % + 8HQS 200 ppm	2.240	1.520	0.720	2.273	1.530	0.730	2.357	1.800	0.793	2.763	1.823	0.800
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.240	1.693	0.793	2.273	1.700	0.793	2.357	1.910	0.933	2.763	1.910	0.930
STS 1:4 ml	D.W	2.240	1.367	0.697	2.273	1.380	0.697	2.357	1.457	0.780	2.763	1.470	0.793
	Sucrose 4 %	2.240	1.560	0.737	2.273	1.527	0.737	2.357	1.817	0.807	2.763	1.797	0.807
	Sucrose 4% +CA 200 ppm	2.240	1.717	0.793	2.273	1.727	0.803	2.357	2.043	1.000	2.763	2.05	1.007
	Sucrose 4 % + 8HQS 200 ppm	2.240	1.557	0.737	2.273	1.580	0.737	2.357	1.760	0.880	2.763	1.847	0.873
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.240	1.717	0.807	2.273	1.737	0.810	2.357	2.067	1.050	2.763	2.077	1.047
L.S.D at	5%	-	0.052	0.052	-	0.052	0.052	-	0.116	0.073	-	0.090	0.052
	1%	-	0.069	0.069	-	0.069	0.069	-	0.155	0.098	-	0.120	0.069

advanced in age after initial till the end of longevity in two seasons.

7.2.5.-Non reducing sugars content (%) in petals and flower stalks :

Data in Table (105&112) reveal that all pulsing solution treatment of bird of paradise cut flower stalks bases scored increases of non reducing sugars content (%) in petals after (14days and end days) from the treatment as compared to control in the two seasons. However, pulsing solution of STS at 1:4mM for 30 minutes gave the highest significant increase in this parameter after (14 and end days) from the treatment as compared to control in the two seasons, with the exception of sucrose at 10% for 24 hours in the first season after (14 day from the treatment) and (kinetin at 20ppm for 24hours or sucrose at 10% for 24 hours) after (14 days from the treatment) in the second season under this study. Furthermore, data in Table (106) reveal that pulsing Bird of paradise cut flower stalks bases in STS at 1:4mM for 30 minutes appeared to be the most effective treatment for inducing the highest values of the percentage of non-reducing sugars in flower stalks after (initial, 14 and end days) from the treatment as compared to control in the two seasons. However, using the treatment of pulsing solution of sucrose at 10% and kinetin at 20ppm resulted highly increases after (14 and end days) in most cases when compared to control in both seasons. Moreover using the treatment of control (D.W) resulted the lowest of values of this parameter in the two seasons.

Referring to the effect holding solution treatments on non-reducing sugars content (%) in petals and flower stalks, data in Tables (106 & 113) reveal that all holding solution treatments succeeded in increasing the percentage of non-reducing sugars in petals and flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. However, the greatest values of this parameter was registered by using holding solution contained (sucrose at 4% + citric acid at 200ppm + 8-HQS at 200ppm) as compared to control in the two seasons, with the exception of holding solution contained (sucrose at 4% + 8-HQS at 200ppm) in the percentage of non reducing sugars in petals after 14 days from the treatment in the first season, and sucrose 4% in the percentage of non-reducing sugars in flower stalks after 14 days from the treatment in the first season, and (sucrose 4%), (sucrose 4% + CA 200ppm) and (sucrose 4% + 8-HQS at 200ppm) respectively in the percentage in non-reducing sugars in flower stalks after 14 days from the treatment in the two season. Moreover, the lowest values of this parameter was registered by using holding solution contained (D.W) as control after (initial, 14 and end days) from the treatment in both seasons under this study.

According to the interaction effective between pulsing solution and holding solutions treatments on Non-Reducing sugars percentage in petals and flower stalk, data in Table (111) indicate that most the combinations treatments between pulsing and holding solution succeeded in increasing the percentage of non-reducing sugars in petals and flower stalks of Bird of paradise cut flower stalks as compared to control (D.W) in the

Table (111): Effect of interaction between pulsing solutions and holding solutions treatments on Non-Reducing sugars percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatment		Non-Reducing sugars percentage in petals						Non -Reducing sugars percentage in flower stalk					
		1st season			2nd season			1st season			2nd season		
Pulsing solutions	Holding Solutions	Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
D.W	D.W	2.353	1.503	0.813	2.380	1.493	0.757	2.427	1.730	0.860	2.510	1.730	0.870
	Sucrose 4 %	2.353	1.773	0.847	2.380	1.857	0.833	2.427	1.867	0.807	2.510	1.893	0.850
	Sucrose 4% +CA 200 ppm	2.353	1.777	0.880	2.380	1.780	0.883	2.427	1.720	0.863	2.510	1.767	0.893
	Sucrose 4 % + 8HQS 200 ppm	2.353	1.850	0.810	2.380	1.883	0.817	2.427	1.897	0.813	2.510	1.867	0.847
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.353	1.803	0.893	2.380	1.807	0.890	2.427	1.737	0.883	2.510	1.720	0.893
Kin.20 ppm	D.W	2.353	1.533	0.810	2.380	1.540	0.807	2.427	1.780	0.837	2.510	1.797	0.863
	Sucrose 4 %	2.353	1.790	0.870	2.380	1.840	0.873	2.427	1.893	0.840	2.510	1.940	0.873
	Sucrose 4% +CA 200 ppm	2.353	1.870	0.897	2.380	1.890	0.910	2.427	1.793	0.870	2.510	1.800	0.907
	Sucrose 4 % + 8HQS 200 ppm	2.353	1.883	0.837	2.380	1.913	0.877	2.427	1.873	0.913	2.510	1.887	0.900
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.353	1.803	0.917	2.380	1.873	0.917	2.427	1.833	0.937	2.510	1.827	0.943
BA 10 ppm	D.W	2.353	1.527	0.797	2.380	1.527	0.797	2.427	1.697	0.860	2.510	1767	0.847
	Sucrose 4 %	2.353	1.780	0.847	2.380	1.850	0.847	2.427	1.900	0.900	2.510	1.927	0.880
	Sucrose 4% +CA 200 ppm	2.353	1.910	0.907	2.380	1.920	0.913	2.427	1.727	0.863	2.510	1.813	0.893
	Sucrose 4 % + 8HQS 200 ppm	2.353	1.863	0.847	2.380	1.940	0.857	2.427	1.753	0.927	2.510	1.820	0.910
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.353	1.817	0.907	2.380	1.860	0.920	2.427	1.813	0.890	2.510	1.837	0.910
Sucrose 10 %	D.W	2.353	1.560	0.803	2.380	1.570	0.797	2.427	1.757	0.867	2.510	1.803	0.847
	Sucrose 4 %	2.353	1.780	0.920	2.380	1.827	0.917	2.427	1.970	0.857	2.510	1.953	0.873
	Sucrose 4% +CA 200 ppm	2.353	1.877	0.943	2.380	1.893	0.953	2.427	2.073	0.903	2.510	2.017	0.913
	Sucrose 4 % + 8HQS 200 ppm	2.353	1.857	0.937	2.380	1.857	0.957	2.427	1.920	0.927	2.510	1.963	0937
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.353	1.890	0.937	2.380	1.903	0.947	2.427	2.103	1.017	2.510	2.103	1.000
STS 1:4 ml	D.W	2.353	1.550	0.837	2.380	1.540	0.840	2.427	1.767	0.830	2.510	1.783	0.820
	Sucrose 4 %	2.353	1.773	0.923	2.380	1.853	0.953	2.427	2.273	0.930	2.510	2.257	0.950
	Sucrose 4% +CA 200 ppm	2.353	1.840	0.987	2.380	1.850	0.983	2.427	2.163	1.060	2.510	2.137	1.017
	Sucrose 4 % + 8HQS 200 ppm	2.353	1.827	0.947	2.380	1.810	0.957	2.427	2.063	0.913	2.510	1.977	0.987
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.353	1.963	0.977	2.380	1.977	0.980	2.427	2.157	1.047	2.510	1.677	1.033
L.S.D at	5%	-	0.090	0.052	-	0.535	0.052	-	0.180	0.090	-	0.208	0.073
	1%	-	0.120	0.069	-	0.713	0.069	-	0.240	0.120	-	0.277	0.098

two season. However the combination treatments of STS at 1:4mM for 30 minutes is being the most effective for inducing the highest values of this parameters, particularly the combined treatment of STS and hording solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or holding solution contained (sucrose 4% + CA 200ppm) in petals in the two seasons, Moreover the highest values of this parameter in flower stalks was registered by using the combined treatment of STS and holding solution contained (sucrose 4% + CA 200ppm) or holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) after (14 and end days) from the treatment as compared to control (D.W) in both seasons, with the exception of the combined treatment of STS and holding solution contained (sucrose 4%) in flower stalks after 14 days from the treatment in the two seasons and the combined treatment of STS and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) in flower stalk at the end of age of longevity in the second season. Any how, the percentage of Non-Reducing sugars in petals and flower stalks under all the interaction treatments between pulsing solution and holding solution of Bird of paradise cut flower stalks was decreased as flower cut stalks advanced in age after initial till the end of longevity in two seasons.

7.2.6.-Potassium content (%) in petals:

Data in Table (112) demonstrate that all pulsing solution treatments of bird of paradise cut flower stalks bases increased of potassium content (%) in petals after (14 and end days) from

the treatment as compared to control in the seasons. However, pulsing Bird of paradise cut flower stalks bases in STS at 1:4mM for 30 minutes caused the highest significant increase of this parameter as compared to control in the two seasons. Moreover, pulsing solution of kinetin at 20ppm for 24hours resulted highly increase in this concern in the two seasons when compared to control. Furthermore, potassium content (5) in petals of Bird of paradise cut flower stalks under all tested pulsing solution treatments was increased till 14 day from the treatment and then decreased after that day to the end of age of longevity in the two seasons in this study.

Furthermore, data in Table (112) reveal that all pulsing solution treatments of Bird of paradise cut flower stalks succeeded in increasing potassium content (%) in flower stalk after (initial, 14 and end days) from the treatment as compared to control in the two seasons. However, pulsing solution of STS at 1:4mM for 30 minutes showed to be the most effective one for inducing the highest significant increase in this parameter as compared to control in the was seasons.

Furthermore, potassium content (%) in flower stalk by using all tested pulsing solution treatments was increased after (initial day) from the treatment till (14 days) and then decreased after that day to the end of longevity in the two seasons, with exception of control (D.W) in the first season was decreased till (14 days) and then increased after that day to the end of age of longevity.

As for the effect holding solution treatments on Potassium content (%) in petals and flower stalks, Data in Table (113) reveal that most holding solution treatments increased the percentage of potassium in petals and flower stalks of Bird of paradise cut flower stalks after (initial, 14 and end days) from the treatment as compared to control in the two seasons. However, the treatment of holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) approved to be the most effective treatment for inducing the highest values of the percentage of potassium in petals and flower stalks in most cases in the two seasons. Furthermore, the percentage of potassium in petals and flower stalks of bird of paradise cut flower stalks was increased after initial from the treatment till 14 days and then decreased after that day till the end of age of longevity under all holding solution treatments as flower cut stalks advanced in age in most cases in the two seasons.

Regarding to the interaction effective between pulsing solution and holding solution on potassium percentage in petals and flower stalk ,data in Table (114) reveal that all the combinations treatments between pulsing solution and holding solution increased the percentage of potassium in petals and flower stalks of Bird of paradise cut flower stalks as compared to control (D.W) in the two seasons. However, the combinations treatments of STS at 1:4mM for 30 minutes recorded the highest values of the percentage potassium in petals and flower stalks especially the combined treatment of STS and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) followed descendingly by the combined treatment between STS

Table (114): Effect of interaction between pulsing solutions and holding solutions treatments on potassium percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatment		Potassium percentage in petals						Potassium percentage in flower stalk					
		1st season			2nd season			1st season			2nd season		
Pulsing solutions	Holding Solutions	Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
D.W	D.W	2.680	2.627	2.590	2.677	2.633	2.603	1.907	2.020	1.887	1.933	2.070	1.930
	Sucrose 4 %	2.680	2.680	2.627	2.677	2.687	2.607	1.907	2.060	1.940	1.933	2.030	1.907
	Sucrose 4% +CA 200 ppm	2.680	2.710	2.653	2.677	2.713	2.657	1.907	2.167	2.050	1.933	2.143	2.077
	Sucrose 4 % + 8HQS 200 ppm	2.680	2.713	2.630	2.677	2.703	2.623	1.907	1.937	1.413	1.933	2.120	2.020
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.680	2.730	2.677	2.677	2.733	2.683	1.907	2.023	1.813	1.933	2.160	2.077
Kin.20 ppm	D.W	2.680	2.677	2.620	2.677	2.650	2.610	1.907	2.047	1.970	1.933	2.073	1.987
	Sucrose 4 %	2.680	2.697	2.643	2.677	2.703	2.643	1.907	2.073	1.940	1.933	2.063	1.940
	Sucrose 4% +CA 200 ppm	2.680	2.760	2.703	2.677	2.747	2.700	1.907	2.207	2.113	1.933	2.213	2.133
	Sucrose 4 % + 8HQS 200 ppm	2.680	2.730	2.690	2.677	2.727	2.693	1.907	2.117	2.013	1.933	2.120	1.990
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.680	2.777	2.727	2.677	2.777	2.717	1.907	2.220	2.110	1.933	2.227	2.140
BA 10 ppm	D.W	2.680	2.663	2.610	2.677	2.667	2.603	1.907	2.073	1.987	1.933	2.097	1.943
	Sucrose 4 %	2.680	2.677	2.627	2.677	2.690	2.627	1.907	2.077	1.987	1.933	2.120	2.023
	Sucrose 4% +CA 200 ppm	2.680	2.730	2.690	2.677	2.727	2.697	1.907	2.173	2.037	1.933	2.200	2.130
	Sucrose 4 % + 8HQS 200 ppm	2.680	2.723	2.683	2.677	2.723	2.700	1.907	2.153	2.027	1.933	2.133	2.013
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.680	2.740	2.703	2.677	2.753	2.697	1.907	2.153	2.007	1.933	2.210	2.140
Sucrose 10 %	D.W	2.680	2.650	2.600	2.677	2.683	2.613	1.907	2.073	1.943	1.933	2.073	1.977
	Sucrose 4 %	2.680	2.680	2.630	2.677	2.697	2.633	1.907	2.160	2.077	1.933	2.133	2.023
	Sucrose 4% +CA 200 ppm	2.680	2.723	2.690	2.677	2.723	2.700	1.907	2.183	2.077	1.933	2.180	2.083
	Sucrose 4 % + 8HQS 200 ppm	2.680	2.740	2.703	2.677	2.730	2.700	1.907	2.177	2.043	1.933	2.140	2.027
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.680	2.737	2.703	2.677	2.737	2.710	1.907	2.173	2.063	1.933	2.210	2.120
STS 1:4 ml	D.W	2.680	2.683	2.630	2.677	2.690	2.633	1.907	2.130	2.023	1.933	2.123	1.990
	Sucrose 4 %	2.680	2.707	2.637	2.677	2.710	2.633	1.907	2.183	2.110	1.933	2.173	2.063
	Sucrose 4% +CA 200 ppm	2.680	2.787	2.743	2.677	2.770	2.733	1.907	2.247	2.133	1.933	2.260	2.150
	Sucrose 4 % + 8HQS 200 ppm	2.680	2.757	2.707	2.677	2.750	2.720	1.907	2.197	2.027	1.933	2.203	2.150
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.680	2.803	2.757	2.677	2.787	2.750	1.907	2.227	2.097	1.933	2.227	2.160
L.S.D at	5%	-	0.036	0.034	-	0.028	0.026	-	0.249	0.041	-	0.073	0.090
	1%	-	0.048	0.045	-	0.037	0.035	-	0.332	0.054	-	0.098	0.120

and (sucrose 4% + CA 200ppm) in the petals. Moreover, the highest increases of the percentage of potassium in flower stalks was registered by the using the combined treatment of STS and sucrose 4% + CA 200ppm) followed descendingly by the combined treatment between STS and (sucrose 4% + CA 200ppm + 8-HQS 200ppm) in the two seasons. Furthermore, the combinations treatments of kinetin at 20ppm for 24hours resulted highly increases in this parameter in petals and flower stalks, particularly the combined treatment between kinetin 20ppm and (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or (sucrose 4% + CA 200ppm) as compared to control (D.W) in the two seasons.

7.2.7.-Total nitrogen and total protein percentage in petals and flower stalks:

Data presented in Table (115) indicate that all pulsing solution treatments recorded increases of the percentage of total nitrogen and total protein in petals of Bird of paradise cut flower stalks as compared to control in the two seasons. However, pulsing Bird of paradise cut flower stalks bases in STS at 1:4mM for 30 minutes approved to be the most effective treatment for inducing the greatest values of this parameter, followed descending by kinetin at 20ppm for 24hours after (initial, 14 and end days) from the treatment in the two seasons. On the reverse, the lowest values of the percentage of total nitrogen and total protein in petals of bird of paradise cut flower stalks was registered by using the treatment of control and BA at 10ppm in the first season, and control and sucrose at 10% in the

Table (115): Effect of pulsing solutions treatments on Total nitrogen percentage, Total protein percentage and phosphorus percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009 .

Treatments		Total nitrogen percentage in petals			Total protein percentage in petals			Total nitrogen percentage in flower stalk			Total protein percentage in flower stalk			Phosphorus percentage in petals			Phosphorus percentage in flower stalk		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
1st season																			
Pulsing solutions	D.W	2.940	2.836	2.827	18.37	17.73	17.67	2.483	2.494	2.483	15.52	15.59	15.52	0.340	0.398	0.397	0.260	0.299	0.303
	Kin.20 ppm	2.940	2.929	2.897	18.37	18.30	18.11	2.483	2.561	2.553	15.52	16.01	15.96	0.340	0.403	0.407	0.260	0.317	0.324
	BA 10 ppm	2.940	2.868	2.859	18.37	17.93	17.87	2.483	2.603	2.596	15.52	16.27	16.23	0.340	0.397	0.407	0.260	0.316	0.319
	Sucrose 10 %	2.940	2.880	2.887	18.37	18.00	18.05	2.483	2.577	2.526	15.52	16.10	15.79	0.340	0.390	0.393	0.260	0.303	0.305
	STS 1:4 ml	2.940	2.943	2.955	18.37	18.40	18.47	2.483	2.615	2.598	15.52	16.34	16.24	0.340	0.419	0.423	0.260	0.330	0.337
L.S.D at	5 %	-	0.061	0.061	-	0.393	0.377	-	0.052	0.046	-	0.099	0.090	-	0.009	0.009	-	0.009	0.007
	1%	-	0.082	0.082	-	0.525	0.502	-	0.069	0.062	-	0.131	0.120	-	0.013	0.012	-	0.013	0.010
2nd season																			
Pulsing solutions	D.W	3.043	2.959	2.957	19.02	18.50	18.48	2.533	2.522	2.484	15.83	15.76	15.53	0.350	0.397	0.401	0.263	0.301	0.306
	Kin.20 ppm	3.043	3.069	3.081	19.02	19.18	19.26	2.533	2.551	2.535	15.83	15.95	15.85	0.350	0.415	0.413	0.263	0.324	0.324
	BA 10 ppm	3.043	3.025	3.033	19.02	18.91	18.96	2.533	2.613	2.576	15.83	16.33	16.10	0.350	0.413	0.410	0.263	0.320	0.323
	Sucrose 10 %	3.043	3.003	3.025	19.02	18.77	18.91	2.533	2.592	2.570	15.83	16.20	16.06	0.350	0.407	0.411	0.263	0.313	0.313
	STS 1:4 ml	3.043	3.137	3.103	19.02	19.60	19.40	2.533	2.602	2.593	15.83	16.26	16.21	0.350	0.430	0.428	0.263	0.348	0.341
L.S.D at	5 %	-	0.073	0.066	-	0.458	0.408	-	0.046	0.040	-	0.280	0.269	-	0.006	0.006	-	0.007	0.008
	1%	-	0.098	0.088	-	0.611	0.544	-	0.062	0.054	-	0.373	0.359	-	0.007	0.007	-	0.009	0.011

second season of this study. Furthermore, data in Table (115) reveal that all pulsing solution treatments succeeded in increasing the percentage of total nitrogen and total protein in flower stalks of bird of paradise cut flower stalks in the two seasons except for Kin at 20ppm after 14days in the second season. However, the greatest values of this parameter was recoded by using pulsing solution of STS at 1:4mM for 30 minutes after (initial, 14 and end days) in the two seasons with the exception of BA at 10ppm after 14 days in the second season. Moreover, pulsing solution of BA at 10ppm for 24hours resulted highly significant increase of this parameter as compared to control in the two seasons. The lowest values of these parameters was registered by using control (D.W) in the two seasons. With respect to the effect holding solution treatments on total nitrogen and total protein percentage in petals, data in Table (116) reveal that holding bird of paradise cut flower stalks bases in holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) appeared to be the most effective for producing the highest values of the percentage of total nitrogen and total protein in petals after (initial, 14 and end days) from the treatment as compared to control in the two seasons, followed descendingly by (sucrose 4% + CA 200ppm) in both seasons.

In addition, the lowest values of the percentage of total nitrogen and total protein in petals of bird of paradise cut flower stalks was registered by using holding solution contained (sucrose 4% + 8-HQS 200ppm) and control (distilled water) respectively in the first and second season after (14 and end days) from the treatment in this study.

Concerning the effect holding solution treatments on Total nitrogen and total protein percentage in flower stalks, data presented in Table (116) indicate that all holding solution treatments succeeded in increasing the percentage of total nitrogen and total protein in flower stalks of Bird of paradise cut flower stalks as compared control (D.W) in the two seasons. However, the highest values of these parameter was recorded by using holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) when compared to control in most cases in the two seasons.

On the reverse, the lowest values of the percentage of total nitrogen and total protein in flower stalk of Bird of paradise cut flower stalks was recorded by holding solution contained distilled water as control and (sucrose 4% + 8-HQS 200ppm) respectively after (14 and end days) from the treatment in both seasons in this study.

Referring to the interaction effective between pulsing solution and holding solution treatments on Total nitrogen and total protein content (%) in petals, data in Table (117) demonstrate that all the combinations treatments between pulsing solution and holding solution increased the percentage of total nitrogen and total protein in petals of Bird of paradise cut flower stalks as compared to control in the two seasons. However, the combinations treatments of STS at 1:4mM for 30 minutes approved to be most effective one for producing the highest values of this parameter, especially the combined treatment of STS and holding solution contained (sucrose 4% +

Table (116): Effect of Holding solutions treatments on Total nitrogen percentage, Total protein percentage and phosphorus percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009 .

Treatments		Total nitrogen percentag in petals			Total protein percentage in petals			Total nitrogen percentage in flower stalk			Total protein percentage in flower stalk			Phosphorus percentage in petals			Phosphorus percentage in flower stalk		
		Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
1st season																			
Holding solutions	D.W	2.940	2.862	2.870	18.37	17.89	17.94	2.483	2.503	2.487	15.52	15.65	15.55	0.340	0.383	0.381	0.260	0.303	0.306
	Sucrose 4 %	2.940	2.874	2.867	18.37	17.96	17.92	2.483	2.563	2.560	15.52	16.02	16.00	0.340	0.389	0.394	0.260	0.305	0.309
	Sucrose 4% +CA 200 ppm	2.940	2.919	2.903	18.37	18.25	18.15	2.483	2.635	2.596	15.52	16.47	16.23	0.340	0.410	0.413	0.260	0.323	0.329
	Sucrose 4 % + 8HQS 200 ppm	2.940	2.860	2.851	18.37	17.88	17.82	2.483	2.505	2.492	15.52	15.66	15.58	0.340	0.405	0.411	0.260	0.307	0.313
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.940	2.941	2.933	18.37	18.38	18.33	2.483	2.653	2.621	15.52	15.52	16.38	0.340	0.421	0.427	0.260	0.327	0.330
L.S.D at	5 %	-	0.061	0.061	-	0.393	0.377	-	0.052	0.046	-	0.099	0.090	-	0.009	0.009	-	0.009	0.007
	1%	-	0.082	0.082	-	0.525	0.502	-	0.069	0.062	-	0.131	0.120	-	0.013	0.012	-	0.013	0.010
2nd season																			
Holding solutions	D.W	3.043	2.991	2.969	19.02	18.70	18.55	2.533	2.515	2.483	15.83	15.72	15.52	0.350	0.393	0.395	0.263	0.308	0.306
	Sucrose 4 %	3.043	3.047	3.031	19.02	19.05	18.95	2.533	2.555	2.544	15.83	15.97	15.90	0.350	0.404	0.403	0.263	0.310	0.311
	Sucrose 4% +CA 200 ppm	3.043	3.057	3.072	19.02	19.10	19.20	2.533	2.651	2.610	15.83	16.57	16.31	0.350	0.423	0.423	0.263	0.334	0.335
	Sucrose 4 % + 8HQS 200 ppm	3.043	3.001	3.021	19.02	18.76	18.88	2.533	2.519	2.503	15.83	15.75	15.64	0.350	0.411	0.412	0.263	0.315	0.318
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	3.043	3.096	3.107	19.02	19.35	19.42	2.533	2.641	2.619	15.83	16.50	16.37	0.350	0.431	0.430	0.263	0.339	0.337
L.S.D at	5 %	-	0.073	0.066	-	0.458	0.408	-	0.046	0.040	-	0.280	0.269	-	0.006	0.006	-	0.007	0.008
	1%	-	0.098	0.088	-	0.611	0.544	-	0.062	0.054	-	0.373	0.359	-	0.007	0.007	-	0.009	0.011

Table (117): Effect of interaction between pulsing solutions and holding solutions treatments on Total nitrogen percentage and Total protein percentage in petals of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatment		Total nitrogen percentage in petals						Total protein percentage in petals					
		1st season			2nd season			1st season			2nd season		
Pulsing solutions	Holding Solutions	Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
D.W	D.W	2.940	2.780	2.800	3.043	2.900	2.893	18.38	17.38	17.50	19.02	18.13	18.08
	Sucrose 4 %	2.940	2.793	2.787	3.043	2.907	2.900	18.38	17.46	17.42	19.02	18.17	18.13
	Sucrose 4% +CA 200 ppm	2.940	2.750	2.710	3.043	3.027	3.013	18.38	17.19	16.94	19.02	18.92	18.83
	Sucrose 4 % + 8HQS 200 ppm	2.940	2.873	2.863	3.043	2.920	2.953	18.38	17.96	17.90	19.02	18.25	18.46
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.940	2.983	2.973	3.043	3.043	3.023	18.38	18.65	18.58	19.02	19.02	18.90
Kin.20 ppm	D.W	2.940	2.900	2.930	3.043	2.997	2.960	18.38	18.13	18.31	19.02	18.73	18.50
	Sucrose 4 %	2.940	2.987	2.930	3.043	3.067	3.083	18.38	18.67	18.31	19.02	19.17	19.27
	Sucrose 4% +CA 200 ppm	2.940	2.997	2.967	3.043	3.107	3.120	18.38	18.73	18.54	19.02	19.42	19.50
	Sucrose 4 % + 8HQS 200 ppm	2.940	2.863	2.820	3.043	3.043	3.070	18.38	17.90	17.63	19.02	19.02	19.19
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.940	2.897	2.840	3.043	3.130	3.173	18.38	18.10	17.75	19.02	19.56	19.83
BA 10 ppm	D.W	2.940	2.857	2.813	3.043	2.987	2.947	18.38	17.85	17.58	19.02	18.67	18.42
	Sucrose 4 %	2.940	2.840	2.860	3.043	3.030	3.007	18.38	17.75	17.88	19.02	18.94	18.79
	Sucrose 4% +CA 200 ppm	2.940	2.893	2.867	3.043	3.010	3.083	18.38	18.08	17.92	19.02	18.81	19.27
	Sucrose 4 % + 8HQS 200 ppm	2.940	2.857	2.857	3.043	3.040	3.067	18.38	17.85	17.85	19.02	19.00	19.17
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.940	2.893	2.900	3.043	3.060	3.063	18.38	18.08	18.13	19.02	19.13	19.15
Sucrose 10 %	D.W	2.940	2.830	2.860	3.043	2.993	3.000	18.38	17.69	17.88	19.02	18.71	18.75
	Sucrose 4 %	2.940	2.863	2.867	3.043	3.040	3.087	18.38	17.90	17.92	19.02	19.00	19.29
	Sucrose 4% +CA 200 ppm	2.940	2.940	2.960	3.043	2.983	3.010	18.38	18.38	18.50	19.02	18.45	18.81
	Sucrose 4 % + 8HQS 200 ppm	2.940	2.877	2.883	3.043	2.967	2.983	18.38	17.98	18.02	19.02	18.54	18.65
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.940	2.890	2.867	3.043	3.030	3.047	18.38	18.06	19.92	19.02	18.94	19.04
STS 1:4 ml	D.W	2.940	2.943	2.947	3.043	3.080	3.043	18.38	18.40	18.42	19.02	19.25	19.02
	Sucrose 4 %	2.940	2.887	2.893	3.043	3.193	3.080	18.38	18.04	18.08	19.02	19.96	19.25
	Sucrose 4% +CA 200 ppm	2.940	3.017	3.013	3.043	3.157	3.133	18.38	18.85	18.83	19.02	19.73	19.58
	Sucrose 4 % + 8HQS 200 ppm	2.940	2.830	2.833	3.043	3.037	3.033	18.38	17.69	17.71	19.02	18.98	18.96
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.940	3.040	3.087	3.043	3.217	3.227	18.38	19.00	19.29	19.02	20.10	20.17
L.S.D at	5%	-	0137	0137	-	0.164	0.147	-	0.880	0.842	-	1.024	0.913
	1%	-	0.183	0.183	-	0.219	0.196	-	1.173	1.123	-	1.366	1.217

CA 200ppm + 8-HQS 200ppm) or holding solution contained (sucrose 4% + CA 200ppm) after (14 and end days) from the treatment as compared to control (D.W) in both seasons. Moreover, the combined treatment of kinetin at 20ppm and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or holding solution contained (sucrose 4% + CA 200ppm) recorded highly increases in the percentage of total nitrogen and total protein in petals of bird of paradise cut flower stalks after 14 and end days from the treatment as compared to control (D.W) in the two seasons.

Additionally data in Table (118) reveal that most the combinations treatments between pulsing solution and holding solution increased the percentage of total nitrogen and total protein in flower stalks of Bird of paradise cut flower stalks as compared to control in the two seasons. However, the combinations treatments of Benzyladenine at 10ppm for 24hours and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or holding solution contained (sucrose 4% + CA 200pm) and holding solution contained (sucrose 4% + 8-HQS 200ppm) showed to be the most effective one for inducing the highest values of this parameter after (14 and end days) from the treatment as compared to control (D.W) in both seasons. Moreover, the combined treatment of STS at 1:4mM for 30 minutes and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) or holding solution contained (sucrose 4% + CA 200ppm) and holding solution contained (sucrose 4%) resulted highly increases in the percentage of total nitrogen and total protein in flower stalks of bird of paradise cut

Table (118):Effect of interaction between pulsing solutions and holding solutions treatments on Total nitrogen percentage and Total protein percentage in flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatment		Total nitrogen percentage in flower stalk						Total protein percentage in flower stalk					
		1st season			2nd season			1st season			2nd season		
Pulsing solutions	Holding Solutions	Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
D.W	D.W	2.483	2.433	2.373	2.533	2.503	2.443	15.52	15.21	14.83	15.83	15.65	15.27
	Sucrose 4 %	2.483	2.440	2.457	2.533	2.463	2.443	15.52	15.25	15.35	15.83	15.40	15.27
	Sucrose 4% +CA 200 ppm	2.483	2.553	2.543	2.533	2.553	2.520	15.52	15.96	15.90	15.83	15.96	15.75
	Sucrose 4 % + 8HQS 200 ppm	2.483	2.447	2.447	2.533	2.490	2.443	15.52	15.29	15.29	15.83	15.56	15.27
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.483	2.597	2.593	2.533	2.600	2.570	15.52	16.23	16.21	15.83	16.25	16.06
Kin.20 ppm	D.W	2.483	2.450	2.433	2.533	2.440	2.403	15.52	15.31	15.21	15.83	15.25	15.02
	Sucrose 4 %	2.483	2.610	2.590	2.533	2.577	2.557	15.52	16.31	16.19	15.83	16.10	15.98
	Sucrose 4% +CA 200 ppm	2.483	2.660	2.653	2.533	2.653	2.643	15.52	16.63	16.58	15.83	16.58	16.52
	Sucrose 4 % + 8HQS 200 ppm	2.483	2.480	2.487	2.533	2.487	2.493	15.52	15.50	15.54	15.83	15.54	15.58
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.483	2.607	2.603	2.533	2.600	2.580	15.52	16.29	16.27	15.83	16.25	16.13
BA 10 ppm	D.W	2.483	2.527	2.550	2.533	2.520	2.490	15.52	15.79	15.94	15.83	15.75	15.56
	Sucrose 4 %	2.483	2.580	2.600	2.533	2.597	2.550	15.52	16.13	16.25	15.83	16.23	15.94
	Sucrose 4% +CA 200 ppm	2.483	2.637	2.627	2.533	2.687	2.623	15.52	16.48	16.42	15.83	16.79	16.40
	Sucrose 4 % + 8HQS 200 ppm	2.483	2.587	2.567	2.533	2.583	2.560	15.52	16.17	16.04	15.83	16.15	16.00
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.483	2.683	2.637	2.533	2.677	2.657	15.52	16.77	16.48	15.83	16.73	16.60
Sucrose 10 %	D.W	2.483	2.527	2.500	2.533	2.527	2.483	15.52	15.79	15.63	15.83	15.79	15.52
	Sucrose 4 %	2.483	2.567	2.537	2.533	2.563	2.590	15.52	16.04	15.85	15.83	16.02	16.19
	Sucrose 4% +CA 200 ppm	2.483	2.663	2.500	2.533	2.710	2.643	15.52	16.65	15.63	15.83	16.94	16.52
	Sucrose 4 % + 8HQS 200 ppm	2.483	2.463	2.450	2.533	2.483	2.463	15.52	15.40	15.31	15.83	15.52	15.40
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.483	2.663	2.643	2.533	2.677	2.670	15.52	16.65	16.52	15.83	16.73	16.69
STS 1:4 ml	D.W	2.483	2.580	2.580	2.533	2.583	2.593	15.52	16.13	16.13	15.83	16.15	16.21
	Sucrose 4 %	2.483	2.617	2.617	2.533	2.573	2.580	15.52	16.35	16.35	15.83	16.08	16.13
	Sucrose 4% +CA 200 ppm	2.483	2.660	2.657	2.533	2.650	2.620	15.52	16.63	16.60	15.83	16.56	16.38
	Sucrose 4 % + 8HQS 200 ppm	2.483	2.550	2.510	2.533	2.553	2.553	15.52	15.94	15.69	15.83	15.96	15.96
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	2.483	2.667	2.627	2.533	2.650	2.620	15.52	16.67	16.42	15.83	16.56	16.38
L.S.D at	5%	-	0.116	0.104	-	0.104	0.090	-	0.220	0.201	-	0.625	0.601
	1%	-	0.155	0.139	-	0.139	0.120	-	0.294	0.268	-	0.834	0.802

flower stalks after 14 and till the end of the longevity as compared to control (D.W) in the two seasons under this study.

7.2.8.-Phosphorus content (%) in petals and flower stalks:

Data in Table (115) demonstrate that all pulsing solution treatments of bird of paradise cut flower stalks resulted increments in phosphorus (%) in petals as compared to control in the two seasons. However, the highest significant increase of this parameter was registered by using pulsing solution of STS at 1:4mM for 30 minutes as compared to other treatments in the two seasons after (14, end days) from the treatment under this study.

Furthermore, Data presented in Table (115) reveal that all pulsing solution treatments of Bird of paradise cut flower stalks increased phosphorus content (%) in flower stalk after (14 and end days) from the treatment when compared to control in the two seasons. However, the highest significant increase of this parameter was registered by using pulsing solution of STS at 1:4mM for 30 minutes after (14 and end days) from the treatment as compared to control (D.W) in the two seasons. Anyhow, phosphorus content (%) in flower stalk under all tested pulsing treatments was increased as flower cut stalks prolonged in age after (initial) from the treatment until (end days) of age of longevity in both seasons.

As for the effect holding solution treatments on Phosphorus content (%) in petals and flower stalks, data in Table (116) reveal that all holding solution treatments increased the percentage of phosphorus in petals and flower stalks of bird of paradise cut flower stalks as compared to control in the two

Table (119): Effect of interaction between pulsing solutions and holding solutions treatments on phosphorus percentage in petals and flower stalk of *Strelitzia reginae* Ait. cut flower stalk during the two seasons of 2007-2008/2008-2009.

Treatment		Phosphorus percentage in petals						Phosphorus percentage in flower stalk					
		1st season			2nd season			1st season			2nd season		
Pulsing solutions	Holding Solutions	Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)			Shelf life periods (days)		
		Initial	14	End	Initial	14	End	Initial	14	End	Initial	14	End
D.W	D.W	0.340	0.380	0.357	0.350	0.377	0.373	0.260	0.290	0.290	0.263	0.293	0.290
	Sucrose 4 %	0.340	0.390	0.387	0.350	0.387	0.393	0.260	0.293	0.293	0.263	0.300	0.293
	Sucrose 4% +CA 200 ppm	0.340	0.407	0.413	0.350	0.400	0.407	0.260	0.307	0.313	0.263	0.310	0.320
	Sucrose 4 % + 8HQS 200 ppm	0.340	0.397	0.400	0.350	0.403	0.407	0.260	0.297	0.300	0.263	0.293	0.300
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.340	0.417	0.427	0.350	0.417	0.423	0.260	0.307	0.317	0.263	0.310	0.327
Kin.20 ppm	D.W	0.340	0.390	0.393	0.350	0.400	0.393	0.260	0.303	0.310	0.263	0.313	0.307
	Sucrose 4 %	0.340	0.387	0.393	0.350	0.403	0.400	0.260	0.307	0.317	0.263	0.317	0.317
	Sucrose 4% +CA 200 ppm	0.340	0.413	0.410	0.350	0.423	0.427	0.260	0.330	0.337	0.263	0.333	0.337
	Sucrose 4 % + 8HQS 200 ppm	0.340	0.410	0.417	0.350	0.417	0.417	0.260	0.310	0.317	0.263	0.317	0.320
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.340	0.413	0.423	0.350	0.433	0.430	0.260	0.337	0.340	0.263	0.340	0.340
BA 10 ppm	D.W	0.340	0.380	0.383	0.350	0.397	0.403	0.260	0.303	0.300	0.263	0.310	0.310
	Sucrose 4 %	0.340	0.390	0.400	0.350	0.410	0.403	0.260	0.310	0.313	0.263	0.310	0.320
	Sucrose 4% +CA 200 ppm	0.340	0.400	0.407	0.350	0.427	0.420	0.260	0.327	0.333	0.263	0.330	0.333
	Sucrose 4 % + 8HQS 200 ppm	0.340	0.400	0.420	0.350	0.410	0.407	0.260	0.307	0.310	0.263	0.313	0.317
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.340	0.417	0.423	0.350	0.423	0.417	0.260	0.333	0.337	0.263	0.337	0.337
Sucrose 10 %	D.W	0.340	0.373	0.373	0.350	0.390	0.397	0.260	0.300	0.303	0.263	0.307	0.307
	Sucrose 4 %	0.340	0.383	0.390	0.350	0.403	0.407	0.260	0.293	0.297	0.263	0.303	0.307
	Sucrose 4% +CA 200 ppm	0.340	0.390	0.393	0.350	0.420	0.417	0.260	0.310	0.317	0.263	0.320	0.320
	Sucrose 4 % + 8HQS 200 ppm	0.340	0.397	0.400	0.350	0.407	0.410	0.260	0.303	0.307	0.263	0.310	0.313
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.340	0.407	0.410	0.350	0.417	0.423	0.260	0.307	0.303	0.263	0.327	0.320
STS 1:4 ml	D.W	0.340	0.390	0.400	0.350	0.403	0.407	0.260	0.317	0.327	0.263	0.317	0.317
	Sucrose 4 %	0.340	0.393	0.400	0.350	0.417	0.413	0.260	0.320	0.327	0.263	0.320	0.320
	Sucrose 4% +CA 200 ppm	0.340	0.440	0.443	0.350	0.447	0.443	0.260	0.343	0.347	0.263	0.377	0.367
	Sucrose 4 % + 8HQS 200 ppm	0.340	0.420	0.420	0.350	0.420	0.420	0.260	0.320	0.330	0.263	0.343	0.340
	Sucrose 4% +CA 200 ppm + 8HQS 200 ppm	0.340	0.450	0.450	0.350	0.463	0.457	0.260	0.350	0.353	0.263	0.383	0.363
L.S.D at	5%	-	0.021	0.020	-	0.013	0.013	-	0.021	0.017	-	0.015	0.018
	1%	-	0.028	0.026	-	0.017	0.017	-	0.028	0.022	-	0.020	0.025

seasons. However, the treatment of holding solution contained (sucrose 4% + CA at 200ppm + 8-HQS 200ppm) gave the greatest significant increase in the percentage of phosphorus in petals and flower stalk of Bird of paradise cut flower stalks as compared to control (D.W) in the two seasons, followed in descending order by (sucrose 4% + 8-HQS at 200ppm) after (14 and end days) from the treatment in the two seasons. On the reverse, the lowest values of this parameter was registered by using control (D.W) and (sucrose at 4%) in the two seasons.

Concerning the effect of interaction between pulsing solution and holding solution treatments on phosphorus content (%) in petals and flower stalks, data in Table (119) indicate that all the interaction treatments between pulsing and holding solutions increased phosphorus percentage in petals and flower stalks of bird of paradise cut flower stalks as compared control in the two seasons. However, the combined treatments between STS at 1:4mM for 30 minutes and holding solution contained (sucrose 4% + CA 200ppm + 8-HQS 200ppm) appeared to be the most effective one produce the highest values of the percentage of total phosphor use in petals and flower stalks of bird of paradise cut flower stalks as compared to control (D.W) in the two seasons, followed descendingly by using the combined treatment between STS and holding solution contained (sucrose 4% + CA 200ppm) and the combined treatment between STS and holding solution contained (sucrose 4% + 8-HQS 200pm) in the two seasons.

The results of this parameters may be discussed in the same was as previously mentioned in the first part (tuberose)