International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2017; 5(6): 400-402

Received: 06-09-2017
Accepted: 09-10-2017

Unnatiben R Patel
Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Sudha Patil
Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Sathyanarayana E
Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Vaishali D Patel
Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Tanvi D Patel
Department of Horticulture, College of Agriculture, Junagadh Agriculture University, Junagadh, Gujarat, India

Correspondence
Unnatiben R Patel
Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Effect of vase solutions on flowers of different varieties of heliconia

Unnatiben R Patel, Sudha Patil, Sathyanarayana E, Vaishali D Patel and Tanvi D Patel

Abstract
The experiment was laid out to study the post harvest life of heliconia inflorescence. There are four varieties (V_1- Red Torch, V_2- Golden Torch, V_3- Kenea Red and V_4- Orange) and eight treatments of vase solutions (T_1- control, T_2- 3 % sucrose, T_3- 50 ppm GA_3, T_4- 100 ppm GA_3, T_5- 200 ppm $Al_2(SO_4)_3$, T_6- 300 ppm $Al_2(SO_4)_3$, T_7- 200 ppm 8-HQC and T_8- 300 ppm 8-HQC) were taken to standardize the vase solution for different varieties of heliconia. Significant influence of varieties was observed for all parameters studied during post harvest life of heliconia. Significantly maximum water uptake and higher fresh weight retention on 7^{th},11^{th} and 15^{th} day, flower opening percentage, number of bracts open with maximum TSS and carotene content on 8^{th}, 10^{th} and 12^{th} day, and useful vase life were recorded in flowers of Golden Torch. Effect of vase solutions was found significant for all -parameters on post harvest quality of heliconia during vase life. Flowers treated with T_4 (100 ppm GA_3) shown significantly maximum water uptake, fresh weight retention, flower opening percentage, number of bracts open, TSS, carotene content and useful vase life (15.50 days).

Keywords: heliconia, vase solutions, golden torch, GA_3, bract opening

Introduction
The inflorescences of heliconia are unique and beautiful, sturdy and highly priced in flower market. Heliconia is gaining popularity in the international flower trade. Hence, addressing its postharvest problems and prolonging its vase life for a considerable period would suffice to be highly beneficial. Some post-harvest problems like low water absorption and uptake, rapid bract and florets darkening and abscission or senescence have been known in heliconia (Paulo *et al.,* 2005) [7]. There is important role of different chemicals like germicides and sugars in form of vase solution on post harvest flower quality and life of different cut flowers. Recently, role of polymanes and antioxidants in improving postharvest quality and life of cut flowers has been reported in gladiolus and carnation (Bagni and Tassoni, 2006) [1]. Therefore, this experiment was planned to improve the quality and post harvest life of this high value flower by using antioxidants and germicides along with sucrose in vase solution.

Materials and Methods
Fresh cut spikes of heliconia were obtained from a Floriculture Research Farm in morning. The experiment was conducted at Laboratory, Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, NAU, Navsari during 2015-2016. The experiment was laid out in completely randomized block design with factorial concept having two factors including four varieties. Four varieties *viz.* V1 - Red Torch, V2 - Golden Torch, V3 - Kenea red and V4 - Orange and eight vase solution *viz.* T1 - control (Distilled water), T2 - 3 % sucrose, T3 - 50 ppm GA3, T4 - 100 ppm GA3, T5 - 200 ppm Al2(SO4)3, T6 - 300 ppm Al2(SO4)3, T7 - 200 ppm 8 - HQC and T8 - 300 ppm 8 - HQC. Each treatments was repeated thrice times. Spikes were harvested at three bract open stage from basal end and sorted for uniform size (75 cm) 24 spikes (8 in each reputation) were held in different vase solutions. Before put in vase solution, spikes were treated with 15% sucrose + 250 ppm 8-HQC. Spikes were weighted and change in fresh weight was calculated on the basis of initial fresh weight. The solution uptake by cut spikes was recorded at alternate day until end of vase life. Carotene content and total soluble sugar was estimated on 8, 10, and 12 days after treatments using 3 bracts from basal end of spike.

The carotene content in bract was estimated by method of Wellburn (1994) [10] and data were statistically analyzed using standard method as suggested by Panse and Sukhatme (1967) [6].

Results and Discussios

Effect of varieties

Among all varieties of heliconia, Golden Torch (V_2) was found best as it recorded maximum water uptake (29.50, 23.21 and 9.94 ml), fresh weight retention (0.68, 4.93 and 8.30 %) at 7th, 11th and 15th day, respectively, flower opening percentage (43.75 %), number of bract open (0.86), TSS (94.07, 72.14 and 44.85 mg/g), carotene content (2.43, 2.13 and 1.87 µg/ml) at 8th, 10th and 12th day, respectively and useful vase life (14.90 days) as compared to all other varieties. The variation among cultivars observed might be due to the differences in senescencing behaviour by producing higher amount of ACC, ethylene forming enzymes and ethylene. The variation in cultivars could be attributed to the differences in number of thick walled supporting cells in xylem elements and phloem fibers and presence and absence of a complex ring of secondary thickening in the flower peduncles of the different varieties (Ritu Jain *et al*., 2009) [8].

Effect of vase solutions

All treatments as vase solution improved water uptake and fresh weight retention in the heliconia inflorescence as compared to flowers kept in distilled water (Table 1). Among all eight treatments, T4 (GA3 100 ppm) showed significantly maximum retention of fresh weight (0.67, 3.76 and 5.88 %) and water uptake (28.23, 20.85 and 7.46 ml) at 7th, 11th and 15th day, respectively. GA3 has been known to enhance the liposomal permeability of the cell membrane to glucose, hydrolyse starch, fructose and sucrose into glucose and fructose molecules (Faragher *et al.*, 1986) [2]. The rate of decline in water uptake and fresh weight retention was much conspicuous in inflorescence placed in control (water).

Spikes of heliconia treated with GA3 @ 100 ppm (T4) showed significantly maximum flower opening percentage (48.26 %) and number of bracts open (0.90). Similar results were noted in cut flowers of gladiolus which have many beneficial effects as GA3 improves the opening of immature buds in gladiolus besides preventing yellowing of leaves (Namita *et al*., 2006). Increase in respiration rate with rapid development of flower buds and there is a need for a substantial carbohydrate supply to the flowers after harvest to initiate opening process (Halevy *et al*., 1978) [3].

Significantly maximum retention of TSS (95.57, 72.89 and 46.97 mg/g) and carotene content in bracts (2.78, 2.29 and 1.88 µg/ml) at 8th, 10th and 12th day, respectively was observed in spikes treated with GA_3 @ 100 ppm (T_4) as compare to control (Table 2). Higher water uptake and fresh weight retention might have restricted the degradation of macro molecules *viz*., starch, proteins, nucleic acid, lipid and stimulated their synthesis in the petal cells and thus contributed to maintained higher levels of TSS. Further, GA3 is also known to mobilize stored food, hydrolyse starch fructose and sucrose in to glucose and fructose molecules this might have further contributed in maintenance of cellular structure. Similar effects of improved TSS due to GA3 as vase solution were recorded in gladiolus by Singh *et al.* (2006) and in heliconia by Mangave (2010) [4]. The carotene is located in chromoplasts which are lipid compound attached to protein complex. During senescence, proteins are lost. Exogenous applied proteins which is highly soluble and reduce the degradation of these proteins which helps to delay senescence. Protective role of GA3 on structure have earlier been discussed. Which maintained TSS level might help to retain pigment level in bracts. Moreover, heliconia spikes treated with GA3 100 ppm recorded significantly maximum vase life (15.50 days). This was a result of highly maintained turgidity due to higher water uptake which retained fresh weight after harvesting of inflorescence and further resulted in improved overall flower quality due to application of GA3 as vase solution (Faragher *et al.*, 1986) [2].

Table 1: Effect of varieties and vase solutions on post harvest life of heliconia cut flowers

Treatments	Water uptake (m l)			Change in fresh weight (%)			Flower opening (%)	Number of bracts open
	7th d a y	11th d a y	15th d a y	7th d a y	11th d a y	15th d a y		
Varieties (V)								
V1 - Re d Torch	2 7. 5 2	1 9. 5 4	6.30	0. 7 4	5. 3 8	8. 5 3	41.49	0.84
V2 - Golden torch	2 9. 5 0	2 3. 2 1	9.94	0. 6 8	4. 9 3	8. 3 0	43.75	0.86
V3 - Kenea Red	2 5. 2 3	1 7. 3 4	2.80	0. 8 0	5. 5 1	8. 8 3	36.72	0.83
V4 - Orange	2 3. 4 6	1 3. 11	0.00	2. 00	6. 8 7	0.00	32.73	0.78
S. Em. ±	0.27	0.22	0.05	0.01	0.05	0.08	0.43	0.01
C. D. a t 5 %	0.77	0.63	0.14	0.04	0.15	0.23	1.22	0.04
Vase solutions (T)								
T1 - Control	2 3.3 7	1 4. 8 1	2.80	1. 4 6	6.99	7. 1 8	30.73	0.78
T2 – 3 % Sucrose	2 5.44	1 7. 44	3.87	1. 3 2	6.78	6. 7 2	32.47	0.79
T3 – 50 mg GA3	2 7.5 0	1 9. 7 4	5.98	0. 77	4.31	5. 9 4	45.14	0.87
T4 – 100 mg GA3	2 8.2 3	2 0. 8 5	7.46	0. 6 7	3.76	5. 88	48.26	0.90
T5 - 200 ppm Al2(SO4)3	2 6.1 9	1 7. 7 8	4.11	1. 1 9	6.51	6. 7 2	34.55	0.82
T6 – 300 ppm Al2(SO4)3	2 6.4 9	1 8. 0 2	4.20	1. 1 3	6.36	6. 4 2	37.67	0.82
T7 - 200 ppm 8 - HQC	2 6.9 5	1 8. 5 7	4.50	0. 99	5.52	6. 2 9	39.06	0.82
T8 - 300 ppm 8 - HQC	2 7.2 4	1 9. 1 7	5.15	0. 9 1	5.16	6. 1 8	41.49	0.83
S. Em. ±	0.38	0.31	0.07	0.02	0.07	0.11	0.61	0.02
C. D. a t 5 %	1.09	0.89	0.20	0.05	0.21	0.32	1.73	0.06

Table 2: Effect of varieties and vase solution on total soluble sugar, carotene content and vase life of heliconia spikes

Treatments	Total soluble sugar (mg/g)			Carotene content (µg/ml)			Useful vase life (days)
	7th day	11th day	15th day	7th day	11th day	15th day	
Varieties (V)							
V1 - Re d Torch	92.64	68.91	42.39	2.31	2.03	1.60	14.62
V2 - Golden torch	94.07	72.14	44.85	2.43	2.13	1.87	14.90
V3 - Kenea Red	91.00	68.07	41.42	2.36	2.08	1.61	14.33
V4 - Orange	89.64	67.40	40.41	2.27	2.00	1.51	12.87
S. Em. ±	0.22	0.39	0.25	0.02	0.01	0.02	0.06
C. D. a t 5 %	0.61	1.11	0.71	0.05	0.04	0.05	0.18
Vase solutions (T)							
T1 - Control	86.64	65.22	33.93	1.73	1.53	1.07	12.63
T2 – 3 % Sucrose	89.21	65.76	38.80	2.00	1.91	1.41	13.33
T3 – 50 mg GA3	94.27	71.22	46.04	2.71	2.27	1.87	14.99
T4 – 100 mg GA3	95.57	72.89	46.97	2.78	2.29	1.88	15.50
T5 - 200 ppm Al2(SO4)3	90.51	67.81	40.89	2.21	2.06	1.56	13.76
T6 – 300 ppm Al2(SO4)3	91.74	69.44	42.51	2.31	2.10	1.79	14.01
T7 - 200 ppm 8 - HQC	92.80	69.59	43.93	2.47	2.13	1.73	14.60
T8 - 300 ppm 8 - HQC	93.67	71.15	45.05	2.55	2.18	1.87	14.64
S. Em. ±	0.30	0.55	0.35	0.03	0.02	0.02	0.09
C. D. a t 5 %	0.87	1.57	1.00	0.07	0.06	0.07	0.25

Conclusions

Among all varieties of heliconia, Golden Torch was found best with maximum vase life of 14.90 days while in case of vase solutions, GA3 improved flower quality with maximum vase life (16.00 days) significantly.

Acknowledgement

The authors are highly grateful to Hon'ble Vice Chancellor and Director of Research, Navsari Agricultural University, Navsari for providing sanction to carry out the research work. The authors are also grateful to Principal and Dean, ASPEE College of Horticulture and Forestry, NAU, Navsari for providing necessary facilities for carrying out the research work.

References

1. Bangi N, Tassoni A. The role of polyamines in relation to flower senescence. In: Floriculture, Ornamental and Plant Biotechnology, Global Sci. Books, UK, 2006; 1:88-95.
2. Faragher JD, Mayak S, Tirosh T. Physiological response of cut rose flowers to cold storage. Plant Physiol. 1986; 67:205-210.
3. Halevy AH, Kofranek AM, Besemer ST. Postharvest handling methods for bird of paradise flowers (*Sterlitzia reginae* Ait.). J. American Soc. Hort. Sci. 1978; 103:165-169.
4. Mangave BD. Post harvest physiology and quality of heliconia inflorescence cv. Golden Torch as influenced by antioxidents. *M.Sc. Thesis* submitted to Navsari Agriculture University, Navsari, 2010.
5. Namita Kumar R, Singh K. Effect of pre-storage pulsing on storage life of gladiolus cut spikes. J. Ornam. Hort. 2006; 9(4):258-261.
6. Panse VG, Sukhatme PV. Statistical Method for Agricutural Workers. ICAR Pub. New Delhi. 1967, 361.
7. Paulo J, Moraes D, Finger FL, Cecon JG, PR, Cesa LP. Influence of benzyladennine on longevity of *Heliconia latispatha* Benth. *Acta Hort.*, 2005; 683:369-71.
8. Ritu Jain, Prasad KV, Singh OP. Effect of different floral preservative solutions on vase life of few chrysanthemum spray cultivars. J. Ornam. Hort. 2009; 12(4):245-250.
9. Singh A, Kumar J, Kumar P. Effects of plant growth regulators and sucrose on post harvest physiology, membrane stability and vase life of cut spikes of gladiolus. Plant Growth Reg. 2008; 55:221-29.
10. Wellburn AR. The spectral determination of chlorophyll a and b, as well as carotenoids using various solvent with spectrophotometers of different resolution. J. Pl. Physiol. 1994; 144:307-313.