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Effect of Holding Solutions on Biochemical and Microbial Observations in Extending the Vase Life of Cut Carnation cv. Kiro

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A B S T R A C T

An experiment was carried out to study the effect of different holding solution combinations on vase life of cut carnation cv. Kiro. The flowers were kept under common holding solution (sucrose 4% + 8-HQS 200 ppm) along with GA_3 at 25 ppm recorded the highest chlorophyll content of leaf (87.48 SPAD unit) on 2nd day and gradually decreased through vase life extends, whereas significantly the highest chlorophyll content of calyx (46.86 SPAD unit) extended through the vase life period resulting in reduced microbial count (1.00×10^{-5} cfu/ml) initially and (85.10×10^{-5} cfu/ml) final microbial count thereby extending maximum vase life (20.32 days) which has been extended the vase life period of carnation flower cv. Kiro.

Introduction

Carnation (*Dianthus caryophyllus* L.) is an important cut flower in the world. Carnation is a climatric flower that is highly sensitive to ethylene (Pun *et al.,* 1999). Due to high perishability, cut flowers are vulnerable to large post-harvest losses upto 50 per cent of the farm value (Singh *et al.,* 2007).

Carnations are more susceptible to mechanical and physical damages and microbial infections by diseases and pests during and after harvest. Floral preservatives affect the quality of cut flowers by extending the vase life, increasing flower size and maintaining the colour of leaves and petals. The vase life of cut flowers and foliage is often shortened by vascular occlusions that constrict vase solutions supply, reduction in stem conductivity is typically caused by blockage of cut stem ends and xylem conduits by microbes, physiological plugging and water columns in xylem vessels by cavitations and air emboli. Cut flower and foliage longevity can be greatly affected by chemical composition of the vase solution. A broad range of biocides has been suggested to prevent the proliferation of microorganisms in vase solutions. However, their assumed antimicrobial action may be confounded by their other physicochemical effects (Edrisi *et al.,* 2012). Water relations plays a critical role in the post-harvest life of cut flowers, water imbalance within the cut flower resulting in

wilting, one of the major causes for termination of vase life (Halevy and Mayak, 1981).

Materials and Methods

The experiment was held in laboratory of Floriculture and Landscape Architecture, College of Horticulture, Dr. Y.S.R. Horticultural University, Venkataramannagudem, West Godavari dist (A.P), during year 2017-18. Experiment laid out in completely randomised design. Sucrose 4% + 8-HQS 200 ppm was used as common holding solution. There are 11 treatments, T_1: holding solution + GA_3 25 ppm, T_2: holding solution + GA_3 50 ppm, T_3: holding solution + BA 25 ppm, T_4: holding solution + BA 50 ppm, T_5: holding solution + $Al_2 (SO_4)_3$ 150 ppm, T_6: holding solution + $Al_2 (SO_4)_3$ 300 ppm, T_7: holding solution + STS 0.25 mM, T_8: holding solution + STS 0.50 mM, T_9: holding solution + Salicylic acid 25 ppm, T_{10}: holding solution + Salicylic acid 50 ppm, T_{11}: control (only holding solution). All the treatments are replicated thrice at 25 ±2°C ambient room temperature, 45-55 per cent relative humidity RH and 40 W cool white florescent tubes to maintain 12 hours photoperiod. In each conical flask, six flowers were placed in each 500 ml conical flasks 300 ml of holding solution. Observations were recorded changes on chlorophyll content of leaf, chlorophyll content of calyx, microbial count and vase life.

Results and Discussion

The data indicated that flowers kept in holding solution (sucrose 4% + 8-HQS 200 ppm) along with GA_3 at 25 ppm recorded the highest total chlorophyll content of leaf (87.48 SPAD unit) on 2^{nd} day and gradually decreased towards 10^{th} day (83.62 SPAD unit) of vase life period which was on par with flowers kept in holding solution along with GA_3 at 50 ppm, followed by flowers kept in holding solution along with BA at 25 ppm (85.12 SPAD unit) on 2^{nd} day to 10^{th} day (80.09 SPAD unit) of vase life period. This might be due to the synergistic effect of HQS and sucrose individually helps in preserving the leaves in good condition by lowering the per cent of wilting and inhibiting the chlorophyll and carbohydrate degradation. GA_3 involves in hydrolysis of polysaccharides and possibly delaying chlorophyll degradation or structural role in chloroplast photosynthesis. As a result, the vase life could be increased. The chlorophyll content was intensified when the flower dry matter content was higher and then it has faded due to depletion and damage of the chloroplasts in the calyx and leaf at advanced senescence, decreased chlorophyll content in leaves with increased storage period. Similar results were obtained by Tarannum *et al.,* (2016) in carnation, Mohan *et al.,* (2016) in cut rose, Jeevitha (2016) in bird-of paradise, Davood *et al.,* (2015) and Madhuri *et al.,* (2016) in carnation.

The total chlorophyll content of calyx differed significantly among all the treatments and the highest chlorophyll content of calyx (46.86 SPAD unit) on 2^{nd} day to 10^{th} day (44.12 SPAD unit) of vase life period was obtained by flowers kept in holding solution (sucrose 4% + 8-HQS 200 ppm) along with GA_3 at 25 ppm, followed by flowers kept in holding solution along with GA_3 at 50 ppm (43.78 SPAD unit) on 2^{nd} day to 10^{th} day (42.56 SPAD unit) of vase life period. This might be due the chlorophyll content of calyx increased initially and then decreased gradually, this might be due to increased chlorophyllase activity during initial days because of better water relations in flower stalk. These results were in accordance with Genkov *et al.,* (1997). Similar results were obtained by Abdul and Asrar (2012) in Antirrhinum, Madhuri *et al.,* (2016) in carnation (Table 1 and 2).

Table.1 Effect of different holding solutions on chlorophyll content on leaf (SPAD unit) and chlorophyll content of calyx (SPAD unit) during vase life of cut carnation cv. Kiro

Treatments	Time period (days)									
	Chlorophyll content of leaf (SPAD unit)					Chlorophyll content of calyx (SPAD unit)				
	2	4	6	8	10	2	4	6	8	10
T_1-Holding solution + GA_3 @ 25ppm	87.48	89.75	87.5	85.49	83.62	46.86	48.23	46.85	45.24	44.12
T_2-Holding solution + GA_3 @ 50ppm	86.12	87.90	85.78	84.02	81.70	43.78	46.74	44.50	43.56	42.56
T_3:-Holding solution + BA @ 25ppm	85.12	87.01	86.05	82.63	80.09	43.10	45.30	42.76	40.38	37.42
T_4-Holding solution + BA @ 50ppm	83.56	85.42	83.91	81.14	78.40	40.84	42.55	38.62	37.42	36.45
T_5- Holding solution + $Al_2(SO_4)_3$ @ 150ppm	82.50	84.53	83.14	80.08	76.83	39.17	41.00	37.98	36.63	35.91
T_6- Holding solution + $Al_2(SO_4)_3$ @ 300ppm	83.04	85.00	84.13	80.79	78.01	40.36	41.56	38.45	36.89	36.12
T_7- Holding solution + STS @ 0.25 mM	81.92	82.19	81.43	78.58	72.85	38.67	40.19	36.48	34.17	33.65
T_8- Holding solution + STS @ 0.50 mM	82.17	83.78	82.9	79.90	75.74	38.93	40.85	37.65	36.32	35.46
T_9:Holding solution + Salicylic acid @ 25ppm	80.75	81.54	80.64	76.56	70.32	36.94	37.15	35.17	34.45	33.24
T_{10}: Holding solution + Salicylic acid @ 50ppm	81.64	82.01	81.23	78.10	71.50	37.42	38.45	35.91	35.26	34.44
T_{11}: Control (only holding solution)	79.80	80.18	79.47	75.60	-	36.09	36.97	30.56	30.07	-
Mean	83.13	84.48	83.27	80.27	69.95	40.10	41.72	38.63	37.30	33.57
SE d	1.816	1.239	1.731	1.823	1.219	0.88	0.547	0.874	0.820	0.964
C.D at 5%	3.778	2.585	3.613	3.804	2.543	1.837	1.143	1.825	1.712	2.011

Holding solution- Distilled water + sucrose 4% + 8-HQS 200 ppm *Significant at (P≤0.05)

Table.2 Effect of different holding solutions on microbial count (cfu/ml) and vase life (days) during vase life of cut carnation cv. Kiro

Treatments	Microbial count (cfu/ml) (10^5 dilutions)		Vase life (days)
	Initial	Final	days
T_1-Holding solution + GA_3 @ 25ppm	1.00	85.10	20.32
T_2-Holding solution + GA_3 @ 50ppm	1.60	87.22	19.60
T_3:-Holding solution + BA @ 25ppm	3.02	95.30	17.92
T_4-Holding solution + BA @ 50ppm	2.60	96.14	18.32
T_5- Holding solution + $Al_2(SO_4)_3$ @ 150ppm	3.50	99.14	15.60
T_6- Holding solution + $Al_2(SO_4)_3$ @ 300ppm	3.16	98.02	16.78
T_7- Holding solution + STS @ 0.25 Mm	4.30	109.80	13.45
T_8- Holding solution + STS @ 0.50 Mm	3.80	100.08	14.35
T_9:Holding solution + Salicylic acid @ 25ppm	4.98	121.00	11.71
T_{10}: Holding solution + Salicylic acid @ 50ppm	4.80	117.06	12.00
T_{11}: Control (only holding solution)	5.90	130.00	9.50
Mean	3.51	10.3.53	15.39
SE d	0.068	2.066	0.356
C.D at 5%	0.143	4.186	0.744
Significance	*	*	*

Holding solution- Distilled water + sucrose 4% + 8-HQS 200 ppm *Significant at (P≤0.05)

A perusal of data indicates that flowers kept in holding solution along with GA_3 at 25 ppm (T_1) recorded the lowest microbial growth (1.00×10^{-5} cfu/ml) during initial count as well as final count (85.10×10^{-5} cfu/ml) which was followed by flowers kept in holding solution along with GA_3 at 50 ppm (T_2) during initial count (4.48×10^{-5} cfu/ml) and final count (98.76×10^{-5} cfu/ml). The highest microbial count during initial count (5.90×10^{-5}cfu/ml) and final count (130.00×10^{-5} cfu/ml) was observed with flowers kept in control treatment (T_{11}) only holding solution. This could be due to sucrose served as a source of energy for microbes, which might have helped its growth to increase their population in vase solution. Similar results were observed by Vijayabhaskar (2002) that maximum microbial count was recorded with higher concentrations of sucrose in the vase solution of cut rose cv. First red. Reduced microbial growth was due to their biocide effect in vase solution (Loubaud and Van Doorn, 2004).

The vase life period of cut carnation differed significantly among the treatments. All the treatments have significantly improved vase life over control (only holding solution) (T_{11}). Among the different treatments, flowers kept in holding solution along with GA_3 @ 25 ppm (T_1) recorded significantly the longest vase life (20.32 days) which was on par with flowers kept in holding solution along with GA_3 @ 50 ppm (T_2) (19.60 days), followed by flowers kept in holding solution along with BA @ 25 ppm (18.32 days). Among all the treatments the lowest vase life (9.50 days) was observed with flowers kept in control (only holding solution) (T_{11}). The vase life period ranged from 9.50 to 20.32 days. The data indicated that flowers kept in holding solution (sucrose 4% + 8-HQS @ 200 ppm) along with GA_3 @ 25 ppm (T_1) recorded significantly the longest vase life. This might be due to GA_3 with sucrose further facilitated the better intake of water and accumulation of total soluble sugars in petal cells probably by enhancing the osmotic driving force for solution uptake by making the cell's water potential more negative which leads to have longer vase life. 8-HQS itself reduced the transpiration and improved water balance due to stomatal closure might have added to keep the flowers fresh for a longer duration. Similar results were also recorded by in Elhm *et al.,* (2014), Kamran *et al.,* (2014) and Davood *et al.,* (2015) in carnation.

References

Abdul, W. and Asrar, A. 2012. Effect of some preservative solutions on vase life and keeping quality of snapdragon (*Antirrinum majus* L.) cut flowers. *Journal of the Saudi Society of Agricultural Sciences.*11:29-35.

Davood, H., Behzad, K., Ali, S. and Dina, Y. 2015. Response of cut Carnation (*Dianthus caryophyllus* L. cv. Tempo) to essential oils and antimicrobial compounds. *International Journal of Biosciences.* 6(3): 36-44.

Edrisi, B., Sadrpoor, A. and Saffari, V. R. 2012. Effects of chemicals on vase life of cut Carnation (*Dianthus caryophyllus* L. 'Delphi') and microorganism's population in solution. *Journal of Ornamental and Horticultural Plants*. 2(1): 1-11.

Elham, H., Vali, R., Amrollah, N. and Javad, F. 2014. Postharvest quality improvement of carnation (*Dianthus caryophyllus* L.) cut flowers by Gibberilic Acid, Benzyl Adenine and Nano Silver. *Agricultural Communications*. 2(2): 28-34.

Genkov, T., Tsoneva, P. and Ivanova, I. 1997. Effect of cytokinins on photosynthetic pigments and chlorophyllase activity in *in vitro* cultures of axillary buds of (*Dianthus caryophyllus* L.). *Journal of*

Plant Growth Regulation. 16(3): 169-172.

Halevy, A.H. and Mayak, S. 1981. Senescence and postharvest physiology of cut flowers. Part I. In: Horticultural Reviews. Vol 2, AVI Publishing Westport, conn. 59-143.

Jeevitha. S. 2016. Effect of Holding Solution on the Vase Life of Bird-of-Paradise Cut Flower. *Environment & Ecology*. 34(2): 735-739.

Kamran, A., Vahid, A., Elham, S. M. and Aida, A. 2014. Evaluation the effect of sucrose and GA_3 treatment on vase life carnation cut flower (*Dianthus caryophyllus* var Yellow). *Pelagia research library. Advances in Applied Science Research.* 5(4):150-154.

Loubaud, M. and Van Doorn, W. G. 2004. Wound induced and bacteria induced xylem blockage in roses, Astilbe and Viburnum. Post-harvest Biology and Technology. 32: 281-88.

Madhuri, M., Bindu, P. R., Hari, P. R. N. and vijay, I. 2016 b. Effect of biocides on the fresh weight, chlorophyll content and microbial load in cut carnation flowers cv. Charmant. *Plant Archives*. 16(2), pp. 777-780.

Mohan, K. P., Nagaraju, R., Swarajya, L. K., Srinivasa reddy, D., Gopal, K. and reddy, M.L.N. 2016. Effect of different vase solutions on vase life of cut flowers cultivar Taj Mahal. *International Journal of Tropical Agriculture*. 34(6): 0254-8755.

Pun, U. K., Rowe, R., Rowarth, J. S., Barnes, M. F., Dawson, C. O. and Heyes, J. A. 1999. Short communication Influence of ethanol on climacteric senescence in five cultivars of carnation. *N.Z.J. Crop Horticultural Science*. 21: 69-77.

Singh, A., Dhaduk, B. K. and Desai, J. R. 2007. Postharvest technology and value addition in cut flowers. *Floriculture today*, September. pp. 40-52.

Tarannum, H. N., Narendra, S. B. And Zaheer, A. B. 2016. Effect of chemical preservations at different concentrations on vase life of carnation (*Dianthus caryophyllus* L.) cut flower cv. Soto. *Environment & ecology*. 34(3): 981-984.

Vijayabhaskar, W. 2002. Effects of chemicals and packaging material on physiological and biochemical changes during flower petal senescence and on vase life of cut rose cv. First Red. *Ph.D. Thesis submitted to Acharya N G Ranga Agricultural University, Hyderabad.*

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