The Bioscan 10(3): 973-976, 2015
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

ENHANCING THE LONGEVITY OF THE *CYMBIDIUM* HYBRID 'PINE CLASH MOON VENUS' THROUGH CHEMICAL APPROACHES

T. USHA BHARATHI*[1] AND D. BARMAN[2]
[1]Division of Ornamental Crops,
Indian Council of Agricultral Research, Bangalore - 560 089, INDIA
[2]National Research Centre for Orchids, Pakyong - 737 106, Sikkim, INDIA
e-mail: t.ushabharathi@gmail.com

KEYWORDS
Pulsing
Cymbidium hybrid 'Pine Clash Moon Venus'
Pulsing solutions
Vase life

Received on :
17.05.2015

Accepted on :
20.08.2015

***Corresponding author**

ABSTRACT
An investigation was carried out to study the role of sucrose, antimicrobial and anti ethylene agents in the form of pulsing treatment on post harvest keeping quality of *Cymbidium* orchid hybrid 'Pine Clash Moon Venus. The cut spikes were subjected to two hours of pulsing with 5% sucrose, 8% sucrose, 10% sucrose, 8-HQS 200 ppm, 10% sucrose + 8-HQS 200 ppm, 10% sucrose + 8-HQS 200 ppm + BA 50 ppm, 0.5mM STS and distilled water as control. Significant differences were recorded among different treatments for fresh weight increase, water loss, water uptake, physiological loss in weight per cent, vase life, appearance of the flower and rostellum colouration. The results revealed that, among the various pulsing solutions used, two hours pulsing with 5% sucrose recorded highest increase in fresh weight on 3rd day (2.33 gm) as compared to control (0.61g). Total water uptake was maximum in 8% sucrose (38.95g) followed by 5% sucrose (31.99g) and total water loss was maximum in 8% sucrose (40.00g). Vase life of flower was highest in 5 % sucrose (56 days) followed by 8% sucrose (54.78 days). The present study revealed the effect of pulsing with different chemicals on the post harvest life of *Cymbidium* orchid hybrid 'Pine Clash Moon Venus' and generate the flowers with longer vase life.

INTRODUCTION

Orchids are the most spectacular among the flowering plants, and have unique colours, forms, sizes and shapes. Orchid industry is a million dollar industry in several countries. The orchids like *Cymbidium*, *Dendrobium*, *Phalaenopsis*, *Vanda*, *Oncidium* and *Cattleya* are popular for their long lasting cut flowers and as potted plants. Among the orchids, *Cymbidium* is highly valued and priced for its exquisite flower spikes. Cymbidum orchids are grown in the North Eastern part of India especially in Sikkim, Arunachal Pradesh and Darjeeling. Fresh flowers and foliages having shorter shelf life because of its perishable nature (Vishnupriya and Jawaharlal, 2014).The post-harvest life of cut flowers of *Cymbidium* depend on both the pre-harvest and post-harvest conditions like any other cut flower. Cymbidium flowers are grown for their excellent cut flowers and are sensitive to ethylene compared to other flowers. The senescence hormone called ethylene produced during senescence reduces the post harvest life which results in wilting and shedding of individual flowers. Enhancing the vase life of Cymbidium orchids is essential to achieve the quality produce at consumer level.

The main cause of premature wilt of flowers is disruption of water absorption due to microbial contamination of cut stems (Leonhardt and Sewake, 1999), rapid loss of fresh weight, water deficit (Aarts, 1957) and low turgidity (Mayak *et al.*, 1974). Leonhardt and Sewake (1999) reported that decreased water absorption caused by microbial plugging of vascular tissues lead to petal drop, wilted flowers and weak stem. Orchid flowers are perishable in nature and extremely sensitive to ethylene (Davison, 1949; Beyer, 1976; Goh *et al.*, 1985) and senescing flowers produce their own ethylene (Arditti, 1979). Cut flowers are highly perishable commodities and vulnerable to higher post harvest losses. A recent survey says that post harvest losses of cut flowers are estimated to about 20-25% at global level. Vase life is a yardstick for the longevity of cut flowers and is an important target for improving flower characteristics, whether by chemical treatment or plant breeding (Yamada *et al.*, 2002). Prolonging the vase life depends on water balance and retardation of senescence which can be achieved by the use of sucrose and certain chemicals. Pulsing of cut flowers with sucrose replaces the depleted endogenous carbohydrate used during postharvest life of flowers (Salunke *et al.*, 1990). Floral preservatives inhibits the synthesis of ethylene after cutting the spike and an ideal floral preservative should contain sucrose as energy source with germicidal effect, which ultimately improves vascular system for longer survival of spike during post harvest. Maintaining the quality of the flowers and extending the post harvest life is most important as quality improvement in order to compete in the world market. Keeping this in view, this experiment was designed and conducted to study the role of different pulsing solutions on post harvest life of cut spikes of *Cymbidium* hybrid 'Pine Clash Moon Venus'.

MATERIALS AND METHODS

An experiment was conducted to study the effect of different

pulsing solutions on post harvest life of *Cymbidium* hybrid 'Pine Clash Moon Venus' at National Research Centre for Orchids, Pakyong, Sikkim. During that period the minimum temperature ranged from 4ºC to 15ºC and maximum temperature ranged from 10ºC to 25ºC and the relative humidity varied from 40 to 45%. Spikes of *Cymbidium* hybrid 'Pine Clash Moon Venus' were harvested at fully opened stage. Uniform spikes of 60 cm length were harvested and precooled in water. Slanting cut was given to the stalks and the spikes were subjected to two hours of pulsing with eight different chemicals. The treatments consisted of 5% sucrose, 8% sucrose, 10% sucrose, 8-HQS 200 ppm, 10% sucrose + 8-HQS 200 ppm, 10% sucrose + 8-HQS 200 ppm + BA 50 ppm, 0.5mM STS and distilled water as control. The observations on fresh weight increase, water loss, water uptake, water loss/water uptake ratio, physiological loss in weight per cent, vase life, appearance of the flower and rostellum colouration were recorded at regular intervals. Appearance based on freshness was observed and scoring was given using 5 point scale. The experiment was carried out in a completely randomized design with three replications and the data were subjected to statistical analysis adopting the standard procedure as laid down by Panse and Sukatme (1978).

RESULTS AND DISCUSSION

Effect of pulsing on water uptake and water loss

The water uptake on 5th day was noticed maximum in 5% sucrose (7.11g) as compared to other treatments (Table 2). However, pulsing with 8% sucrose improved water uptake on the 10th day (6.56g), 20th day (6.33g), 30th day (5.39g) and 40th day (5.28g). There was a tendency of lower water uptake in most of the treatments with progress of time proceeds. The data (Table 3) reveals that the total water uptake was maximum in 8% sucrose (38.95g) followed by 5% sucrose (31.99g). Total water loss was maximum in solution containing 8% sucrose (40.00g) followed by 5 % sucrose (37.21). Although, the loss of water was higher in the treated flowers, the water loss or water uptake ratio an indicator of water balance was profoundly lowered in these flowers compared to control. There is no significant difference was noticed in water loss/ water uptake ratio. The results indicate that higher water uptake leads to higher water loss. Increased energy added from sucrose helps to maintain the stem steady over a longer period, resulting in increased water uptake and corresponding water loss. These results are in close agreement with those of Ali (2008) in Daffodil and Maitra and Roychoudhury (2005) in Anthurium. The most widely accepted theories on extending vase life of cut flowers are based on the improvement in water relations within the stem (Goh *et al.*, 1985). Sucrose in the pulsing solution was the main carbohydrate source as osmoticin, which decreases the water potential (Halevy and Mayak, 1974) and thus improved the water uptake (Kofranek and Halevy, 1976). The increased solution uptake in the cut spikes further caused an increase in fresh weight. Physiological loss in weight per cent was maximum in 5 % sucrose (10.26) and lowest in 10% sucrose (5.29).

Effect of pulsing on fresh weight increase

Pulsing chemicals as well as pulsing duration significantly influenced the post harvest behaviour and quality of cut spikes. Table 1 reveals that among the various pulsing solutions used, 5% sucrose recorded the highest fresh weight increase on 3rd day (2.33 gm), 9th day (2.72) and 15th day (2.05) as compared to other treatments. Decrease in fresh weight was noticed from 15th day onwards in control and 27th day onwards in all the treatments except in 5% sucrose. There are many factors responsible for the decrease in fresh weight among which drop in the pool of dry matter and respirable substrate is of utmost importance (Nichols, 1973).

Effect of pulsing on vase life

The different pulsing treatments had a significant effect on the vase life of the cut spikes (Table 3). The spikes pulsed with 5 % sucrose recorded the highest vase life of 56.00 days followed by 8% sucrose (54.78 days). The vase life of cut orchids did not depend on only water supply, but also on respiratory substrate or food reserve (Ketsa and Boonrote, 1990). Treating the flowers with sucrose is found to be beneficial in delaying senescence processes (Yakimova *et al.*, 1996). Rattanawisalanon *et al.* (2003) suggested that exogenous supply of sugars delays wilting in many flowers and this effect is due to maintenance of starch and sugar levels in cut flowers. Ketsa *et al.* (2005) reported that sucrose at 5% increased the vase life of unpollinated orchid flowers by delaying wilting and suppressing flower abscission in *Dendrobium* cv. Pompadour. Devi *et al.* (2005) also reported that pulsing of *Phaius tankervilliae* with 5% sucrose for 6 hours increased the vase life. However, in the present study, Sucrose at 10% reduced the vase life (days) and caused reverse osmosis in the cut flowers of *Cymbidium*. This result is in line with the earlier reports of Ketsa and Boonrote (1990) in *Dendrobium* cv.Tushabhhe in which pulsing the flowers with

Table 1: Effect of pulsing on fresh weight increase of *Cymbidium* hybrid 'Pine Clash Moon Venus'

Treatments	Fresh weight Increase (g)				
	3rd day	9th day	15th day	21st day	27th day
T_1- Sucrose 5 %	2.33	2.72	2.05	1.67	1.05
T_2 - Sucrose 8 %	1.05	1.00	1.11	0.77	-0.17
T_3 – Sucrose 10 %	1.61	1.72	1.66	0.22	-0.78
T_4- 8 HQS 200 ppm	0.95	1.39	1.39	0.67	0.22
T_5 - Sucrose 10 % + 8 HQS 200 ppm	0.72	0.61	0.33	0.11	-0.78
T_6 - Sucrose 10 % + 8 HQS 200 ppm + BA 50 ppm	1.39	1.5	1.33	0.39	-0.31
T_7 – 0.5 mM STS	1.28	1.72	2.67	1.39	-0.22
T_8 - Control (Distilled water)	0.61	0.72	-0.45	-0.94	-2.17
SED	0.48	0.55	0.70	NS	NS
C.D (p=0.05)	1.02	1.17	1.49	NS	NS

Table 2: Effect of pulsing on water uptake of *Cymbidium* hybrid 'Pine Clash Moon Venus'

Treatments	Water uptake(g)				
	5th day	10th day	20th day	30th day	40th day
T_1- Sucrose 5 %	7.11	6.28	5.61	4.44	4.17
T_2 - Sucrose 8 %	6.61	6.56	6.33	5.39	5.28
T_3 – Sucrose 10 %	5.50	5.55	4.39	4.44	3.28
T_4- 8 HQS 200 ppm	6.33	5.28	4.61	3.55	2.78
T_5 - Sucrose 10 % + 8 HQS 200 ppm	4.89	3.94	4.94	2.44	2.28
T_6 - Sucrose 10 % + 8 HQS 200 ppm + BA 50 ppm	4.94	4.83	4.72	4.28	2.56
T_7 – 0.5 mM STS	6.22	6.00	5.39	4.55	3.45
T_8 - Control (Distilled water)	5.79	5.00	4.71	4.17	3.04
SED	0.38	0.38	0.32	0.34	0.34
C.D (p=0.05)	0.81	0.81	0.69	0.72	0.71

Table 3: Effect of pulsing on the post harvest parameters of *Cymbidium* hybrid 'Pine Clash Moon Venus'

Treatments	Total water uptake (g)	Total water loss(g)	Water loss/ water uptake ratio	Physiological loss in weight %	Vase life (days)	Appearance	Rostellum colouration intensity
T_1- Sucrose 5 %	31.99	37.21	1.31	10.26	56.00	2.33	+
T_2 - Sucrose 8 %	38.95	40.00	1.24	9.36	54.78	1.89	+
T_3 – Sucrose 10 %	27.38	27.38	1.15	5.29	46.58	1.00	+ +
T_4- 8 HQS 200 ppm	22.99	26.38	1.15	5.38	49.88	1.22	+
T_5 - Sucrose 10 % + 8 HQS 200 ppm	18.1	22.16	1.20	8.43	46.55	1.66	+ +
T_6 - Sucrose 10 % + 8 HQS 200 ppm + BA 50 ppm	22.94	27.88	1.27	6.80	49.11	1.00	+ +
T_7 – 0.5 mM STS	36.55	36.55	1.21	8.83	49.11	1.22	+ +
T_8 - Control (Distilled water)	26.37	28.47	1.08	7.45	45.53	1.00	+ + +
SED	3.04	4.91	NS	1.57	3.17	0.40	
C.D (p=0.05)	6.45	10.42	NS	3.33	6.73	0.85	

+ - Less, + + - Moderate, + + + - High

10% sucrose showed decreased vase life, withering of petals and sepals. Further corroboration comes from Moraes *et al.* (2007) who observed that treating the flowers of *Epidendrum ibaguense* with 5, 10, 15 or 20% sucrose for 24h, shortened the vase life. Singh (2005) also reported that the ineffectiveness of higher sucrose solution concentration could be due to reduced water potential which might have led to reduced uptake in gladiolus.

Effect of pulsing on appearance and intensity of rostellum colouration

The data (Table 3) indicate that the appearance and visual quality of the cut spikes pulsed with 5 % sucrose scored higher (2.33) as compared to other treatments. This might be due to the fact that regulatory factors such as water relations, carbohydrate levels and ethylene production and their inter relationships determine post harvest longevity and quality. Sucrose has been the main ingredient of various pulsing solutions and has been found to be of great value in prolonging life, promoting opening and improving the colour and the size of the petals in several flowers (Mayak *et al.*, 1973). Rostellum colouration is the major phenomenon which determines the senescence of orchid flowers which is regulated by the endogenous and exogenous ethylene synthesis. In the present experiment, the intensity of rostellum colouration was highest in control and least in the treatments involving 5% sucrose, 8% sucrose and 8HQS 200 ppm. Attri *et al.* (2005) reported pollination stimulus and enhanced pigment development in the lip of orchids during the commencement of senescence. Sucrose may interact with other internal plant hormones in regulating the process of senescence. Sucrose enhances the effect of cytokinins in delaying senescence of flowers and reduces the effect of ethylene in promoting senescence (Mayak and Delley, 1976). Earlier workers (Borochov *et al.*, 1976) have demonstrated that sucrose antagonized the effect of abscisic acid in promoting the senescence of roses.

Pulsing of *Cymbidium* cut flowers with different pulsing solutions influenced the post harvest life of the flowers. Among the treatments, two hours pulsing with 5 % sucrose significantly increased the vase life of cut spikes of *Cymbidium* hybrid 'Pine Clash Moon Venus'.

REFERENCES

Aarts, J. F. T. 1957. Overde houdbaarheid van snijbloemen van snijbloemen (on the keepability of flowers). *Meded. Landbouwhogesch.* **57:** 1-62.

Ali, S., Khan, F. U., Khan, F. A. and Wani, S. A. 2008. Post harvest behaviour of cut daffodil as influenced by certain pulsing treatment. *J. of ornamental Hort.* **11(2):** 81-90.

Arditti, J. 1979. Aspects of the physiology of orchids. *Adv. Bot. Regulat.* **7:** 421-655.

Attri, L. K., Bhanwra, R. K., Nayyar, H. and Vij, S. P. 2005. Pollination related changes in the development of female gametophyte in *Cymbidium pendulum* (Roxb.) Sw. (Orchidaceae). *Phytomorphology.* **55(3-4):** 297-302.

Beyer, E. M. 1976. A potent inhibitor of ethylene action in plants. *Plant Physiol.* **58:** 268-271.

Borochov, A., Mayak, S. and Halevy, A. H. 1976. Combined effects of acid and sucrose on growth and senescence of rose flowers. *Plant Physiol.* **36:** 221-224.

Davison, O. W. 1949. Effect of ethylene on orchid flowers. Proc. *Amer. Soc. Hort. Sci.* **53:** 440-446.

Devi, J., Sharma, G. and Deka, P. C. 2005. Effect of pulsing and storage temperature on quality and vase life of *Phaius tankervilleae*. *J. Orchid Soc. India*. **19(1-2):** 29-33.

Goh, C. J., Halvey, A. H., Engel, R. and Konfranek, A. M. 1985. Ethylene evolution and sensitivity in cut orchid flowers. *Scientia Hort.* **26:** 57-67.

Halevy, A. H. and Mayak, S. 1974. Improvement of cut flower quality, opening and longevity by preshipment treatment. *Acta. Hort.* **43:** 335-347.

Ketsa, S. and Boonrote, A. 1990. Holding solutions for maximizing bud opening and vase life of *Dendrobium* 'Youppadeewan' flowers. *J. Hort. Sci.* **65:** 41-47.

Ketsa, S., Wisutiamonkul, A. and Roengmongkol, K. 2005. Role of ethylene in ovary growth and vase life of *Dendrobium* 'Pompadour' flowers. *Acta Hort.* **687:** 71-75.

Kofraneck, A. M. and Halevy, A. H. 1976. Sucrose and metal salts pulsing of gladiolus stems before storage. *Hort Sci.* **11:** 572-573.

Leonhardt and Sewake 1999. *Growing Dendrobium orchids in Hawaii*: *Production and pest management guide*, CTAHR, University of Hawaii. pp. 1-92.

Maitra, S. and Rouchowdhury, N. 2005. Effect of pulsing and holding solutions on postharvest life of cut flowers in *Anthurium andreanum* Lind.cv.Nitta. *J. Ornamental Hort.* **8(3):** 186-191.

Mayak, S. and Delley, D. R. 1976. Effects of sucrose on response of cut carnation to kinetin, ethylene and abscissic acid. *J. Am. Soc. Hort. Sci.* **101:** 583-585.

Mayak, S., Bravdo, B., Gvilli, A. and Halvey, A. H. 1973. Improvement of opening of cut flower gladioli flowers by pretreatment with high sugar concentrations. *Scientia Hort.* **1:** 357-365.

Mayak, S., Halevy, A. H., Sagie, S., Bar-Yoseph, A. and Bravdo, B. 1974. The water balance of cut rose flowers. *Physiol Plant.* **31:** 15-22.

Moraes, P. J., de., F. L., Finger, J. G. Barbosa and Cecon, P. R. 2007. Postharvest longevity of *Epidendrum ibaguense* orchid flowers. *Revista Brasileira de Hort. Ornamental.* **13(1):** 31-37.

Nichols, R. 1973. Senescence of cut carnation flower: respiration and sugar status. *J. Hort. Sci.* **48:** 111-121.

Panse, U. G. and Sukatme, P. V. 1978. *Statistical Method of Agricultural Workers*. Indian Council of Agricultural Research, New Delhi, India.

Rattanawisalanon, C., Ketsa, S. and van Doorn, W. G. 2003. Effect of aminoxyacetic acid and sugars on the vase life of *Dendrobium* flowers. *Postharvest Biol. and Technol.* **29:** 93-100.

Salunkhe, D. K., Bhat, N. K. and Desai, B. B. 1990. *Post harvest biotechnology of flowers and ornamental plants*. Springer Verlag, Berlin. p.192.

Singh, A., Kumar, J., Kumar, P. and Singh, V. P. 2005. Influence of 8-Hydroxy Quinoline (8-HQ) and sucrose pulsing on membrane stability and postharvest quality of gladiolus cut spikes. *J. Ornamental Hort.* **8(4):** 243-248.

Yakimova, E., Atanassova, B. B. and Kapchina-Toteva, V. 1997. Longevity and some metabolic events in post-harvest spray carnation flowers. *Bulg. J. Plant Physiol.* **23:** 57-65.

Yamada, T., Takatsu, Y., Manabe, T., Kasumi, M. and Marubashi, W. 2002. Suppressive effect of trehalose on apopototic cell death leading to petal senescence in ethylene - insensitive flowers of gladiolus. *Plant Sci.* **164:** 213-221.

Vishnupriya, M. and Jawaharlal, M. 2014. Glycerinization of foliage for dry flower products making. *The Bioscan*. **9(2):** 507-511.