**Original Research Article**

**Vase Life Studies on Cut Foliages under Shevaroy Condition of Eastern Ghats**

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**ABSTRACT**

Post-harvest studies were attempted using pulsing and simulated transportation on vase life of 29 ornamental cut foliages under Shevaroy hills at Horticultural Research Station, Yercaud. Holding solution containing Sucrose 5% + AgNO₃ 50 ppm significantly increased vase life of Dracaena fragrans ‘Massangeana’, Heliconia rostrata, Philodendron red emerald and Dracaena fragrans ‘lemon lime’. Pulsing solution containing Sucrose 5%+ AgNO₃100 ppm significantly increased vase life of Cordyline chocolate queen, Nephrolepis cordifolia, Cordyline terminalis and Cordyline compacta. The study also revealed that vase life durations ranged from 6.00 to 15.00 days.

**Keywords**

Cut stems, Sucrose, Silver Nitrate and Packing materials

**Article Info**

Accepted: 04 August 2020
Available Online: 10 September 2020

**Introduction**

Cut greens are an important component of the floricultural industry, largely used for decoration as filler in floral compositions. They provide freshness and colour variety to arrangements and bouquets (Pacifici et al., 2007). Foliage plants include all plants grown for their attractive leaves rather than for flowers and fruits. In general horticultural terms, however plants are those with attractive foliage and flowers that are able to survive and grown indoors. Foliage plants, in common terminology, are called house plants.

The cut foliage industry in Florida started in the 1980s when growers started producing Asparagus sp for shipment to northern markets (Manning, 1984). Nowadays, cut flowers and foliage occupy an important position in the local and foreign markets, due to its importance as a source of national income.

There are suitable environmental conditions for the production of flower and foliage crops for domestic and export market. Cut foliage production has been increasing rapidly in recent years. Flowers and foliage plants are
some of the most colourful and attractive horticultural plants. Some are used to decorate the rooms while others are used to beautify the areas around our homes and public building. The preservatives materials used as pulsing and holding solutions seemed to prolong longevity. In this study, some chemical preservatives i.e., citric acid or aluminum sulphate as a biocide alone on with sucrose were used to prolong vase life (Chen et al., 2004).

**Materials and Methods**

The present investigation was carried out at Horticultural Research Station, Tamil Nadu Agricultural University, Yercaud during 2012-2014. The experimental site is situated between 11° 04” to 11° 05” North latitude and 78° 05” to 78° 23” East longitude and at an altitude of 1500 m above Mean Sea Level.

The average minimum and maximum temperature of the area were 12.4°C and 31.0°C respectively. The soil is laterite in texture with 0.5 to 1.5 m depth. The experiment was laid out in a Randomized Block Design with three replication. Planting of twenty nine cut foiliages was made in 44×21 m with plant spacing 1 × 0.8 cm. Data was generated on vegetative characters at 30 day intervals. Vegetative characters like plant height, number of shoots, number of leaves, length of leaves, width of leaves, plant spread, stem girth and post harvest characters like Pulsing solutions, Holding solutions and packing studies.

The details of the treatments used are given below:

**Pulsing treatments**

P\(_0\) – Filtered Water  
P\(_1\) – Acidified Water (pH 3.5)  
P\(_2\) – Sucrose 5%

P\(_3\) – Sucrose 5%+ AgNO\(_3\) 50ppm  
P\(_5\) – Sucrose 5%+ AgNO\(_3\) 100ppm

**Holding treatments**

H\(_0\) – Filtered Water  
H\(_1\) – Acidified Water (pH 3.5)  
H\(_2\) – Sucrose 5%  
H\(_3\) – Sucrose 5%+ AgNO\(_3\) 25ppm  
H\(_4\) – Sucrose 5%+ AgNO\(_3\) 50ppm

**Packaging studies**

The foliage of different species were treated with the best pulsing solution and packed (both dry without any cotton plug and with a cotton plug at the petiole end) in cartons of 60×30×10 cm in bunches of twelve/carton.

The following lining materials were used along with control:

Print sheet  
Polythene sheet  
Polypropylene sheet

The data generated during the course of study was subjected to statistical analysis as prescribed by Panse and Sukhatme (2000).

**Results and Discussion**

Among the different holding solutions used, higher vase life was recorded in H\(_4\) (Sucrose 5% + AgNO\(_3\) 50 ppm) with 16.3 days. This was significantly superior to other holding treatments. Cut foliage treated with Sucrose 5%, Sucrose 5%+ AgNO\(_3\) 25 ppm treatment also showed a relatively longer vase life (15.9 days) (Table 1). Forestell (1991) also reported that pulsing cut Eucalyptus gunni with STS or 8 HQC did not lengthen the vase life. According to postharvest treatments for codiaeum cut stems showed highest vase life in 8-HQS and had no significant differences for preservatives and tap water. 8-HQS
controlled microbial growth in the holding solution and helped to prolong vase life of cut stems (Hettiarachchi and Balas, 2005). The enhancement of vase life of cut foliages by using sucrose in combination with AgNO₃ @ 20 and 40 ppm reported by Malakar et al., 2017. Wijayabandara et al., 2018 reported that the most effective vase solutions for *Ophiopogon japonicus* were sucrose 20 or 30 g/L pulsing treatments for 24 hour.

**Table 1** Effect of the holding solution on the cut foliages at Shevaroy condition

| Name of the species                  | H₀  | H₁  | H₂  | H₃  | H₄  | Mean  |
|-------------------------------------|-----|-----|-----|-----|-----|-------|
| *Dracaena reflexa*                  | 7.00| 7.50| 8.60| 15.1| 14.7| 10.60 |
| *Cordyline tango*                   | 7.00| 7.50| 12.2| 13.4| 13.7| 10.70 |
| *Dracaena sanderiana*               | 6.50| 7.20| 12.6| 14.5| 16.1| 11.40 |
| *Dracaena compacta*                 | 6.20| 6.30| 11.7| 14.1| 15.7| 10.80 |
| *Dracaena reflexa* ‘Song of Jamaica’| 7.20| 5.60| 10.3| 15.9| 16.3| 11.00 |
| *Dracaena fragrans* ‘Massangeana’   | 8.40| 7.30| 11.5| 15.0| 15.5| 11.50 |
| *Dracaena* ‘Purple compacta’        | 7.10| 6.10| 11.5| 12.9| 12.9| 10.10 |
| *Dracaena marginata*                | 5.20| 5.40| 10.4| 14.5| 15.2| 10.10 |
| *Cordyline fruitcosa*               | 7.20| 7.50| 10.9| 13.3| 14.5| 10.70 |
| *Philodendron xanadu*               | 7.90| 6.40| 11.9| 12.9| 14.4| 10.70 |
| *Philodendron red emerald*          | 7.70| 6.70| 11.7| 13.1| 16.2| 11.10 |
| *Anthurium andreanum*               | 6.40| 6.50| 11.3| 15.0| 15.5| 10.90 |
| *Dracaena fragrans* ‘lemon lime’   | 7.10| 6.20| 11.2| 12.4| 16.2| 10.60 |
| *Aglaonema Crispum*                 | 8.40| 6.70| 10.7| 14.0| 13.6| 10.70 |
| *Cordyline compacta*                | 7.00| 7.00| 11.6| 13.5| 15.3| 10.90 |
| *Cordyline negra*                   | 6.40| 6.60| 11.4| 12.3| 14.1| 10.20 |
| *Cordyline terminalis*              | 7.30| 6.20| 9.90| 13.3| 14.5| 10.30 |
| *Dracaena reflexa var tropical*     | 6.50| 6.60| 11.3| 13.6| 14.5| 10.50 |
| *Cordyline chocolate swirl*         | 6.90| 5.70| 13.4| 14.7| 15.2| 11.20 |
| *Cordyline chocolate queen*         | 7.40| 7.50| 12.5| 12.9| 13.7| 10.80 |
| *Nephrolepis cordifolia*            | 7.80| 6.50| 10.1| 12.1| 14.4| 10.20 |
| *Nephrolepis falcate*               | 7.60| 6.90| 12.2| 14.3| 15.3| 11.30 |
| *Philodendron green emerald*        | 7.70| 6.00| 12.1| 14.1| 15.4| 11.10 |
| *Philodendron ‘ceylon gold’         | 6.50| 5.90| 11.9| 10.0| 13.4| 9.50  |
| *Philodendron imbe ‘variegata’      | 6.30| 6.80| 11.4| 15.3| 15.1| 11.00 |
| *Heliconia rostrata*                | 7.40| 6.00| 11.3| 13.7| 16.3| 10.90 |
| *Asparagus sprengeri*               | 6.70| 7.20| 11.5| 15.3| 15.3| 11.20 |
| *Asparagus setaceous*               | 7.3 | 5.8 | 11.3| 13.6| 15.5| 10.70 |
| *Asparagus densiflorus*             | 5.7 | 6.4 | 10.0| 12.7| 14.1| 9.80  |

**SED** 0.40 0.36 0.70 1.10 0.74 -

**CD (P = 0.05)** 0.81 0.72 1.40 2.21 1.49

*H₀ – Filtered Water  H₁ – Acidified Water (pH 3.5)  
H₂ – Sucrose 5%  H₃ – Sucrose 5% + AgNO₃ 25ppm  
H₄ – Sucrose 5% + AgNO₃ 50ppm
Table 2: Effect of pulsing treatments on the cut foliage at Shevaroy condition

| Name of the species                        | P₀  | P₁  | P₂  | P₃  | P₄  | Mean |
|--------------------------------------------|-----|-----|-----|-----|-----|------|
| *Dracaena reflexa*                         | 12.90 | 9.80 | 10.20 | 10.90 | 17.10 | 12.20 |
| *Cordyline tango*                          | 10.40 | 10.50 | 11.50 | 10.80 | 18.30 | 12.30 |
| *Dracaena sanderiana*                      | 9.10 | 9.00 | 9.70 | 9.20 | 19.70 | 11.30 |
| *Dracaena compacta*                        | 9.60 | 9.80 | 9.60 | 9.70 | 16.80 | 11.10 |
| *Dracaena reflexa*’ Song of Jamaica’       | 9.10 | 8.90 | 9.40 | 9.10 | 17.90 | 10.90 |
| *Dracaena fragrans* ‘Massangeana’          | 10.40 | 9.00 | 12.90 | 10.80 | 19.00 | 12.40 |
| *Dracaena ’ Purple compacta’               | 9.20 | 10.10 | 10.60 | 10.00 | 20.60 | 12.10 |
| *Dracaena marginata*                       | 8.10 | 9.90 | 12.00 | 10.00 | 20.10 | 12.00 |
| *Cordyline fruitcosa*                      | 8.60 | 8.20 | 9.10 | 8.70 | 19.70 | 10.90 |
| *Philodendron xanadu*                      | 8.00 | 8.20 | 10.10 | 8.70 | 20.00 | 11.00 |
| *Philodendron red emerald*                 | 9.20 | 8.90 | 11.30 | 9.80 | 17.90 | 11.40 |
| *Anthurium andreanum*                      | 10.50 | 10.10 | 11.80 | 10.80 | 17.40 | 12.10 |
| *Dracaena fragrans* ‘lemon lime’           | 9.30 | 11.70 | 12.70 | 11.20 | 16.50 | 12.30 |
| *Aglaonema Crispum*                        | 8.40 | 10.10 | 12.30 | 10.30 | 15.80 | 11.40 |
| *Cordyline compacta*                       | 8.50 | 10.40 | 10.10 | 9.70 | 19.50 | 11.60 |
| *Cordyline negra*                          | 8.30 | 9.50 | 10.60 | 9.50 | 18.50 | 11.30 |
| *Cordyline terminalis*                     | 8.30 | 9.50 | 10.80 | 9.50 | 19.40 | 11.50 |
| *Dracaena reflexa var tropical*            | 8.50 | 8.20 | 9.50 | 8.70 | 18.40 | 10.70 |
| *Cordyline chocolate swirl*                | 7.80 | 8.30 | 10.30 | 8.80 | 17.10 | 10.40 |
| *Cordyline chocolate queen*                | 8.70 | 10.40 | 11.80 | 10.30 | 20.30 | 12.30 |
| *Nephrolepis cordifolia*                   | 8.90 | 8.90 | 11.20 | 9.70 | 19.30 | 11.60 |
| *Nephrolepis falcate*                      | 8.80 | 8.30 | 10.50 | 9.20 | 17.10 | 10.80 |
| *Philodendron green emerald*               | 8.20 | 7.80 | 10.30 | 8.80 | 19.60 | 10.90 |
| *Philodendron ‘ceylon gold’                | 7.40 | 8.30 | 10.80 | 8.80 | 17.00 | 10.40 |
| *Philodendron imbe ‘variegata’             | 7.70 | 8.20 | 11.30 | 9.10 | 17.50 | 10.70 |
| *Heliconia rostrata*                       | 7.90 | 8.10 | 13.30 | 9.80 | 19.90 | 11.80 |
| *Asparagus sprengeri*                      | 7.60 | 8.50 | 10.50 | 8.90 | 17.50 | 10.60 |
| *Asparagus setaceous*                      | 8.00 | 9.20 | 12.30 | 9.90 | 17.90 | 11.50 |
| *Asparagus densiflorus*                     | 7.50 | 7.90 | 9.50 | 8.30 | 18.60 | 10.30 |
| **SED**                                    | **0.48** | **0.55** | **0.61** | **0.88** | **0.74** | - |
| **CD (P= 0.05)**                           | **0.97** | **1.11** | **1.23** | **1.77** | **1.49** | - |

P₀ – Filtered Water  P₁ – Acidified Water (pH 3.5)  P₂ – Sucrose 5%  P₃ – Sucrose 5% + AgNO₃ 50 ppm  P₄ – Sucrose 5% + AgNO₃ 100 ppm
Table 3: Effect of packing / lining materials on cut foliages at Shevaroy condition

| Name of the species                        | Print Sheet | Polythene Sheet | Polypropylene sheet | Mean  |
|-------------------------------------------|-------------|----------------|---------------------|-------|
| Dracaena reflexa                          | 4.50        | 7.00           | 7.90                | 6.40  |
| Cordyline tango                           | 4.50        | 6.70           | 8.00                | 6.40  |
| Dracaena sanderiana                       | 6.50        | 6.90           | 8.10                | 7.10  |
| Dracaena compacta                         | 6.40        | 7.80           | 8.40                | 7.50  |
| Dracaena reflexa ‘Song of Jamaica’        | 6.20        | 7.10           | 9.00                | 7.40  |
| Dracaena fragrans ‘Massangeana’           | 13.60       | 16.50          | 16.60               | 15.60 |
| Dracaena ‘Purple compacta’                | 5.90        | 7.40           | 9.30                | 7.50  |
| Dracaena marginata                        | 11.30       | 12.10          | 12.40               | 11.90 |
| Cordyline fruitcosa                       | 11.40       | 12.00          | 12.40               | 11.90 |
| Philodendron xanadu                       | 10.70       | 12.00          | 12.90               | 11.80 |
| Philodendron red emerald                  | 11.10       | 11.10          | 13.10               | 11.80 |
| Anthurium andreanum                       | 9.30        | 9.80           | 10.90               | 10.00 |
| Dracaena fragrans ‘lemon lime’            | 6.90        | 8.50           | 10.90               | 8.80  |
| Aglaonema Crispum                         | 13.50       | 14.30          | 15.10               | 14.30 |
| Cordyline compacta                        | 10.30       | 11.00          | 12.30               | 11.20 |
| Cordyline negra                           | 10.90       | 11.70          | 13.40               | 12.00 |
| Cordyline terminalis                      | 11.90       | 12.30          | 14.80               | 13.00 |
| Dracaena reflexa var tropical             | 8.40        | 9.90           | 12.00               | 10.10 |
| Cordyline chocolate swirl                 | 9.50        | 11.30          | 12.30               | 11.00 |
| Cordyline chocolate queen                 | 9.40        | 11.10          | 12.50               | 11.00 |
| Nephrolepis cordifolia                    | 12.30       | 12.70          | 13.50               | 12.90 |
| Nephrolepis falcate                       | 10.70       | 11.30          | 12.60               | 11.50 |
| Philodendron green emerald                | 13.80       | 14.80          | 13.70               | 14.10 |
| Philodendron ‘ceylon gold’                | 12.90       | 13.50          | 14.80               | 13.70 |
| Philodendron imbe ‘variegata’             | 11.70       | 11.90          | 12.90               | 12.20 |
| Heliconia rostrata                        | 11.80       | 13.50          | 12.40               | 12.60 |
| Asparagus sprengeri                       | 9.80        | 10.60          | 11.30               | 10.60 |
| Asparagus setaceous                       | 10.60       | 10.80          | 11.90               | 11.10 |
| Asparagus densiflorus                     | 10.10       | 10.30          | 12.50               | 11.00 |
| SEd                                       | 0.58        | 0.58           | 0.63                |       |
| CD (P= 0.05)                              | 1.16        | 1.16           | 1.26                |       |

It is evident from Table 2 that significant effect on number of roots was noticed under the treatment P₄ (Sucrose 5% + AgNO₃100 ppm) with 20.60 days. This was significantly superior to other pulsing solutions. It was followed by P₂ (Sucrose 5%) with 13.30 days. Nooh et al., (1986) on the other hand reported addition of 8-HQC and Sucrose to the holding solution of Rhus hypophyllum and Nephrolepis exceltata was more effective than tap water. Criley and Parvin (1993) conducted trails with 21 different cut foliages and found only two genera to be benefited by the use of floral preservatives. In the holding solutions like distilled water and acidified water
like *Codiaeum varigatum* rooted. Stamps and Osborne (2003) reported rooting of croton leaves in water. They also reported the use of floral preservatives to be determined in the longevity of croton leaves. Elhindi (2012) revealed that in the cut sweet pea (*Lathyrus odoratus* L.) flowers held in the solution containing sucrose + 8-hydroxyquinoline (Suc+HQS) was more effective in promoting absorption rate, achieved greater maximum fresh mass, had better water balance for a longer period, extended the vase life (up to 17 d), and delayed degradation of chlorophylls.

Average vase life for individual harvest ranged from 7.9 d for *Dracaena reflexa* and 8.0 d for *Cordyline tango* to 14.80 d for *Philodendron ‘ceylon gold’* and *Cordyline terminalis* (Table 3). *Dracaena reflexa* and *Dracaena sanderiana* frequently had the shortest vase life across all harvests. Packing should protect the cut foliage from any physical damage, water loss and detrimental external conditions during transport. The material used for packing helps to regulate water loss and respiration. Packing the foliage using wet cotton plugs at the petiole end was found to give a better result, which was in conformity with the results of the study, by Nowak and Rudnicki (1990) reported that mature stems of *Asparagus setaceous* and mature leaves of *Dracaena sp*, *Cordyline terminalis* kept well when packed in plastic bags or plugging with wet cotton and packing without lining material was enough to transport the foliage.

In conclusion the increasing vase life is the key issue in the post harvest management of cut foliages. It appears that chemicals used for enhancing vase life, improve the water uptake of cut foliages by reducing the vascular blockage and ultimately improving the vase life. From the results obtained in this experiment, it could be concluded that effect of pulsing treatments and holding treatments (P5- Sucrose 5% + AgNO₃100 ppm and H₄. Sucrose 5% + AgNO₃ 50 ppm) could significantly improve the keeping quality of cut foliages.

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How to cite this article:
Anand, M., A. Sankari and Kayalvizhi, K. 2020. Vase Life Studies on Cut Foliages under Shevaroy Condition of Eastern Ghats. Int.J.Curr.Microbiol.App.Sci. 9(09): 34-40. doi: https://doi.org/10.20546/ijcmas.2020.909.004