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Studies on preservation and shelf life of cut anthurium flower

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ABSTRACT

Anthurium (Anthurium andraeanum Lind) is an internationally important cut flower for its virtue of color variation and long vase life which can contribute largely to the floriculture industry; making it the largest genus in the plant family Araceae. Cv. Tropical was collected and experiment was conducted under laboratory condition at the department of Post Harvest Technology, BCKV. Flowers were cut and they were weighed and subjected to preservative solution with freshly prepared comprising treatments [T_1=Sucrose (2%)+CA(200ppm), T_2=Sucrose (2%) +CA(200ppm)+HQS (200 ppm), T_3=Sucrose (2%)+CA(200ppm)+Al_2S0_4 (200ppm), T_4= Sucrose (2%)+CA(200 ppm)+BA (50ppm), T_5= Sucrose (2%)+CA(200ppm)+HQS (200ppm)+BA(50ppm), T_6= Sucrose (2%)+CA(200ppm)+Al_2S0_4 (200ppm)+BA(50ppm), T_7=BA(50ppm) and T_8=Distilled water] separately. All the treatments enhanced the keeping quality and vase life compare to the control ones. Among all the treatments T_4 resulted in increased uptake of water and total water loss. Increased fresh weight was maximum in T_5 load in turn extended vase life. T_2 showed maximum retention in spadix colour upto 17 days before blackening and glossiness for 19 days. Maximum vase life was observed in T_1, T_2 and T_5 of 20 days. The lowest decrease in fresh weight was noticed with T_5 but it took maximum time. Percentage loss in weight and fresh weight loss is highest in T_1. Blackening of spadix and blueing of spathe were start showing first in control at 8^{th} day and in T_6 (13^{th} day) respectively. It has been concluded that cut anthurium flower with T_5 delay the onset of flower senescence, maintained post-harvest quality and prolong the vase life compared to other treatments.

Keywords: Anthurium**,** chemicals, preservation, pulsing and shelf life

Anthurium (*Anthurium andraeanum* Lind) is an internationally important cut flower for its virtue of color variation and long vase life which can contribute largely to the floriculture industry; making it the largest genus in the plant family Araceae. In the global flower trade it ranks nineth and both for its cut flower and whole plant commands a respectable price. Netherlands is the world's leading producer and exporter. For the purpose of attractive foliage and showy cut flower, anthuriums are cultivated as tropical plants. Heart-shaped, flat, puckered, shiny and brightly coloured spathes or bracts subtended numerous inflorescences (spadices) produced by the anthurium. It is very popular for its flower arrangers which have bold effect, bright colour and long keeping quality (Agasimani, 2009). Research of the post-harvest handling of anthurium flowers need to be undertaken, because in general floriculture and post harvest handling and preservation of cut-flowers and in particular, anthurium is at an infant stage. For securing the prolong vase life of cut flowers, it is recommended for addition of chemical preservatives to the holding solution. Therefore, any treatment that will maintain the flower quality after harvest and increase the vase life of anthurium will enhance its production.

MATERIALS AND METHODS

Anthurium was collected from local grower, Kalyani and experiment was conducted under laboratory condition at the department of Post Harvest Technology, Faculty of Horticulture, BCKV, West Bengal. When spadix is almost fully developed flowers are harvested. One-third to two-third on the spadix open of the true

Treatments	
T_1	Sucrose (2%) + citric acid (200 ppm)
T_2	Sucrose (2%) + citric acid (200 ppm) + HQS (200 ppm)
T_3	Sucrose (2%) + citric acid (200 ppm +Al2S04 (200 ppm)
T_4	Sucrose (2%) + citric acid (200 ppm) + BA (50 ppm)
T_5	Sucrose (2%) + citric acid (200 ppm) + HQS (200 ppm) + BA (50 ppm)
T_6	Sucrose (2%) + citric acid (200 ppm) + Al2S04 (200 ppm) + BA (50 ppm)
T_7	Benzyl adenine (50 ppm)
T_8 (Control)	Tap water.

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flowers is the best stage of harvesting. To prevent the basal rotting flowers are cut with sharp knife/secateurs leaving 3 cm on the mother plant with uniform stems of about 25-30 cm in length. No treatment was given to the flowers from the period after the harvest till the materials were brought to the laboratory. After that they were weighed and subjected to preservative solution with freshly prepared comprising treatments separately.

Observations were recorded on water uptake (ml), water loss (ml), increase and decrease in fresh weight (g), number of days taken for increase in fresh weight (d) and number of days taken for decrease in fresh weight (d) in the experiments. Besides, days taken for discolouration of spathe and phytotoxic symptoms were also observed in preservative solution experiment. The number of days in preservative solution was also recorded. Water uptake was also recorded by weighing the cut flowers before putting in the preservative solution and weighing was continue for the entire period study at an interval of 20th day. The analysis of the data obtained in experiment was analyzed by completely randomized design with three replication (Gomez and Gomez, 1984).

During the period of the experiment the changes in temperature (^{0}C) (maximum and minimum) recorded was (26-30.1)^{0}C and relative humidity (RH%) recorded was within the range of 79-95% (Fig. 1, 2).

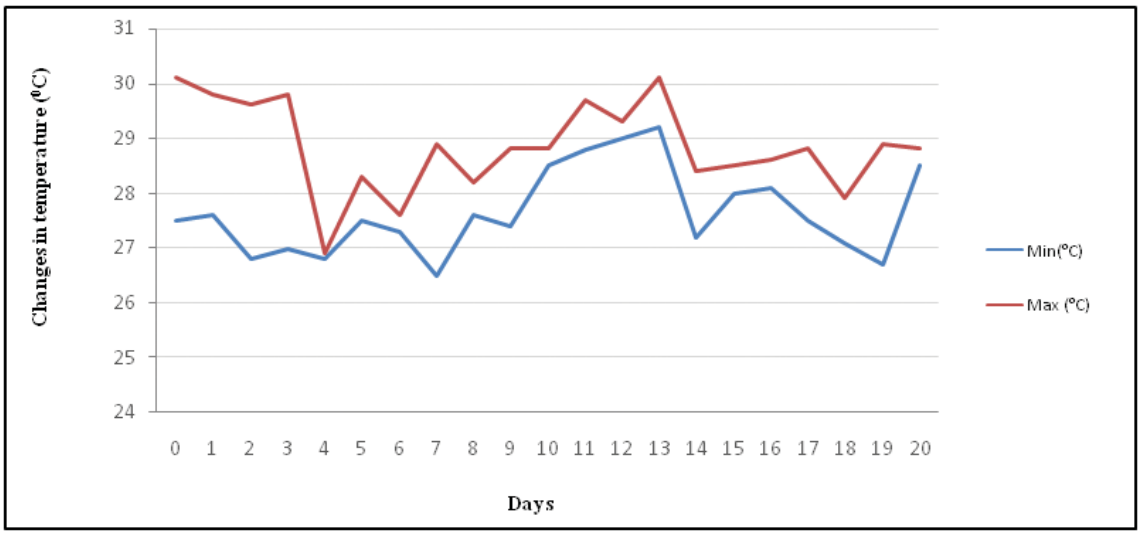


Fig. 1: Changes in temperature (max. and min.) during the period of experimentation of anthurium cut flowers

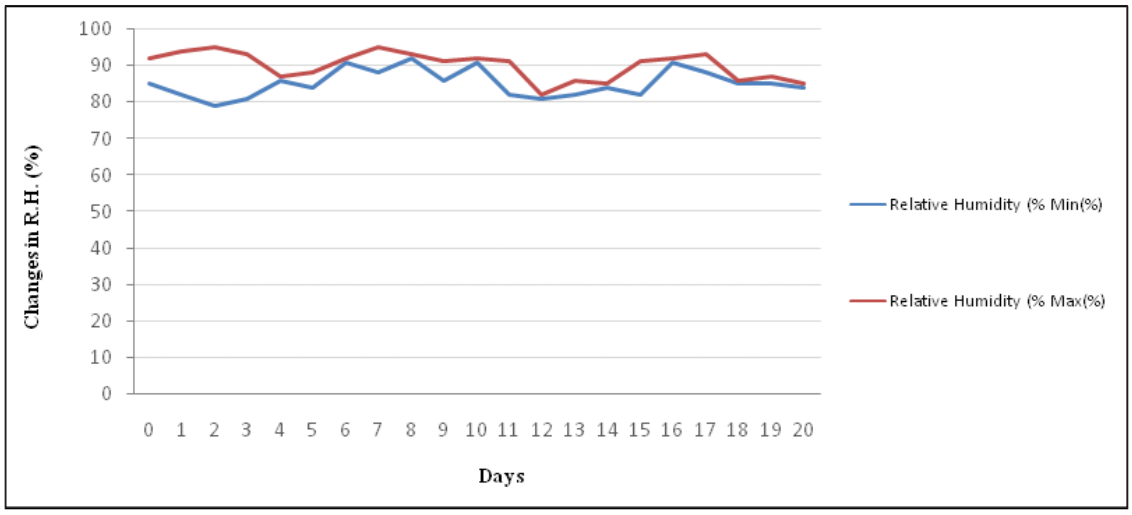


Fig. 2: Changes in relative humidity (max. and min.) during the period of experimentation of anthurium cut flowers

RESULTS AND DISCUSSION

Significant effects of different preservative solutions were observed on various aspects of post harvest period of cut flowers. The results on the effect of preservative solution in cut anthurium flower are presented in table 1. The result on the effect of preservative solution in cut anthurium flower showed improved water uptake which is highest (5.17 ml) in T_4 was observed and lowest in control. Pulsing of anthurium cut flowers with chemicals, helped to maintain higher water uptake along with the higher water loss in compare to the control flowers. The water uptake and water loss by the control flowers decreased throughout its vase life. Among the different treatments, flowers treated with preservative solution (T_5) containing sucrose (2%), citric acid (200 ppm), HQS (200 ppm), BA (50 ppm) took maximum time (7.33 d) to increase the fresh weight (1.01g). In fresh weight the lowest increase of flowers was noticed with tap water (0.81g) and it reached to that stage at the earliest (2.00 d). It can be clearly recognised to higher transpiration rate and decreased microbial load in the flowers. Increasing in transpiration pull, water uptake increases in cut flower pulsed in solution due to reduce of blockage to the flow of water uptake in comparison to control flowers which were pulsed in tap water. Aarts(1957) found from his experiment that loss of water through transpiration is very much essential for maintaining the continuity of water uptake. It also showed a tendency of the flowers with higher water loss would invariably have higher uptake.

Due to antimicrobial activity of chemical present in the solution during the vase life period, water uptake (ml) of cut anthurium flowers (which were treated with T_1 to T_7 preservative solution) initially increased from the beginning then decreased gradually as shown in fig. 3 and 4. It also indicated the possibility of reduced blockage in the flower stem to the flow of water uptake in the pulsed cut flowers. In the absence of antimicrobial agents in the control,the water uptake decreased all along the vase life period and increased microbial load might have created blockage. These observations also satisfied with the observation made by Singh and Sharma (2003) in gladiolus and Singh *et al.* (2003) in carnation.

Table 1: Effect of different preservative solution on water uptake and weight loss of cut anthurium spikes

Treatments	Water uptake(ml) for 20 days	Total water loss(ml) for 20 days	Increase in fresh wt. (g)	No. of days for increase in fresh wt.(d)	Decrease in fresh wt. (g)	No. of days for decrease in fresh wt. (d)
T_1•	4.05	6.75	1.00	4.00	5.43	4.86
T_2	3.87	6.57	0.91	5.33	3.90	4.57
T_3	3.97	6.67	0.94	4.67	4.37	3.43
T_4	5.17	7.87	0.93	5.33	2.13	2.57
T_5	3.63	6.33	1.01	7.33	1.13	5.43
T_6	3.80	6.50	0.91	4.00	2.53	2.29
T_7	4.33	7.03	0.93	4.67	2.63	4.29
T_8 (Control)	3.17	5.87	0.81	2.00	1.80	2.57
CD at 5%	**1.43**	**2.29**	**0.73**	**1.75**	**1.16**	**3.09**
SEm (±)	**0.51**	**0.82**	**0.26**	**0.63**	**0.42**	**1.10**

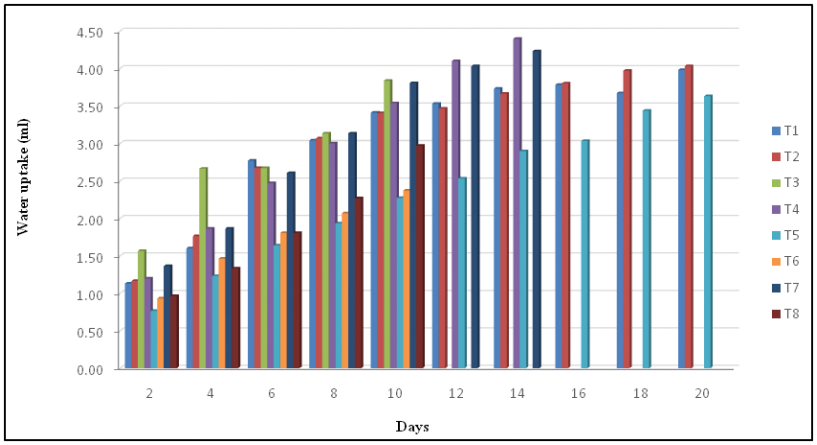


Fig. 3: Changes in water uptake (ml) by cut flower of anthurium for 20 days

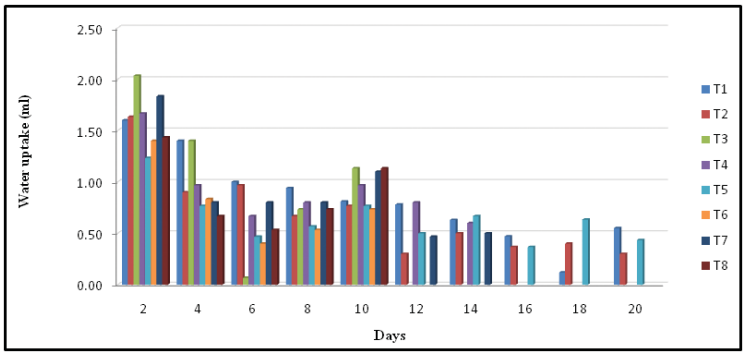


Fig. 4: Changes in water uptake(ml) at different day of storage

The anthurium cut flowers maintained higher water loss on daily basis and also cumulative water uptake as compared to control flowers on all the days of vase life which were pulsed and kept in holding solutions containing chemicals. For maintaining the continuity of flow of water and water uptake in the flower stems the higher water loss through transpiration is essential (Aarts, 1957). Table 1 showed that total water loss (ml) at interval of 20th days is highest (7.87 ml) in T_4 and lowest (5.87 ml) in control. Due to this fact, in the vase solution microbial load decreased and the water uptake and consequently with increased water loss, which indicated the linkage between water uptake to water loss and this has been recorded previously by Singh *et al*. (2007) in gladiolus and Reddy *et al.* (2005) in rose.

Preservative treatment showed significant increase in the fresh weight of anthurium cut flowers (Table 1). Among the different treatments, flowers treated with preservative solution *i.e.*, T_5 took maximum time (7.33 d) to increase the fresh weight (1.01 g). The lowest increase in fresh weight of flowers was noticed with tap water (0.81 g) and it reached to that stage at the earliest (2.00 d). The maintenance of fresh weight and rate of reduction of fresh weight affects the longevity of cut flowers. The anthurium flowers with holding solution containing chemicals found higher fresh weight in compare to those of control flowers on all the days of vase life. Decreased of microbial load with increased of water uptake and cumulative water uptake was the major reason behind it. Patil and Reddy (1997) in golden rod,

Table 2: Effect of different preservative solution on quality and vase life of anthurium cut spikes

Treatments	Blackening of spadix (d)	Loss of glossiness of spathe(d)	Blueing of spathe (d)	Loss in weight of flower(%)	Days taken from discolouration of spathe(d)	Fresh wt. Loss of flower (g)	Vase life (d)
T_1	14.67	15.33	16.67	41.18	18.00	5.43	20.00
T_2	16.67	19.33	20.00	26.50	20.00	3.90	20.00
T_3	12.00	14.00	17.33	35.67	19.33	4.37	17.33
T_4	14.00	16.00	17.33	23.63	18.00	2.13	18.00
T_5	14.00	18.67	19.33	12.57	20.00	1.13	20.00
T_6	12.00	11.33	12.67	28.57	13.33	2.53	16.67
T_7	16.00	16.00	18.00	29.57	18.00	2.80	17.33
T_8 (Control)	8.00	12.00	13.33	19.90	13.33	1.80	14.67
SEm (±)	**1.69**	**1.92**	**2.06**	**3.80**	**2.12**	**0.42**	**2.20**
CD at 5%	**4.73**	**5.37**	**5.75**	**10.64**	**5.94**	**1.17**	**6.16**

Singh *et al*. (2007) in gladiolus and Singh *et al*. (2003) in carnation was also found this trend of higher fresh weight due to higher water uptake in the holding solution

Preservative treatment showed significant decrease in the fresh weight of anthurium cut flowers shown in Table 1. Among the different treatments, flowers treated with preservative solution (T_5) containing sucrose 2%, citric acid 200 ppm, HQS 200 ppm and BA 50 ppm took maximum time (5.43 d) and minimum time flowers treated with T_6 which decrease in the fresh weight. The lowest decrease in fresh weight (1.13 g) of flowers was noticed with T_5 and highest in T_1 (5.43 g). Number of

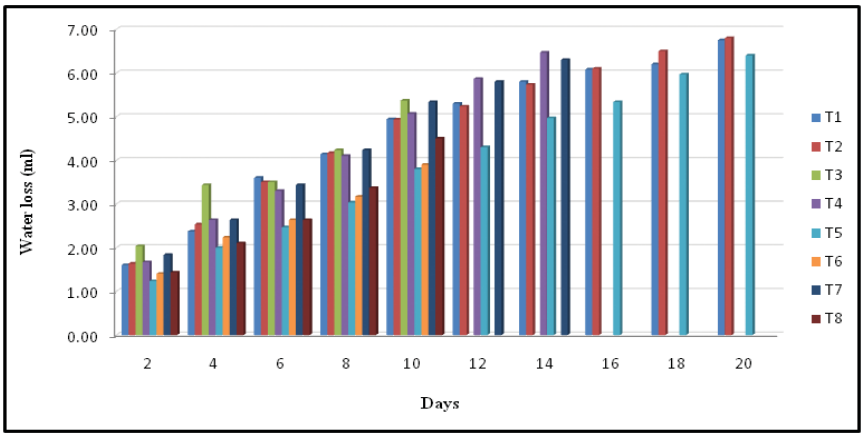


Fig. 5: Total water loss (ml) for the entire period of storage

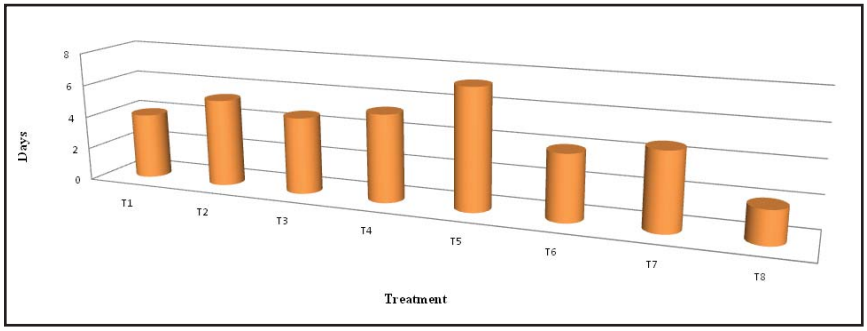


Fig. 6: Number of days increase in fresh weight in anthurium cut flowers

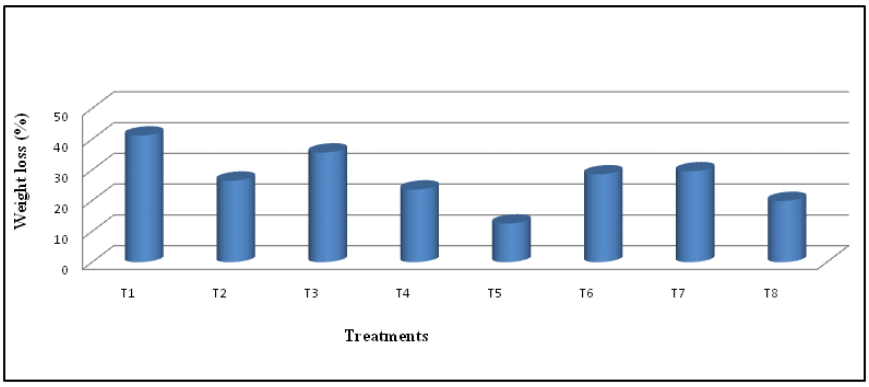


Fig. 7: Total loss in weight of flower (%) for the entire period of experiment

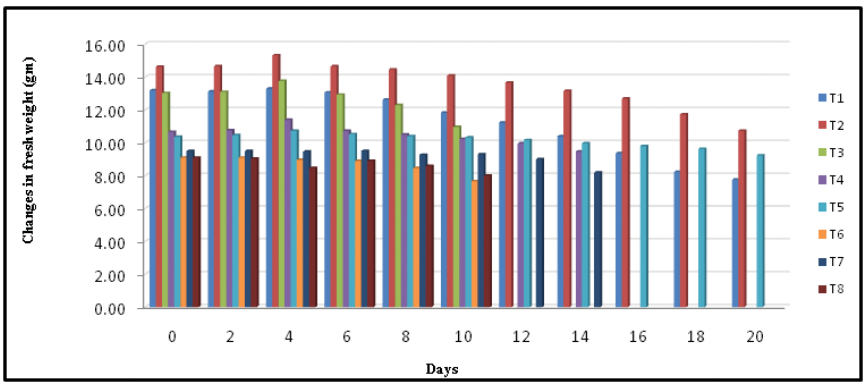
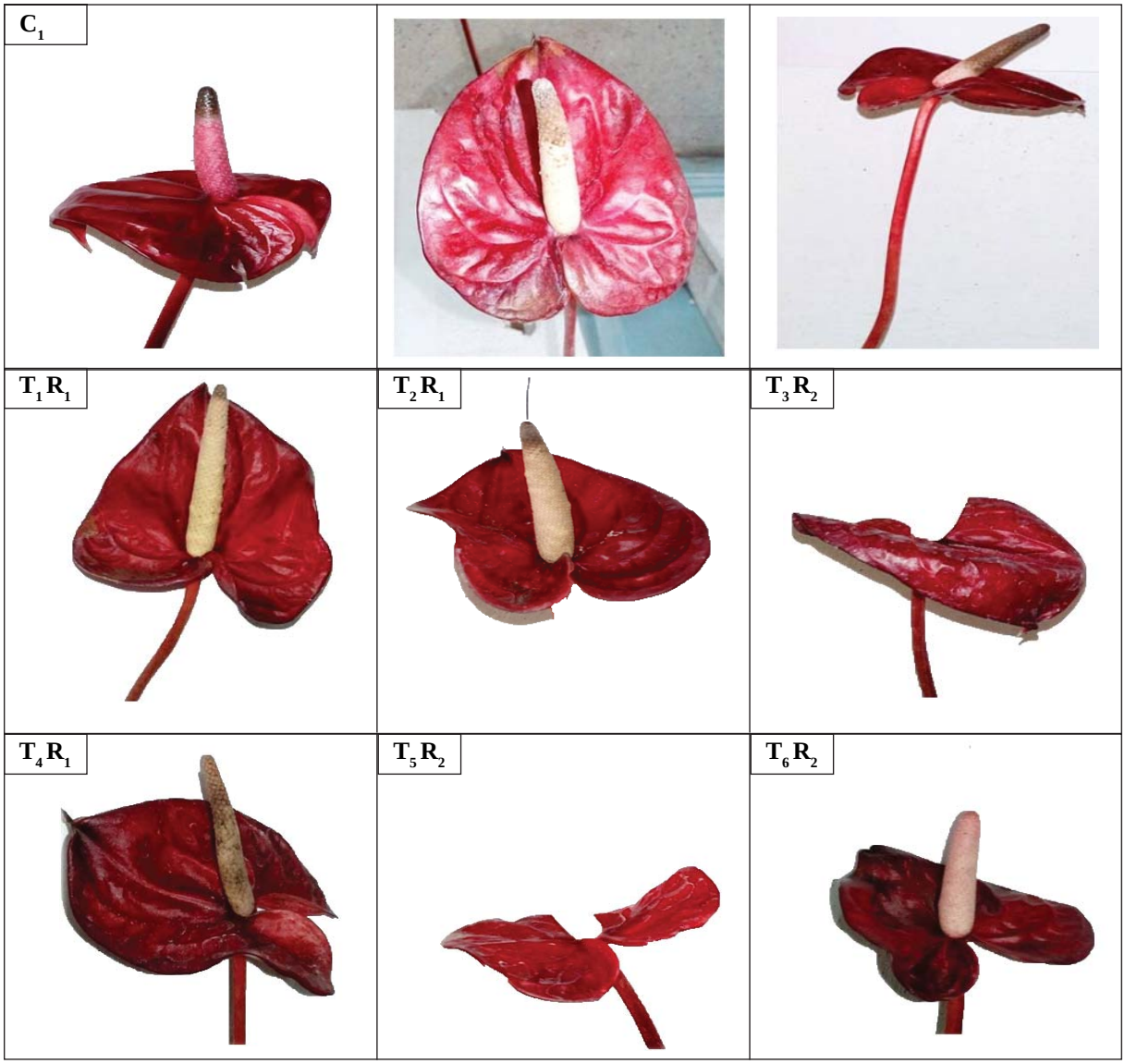
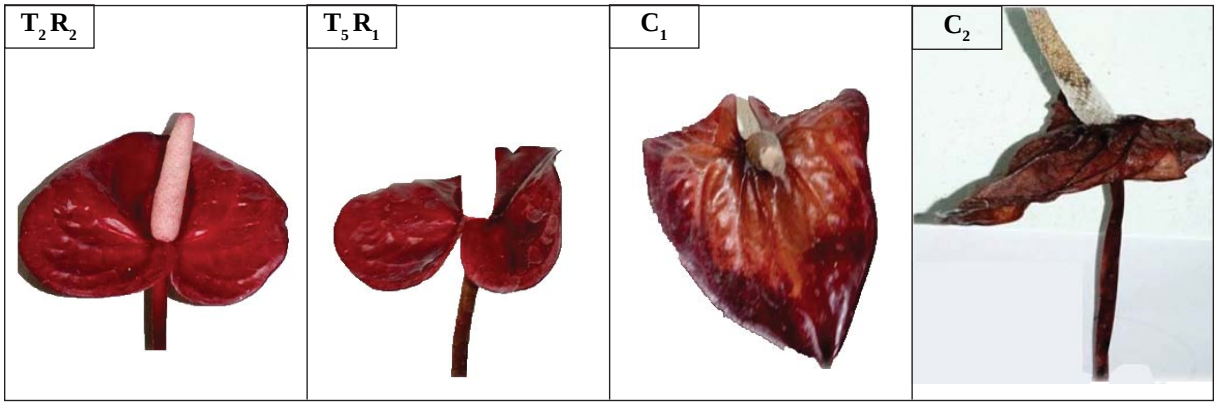


Fig. 8: Changes in fresh weight (gm) in anthurium cut flower preservation



Treatment flowers at 16th day of preservation



Comparison of cut anthurium flower kept in preservative solutions along with control at 14th day of experiment

days required for increase and decrease of the fresh weight were found higher with the holding solution. Pulsing with sucrose is beneficial as it reduces the enzyme activity of cut roses and ultimately delays the onset of senescence in storage, which prevents or reduces the proteolysis along with 8-HQS (Shiva *et al*., 2002). Coorts (1973) revealed that the longevity of cut flowers is related to the maintenance of fresh weight.

Fig. 5 showed that total water loss at interval of 20th days are initially increased from the beginning and in fig. 6 showed that number of days increased in fresh weight in cut flower of Anthurium in highest in treatment T_5 and lowest in control.

Data presented in table 2 showed that, blackening of spadix were start showing first in control (at 8th day) and latest shown in T_2 at 17th day followed by T_7 at 16th day, T_1, T_4, T_5 at 14th day and T_3, T_6 at 12th day. Blueing of spathe were start showing first in T_6 (at 13th day) and latest shown in T_2 at 20th day followed by T_5 at 19th day, T_7 at 18th day, T_3, T_4, T_1 at 17th day and control at 13th day. Discolouration of spathe was first showing in control (at 13th day) and latest in T_2 and T_5 at 20th day. Data revealed highly differences among various preservative solutions for vase life. Longest vase life (20 d) was recorded in treatment T_1, T_2 and T_5 followed by T_4 which last long for 18th day. All the treatments improved post harvest quality along with vase life, compared to the control which had shorter life (14th day). In anthurium cut flowers, with increasing of fresh weight could be attributed to maintenance of better water balance as a result of exogenous supply of sugar during pulsing which replaces the depleted carbohydrates as a source of energy utilized during respiration (Coorts, 1973). It may be occurred due to the sucrose which helped in maintaining turgidity and osmotic potential in the flowers, in the other hand HQS helped in enhanced water uptake by maintaining better fresh weight in all the days of vase life by reducing the microbial load.On increasing of microbial load which might have led to stem plugging and resulting in reduced water uptake as evidenced by the data, vase life in control flowers were found to be the lowest. The result also satisfied the observations made by Singh *et al*. (2007) in gladiolus and Singh *et al*. (2003) in carnation.

Benzyl adenine reduces the rate of respiration which is a natural anti-senescence agent. "Anthurium flowers when pulsed with benzyl adenine 50 ppm for 24 hours had enhanced fresh weight (20.75%), increased days taken for spadix necrosis (20.67 days), days taken for gloss loss (28.33 days), days taken for spathe blueing (32.67 days), vase life (32.67 days) and minimum physiological loss in weight of 7.94 %" (Devi and Jawaharlal, 2004). Same workers (2005) suggested that if benzyl adenine 25 ppm+ sucrose 2% is used as a holding solution in anthurium then it can extended the days taken for gloss loss (24.67 days), spadix necrosis (26.67 days), vase life (34.33 days), spathe blueing (29.67 days) and also minimized the physiological loss in weight (9.21 %). The picture of the different treatments at 16th days and control at 10th days of preservation are given below, whereas comparison of treatments along with control is also given.

Fig. 7 showed that, percentage loss in weight of flower is highest in T_1 (41.18%) and least in T_5 (12.57%). In other hand fresh weight loss of flower is highest in T_1 (5.43 g) and least in control (1.8 g) presented in table 2. The vase life of cut anthurium flower is highest in T_1, T_2 and T_3 which is last long for 20 days and least in control (14 days).

Fig. 8 showed that, fresh weight for cut anthurium flowers (which were treated with T_1 to T_7 preservative solution) initially increased from beginning to 4th day and then decreased gradually.

The present investigation revealed that the treatment of cut anthurium flower cv. Tropical with 2% sucrose along with citric acid and HQS (200 ppm) each in combination with BA (50 ppm) *i.e.*, T_5 delay the onset of flower senescence, maintained post-harvest quality and prolong the vase life compared to other treatments. It can be concluded that all the treatments enhanced the post harvest quality and vase life of cut flowers in compare to the control ones.

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REFERENCES

Aarts, J.F.T. 1957. Over de hundbaarheid van snijbloemen (on the keep ability of cut flowers). *Meded Landbouwhoqeschoot*, **57**: 1-62.

Agasimani, A. D. 2009. Evaluation of anthurium varieties under greenhouse for yield and quality of cut flowers. *M. Sc. Thesis*. Uni. Agri. Sci., Dharwad, India.

Coorts, G. D. 1973. Internal metabolic changes in cut flowers. *Hort. Sci*., **8**: 195-198.

Devi, R. A. and Jawaharlal, M. 2004. Impact of pulsing solution on postharvest life of *Anthurium andreanum* cv. Temptation. *J. Ornamen. Hort*., **7**(2): 213-216.

Devi, R. A. and Jawaharlal, M. 2005. Effect of holding solution on postharvest life of cut flowers in anthurium (*Anthurium andreanum Lind.)* cv. Temptation.*J. Ornamen. Hort.*, New Series. **8**(4): 318-319.

Gomez, K.A. and Gomez, A.A. 1984.Statistical Procedures for Agricultural Research.2nd Edition, John Wiley and Sons Inc., New York.

Patil, S. R. and Reddy, B. S. 1997.Effect of cobalt sulphate and sucrose on post harvest physiology of golden rod cut flowers. *Karnataka J. Agric. Sci*., **10**(2): 591-594.

Reddy, C. B. H., Gopinath, G. and Chikkasubbana, V. 2005.Effect of pulsing, 8-HQC and citric acid on the vase life of Bird of paradise (*Sterlitziareginae* Ait.) cut flowers. *J. Res. Angrau.*, **33**(3): 29-32.

Shiva, K.N., Chatterjee, S.R. and Bhattacharjee, S. K. 2002. Changes in protease activity of cut roses as affected by pulsing and cold storage. *Indian J. Hort.*,**59**(2):196-200.

Singh, K. and Sharma, M. 2003. The post harvest life of pulsed gladiolus spikes.; the effect of preservation solution. *Acta Hort.*,**624**: 395-398.

Singh, A., Kumar, J. and Kumar, P. 2007. Effect of pulsing, modified atmospheric storage at low temperature and vase solution on flower quality and vase life of gladiolus cut spikes. *J. Ornamen. Hort.*,**10**(2): 96-100.

Singh, K., Singh, P. and Kumar, M. 2003. Effect of vase and pulsing solutions on keeping quality of standard carnation cut flowers. *J. Ornamen. Hort.*, **10**(1): 20-24.