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RESEARCH PAPER

Effect of holding solutions with different combinations of chemical on post harvest physiology of anthurium (*Anthurium adreanum* L.) cv. Tropical

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SUMMARY :

The investigation was carried out to know the influence of diffferent chemicals on postharvest life of anthurium. Holding of anthurium flowers in solution having 3 per cent sucrose + 250 ppm cobalt chloride resulted in increased water uptake (5.49 g/flower), water loss (5.19 g/flower), fresh weight (102.06 %), vase life (21.67days), low microbial count (13.63×10^{-6} CFU) and the benefits (6.46‘/flower) when compared to that of control.

KEY WORDS : Anthurium, Holding, Sucrose, Cobalt chloride, Vase life

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Anthuriums (*Anthurium andreanum* L.) are herbaceous perennial ornamental plants cultivated for their long lasting flowers or for their attractive foliage. Anthurium belongs to family Araceae and is native to tropical zones of Central and South America. Anthurium commands a respectable price in the market because of their brilliant colours have made it exceptionally popular as a cut flower. Therefore, the crop is cultivated in many parts of the world to produce cut flowers for both domestic and international markets.

The name anthurium is derived from Greek word ‘anthios’ meaning flower, and ‘aura’, tail, referring to the spadix. It is the national flower of mauritius. Anthurium flowers are harvested at three quarter satge and they are expected to continue their growth later, where they are likely to be deprived off the metabolites under the conditions in which they are regularly held (Halevy and Mayak, 1974). This necessitates addition of substances such as sugars, bactericides, growth regulators etc, in the holding solution. Floral preservatives usually contain water to maintain turgidity, sugar as a energy source, a anti-microbial agent to inhibit the growth of microorganisms, anti ethylene chemical.

Anthurium is becoming increasingly popular as an exquisite flower in India, and there is need to standardise post harvest practices to suit our conditions. Hence, an attempt was made in this direction to experiment on standardization of holding solutions for extending vase life of anthurium cut flowers.

EXPERIMENTAL METHODS

The present investigations were carried out to standardize the best holding solutions for extending vase life of anthurium cut flower, during 2010-2011 at the Department of Floriculture

and Landscape Architecture, Kittur Rani Channamma College of Horticulture, Arabhavi, University of Horticultural Science, Bagalkot. The pre conditioned flowers were sorted out for their uniform size, so as to maintain uniformity throughout the experiment. The experiment comprised of 11 treatments replicated thrice in Completely Randomized Design (CRD). The flower stems were trimmed to maintain uniform length. Flowers were placed in 500 ml conical flasks containing 300 ml de-ionized water and solutions of (T_1: 2 % sucrose + 50 ppm benzyl adenine, T_2: 2 % sucrose + 200 ppm citric acid, T_3: 2 % sucrose + 250 ppm cobalt chloride, T_4: 2 % sucrose + 200 ppm aluminium sulphate, T_5: 2 % sucrose + 250 ppm 8-HQS, T_6: 3 % sucrose + 50 ppm benzyl adenine, T_7: 3 % sucrose + 200 ppm citric acid, T_8: 3 % sucrose + 250 ppm cobalt chloride T_9: 3 % sucrose + 200 ppm aluminium sulphate, T_{10}: 3 % sucrose + 250 ppm 8-HQS and T_{11}: Control (Distilled water). Experiments were conducted in the laboratory with a relative humidity of 68-76 per cent and temperature of 25.40-28.30^{0}C, three flowers in each replication for all the treatments. Observations *viz*., water uptake, water loss, fresh weight, vase life and microbial load recorded at regular intervals.

EXPERIMENTAL FINDINGS AND ANALYSIS

Cut flowers held in chemical solutions absorbed more water than control. Among the different treatment combinations flowers held in solutions having 3 per cent sucrose + 250 ppm cobalt chloride maintained increased water uptake and reached maximum (5.49g/flower) on 13th day, whereas the minimum (3.72 g/ flower) water uptake was noticed in control in 9th of vase life (Table 1). The increased water uptake may be due to decreased microbia load as cobalt chloride is reported to toxic to fungal growth (Mishra *et al*., 1973), hence, increased the water uptake by reducing the stem plugging and sucrose helped in maintainance of osmotic potential and turger potential (Murali, 1990; Singh *et al*., 2000; Patil and Reddy, 1997).

Flowers held in 3 per cent sucrose + 250 ppm cobalt chloride maintained increased water loss throughout their vase life compared to flowers held in other treatments. These cut flowers reached their maximum water loss (5.19 g/flower) on 13th day of vase life, whereas flowers held in control solutions had shown minimum water loss (3.58 g/ flower) on 9th day of vase life (Table 1). This might be due to increased water uptake as a result of decreased microbial load in these holding solutions. Aarts (1957) reported that transpiration is essential in extending the vase life of cut flowers and any process which hinders normal transpiration will decrease the keeping quality of cut flowers. Cobalt chloride present in the holding solution suppressed the growth of microbial growth thereby increased the water uptake and invariably it resulted in increased water loss (Reddy, 1993; Singh *et al*., 2003).

Flowers held in holding solutions recorded maximum fresh weight throughout the vase life as compared to the flowers held in control. Cut flowers held in 3 per cent sucrose + 250 ppm cobalt chloride maintained increased fresh weight throughout the period of vase life (Table 1). The fresh weight in these cut flowers reached maximum (102.06 %) on 13th day whereas flowers held in control showed minimum fresh weight (100.57 %) on 9th day. This was due to decreased microbial load, enhanced water uptake and maintenance of higher water balance in flowers (Patil and Reddy, 1997; Singh *et al*., 2003).

The maximum (21.67 days) vase life was recorded in flowers held in solution having 3 per cent sucrose + 250 ppm cobalt chloride and which were found to be at par with flowers

Table 1 : Effect of holding solutions with different combinations of chemicals on post harvest physiology of anthurium cv. Tropical

Treatments	Water uptake (g/flower)				Water loss (g/flower)				Fresh weight (%)				Vase life (days)
	3rd day	6th day	9th day	13th day	3rd day	6th day	9th day	13th day	3rd day	6th day	9th day	13th day	
T_1	3.45	3.79	4.06	3.75	3.34	3.65	3.90	3.71	100.07	100.42	100.91	99.90	16.33
T_2	3.47	3.81	4.16	3.94	3.38	3.69	4.01	3.89	100.26	100.58	100.83	100.49	17.33
T_3	4.04	4.19	4.46	4.49	3.91	4.04	4.28	4.39	99.98	100.37	100.64	100.11	18.33
T_4	3.58	3.96	4.29	4.73	3.46	3.82	4.13	4.54	99.99	100.36	100.73	101.26	20.00
T_5	3.59	3.96	4.29	3.95	3.49	3.83	4.12	3.93	100.31	100.68	101.15	100.19	16.67
T_6	3.16	3.46	3.83	3.51	3.01	3.28	3.62	3.46	100.19	100.54	100.82	100.36	17.00
T_7	3.49	3.79	4.05	3.76	3.39	3.66	3.89	3.78	99.99	100.50	100.76	100.02	15.33
T_8	4.20	4.58	4.95	5.49	3.97	4.33	4.68	5.19	100.74	101.15	101.43	102.06	21.67
T_9	3.28	3.61	3.86	4.11	3.17	3.47	3.69	3.95	99.99	100.41	100.72	101.25	19.00
T_{10}	3.35	3.69	4.01	3.86	3.19	3.50	3.78	3.75	100.12	100.49	100.83	100.41	17.33
T_{11}	3.08	3.34	3.72	3.27	3.00	3.23	3.58	3.24	99.81	100.23	100.57	99.75	13.67
S.Em±	0.07	0.04	0.03	0.03	0.05	0.05	0.04	0.04	0.33	0.08	0.06	0.13	0.69
C.D. (P=0.01)	0.19	0.11	0.08	0.09	0.14	0.14	0.11	0.12	0.97	0.25	0.18	0.38	2.02
C.D. (P=0.05)	0.26	0.15	0.11	0.12	0.18	0.19	0.15	0.17	1.31	0.33	0.24	0.52	2.75

held in treatment T_4 and whereas minimum vase life (13.67 days) was observed in flowers held in control (Table 1). Enhanced water uptake, coupled with low transpiration loss, good water balance and fresh weight resulted in increased vase life of cut flowers (Halevy and Mayak, 1981). This might be due to fact that sucrose helped in maintaining turgidity and osmotic potential in the flowers and whereas cobalt chloride helped in maintaining better fresh weight in all the days of vase life by reducing the microbial load which resulted in enhanced water uptake (Reddy, 1993; Singh *et al.*, 2000).

Significant differences were obtained among the treatments with respect to microbial load in anthurium cut flower. While highest microbial load (count) was recorded in control with 10.63, 18.79, 26.50 × 10^{-6} CFU on 2nd, 12th and on termination day and the lowest microbial load (count) was found in solution containing 3 per cent sucrose + 250 ppm cobalt chloride with 2.87, 7.68, 13.63 × 10^{-6} CFU on 2nd, 12th and on termination day (Table 2). This might be due to antimicrobial property of cobalt chloride in reducing the microbial population as a result of germicidal effect (Reist, 1993; Mishra *et al*., 1973 and Murali, 1990). The data on economic analysis on different holding treatments on vase life of anthurium flowers are given in Table 3. The benefits (‘/ flower) was higher (6.46) in solution containing 3 per cent sucrose + 250 ppm cobalt chloride (T_8) followed by T_4 (5.27) and the least was observed in T_{11} (0.00). This is due to enhanced vase life in these cut flowers.

Table 2 : Microbial load of in vase solution of different chemical combinations in anthurium cv. Tropical

Treatments	Microbial load (x10^{-6} CFU)		
	2nd day	12th day	On termination day
T_1	3.03	8.31	14.96
T_2	2.98	8.01	13.97
T_3	2.92	8.48	13.93
T_4	2.95	7.89	13.86
T_5	3.13	9.12	14.65
T_6	3.08	8.03	15.02
T_7	3.01	8.53	14.09
T_8	2.87	7.68	13.63
T_9	3.02	7.97	13.75
T_{10}	3.44	9.64	14.63
T_{11}	10.63	18.79	26.50
S Em ±	0.05	0.20	0.89
C.D. (P=0.05)	0.13	0.58	2.60
C.D. (P=0.01)	0.18	0.79	3.53

Table 3 : Economics of holding solutions on vase life of anthurium cv. Tropical

Treatments	Cost of different chemicals									Total vase life (days)	Cost/day (`/day)	Extended vase life over control (days)	Benefits (`/flowe)
	Sucrose cost			Preservative cost			Cost of flower (`)	Cost Of distilled water (`)	Total cost (`)				
	Quantity (g)	Rate (`/g)	Amount (`)	Quantity (g)	Rate (`/g)	Amount (`)							
T_1	0.69	0.60	0.42	0.02	213.00	3.69	16.00	0.28	20.38	16.33	1.25	2.66	3.32
T_2	0.71	0.60	0.43	0.01	1.34	0.01	16.00	0.29	16.72	17.33	0.96	3.66	3.53
T_3	0.72	0.60	0.43	0.01	19.98	0.18	16.00	0.29	16.90	18.33	0.92	4.66	4.30
T_4	0.66	0.60	0.40	0.01	0.37	0.00	16.00	0.26	16.66	20.00	0.83	6.33	5.27
T_5	0.52	0.60	0.31	0.01	26.52	0.17	16.00	0.21	16.70	16.67	1.00	3.00	3.01
T_6	0.90	0.60	0.54	0.01	213.00	1.60	16.00	0.24	18.39	17.00	1.08	3.33	3.60
T_7	0.71	0.60	0.43	0.00	1.34	0.01	16.00	0.19	16.62	15.33	1.08	1.66	1.80
T_8	1.46	0.60	0.88	0.01	19.98	0.24	16.00	0.39	17.51	21.67	0.81	8.00	6.46
T_9	0.84	0.60	0.50	0.01	0.37	0.00	16.00	0.22	16.73	19.00	0.88	5.33	4.69
T_{10}	0.99	0.60	0.60	0.01	26.52	0.22	16.00	0.26	17.08	17.33	0.99	3.66	3.61
T_{11}	0.00	0.60	0.00	0.00	0.00	0.00	16.00	0.20	16.20	13.67	1.19	0.00	0.00

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