Plant Archives Vol. 16 No. 2, 2016 pp. 966-968 *ISSN 0972-5210*

EFFECT OF SUCROSE ON WATER RELATIONS IN CUT CARNATION FLOWERS CV. CHARMANT.

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Abstract

The vase life of cut carnation flowers were studied to determine the physiological, biochemical and microbial factors that affect the rate of senescence. Cut carnations were obtained from the commercial grower in Nujiveedu and treated with biocides at different concentrations. The carnations were considered to have senesced, when the petals showing shrinking (or) petals turns to brown or black colour and the necks had bent over or when one-third of the petals began to droop, whichever occurred earlier. The experimental flowers were held in the laboratory at about 25±2°C ambient room temperature, 45 to 55 per cent relative humidity (RH) and 40W cool white fluorescent tubes to maintain 12 hours photoperiod. The experiment was held in laboratory of the Department of Horticulture, College of Horticulture, A. P. Horticulture University, Venkataramannagudem, West Godavari dist (A.P.), India. The experiment extended from October 2010 to March 2011. Among the different sucrose concentrations, sucrose at 6% recorded highest water uptake and transpirational loss of water resulting in increased water balance and in respect of fresh weight of flower; it followed sucrose 9% which recorded highest fresh weight. Higher sucrose concentrations *i.e.,* sucrose 18% and 21% recorded reduced fresh weight. Whereas, lowest values of WU, TLW, WB and FW were observed with control.

Key words : *Dianthus caryophyllus,* cut flower, sucrose, water uptake, TLW, water balance, fresh weight, vase life.

Introduction

Sucrose acts as a major substrate for all the physiological processes in the tissue. As long as flowers are on mother plant, they get food materials from them. Once they are harvested, the cut flower is deprived of carbohydrates and depends on reserve food materials to continue metabolic activities. The carbohydrate status of cut flower will decide its longevity after harvest (Coorts, 1973). Hence, exogenous supply of sugars will play an important role in extending the vase life of cut flowers and carnation is also no exception to it. Carnation (*Dianthus caryophyllus* L.) belonging to the family Caryophyllaceae is one of the most important and an excellent cut flower crops grown in almost all the countries of the world and ranks second on global floriculture screen (Patil *et al*., 2004). Due to increased demand of cut flowers in domestic as well as international markets there is great scope to develop suitable post harvest technology specific to each cut flower to reach higher market price.

Materials and Methods

The experiment was held in laboratory of the Department of Horticulture, College of Horticulture, A. P. Horticulture University, Venkataramannagudem, West Godavari dist (A.P.), India during October 2010 to March 2011 by using biocides in holding solutions. There are 7 treatments sucrose 6%, sucrose 9%, sucrose 12%, sucrose 15%, sucrose 18%, sucrose 21% and Control (Distilled Water).

Water uptake (WU)

The difference between consecutive measurements of container + solution (without flower) recorded at every alternate day (*i.e.*, once in two days) interval to measure the water uptake within that particular duration of period and represented as gram per flower (Venkatarayappa *et al*., 1980).

Transpirational loss of water (TLW)

The difference between consecutive measurements of container + solution + flowers recorded at every

Table 1 : Effect of post harvest application of sucrose on water uptake (g/f) and transpirational loss of water (TLW) (g/f) during vase life period of cut carnation cv. Charmant.

Treatment	Time Period (Days)													
	Water uptake (g/f)							Transpirational loss of water (TLW) (g/f)						
	2	4	6	8	10	Mean	12	2	4	6	8	10	Mean	12
Sucrose 6%	20.42	18.39	17.6	14.49	10.45	16.27^{a}	6.55	19.65	18.13	17.76	15.06	11.34	16.39^{a}	8.29
Sucrose 9%	19.61	17.38	14.71	11.44	8.32	14.29^{b}	3.70	18.32	16.35	13.95	11.58	9.32	13.90^{b}	6.68
Sucrose 12%	18.56	16.61	14.37	8.45	6.12	12.82^{c}	-	18.25	17.04	15.35	9.78	7.94	13.67^{b}	-
Sucrose 15%	18.61	16.41	10.35	7.51	5.06	11.59^{d}	-	17.65	16.11	10.79	8.98	6.85	12.08^{c}	-
Sucrose 18%	17.42	15.59	9.34	6.44	4.73	10.71^{e}	-	17.12	16.14	10.43	7.61	7.17	11.70^{d}	-
Sucrose 21%	17.81	15.49	10.63	6.74	4.98	11.13^{d}	-	18.35	16.35	11.74	8.18	8.62	12.65^{c}	-
Control (DW)	10.45	8.57	7.28	5.82	4.40	7.30^{f}	-	12.3	10.65	9.61	8.64	7.26	9.69^{e}	-
Mean	17.55^{a}	15.49^{b}	12.04^{c}	8.70^{d}	6.29^{e}			17.38^{a}	15.82^{b}	12.80^{c}	9.98^{d}	8.36^{e}		
	F- test	S.Em+	CD 5%											
For days (D)	**	0.21	0.6						0.22	0.62				
For treatment(T)	*	0.2	0.55						0.21	0.58				
For DxT	**	0.52	1.46						0.54	1.52				

** Significant at ($P < 0.01$), * Significant at ($P < 0.05$), NS : Not significantFigures bearing same letters did not differ significantly.

alternate day of interval to measure transpirational loss of water within that particular duration of period (Venkatarayappa *et al*., 1980) and represented as gram per flower.

Water balance (WB)

Water balance in flower tissue was calculated as the difference between water uptake and transpirational loss of water and represented as gram per fresh weight (Venkatarayappa *et al*., 1980).

Fresh weight change (FWC)

The difference between the weight of the container + solution + flower and the weight of container + solution recorded at every alternate day to measure the fresh weight change of flower during that particular period / duration of time (Venkatarayappa *et al*., 1980). The weight of flower stems on the first day of each experiment was assumed to be 100 per cent. Subsequent weights were referred to as percentage of the initial value.

Results and Discussion

The carnation cut flowers held in different sucrose concentrations differed significantly on water uptake. The treatment, sucrose 6% recorded significantly highest WU (16.27 g/f) followed by sucrose 9% (14.29 g/f) and sucrose 12% (12.82 g/f) compared to all other concentrations studied. Whereas, the treatment, control recorded significantly lower WU (7.30 g/f) (table 1). Similarly, sucrose 6% recorded maximum transpirational loss of water, (16.39 g/f) followed by sucrose 9% (13.90 g/f) (table 2). This could be due to exogenous application of sucrose which might have increased the ability of cut flowers to absorb water by influencing the water potential and osmotic potential (Halevy and Mayak, 1974; Paulin *et al*., 1986). Behera (1993) also reported higher water uptake in sucrose treated carnation flowers. These results were in the line of findings of Prashanth (2006) in cut gerbera, who observed maximum water uptake and transpirational loss of water in cut gerberas held in optimum concentration of sucrose *i.e.,* 5%. Halevy and Mayak (1979) also reported similar results in cut flowers. According to their opinion, sugars are responsible for maintenance of water balance in cut flowers by inducing stomatal closure in the leaves and thereby reducing water loss. Due to higher WU over TLW, the treatment, sucrose 9% had recorded maximum water balance (5.39 g/f), which was followed by sucrose 6% (4.88 g/f).

The fresh weight was significantly highest with sucrose 9% (101.68 g/f) in holding solution due to an improved water status in the flower tissue compared to all other treatments. This is in conformity with the finding

Table 2: Effect of post harvest application of sucrose on water balance (g/f) and fresh weight change (% of initial weight) during vase life period of cut carnation cv. Charmant.

Treatment	Time Period (Days)													
	Water balance (g/f)							Fresh weight change (% of initial weight)						
	2	4	6	8	10	Mean	12	2	4	6	8	10	Mean	12
Sucrose 6 %	5.77	5.26	4.84	4.43	4.11	4.88^{b}	2.01	103.33	101.13	99.31	97.53	96.15	99.49^{b}	92.47
Sucrose 9 %	6.29	6.03	5.76	4.86	4	5.39^{a}	3.26	105.58	104.46	103.29	99.39	95.67	101.68^{a}	87.1
Sucrose 12 %	5.31	4.57	4.02	3.67	3.18	4.15^{d}	-	101.34	98.14	95.76	94.24	92.12	96.32^{d}	-
Sucrose 15 %	5.96	5.3	4.56	3.53	3.21	4.51^{c}	-	104.16	101.3	98.1	93.64	92.25	97.89^{c}	-
Sucrose 18 %	5.3	4.45	3.91	3.83	2.56	4.01^{d}	-	101.3	97.62	95.28	94.94	89.44	95.71^{d}	-
Sucrose 21 %	4.46	4.14	3.89	3.56	1.36	3.48^{e}	-	97.66	96.28	95.2	93.77	84.24	93.43^{e}	-
Control (DW)	3.15	2.92	2.67	2.18	2.14	2.61^{f}	-	91.99	91	89.91	87.79	87.62	89.66^{f}	-
Mean	5.54^{d}	4.67^{b}	4.24^{c}	3.72^{d}	2.94^{e}			100.77^{a}	98.56^{b}	96.69^{c}	94.47^{d}	91.07^{e}		
	F- test	S.Em+	CD 5%											
For days (D)	**	0.1	0.27					**	0.42	1.17				
For treatment(T)	**	0.09	0.25					**	0.38	1.08				
For DxT	**	0.23	0.66					**	1.02	2.86				

** Significant at ($P < 0.01$), * Significant at ($P < 0.05$), NS : Not significant, Figures bearing same letters did not differ significantly. The data was analysed statistically after uniform addition of a base value 5.0

of Marousky (1971) who opined that, the cut flowers treated with sucrose reduced the water loss thereby increasing the fresh weight of flowers.

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