The Bioscan 11(1): 197-199, 2016
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

EFFECT OF DIFFERENT POLYFILMS AND STORAGE TEMPERATURES ON POSTHARVEST QUALITY OF GERBERA (*GERBERA JAMESONII*) CV. 'SAVANA RED'

TRUPTI PATEL[1], ALKA SINGH[1], T. R. AHLAWAT[2] AND D. B. KAPADIYA[1]
[1]Department of Floriculture and Landscape Architecture,
[2]Department of Fruit Science,
ACHF, Navsari Agricultural University, Navsari - 396 450, Gujarat, INDIA
e-mail: dralkasinghdhaka@gmail.com

KEYWORDS
Gerbera
MAP
PP
HDPE
Cold storage

Received on :
05.10.2015

Accepted on :
22.01.2016

***Corresponding author**

ABSTRACT

The study was carried out to find the effect of different packaging films *viz*., PP (24µ), HDPE (28µ), LDPE (112µ) and control(without any packaging) and storage temperature *viz.*, 5°C, 10°C and 15°C for a period of 7 days on flower quality and vase life of gerbera cut flowers cv. Savana Red. PP packaged gerbera cut flowers stored at lower temperature at 5°C showed significantly negligible physiological loss in weight just after storage, maintained maximum water uptake (119.33 ml) and higher retention of fresh weight during vase life after storage as compared to all other treatments. Petal TSS(10.90°Brix) and MSI (87.48%) were also recorded higher in PP packaged cold stored gerbera (5°C) which delayed the petal senescence and exhibited enhanced vase life (8.33 days) as compared to without packaged cold stored gerbera cut flowers. Flower quality in terms of flower diameter(10.57 cm), percent opening of disc florets(13.33%), absence of scape bending curvature as well as overall quality graded on visual basis were also higher in gerbera cut flowers stored at (5^{0}C) with PP packaging.

INTRODUCTION

Gerbera is one of the most important commercially grown cut flower crop in the worldhaving multiple uses in flower arrangements and bouquets. Flower market often encounters the problems of frequent gluts and price crash, wherein an appropriate storage technique for cut flowers is required during the periods of decline in demand. The vase life of gerbera is limited due to stem plugging and scape bending as it has hollow stem. Research on improvement of postharvest life of gerbera flowers is meagre (Prashant and Chandrasekar, 2007, Celikel and Reid, 2002). Dry storage of flowers causes deterioration in the flower quality while the technique of modified atmosphere packaging (MAP) of fresh flowers at low temperature contributes in maintaining flower quality during storage (Grover *et al.*, 2006) and shipment (Zeltzer *et al.*, 2001). The key to successful passive MAP of fresh flowers is to use the suitable poly film to ensure and establish the optimal Equilibrium Modified Atmosphere (EMA) at low temperature during storage (Day, 2001). Hence, the present experiment was conducted to investigate the effect of different poly films for passive MAP and storage temperatures on the quality of gerbera flowers in order to evolve an optimum storage technique.

MATERIALS AND METHODS

Experiment was carried out in Floriculture Research Laboratory, Department of Floriculture and Landscaping, ASPEE College of Horticulture and Forestry, NAU, Navsari. The cut flowers of gerbera cv. Savana Red were obtained from commercial greenhouse unit located nearby Navsari. Flowersat harveststage having two whorls of central disc florets open with uniform flower size (11 ± 0.5 cm), fresh weight (5 ± 1g) and flower stalk (40 ± 5cm) were selected. The standard packaging films of different materials like polypropylene (PP, 24µ), High density polythene (HDPE, 28µ), Low density polythene (LDPE, 112µ) were purchased from the local market for experiment. The experiment was conducted in completely randomized design with three repetitions.The flowers were sortedinto bundles of 10 flowers each and sealed packed in different films. The packages were stored in vertical position in cold storage at 5, 10 and 15^{o}C temperature for a duration of 7 days. The bundles of non-MA packaged flowers were also kept in cold storage as control. After the storage, the bottom 2.5 cm portion of the basal end was re-cut under water to remove surface blockages and the basal ends were dipped in 250 mL tap water and observations were recorded during the post storage vase life.

The observations were recorded on Physiological Loss in Weight (PLW %) just after storage while total water uptake by flowers (ml) was estimated by the end of vase life. Observations on flower diameter (cm), Total soluble solids (^{0}Brix), Membrane Stability Index (MSI%), scape bending angle (degree) was estimated on 4th day after storage.Vaselifedays was recorded till senescence of post storage flowers. The recorded data was statistically analysed (ANOVA analysis) and CD at 5% significance was determined for treatment comparison.MSI was calculated on the basis of electrolyte leakage (ion leakage) of the petal tissue according to the method used by Bailley *et al*. (1996).

RESULTS AND DISCUSSION

Cut gerbera flowers cv. Savana Red stored at 5°C temperature with PP packaging recorded minimum PLW% during storage (0.03 %), maximum total water uptake (119.33 ml) and higher fresh weight retention (3.76 %) followed by HDPE packaging while cold stored gerbera flowers without any packaging (control) at 15°C temperature recorded maximum physiological loss in weight (21.97 %), minimum total water uptake (46.00 ml) and maximum loss in weight (44.87 %) as shown in Table 1.

Minimal cell damage during storage and retaining of normal cell condition after storage on account of minimal physiological loss in weight during storage of PP packaged 5°C stored flowers, contributed to higher water uptake and fresh weight retention during vase life. Dry storage of flowers (without packaging) is known to suffer from decreased water uptake after storage due to damaged xylem structure on account of desiccation during cold storage (van Doorn and D'Hont, 1994). Similar result of low PLW %, higher water uptake and fresh weight % in cut flowers with PP packaging film is well reported in gladiolus cut spikes (Singh *et al*., 2007 and Grover *et al*., 2006) and in rose flowers (Makwana, *et al.,* 2015).Temperature influences weight loss and water uptake by increasing transpiration and respiration. Flowers stored at lower temperature are known to maintain higher fresh weight and water uptake as compared to those stored at higher temperatures as reported in rose (Palanikumar and Bhattacharjee, 2001).

Table 1: Effect of MA packaging films and storage temperature on Physiological Loss in Weight (PLW %) just after storage, total water uptake(ml) during vase life and decrease in fresh weight (%) on 4th Day of vase life

Treatment	PLW (%) Storage temperature (°C)				Water uptake (ml) Storage temperature (°C)				Decrease in fresh weight (%) Storage temperature (°C)			
Packaging (P)	C_1 (5°C)	C_2 (10°C)	C_3 (15°C)	Mean	C_1 (5°C)	C_2 (10°C)	C_3 (15°C)	Mean	C_1 (5°C)	C_2 (10°C)	C_3 (15°C)	Mean
P_1 = PP	0.03	0.17	0.55	0.25	119.33	100.67	90.00	103.33	3.76	4.67	5.17	4.53
P_2 = HDPE	0.83	0.89	1.12	0.95	100.33	97.67	84.33	94.11	4.33	6.40	7.23	5.99
P_3 = LDPE	1.03	1.41	3.55	2.00	87.00	89.67	76.67	84.44	6.03	10.13	12.53	9.57
P_4 = Control	15.84	18.47	21.97	18.76	68.00	64.33	46.00	59.44	32.33	41.33	44.87	39.51
Mean	4.43	5.23	6.79		93.67	88.08	74.25		11.62	15.63	17.45	
S.Em. +	P = 0.02	C = 0.02	P x C = 0.03		P = 1.90	C = 1.65	P x C = 3.30		P = 0.32	C = 0.27	P x C = 0.55	
CD at 5%	P = 0.06	C = 0.06	P x C = 0.09		P = 5.56	C = 4.81	P x C = NS		P = 0.93	C = 0.80	P x C = 0.60	

Table 2: Effect of MA packaging films and storage temperature onscape bending angle (degrees),flower diameter (cm) andopening of disc florets (%) at 4th day of vase life

Treatment	Scape bending angle (degrees) Storage temperature (°C)				Flower diameter (cm) Storage temperature (°C)				Opening of disc florets (%) Storage temperature (°C)			
Packaging (P)	C_1 (5°C)	C_2 (10°C)	C_3 (15°C)	Mean	C_1 (5°C)	C_2 (10°C)	C_1 (15°C)	Mean	C_1 (5°C)	C_2 (10°C)	C_1 (15°C)	Mean
P_1 = PP	16.67	26.67	30.00	24.44	10.57	9.87	9.33	9.92	13.33	15.00	20.00	16.11
P_2 = HDPE	23.33	36.67	35.00	31.67	10.50	9.77	8.97	9.74	13.50	16.67	21.67	17.28
P_3 = LDPE	30.00	40.00	40.00	36.67	10.00	9.17	8.90	9.38	14.17	18.33	22.50	18.33
P_4 = Control	91.67	120.00	126.67	120.00	7.10	6.83	5.33	6.42	12.50	16.67	25.00	18.06
Mean	45.83	55.83	57.92		9.54	8.91	8.15		13.38	16.67	22.29	
S.Em. +	P = 2.55	C = 2.20	P x C = 4.41		P = 0.08	C = 0.07	P x C = 0.15		P = 0.94	C = 0.81	P x C = 1.63	
CD at 5%	P = 7.43	C = 6.44	P x C = NS		P = 0.25	C = 0.21	P x C = 0.43		P = NS	C = 2.38	P x C = NS	

Table 3: Effect of MA packaging films and storage temperature on Total soluble solids (⁰Brix) andMembrane Stability Index (%) in the petal tissue on 4th day and vase life of post storage flowers

Treatment	TSS (°Brix) Storage temperature (°C)				MSI (%) Storage temperature (°C)				Vase life (days) Storage temperature (°C)			
Packaging (P)	C_1 (5°C)	C_2 (10°C)	C_3 (15°C)	Mean	C_1 (5°C)	C_2 (10°C)	C_3 (15°C)	Mean	C_1 (5°C)	C_2 (10°C)	C_3 (15°C)	Mean
P_1 = PP	10.90	10.27	9.37	10.18	87.48	77.30	64.43	76.40	8.33	7.00	5.67	7.00
P_2 = HDPE	10.17	9.80	8.50	9.49	83.27	71.27	58.30	70.95	8.00	6.67	5.33	6.67
P_3 = LDPE	9.23	9.30	8.30	8.94	80.33	62.85	47.53	63.57	7.33	6.00	4.00	5.78
P_4 = Control	8.47	7.57	6.23	7.42	65.70	50.56	0.00	38.75	4.33	3.67	2.33	3.33
Mean	9.69	9.23	8.10		79.19	65.49	42.57		7.00	5.79	4.14	
S.Em. +	P = 0.11	C = 0.10	P x C = 0.20		P = 0.36	C = 0.31	P x C = 0.62		P = 0.19	C = 0.17	P x C = 0.34	
CD at 5%	P = 0.33	C = 0.29	P x C = 0.57		P = 1.05	C = 0.91	P x C = 1.82		P = 0.57	C = 0.50	P x C = NS	

Cut gerbera flowers stored at 5°C temperature with PP packaging recorded lowest scape bending curvature (16.67^0) and maximum flower diameter (10.57 cm)followed by HDPE packaging, while gerbera flowers stored at 15°C without any packaging (control), showed highest scape bending curvature (126.67^0), Table 2. Further, with increase in storage temperature, increase in opening of disc florets was observed. Restricted opening of disc florets was also observed in flowers stored in PP and HDPE packaging. Lower PLW in PP and HDPE packaging at low temperature contributed restricted opening of disc florets in gerbera flowers. Decreased in scape bending curvature and increased flower diameter in PP and HDPE packaged cold stored gerbera cut flowers at lower temperature (5^{0}C) can be attributed to better water balance in stem and petals with maintained high water uptake, fresh weight and high petal TSS as also reported earlier in cut flowers (Zeltzer et al., 2001). Higher stem bending curvature in cut flowers has been known to occur due to water stress (Paulin *et al*. 1985) and carbohydrate stress (Marousky, 1986). Correlation of TSS and water uptake with their scape bending has been earlier indicated in rose (Makwana, *et al.,* 2015).

TSS, MSI and vase life of gerbera stored under Modified Atmosphere Packaging using all the three films at lower temperature (5^{o}C) was higher as compared to control. Cut gerbera flowers stored at 5°C temperature with PP packaging recorded maximum TSS (10.90 ^{0}Brix), MSI (87.48 %)and vase life (8.33 days), while cold stored gerbera flowers at 15^{0}C without any packaging (control), observed minimum TSS in petals (6.23 ^{0}Brix) and vase life (2.33 days). The adequate levels of water balance due to higher water uptake and TSS level in petal cells of the PP and HDPE packaged gerbera cut flowers retained the bio-membrane fluidity and permeability and thus contributed in high MSI of the petal tissue. The significant decrease in MSI in the petals of cut gerbera flowers dry stored as such (without any packaging) was due to desiccation (high PLW%), water and sugar stress (low water uptake, petal TSS) and early senescence with shorter vase life as also observed in gladiolus (Singh and Kumar, 2009), in jasmine (Singh *et al.,* 2009) and in rose (Makwana, *et al.,* 2015).

REFERENCES

Bailley, C. A., Corbineare, F. and Come, D. 1996. Changes in melondialdehyde content and in superoxide dismutase, catalase and glutathione reductase activities in sunflower seeds as related to deterioration during accelerated aging. *Physiology of Plantarum*. **97:** 104-110.

Celikel, F. and Reid, M. 2002. Storage temperatures affects the quality of cut flowers from Asteraceae. *Hort. Science*. **37(1):** 148-150.

Day, B. P. F. 2001. Modifie d atmosphere packaging of fresh fruit and vegetables- An overview. *Acta. Hort*. **553:** 585-590.

Grover, J. K., Gupta, A. K., Singh, K., Kumar, A. and Singh, P. 2006. Studies on passive modified atmosphere storage of gladiolus spikes. *Advances in Hort. Science*. **20:** 175-180.

Makwana, R. J., Alka Singh and Neelima, P. 2015. Effect of cold storage techniques on flower quality and vase life of rose var. 'Sun King'. *The Bioscan*.**10(1):** 225-227.

Marousky, F. G. 1986. Vascular structure of the gerbera scape. *Acta Hort*. **181:** 399-405.

Palanikumar, S. and Bhattacharjee, S. K. 2001. Effect of wet storage on post-harvest life and flower quality of cut roses. *J. Ornam. Hort.* New series. **4(2):** 87-90.

Paulin, A., Kerhardy, F. and Maestri, B. 1985. Effect of drought and prolonged refrigeration on senescence in cut carnation (*Dianthus caryophyllus*). *Physiol. Plant*. **64:** 535-540.

Prasanth, P. and Chandrasekhar, R. 2007. Changes in postharvest life of cut gerbera as influenced by different concentrations of sucrose. *Indian Agric*. **51(1& 2):** 63-68.

Singh, A. and Kumar, J. 2009. Influence of sucrose pulsing and sucrose in vase solution on flower quality of Modify Atmosphere Low Temperature (MALT)-stored gladiolus cut spikes. *Acta Hort.* **847:** 129-138.

Singh, A., Dhaduk, B. K. and Ahlawat, T. 2009. Storage of jasmine (*Jasminum sambac*) in Passive MAP. *Acta Hort*. **847:** 321-326.

Singh, A., Kumar, P. and Kumar, J. 2007. Effect of packaging films for modified atmosphere storage at low temperature on petal senescence in Gladiolus cut spikes. *Indian J. Crop Sci.* **2(1):** 86-91.

Van Doorn, W. G. and D', Hont, K. 1994. Interaction between the effects of bacteria and dry storage on the opening and water relations of cut rose flowers. *J. Applied Bacteriology*. **77(6):** 644-649.

Zeltzer, S., Meir, S. and Mayank, S. 2001. Modified atmosphere packaging of long term shipment of cut flowers. *Acta Hort.* **553:** 631-634.