



[Research Article]

## Screening of gerbera (*Gerbera jamesonii*) cultivars for quality, vase life and stem bending

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### ABSTRACT

The present study was conducted to evaluate the post harvest performance of ten commercial gerbera cultivars for quality, vase life and stem bending. There were significant differences among different cultivars with respect to floral traits, water relation parameters, and vase life. The maximum stalk length was observed in Dune (65.85 cm), while maximum stalk diameter was recorded in Sunway (8.13 mm). The highest flower diameter (13.17 cm) was recorded in Sunway while numbers of ray florets were found maximum in Rosalin (75.20). The length of ray florets was recorded highest in Salvadore (4.60 cm). In vase life study, maximum fresh weight change was recorded in Kayak (124.29 %) on 8<sup>th</sup> day and minimum fresh weight change (87.92 %) in Scope on 16<sup>th</sup> day. Among all the cultivars, Dune recorded maximum water uptake (50.24 g/flower) and water loss (38.84 g/flower). The water balance exhibited significant differences among the cultivars and recorded maximum (11.40 g/flower) in Dune. The longest vase life exhibited by Dune (15.67 days) followed by Winter Queen (14.47 days) and Dana Ellen (14.40 days). The minimum stem bending incidence (0°- 15°) was recorded in cultivars Cacharell and Winter Queen. Based on performance cultivars Dune, Winter Queen, Dana Ellen, Carambola and Cacharell were found promising for commercial quality cut flower production.

**KEY WORDS:** *Gerbera jamesonii*, floral traits, water relations, vase life

*Gerbera* (*Gerbera jamesonii* Bolus ex. Hooker F.), a stemless perennial herb belongs to family Asteraceae. It is native to South Africa and Asia, also known as Transvaal, Barberton or African daisy (Das *et al.*, 2003). It occupies 5<sup>th</sup> position in the international flower trade (Hedau *et al.*, 2012) owing to its wide range of bewitching colours, forms and attractive geometrical shape. It is suitable for wide range of floral arrangements, bouquet and dry flower crafts and also used for beds, borders, pot culture and rock gardens. It is grown throughout the world in a wide range of agro-climatic conditions. About seven species were reported to be distributed in temperate Himalayas from Kashmir to Nepal at an altitude of 1300 to 3200 meters in India (Bhattacharjee and De, 2003). *Gerbera* have more than 300 cultivars with different floral traits, vase life and stem bending (Ferrante *et al.*, 2007). In cut flowers trade, floral quality traits like stalk length and flower diameter are important parameters along with uniformity in size, thickness, straightness, colour, vase life and bending incidence. Post harvest quality and vase life are phenomenon of physiological process

which depends upon water uptake, transpirational loss, water balance, respiration and varietal difference. The stem bending which occurs 10 cm below capitulum is the main disorder besides flower wilting. The stem bending is affected by genetic makeup, phytohormones, minerals, water imbalance caused by bacterial activity in xylem vessels, preharvest conditions and storage temperature after harvesting (Javed *et al.*, 2011). There is meager information available on these quality traits in gerbera which leads to loss of grade and quality as well as returns to the growers. Therefore, considering above facts an attempt has been made to screen the gerbera cultivars having improved postharvest floral quality traits, maximum vase life and minimum stem bending incidence for commercial cut flower production.

### MATERIALS AND METHODS

The present study was carried out at Laboratory of Post Harvest Technology, CITH, Srinagar (J&K) during 2009-2010. Ten different commercial cultivars Cacharell,

Salvadore, Scope, Dana Ellen, Sunway, Kayak, Carambola, Dune, Rosalin and Winter Queen were grown in polyhouse using recommended growing practices and it was laid out in Randomized Block Design (RBD) replicated thrice. Flowers were harvested in early morning when outer floret fully opened and perpendicular to stalk and pre-cooled for 1 hour at 5°C temperature. Post harvest floral quality traits *i.e.*, flower stalk length and diameter, flower size, flower disc diameter, number and length of ray floret, flower fresh weight and colour were recorded. Flower colour was identified by the RHS colour chart (Anon., 2007). In vase life study, flower of uniform stalk length were placed in preservative solution of 4% sucrose plus 20 ppm silver nitrate (Nair *et al.*, 2003) in Completely Randomized Design (CRD) with three replications. Vase life was considered to be terminated when petal start wilting and colour fading. Data were recorded on fresh weight change (% of initial fresh weight), water uptake, water loss, water balance, vase life and stem bending. The stem bending was classified based on Celikel and Reid methods (2002). The stalk curvature was measured and categorized based on 0° - 15°, 15°-25°, 25°-65°, 65°-90° and >90° stalk curvature. Data were analyzed statistically using standard methodology as suggested by Gomez and Gomez (1984).

## RESULTS AND DISCUSSION

### Floral traits

It is evident from Table 1 that there were Significant differences for floral traits among different cultivars. The maximum stalk length was observed in Dune (65.85 cm) followed by Rosalin (58.44 cm) and minimum stalk

length was measured in Scope (46.31 cm). The variation in stalk length may be owing to their genetic character (Halevy and Mayak, 1981). Stalk length was found to be positively correlated with flower diameter (Rao and Vasudevan, 2009) which is important quality trait in gerbera. The maximum stalk diameter was recorded in Sunway (8.13 mm) and minimum was recorded in Cacharell (5.84 mm). The highest flower diameter (13.17 cm) was observed in Sunway while lowest flower diameter was noticed in Kayak (10.02 cm). The flower disc diameter was found maximum in Scope (2.20 cm) and minimum in Sunway (0.90 cm). Similar variation in stalk length, thickness and disc diameter was also reported by Barua and Bordoloi (2012) in gerbera. The maximum flower fresh weight was recorded in Dune (37.60 g) while Kayak exhibited lowest value for fresh weight of flower (24.60 g). Number of ray florets varied from 54.60 in Winter Queen to 75.20 in Rosalin. The longest ray florets were recorded in Salvadore (4.60 cm) and smallest in Dana Ellen (2.40 cm). The cultivars Sunway and Cacharell produced flower having highest (6.09 mm) and lowest (3.64 mm) flower neck diameter, respectively. Flower colour in different cultivars varied from different shades of red purple, yellow, orange, yellow orange, white and red. Similar type of variation in different floral traits were also observed by Singh and Srivastava (2008); and Barooah and Talukdar (2009) in gerbera cultivars evaluation. This difference can be attributed to genetic makeup of cultivars.

### Water relation parameters

Analysis of data revealed that fresh weight and water relation parameters varied significantly (Table 2)

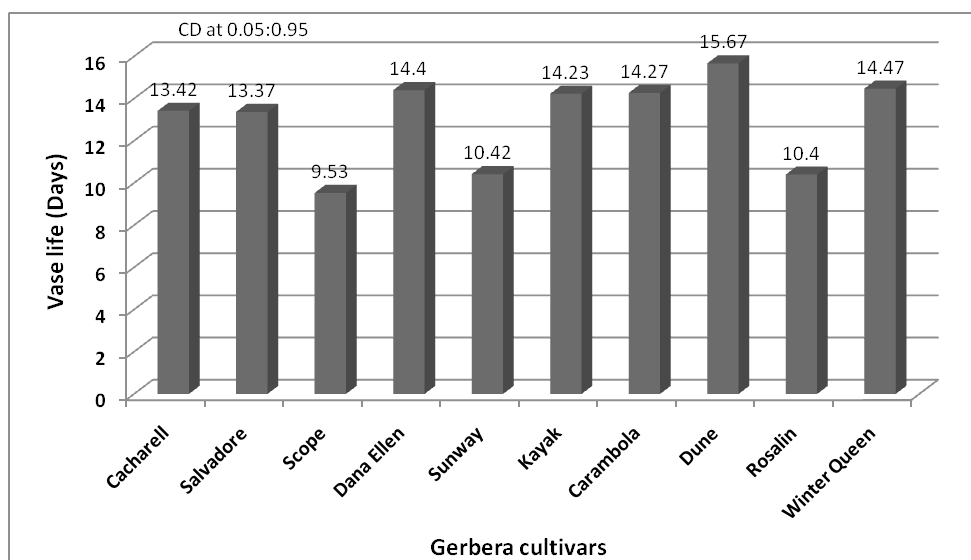


Fig. 1: Vase life of different gerbera cultivars in preservative solution

**Table 1: Morphometric floral quality traits of different gerbera cultivars**

Cultivars	Stalk length (cm)	Stalk diameter (mm)	Flower diameter (cm)	Flower disc diameter (cm)	Flower fresh weight (g)	No. of ray floret	Length of ray florets (cm)	Flower neck diameter (mm)	Flower colour
Cacharell	55.56	5.84	12.11	1.80	32.60	65.40	4.50	3.64	Red Purple 67 C
Salvadore	51.93	7.71	10.26	1.90	33.80	54.70	4.60	5.72	Red 43 A
Scope	46.31	7.43	11.33	2.20	29.50	60.70	4.00	5.20	Yellow 13 A
Dana Ellen	55.11	6.37	12.57	1.50	31.70	57.10	2.40	4.87	Yellow 12 A
Sunway	55.22	8.13	13.17	0.90	35.50	72.20	2.80	6.09	Orange N25 B
Kayak	48.14	8.11	10.02	1.40	24.60	70.30	3.50	6.01	Yellow Orange 14 B
Carambola	57.93	7.41	11.86	1.80	33.70	55.40	4.30	5.23	Red 46 A
Dune	65.85	6.58	12.87	1.60	37.60	73.60	2.80	5.06	Orange 25 A
Rosalin	58.44	7.40	10.80	1.70	34.76	75.20	3.20	5.26	Red Purple 62 D
Winter Queen	48.24	7.82	12.38	2.10	35.45	54.60	4.50	5.52	White 155 B
CD at 5%	7.49	0.61	1.23	0.10	2.46	3.19	0.21	0.14	

**Table 2: Study of water relations attributes in different gerbera cultivars**

Cultivars	Fresh weight change during different days (% of initial fresh weight)								Water uptake (g/flower)	Water loss (g/flower)	Water balance (g/flower)
	2	4	6	8	10	12	14	16			
Cacharell	108.66	110.19	111.27	115.19	106.92	103.20	99.67	92.97	38.42	30.1	8.32
Salvadore	107.89	109.55	110.25	114.11	106.50	102.35	99.24	92.42	37.51	29.35	8.16
Scope	105.27	107.41	108.10	112.98	103.56	99.781	94.65	87.92	30.28	25.96	4.32
Dana Ellen	112.59	113.80	115.45	119.22	110.70	107.03	102.5	97.37	46.37	36.51	9.86
Sunway	106.00	107.67	108.23	111.97	104.71	100.68	96.95	91.16	33.29	26.72	6.57
Kayak	115.57	117.52	119.11	124.29	113.31	108.58	102.6	95.48	42.09	32.85	9.24
Carambola	111.38	112.65	113.84	117.60	109.65	106.30	102.08	97.25	43.15	33.66	9.49
Dune	111.82	113.56	114.46	117.52	110.02	107.10	103.76	101.7	50.24	38.84	11.40
Rosalin	106.04	107.35	108.36	112.30	104.21	100.45	96.24	90.65	33.01	26.6	6.41
Winter Queen	111.42	112.58	114.11	117.45	109.71	106.57	102.9	98.05	48.25	38.05	10.20
CD at 5%	2.67	2.52	1.69	2.89	2.14	1.96	2.60	2.53	1.94	2.37	0.58

among the cultivars. Fresh weight was increased up to 8<sup>th</sup> day in all cultivars, thereafter decline in fresh weight was observed. Maximum fresh weight change was recorded in Kayak (124.29 %) on 8<sup>th</sup> day and minimum fresh weight change (87.92 %) in Scope on 16<sup>th</sup> day. The cultivar Dune sustained highest increase in fresh weight over initial up to 16<sup>th</sup> day, while cultivars Winter Queen, Carambola, Kayak and Dana Ellen recorded increase in

fresh weight over initial up to 14<sup>th</sup> day. Whereas cultivars Rosalin, Sunway, Salvadore and Cacharell observed increased fresh weight over initial up to 12<sup>th</sup> day and Scope maintained shortest increase in fresh weight over initial up to 10<sup>th</sup> day only. Increase in fresh weight can happen only when the rate of water absorption is greater than transpiration rate (Rogers, 1973).

**Table 3: Stem bending incidence (%) of different gerbera cultivars**

Cultivars	Stalk curvature with respect to initial day				
	0-15°	15-25°	25-65°	65-90°	>90°
Cacharell	70	12	0	0	18
Salvadore	25	0	0	10	65
Scope	60	10	30	0	0
Dana Ellen	60	10	0	10	20
Sunway	10	10	60	0	20
Kayak	60	10	25	0	05
Carambola	10	20	50	20	0
Dune	20	60	0	0	20
Rosalin	30	0	0	10	60
Winter Queen	70	0	10	15	5

The water uptake by gerbera cut flowers was significantly affected by different cultivars. Among all the cultivars, maximum water uptake was recorded in Dune (50.24 g/flower) and lowest water uptake (30.28 g/flower) was recorded in Scope. The water loss from flower stalk varied significantly among different cultivars and were recorded maximum and minimum in Dune (38.84 g/flower) and Scope (25.96 g/flower) respectively. The water balance also exhibited significant differences among the cultivars. Flower stalk from Dune and Winter Queen recorded highest water balance (11.40 g/flower) and (10.20 g/flower), respectively and were statistically different to other cultivars except Dana Ellen. The lowest water balance (4.32 g/flower) was recorded in Scope. There were significant differences in vase life among different cultivars (Fig. 1). The longest vase life was recorded in Dune (15.67 days) followed by Winter Queen (14.47 days) and Dana Ellen (14.40 days). The shortest vase life was observed in Scope (9.53 days) followed by Rosalin (10.40 days). It is observed that the cultivars having higher water balance have longer vase life owing to higher water potential in the vascular tissues and inflorescence. Increased water uptake maintains turgidity, freshness of flowers and thus enhances vase life owing to improved water balance and post harvest physiology. The variation in vase life among different cultivars may be due to inherent traits (Gondhali *et al.*, 1997). Water loss due to decline in uptake of water coupled with transpiration results in water stress, which ultimately reduce turgidity and vase life of cut flowers (Halevy and Mayak, 1981).

### Stem bending incidence

Data presented in Table 3 indicates that wide range of stem bending incidence found in gerbera and is cul-

tivar dependent. The severe stem bending incidence (>90°) was observed in Salvadore (65 %) followed by Rosalin (60 %), whereas low (0°-15°) in cultivars Cacharell (70 %) and Winter Queen (70 %). Moderate stem bending incidence (25°-65°) was observed in cultivars Carambola (50 %) and Sunway (60 %). Most of stalks (60 %) from cultivars Scope, Dana Ellen and Kayak recorded less stem bending incidence (0°-15°). Based on the results it is clear that stem bending incidence are cultivar dependent and varies from cultivar to cultivar, this is in agreement with the results obtained by of Ferrante *et al.*, (2007) in gerbera. It is therefore concluded that there were significant differences in floral quality traits among different gerbera cultivars. The gerbera cultivars should be chosen with proper strategy as vase life and stem bending incidence varied from cultivar to cultivar. Hence, based on improved post harvest quality traits cultivars Dune, Winter Queen, Dana Ellen, Carambola and Cacharell can be selected for commercial cut flower production.

### REFERENCES

- Anonymous, 2007. RHS Colour Chart. The Royal Horticultural Society, Fifth Edition. 80, Vincent Square, London, United Kingdom.
- Barooah, L. and Talukdar, M.C. 2009. Evaluation of different gerbera (*Gerbera jamesonii* Bolus ex. Hooker F.) cultivars under agro climatic conditions of Jorhat, Assam J. Orna. Hort., **12**(2):106-110.
- Barua, V. and Bordoloi, R. 2012. Performance of gerbera cultivars under low cost polyhouse. *Prog. Hort.*, **44**(1): 37-39.
- Bhattacharjee, S.K. and De, L.C. 2003. Advanced com-

- mercial floriculture. Avishkar publication, Jaipur, pp. 299-308.
- Celikel, F.G. and Reid, M.S. 2002. Storage temperature affects the quality of cut flowers from the Asteraceae. *Hort Sci.*, **37**(1):148-150.
- Das, P.; Samanta, P.K.S. and Parthasarathy, V.A. 2003. Gerbera. In: Commercial Flowers, Vol 2 Eds. Bose T.K., Yadav L.P., Pal P., Parthasarathy V.A. and Das. P., Naya Udyog, Kolkata, pp. 163-202.
- Ferrante, A.; Alberici, A.; Antonacci, S. and Serra, G. 2007. Effect of promoter and inhibitor of phenylalanine ammonia-lyase enzyme on stem bending of cut gerbera flowers. *Acta Hort.*, **755**: 471-476.
- Gomez, K.A. and Gomez, A.A. 1984. Statistical procedures for agricultural research. Second edition. John Wiley and Sons. Inc., New York, USA.
- Gondhali, B.V.; Yadav, E.D. and Dhemre, J.K. 1997. Evaluation of chrysanthemum for cut flowers. *Orissa J. Hort.*, **25**: 10-13.
- Halevy, A.H. and Mayak, S. 1981. Senescence and post harvest physiology of cut flowers, Part-II, *Hort. Rev.*, **3**:59-143.
- Hedau, N.K.; Singh, B. and Mishra, P. 2012. Evaluation of gerbera genotypes under protected conditions. *Progressive Hort.*, **44**(2): 336-337.
- Javed, N.D.M.; Ahmad, K.; Mostafa, A. and Roya., K. 2011. Post harvest evaluation of vase life, stem bending and screening of cultivars of cut gerbera (*Gerbera jamesonii* Bolus ex. Hook f.) flowers. *Afr. J. Biotechnol.* **10**(4): 560-566.
- Nair, S.A.; Singh, V. and Sharma, T.V.R.S. 2003. Effect of chemical preservatives on enhancing vase life of gerbera flowers. *J. Tropical Agri.*, **41**: 56-58.
- Rao, V.K. and Vasudevan, V. 2009. Correlation studies in gerbera (*Gerbera jamesonii* Bolus ex. Hook f.) genotypes. *Progressive Hort.*, **41**(1): 43-45.
- Rogers, M.N. 1973. A historical and critical review of post harvest physiology research on cut flowers. *Hort Sci.*, **8**:189-194.
- Singh, B. and Srivastava, R. 2008. Varietal evaluation of gerbera as influenced by growing conditions. *J. Orna. Hort.*, **11**(2): 143-147.