

## INFLUENCE OF DIFFERENT PRESERVATIVES FOR LONGEVITY OF GERBERA (*Gerbera jamesonii*, Hook) VASE LIFE

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### ABSTRACT

Postharvest studies were carried out in 2 varieties of gerbera; 'Malibu' and 'Sunway' to find out the effect of vase solutions (distilled water, sodium hypochlorite 40 ppm, 8-HQS 200 ppm, Flora Life 10 gm/l, GA<sub>3</sub> 5mg/l, sucrose 2% + 8-HQS 100 ppm and CaCl<sub>2</sub> 1%) for prolonging the vase life during September 2009 to March 2010. Laboratory experiments were carried out in randomized complete block design in controlled room having 18±2<sup>o</sup>c temperature, 68±2% relative humidity and 100 lux light. Among 7 different vase solutions, sodium hypochlorite 40 ppm (19.1 days) and calcium chloride 1% (18.8 days) were found to be the most effective to prolong the vase life of the gerbera cut flowers, while the effect of HQS 200 ppm (10.4 days) and 'Flora life' 10gm/l (9.5 days) was insignificant compared to the control (distilled water) (10.1 days). Total solution uptake was found the highest in variety, Sunway in sodium hypochlorite (42.12 ml), followed by calcium chloride (38.6 ml), GA<sub>3</sub> (26.36 ml), HQS (22.1 ml), control (19.54 ml), and Flora life (18.82 ml). Increment of floral diameter at the fourth day of vase life was 2.74% whereas at the last day (13 days) there was reduction of floral diameter by 5.03%

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**Key words:** Gerbera, preservatives, solution uptake, vase life

### INTRODUCTION

Floriculture holds a great export potential in Nepal. Commercial flower production has been expanded to 34 districts in the country. This sector provides employment opportunities to about 2,500 people among them 60% are women. Total turn over of this sector was about 230 million rupees in 2006 (FAN, 2007), which increased to 560 million rupees in 2009 (FAN, 2010). Nepalese cut flowers stand at one of the most prioritized position in international market as compared to other agricultural products in terms of export market potential (UNCTAD/WTO, 2007).

Gerbera (*Gerbera jamesonii*) also known as Transvaal daisy or Barberton daisy, is one of most important cut flower in Nepal. It has considerable demand in both domestic and export markets. The daily demand of gerbera in Kathmandu is 1500-3000 sticks and selling price is around Rs.15.0 per stick. The area of gerbera cultivation in Nepal was 0.25 ha in 2004/2005 (MOAC, 2009) and now, estimated to be about 0.72 ha. However, since the domestic production is insufficient to meet market demand of Kathmandu about 65% of gerbera is being supplied by import from India.

Most gerbera varieties should be harvested when the 2 outer rows of disk florets begin to open. If flower stems are pulled from the ground, it should be immediately cut 10 cm from the bottom to remove the 'woody' base of the stem. After harvesting, flower stalk should be placed soon in a solution containing 40 ppm sodium hypochlorite. Gerberas are unaffected by exposure to ethylene (Reid, 2004).

Keeping quality is an important parameter for evaluation of cut flower quality, for both domestic and export markets. Addition of chemical preservatives to the holding solution is recommended to prolong the vase life of cut flowers. Keeping quality of flowers is affected by internal as well as external factors. The internal factors that affect keeping quality of cut blooms include the rate of water absorption and transpiration, respiration, temperature, relative humidity and wind velocity. Postharvest handling such as reduced stem plugging, restrict microbial activity, delay flower senescence through the provision of external source of water and nutrients also play important roles in enhancing keeping quality of flowers. (Meman and Dabhi, 2006).

Generally, gerbera is grown in Falgun-Chaitra (February-March) or Shrawan-Bhadra (July-August) in Kathmandu valley and production starts after 3 months of planting. In winter, especially, from October-February (Kartik-Falgun), there is high demand and low supply of cut flowers. Flower growers bring most of their domestic products (gerbera, carnation, gladiolus, Dutch rose) in the market after March-April (Chaitra-Baisakh) and do not get high price due to large supply.

Besides, the problem with gerbera cut flowers is the short postharvest life (Wernett *et al.*, 1996). Low production due to fungal disease and high postharvest losses due to lack of postharvest treatment are major problems of the gerbera production and marketing in Nepal. Therefore, the study was carried out to study the effect of vase solutions and varieties on vase life of gerbera cut flower.

## MATERIALS AND METHODS

Two varieties Sunway (longest vase life) and Malibu (shortest vase life) were selected from past experiment (Acharya *et al.*, 2010) on the basis of their vase life performance. These varieties were tested in 7 vase solutions namely distilled water (control), Sodium hypochlorite 40 ppm, 8-HQS 200 ppm (8-hydroxyquinoline sulphate), GA<sub>3</sub> 5 mg/liter (Gibberellic acid), sucrose 2%+8-HQS 100 ppm, Flora life (commercial solution) 10 gm/liter, and CaCl<sub>2</sub> (Calcium chloride) 1%. Treatments were laid out in RCBD with 5 replications. The experiment was repeated twice.

After checking and rejecting abnormal, diseased and damaged flower, the prepared cut flower was placed in 250 ml conical flask by filling above 7 types of 200 ml vase solution. One conical flask had one cut flower for vase life study. After keeping flower stalk in the solution, the top of the conical flask was wrapped with aluminum foil to prevent evaporation loss.

Floral diameter was measured using verniercaliper at 3 days interval of vase life from the first day.. After placing the stalk of the flower in the conical flask containing different vase solutions, the level of solution in the flask was marked with permanent marker. Solution uptake was measured at 3 days interval with the help of 5 ml syringe separately for different solutions. The added volume of solution at the marked point after 3 days interval was considered as the solution uptake of the flower.

For vase life study, flowers were kept in a controlled room having 18±2°C temperature and 68±2% relative humidity. The light was measured by Digital Lux meter, LX-101, Lutron company, made in Taiwan. On an average there was 100 lux light intensity in the observation room, . The source of light was fluorescent tube light and the day length was maintained at 12hr.

The quality of flower during vase life was evaluated in 5-1 scale on the basis of visual observation. Scale 5 was considered as the best quality of the flower whereas scale 1 poor quality at vase life termination stage. Senescence characteristics with grade of two varieties are given in plate 1.

## RESULTS AND DISCUSSION

### Effect of vase solutions on the vase life

Effect of different vase solutions was found highly significant ( $P < 0.001$ ) on the vase life of gerbera cut flower (Table 1). Sodium hypochlorite 40 ppm (19.10 days vase life) and Calcium chloride 1% were found most effective vase solutions to prolong the vase life (18.8 days vase life) of gerbera cut flower. Research in postharvest physiology of cut flowers indicates that calcium (Ca) might be involved in delaying flower senescence by postponing cell membrane degradation (Nan, 2007). Moreover, past research with different cut flower species, *Rosa hybrida* (Bhattacharjee and Palanikumar, 2002; De Capdeville *et al.*, 2005; Michalczuk *et al.*, 1989; Torre *et al.*, 1999), *Gerbera jamesonii* (Gerasopoulos and Chebli, 1999), gladiolus (Pruthi *et al.*, 2001) indicated that Ca increase postharvest longevity of cut flowers. With respect to sodium hypochlorite, FAN (2009) reported that it was effective in some locations for prolonging vase life of gerbera.

Sucrose 2%+HQS 100 ppm and GA<sub>3</sub> (5mg/lit.) had incremental effect with 13.8 and 12.7 days vase life respectively over the control solution (distilled water). Meman and Dabhi (2006) also reported that longest gerbera vase life (9.87 days) was from the combination of sucrose 4%+8-HQC 250 ppm. Emongor (2004)

stated that sucrose enhanced the effect of cytokinins in delaying senescence of flowers and reduced the effect of ethylene in promoting it. Sugar also improves the water balance in flowers and regulates the closure of stomata (Marousky, 1969) that reduce transpirational water loss.

Regarding practical application of vase solutions for prolonging the vase life of the flower by farmers, retailers and wholesalers, the cost of vase solution should be considered. The cost of vase solution was calculated based on the solution required in the vase life and market price of the preservatives (Sodium hypochlorite @NRs. 400/lit. and Calcium chloride @NRs. 700/Kg). It was found that for 1000 gerbera flowers, NRs. 220.0 was required for the Calcium chloride where as NRs. 0.61 was required for the Sodium hypochlorite.

**Table 1.** Effect of different vase solutions on the vase life of gerbera cut flower

Treatments	Vase life (days)
Distilled water	10.10 <sup>c</sup>
Sodium hypochlorite 40 ppm	19.10 <sup>a</sup>
HQS 200 ppm	10.4 <sup>c</sup>
Flora life 10 gm <sup>-1</sup>	9.5 <sup>c</sup>
GA <sub>3</sub> 5 mg <sup>-1</sup>	12.7 <sup>b</sup>
Sucrose 2%+HQS 100 ppm	13.8 <sup>b</sup>
Calcium Chloride 1%	18.8 <sup>a</sup>
LSD	1.384
SE m±	2.377
P value	<0.001
CV %	11.43

<sup>1</sup>\*\*\* Significant at P <.001. Means within columns followed by the same letter are not significantly different at 5% level by DMRT.

#### Interaction effect of vase solutions and varieties

Interaction effect of vase solutions and two varieties (Table 2) on vase life of gerbera cut flower was found to be significantly different (P <.001). Sunway variety had the longest vase life (21.2 days) in Sodium hypochlorite solution, followed by Calcium chloride solution (19.4 days), whereas shortest vase life (9.6 days) was in 'Flora life' solution. Shortest vase life of Malibu variety was found from GA<sub>3</sub> (9.6 days) and 'Flora life' solutions (9.4 days), whereas longest vase life of same variety was found from Calcium chloride (18.2 days) and followed by Sodium hypochlorite solution (17 days). Neck and stalk bending was found more in Sunway variety than in Malibu variety.

It was found that there was no significant effect of GA<sub>3</sub> (9.6 days), Flora life (9.4 days) and control (distilled water) (9.8 days) on longevity of Malibu variety. In case of Sunway variety, similar effect on vase life was found from HQS and control solutions. Emongor (2004) found that there were no significant differences among GA<sub>3</sub> concentrations with respect to their ability to reduce wilting of gerbera in vase life.

**Table 2.** Interaction effect of vase solutions and varieties on vase life of gerbera

Treatments	Vase life (days)	
	Varieties	
	Malibu	Sunway
Distilled water	9.8 <sup>f</sup>	10.4 <sup>ef</sup>
Sodium hypochlorite	17.0 <sup>cd</sup>	21.2 <sup>a</sup>
HQS	10.2 <sup>ef</sup>	10.6 <sup>ef</sup>
Flora life	9.4 <sup>f</sup>	9.6 <sup>f</sup>
GA <sub>3</sub>	9.6 <sup>f</sup>	15.8 <sup>d</sup>
Sucrose+HQS	12.0 <sup>e</sup>	15.6 <sup>d</sup>
Calcium chloride	18.2 <sup>b</sup>	19.4 <sup>ab</sup>
LSD	1.957	
SE m±	2.377	
P value	<0.001	
CV %	11.43	

<sup>1</sup>\*\*\* Significant at P <.001. Means within columns followed by the same letter are not significantly different at 5% level by DMRT.

### Total solution uptake

The total uptake of vase solutions significantly ( $P < 0.05$ ) varied with the kind of gerbera varieties and types of vase solution (Table 3). Total solution uptake in Sunway variety was found the highest in Sodium hypochlorite (42.12 ml), followed by Calcium chloride (38.6 ml), GA<sub>3</sub> (26.36 ml), HQS (22.1 ml), control (19.54 ml), and Flora life (18.82 ml).

As in case of Malibu variety, total solution uptake was also found the highest in Sodium hypochlorite solution (34.18 ml), followed by HQS (28.16 ml), Calcium chloride (24.84 ml), Sucrose+HQS (22.3 ml), control (17.42 ml), Flora life (15.58 ml), and GA<sub>3</sub> (14.48 ml). It was reported that among different stalk lengths (30, 40, 50 and 60cm) of 'Savana Red' gerbera variety, maximum amount of solution (sucrose 4%+250 ppm HQC) was absorbed by the variety having 60 cm length at third (41.86 ml), sixth (35.76 ml), and ninth day (18.99 ml) (Meman and Dabhi, 2006). Inorganic salts and sugars have been reported to improve water absorption of cut flowers by positively affecting water balance (Mayak *et al.*, 1974; Halevy, 1976).

**Table 3.** Effect of different vase solutions on total solution uptake on vase life of gerbera

Treatments	Total solution uptake (ml)	
	Varieties	
	Malibu	Sunway
Distilled water	17.42 <sup>cde</sup>	19.54 <sup>cde</sup>
Sodium hypochlorite	34.18 <sup>abcd</sup>	42.12 <sup>a</sup>
HQS	28.16 <sup>abcde</sup>	22.1 <sup>bcde</sup>
Flora life	15.58 <sup>de</sup>	18.82 <sup>cde</sup>
GA <sub>3</sub>	14.48 <sup>c</sup>	26.36 <sup>abcde</sup>
Sucrose + HQS	22.3 <sup>bcde</sup>	34.72 <sup>abc</sup>
Calcium chloride	24.84 <sup>abcde</sup>	38.6 <sup>ab</sup>
LSD	17.48	
SE m±	43.481	
P value	0.0153	
CV %	25.7	

<sup>1</sup>\* Significant at  $P < 0.05$ . Means within columns followed by the same letter are not significantly different at 5% level by DMRT.

### Effect on floral diameter

Effect of different vase solutions on floral diameter variation in vase life of different gerbera varieties is given in Figure 1. On the 4<sup>th</sup> day of vase life, 2.74% increment of floral diameter was observed whereas on the last day of vase life, 5.03% reduction of floral diameter was found. With respect to two varieties, 3.3% and 2.2% floral diameter increment on 4<sup>th</sup> day and 4.44% and 5.62% floral diameter reduction at the last day (13 days) were found in the vase life of Malibu and Sunway variety respectively.

Although, there was not so drastic effect of vase solutions on floral diameter of the varieties, in Malibu highest floral diameter increment (5.63%) was found by HQS solution, followed by Sodium hypochlorite (5.54%), distilled water (5.06%), GA<sub>3</sub> (2.34%), Sucrose+HQS (1.64%), Calcium chloride (1.58%) and Flora life (1.28%) on the 4<sup>th</sup> day of vase life. But as in case of Sunway, highest floral diameter increment (3.72%) was found by Sucrose+HQS solution, followed by Sodium hypochlorite (3.59%), distilled water (3.28%), GA<sub>3</sub> (3.0%), HQS (1.65%), Calcium chloride (0.52%) and negative effect by Flora life at the same day. Likewise, in Malibu, highest floral diameter reduction (10.48%) was found by Flora life solution, followed by GA<sub>3</sub> (8.32%), distilled water (4.94%), Sucrose+HQS (4.56%), HQS (3.26%), Sodium hypochlorite (0.9%), and Calcium chloride (0.39%) at the last day (13 days) of vase life. But as in case of Sunway, highest floral diameter reduction (12.5%) was found by GA<sub>3</sub> solution, followed by Flora life (6.08%), Sucrose+HQS (5.85%), distilled water (4.8%), Sodium hypochlorite (3.7%), Calcium chloride (3.68%), and HQS (2.64%) at the same vase life day.

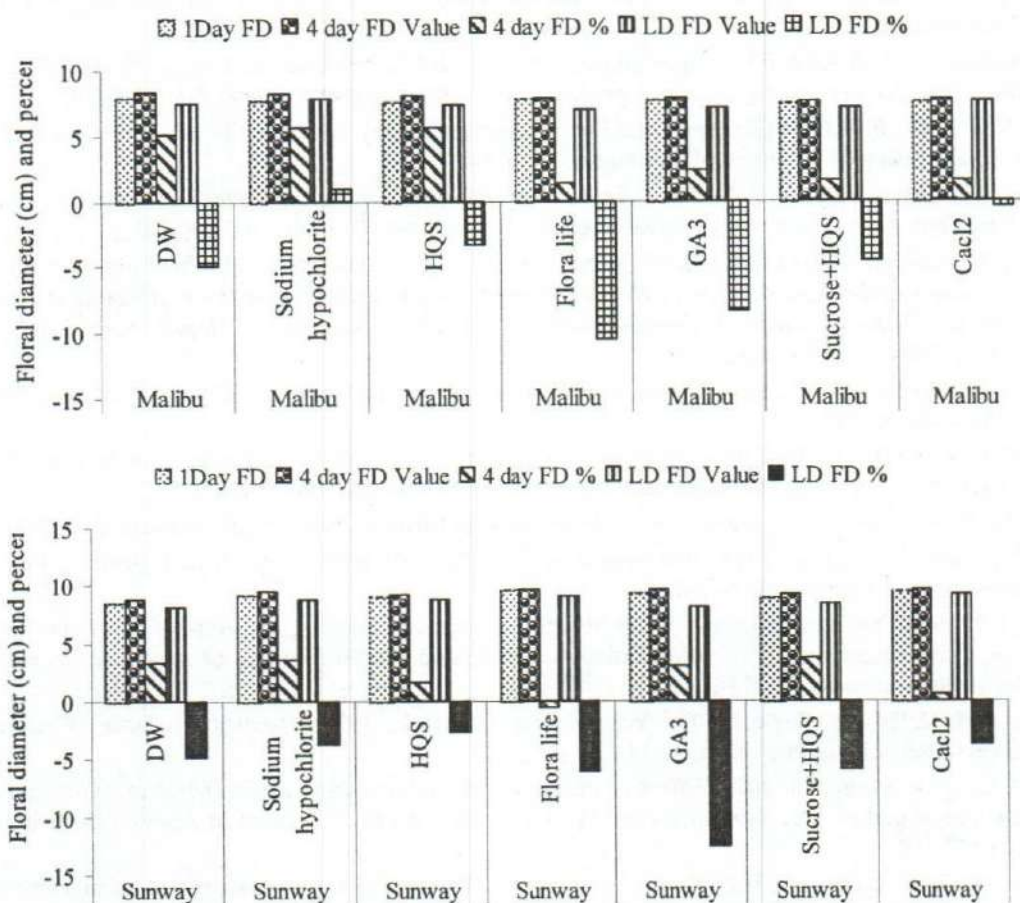


Figure 1. Effect of different vase solutions on floral diameter variation in vase life of different gerbera varieties.

Thus Sodium hypochlorite 40 ppm and Calcium chloride 1% solutions were the most effective vase solutions to prolong the vase life of gerbera cut flower. Sodium hypochlorite was more cost effective than Calcium chloride solution.

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