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EFFECT OF CHEMICAL FLORAL PRESERVATIES ON EXTENDING VASE LIFE OF GERBERA (*GERBERA JAMESONII* H. BOLUS)

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Abstract

An experiment was conducted at post-harvest laboratory, Department of Horticulture, Faculty of Agriculture, Annamalai University to evaluate the vase life of cut gerbera flowers using different chemical floral preservatives. 'Goliath' variety of gerbera is chosen and subjected to eight different treatments of preservative solutions *viz.* T_1 - 2% sucrose + distilled water, T_2 - 25 ppm $AgNO_3$ + distilled water, T_3 - 200 ppm 8-HQS + distilled water, T_4 - 2% sucrose + 25 ppm $AgNO_3$ + distilled water, T_5 - 2% sucrose + 200 ppm 8-HQS + distilled water, T_6 - 25 ppm $AgNO_3$ + 200 ppm 8-HQS + distilled water, T_7 - 2% sucrose + 25 ppm $AgNO_3$ + 200 ppm 8-HQS + distilled water, T_8 - Distilled water (control). The minimum weight loss, number of days taken for flower head drooping, petal discolouration, petal fall and the solution uptake was observed higher in treatment T_7 (2% sucrose + 25 ppm AgNO3 + 200 ppm 8-HQS + distilled water) followed by treatment T_4 (2% sucrose + 25 ppm $AgNO_3$ + distilled water). The vase life characters was significantly reduced when the cut flower stems are placed in control (T_8).

Introduction

Gerbera belongs to the family 'Asteraceae' is the most elegant cut flower and ranks fifth position among top ten cut flowers. The flowers are found in a wide range of colours and size with good keeping quality, leading them attractive to different floral arrangements. It is native to tropical regions of South America, Africa and Asia. The plant is dwarf, herbaceous, perennial and grows in clump with solitary flower head on long slender stalks, which grows well above the foliage. Depending on the cultivar, post-harvest handling operations and vase solutions employed, the gerbera flowers can last long for one to four weeks. The main post harvest disorder of gerbera is stalk bending and breakage. The genetic makeup of gerbera appears to play a significant role in vase life. Plant hormones like ethylene and cytokinins may change the incidence of stalk break during post harvest storage life. Moreover, highest levels of electrolyte leakage and low water potential were also found to be the reason for stalk bending. The accumulation of bacteria in vase water and subsequent xylem clogging by the bacteria in the cut end is often associated with premature senescence in gerbera (Acharyya *et al.,* 2013). Therefore, this experiment was conducted to extend the post-harvest vase-life of cut gerbera flowers through the use of floral preservatives under tropical conditions where there is a shortage of cut flowers at affordable prices.

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Materials and Methods

The experiment was conducted at post graduate laboratory, Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamil Nadu, India on March 2019. Gerbera flowers of the variety 'Goliath' were harvested when all the florets opened fully and were perpendicular to the stalk. The flowers were harvested early in the morning and were immediately placed in water for pre-cooling. The flower stalks are given slant cut to provide more solution accumulated area. The uniform sized stalks were placed in holding solution to study the keeping quality. Eight treatments of holding solutions were used (Table 1) and the experiment was conducted in

Table 1: Treatment details of the holding solutions.

Treatments	Particulars
T_1	2% sucrose + distilled water
T_2	25 ppm $AgNO_3$ + distilled water
T_3	200 ppm 8-HQS + distilled water
T_4	2% sucrose + 25 ppm $AgNO_3$ + distilled water
T_5	2% sucrose + 200 ppm 8-HQS + distilled water
T_6	25 ppm $AgNO_3$ + 200 ppm 8-HQS + distilled water
T_7	2% sucrose + 25 ppm $AgNO_3$ + 200 ppm 8-HQS + distilled water
T_8	Control (distilled water)

completely randomized design with three replications. The post-harvest parameters observed were initial and final weight of cut flowers, days taken for drooping of flower heads, days taken for discolouration of petals, days taken for petal fall and solution uptake by the flowers. The data collected data were statistically analyzed using OPSTAT computer package program.

Results and Discussion

The readings of fresh weight of cut flower stems were taken initially and the final weight was observed at the end of the experiment (Table 2). The cut flowers stems kept in treatment T_7 (2% sucrose + 25 ppm $AgNO_3$ + 200 ppm 8-HQS + distilled water) showed minimum weight loss, whereas the lower flower weight was observed in treatment T_8 (control). The stems of gerbera are highly prone to water stress. The blockage of the base of stem due to bacterial plugging results in decrease of water uptake by stem which results in gradual weight loss. A very high level of turgidity is necessary for continuation of normal metabolic activities in the cut flowers. Sucrose helps in maintaining the water balance and turgidity. Hence, addition of sucrose to the holding solution might have led to increased uptake of the holding solution and thereby freshness is enhanced and weight loss is prevented. This was in conformity with the findings of Rogers (1973).

The useful vase-life of the cut blooms terminated when the flower heads started drooping, which was followed by petal discolouration and petal fall, which represented the end of effective vase-life of cut flowers. The highest number of days taken for flower head drooping was recorded in the treatment T_7 (2% sucrose + 25 ppm $AgNO_3$ + 200 ppm 8-HQS + distilled water) (7.33), followed by treatment T_4 (2% sucrose + 25 ppm $AgNO_3$ + distilled water) (6.99). Whereas, the minimum number of days for flower head drooping was recorded in treatment T_8 (control) (4.33) (Table 2). These results are similar to the findings of Awad *et al.,* (1986), who concluded that the beneficial effect of $AgNO_3$ in the vase-water to the production of Ag+ ions, which might inhibit the rise of ethylene precursor, thereby enhancing the longevity of cut flowers and prevents from flower head drooping.

The maximum number of days for discolouration of petals was in 2% sucrose + 25 ppm $AgNO_3$ + 200 ppm 8-HQS + distilled water (T_7) (11.77), which was on par with 2% sucrose + 25 ppm $AgNO_3$ + distilled water (T_4) (11.55) and % sucrose + 200 ppm 8-HQS + distilled water (T_5) (11.33). The beneficial effect of sucrose on prolonging vase life in cut flowers has been attributed to suppression of ethylene biosynthesis or sensitivity to ethylene (Aarts, 1957). These results are similar to the findings of Vignesh Kumar (2018) in gladiolus *cv.* American Beauty. The number of days taken for discolouration of petals was least recorded in control (T_8) (7.66). Without the addition of sucrose and biocides, the water uptake and fresh weight of cut gerbera decreased considerably and leads to drooping and discolouration of petals (Van Meeteren, 1978).

Table 2: Effect of chemical floral preservatives on vase life characteristics of gerbera

Treatments	Initial weight of fresh flowers (g)	Final weight of flowers (g)	Days taken for flower head drooping	Days taken for petal discolouration	Days taken for petal fall	Solution uptake (ml)
T_1	30.6	19.33	5.99	10.99	11.33	124.3
T_2	30.0	18.66	5.66	10.44	11.0	121.6
T_3	29.33	15.66	5.11	9.55	9.66	119.0
T_4	28.0	17.33	6.99	11.55	12.66	128.0
T_5	29.66	18.66	6.44	11.33	12.0	125.5
T_6	28.66	17.66	5.77	10.66	11.0	123.0
T_7	28.0	18.33	7.33	11.77	13.33	131.0
T_8	30.33	14.66	4.33	7.66	9.33	116.5
S.Ed.	1.37	0.47	0.23	0.26	0.55	0.99
CD (P=0.05)	N.S	1.00	0.49	0.55	1.18	2.14

Petal fall in cut blooms represented the termination of the effective vase-life which was prolonged by using 2% sucrose + 25 ppm $AgNO_3$ + 200 ppm 8-HQS + distilled water (T_7) in the holding solution or 2% sucrose + 25 ppm $AgNO_3$ + distilled water (T_4). The petal fall was accelerated when no preservatives were added to the holding solution which was observed in treatment T_8 (control) (9.33). Sucrose is widely used in floral preservatives, which acts as a food source or respiratory substrate and delays the degradation of proteins and improves the water balance of cut flowers. Steinitz (1982) opined that addition of sucrose to the solution increased the mechanical rigidity of the stem by inducing cell wall thickening and lignification of vascular tissues. Sucrose antagonizes the effect of ABA, which promotes senescence (Halevy and Mayak, 1979) and thereby reduces petal fall.

There is a close relationship between vase life and water stress in gerbera (Nozari deljou *et al.,* 2011). The solution uptake was significantly better in treatment T_7 (2% sucrose + 25 ppm $AgNO_3$ + 200 ppm 8-HQS + distilled water) (131.0), while the minimum uptake of solutions by flower stalks was noticed in treatment T_8 (control) (116.5). The gerbera flowers after harvest is very sensitive to water uptake (Zamani *et al.,* 2011). The decrease in solution uptake of cut flowers during vase life period was probably due to growth of microbes and air embolism in vascular tissues. It is in conformity with the findings of Ketsa *et al.,* (1995) who opined that $AgNO_3$ and 8-HQS prevented microbial occlusion of xylem vessels in Dendrobium, thereby enhancing water uptake and increasing the longevity of cut flowers.

Conclusion

The improvement in vase-life of gerbera flowers in 2% sucrose + 25 ppm $AgNO_3$ + 200 ppm 8-HQS + distilled water (T_7) solution might be due to the combination of chemical floral preservatives provides optimum food supply to the cut stems after harvesting and it also acts as a very effective biocide, which completely inhibits the microbial growth. Sugars alone, however, tends to promote microbial growth. Hence, the present investigation revealed the combination of sugars and biocides might have extended the vase-life and quality of cut flowers.

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