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Effect of chemical preservatives on keeping quality and vase life of Gerbera (*Gerbera jamesonii*) *cv.* Livia

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Abstract
The present investigation entitled "Effect of chemical preservatives on keeping quality and vase life of Gerbera (*Gerbera jamesonii*) cv. Livia" was conducted during April 2025 at the Department of Floriculture & Landscaping, College of Horticulture and Research Station, Saja, Bemetara (C.G.). The experiment was laid out in a Completely Randomized Design (CRD) with ten treatments, comprising T_0 (Distilled water – Control), T_1 (Citric acid @ 100 ppm + 4% sugar), T_2 (Citric acid @ 200 ppm + 4% sugar), T_3 (Citric acid @ 300 ppm + 4% sugar), T_4 (8-HQS @ 100 ppm + 4% sugar), T_5 (8-HQS @ 200 ppm + 4% sugar), T_6 (8-HQS @ 300 ppm + 4% sugar), T_7 (Salicylic acid @ 100 ppm + 4% sugar), T_8 (Salicylic acid @ 200 ppm + 4% sugar) and T_9 (Salicylic acid @ 300 ppm + 4% sugar).
Observations were recorded on different postharvest quality traits such as vase life, fresh weight, flower diameter, solution uptake, stem bending, petal discoloration, petal shriveling, physiological weight loss or gain, stem diameter, and petal drooping.
Results revealed that among the treatments, 8-HQS @ 200 ppm + 4% sugar (T_5) performed best for most parameters, recording the longest vase life (12.1 days), maximum flower diameter (9.89, 9.38, 8.31, 6.69, and 8.31 cm on the 1st, 3rd, 5th, 7th, and 9th day, respectively), highest solution uptake (60.8 ml), greatest physiological weight gain (+4.4 g on the 3rd day and least loss −1.9 g on the 9th day), and consistently superior stem diameter (7.59, 7.28, 6.46, 5.60, and 5.60 mm on corresponding days). This treatment also delayed senescence by prolonging days to stem bending (13.9 days), petal discoloration (13.8 days), petal shriveling (14.0 days), and petal drop (17.9 days). Salicylic acid @ 200 ppm + 4% sugar (T_8) also showed significant improvements over the control, particularly in flower diameter and solution uptake, and was statistically at par with T_5 for certain traits. By contrast, the control (T_0, distilled water) consistently recorded the poorest performance with the shortest vase life (7.1 days), minimum flower diameter (6.02, 5.70, 5.06, 4.17, and 5.06 cm), lowest solution uptake (49.9 ml), smallest stem diameter (5.64, 5.41, 4.80, 4.37, and 4.15 mm), and earliest onset of senescence symptoms.
The superior performance of T_5 may be attributed to the antimicrobial action of 8-HQS, which prevented xylem blockage and maintained continuous water uptake, while sugar supplied the necessary energy to sustain cell metabolism and flower turgidity.)

Keywords: Gerbera, vase life, 8-HQS, salicylic acid, citric acid, sugar solution, postharvest quality

Introduction

Gerbera (*Gerbera jamesonii*), popularly referred to as the Transvaal daisy, is a member of the Asteraceae family. It ranks fourth among the ten most popular and commercially important cut flowers globally, based on global floriculture trends (Soad *et al*., 2011) [10]

The duration of post-harvest viability, typically assessed by vase life, is an essential criterion for determining the quality of cut flowers. The primary objective of post-harvest technology is to extend vase life while ensuring client satisfaction (Buys, 1978) [9]. Studies indicate that appropriate vase solutions can markedly extend the post-harvest longevity of cut flowers (Halevy and Mayak, 1979- 1981) [8].

Floral preservatives are chemicals that are meant to make flowers last longer, make them bigger and brighter, and keep them fresh overall. There are many ways to use these preservatives, such as pulsing solutions for short treatments, pre-shipment solutions, and holding solutions for retail and display times. Water, sugar, and biocides are usually the main parts of these things. (Halevy *et al*., 1981) [8].

Gerbera possesses significant potential in the export market, especially to European nations during the winter season. Given its limited vase life, enhanced measures are necessary to augment its longevity and quality. Enhancing vase life is a primary goal in contemporary floriculture. The ephemeral quality of cut flowers renders them particularly susceptible to post-harvest losses, which can reach as much as 40–50% in certain instances (Bhattacharjee, 1999a) [7]. Gerbera, in conjunction with carnation, orchid, lily, and chrysanthemum, is considered one of the most favored cut flower species due to its vibrant colors and exceptional bloom quality (Raghava, 1999).

Materials and Methods

Methodology adopted for recording observation.

1. Vase life of spike (days)

The end of the vase life of gerbera cut flower was ascertained by visualizing the appearance of a fading of petals wilting or blueing or, bend neck. The vase life was expressed in terms of the total number of days from the date of harvesting of gerbera cut flower to the end of vase life of flower. Re-cutting of gerbera cut flower were performed (2 to 3 cm) every day.

2. Flower diameter (cm)

The flower head diameter was recorded by Vernier calliper the average values were recorded every-day in (mm).

3. Solution uptake (ml)

Solution uptake was determined by recording the difference between the initial volume of vase solution and the remaining volume at specific intervals. This parameter reflected the water absorption capacity of the cut stems.

4. Days taken for stem bending

Recorded as the number of days from vase placement until noticeable neck bending (≥45°) occurred, indicating stem weakness and loss of turgidity.

5. Days taken for first petal discoloration

Noted as the day when visible fading, browning, or patchy discoloration first appeared on petals, indicating onset of senescence.

Results and Discussion

1. Vase life (Days)

The data on vase life of gerbera showed a significant effect of different treatments, as illustrated in Table 1.

The longest vase life of gerbera cut spikes was observed in T_5 with, 8-HQS 200 ppm + 4% sugar, extending it to 12.1 days followed by T_8 with Salicylic acid 200 ppm + 4% sugar (11.4 days) and T_1 (Citric acid 100 ppm + 4% sugar) 10.3 days. This concentration was the most effective at prolonging the vase life of the flowers. In comparison, the control group T_0 with distilled water (Control) had the shortest vase life of 7.1 days.

The key factors contributing to reduced vase life include nutrient deficiencies, bacterial and fungal infections, water stress leading to wilting, and vascular blockage (Alaey *et al.*, 2011) [4] and the application of different chemicals can influence the postharvest life of cut flowers (Prashanth *et al.*, 2010) [5].

A similar result was reported by Muraleedharan and Joshi (2018) who reported that the cut spikes of gerbera treated with 8-HQS had a longer vase life than the cut spikes subjected to other treatments. Similarly, Aghera *et al.* (2016) [6] reported that 8-HQS improved the vase life of Gerbera. reported that the use of 8HQS at specific concentrations can increase the vase life of gerbera flowers more than the use of other chemicals.

2. Flower diameter (cm)

The data on flower diameter of cut gerbera revealed a significant effect of various concentrations of vase solution, as presented in Table 2 Among all treatments, the maximum flower diameter on all observation days was recorded in treatment T_5 (8-HQS 200 ppm + 4% sugar) with values of 9.89, 9.38, 8.31, 6.69, and 8.31 cm on the 1st, 3rd, 5th, 7th, and 9th day, respectively. This was followed by treatment T_8 (Salicylic acid 200 ppm + 4% sugar) which also maintained comparatively higher flower diameter (8.65, 8.20, 7.27 cm). On the other hand, the control treatment T_0 (Distilled water**)** recorded the minimum flower diameter (6.02, 5.70, 5.06, 4.17, and 5.06 cm), indicating poor flower opening and reduced floret expansion during the vase life. The increase in flower diameter with 8-HQS and salicylic acid treatments, especially at 200 ppm with 4% sugar, may be attributed to improved water uptake and reduced microbial blockage in the stem vessels. 8-HQS acts as a biocide, maintaining xylem conductivity and enhancing turgor pressure, which supports better petal expansion. The addition of sugar provides an energy source that sustains cell metabolism, leading to larger flower blooms. Hence, the combined effect of antimicrobial action and energy supply contributes to the increased flower diameter observed in treated gerbera spikes.

3. Solution uptake (ml)

This investigation involved testing various concentrations of vase solution to assess their impact on the uptake of vase solution in gerbera flowers. The findings presented in Table 3 demonstrate that the treatment involving 8-HQC at a concentration of 200 ppm combined with 4% sugar (T_5) achieved the highest uptake rate, reaching 60.8 ml, which was comparable to T_8 (57.9), consisting of Salicylic acid at 200 ppm plus 4% sugar. While the controlled treatment using distilled water resulted in a minimal water uptake of 49.9 ml.

Compared to the control and SA treatments, 8-HQC when used as an additive, significantly increased solution uptake. It also increased the relative fresh weight and extended the vase life of cut gerbera stems. Preservatives play important roles in minimizing xylem obstruction, enhancing water absorption, and acting as biocides that inhibit bacterial development, as mentioned by Reddy and Singh (1996) and Morousky (1969). Hutchinson *et al.* (2013) reported that 8-HQC reduces water loss in cut flowers and extends their vase life. Furthermore, the presence of 8-HQC in vase solutions increases water absorption and delays the senescence of gerbera flower spikes, as noted by Mishra and Sahare (2022). Dhanasekaran (2020) conducted experiments and

4. Days taken for stem bending

The data regarding days taken for stem bending of cut gerbera spikes showed a significant effect due to different vase solution treatments, as presented in Table 4 Among all treatments, the maximum number of days taken for stem bending (13.9 days) was observed in treatment T5 (8-HQS 200 ppm + 4% sugar), followed by T8 (Salicylic acid 200 ppm + 4% sugar) with 13.1 days and T_6 (8-HQS 300 ppm + 4% sugar) with 11.4 days, which were statistically *at par*. On the other hand, the control treatment T0 (Distilled water) recorded the minimum duration (8.2 days) for stem bending, indicating early loss of stem strength and turgidity. discovered that a vase solution containing 8-HQS enhances water absorption in cut spikes of gerbera. energy supply contributes to the increased flower diameter observed in treated gerbera spikes.

This is because 8-HQS acts as a potent biocide, maintaining stem hydraulic conductivity by preventing microbial growth and xylem blockage. Additionally, sugar in the vase solution serves as an energy source, supporting cellular metabolism and delaying senescence. These results are in line with the findings of van Doorn *et al.* (2004) [3], who reported improved stem strength and reduced bending in cut flowers treated with antimicrobial preservatives. Meman and Dabhi (2006) [1] and Singh *et al.* (2016) [2] also observed significant delays in stem bending in gerbera and rose, respectively, when treated with 8-HQS-based solutions, further validating the current results.

5. Days taken for first petal discoloration

It is evident from the data presented in Table 5 that the days taken for petal discoloration in gerbera flowers were significantly influenced by different vase solution treatments. Among the treatments, the maximum duration for petal discoloration (13.8 days) was recorded in T_5 (8-HQS 200 ppm + 4% sugar), followed by T_8 (Salicylic acid 200 ppm + 4% sugar, 12.1 days) and T_9 (Salicylic acid 300 ppm + 4% sugar, 12.0 days), which were statistically at par. In contrast, the minimum duration for petal discoloration (7.8 days) was observed in the control treatment T_0 (Distilled water), indicating rapid senescence. The delayed petal discoloration in T_5, T_8, and T_9 may be due to the antimicrobial action of 8-HQS and salicylic acid, which reduced microbial blockage and enhanced water uptake, while added sugar supplied energy for petal maintenance. In contrast, the control (T_0) showed early discoloration due to lack of preservatives and energy source.

Table 1: Effect of chemical preservatives on vase life of gerbera

Treatment	Vase life (Days)
T_0	7.1
T_1	10.3
T_2	9.9
T_3	7.8
T_4	9.7
T_5	12.1
T_6	9.8
T_7	9.1
T_8	11.4
T_9	8.9
SEM±	0.12
CD at 5%	0.36

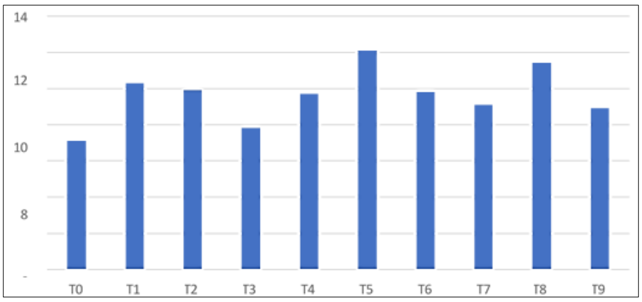

Fig 1: Effect of chemical preservatives on vase life of gerbera

Table 2: Effect of chemical preservatives on Flower diameter (cm) of gerbera

Treatment	Flower diameter (cm)				
	1st day	3rd day	5th day	7th day	9th day
T_0	6.02	5.70	5.06	4.17	5.06
T_1	8.04	7.62	6.75	5.48	6.75
T_2	7.85	7.42	6.60	5.27	6.60
T_3	7.46	7.06	6.27	4.90	6.27
T_4	7.73	7.32	6.49	5.18	6.49
T_5	9.89	9.38	8.31	6.69	8.31
T_6	8.24	7.81	6.92	5.61	6.92
T_7	7.57	7.17	6.36	5.11	6.36
T_8	8.65	8.20	7.27	5.88	7.27
T_9	7.55	7.14	6.34	5.10	6.34
SEM±	0.38	0.39	0.29	0.18	0.29
CD at 5%	1.13	1.16	0.85	0.52	0.85

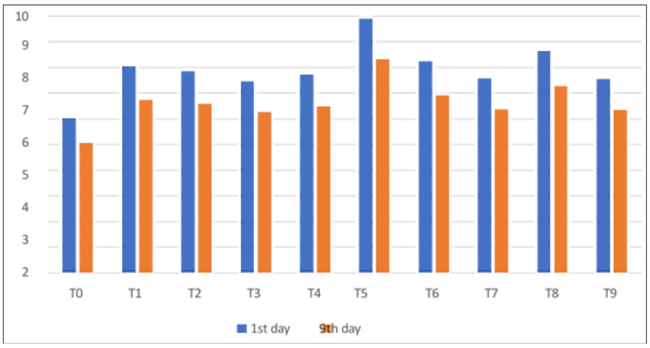

Fig 2: Effect of chemical preservatives on Flower diameter (cm) of gerbera

Table 3: Effect of chemical preservatives on Solution uptake (ml) of gerbera

Treatment	Solution uptake (ml)
T_0	49.9
T_1	56.3
T_2	53.7
T_3	50.9
T_4	53.0
T_5	60.8
T_6	54.7
T_7	52.3
T_8	57.9
T_9	51.6
SEM±	1.10
CD at 5%	3.26

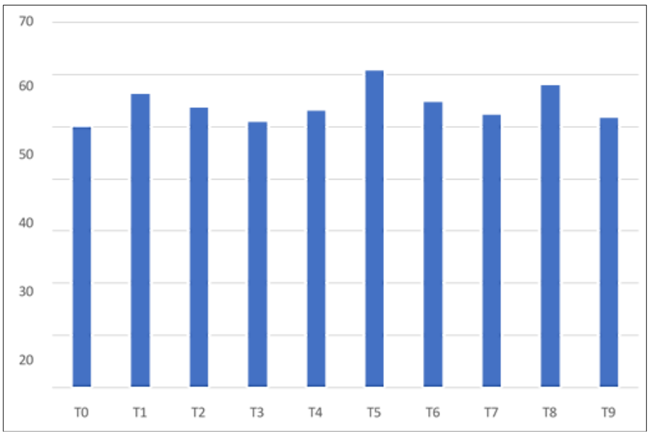

Fig 3: Effect of chemical preservatives on Solution uptake (ml) of gerbera

Table 4: Effect of chemical preservatives Days taken for stem bending of gerbera

Treatment	Days taken for stem bending
T_0	8.2
T_1	11.3
T_2	11.2
T_3	10.4
T_4	11.1
T_5	13.9
T_6	11.4
T_7	10.8
T_8	13.1
T_9	11.1
SEM±	0.22
CD at 5%	0.64

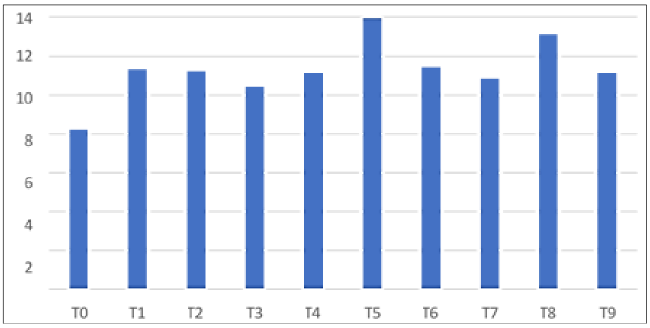

Fig 4: Effect of chemical preservatives on Days taken for stem bending of gerbera

Table 5: Effect of chemical preservatives on Days taken for first petal discoloration of gerbera

Treatment	Days taken for first petal discoloration
T_0	7.8
T_1	9.3
T_2	11.0
T_3	10.3
T_4	10.4
T_5	13.8
T_6	11.3
T_7	11.0
T_8	12.1
T_9	12.0
SEM±	0.21
CD at 5%	0.63

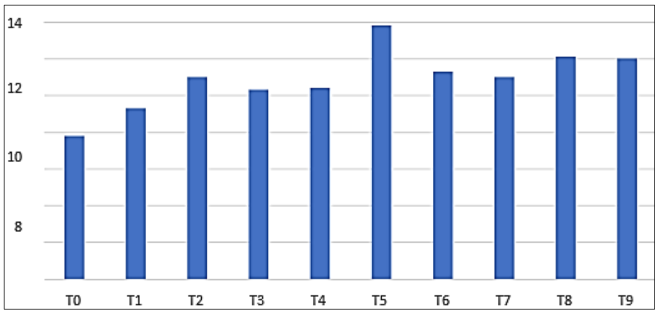

Fig 5: Effect of chemical preservatives on Days taken for first petal discoloration of gerbera

Conclusion

From the present research, it can be concluded that among all the treatments, 8- HQS at 200 ppm + 4% sugar (T_5) proved most effective in improving postharvest quality and extending the vase life of gerbera cv. Livia. This treatment significantly enhanced vase life, fresh weight, flower diameter, solution uptake, stem diameter, and delayed petal discoloration, shriveling, bending, and petal drop compared to the control (T_0), which consistently showed the least favorable results.

The effectiveness of T_5 may be attributed to the antimicrobial action of 8-HQS, which prevented vascular blockage and maintained water uptake, and the energy supply from sugar, which sustained cellular metabolism and turgor. Therefore, the use of 8-HQS (200 ppm) with 4% sugar can be recommended as a suitable preservative solution for enhancing the vase life, market value, and commercial acceptability of gerbera cut flowers.

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