



## Effect of Floral Preservatives on Post Harvest Life of Gladiolus (*Gladiolus grandiflorus* L.) cv. American Beauty

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### Authors' contributions

This work was carried out in collaboration between both authors. Author YA designed the study, performed the statistical analysis, and wrote the protocol. Author AVK wrote the first draft of the manuscript, managed the analysis of the study. Both authors read and approved the final manuscript.

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### ABSTRACT

A Postharvest experiment was conducted to maximize the vase life of gladiolus using different preservative solution in Department of Horticulture, Faculty of Agriculture, Annamalai University. In this experiment the treatment consisted of two preservative chemicals viz., 8-hydroxy quinoline sulphate @ 150, 300, 450 ppm and silver nitrate @ 25, 50, 75 ppm along with sucrose @ 2 and 4 per cent along with control (distilled water). The results of this experiment revealed that the maximum water uptake, transpirational loss of water, water balance, fresh weight change, percentage of opened florets, floret diameter, longevity of floret, vase life was recorded in T<sub>5</sub> (8-HQS @ 300 ppm + sucrose 4%), when compared to control. Some parameters like optical density of vase solution, days taken for the basal floret to open in vase and the percentage of wilted florets were observed least in T<sub>5</sub> (8-HQS @ 300 ppm + sucrose 4%). T<sub>5</sub> (8-HQS @ 300 ppm + Sucrose 4%) solution was found best to extend the vase life of gladiolus.

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## 1. INTRODUCTION

*Gladiolus* (*Gladiolus grandiflorus* L.) belonging to the family Iridaceae, is an important ornamental bulbous plant. *Gladiolus* is an important commercial flower crop having pivotal place as cut flower both in domestic as well as international market. The flowers are used in flower arrangement, in bouquets and for indoor decorations [1]. *Gladiolus* is a slender herbaceous perennial with sword shaped phyllode leaves, grown both for gardens and floral decorations. In cut flower industry the most important aspect is post-harvest handling in order to maintain flower freshness and original colour of flower for longer period after cutting from the mother plants [2]. Senescence is the final stage of plant development that follows the physiological maturity consequently leading to the death of cell, organ or the whole plant (Sudaria *et al.*, 2017). Petal senescence is associated with highly physiological and genetically controlled processes that include membrane leakage, degradation of macromolecules and oxidative stress [3]. Delayed floral senescence and adequate quality are essentials for the marketable flowers and are also important goal of cut flower industry and researchers [4]. Longer life of cut flowers makes sure that the customers, retailers and final consumers will be satisfied and will return back to purchase more flowers [5]. Science works best when basic principles can be translated into practical technological solutions, and post-harvest longevity of cut flowers can often be improved by use of suitable vase solutions [6,7]. Several attempts were made to study the effect of different chemicals, sugars, including growth regulators to extend the vase life of cut flowers having economic value [8-12]. Considering the above factors, the present work has been undertaken to study the influence of floral preservatives on the post harvest life of gladiolus spikes (*Gladiolus grandiflorus* L.) cv. American Beauty to evaluate the post harvest quality and vase life.

## 2. MATERIALS AND METHODS

Experiment was conducted at Department of Horticulture, Faculty of Agriculture, Annamalai University, during October, 2017 to find out the appropriate preservative solution for extending the vase life of gladiolus. The variety used for the study was American Beauty with characters such

as reddish pink florets with whitish throat and whitish blue anthers. Spikes were 70-75cm long, each with 10-12 florets (8-9cm in size). The shelf life of the variety used was 3 days. The stems were procured from Hosur flower market. Twelve chemical preservative solution for extending the vase life was selected based on Kumar *et al.* [13] and the treatments are T<sub>1</sub> (8-HQS @ 150 ppm + sucrose 2%), T<sub>2</sub>- (8-HQS @ 300 ppm + sucrose 2%), T<sub>3</sub>- (8-HQS @ 450 ppm + sucrose 2%), T<sub>4</sub>- (8-HQS @ 150 ppm + sucrose 4%), T<sub>5</sub>- (8-HQS @ 300 ppm + sucrose 4%), T<sub>6</sub>- (8-HQS @ 450 ppm + sucrose 4%), T<sub>7</sub>- (AgNO<sub>3</sub> @ 25 ppm + sucrose 2%), T<sub>8</sub>- (AgNO<sub>3</sub> @ 50 ppm + sucrose 2%), T<sub>9</sub>- (AgNO<sub>3</sub> @ 75 ppm + sucrose 2%), T<sub>10</sub>- (AgNO<sub>3</sub> @ 25 ppm + sucrose 4%), T<sub>11</sub> - (AgNO<sub>3</sub>@ 50 ppm + sucrose 4%), T<sub>12</sub> -(AgNO<sub>3</sub>@ 75 ppm + sucrose 4%), T<sub>13</sub>-Control (Distilled water) using Completely Randomized Design with three Replications. Data were recorded at 6<sup>th</sup> day of the experiment on water uptake, Transpirational Losses, Opened florets, Longevity of floret, Vase life. For all the treatments one spikes/ 500 ml glass bottles was used with 200ml solution. The mean temperature recorded during the study period was 29.15°C and 84 per cent relative humidity. The experimental flowers were held in the laboratory at ambient room temperature and 29.15°C and 84 per cent relative humidity (RH) coupled with 40W cool white fluorescent tubes, on a 12 hours photoperiod.

## 3. RESULTS AND DISCUSSION

### 3.1 Water Uptake (g/s)

The flowers held in different concentrations of floral preservatives differed significantly. On day 2, the highest WU (12.37) recorded in T<sub>5</sub> (8-HQS @ 300 ppm + 4% Sucrose), followed by T<sub>11</sub> (AgNO<sub>3</sub> @ 50 ppm + 4% Sucrose) with a WU of (12.11) (Table 1). Among all the treatments, control (T<sub>13</sub>) recorded significantly lowest WU (8.85). Similar results were obtained on day 4 and 6. The maximum WU was observed in gladiolus spikes held in 8-HQS @ 300 ppm +sucrose 4 % due to its effective transportation within the floral stems and reduced stem blockage, which was similar to the findings of Marousky [14] in cut rose. Further, stem blockage might be due to their specific germicidal property which was supported by the findings of Larsen and Frolich [15] in cut carnation.

### 3.2 Transpirational Loss of Water (g/s)

Water deficit have direct effect on turgor of cut flowers, which accelerates wilting and senescence [16]. Among the preservative chemicals used, gladiolus spikes held in 8-HQS @ 300 ppm + sucrose 4 % recorded highest TLW, followed by AgNO<sub>3</sub> @ 50ppm + sucrose 4% and least value recorded in control (distilled water). The biocide 8-HQS @ 300 ppm along with sucrose 4% not only increased water uptake of gladiolus spikes effectively but also increased transpirational loss of water (Table 1). Higher TLW by gladiolus spikes held in 8-HQS @ 300 ppm + sucrose 4% might be due to higher water uptake to avoid temporary water stress [8].

### 3.3 Days to Opening of Basal Floret in Vase (Days)

The spikes held in different concentrations of floral preservatives differed significantly with lowest number of days to opening of basal floret (0.61) recorded in T<sub>5</sub> (8-HQS @ 300 ppm + 4% Sucrose), followed by T<sub>11</sub> (AgNO<sub>3</sub> @ 50 ppm + 4% Sucrose) (0.69). Among all the treatments, control (T<sub>13</sub>) recorded significantly highest number of days to opening of basal floret (1.45). The results were similar to the results of Nowak and Mynett, [17] in Asiatic lily.

### 3.4 Opened Florets (%)

The maximum percentage of opened florets (84.55) was observed in T<sub>5</sub> (8-HQS @ 300 ppm + 4% Sucrose) on day 6, followed by T<sub>11</sub> (AgNO<sub>3</sub> @ 50 ppm + 4% Sucrose) (83.62). The minimum percentage of opened florets (75.20) were recorded in T<sub>13</sub> (control) on day 6 (Table 2). It may be mentioned that opening of florets in a spike is largely due to interaction of higher water potential and reserve carbohydrate maintained in the floral spike in addition to the environmental factors like light and temperature. Benzyladenine at low concentrations (25 mg L<sup>-1</sup>) improves the vase life and floret opening of the tuberose cut stems, while high concentrations (100 mg L<sup>-1</sup>) were ineffective [18].

### 3.5 Longevity of Florets (Days)

Among the different treatments, T<sub>5</sub> (8-HQS @ 300 ppm + 4% Sucrose) recorded the maximum longevity of florets (2.79), followed by the treatment T<sub>11</sub> (AgNO<sub>3</sub> @ 50 ppm + 4% Sucrose) with a longevity of 2.68 days (Table 2). The minimum longevity of florets (1.91) was observed in T<sub>13</sub> (control). Longevity of floret is an important parameter which also contributes to the post harvest life of gladiolus spike. In absence of use of any floral preservative, the variation in longevity of floret as observed in the present study might be due to difference in genetical makeup of the varieties.

**Table 1. Effect of gladiolus flowers to different chemicals used and data recorded on 6th day of the experiment**

Treatments	Water uptake (g/s)			Transpirational loss of water (g/s)		
	2 <sup>nd</sup> day	4 <sup>th</sup> day	6 <sup>th</sup> day	2 <sup>nd</sup> day	4 <sup>th</sup> day	6 <sup>th</sup> day
T <sub>1</sub>	9.97	7.81	6.98	9.63	8.22	7.82
T <sub>2</sub>	10.61	8.41	7.65	10.10	8.55	8.25
T <sub>3</sub>	9.36	8.12	6.93	9.19	8.61	7.70
T <sub>4</sub>	11.72	9.14	8.15	10.94	9.33	8.87
T <sub>5</sub>	12.37	10.28	9.27	11.42	9.64	9.30
T <sub>6</sub>	11.45	9.78	8.47	10.76	10.01	9.50
T <sub>7</sub>	9.10	7.62	6.33	9.01	8.20	7.54
T <sub>8</sub>	10.35	8.63	7.80	9.86	8.90	8.47
T <sub>9</sub>	9.61	8.23	7.16	9.42	8.78	8.33
T <sub>10</sub>	11.19	9.32	7.46	10.51	8.91	7.94
T <sub>11</sub>	12.11	9.57	8.69	11.19	9.45	9.11
T <sub>12</sub>	10.90	9.01	7.23	10.35	9.40	8.13
T <sub>13</sub>	8.85	6.65	5.64	8.77	7.98	7.34
SED	0.11	0.14	0.15	0.10	0.07	0.08
CD (P=0.05)	0.23	0.30	0.31	0.22	0.16	0.18

**Table 2. Effect of gladiolus flowers to different chemicals used and data recorded on 6th day of the experiment**

Treatments	Days to opening of basal floret in vase (days)	Opened florets (%)	Longevity of florets (days)	Vase life (days)
T <sub>1</sub>	1.17	77.83	2.25	7.98
T <sub>2</sub>	1.02	79.42	2.32	8.27
T <sub>3</sub>	1.30	76.13	2.07	7.58
T <sub>4</sub>	0.73	82.72	2.59	8.97
T <sub>5</sub>	0.61	84.55	2.79	9.46
T <sub>6</sub>	0.81	81.86	2.57	8.86
T <sub>7</sub>	1.38	75.97	1.98	7.34
T <sub>8</sub>	1.12	78.61	2.23	8.06
T <sub>9</sub>	1.27	76.94	2.15	7.81
T <sub>10</sub>	0.91	81.12	2.49	8.63
T <sub>11</sub>	0.69	83.61	2.68	9.22
T <sub>12</sub>	0.93	80.35	2.40	8.44
T <sub>13</sub>	1.45	75.20	1.91	7.08
SED	0.03	0.37	0.03	0.09
CD (P=0.05)	0.05	0.77	0.06	0.19

Further, Abdel Kader and Rogers [19] in cut flowers and Krishnappa and Reddy [20] in carnation reported that longevity can be increased by using a preservative solution containing an antimicrobial agent, an acidifying agent, and sucrose which will support the present results.

### 3.6 Vase Life (Days)

The gladiolus spikes held in different concentrations of floral preservative treatments differed significantly with highest vase life (9.46) recorded by spikes held in the treatment T<sub>5</sub> (8-HQS @ 300 ppm + 4% Sucrose) followed by T<sub>11</sub> (AgNO<sub>3</sub> @ 50 ppm + 4% Sucrose) (9.22), while control recorded significantly lowest vase life (7.08) compared to the other treatments (Table 2). The increased vase life period by gladiolus spikes in 8-HQS @ 300 ppm + sucrose 4% might be due to better water relations, delay in protein degradation, maintenance of membrane integrity, leading to delay in petal senescence. The present results were in accordance with findings of Dineshbabu et al. [21] in dendrobium, flowers who suggested that holding solutions containing 8-HQS and sucrose improves water consumption, fresh weight and flower freshness and reduces the respiration rate and physiological loss in weight thereby extending the vase life. AgNO<sub>3</sub> @ 50 ppm + sucrose 4% was also effective in increasing vase life due to improved water status reduction in microbial growth, thereby maintaining better tissue water potential.

## 4. CONCLUSION

In this study treatment combination T<sub>5</sub> (8-HQS @ 300 ppm + 4% Sucrose) positively influenced the cut flowers in vase solution by providing food and also minimised the antimicrobial activity in the holding solution, as a result increase the water uptake, Transpirational loss, Percentage of opened florets, longevity of florets and increased vase life of gladiolus flower.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

- Mehraj H, Mahasen M, Taufique T, Shiam IH, Jamal Uddin AFM. Vase life analysis of yellow gladiolus using different vase solutions. J. Expt. Biosci. 2013;4(2):23-26.
- Anonymous. Global (January) APEDA, New Delhi. 1994;29-40.
- Seglie M, Sisler EC, Reid MS. Role of ethylene in flower senescence of (*Gypsophilla paniculata* L.). Post harvest Biol. Technol. 2012;1:265-272.
- Bhattacharjee SK, De LC. Post harvest technology of flowers and ornamental plants. Pointer publishers. 2005;442.
- Adarsh K, Sanjeev K, Sudhir C. Vase life studies in tuberose (*Polianthes tuberosa*) cv. Shringar as affected by post harvest

- handling treatments. Asian J. Hort. 2010;5(1):7-10.
6. Halevy AH, Mayak S. Senescence and post harvest physiology of cut flowers – Part 1. In: J., Janick (ed.) Hort. Rev., Vol.I, AVI Publishing, Westport, Conn. 1979;204-236.
  7. Halevy AH, Mayak S. Senescence and post harvest physiology of cut flowers – Part II. Hort. Rev. 1981;3:59-143.
  8. Halevy AH, Byrne TG, Kofranek AM, Farnham DS, Thompson JF, Hardenburg RC. Evaluation of post harvest handling methods for transcontinental truck shipments of cut carnations, chrysanthemums, and roses. J. Amer. Soc. Hort. Sci. 1978;103:151-156.
  9. Marousky FJ. Influence of soluble salts and floral preservatives on open and bud cut Chrysanthemum and Snapdragon flowers. Proc. Tropical Region Amer. Soc. Hort. Sci. 1978;18:247-256.
  10. Murali TP. Mode of action of metal salts and sucrose in extending the vase life of cut Gladioli. Acta Hort. 1990;343: 313-320.
  11. Emongor VE. Effects of gibberellic acid on post-harvest quality and vase life of cut gerbera cut flowers (*Gerbera jamesonii*). J. Agron. 2004;3(3):191-195.
  12. Prashant P. Studies on the role of physiological and biochemical components with floral preservatives on the vase life of Cut Gerbera (*Gerbera jamesonii* Bolus ex. Hook.) cv. Yanara. Ph. D. Thesis Acharya N.G. Ranga Agricultural University, College of Agriculture, Rajendranagar, Hyderabad; 2006.
  13. Kumar A, Kumar J, Singh AK. Studies on effect of biocide and sucrose on post-harvest life of gladiolus cv. White Prosperity. The Asiatic J.of Hort. 2012;7(2):324–326.
  14. Marousky FJ. Vascular blockage and moisture retention in cut roses induced by pH, 8- hydroxy quinolene citrate and sucrose. J. Amer. Soc. Hort. Sci. 1969;94:223-226.
  15. Larsen FE, Frolich M. The influence of 8-hydroxyquinolene citrate, N-dimethyl amino succinamic acid, and sucrose on respiration and water flow in 'Red Sim' Carnation in relation to flower senescence. J. Amer. Soc. Hort. Sci. 1969;94:289-291.
  16. Halevy AH, Mayak S. Improvement of cut flower quality, opening and longevity by pre-shipment treatments. Acta Hort. 1974;43:335-347.
  17. Nowak J, Mynett K. The effect of sucrose, silver thiosulphate and 8-hydroxyquinoline citrate on quality of Liliium inflorescences cut at the bud stage and stored at low temperature. Sci. Hort. 1985;25:299-302.
  18. Hutchinsson MJ, Chebet DK, Emongor VE. Effect of accel, sucrose and silver thiosulfate on the water relations and postharvest physiology of cut Tuberose flowers. African Crop Sci. J. 2003;11(4):279-287.
  19. Abdel KH, Rogers MN. Post-harvest treatment of *Gerbera jamesonii*. Acta Hort. 1986;181:169-176.
  20. Krishnappa KS, Reddy NS. Effect of cultivars, fertigation levels and floral preservatives in extending vase life of Carnation cut flowers. Mysore J. Agri. Sci. 2004;38(3):314-318.
  21. Dineshababu M, Jawaharlal M, Vijayakumar M. Influence of holding solutions on the post-harvest life of Dendrobium hybrid Sonia 17. South Indian Hort. 2002;50(9):451-457.

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