International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(10): 294-296
www.biochemjournal.com
Received: 20-07-2025
Accepted: 24-08-2025

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Effect of different floral preservatives for improving the vase life of cut spikes of orchids (*cv*. Sonia-17)

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DOI: https://www.doi.org/10.33545/26174693.2025.v9.i10Sd.5840

Abstract
The present research work entitled "Effect of different floral preservatives for improving the vase life of cut spikes of orchids (*cv*. Sonia-17)" was conducted to evaluate the most effective floral preservative for *Dendrobium* cv. Sonia-17. The entire experiment was carried out in a completely randomized design with 10 treatments and 3 replications. Among the treatments, T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5% was found to be the best, performing a significant enhancement in the vase life of cut spikes compared to all other treatment combinations. This treatment also exhibited notable improvement across almost all observed parameters, signifying its better-quality role in maintaining the post-harvest superiority of *Dendrobium* flowers.

Keywords: Dendrobium cv. Sonia-17, floral preservatives, vase life, 8-HQS, sucrose

Introduction
Orchids flower are a distinctive group of Angiosperms. There is aptly called 'Angel Flowers'. They are widely distributed to his range of diversity in color, form, size & shape. These flowers are classiness and excellent keeping quality adds immense value and used to ornamental plant as well as a cut flower worldwide. The first time scientist descript of the Indian orchids was provided by the Dutch Governor of Malabar, Von Rheede (1678-1703) in his monumental work *"Hortus Malabaricus"*.

Orchids contribute around 9% of the total flora and mainly one of the best prominent families of flowering plants. These are belongs to the family of Orchidaceae. These are present more than 600 genera & over 25000 species of which 1400 are initiated in India. The Kalimpong, with West Bengal's Darjeeling district, is known as "Orchid Heaven".

It is dispersed up to an elevation of 4300 meters above mean sea level.

Sucrose certain chemicals these are used holding of solutions to avoid microbial activity and enhance vase life. Maintaining flowers quality and extended post-harvest life is mainly important as a quality enhancement of orchids. Vase life of *Dendrobium*s has been greatly influenced by ethylene production and respiration and their physiological processes that are responsible from deterioration and short plant. The suitable postharvest management of a few cut flowers is of highly importance to make sure the long-lasting keeping quality. Maintenance all these considerations of research were taken up in regulates to improve the vase life of cut spikes. Marketable formulations of floral preservatives containing carbohydrates, germicides, and inhibitors of ethylene, growth regulators, and added chemicals are used broadly to retain freshness of flowers during transport and to increase their subsequent vase life in industrial countries (Singh *et al*., 2024) [12].

Material and Methods
Dendrobium 'Sonia-17' was collected from 'Tarra' Village orchid ambika farm with standard production procedure, which is 40-50 km far from College of Horticulture and Reaseach Station Sankara, Patan, Dung. The flowers were harvested at commercial maturity and kept in water after harvest for maintaining freshness and turgidity of spikes and then the cut end of spikes were tied up with moistened cotton in small plastic bags and then the spikes were kept in polythene bags taking sufficient care. Ten spikes were packed from polythene and then packed are corrugated fiber board and brought to the laboratory.

The all experiment was carried out in a completely randomized design with ten treatments and three replications. The treatment used by T_0 Distilled Water (200 ml) (Control), T_1 Sucrose 2.5%, T_2 Glucose 5%, T_3 Sprite (200 ml), T_4 Lemon Juice (200 ml), T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5%, T_6 Sprite (200 ml) + Lemon Juice (200 ml), T_7 Citric acid (200 ppm) + Lemon Juice (200 ml), T_8 Salicylic Acid (200 ppm) and T_9 Aluminum Sulfate (200 ppm) and the observations were recorded on fresh wt. (g) of cut spikes at harvest, fresh wt. (g) of cut spikes at 3rd day in vase, fresh wt. (g) of cut spikes at 6 rd day in vase, fresh wt. (g) of cut spikes at 9 rd day in vase, fresh wt. (g) of cut spikes at senescence, moisture percentage of cut spikes at harvest, moisture percentage e of cut spike at senescence, total water uptake (ml), no. of florets per spike, length of florets (cm), diameter of florets (cm), vase life of cut spikes (days), days of fading of last flower, days to first petal dropping and days of first floret wilting.

Result and Discussion

Different floral preservative solution showed significant Influence on maximum fresh weight (g) of cut spikes at harvest (19.69), on the 3rd day (18.88), on the 6th day (17.92), and on the 9th day (16.50) in vase life solution was recorded in treatment T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5%, followed by T_2, and the minimum fresh weight (g) of cut spikes at harvest (11.30), on the 3rd day (11.10), on the 6th day (11.33), and on the 9th day (9.12) in vase solution was recorded in treatment T_7 Citric acid (200 ppm) + Lemon Juice (200 ml).

The highest fresh weight (g) of cut spikes at senescence (7.97) was observed in treatment T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5%, followed by T_8, and the lowest fresh weight (g) of cut spikes at senescence (6.23) was recorded in treatment T_0 Distilled Water (200 ml) (Control).

The maximum moisture percentage of cut spikes at harvest and at senescence resulted in treatment T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5%, followed by T_8, and the minimum moisture percentage of cut spikes at harvest and at senescence resulted in treatment T_4 Lemon Juice (200 ml).

There was a substantial effect on the total water uptake (ml) of the various floral preservative solution combinations. Among the vase life solutions, the higher total water uptake (ml) was recorded in treatment T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5%, followed by T_8, and lower total water uptake (ml) was recorded in treatment T_4 Lemon Juice (200 ml).

Among the different floral preservatives, the maximum no. of florets per spike (5.33) was noted in treatment T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5% (5.00), followed by treatment T_8 Salicylic Acid (200 ppm), and the lowest no. of florets per spike (3.67) was recorded in treatment T_4 Lemon Juice (200 ml).

The longest length of florets (8.23 cm) was observed in treatment T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5%, followed by treatment T_8 Salicylic Acid (200 ppm) (8.20 cm), and the smallest length of florets (7.93 cm) resulted from treatment T_4 Lemon Juice (200 ml).

Among the floral preservatives, the highest diameter of florets (8.17 cm) was noted in treatment T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5%, followed by treatment T_8 Salicylic Acid (200 ppm) (8.13 cm), and the lowest diameter of florets (8.00 cm) was recorded in treatment T_4 Lemon Juice (200 ml).

The longest vase life of cut spikes (23.67 days) was observed in treatment T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5%, followed by treatment T_8 Salicylic Acid (200 ppm) (23.33 days), and the smallest vase life of cut spikes (19.67 days) was recorded in treatment T_4 Lemon Juice (200 ml).

Among the highest days of fading of the last flower (24.00 days) was recorded in treatment T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5%, followed by treatment T_8 Salicylic Acid (200 ppm) (23.67 days), and the lowest days of fading of the last flower (20.33 days) resulted in treatment T_4 Lemon Juice (200 ml).

The longest days to first petal dropping (7.67) resulted with treatment T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5%, followed by treatment T_8 Salicylic Acid (200 ppm) (7.33), and the smallest number of days to first petal dropping (4.67) was noted in treatment T_4 Lemon Juice (200 ml).

Among the different floral preservatives, the maximum days to first floret wilting (7.00) was noted with treatment T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5%, followed by treatment T_8 Salicylic Acid (200 ppm) (6.67), and the minimum days to first floret wilting (3.33) was observed in treatment T_4 Lemon Juice (200 ml).

The fresh weight (g) of cut spikes at harvest, at the 3rd day, 6th day, and 9th day in vase life solution was significantly influenced by application of vase solution throughout the investigation period. These results are findings might be due to a slower rate of senescence, which in turn extended vase life by helping to sustain respiration and preserve cell membrane integrity (Jomy 1998) [7] and also reported that the using of a combined of 4% sucrose and 400 ppm 8-HQS extended the fresh weight and vase life of *Dendrobium* flowers. Similar results were noted by Yoo and Kim (2003) [14].

The formulation of 8-HQS (200 ppm) + 2.5% sucrose + 5% glucose plays a crucial role for increasing the number of florets per spike in marigold. This combination likely improved nutrient availability and water uptake while inhibiting microbial growth in the vascular tissues. The incidence of sugars provides a source of energy used for continued metabolic activity and flower enlargements, while the 8-HQS prevent xylem blockage, proving efficient translocation of water and nutrients, and these are promoting and contributing to an increase in floret production. (Van Doorn *et al*. 1991) [16]. De *et al*. (2015) [5] and Tiwari and Gupta (2021) [13] also had similar results to the findings of Beniwal *et al*. (2011) [2] in gladiolus and Bharathi and Barman (2015) [3] in cymbidium orchid.

The impact of HQS in the treatments significantly improved water uptake, which could be attributed to both physical and biological changes of modifications in the stem (Marousky, 1972) [10]. This observation is likely due to the role of biocides as antimicrobial agents, effectively reducing stem blockage. While sugars promote microbial activity proliferation, the formulation of sugars with biocides appears to counter this effect, thereby enhancing the longevity of cut flowers (Halevy and Mayak, 1981) [6]. Similar results were also reported by Nag and Mandal (2022) [11].

Conclusion

The data from the present analysis indicated that treatment T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5% exhibited significant efficiency across almost all evaluated parameters. The findings demonstrated that T_5 8-HQS (200 ppm) + Sucrose 2.5% + Glucose 5% had a notable impact on the majority of traits, resulting in the highest fresh weight (g), moisture percentage of cut spikes at harvest, and number of florets per spike, along with extended flower longevity and prolonged vase life.

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