THE EFFECT OF SUGAR AND GINGER EXTRACTS AS FLORAL PRESERVATIVES TO INCREASE THE VASE LIFE OF CHRYSANTHEMUMS

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Cut flowers play an important role in the commercial floriculture industry and bring export earnings that highly contribute to the economy of the country. Their vase life and longevity depend on the flower variety and are influenced by pre-harvest, harvest, and post-harvest conditions. Among cut flowers, Chrysanthemums have a high commercial value and are widely cultivated across several regions, particularly to meet domestic and international demand. With the recent advancements in post-harvest senescence research, various techniques are used to extend the vase life of cut flowers. However, with the growing interest in natural alternatives rather than synthetic chemicals, this study investigated the use of sugar and ginger extract as natural preservatives to improve the postharvest quality and the vase life of Chrysanthemums cut flowers. Fifty flowers were harvested in the morning to ensure freshness, stems were cut under water to prevent gas embolisms and transported to the laboratory wrapped in moist newspaper. Ten treatments were used: distilled water (control), sugar solutions at 1,000 ppm, 10,000 ppm, and 100,000 ppm; ginger extract solutions at the same three concentrations; and sugar–ginger mix solutions at 1,000 ppm, 10,000 ppm, and 100,000 ppm. The observations of the experiment were carried out over 25 days. All treatments showed an initial increase in fresh weight during the first two days and a gradual decline with the time. Among them, the 10,000 ppm sugar–ginger mix solution yielded the best results, with a maximum relative fresh weight of 78.5% and an extended vase life of 25 days. In comparison, the control had a 66.3% relative weight and a vase life of 17 days. The 10,000 ppm ginger-only treatment also performed well, extending vase life to 19 days. Overall 10,000 ppm sugar–ginger combination is the most effective natural preservative tested, enhancing both the appearance and longevity of Chrysanthemums cut flowers. The sugar provides a respiratory substrate, while the ginger solution acts as the antimicrobial agent to control harmful bacteria and prevent plugging of the xylem and phloem. This investigation indicates that natural, eco-friendly preservatives may also serve as effective agents for extending the vase life and the longevity of Chrysanthemums.

Keywords: Chrysanthemums, cut flower, sugar solution, ginger solution, sugar ginger mix solution, distilled water, fresh weight

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INTRODUCTION

The commercial efficiency of the floriculture industry and environmental sustainability are impacted by the large number of fresh flowers that are wasted every day because of their short vase life. Maintaining quality is a crucial factor in assessing the quality of cut flowers for both domestic and international markets. This also applies to chrysanthemums, which are well known for their vivid hues and broad appeal. This urgent problem emphasizes the necessity of creative solutions to increase the post-harvest durability of cutting flowers, minimizing waste, and optimizing their use. The objective of this research is to explore the effects of three distinct solutions as floral preservatives on the vase life of chrysanthemums flowers. By evaluating key indicators such as discolouration, wilting, and stem quality, this study seeks to identify strategies for increasing freshness and conserving flowers. The vase life of cut flowers is mainly affected by two main factors, namely ethylene which accelerates the senescence of many flowers, and microorganisms, especially fungi and bacteria, that grow in the vase solution, block the stem end and limit water uptake by the flowers, besides the production of chemical compounds that cause vascular blockage and thus reduce the vase life of cut flowers (Amin, 2017) Chrysanthemums, also known as ‘kapuru’, is one of the prettiest varieties of perennials that start blooming early in the fall. The name of this flower ‘chrysanthemum’ is derived from the combination of two Greek words, ‘chrys’ and ‘anthemon’. The flower's ageing process quickens once it separates from its mother plant and continues to carry out functions including breathing and transpiration. Postharvest treatment is essential to slow down their aging process and, in turn, extend their vase life. One of the most significant issues with cut flowers is their short postharvest life. One of the most popular ways to extend the vase life of cut flowers is to add vase preservatives to vase solutions (kumar *et al*., 2024)

Different microorganisms affect cut flowers differently, and some may have no effect at all. Furthermore, the media used to determine microbial concentrations in vase solutions may not have been suitable for growth of microbial taxa adversely affecting flower vase life (Prabawati *et al*.,2013). Ginger has natural antimicrobial properties and bioactive compounds. It helps reduce the growth of bacteria and fungi that typically shorten the vase life of the flower. Sugar was discovered to be commonly used for extending the cut flower's vase life. Adding sugar, such as sucrose, to vase water helps extend the vase life of cut flower since it plays a crucial role as a substance for respiration in plants (Prabawati *et al*.,2013).

A floral preservative is usually a complex mixture of sucrose, acidifier, an inhibitor of microorganisms and also an anti-ethylene action (Singh *et al*.,2023). Vase life of cut flowers is mainly affected by two main factors, namely ethylene which accelerates the senescence of many flowers, and microorganisms especially fungi and bacteria that grow in the vase solution, block the stem end and limit water uptake by the flowers, besides the production of chemical compounds that cause vascular blockage and thus reducing the vase life of cut flowers(Amin, 2017).

METHODOLOGY

To reduce stress and maintain flower quality, robust chrysanthemums plants were selected, and blooms were harvested early in the morning to ensure maximum freshness and hydration. For consistency, fifty flowers were collected at the same maturity stage- fully opened- and with uniform stem lengths. Immediately after harvesting, the stems were cut at a 45° angle under water to prevent air blockages in the vascular system and improve water uptake, then wrapped in moist newspaper for transport to the laboratory. Ten treatments, solutions were prepared: distilled water B1 (control); sugar solutions at S1;1,000 ppm, S2;10,000 ppm, and S3;100,000 ppm; ginger extract solutions at G1;1,000 ppm, G2;10,000 ppm, and G3;100,000 ppm; and sugar–ginger mix solutions at the same three concentrations, M1;1,000ppm, M2;10,000ppm and M3;100,000ppm. To prepare the ginger extract, 100 grams of fresh ginger root were washed, peeled, and blended with 10 ml of water into a smooth slurry. The pulp was then pressed through a clean cotton towel to extract the juice, ensuring maximum yield and eliminating fibrous residues. Ginger solutions were prepared by dissolving 1 g, 10 g, and 100 g of ginger juice into 1 liter of distilled water for G1, G2, and G3 concentrations, respectively. Likewise, sugar solutions were made by dissolving 1 g, 10 g, and 100 g of sugar in 1 liter of distilled water. For sugar–ginger mixtures, equal parts of sugar and ginger extract were combined—0.5 g each for M1, 5 g each for M2, and 50 g each for M3—dissolved in 1 liter of distilled water and thoroughly mixed to ensure uniformity. Each treatment used 500 ml of solution in identical transparent glass vases. A control group of five flowers was placed in vases containing only

distilled water. All vases were kept under controlled conditions with stable temperature, relative humidity between 60%–70%, and indirect light to simulate ideal display environments. The pH of each solution was measured using a pH meter or test strips, as maintaining a pH between 3.5 and 4.0 is known to positively influence vase life and enhance the quality of cut flowers across various species.

RESULTS AND DISCUSSION

This study evaluated the vase life of cut Chrysanthemum flowers under various treatment conditions, highlighting the effects of sugar and ginger solutions on bloom longevity (Figure 1). Flowers kept in distilled water (control) exhibited the 17 days vase life, indicating the importance of supplemental nutrients and antimicrobial agents. Sugar solutions significantly extended vase life, with the S2 concentration showing the greatest improvement, likely due to the provision of metabolic energy necessary for cellular functions.

In contrast, ginger alone at G1 was less effective, resulting in a shorter vase life, suggesting that its antimicrobial properties alone were insufficient to maintain hydration and metabolic activity. However, the G2 ginger solution performed better, extending vase life to 19 days and promoting inflorescence opening, which points to an optimal balance of antimicrobial effect without causing phytotoxic stress.

The combination treatments of sugar and ginger produced the most promising results. Particularly, the M2 sugar–ginger solution yielded the longest vase life of approximately 25 days, while also supporting inflorescence opening and maintaining fresh appearance. This synergistic effect is attributed to the complementary roles of sugar in providing energy and ginger in suppressing microbial growth (Meperanum *et al*, 2025). These findings offer practical implications for florists and postharvest technologists seeking eco-friendly alternatives to synthetic preservatives.

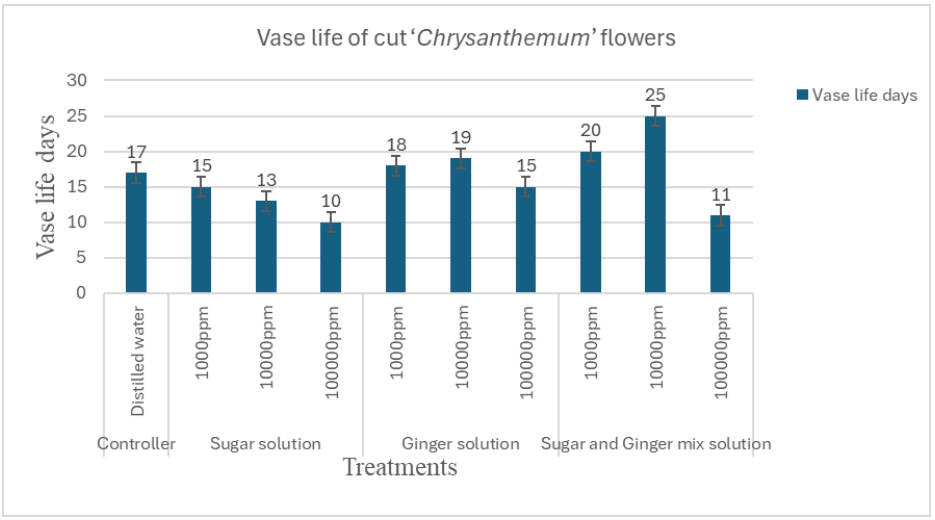

Figure 1: Effect of treatments on vase life of cut Chrysanthemum flowers

Relative fresh weight

Throughout the study, an initial increase in relative fresh weight was observed during the first two days across treatments, followed by a gradual decline. The S1 sugar solution maintained higher relative fresh weight than the S2 treatment (Figure 2). Ginger solutions also preserved fresh weight, though not as effectively as sugar. The greatest retention of fresh weight was observed in the M2, sugar–ginger mixture, reinforcing the beneficial synergistic interaction of the two components.

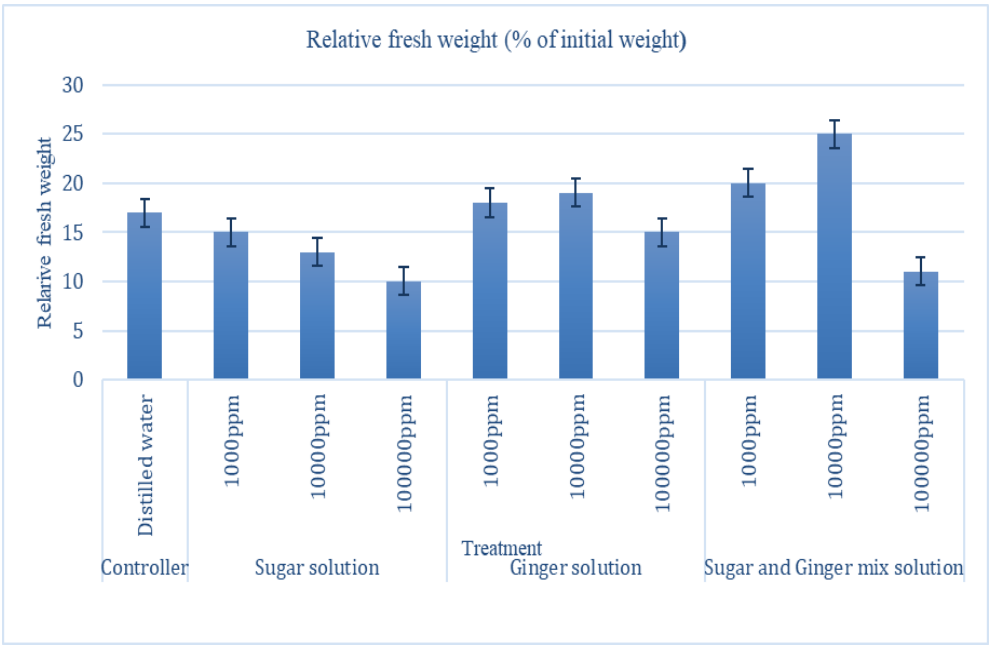

Figure 2: Changes in the relative fresh weights of cut Chrysanthemums flowers

Inflorescence opening

Inflorescence development varied across treatments. Though all flowers were harvested at the same developmental stage, the control showed immediate flower opening, whereas the treatments delayed opening, indicating their influence on extending vase life. Low sugar concentration (S1) supported both bloom opening and moderate vase life. However, higher concentrations (S2 and S3) of sugar alone or sugar–ginger mixes inhibited flower opening, likely due to osmotic stress. Ginger alone at G2 promoted flower opening and extended vase life. The best outcome was achieved with the M2 sugar–ginger solution, which balanced nutrient support and antimicrobial protection to promote both bloom opening and extended longevity. Conversely, S3, G3, and M3 concentrations had adverse effects, with a reduced vase life of only 11 days and no inflorescence opening, demonstrating phytotoxic or osmotic damage at high doses.

Overall, both sugar and ginger solutions positively influence the vase life of cut flowers. Ginger was found to possess potent antimicrobial properties, effectively inhibiting microbial growth and thereby preventing bacterial blockage in the xylem vessels. This helps to maintain water uptake, which is crucial for sustaining flower freshness. In addition, sugar solutions contributed to enhanced water balance and osmotic regulation. Sucrose, in particular, played a vital role in extending the vase life of flowers by serving as a respiratory substrate and maintaining cell turgor pressure. These results align with previous studies highlighting the benefits of carbohydrate supplementation in postharvest flower management. It is also evident that flower longevity and quality in vase solutions are influenced by multiple factors, including the type and concentration of the preservative agents used.

CONCLUSION/RECOMMENDATIONS

This study demonstrates the significant impact of preservative treatments on the vase life and visual quality of cut chrysanthemums flowers. The M2, sugar–ginger combination proved to be the most effective, extending vase life to 25 days while maintaining bloom development and overall freshness. The results underscore the importance of optimizing concentration levels, as excessively high doses can lead to phytotoxicity and osmotic stress, ultimately reducing flower quality. These findings support the use of natural, sustainable alternatives to synthetic floral preservatives. By incorporating treatments like ginger extract, the floriculture industry can meet consumer demands for eco-friendly products while improving flower shelf life, reducing waste, and enhancing market value. This research offers valuable insights for florists,

researchers, and stakeholders seeking innovative and sustainable approaches to postharvest flower preservation.

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