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Effect of silver thiosulphate, silica and dextrose on extending the vaselife of cut roses

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Abstract
An experiment was done to determine the best preservative to use to keep cut roses fresh for longer period or extend the shelf life. Eight chemical preservative solutions were used for hydration and these were HT0: Distilled Water (Control)., HT1: Control + Silver thiosulphate (15 ml)., HT2: Control + Silica (2.5 gms)., HT3: Control + Dextrose (3 gms)., HT4: Control + Silver thiosulphate (10 ml) + Silica (2 gms)., (HT5) Control + Silver thiosulphate (10 ml) + Dextrose (2 gms)., (HT6) Control + Silica (2 gms) + Dextrose (2 gms)., and (HT7) Control + Silver thiosulphate (8 ml) + Silica (1.5 gms) + Dextrose (1.5 gms). In the present study the variables analysed were colour, form, texture, appearance and vaselife. From the experiments, the results showed that among all treatments, treatment HT7 was found to give good results and extended the vaselife period of cut roses to 11 days. Thus, hydration treatments mainly the combined application of low concentrations of STS, silica and dextrose provided an opportunity to administer water soluble chemical inhibitors of ethylene action and delayed senescence of flowers.

Keywords: Rose, hydration treatments, chemical preservatives, colour, form, texture, appearance and vase life

Introduction
The most popular cut flower among all flowers in the world is the rose. It's longevity in the flower vase can be increased by using the vase life extending solutions. Addition of sugar to the vase solution counteracted the adverse effects of defoliation on petal color and overcome the increased bud blasting (Hatami *et al*., 2013) [1]. The use of silver thiosulphate the vase life was significantly extended (Banaee *et al*., 2013 and Fariba *et al*., 2012) [2, 3]. STS, silica and sucrose combined had significant effect on the vase life of cut flowers (Hashemabadi *et al*., 2014) [4] specifically cut rose (Kader, 2012) [5]. Silver Thiosulphate and silica with dextrose increased fresh weight, water uptake, and flower vase life (Shirin and Mohsen, 2011) [6]. Considering the above facts the current study was undertaken to find out the appropriate preservative solution for extending the vase life of the cut rose using hydration treatments.

Materials and Methods
Location and period of the study
Experiment was conducted at Professor Jayashankar Telangana State Agriculture University, College of Community Science, Department of Resource Management and Community Sceince, Hyderabad, Telangana during February 2021 to April 2021 to find out the hydration preservative solution for extending the vase life of cut roses.

Treatments and experimental design
Eight hydration chemical preservative solutions were used for vase life analysis and these were HT0: Distilled Water (Control)., HT1: Control + Silver thiosulphate (15 ml)., HT2: Control + Silica (2.5 gms)., HT3: Control + Dextrose (3 gms)., HT4: Control + Silver thiosulphate (10 ml) + Silica (2gms)., (HT5) Control + Silver thiosulphate (10 ml) + Dextrose (2 gms)., (HT6) Control + Silica (2 gms) + Dextrose (2 gms)., and (HT7) Control + Silver thiosulphate (8 ml) + Silica (1.5 gms) + Dextrose (1.5 gms) using Random purposive sampling technique with three replications.

Data collection: Data were collected on vase life and on the variables of colour, form, texture and appearance. For physical observation of qualitative parameters, an observation tool (rating scale) developed by Reddy and Kumari (2010) [7] and Sireesha (2012) [9] was used.

Observations were made by identified expert panel of judges who had the experience of evaluating flowers characteristics. The parameters taken for evaluation in the rating scale were the colour, texture, form and appearance.

Statistical analysis

The data was analysed, tabulated, and compared with control samples for each treatment; it was then put through F-Test Two-Sample for Variances and t-Test: Paired Two Sample for means to investigate the impact of treatments on flower keeping quality. Only numerical data can be used with this technique.

Results and Discussion

Flowers are hydrated so they can absorb water, extending their lifespan after being cut. Adding a concoction of compounds known as floral preservatives to the water will prolong the life of cut flowers. Floral preservatives are advantageous for cut flowers since after being plucked, their root systems are unable to access nutrients or water. Some flower preservation formulations also help to prolong the life of the flowers' inherent properties. In this section of the study, it is explored if specific hydration treatments using common chemicals are appropriate for roses. The roses were given eight different hydration treatments using chemical preservatives, and Table 1 shows the physical observation ratings. Regardless of the treatments, it can be seen from the data that flowers stayed fresh for a third day without changing in terms of their physical characteristics.

The effects of hydration treatments on roses were shown by the results presented in Table 1. In Figure 1, flowers with chemical preservatives showed a noticeable difference in how well they maintained their freshness. The quality of flowers treated with HT0 and HT2 blooms gradually declined after the fourth day, as can be seen. Flowers given the HT7 treatment kept their freshness up until the ninth day, after which there was a slight variation. This observation led to the conclusion that roses treated with the right proportions of silver thiosulphate, silica, and dextrose in distilled water produced flowers of higher quality than roses treated with other treatments with high concentrations, according to Shahram *et al*. (2020) [10] findings. Respiration, the breakdown of carbohydrates, water uptake, and other processes all reduce the vase life of cut flowers. The amount of ethylene produced when cut flowers are in the vase has a significant impact on senescence. Cut flower vases that have been filled with preservatives that contain adequate amounts of dextrose and silver thiosulfate are very helpful in extending the life of cut flowers because the soluble sugars and carbohydrates in the petals help cut roses maintain their quality for a longer period of time.

Table 1: Effect of Hydration treatments on Physical Observation scores of Roses

Treatments/Days	HT0	HT1	HT2	HT3	HT4	HT5	HT6	HT7
Day 1	11	11	11	11	11	11	11	11
Day 2	11	11	11	11	11	11	11	11
Day 3	7	11	11	9	11	11	11	11
Day 4	7	11	9	9	11	11	11	11
Day 5	3	9	7	8	11	9	11	11
Day 6	3	9	6	6	9	9	10	11
Day 7	-	6	-	3	9	7	10	11
Day 8	-	3	-	-	7	7	9	11
Day 9	-	-	-	-	4	5	8	11
Day 10	-	-	-	-	-	4	-	9
Day 11	-	-	-	-	-	-	-	9

*HT- Hydration Treatments

The cut rose's vase life varied dramatically amongst different vase options. Maximum vase life was found from HT7 (11 days) followed by HT5 (10 days) while minimum from HT0 and HT2 (6 days) (Table 01). Rose flower showed maximum 11 days in flower vase (Mehraj *et al*. 2013) [11]. It was observed that sucrose along with STS maintained prolonged vase life for 11 days than other treatment (Anserwadekar and Patil, 1986) [12]. Silica and sucrose increases vase life by improving the antioxidant system and reducing oxidative stress damages during rose flower senescence (Gerailoo and Ghasemnezhad, 2011) [13] and senescence (Kazemi and Ameri, 2013) [14]. The significant increase (0.05%) in vase life is considered to be due to plant regulating and anti-stress properties of silica and dextrose (Vahdati Mashhadian *et al*., 2012) [15]. However, the fresh weight, water uptake, floral diameter, and flower vase life were also boosted by the combination of silver thiosulphate and sucrose (Shirin and Mohsen, 2011) [6].

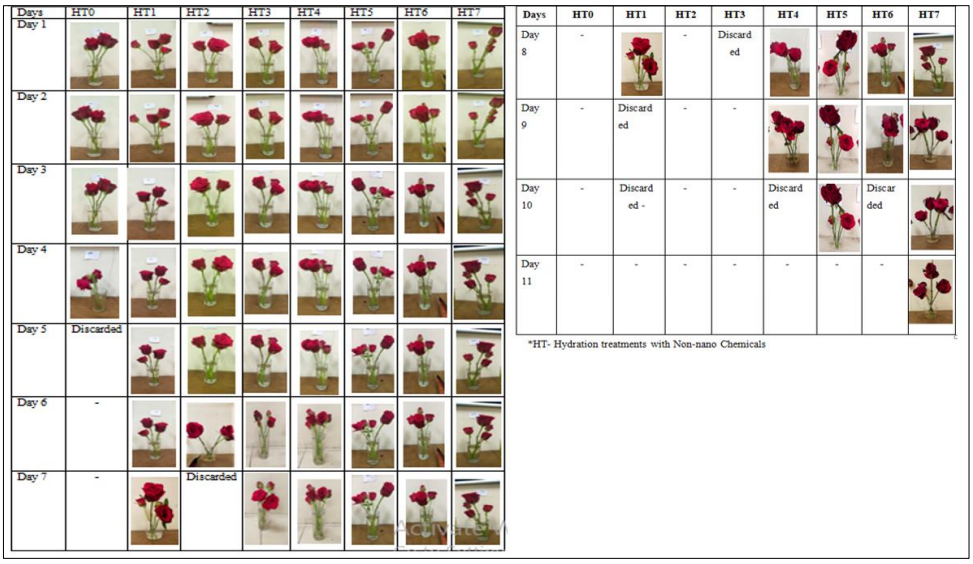

Fig 1: Effect of Hydration Treatments on Roses

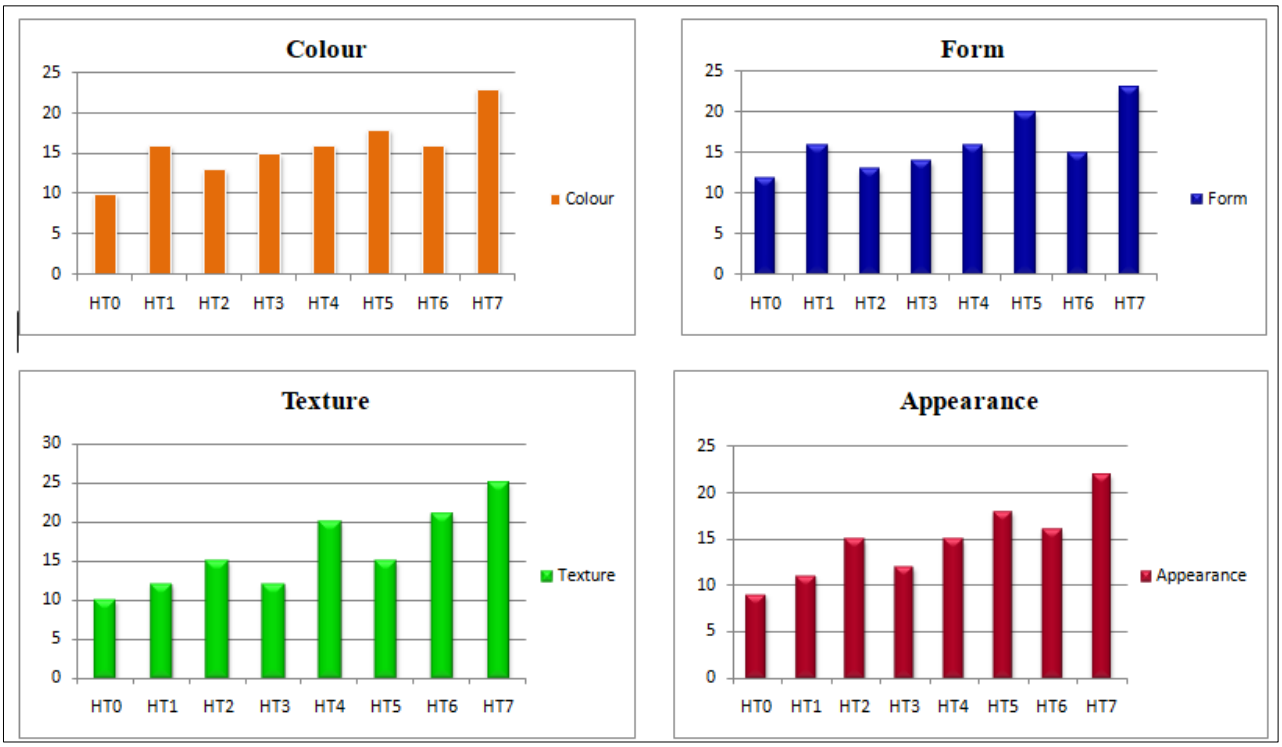

Fig 2: Qualitative Parameters Scores of Colour, Form, Texture and Appearance of Roses with Hydration Treatments

From Figure 1 and Figure 2, qualitative characteristics for hydrated cut flowers showed that HT7 and HT5 both received high scores for colour, form, texture, and appearance. The score values increased with the addition of STS, dextrose, and silica (HT7). This part of the study demonstrated how improving the quality of cut flowers by employing specific preservatives, especially silver, was possible.

Colour

Due to the presence of silver ions in silver thiosulpahte at low concentrations, which reduced the bacterial xylem clogging that causes early and quick senescence of cut flowers (Peter *et al*. 2020) [16], and concentrations of silver thiosulphate and silica that induced colour shift due to lipid peroxidation, it was found from the results that HT7 and HT5 underwent the least amount of colour change (Hatami *et al*. 2013) [1].

Form

The size and shape of the blooms changed dramatically with varied combinations and concentrations, and when compared to the other treatments, HT7, HT5, and HT1 were determined to be the most effective. This reveals that chemical mixtures in different ratios significantly affected the quality of the bloom.

Texture

In mixed concentrations, there was a noticeable shift in the texture of the flowers, and these HT7 and HT6 were best with, while the other flowers lost their texture. This discovery demonstrates the significance of adding dextrose and small amounts of silica to the hydration process to ensure that the cut flowers maintain their texture (Saifuddin *et al*. 2017) [17].

Appearance

Rose colour in nature appears glossy and smooth; HT7 performed better in terms of colour, form, texture, and aesthetic scores. The cut flowers were able to retain their naturalness for longer days thanks to the hydration treatments. Given that HT7 gave high scores for colour, form, and texture and that these factors influence one another, as stated by Hayat (2012) [18], this resulted in high scores for appearance.

Table 2: F test and t- Test of Physical Observation score of Roses

F-Test Two-Sample for Variances			t-Test: Paired Two Sample for Means		
			Day 6	HT0	HT7
	Day 5	Day 6	Mean	3	6
Mean	8.271	8.582421	Variance	2	1.6
Variance	2.44444	10.54291	Observations	9	9
Observations	8	8	Pearson Correlation	0.246301	
df	7	7	Hypothesized Mean Difference	0	
F	0.39636		df	8	
P(F<=f) one-tail	0.016358		t Stat	-3.36311	
F Critical one-tail	0.257421		P(T<=t) one-tail	1.982251	
			t Critical one-tail	1.832152	
			P(T<=t) two-tail	2.866322	
			t Critical two-tail	2.304824	

To determine the impact of treatments on the number of days needed to maintain the attributes of the flowers shown in Table 1, these scores were statistically analysed. The results showed that cut rose flowers held their quality well up to the eighth day and then began to significantly decline, whereas in HT7, the flowers remained fresh for up to eleven days (F-Test Two- Sample for Variance). For a period of 11 days, it was discovered that treatment HT7 significantly outperformed all other treatments (t-Test: Paired Two Sample for Means). Therefore, hydration offers a chance to provide chemical

ethylene action inhibitors that are water soluble at low concentrations of silver thiosulphate, silica, and dextrose to cause floral senescence (Chamani *et al*., 2005) [19].

Conclusion

From the current study it was found that HT7-Control + Silver thiosulphate (8 ml) + Silica (1.5 gms) + Dextrose (1.5 gms) was the best chemical hydration treatments for the cut red rose cultivar. Hydration treatment HT7 can be used to increase the vase life of the cut Red rose and to enhance its overall quality. As alternative compounds nano particles of these preservatives can be used for further research.

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