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Extending the Vase Life of Roses (*Rosa hybrida*) with Different Preservatives

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ABSTRACT

This experiment revealed significant influence of sucrose ($C_{12}H_{22}O_{11}$) and silver nitrate ($AgNO_3$) at different concentrations on the vase life of two roses *(Rosa hybrida)*, namely *Trika* and *Whisky Mac*. It was found that different treatments had significant effect on each cultivar. The cultivar, *Whisky Mac***,** excelled over *Trika* in all the treatments. Furthermore silver nitrate, in most of the cases, gave better performance than the sucrose in enhancing the shelf life of cut flowers of both the cultivars. The concentration of sucrose @25 g L^{-1} superseded over the other sucrose concentrations with the value of 8.2 days in *Whisky Mac* and 7.5 days in *Trika* comparing the control (distilled water) with the average value of 5.3 days. In all the treatments containing sucrose and silver nitrate, the concentration of 150 ppm of $AgNO_3$ prolonged the maximum number of days in both the cultivars, which were 4.3 and 3.2 days more in *Whisky Mac* and *Trika,* respectively as compared to control.

Key Words: Rose; *Rosa hybrida;* Trika and Whisky Mac; Vase life; Sucrose; Silver nitrate

INTRODUCTION

Roses *(Rosa hybrida)* of Rosaceae family are recognized highly valuable for economical benefits being the best source of raw material to be used in agro-based industry especially in the cosmetics and perfumery. Additionally, roses play a vital role in the manufacturing of various products of medicinal and nutritional importance. However, a very peculiar aspect of rose production is to get the cut flowers, which greatly deals with the floricultural business (Butt, 2003).

Different ways have been reported by several researchers to increase the vase life of roses keeping their freshness for a longer period. The vase life of cut rose flowers held in 500 ppm alar+5% sucrose was extended upto 4 days provided the temperature and relative humidity is maintained at 70-75^{O}F and 40-45%, respectively (Metzgar, 1973). Study of combined effect of abscisic acid (ABA) and sucrose on growth and senescence of rose flowers proved that sucrose retarded and ABA promoted processes associated with senescence (Borochove *et al*. 1976). The lower concentrations of both BA and ethephone hastened flower wilting (Lukaszewsk, 1986). Similarly, vase life of cut rose cv., *Marry Devor***,** was doubled in 3% sucrose +50 ppm $AgNO_3$ compared with control (Cho & Lee, 1980).

Pulsing of cut roses for 10 and 20 min with $AgNO_3$ improved the vase life upto 6.0 and 5.3 days, respectively (Reddy & Nagarajaiah, 1988). Similarly pulsing with AgNo3 and sucrose + citric acid solution for 16 h precooling prior to shipment, not only extended the longevity, but also prevented bent-neck of flower stems of '*Cara Mia'* rose cultivar (Halvey *et al.*, 1978). The solution of silver nitrate (2.5 mg dm^3) + 8 HQS (130 mg dm^3) + citric acid (200 mg dm^3) + sucrose (30 g dm^3) extended vase life of cut rose flowers from seven days (in deionized water) to 17 days and the flowers remained open completely (Ferreira & Swardt, 1983). Addition of bactericides and fungicides in solution of $AgNo_3$ and sucrose improved the flower size and the largest buds opened in three instead of five days; whereas, their vase life was four days greater than control (Nikolova & Koncazak, 1986).

Rose flower stems immersed in silver thiosulphate (STS) solution doubled the vase life from 5 to 10 days (Reid *et al.,* 1980). Similarly, Cobalt nitrate at 270 or 360 ppm and 8-hydroxyquinoline citrate (8 HQC) increased the vase life of roses cv. *Samontha* from 7.2 days in deionized water to 11.5, 11.7 and 13.2 days, respectively (Mahr & Hanan, 1982). The flower longevity of roses (cv. *Samantha*) was increased in calcium nitrate pulse, but pulsed flowers in fluoride did not survive as long as the control (Pearson-Mims & Lohr, 1990). The solution of sodium dichloro-s-friazins-trione (SDT) with the addition of 1.5-3% sucrose extended the vase life of a wide range of cut flowers including roses, carnations and chrysanthemum (Kofrannek *et al.,* 1975).

The cut flowers of different cultivars of rose show variation in their attitude regarding vase life due to gene differences. The use of sucrose with or without certain additive and also the use of some chemicals to the pulsing solutions could be of practical significance for prolonging the life of many cultivars of cut roses. Such preservatives to extend flower life might be used effectively at all levels of handling the crop that would be beneficial both for producers and consumers. The present study was envisaged

to ascertain the effect of different doses of sucrose and silver nitrate to enhance the vase life of two rose cultivars.

MATERIALS AND METHODS

The chemicals used in the trial include analytical sucrose ($C_{12}H_{22}O_{11}$) and Silver nitrate ($AgNO_3$). Two rose cultivars, *Trika* and *Whisky Mac*, were selected for study. Two-year-old plants of the selected rose cultivars were tagged. These plants were grown under normal field conditions. At 'Half-open' stage, the flower cuttings of each cultivar were harvested at random with a sharp sterilized secateur. The length of each flower cutting was maintained 12 cm. All other buds and foliage from each stem were removed. Immediately after detaching the flower cuttings from the respective parent plants, a smooth slanting cut was given to each cut stem to facilitate the optimum uptake of the given solution. The samples were brought instantly in laboratory and washed with deionized water to remove dust from the surface of flower cuttings. The dust-free samples were then randomly divided into seven groups with 3 replications, containing two flower cuttings in each replication.

Different concentrations of silver nitrate and sucrose solution were prepared and deionized water of pH 5.6 was used to make the dilutions. The same deionized water was used as control (T1). For testing the effect of sucrose, the flower stems were dipped in the concentrations (g L^{-1}) of 20 (T2), 25 (T3) and 30 (T4). Flower stems were given pulsing treatment for 24 h with $AgNO_3$ concentrations (ppm) of 50 (T5), 100 (T6) and 150 (T7). After pulsing, the assigned samples of flower stems were immediately transferred into the containers filled with simple distilled water. However, flower cuttings treated with different sucrose concentrations were not transferred into simple distilled water, rather they remained in their respective solutions. Equal volume of solution was assigned to all treatments. The bottom of flower cuttings in each treatment remained completely immersed throughout the trial arranged at ambient temperature of 27 ±2 °C.

The flowers were observed daily till the senescence of petals. The data collected were analyzed adopting two factors-Completely Randomized Design for treatments, cultivars and treatments x cultivars interactions by using MSTAT-C (Michigan State Univ., E. Lansing). The means were compared by Duncan's multiple range test at $P \leq 0.05$ (Nissen, 1982).

RESULTS AND DISCUSSION

Statistical analysis showed that the varieties and treatments responded positively for the enhancement of vase life. The control flowers of both the varieties remained reasonably fresh for 5.3 days whereas flowers treated with 25g L^{-1} sucrose (T3) remained fresh for 7.8 days. While the use of 150 ppm $AgNO_3$ (T7) scored the highest average value of 9 days. Over all performance of varieties indicated that *Whisky Mac* excelled over *Trika* by scoring 7.4 and 6.4 days, respectively (Table I).

Trika performed the best at 150 ppm $AgNO_3$ (T7) followed by 25 g L^{-1} sucrose (T3) which is in close proximity with the treatment of 100 ppm $AgNO_3$ (T6). In case of *Whisky Mac***,** again T7 exhibited the top performance compared with other treatments followed by T6 and T3 that appeared with similar pattern. *Whisky Mac* had more vase life over *Trika* under the action of identical treatments (Table I).

The chemical action of various preservatives in plant metabolism to keep the tissue cells active and alive for a longer period to sustain the post harvest life of several cut flower species have already been quoted in the literature (Crossmann, 1975; Parups, 1976; Paull & Goo, 1982; Mor *et al*., 1989; Reddy, 1989). A number of chemicals had demonstrated their active role to extend the vase life of cut roses. *Whisky Mac* and *Trika* both had kept their identity in showing different response of performances in all the treatments of sucrose and nitric acid. This response is noticeably variable even within the doses of each preservative, augmenting that the taken two cultivars of rose differ themselves genotypically which might have responded phenotypically in the form of vase life (Butt & Al-Haq, 1991). *Whisky Mac* is presumably to be more responsive than *Trika* to both sucrose and nitric acid at different levels which is evident from the fact that these substances/chemicals had more effect on this cultivar, directly or indirectly, in reducing the rate of transpiration (Butt, 2003).

In our results, the response of nitric acid over sucrose was relatively more triggering to the vase life of *Trika* and *Whisky Mac.* A gradual increase in the doses of silver nitrate (50, 100,150 ppm) might had arrested the processes associated with senescence of rose cut flowers of both the cultivars. The role of silver nitrate in the biosynthetic process of plants is experimentally evident. This chemical is a potent inhibitor of ethylene action and has a deep impact on the metabolic routine in the plant body. The ethylene produced by the application of silver nitrate has shown to affect the protoplast within the cell body. Production of

Table I. Effect of different preservatives on the vase life of rose cultivars

Treatments	Number of days		Treatment
	Trika	Whisky Mac	Means
(T1) Distilled water	*5.0	5.5	5.3d
(T2) Sucrose 20gl^{-1}	5.8 b	6.7 a	6.3c
(T3) Sucrose 25gl^{-1}	7.5 b	8.2 a	7.8b
(T4) Sucrose 30gl^{-1}	5.3 b	6.5 a	5.9d
(T5) $AgNO_3$ 50ppm	6.0	6.8	6.4c
(T6) $AgNO_3$ 100ppm	7.0 b	8.3 a	7.6b
(T7) $AgNO_3$ 150ppm	8.2b	9.8a	9.0a
Variety Means	6.4b	7.4a	

*The mean values without indicating alphabets are non-significant.

ethylene due to silver nitrate seemed to be involved in growth differentiation and regeneration. The application of silver nitrate ($AgNO_3$) with different doses gave some positive results with respect to improved stem and leaf size, and the length of plantlets usually remained smaller, attributing to the absence of cells enlargement in the presence of profused cell multiplication (Khalid *et al*., 1991; Taylor *et al*., 1994). Followed by the same line of action, it is clear from our results that higher dose of silver nitrate had inhibited the activation of cut flowers without interrupting the smoothness of body mechanism at cellular level for cells survival to afresh to flowers for a longer period of both *Trika* and *Whisky Mac.* These results are in agreement with the Nikolova and Koncazak (1986) and Reddy (1989) who proved the usefulness of $AgNO_3$ due to the definite action at cellular level responsible for the improvement of cut flowers.

Although extension in the number of days of cut flowers of *Trika* and *Whisky Mac* was comparatively lesser in sucrose than in the silver nitrate, yet different doses of sucrose affected prominently in both the cultivars. Sucrose with the dose of 25 g L^{-1} shared the highest contribution in improving the vase life of both the cultivars leaving behind upper (30 g L^{-1}) and lower (20 g L^{-1}) doses. This result gave a clear clue that the either dose of sucrose had affected negatively and that a very precise concentration is required for a particular cultivar on the basis of certain plant characteristics. Faster break down of sugar coupled with rapid loss of water through transpiration caused quick senescence of flower cells or in the attached branch with flower. This could have happened in the control plants of our experiment. To coupe with this cellular deficiency, cut flowers could be provided the supplemental dose of sucrose maintaining the post harvest life. However, the excessive or lower doses of sucrose equally influenced the vase life adversely that could be attributed to the unbalancing of sugar-water concentration in the cellular tissues of cut roses. This perturbing situation in the plant body may lead to affect the stomatal activities which must relates with the intensity and frequency of transpiration and/or evapotranspiration. Research indicated a speculation that sucrose not only retarded the senescence but also promote the associated processes such as wilting, increase in pH and decrease in petal protein contents (Borochov *et al*., 1976; Butt, 2003).

CONCLUSION

The improvement of vase life of *Trika* and *Whisky Mac* by the use of sucrose and silver nitrate remained approximately for 3-4 days more compared with control (simple distilled water), which suggests that an extensive research work should be carried out to reach in a final conclusion for using such chemicals to enhance the vase life in roses.

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