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# Assessment of concurrent of the sucrose and silver nitrate on cut flower of rose (*Rosa hybrida* cv. 'Red One')

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**Key words** *Rosa hybrida*, cutflowers, Sucrose, silver nitrate.

**Abstract**

The rose plant is one of the most widely sold and appreciated ornamental flowers throughout the world. Vase life of cut rose flowers is usually short. Hence, we studied effect of sucrose combined with silver nitrate on rose (*Rosa hybrida*) cut flowers. The study was carried out in a completely randomized design. Sucrose was used in one concentration (5%w/v) and silver nitrate with four concentrations (0, 10, 20 and 30 ppm). Characters such as vase life, flower quality, water uptake, and leaf chlorophyll, fresh and dry weight were measured. Results showed that there were not significant differences between fresh weights of cut flowers at the end; but in dry weight treatment by 30 ppm silver nitrate had significant difference than others. Also, vase life of cut flowers was the most in treatment by sucrose 5% simultaneous 30 ppm silver nitrate. We conclude that sucrose and silver nitrate treatment have significant effect on quality parameters of rose cut flowers and can maintain the vase life of flowers for a longer period. So we recommend that using sucrose and silver nitrate can improve vase life of rose cut flowers.

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## Introduction

Rose plant, it was called "The Queen of Flowers", has been used as a garden plant since the dawn of civilization(MohyEldeen, 2011). Roses belong to the family of Rosaceae and Genus Rosa. The main purpose of its cultivation is to get the cut flowers, which greatly deals with the floricultural business (Butt, 2003). Reducing cut flower vase-life has been shown to result from increased respirationrate, low carbohydrate level, bacterial or chemical blockage, and increased ethylene in the air (Silvanda *et al.*, 2011).The sugar acts as a factor controlling vase life. Sucrose has been known to extend flower life by supplementing the natural sugar that is rapidly utilized after cutting (Nowak and Rudnicki, 1990). Pulsing with sucrose applied at prestorage stage increased the postharvest longevity of many cut flowers, probably by replacing the carbohydrates during cold storage (Van Doorn *et al.*, 1991), or preventing leaf desiccation (Jones, 1995; Silvanda *et al.*, 2011).Most cut flowers protective include carbohydrates, antimicrobials, anti-ethylene, growth regulators and some nutrients (Asghary, 2012). Carbohydrates reinforce fundamental mechanisms of increasing vase life such as function and structure of mitochondria protecting and water balance by transpiration controlling and increasing water uptake (Asghary, 2012; Butt, 2003). Anti microbes such as silver nitrate, silver thiosulphate, aluminumsulphate prevent microbes' activity due to antibacterial of their properties (Zamani *et al.*, 2011). One of factors that accelerate degradation of cut flowers is bacteria activities and precipitation in vessels which results in closing them and flowers expose to drought (Asghari, 2012). Really, flowers expose either to water or nutrients deficiency spontaneously. Because of removing nutrients such as carbohydrates, as well as closing vessel due to microorganisms activities, Vase life of cut rose flowers is usually short. Cut flowers wilt and floral axis become bent (bent-neck) just below the flower head (Van Doorn *et al.*, 1997). The development of such symptoms is considered to be caused by vascular occlusion, which inhibits water supply to the flowers (Loub and Van Doorn, 2004).

Silver nitrate ($AgNO_3$) is one of the most common forms of silver salts used in commercial flower preservatives solutions and mostly used either as ethylene binding inhibitor or anti-microbial(MohyEldeen, 2011). Increasing $AgNO_3$ strikingly enhanced vase life and solution uptake by removing bacteria and water supply in rose cut flowers (Singh and Tiwari, 2002).

There are some documents demonstrate that treatments with anti-ethylene compounds, such as STS (silver thiosulfate) and silver nitrate, can effectively protect flowers against exogenous ethylene (MohyEldeen, 2011; Hunter *et al.*, 2004; Redman *et al.*, 2002; Serek and Trolle, 2000; Serek *et al.*, 1995).

The aim of this study was investigation on simultaneous effect of sucrose and silver nitrate on vase life extension in rose cut flower.

## Materials and methods

*Plant preparation*

*Rosa hybrida* cv. 'Red One' flowers at the commercial stage of bud opening were harvested early in the morning from plants grown in a commercial greenhouse at Isfahan, Iran at the autumn of 2012. Average of temperature in lab was 15˚C and relative humidity of 60%. Cut flower stems became the same size with three leaves on these. Thicknesses of stems were about 2mm. wet weight of cut flowers were measured by digital balance. Cut flowers were placed in the solutions in graded cylinder for 14 days.

Sucrose (Merck™) was used in concentration 5% w/v. silver nitrate (Merck™) was applied at concentrations of 0, 10, 20 or 30 ppm. Distilled water considered as control. The two compounds were dissolved in sterilized distilled water in 250 mL graded cylinder. The flowers were kept at room temperature (23+1°C) at normal day light and natural ventilation

*Measurement of Vase life*

Vase life considered as the period between harvest and the time when either the petals lost turgor or at least one

petal had abscised. It measured by changing in quality indices during 14 days of the experiment considered as vase life. Vase life was determined as the number of days to wilting of flowers (Nabigol, 2012).

*Flower quality assay*

The parameters such as wilting, bending and color changing considered as negative for cut flowers and then ranked cut flowers between 0-7 (Zamani *et al.,* 2011).

*Water uptake assay*

Water consumption was measured at the end of experiment in each of the graded cylinders.

Upper head of cylinders covered with aluminum foil, due to transpiration in cylinders were considered zero. At the end of experiment, we measured fresh weight of cut flowers as the follows: water uptake = [(initial fresh weight - final fresh weight)] (Cortes *et al.,* 2011). It calculated by reducing water content of each cylinder during the experiment.

*Chlorophyll Content Measurement*

Leafs Total chlorophyll (a+b) content was measured by chlorophyll meter (SPAD- 502, Minolta Co. Japan) which is presented by SPAD senescence value. Average of 3 measurements from different spots of a single leaf was considered (Zamani *et al.,* 2011).

*Measurement of fresh weight*

For measurement of maximum wet weight and quality .Fresh weight measured by subtracting weight of cut flowers in first and end at the end of experiment.

*Weight Water Uptake and Fresh*

The volume of water uptake was calculated by subtracting the volume of waterevaporated from a control bottle without cut flowers from the amount of water decreased in bottles containing flowers.The fresh weight of the cut flowers also measured in initial day and terminal dayof experiment (Zamani *et al.,* 2011).

*Measurement of Dry weight*

The end of experiment, cut flowers put in the special bags and lay in the oven for 48 hours in 75˚C. After that, they weighted by digital balance in grams.

*Statistical analysis*

The experiment was done in completely randomized design by 3 replicas that contain 5 cut flowers in each. Data were analyzed by one way ANOVA using SAS software. Following ANOVA, the Duncan test at the level of 0.05was used to separate treatment means.

**Results**

Cut flowers lay in graded cylinders for 14 days. After that, we measured water loss from the cylinders as solution uptake. Results regarding the water uptake by the cut spikes show that maximum water was taken up by the spikes kept in control (Fig. 1). Results showed that there is significant difference between cut flowers that treated by sucrose at the level of 0.05but no for rose cuts treated by sucrose and silver nitrate (Table 1). Leaf chlorophyll measured by chlorophyll-meter at the end of experiment. Results showed that all these treatments differed non-significantly with each other.

**Table 1.** characters that measured during the experiment as affected by treatments.

| Treatments | Solution uptake (%) | Chlorophyll | Quality index | Fresh weight(g) | Dry weight(g) |
|---|---|---|---|---|---|
| Control | $85^{a}$ | $30^{a}$ | $5.1^{bc}$ | $20.7^{a}$ | $13.5^{b}$ |
| Sucrose 5% + 0 ppm $AgNo_3$ | $63^{b}$ | $59^{a}$ | $4.4^{c}$ | $21.5^{a}$ | $15.5^{b}$ |
| Sucrose 5% + 10ppm $AgNo_3$ | $68^{ab}$ | $42^{a}$ | $5.2^{bc}$ | $20.4^{a}$ | $16.5^{b}$ |
| Sucrose 5% + 20ppm $AgNo_3$ | $72^{ab}$ | $56^{a}$ | $5.8^{bc}$ | $18.2^{a}$ | $16.8^{b}$ |
| Sucrose 5% + 30ppm $AgNo_3$ | $77^{ab}$ | $43^{a}$ | $7.7^{a}$ | $21.1^{a}$ | $18.5^{a}$ |

*Letters explain the significant differences between means, according to Duncan multiple range at level 5%.

We measured some characters such as wilting and neck bending of cut flower and color changing of petals as quality index. Data on quality index showed that treatment by 30 ppm silver nitrate had

maximum level and the minimum quality index was noted in treatment with 0 ppm silver nitrate. There were not significant differences between fresh weights of cut flowers at the end; but in dry weight treatment by 30 ppm silver nitrate had significant difference than others (Fig 2).

Totally, results indicated that vase life of cut flowers were the most in treatment by sucrose 5% simultaneous 30 ppm silver nitrate (Fig. 1).

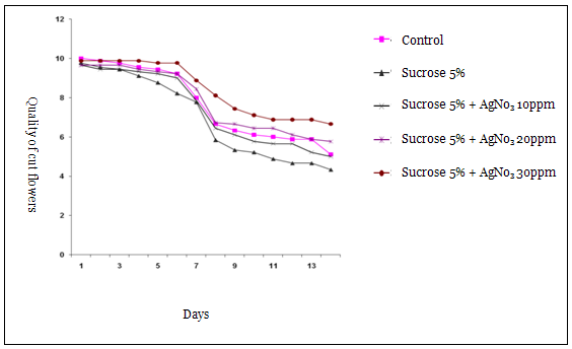


**Fig. 1.** changes of quality index in cut flowers as affected by various treatments during the study.

**Discussion**

Silver nitrate ($AgNO_3$) is relatively potent inhibitors of ethylene action in plant tissues (MohyEldeen, 2011). Therefore, the treatment of $AgNO_3$ can be decreased the ethylene production by rose cut flowers tested in comparison to control .It is also provides some antimicrobial activity inside the plant tissues (Silvanda, 2011; MohyEldeen, 2011). This could explain the effective role of $AgNO_3$ in prolonging the vase life of rose cut flowers. In this study, we showed that silver nitrate can prolong vase life of rose cut flowers. These results are in harmony with the result of Singh and Tiwari (2002); Harode *et al.* (1993) and Reddy *et al.* (1988).

Sucrose can act as a source of nutrition for tissues approaching carbohydrate starvation, flower opening and subsequent water relations; thus, Kuiper and coworkers (1995) suggested that sucrose can supply increases the longevity of many cut flowers. Similar finding were obtained by Ichimura *et al.* (2005); Lalonde *et al.* (1999); Ichimura, (1988).

According to the simultaneous role of sucrose with $AgNO_3$, our findings showed that these two chemicals had significant effects on cut flowers as extended the vase life and improved their quality. Similar results were obtained by MohyEldeen (2011). A significant improvement in vase life of rose cut flowers was occurred when treated with 30 ppm (AgNO3) more effects when combined with 5% (w/v) sucrose, so we recommend that to use the previous treatments with this concentrations for a long vase life and commercial productions.

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