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Study on Some Chemical Compounds on the Vase Life of Two Cultivars of Cut Roses

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Abstract

Rose (*Rosa hybrida* L.) is one of the mostly cultivated cut flowers in Iran and around the world. The study was carried out to increase the vase life and quality of cut rose ‘Grand Prix` and ‘Avallanche` by using various floral preservative solutions. Floral preservative solutions were $AgNO_3$, 8-HQS, nano silver and distilled water. Treatments were compared with tap water as control. The experiment was arranged in a randomized complete block design. The effects of applied treatments on longevity and quality of cut rose flowers were evaluated by using the percentage of opening the flower, flower diameter, the vase life and relative fresh weight. Results showed that the flowers treated with 8-HQS (250 mg l^{-1}) + nano silver (2mg l^{-1}) had the highest flower diameter and the percentage of opening the flower among treatments. Maximum vase life (14.33 d) of cut rose obtained with (nano silver 2mg l^{-1}), and minimum (6.54 d) with $AgNO_3$. The vase life of control was 5.79 d.

Keywords: Distilled water, Nano silver, Rose, Silver nitrate, 8-hydroxy quinoline sulphate.

INTRODUCTION

Rose (*Rosa sp.*) is belong to Rosaceae family which identified as the highest demand flower in world (Khalighi & Shfiei, 1994). One problem in our country is postharvest waste of horticultural products, especially ornamental plants. Rose has short vase life. The most important way to effects of ethylene on horticultural products, especially cut flowers, is to use of chemical materials for blocking activity or synthesis of ethylene. This materials included that carbohydrates, bactericides, biocides, acidosis and ethylene inhibitors (Ebrahimzadeh and Seifi, 1999). Application of some compound such as sucrose or 8-hydroxy quinoline (8-HQ) is effective to increase vase life of cut roses (Michalcznk *et al.,* 1989).

Among the preservative solutions which are used to increase cut flowers longevity, 8-HQ is more effective to control microbial agents and mostly uses in many of cut flowers (Kader, 2002; Reddy *et al.,* 1995; Khalighi and Shafiei, 1994 and Hussein, 1994). Some part of suitable effect of 8-HQ had been attributed to the water balance and closing of stomata.

Also, 8-HQS and 8-HQC, cause to acidify of water and using them continuously, had been increased vase life of cut roses remarkably, and when it used with sucrose, because of facilitating in transfer water through vessel elements, cause to increase sugar in petals and to increase flower diameter (Ichimura and Sotu, 1999). It had been reported that using 8-HQS in cut *Lisianthus* improves flower vase life (Ichimura and Korenaga, 1998). In a research, Reddy *et al.,* (1995), used mixed compounds such as citric acid, 8-HQS and sucroce. 8-HQS and %4 sucrose caused to increase flower longevity by 16 days and improve water retention and water uptake by flowers.

Two common compounds containing silver which are used for cut flowers are $AgNO_3$ and STS (Azadi *et al.*, 2001 and Fahmy *et al.,* 2005). $AgNO_3$ is relatively unmobile in plant and acts as an antimicrobial and ethylene blocker factor in plants (Bartoli *et al.,* 1996). Effects of $AgNO_3$ was studied on vase life and bud opening in cut orchids (Dendrobium pompadour), results showed that $AgNO_3$ is better than STS in controlling of microbial growth and increasing in bud opening and vase life (Ketsa, 2000). Today, several chemical compounds were introduced for preservation of plant against pathogens and increasing of vase life, but some of these compounds have side effects for environment. Silver nano particles are good and safe antibacterial tool for ornamental and horticultural products.

Main aim of this study is research on effects of different chemical compounds such as $AgNO_3$, 8- hydroqy quinoline sulphate (8-HQS), SNP and distilled water for increasing vaselife of cut roses 'Grand prix' and Avalanche'.

MATERIALS AND METHODS

Cut roses 'Avalanche' and 'Grand prix' harvested from a greenhouse around Takestan in commercial stage and after pre-cooling in temperature 5 °C for 4 hours, transferred to laboratory. All of the flowers harvested in optimum physiological stage. The flowers recutted under the water and the height of all flower branches set on 55 cm.

The leaves and blades of lower part of branches eliminated and only 3 leaves over the stem protected. Then the concerned treatments performed on them (Table 1). Environmental conditions in vase life room was: temperature 19-21°C, photoperiod 9 hr, light intensity 15-20 µmol $s^{-1}m^{-2}$ using white fluorescent lamp and 60% relative humidity.

Experimental Design and Treatments

This experiment had been performed in RCBD on two cultivar of cut roses 'Avalanche' and 'Grand prix' with 11 different chemical treatments in three replications, each plot was include 4 cut flowers. Chemical treatment in this experiment is as follow (Table 1).

Measurement of Characteristics

Relative fresh weight, fresh weight to dry weight ratio, flower diameter, flower opening and vase life were measured. Vase life finished with some symptoms such as necrosis, wilting and abscission of petals, chlorosis and abscission of leaves, bent neck and outrolling of petals which cause to reduce flower attraction and marketing.

Every 4 days, flower diameter measured by caliper and record in each flower, separately.

Relative fresh weight measured every 2 days. For this purpose, flower branch was weighted and its relative fresh weight calculated by using the following formula (Bartoli *et al.,* 1996; Setyaddjit *et al.,* 2004).

$RFW=W_t/ W_{t=0} \times 100$

W_t = F.W in 2, 4, 6th,…day.

$W_{t=0}$ = F.W in zero day.

For measuring of dry weight to fresh weight ratio, fresh weight was measured every 2 days and after the end vase life, all of the cut flowers located in oven 60 °C for 72 hrs.

Data Analysis

Data were analysed with MSTATC software. Mean comparison carried out with DNMRT.

RESULTSA AND DISSCISSIONS

In Avalanche cultivar, 2 and 1 mg l^{-1} SNP (T_4, T_5) and distilled water (T_{10}) have the highest vase life, 18.17, 17, 5 and 16, 58 days, respectively. These treatments had significant difference with other treatments. Also the least vase life was showed in $AgNO_3$ and control. In Grand prix cultivar, T_6 and T_8 had highest vase life and the least average in this cultivar is related to control treatment (Table 2). Increasing vase life in T_4 and T_5 in Avalanch cultivar can attribute to the effect of SNP in various levels and also it can refer to in water quality in T_{10} treatment (table 3). The existence of SNP inhibits growth of microorganisms. These results were agreed with Kim *et al.,* (2005).

In $AgNO_3$ treatment (T_1), wilting and bent neck observed in early days. Water stress symptoms (wilting) and bent neck are explainable in T_1, $AgNO_3$ banded to organic compounds and cannot moves upward in vessels (Nowak and Rudnicki, 1990). Also, susceptibility of vessels of herbaceous plants and toxicity of Ag^+ as a heavy metal, are two important reasons for this effect (Alvarez *et al.,* 1994). It seems that Ag^+ damages to vessels and inhibits water transfer in xylem and flowers will wilt. The results of this research about the effect of $AgNO_3$ is not agreed with Khondakar and Mazumdar (1985), because they had been obtained the best results with sucrose 3% + 8-HQC 3% + $AgNO_3$ %1, while the results of current research was similar to Alvarez *et al.,* (1994), which in both two research, undesirable effect of $AgNO_3$ on cut rose and tuberose had been observed. Alvarez *et al.,* (1994) used 600 mg l^{-1} $AgNO_3$, while Khondakar and Mazumdar (1985) applied less than 1% and observed that this concentration had negative effect. It seems that 8-HQ eliminated the negative effect of $AgNO_3$. Our results were agreed with the results of Jowkar and Salehi (2006) but it was not agreed with Lal (1993).

If distillated water has high quality cut flowers have more vase life. Halvey (1976) showed that distilled water is suitable for preservative solution. In the present research , distilled water was one of the best treatment to increasing vase life of cut Rose 'Avalanche'.

According to ANOVA, simple effect of time, cultivar and treatment on flower diameter and the interaction between treatment and were significant ($P\leq 0.01$).

Treatments T_6, T_8 and T_9 had the highest average of flower diameter, but them difference with T_3, T_4, T_5 and T_7 was not significant. Lowest flower diameter was for control plants.

In rose 'Grand Prix' effect of interaction between chemical compounds and cultivars on flower diameter was significant and T8 had the highest average of flower diameter. T_3, T_4, T_5, T_6,

T_7, T_8 and T_9 had not significant differences with each other. Also in cut roses ‘Avalanche’ distilled water with the average of 105.7 mm had the highest flower diameter which had not significant differences with T_6 treatment.

This results had agreed with the results of Hussein (1994), Fakhrae and Maidani (2004) and Kalatejari (2009).

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Tables

Table 1. Chemical compounds

Treatment	Chemical compounds
T_1	$AgNO_3$ (300 mgl^{-1})
T_2	8-HQS (250mg l^{-1})
T_3	8-HQS (500mg l^{-1})
T_4	SNP (1mg l^{-1})
T_5	SNP (2mg l^{-1})
T_6	8-HQS (250mg l^{-1}) + SNP(1mg l^{-1})
T_7	8-HQS (500mg l^{-1}) + SNP(1mg l^{-1})
T_8	8-HQS (250mg l^{-1}) + SNP(2mg l^{-1})
T_9	8-HQS (500mg l^{-1}) + SNP(2mg l^{-1})
T_{10}	Distilled Water
T_{11}	Control

Table 2. Mean comparison of traits in 'Grand prix'

Treatment	Flower opening (%)	FW/DW	Flower diameter (mm)	RFW	Vaselife (days)
T_1	48.75 f	4.506 ghi	81.38 e	69.92 i	7.250 hij
T_2	84.17 ab	5.352 cde	94.05 d	100.6 a	11.17 bcde
T_3	90.42 a	4.499 hi	97.31 bcd	90.01 f	8.833 fgh
T_4	82.92 abc	4.179 ij	95.91 bcd	84.40 g	9.917 efg
T_5	84.17 ab	4.447 hi	95.22 cd	91.41 f	10.50 def
T_6	84.58 ab	5.116 def	98.76 bcd	97.87 abcd	12.92 b
T_7	86.25 ab	5.006 efg	96.96 bcd	98.24 abcd	12.17 bcd
T_8	86.25 ab	5.098 def	100.7 abc	99.31 abc	12.67 bc
T_9	83.75 ab	4.805 fgh	100.3 abcd	93.41 ef	10.92 cde
T_{10}	61.25 e	4.009 ijk	81.21 e	68.23 ij	7.667 hi
T_{11}	47.50 f	3.544 k	64.85 f	62.51 k	5.500 j

Means followed by some letter within each column don't differ significantly according to Duncan multiple range test at P≤0.01

Table 3. Mean comparison of traits in 'Avalanche'

Treatment	Flower opening (%)	FW/DW	Flower diameter (mm)	RFW	Vaselife (days)
T_1	30.00 g	4.930 efgh	86.23 e	64.59 k	5.833 j
T_2	72.50 d	5.933 ab	95.39 bcd	95.86 cde	11.00 cde
T_3	64.17 e	5.906 ab	98.00 bcd	79.37 h	8.667 gh
T_4	85.83 ab	5.879 ab	100.6 abc	97.89 abcd	16.58 a
T_5	85.83 ab	5.977 ab	98.19 bcd	97.84 abcd	18.17 a
T_6	85.00 ab	5.684 abc	101.8 ab	97.24 abcd	11.42 bcde
T_7	78.75 bcd	5.780 abc	96.58 bcd	96.57 bcde	10.75 de
T_8	83.33 ab	6.042 a	100.6 abc	99.97 ab	11.83 bcd
T_9	75.42 cd	5.796 abc	101.1 abc	96.56 bcde	10.00 efg
T_{10}	82.92 abc	5.524 bcd	105.7 a	95.79 de	17.50 a
T_{11}	30.00 g	3.822 jk	65.79 f	65.41 jk	6.083 ij

Means followed by some letter within each column don't differ significantly according to Duncan multiple range test at P≤0.01