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Effect of *Mentha pulegium* extract and 8-hydroxy quinoline sulphate to extend the quality and vase life of rose (*Rosa hybrid*) cut flower

Davood Hashemabadi[1]*, Ali Mohammadi Torkashvand[1], Behzad Kaviani[1], Maryam Bagherzadeh[2], Mohaddeseh Rezaalipour[2] and Mohammad Zarchini[3]

[1]Department of Horticulture, Rasht Branch, Islamic Azad University, Rasht, 4147654919, Iran
[2]Department of Horticulture, Rasht Branch, Islamic Azad University, Rasht, 4147654919, Iran
[3]Young Researchers Club, Rasht Branch, Islamic Azad University, Rasht, 4147654919, Iran
*Corresponding Author E-mail: davoodhashemabadi@yahoo.com

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Abstract

Rose is an ornamental plant which contains one of the world's top cut flowers. Vase life of cut rose flower is short. Extracts of *Mentha pulegium* and 8-hydroxy quinoline sulphate (8-HQS) were used as two preservative solutions, aiming to extend the vase life of cut rose (*Rosa hybrid* L.) flowers. Rose flowers were treated with a vase solution containing the extract of *M. pulegium*, at concentrations of 0, 10, 20 and 30%, in combination with 8-HQS at concentrations of 0, 200, 400 and 600 mg l^{-1}. Longevity of cut roses flowers was determined on the basis of wilting and chlorophyll retention. Cut roses flowers were kept at room temperature (20±2°C) under normal day light and natural ventilation. The vase life of cut flowers studied was prolonged by all 8-HQS and extract treatments. The best concentration of 8-HQS and extract were 400 mg l^{-1} and 10%, respectively. Our results indicated that the flowers treated with the extract and 8-HQS had longer vase life, higher rate of solution uptake and lower SPAD value (total chlorophyll) compared to the control. Also, cut flowers treated with the extract and 8-HQS had least bacterial colonies. The greatest longevity of vase life by 11.20 and 10.25 days was related to 400 mg l^{-1} 8-HQS and 10% of extract, respectively. These treatments improved cut vase life more than the control treatment. The maximum solution uptake (1.85 ml g^{-1} f.wt.) and minimum SPAD value (2.19) were calculated in 30% extract along with 200 mg l^{-1} 8-HQS, and 200 mg l^{-1} 8-HQS, respectively. The lowest number of bacterial colonies (55.75) was obtained in treatment of 600 mg l-1 8-HQS. Flower quality of specimens treated with extract and 8-HQS was better than those of the control. The experiments were repeated three times with three replicates and a completely randomized design had been used. The present study concludes that it would be possible to use preservative solutions containing extract of *M. pulegium* L. and 8-HQS to extend vase life of cut rose (*R. hybrida* L.) flowers.

Key words

Antimicrobial agents, Essential oils, Flower longevity, Ornamental plants, Vase solutions

Introduction

Rose (*Rosa hybrida* L.) belongs to Rosaceae family and is the most popular flower due to its ornamental and commercial value. Roses are grown world wide as cut flowers, potted plants and home gardens, and play a vital role in manufacturing of various products of medicinal and nutritional importance. The main aim of rose plant cultivation is to get cut flowers (Butt, 2003). Vase life of cut rose flowers is usually short and is related to physio-chemical processes and reduces through ethylene production and bacterial contamination in vase solution (van Doorn *et al.,* 1997; Alaey *et al*., 2011). Short vase life is highly influenced by water loss and wilting during transpiration (van Doorn *et al*., 1997). Some treatments have been applied to increase the vase life of cut rose flowers by regulating water balance, distribution of assimilates, delaying senescence and blocking microbial agents (Alaey *et al*., 2011). Water balance is a main factor determining the quality and longevity of cut flowers (da Silva, 2003). The major form of vascular occlusion is blockage of xylem vessels by air emboli and microorganisms (van Doorn,

1997). Microorganisms, especially bacteria and fungi that grow in preservative solutions adversely effect the longevity of cut flowers. These microorganisms and their products plug the stem ends and restrict water absorption, which reduces the longevity of cut flowers (van Doorn *et al*., 1997; Alaey *et al*., 2011). Microbes can also produce ethylene and secrete toxic compounds, also pectinase and accelerate senescence. Ethylene accelerates senescence. Several agents such as essential oils and 8-hydroxyquinoline have been used in cut flower vase solution to extend vase life by improving water uptake (Bounatirou *et al*., 2007; Lü *et al*., 2010).

Essential oils and their derivatives, as organic natural substances, are safe and environmental friendly substances and have antimicrobial properties (Solgi *et al*., 2009). Essential oils belong to terpenoids and aromatic compounds. The antimicrobial properties of essential oils have been known for a long time and evaluated to extend the vase life of some cut flowers (Arras and Usai, 2001; Voda *et al*., 2003; Burt, 2004; Solgi *et al*., 2009). The antimicrobial mechanism of some essential oils is due to synthetic inhibition of DNA, RNA, protein and carbohydrates (Xia *et al*., 1995; Gogoi *et al*., 1997). Not enough information is available on the effect of essential oils on vase life of rose cut flowers.

8-hydroxy quinoline sulphate (8-HQS) has antimicrobial properties and has been used in association with sucrose and other chemicals to extend the vase life of cut flowers (Ketsa *et al*., 1995). Application of 8-HQS significantly increased the vase life of some cut flowers (Ichimura *et al*., 1999; Kim and Lee, 2002; Dineshbabu *et al*., 2002). 8-HQS treatment prevents the growth of microorganisms in xylem and thus maintains water uptake (Beura *et al*., 2001). Addition of germicide such as 8-HQS to a preservative solution containing sucrose is necessary to inhibit microbial growth (Sacalis, 1993). Preservative solutions and control ethylene synthesis, pathogen development, maintenance of water (Arboleda, 1993). 8-HQS salts are commonly used chemical compounds for floral preservative in roses (van Doorn, 1997). The objective of the present study was to evaluate the effect of extract of *Mentha pulegium* L. and 8-hydroxy quinoline sulphate (8-HQS) on extending the vase life and increasing the postharvest quality of cut rose (*Rosa hybrid* L.) flowers by controlling microbial growth in vase solution.

Materials and Methods

Experimental design and treatment : Cut rose (*Rosa hybrid* L.) flowers were obtained from a hydroponic greenhouse in Tehran, Iran, at their optimum developmental stage. The flowers were immediately placed in buckets in an upright position and transported to the postharvest laboratory. To minimize moisture loss during transportation, buckets containing flower stems were covered with plastic films. In laboratory, stems were re-cut under deionized water to a length of approximately 52 cm. The flowers were selected for uniformity of size and color.

The experimental design was randomized complete block design (RCBD) with a factorial arrangement of treatments consisting of four concentrations of extract of *Mentha pulegium* (0, 10, 20 and 30%) × four 8-HQS concentrations (0, 200, 400 and 600 mg l^{-1}) × three replications × sixteen treatments. In each experiment, three cut roses were placed into a 1000 ml vase that was filled with 250 ml of preservative solution containing the aforementioned concentrations of *M. pulegium* extract and 8-HQS. Distilled water was used as control. To minimize evaporation and prevent contamination, the mouths of the pots were covered with sheets of low density polyethylene film. The flowers were kept in a vase in a room under the following conditions: temperature of 20 ± 2°C, relative humidity of 60-70%, light intensity of 15-20 µmol $m^{-2}s^{-1}$, using cool white florescent tubes and a daily light period of 12 hrs.

Vase life : The criterion for the end of vase life was the time point at which the flowers showed symptoms of petal wilting or curling.

Bacterial counts : For determination of bacterial concentration in stems after pulsing, 2-cm length (approximately 0.5 g) segments were cut from the stem ends. Explants were washed three times with sterile distilled water to reduce surface microbial loads. The explants were then ground and diluted with 0.9% sterile saline. Aliquots (0.1 ml) of extract were spread on nutrient agar plates, and bacterial colonies were enumerated after incubation for 24 hrs at 37°C. All bacteria counts were conducted on triplicate sub-samples (Bleeksma and van Doorn, 2003; Balestra *et al*., 2005).

Chlorophyll index : Using an SPAD-502 chlorophyll meter manufactured by Minolta Company, chlorophyll index (CI) of cut rose was measured at two stages: after treatment with extract of *M. pulegium* L. and 8-HQS, and 2) at the end of vase life of cut rose. The chlorophyll index loss was calculated as follows:

Chlorophyll index loss = [(CI after treatment with SNP and STS) – (CI at the end of vase life).

Dry matter : At the end of flower vase life, fresh weight of flower of each treatment were calculated and then dried to constant weight in an oven for 24 hr at 72°C. Dry matter percentage of cut flowers was calculated by the following equation: DM (%) = dry weight/fresh weight × 100.

Solution uptake : In order to determine the evaporation of vase solutions, 4 dishes with 500 ml distilled water was placed between the dishes containing cut flowers. The content of these dishes were weigh on the last day of each plot's vase life, solution uptake was determined for each plot as the following expression: (500 - the reduced content of solution in the dishes at the last day of vase life + the surface evaporation of the last day = Y). Then, Y was divided by the first day's fresh flower weight of each plot and multiplied by 100: Y/the first day fresh weight); this data is solution uptake per plot (ml g^{-1} f.wt.).

Total protein content of petals : On 5th day of vase life, one cut flower of each plot was used for determining total protein content of petals. It was estimated by Kjeldahl digestion method for the quantitative determination of nitrogen; the results were then multiplied with 6.25 and protein content of petals was calculated.

Statistical analysis : Using SPSS statistical software, data were subjected to analysis of variance (ANOVA), and means were compared using the least significant difference (LSD) test at $p \leq 0.05$ level.

Results and Discussion

In the present study, different concentrations of *M. pulegium* extract and 8-HQS were used as the main sources of variation. Based on the results, extract of *M. pulegium* and 8-HQS could extend the vase life of cut rose (*Rosa hybrida*) flowers.

Significant differences ($p \leq 0.05$) were obtained for vase life after treatment of cut flowers with *M. pulegium* extract and 8-HQS. Treatment of cut flowers with 10% of of *M. pulegium* extract resulted in more vase life (10.25 days) than control (8.29 days). Also, the average vase life increased for cut flowers pre-treated with 400 mg l^{-1} of 8-HQS (11.20 days) (Table 2). These results are agree in ment the study of Ichimura *et al*. (1999) who found that cut rose flowers treated with a mixture of 200 mg l^{-1} 8-HQS and 3% sucrose showed increase in vase life. Similar result was obtained on lisianthus (Hojjati *et al*., 2007). These researchers showed that the use of 300 mg l^{-1} of 8-HQS improved the vase life. Positive effect of plant extracts (essential oils) on extending the vase life of cut rose flowers (Jalili Marandi *et al*., 2011; Shanan, 2012) and some other cut flowers (Solgi *et al*., 2009; Oraee *et al*., 2011; Mousavi Bazaz and Tehranifar, 2011) have been shown. Solgi et al. (2009) and Hashemabadi *et al*. (2011), stated that using some essential oils significantly improved the vase life of Gerbera. Shanan (2012) indicated that some essential oils significantly prolonged the vase life of cut rose flowers. Studies of Bayat *et al*. (2011) and Kazemi and Ameri (2012) on carnation cut flowers showed that all concentrations of essential oils prolonged vase life as compared to control flowers. Hegazi and Gan (2009) found that some essential oils increased spike vase life of *Gladiolus hybrida*.

Cut flowers kept in solution containing 30% of *M. pulegium* extract and 200 mg l^{-1} 8-HQS showed minimum decrease in water uptake rate (1.85 ml g^{-1} f.wt.) (Table 2). All concentrations of *M. pulegium* extract and 8-HQS improved solution uptake than control (1.02 ml g^{-1} f.wt.) (Table 2). Preferential solution uptake of flowers incubated in *M. pulegium* extract and 8-HQS suggesting a possible decrease in xylem blockage due to reduced microbial growth. Anjum *et al.* (2001) reported that proper antimicrobial agent in vase solution can prevent the growth of microbes and increased water uptake. Positive effect of *M. pulegium* extract and 8-HQS may be attributed to their antimicrobial activity that reduced bacterial population and resulted in increase vessel conductivity and water uptake. Nowadays, antimicrobial property of essential oil is well known (Burt, 2004). Studies of Solgi *et al*. (2009) and Mousavi Bazaz and Tehranifar (2011) showed that essential oil increased solution uptake and relative fresh weight in *Gerbera* and *Alstroemeria* cut flowers. Also, some studies revealed that 8-HQS could increase solution uptake in cut flowers (Ichimura *et al*., 1999; Kim and Lee, 2002; Elgimabi and Ahmad, 2009; Ajmad and Ahmad, 2012).

Extract of *M. pulegium* and 8-HQS had significant effect on bacterial populations in the stem end of cut rose flowers ($p \leq 0.01$) (Table 1). Generally, the used extract of *M. pulegium* and 8-HQS significantly reduced microbial density in the stem ends of rose as compared with control (Table 2). The high**est** inhibitor of microbial counts (6.50 colonies) appeared when 8-HQS at 600 mg l^{-1} was added to the holding solution than control (19.00 colonies) (Table 2). Also, data presented in Table 2 showed that the content of bacterial colonies in stems treated with 30% (9.75 colonies) was less than those of control (16 colonies). The obtained results confirmed that the preservative agents reduced the number of bacterial colonies by acting as a microbial inhibitor in the preservative solution.

Table 1 : Analysis of variance for the effects of different concentrations of extract of *Mentha pulegium* L. and 8-hydroxy quinoline sulphate on some traits of cut rose (*Rosa hybrid* L.) flowers

Source of variance	df	Dry metal (%)	Fresh weight loss (g)	Brix (B°)	Loss of chlorophyll (SPAD)	Solution uptake (ml)	Flower opening index	Number of bacteria in vase solution ($Log^{10}CFml^{1}$)	Number of bacteria in stem end ($Log^{10}CFml^{1}$)	Ethylene ($nllg^{-1}f.wt.$)	Petal protein content (%)	Cartenoid (µg f.wt.)
M	3	42.38^{*}	2.47^{**}	0.74^{ns}	8.18^{ns}	0.17^{**}	0.11^{**}	36630.50^{**}	84.85^{**}	0.06^{**}	227.04^{**}	0.47^{**}
H	3	38.94^{*}	14.76^{**}	2.91^{**}	45.70^{**}	1.02^{**}	0.10^{**}	4648.50^{**}	322.29^{**}	0.49^{**}	197.12^{**}	1.55^{**}
M × H	9	5.96^{ns}	1.16^{**}	0.16^{ns}	4.98^{ns}	0.10^{*}	0.04^{**}	908.00^{**}	32.59^{ns}	0.01^{ns}	30.01^{**}	0.24^{**}
Error	32	9.50	0.37	0.27	5.06	0.03	0.005	100.00	16.14	0.01	0.31	0.02
Total	47	601.65	74.23	21.27	368.58	5.74	1.22	135209.00	2031.47	2.16	8703.10	36.32
CV	47	8.12	74.23	38.26	61.85	13.92	4.07	15.09	32.74	21.08	46.91	55.01

**: Significant at $\alpha = 1\%$, *: Significant at $\alpha = 5\%$, ^{ns}: Not significant. M: Extract of *Mentha pulegium* L., H: 8-Hydroxy quinoline sulphate

Application of essential oils and 8-HQS to prolong vase life of cut rose flowers has been observed by some researchers (Liao *et al*., 2000; Elgimabi and Ahmed, 2009; Shanan, 2012). Low water uptake by cut flowers is often due to occlusions located mainly in the basal stem end (He *et al*., 2006) and microorganisms and their decay products are a common cause of stem end blockage (van Doorn, 1997; Williamson *et al*., 2002). In many cut flowers, suppression of microbial growth in vase solution results in delayed wilting (van Doorn, 1997). Anjum *et al*. (2001) showed that adding a suitable germicide in vase solution can prevent the growth of microbes. The present results showed that application of *M. pulegium* extract and 8-HQS could be useful for decreasing bacterial populations in stem end. These findings are in agreement with findings of Kwon and Kim, (2000); Liu *et al*. (2009) and Oraee *et al*. (2011).

A significant effect ($p \leq 0.01$) in petal protein content was recorded in the samples kept in solution containing both *M. pulegium* extract and 8-HQS (Table 1). Increase in petal protein content was highest (20.43%) in cut flowers treated with 10% of *M. pulegium* extract and 200 mg l^{-1} 8-HQS (Table 2). This amount of protein was higher than that of control (11.67%). High concentration of *M. pulegium* extract and 8-HQS had negative effect on petal protein content. Decreasing the peptidase activity caused increase in protein content. Vase life prolongation compound lessened endo-protease activity and delayed reduction in total protein content. Buchanan-Wollaston and Ainsworth (1997) revealed that along vase period and due to senescence, the main stored metabolites re-transferred into the plant system and protein refraction is the main part of this re-mobilization, so proteolytic enzymes activity is the necessary factor of senescence. Wagstaff *et al*. (2002) revealed that the endo-protease activity increased during vase period in cut *Alestromeria* flowers. Improvement of water uptake and decreasing the drought stress increase the plasma membrane stability (Eason and Webster, 1995; Sod and Nagar, 2003; Lersleronga *et al*., 2009). Plasma membrane instability is maximum during cut flowers senescence (Ezhilmathi *et al*., 2007). Our findings about the positive effect of anti-microbial agents is in consistent with that of Hashemabadi (2012). Water stress causes reduction in biosynthesis and protein content of flowers. Proteins degradation is an important factor during the senescence. Anti-ethylene compounds sustain proteins in petals. Nikbakht *et al*. (2008) showed that the use of

Table 2 : Mean comparison of the effects of different concentrations of extract of *Mentha pulegium* and 8-hydroxy quinoline sulphate on some traits of cut rose (*Rosa hybrid* L.) flowers

Treat-ments	Vase life (Day)	Dry metal (%)	Fresh weight (g)	Brix (B°)	Chlorophyll (SPAD)	Solution uptake (ml)	Flower opening	No. bacteria (solution)	No. bacteria (stem end)	Ethylene (nllg^{-1} f.wt.)	Protein (%)	Cartenoid (µg f.wt.)
M1	8.29^{c}	35.27^{b}	3.37^{a}	1.63	4.64	1.21^{b}	1.80^{b}	148.75^{a}	16.00^{a}	0.540^{a}	15.32^{a}	0.80^{b}
M2	10.25	39.59^{a}	2.32^{c}	1.03	3.75	1.49^{a}	1.94^{a}	41.00^{b}	12.00^{b}	0.36^{b}	14.58^{b}	0.98^{a}
M3	9.50	38.05^{a}	2.63^{bc}	1.41	2.63	1.41^{a}	1.75^{bc}	43.75^{b}	11.33^{b}	0.47^{a}	13.11^{c}	0.76^{c}
M4	9.20	38.80^{a}	2.98^{ab}	1.40	3.52	1.40^{a}	1.72^{c}	31.50^{c}	9.75^{b}	0.51^{a}	5.83^{d}	0.49^{d}
H1	8.20^{b}	35.47^{b}	4.29^{a}	1.88^{a}	6.42^{a}	1.02^{d}	1.93^{a}	95.75^{a}	19.00^{a}	0.70^{a}	16.05^{a}	0.90^{b}
H2	10.87^{a}	39.80^{a}	2.02^{c}	1.25^{b}	2.19^{b}	1.51^{b}	1.78^{b}	57.50^{b}	12.66^{b}	0.34^{c}	13.84^{b}	1.12^{a}
H3	11.20^{a}	38.31^{a}	1.91^{c}	0.74^{c}	2.38^{b}	1.69^{a}	1.77^{bc}	56.00^{b}	10.91^{bc}	0.27^{c}	12.39^{c}	0.75^{c}
H4	6.95^{c}	38.12^{a}	3.09^{b}	1.60^{ab}	3.55^{b}	1.29^{c}	1.72^{c}	55.75^{b}	6.50	0.58^{b}	6.56^{d}	0.27^{d}
M1H1	6.83	33.95	4.95^{ab}	2.10	7.05	0.69^{i}	2.06^{a}	210.00^{a}	30.00	0.74	11.67^{d}	0.40^{m}
M1H2	9.16	36.16	2.45^{efgh}	1.76	2.31	1.21^{fgh}	1.64^{ij}	135.00^{b}	13.33	0.43	20.43^{a}	1.32^{b}
M1H3	11.00	36.40	1.97^{ghi}	1.00	4.10	1.66^{abc}	1.84^{defg}	140.00^{b}	12.33	0.30	17.51^{b}	0.95^{f}
M1H4	6.16	34.57	4.13^{bc}	1.66	5.10	1.29^{defg}	1.68^{jhi}	110.00^{c}	8.33	0.69	11.67^{d}	0.56^{k}
M2H1	9.50	35.68	3.24^{cdef}	1.33	8.31	1.38^{cdefg}	2.01^{ab}	57.00^{de}	15.33	0.56	20.43^{a}	1.55^{a}
M2H2	11.83	41.09	2.31^{fgHi}	1.06	3.09	1.46^{bcdef}	1.82^{defg}	40.00^{fg}	13.33	0.34	17.51^{b}	1.25^{c}
M2H3	11.66	39.47	1.79^{hi}	0.50	2.18	1.81^{a}	1.94^{abcd}	35.00^{fgh}	11.66	0.10	14.54^{c}	0.90^{g}
M2H4	8.00	42.12	1.94^{ghi}	1.23	1.43	1.34^{cdefg}	1.99^{abc}	32.00^{ghi}	7.66	0.47	5.84f	0.21^{n}
M3H1	9.00	35.28	3.74^{cd}	2.16	3.98	1.09^{gh}	1.77^{fgh}	65.00^{d}	16.00	0.73	14.56^{c}	0.01^{e}
M3H2	10.16	40.61	2.00^{ghi}	1.16	1.83	1.55^{abcde}	1.88^{cdef}	38.00^{fg}	13.00	0.35	17.51^{b}	1.16^{d}
M3H3	11.66	37.61	1.83^{hi}	0.80	1.26	1.73^{ab}	1.72^{ghi}	30.00^{ghi}	10.33	0.28	14.56^{c}	0.69^{j}
M3H4	7.16	38.72	2.94^{defg}	1.53	3.45	1.28^{dfeg}	1.63^{ji}	42.00^{efg}	6.00	0.54	5.84^{f}	0.20^{n}
M4H1	7.50	36.98	5.21^{a}	1.93	6.34	0.91^{hi}	1.90^{bcde}	51.00^{def}	14.66	0.79	2.92^{g}	0.64^{j}
M4H2	12.33	41.35	1.32^{i}	1.00	1.54	1.85^{a}	1.80^{efgh}	17.00^{i}	11.00	0.25	8.75^{e}	0.76^{h}
M4H3	10.50	39.78	2.06^{ghi}	0.66	1.98	1.59^{abcd}	1.60^{ji}	19.00^{hi}	9.33	0.40	8.75^{e}	0.49^{j}
M4H4	6.50	37.10	3.35^{cde}	2.00	4.25	1.26^{efg}	1.58^{j}	39.00^{gf}	4.00	0.62	2.92^{g}	0.10^{o}

Values in each row that are followed by the same letter are not significantly different by LSD test (pd"0.05). M: Extract of *Mentha pulegium*, H: 8-Hydroxy quinoline sulphate

anti-microbial compounds increased protein content in cut gerbera flowers.

Based on the present results, the chlorophyll content was affected by 8-HQS treatment ($p \leq 0.01$) (Table 1). As compared to the control 200 mg l^{-1} 8-HQS resulted in lower chlorophyll decreasing index. Least chlorophyll degradation (2.19) was observed in cut roses treated with 200 mg l^{-1} 8-HQS. The highest chlorophyll degradation (6.42) was observed in control plants (Table 2). The present results are in agreement with some studies that showed 8-HQS minimized loss in chlorophyll content of cut flowers (Elgimabi and Ahmed, 2009; Hussein, 1994; Knee, 2002; Bhattacharjee, 1994; Ichimura and Goto, 1999). Application of *M. pulegium* L. extract had no significant effect on chlorophyll biosynthesis. Among the compounds used for increasing the flowers vase life, cytokinins have most effect. Also, anti-ethylene and anti-microbial compounds have different effect. Similar finding was reported by Kazemi (2012). Some compounds such as 8-HQS have been found to decrease chlorophyllase enzyme activity (Ferrante *et al*., 2002).

Data analysis showed that the effect of 8-HQS and *M. pulegium* extract were significant on dry matter (Table 1). Results showed that 8-HQS and *M. pulegium* extract in suitable concentration increased dry matter of cut rose flowers. Dry weight increased in case of 10% extract of *M. pulegium* L. (39.60%) and 200 mg l^{-1} 8-HQS (39.81) compared to control (35.27 and 35.47%, respectively) (Table 2). Positive effect of 8-HQS and extract of *M. pulegium* L. on dry matter is due to their antimicrobial properties, decrease of respiration and carbohydrates metabolism, retaining of water relations and improving the quality of cut flowers (Blankenship and Dole, 2003). The present results are in agreement with the reports of Basiri *et al.* (2011) who used anti-microbial agent to increase dry matter. Some studies revealed that 8-HQS minimized losses in dry matter cut flowers (Elgimabi and Ahmed, 2009; Hussein, 1994; Knee, 2002; Bhattacharjee, 1994; Ichimura and Goto, 1999). It is well known that sugar supply, increases the vase life of cut flowers, since it acts as a source of nutrition for tissues approaching carbohydrate starvation (Elgimabi and Ahmed, 2009).

In conclusion, current study showed that 8-hydroxy quinoline sulphate (8-HQS) has antimicrobial and anti-ethylene property and delay senescence in cut rose. The vase life of cut flower was prolonged by all 8-HQS and extract treatments. The best concentration of 8-HQS and extract were 400 mg l^{-1} and 10%, respectively.

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