I J T A
© Serials Publications
National Academy of Agricultural Science (NAAS) Rating : 3.03

Comparison the effect of extracts of *Zataria multiflora*, *Mentha piperita*, and Satureja on the vase Life of Roses (*Rosa hybrida* Var. DeRuitr)

Zakerin Abdul Rasool* **and Golban, Sae'id****

ABSTRACT: *The short life of cut flowers in different varieties has always caused damage and economic loss. We used medicinal plants as preservatives because they have natural, cheap ingredients and cause no environmental pollution. This experiment aimed to investigate the effect of extracts of Satureja, Zataria multiflora, and Mentha piperita on the vase life of cut rose flowers. This research was conducted in a completely randomized statistical design with 15 treatments and 3 repetitions, and 3 flowers were considered in each experimental units. Rose cut flowers were provided from a greenhouse in Shiraz and after cutting the stem ends under running water, they were placed in the vase containing distilled water + sucrose 4%, and the above extracts with concentrations of 200, 400 and 600 ppm and distilled water as control treatment. The results showed that the extract of satureja with concentrations of 200, 400, and 600 ppm significantly caused delays in stem bending, petal abscission, wilting time, and increase in vase life of cut rose flowers. Statistically, no significant difference was observed between Zataria multifora and Mentha piperita extract.*

Keywords*: Rose cut flowers, herbal essences, vase life, Zataria multiflora, Mentha piperita (peppermint), satureja*

INTRODUCTION AND GOAL

Rose with the scientific name of *Rosa hybryda* is a member of the Rosaceae family and native to various regions of the northern hemisphere (1) that currently constitutes about 40% of all cut flowers in the United States and is important in other countries as well (2). Various factors can reduce the life of cut rose flowers. So, much research was conducted to improve the vase life of rose cut flowers. Postharvest life of cut flowers and decorative greenery is often affected by blockage of stem ends and xylem vessels by microbes, physiological obstruction, and existence of air in the xylem vessels which prevents water absorption or leads to secretion of extracellular enzymes that can destroy the cell walls of xylem tubes (3). Then, water stresses due to reduced water absorption appears as decays of petals, leaves and bent flower stems and thus reduces the postharvest life of cut rose flowers. However, there are significant differences in postharvest life of different varieties of roses (4). Because of the toxicity of most chemicals and environmental pollutions caused by them, use of relatively cheap, natural ingredients with no side effects on humans and environment (5) is of very great importance. Recent studies have shown that extracts and essences of medicinal herbs have germicidal effects and can replace chemical compositions in preservative solutions of cut flowers. In a research on the effect of the oils of thyme, caraway, and peppermint on vase life of cut flowers of cloves, it was shown that only the solution containing ethanol 7%increased longevity of flowers compared to the control group (6). Sadeghi-Nejad *et al*. (2010) proved anti-fungal effect of Satureja leaf extract against several fungi so that this extract showed antifungal activity against all tested fungi at concentrations of 5000 to 625 micrograms per ml and minimum inhibitory concentration (MIC) varied depending on the type of fungus (7). The results of other tests showed anti-fungal effects of medicinal herbs extracts including thyme and Carum copticum. The aim of this study was to evaluate the effect of various herbal oils on longevity of cut roses.

MATERIALS AND METHODS

This experiment was conducted as a completely randomized design and contained extracts of *Zataria*

* Assistant Professor, Department of Horticulture, Islamic Azad University, Jahrom branch, Jahrom Iran.
** Department of Horticulture, Islamic Azad University, Jahrom, Iran.

multiflora, *Mentha piperita* and satureja and 4 levels of zero-200-400 and 600 ppm + sucrose 4% and control treatment containing distilled water + sucrose 4%, and these treatments were performed in 3 repetitions. Each vase consisted of 3 cut rose flowers. After preparing the extracts of medicinal herbs, the cut rose flowers were placed in these solutions at an average temperature of 20 °C and relative humidity of 65 %. The light was adjusted with 2 fluorescent lamps in the range of 500 to 600 lux with regular 12 hours of light and 12 hours of darkness courses. Finally, the length of vase life, number of withered flowers, quality of flowers, and bending of stems from vertical plane was measured. Statistical analysis was performed using SPSS software and comparison of averages was made using Duncan's multiple range test.

DISCUSSION AND CONCLUSION

Leaf longevity: the results of this study showed that the treatment effect of water + sucrose 4% on leaf longevity was higher than other treatments such that it was statistically significant with the resulting increase compared to treatment of *Zataria* with a concentration of 200 ppm and treatment of *Mentha piperita* with a concentration of 600 ppm (Chart 1). Halevy and Mayak (1979) suggested that sucrose neutralizes the effect of Abscisic acid which drives aging (9). Hence, a combination of sugars and antimicrobial agents are essential to increase the vase life. The results of this research are consistent with the results gained by Solgi *et al.* (2009) on gerbera flowers (10). Carbohydrates and especially sucrose are the main source of feeding flowers and energy supply for biochemical and physiological processes after separation from the mother plant. Hence, sucrose is widely used in preservative solutions. According to various available reports, sucrose has a great role in increasing the vase life. Sucrose acts as a food source or respiratory substrate, delays analysis of proteins, and improves water balance in cut flowers.

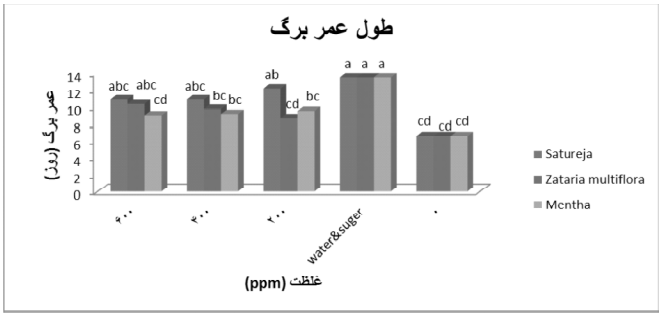

Chart 1: Comparison of the different levels of preservative solutions on leaf longevity of roses

Vase life

Results of this study showed that the use of Satureja extract as well as sucrose in preservative solution of flowers increases the life of flowers. This is in line with the results obtained by Gimdil *et al*. (2011), Tahmasebi *et al*. (2011), Azhari *et al*. (2010) on the increase of vase life using vegetable oils in floral preservative solution (11-13). Solgi *et al*. (2009) showed in their study that active ingredients of herbal oils in preservative solution of gerbera flowers lead to increase in vase life, which confirmed the results of this experiment (10).

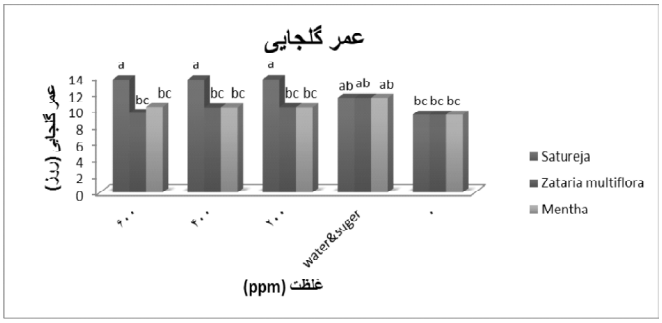

Chart 2: Comparison of the different levels of preservative solutions on vase life of roses

Stem bending

According to the obtained results, Satureja extracts with concentration of 600 ppm showed the best results in reducing the stem bending, and with increase in wet weight and water in petals, stem bending was reduced (chart 3). This is line with the findings of Nair *et al*. (2000), Movahed *et al*. (2011), Kamyab *et al*. (2009), and Bayat *et al*. (2010) regarding that the use of herbal oils in preservative solutions of cut flowers results in decrease of stem bending by enhancing the solution absorption, wet weight and the water within petals (14-17).

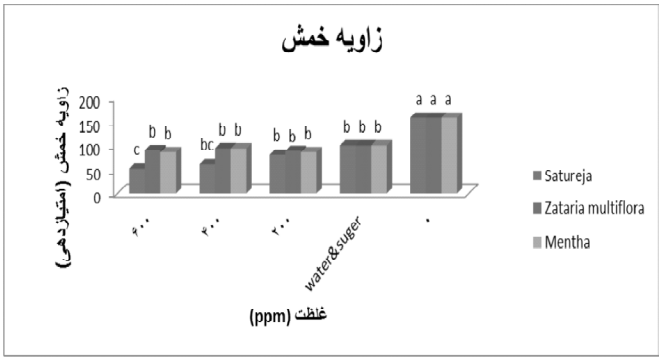

Chart 3: Comparison of the different levels of the preservative solution on bending angle of roses

Time and level of wilting

The results of this study showed that the treatment effect of satureja with a concentration of 600 ppm on wilting time was more than the other two extracts (4). The comparison between treatments containing extracts on percentage of rose wilt suggested that treatments of 200 ppm thyme and 400 ppm peppermint had a significant decrease compared to the control satureja. And other treatments in this study had no significant differences relative to each other (chart 5). Pearson-Mims *et al*. (1990) indicated in their research that by increase in the vase life, water relations of cut flowers gradually changes and the following are observed: reduced solution absorption, reduced relative wet weight and amount of water available in different parts of the flower stems (18). Of the reasons for this change are the microorganisms growing in the flower stems which disturb water absorption and finally cause wilting of flowers. Mousavi Bazaz and Tehrani Fard (2011) examined the effect of ethanol, methanol, and herbal extracts of peppermint, thyme, and caraway on the vase life of Alstroemeria and observed the beneficial effects of herbal oils on increase of the vase life (19). One of the conventional methods of preserving cut flowers is the use of various preservative solutions. Sucrose is a compound commonly used in such solutions. This is the precursor and energy source needed for breathing and carbon skeleton formation (20-21). However, sugars stimulate growth and increase of bacteria in the solution which ultimately leads to clogging of xylem vessels of cut flowers (21) Therefore, use of disinfectants and microbicides like essences in vase solutions helps to prevent blockage of stem xylem vessels, reduces microbial growth and stem resistance to water flow and leads to increase in absorption of solution by flowers and ultimately, increase in their vase life (22).

Petal abscission

Results of this study showed that the treatment effect of 200 mg peppermint had a significant decrease compared to other treatments of satureja. Among treatments containing satureja oil, statistical increase was observed compared to other treatments but this increase was not significant (Chart 6). Research has shown that adding a bactericidal combination with sucrose has a better effect on vase life. The reason for this was bacterial population control and non-production of toxic metabolites by vase microbes (23). Antimicrobial properties of herbal oils is due to the active ingredients in such oils. Due to overlapping

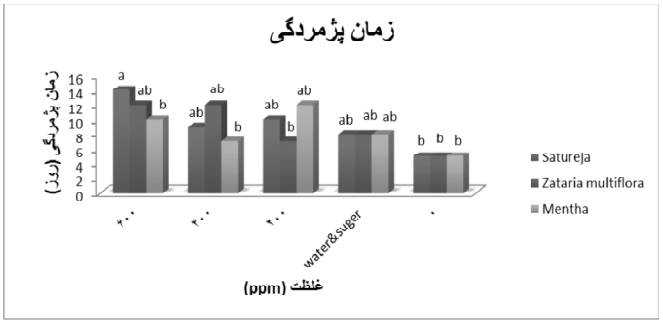

Chart 4: Comparison of different levels of preservative solutions on wilting time of roses

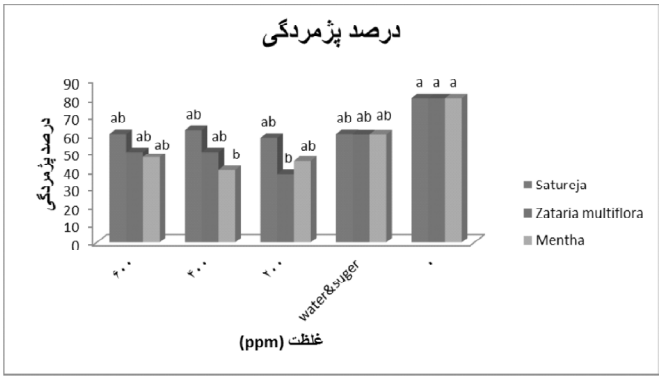

Chart 5: Comparison of the different levels of preservative solutions on the wilting percentage of roses

activities of various compounds present in oils, the wall and cell membrane of pathogens is damaged and permeability of cells is increased; this leads to damage and death of pathogenic cells (24).

According to the results of this research, it can be stated that the use of satureja extract with volatile essences and antibacterial properties can help to extend the cut rose flowers life. Since this is a herbal treatment and has no harmful environmental effects, it can be used as an organic preservative solution. Extracts can also be used as safe and nature-friendly substitutes for chemicals to increase the vase life of roses, and commercialization of these compounds requires additional testing of their formulations.

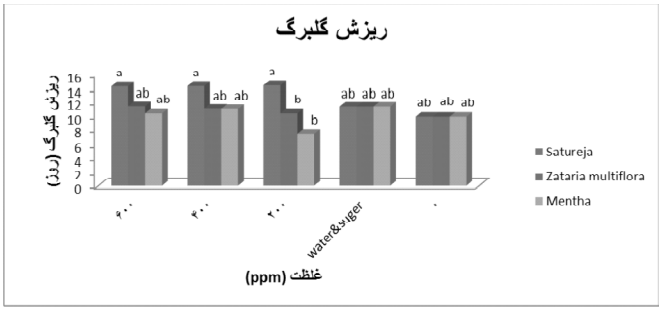

Chart 6: Comparison of the different levels of preservative solutions on rose petal abscission

REFERENCES

Anderson, N.O. (2006), *Flower breeding and genetics, Issues, challenges and opportunities for the 21 century*, Netherlands. 700 pp.

Acquaah, G. (2002), Horticulture, Principles and Practices. Pearson Education, Singapore. 787p.

Damunupola, J.W., Qian, T., Muusers, R., Joyce, D.C., Irving, D.E. & Van Meeteren, U. (2010), Effect of S-carvone on vase life parameters of selected cut flower and foliage species. *Postharvest Biology and Technology*, 55, 66-69.

Laird, G., John, Ph. & Pearson, S. (2005), Rose vase life: Cultivar and contamination source as critical factors. *Acta Horticulturae*, 687, 85-90.

Okigbo, R.N. & Ikediugwu, F.E.O. (2005), Biological control of post-harvest fungal rot of yams (*Dioscorea sp*.) with *Bacillus subtillis*. *Mycopathological*, 159 (2), 307-314.

Karimian Fariman, Z. & Tehranifar, A. (2011), Effect of Essential Oils, Ethanol and Methanol to Extend the Vase-life of Carnation (*Dianthus caryophyllus* L.) Flowers. *Journal of Biolgy Environmental Science*, 5 (14), 91-94.

Sadeghi-Nejad, B., Shirvani, F., Ghanbari, S., Alinejadi, M. and Zarrin, M. (2010), Antifungal activity of Satureja Khuzestanica (Jamzad) leaves extracts. *Jundishapur Journal of Microbiology*, 3(1) 36-40.

Maskooki, A. Mortazavi, S.A. p. (2004), The effect of thyme and Carum copticum oil on controlling the growth of Aspergilus parasiticus fungus. Journal of Science and Technology of Agriculture and Natural Resources. 8th year. No.2. 207-214.

Halevy, A. H and S. Mayak. (1979), Senescence and postharvest physiology of cut flower. Part 2. Hort Rev. 1: 59-146.

Solgi, M., Kafi, M., Taghavi, T.S. and Naderi, R., (2009), Essential oils and silver nanoparticles (SNP) as novel agents to extend vase-life of gerbera (*Gerbera jamesonii* cv. 'Dune') flowers. Postharvest Biology and Technology, 53(3): 155-158.

Gidmil, H, M, and Aminifar. (2011), The effect of caraway and eucalyptus oils on lasting of gerbera cut flowers (Gerbera jamesonii). Proceedings of the First National Congress of new Agricultural Sciences and technologies.

Tahmasebi, A, A., Alizadeh, A. H. Aboutalebi and M.Zadeh Bagheri. (2011), The effect of herbal oils and silver nanoparticles on postharvest life of cut flowers of Lilium (Lilium Robina). Proceedings of the National Conference on Advances in Agronomy. Page 15.

Azhari, M., R. N. Sani, A, Firouz and F. Iran Nejhad. (2010), Effect of solutions containing fennel seed oil on longevity of cut flowers of miniature cloves. Proceedings of the Fifth National Conference on new ideas in agriculture.

Nair, S. A., B. L. Attri and T. V. R. S. Sharma. (1998), Tender nut water: a natural floral preservative. Indian Coconut Journal (Cochin). 12(29): 5-6.

Movahed, Z. Z., M. Kafi, A. Khalighi, M. Azizi and R. Sharifi. (2011), An evalution of the possibility of replacing natural compounds (Eugenia caryophyllata essential oil and other extracts) instead of chemical antibacterial compounds in preservative solution of cut gerbera flowers. Iranian Journal of Horticultural Science. 4(41): 337-345.

Kamyab, F., M. Hashemi-Pour, R. Farooqi & H. Far Hokmabadi. (2009), Studying the effects of fennel and thyme extracts with preservative solution on the quality and vase life of royal roses. Iranian Horticultural Science Congress.

Bayat, H. M. Azizi, M. Shoor, N. Vahdati. (2010), The effect of ethanol and medical plants on increase of the vase life of cut clove flowers (*Diantus caryophyllus cv. Yellow candy*). Proceedings of the Fifth National Conference on new ideas in agriculture. Page 44.

Pearson-Mims, C. and V. Lohr. (1990), Fluoride injury to cut 'Samantha' roses may be reduced by pulsing with calcium nitrate. HortScience 25:1270-1271.

Mousavi Bazaz A., and Tehranifar A. (2011), Effect of ethanol, methanol and essential oils as novel agents to improve vase-life of alstroemeria flowers. J. Biol. Environ. Sci. 5:41-46.

Pun, U. K., H. Shimizu K. Tanase and K. Ichimura. (2005), Effect of sucrose on ethylene biosynthesis in cut spray carnation flowers. Acta Hort. 669:171-174.

Stephens, I.A., G. Jacobs and D.M. Holcroft. (2001), Glucose prevents leaf blackening in 'Sylvia' proteas. Postharvest Biol. Technol. 23:237–240.

Knee, M. (2000), Selection of biocides for use in floral preservatives. Postharvest Biol. Technol. 18:227-234.

Van Doorn, W.G. & De Witte, Y. (1997), Sources of the bacteria involved in vascular occlusion of cut rose flower. *Journal of the American Society for Horticultural Science*, 122 (2), 263-266.

Burt S. (2004), Essential oils: their antibacterial properties and potential applications in food – a review. International Journal of Food Microbiology, 94: 223-253.