



Determination of The Effects of Sage and Balm Extracts on Vase Life in Gerbera cv. Rosalin

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Abstract

Gerbera (*Gerbera jamesonii*) is a perennial Mediterranean plant which belongs to the *Asteraceae* family. This flower with increasing commercial significance in the world and in considerable demand in both domestic and export markets. The blooms are attractive, suitable for any type of floral arrangements and are available in different colors and hues. Besides floral arrangements, gerbera is widely used in bouquets. But the most important problems of gerbera is bent neck and short vase life. The major reason for the short vase life is low water uptake due to bacterial and fungal contaminations. The use of preservative solutions are recommended to extend the vase life. Silver ions are used as an antiseptic compound to inhibit microorganism activities. But taking into consideration the danger of silver for human health and environment, the use of safely materials is necessary. The aim of this study was to determine the effectiveness of sage (*Salvia officinalis*) and balm (*Melissa officinalis*) extracts on vase life of gerbera cv. Rosalin. In study, sage and balm extracts were applied to vase solution on different concentrations (50 and 100 µL/100 mL). Vase life (day), relative fresh weight (%) and water uptake (mL/day) were evaluation. Also total phenolic compound contents which are known to possess antimicrobial activity of extracts were determined as spectrophotometrically. In this research, results showed that treatments effected the vase life depending on plant extracts and its different concentrations. The longest vase life were obtained on sage (50 µL/100 mL and 100 µL/100 mL) and balm extract (50 µL/100 mL). The total phenolic compound contents of sage extract were higher than balm extract. Water uptake and RFW values did not result any statistically significant difference in applications. As a result of this study, plant extracts were positively effect on vase life in gerbera cv. Rosalin.

Key Words: Gerbera, sage, balm, vase life, phenolic compound

Rosalin Gerbera Çeşidinde Vazo Ömrü Üzerine Adaçayı ve Melisa Ekstraktlarının Etkilerinin Belirlenmesi

Özet

Gerbera (*Gerbera jamesonii*) Asteraceae familyasına ait çok yıllık bir Akdeniz bitkisidir. Ticari önemi gittikçe artan bu bitkiye yurtiçi ve yurtdışı pazarlarında yoğun bir talep söz konusu olmaktadır. Farklı renk ve tonlarda çekici çiçekleri ile her tür çiçek düzenlemesine uygun olan gerbera bitkisi arajmandan çok genellikle buket şeklinde kullanılmaktadır. Gerberanın en önemli problemi ise boyun bükülmesi ve vazo ömrünün kısa olmasıdır. Kısa vazo ömrünün temel nedeni bakteriyel ve fungal enfeksiyonlar nedeni ile düşük su alımıdır. Vazo ömrünü uzatmak için ise koruyucu solüsyonların kullanımı önerilmektedir. Gümüş iyonları mikroorganizma aktivitelerini inhibe etmek için bir antiseptik bileşik olarak kullanılmaktadır. Ancak insan sağlığı ve çevre üzerine ağır metallerin etkisi göz önüne alındığında güvenli çevre dostu materyallerin kullanımı zorunlu olmaktadır. Bu çalışma da Rosalin gerbera çeşidinde adaçayı (*Salvia officinalis*) ve melisa (*Melissa officinalis*) ekstraktlarının vazo ömrü üzerine etkinliklerini belirlemek amacı ile gerçekleştirilmiştir. Araştırmada adaçayı ve melisa ekstraktları vazo solüsyonlarına farklı konsantrasyonlarda (50 ve 100 µL/100 mL) uygulanmıştır. Vazo ömrü (gün), oransal taze ağırlık (%) ve su alımı (mL/gün) değerleri belirlenmiştir. Bunların yanında ekstraktların antimikrobiyal etkili bileşikler oldukları bilinen toplam fenolik bileşik içerikleri de spektrofotometrik olarak belirlenmiştir. Araştırma sonuçları bitki türü ve ekstrakt konsantrasyonuna bağlı olmak üzere gerbera da vazo ömrü üzerine uygulamaların etkili olduğunu göstermiştir. En uzun vazo ömrü adaçayı ekstraktları (50 µL/100 ml ve 100 µL/100 mL) ve melisa ekstraktından (50 µL/100 ml) elde edilmiştir. Toplam fenolik bileşik içeriğinin adaçayı ekstraktında melisa ekstraktına göre daha yüksek seviyelerde olduğu belirlenmiştir. Su alımı ve oransal taze ağırlık değerleri bakımından uygulamalar arasında istatistiksel bir farklılık bulunmadığı belirlenmiştir. Araştırmada sonuç olarak bitki ekstraktlarının Rosalin gerbera çeşidinde vazo ömrünü olumlu olarak etkilediği belirlenmiştir.

Anahtar Kelimeler: Gerbera, adaçayı, melisa, vazo ömrü, fenolik bileşik

INTRODUCTION

Gerbera (*Gerbera jamesonii*) belongs to the *Asteraceae* family, which is a perennial Mediterranean plant [1]. Gerberas are used for garden decoration, making bouquets and especially as cut flowers [2]. In recent years gerbera becomes one of the ten most popular cut flowers in the world. Moreover it occupies the fourth place in cut flowers according to global trends in floriculture [3].

Gerberas are very popular cut flowers due to a wide availability of varieties with vibrant petal colors and flower

forms [4]. But the most important problem of the gerbera flowers is the short-life and neck bending. Short vase life is economically important problems on the cut flowers, because it strongly affects consumer satisfaction and repeat purchasing and it influences the value of the cut flowers [5].

Vase life termination for many cut flowers is characterized by wilting which is due to loss of water from the cells [6]. When the volume of water uptake decreases,

water deficit and wilting develops. Low water uptake is often due to blockage of xylem vessels by microorganisms [7]. Many chemicals have been used in cut flowers vase solutions for inhibiting microorganisms growth, which extends the vase life by improving water uptake. These chemicals include silver nitrate, aluminum sulphate, 8-hydroxyquinoline sulphate and 8-hydroxyquinoline citrate, which are harmful for the environment and human health and also expensive [8, 9, 10, 11, 12, 13, 14, 15].

A suitable method for extended vase life, which easy to use, natural, safe and inexpensive compounds is always crucial in this respect for large-scale applications [2]. Natural plant extracts have come into prominence nowadays. Some natural plant extracts have strong antimicrobial properties against some pathogens. These antimicrobial properties are attributed to the high levels of phenolic compounds [16]. The aim of this study was to determine the effectiveness of sage (*Salvia officinalis*) and balm (*Melissa officinalis*) extracts which have phenolic compounds on vase life of gerbera cv. Rosalin.

MATERIALS AND METHODS

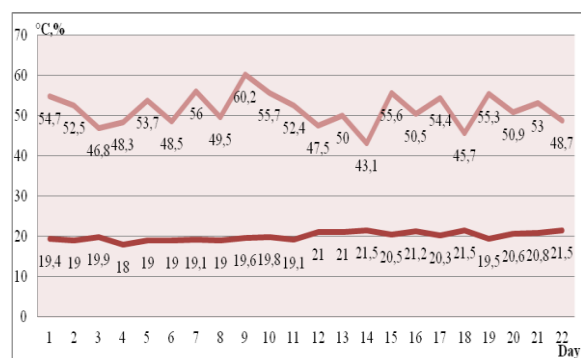
Gerbera cv. Rosalin was used as a plant material in this study. The cut gerbera flower (*Gerbera jasmonii*), 'Rosalin' were obtained from a commercial greenhouse in Antalya. Flowers were harvested at their commercial stage which had two rows of outer florets open on the central disk. They were immediately transferred to the Science and Technology Research and Application Center at Bozok University.

After reaching to laboratory, the stem of plants recuted in a 45±2 cm height and initial fresh weights were recorded at the start of experiment. Then flowers were placed in the 100 mL graduated cylinders containing 90 mL vase solutions. Each treatments had four replications of one flower.

Vase solutions which were prepared at the beginning of experiment. Solutions were consisting of sage (*Salvia officinalis*) (50 and 100 µL/100 mL) and balm (*Melissa officinalis*) (50 and 100 µL/100 mL) extracts. Control treatment was consisted on water.

The flowers were kept in a controlled room under the following conditions: 12 h photoperiod at a photosynthetically activated radiation of 1100 lux, provided by fluorescent lamps, temperature of 20±2°C and relative humidity of 50±5% (Table 1).

Table 1. Humidity and temperature values of controlled room



In this experiment, the measured traits were vase life, water uptake and relative fresh weight (RFW).

The determination of vase life

The end of vase life was defined as the time that flowers showed some symptoms of wilting and inrolling, stem bending (>90) or break

The determination of RFW

RFW was recorded every day and was calculated using the formula: $RFW (\%) = W_d / W_{d0} \times 100$ (W_d : stem weight; W_{d0} : initial stem weight).

The determination of water uptake

Water uptake (WU) was calculated by this formula: $WU (mL/day) = S_{d1} - S_d / W_{d0}$ (S_{d1} : solution weight in previous day; S_d : daily solution weight).

The determination of total phenolic compound content

For phenolic compound extraction leaves of sage and balm plants were separated, weighed and homogenized with ethyl alcohol. After incubated in water bath and centrifuged. Supernatant was evaporated in rotary evaporator. Obtained extracts were dissolved in methyl alcohol and later used in total phenolic compound analysis. Total phenolic compound amounts were analyzed in line with [17] through the use of Folin Ciocalteu colometric method. Spectrophotometer readings were carried out at 765 nm wavelength, and total phenolic compound amounts were determined in as mg/g in terms of gallic acid (Gallic Acid Equivalent=GAE) by utilizing the standard gallic acid curve. Analyses were conducted with 3 repetitions.

Statistical analysis: The data used in the study belong to gerbera plants, two plant extracts, two concentrations and control groups. Tests were conducted with four repetitions with one flower in each repetition. Data were subjected to analysis of variance with mean separation by Duncan's multiple comparisons test. Differences were considered statistically significant at the $p \leq 0.05$ levels. Statistical analysis was performed using packet programme of IBM SPSS Statistics 20.0.

RESULTS AND DISCUSSION

In this study, effects of balm and sage extracts were investigated to extend vase life on gerbera 'Rosalin'. According to variance analysis, effects of sage and balm extracts on vase life were significant statistically (Table 2). Sage extract (50 and 100 µL/100mL) and balm extract (50 µL/100mL) was more effective on vase life than balm extract on 100 µL/100mL concentration and control group.

Within the scope of the study also the changes introduced to gerbera cv. Rosalin vase solution by plant extracts were examined. It was determined that applying extracts on vase solution did not result in any statistically significant difference in water uptake and RFW. However, the lowest water uptake was obtained from control group as a value. RFW values were obtained at close levels on sage extract (50 µL/100 mL) and control group (102,63 and 101,77 % respectively) (Table 2).

The total phenolic compound contents of sage and balm extracts were also determined in this study. It was observed that the plant extracts used in the study, the phenolic compound content of sage reached higher levels than those reached by the balm extract. As a matter of fact, it was observed that the 38.326 mg/g (GAE) total phenolic compound content of the sage extract was higher approximately 40 fold than other (Table 3).

Table 2. Effects of sage and balm extracts on gerbera cv. Rosalin flowers

	Vase Life (day)	Water Uptake (mL/dayg)	RFW (%)
Sage (50 µL/100 mL)	21,00 a*	0,72	102,63
Sage (100 µL/100 mL)	19,00 ab	0,70	95,48
Balm (50 µL/100 mL)	19,00 ab	0,88	97,81
Balm (100 µL/100 mL)	18,25 b	0,83	97,64
Control	16,25 b	0,66	101,77

p<0,05

*The letters show the difference among the extracts. The differences among the letters are important in p<0.05 level.

Table 3. Total phenolic compound contents of sage and balm extracts

Phenolic content (mg/g GAE)	Sage extract	Balm extract
	38,326	0,948

There are many studies for extension of vase life by using plant extract. They generally focused on plants that contain large amounts of phenolic compounds have antioxidant activity [18, 19, 20]. For this purpose, among of the most used plants are black cumin, peppermint, lavender and especially thyme [13, 14, 19, 20, 21, 22, 23]. There is not a study about using of sage and balm in vase life. In these studies the concentration of used extracts have been found to be effective for vase life extension. Such natural treatments by using plant extracts are very important because of harmless on human health and the environment. Further investigation should be carried out to determine the optimal concentration of plant extracts to prolonging vase life.

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