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The effects of benzyl adenine, gibberellic acid and salicylic acid on quality of tulip cut flowers

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ABSTRACT: Tulip is known as an economical important ornamental plant. The present research was conducted based on completely randomized design to evaluate the induced changes in tulip cut flowers caused by the application of benzyl adenine (BA), Giobberellic acid (GA) and salicylic acid (SA). Tulip cut flowers were treated with different concentrations of SA (0, 50, 100 and 150 mgL^{-1}), GA (0, 20, 50 and 150 mgL^{-1}) and BA (0, 50, 75, 150 mgL^{-1}) in pulse method. Cut flowers were grouped in ten different treatment groups including control (C), BA50, BA75, BA150, GA20, GA50, GA100, SA50, SA100, SA150. The reduction rates of antocyanin contents during experimental days were alleviated by the applied treatments where the best results were found in BA or GA treated flowers. The application of the BA, GA and SA had stimulating effects on the activity of superoxide dismutase enzyme where the highest amounts were observed in GA20, GA50, GA100 and BA50, respectively. In comparison to the control samples, the decreasing rates of relative fresh weight of tulip cut flowers were significantly declined by the applied growth regulators.

Keywords: Benzyl adenine; Gibberellic acid; Phytohormones; Postharvest; Salicylic acid; Senescence

Abbreviations: BA- benzyl adenine; GA- gibberellic acid; SA- salicylic acid; SOD- superoxide dismutase

INTRODUCTION

With regard to the modern flower industry, there is more attention to the postharvest longevity of cut flowers. It is stated that the postharvest life of cut flowers could be changed using different chemicals (Prashanth et al., 2010).

Various plant growth regulators are involved in the regulation of senescence process. The application of phytohormones as preservatives in vase solution have been suggested by the many researchers (Han, 2001; Emongor, 2004; Singh et al., 2008; Danaee et al., 2011; Janowska and Stanecka, 2011) to extend longevity of cut flowers. However, the obtained results in different studies are variable mainly depend on plant species, the applied preservatives and the used concentrations. Different kinds of preservatives should be supplied based on the plant species at correct time and concentrations, to extend cut flower longevity.

Tulip belongs to the Liliaceae family and known as an economical important ornamental plant. However, there are little researches on the postharvest longevity of tulip cut flowers. The objectives of this study are the evaluation of the induced changes caused by the application of benzyl adenine (BA), Giobberellic acid (GA) and salicylic acid (SA) in pulse treatment method as well as the determination of the best preservatives for promoting the vase life of tulip cut flowers.

MATERIAL AND METHODS

Cut tulip flowers, Tulip apeldoorn Elite, were prepared from reliable commercial growers. Experiments were done in a postharvest room (22 ± 1 ºC, 60 ± 5% relative humidity and 12 h photoperiods). Cut flowers were re cut, weighted and treated for 24 hours (pulse treatment) with different concentrations of salicylic acid (SA), gibberellic

acid (GA) or benzyl adenin (BA). Various concentrations of SA (0, 50, 100 and 150 mgL^{-1}), GA (0, 20, 50 and 150 mgL^{-1}) and BA (0, 50, 75, 150 mgL-1) were applied. The pulse treated cut flowers were transferred to the containers containing 3% (w/v) saccharose and 8-hydroxyquinoline sulphate (8HQS), 150 mgL^{-1}. Cut flowers were grouped in ten different treatment groups with three replications and five flowers in each replication: Control (C), BA50, BA75, BA150, GA20, GA50, GA100, SA50, SA100, SA150.

Superoxide dismutase (SOD) activity was determined according to the method of Giannopolitis and Ries (1977). One enzyme unit of SOD activity is defined as the amount of enzyme required to cause 50 % inhibition of the rate of nitro blue tetrazolium (NBT) reduction measured at 650 nm. The superoxide dismutase (SOD) activities were calculated and expressed as $UnitEg^{-1}fw$.

Flower pigmentation was quantified by measuring the amount of anthocyanins in petals using acidic methanol (1% HCl, v/v) as an extraction solvent. Anthocyanin concentrations of petals were calculated and expressed as A_{530} $g^{-1}fw$.

Relative fresh weights of cut flowers were calculated and expressed in percentages.

Analysis of variance was performed on all data sets using SPSS software. Duncan test with probability of 0.05 was used to assess significant differences between treatments.

RESULTS AND DISCUSSION

As it was indicated in table 1, the anthocyanin contents in all treatments gradually decreased during the experimental times. However, the reduction rates of anthocyanin contents were alleviated by the applied treatments where the best results were found in BA or GA treated flowers. The evaluation of the effects induced by the applied treatments on the activity of SOD enzyme revealed that the application of the BA, GA and SA had stimulating effects on the activity of SOD enzyme as an important antioxidant enzyme where the highest amounts were observed in GA20, GA50, GA100 and BA50 groups, respectively (Table 2). The stimulated antioxidant system could be resulted in alleviated senescence and declined degradation rates of compounds like anthocyanin.

The accumulations of reactive oxygen species were decreased via GA-increased activities of antioxidant enzymes in cucumber (Qing Zhu et al. 2011). The cellular antioxidant system could be influenced by the exogenous salicylic acid (SA) treatment (Huang et al., 2008). It is well documented that cytokinin is anti senscenece (Arteca, 1996).

The relative fresh weights of the cut flowers gradually decreased during experimental days. However, the decreasing rates of relative fresh weight of tulip cut flowers were significantly declined by the applied growth regulators (Table 3). It could be resulted from the increased solution uptake and reduced transpiration rates induced by the used treatments. It seems that higher water contents observed in SA, BA or GA treated samples resulted from the increased solution uptake and/or decreased transpiration.

A positive correlation was found between vase life and solution uptake in cut flowers (Nazari Deljou et al. 2011). There was negative correlation between SA application and microbe population in vase solution of carnation cut flowers (Kazemi et al., 2011). The declined loss of fresh weight in SA treated cut flowers has been related to the decreasing effects of SA on tissue transpiration and respiration (Hatamzadeh et al., 2012). Cytokinins and gibberelins have potential to decline weight loss and improved quality of cut gerbera flowers (Danaee et al., 2011).

In collusion, based on our results it seems that BA, GA and SA has potential to induce favorable changes like stimulated antioxidant enzymes, declined degradation and alleviated senescence which could affect longevity and quality of cut flowers during the postharvest life.

Table 1. The effects of different concentration of BA, GA and SA on anthocyanin contents in petal tissues during experimental days expressed as $A_{530}g^{-1}fw$

days treatments	٠	3	6
Control	1.97a	1.6c	1.36e
BA50	1.97a	2.06a	1.96a
BA75	1.96a	1.96a	1.86ab
BA150	1.95a	2a	1.8abc
GA20	2a	1.87ab	1.8abc
GA50	1.95a	1.96a	1.9ab
GA100	1.98a	2a	1.86ab
SA50	2a	1.7bc	1.51de
SA100	1.96a	1.9ab	1.66bcd
SA150	2a	2a	1.58cde

*: Data are means of three replicates. Mean values followed by different letters (a, b, c, d, e) are significantly different, according to the Duncan's test.

Table 2. The effects of different concentrations of BA, GA and SA on superoxide dismutase activities during experimental days expressed as UnitEg^{-1}fw.

days treatment groups	٠	3
Control	7.66a	6.5e
BA50	7.73a	11.9bc
BA75	7.63a	11.16cd
BA150	7.6a	10.63d
GA20	7.56a	15.7a
GA50	7.63a	12.4b
GA100	7.6a	12.4b
SA50	7.73a	10.23d
SA100	7.56a	11.05cd
SA150	7.76a	11.23cd

*: Data are means of three replicates. Mean values followed by different letters (a, b, c, d, e) are significantly different, according to the Duncan's test.

Table 3. The effects of different concentration of BA, GA and SA on relative fresh weight of cut flowers during experimental days expressed as percent.

Days Treatment groups	٠	2	4	6	8
Control	100a	92.8b	77.6c	62.5c	-
BA50	100a	100a	95.6a	89.5a	86.1a
BA75	100a	99.6a	95.3a	86.6ab	82.3ab
BA150	100a	100a	96.3a	87.2a	75.5abcd
GA20	100a	100a	93a	89a	78.4abc
GA50	100a	100a	89.5abc	81ab	74.5abcde
GA100	100a	100a	90.48ab	86.2ab	82.6ab
SA50	100a	100a	80.4bc	75b	64.5e
SA100	100a	100a	94.1a	91.5a	71.6de
SA150	100a	100a	94a	86ab	70.33de

*: Data are means of three replicates. Mean values followed by different letters (a, b, c, d, e) are significantly different, according to the Duncan's test.

REFERENCES

Arteca RN. 1996. Plant growth substances: principles and application. Chapman and Hall: New York.

Danaee E, Mostofi Y, Moradi P. 2011. Effect of GA3 and BA on postharvest quality and vase life of gerbera (Gerbera jamesonii. cv. Good Timing) cut flowers. Hortic Environ Biotechnol. 52(2):140-144.

Emongor VE. 2004. Effect of gibberellic acid on postharvest quality and vase life of gerbera cut flowers (Gerbera jamesonii). J Agron. 3: 191-195.

Giannopolitis CN, Ries SK. 1977. Superoxide dismutase, purification and quantitative Relationship with water soluble protein in seedlings. Plant Physiol. 59: 315-318.

Han SS. 2001. Benzyladenine and Gibberellins Improve Postharvest Quality of Cut Asiatic and Oriental Lilies. Hort Sci. 36(4):741–745.

Hatamzadeh A, Hatami M, Ghasemnezhad M. 2012. Efficiency of salicylic acid delay petal senescence and extended quality of cut spikes of Gladiolus grandiflora cv 'wing's sensation'. Afr J Agric Res. 7(4): 540-545.

Huang R, Xia R, Lu Y, Hu L, Xu Y. 2008. Effect of pre-harvest salicylic acid spray treatment on post-harvest antioxidant in the pulp and peel of 'Cara cara' navel orange (Citrus sinenisis L. Osbeck). J Sci Food Agric. 88(2): 229–236.

Janowska B, Stanecka A. 2011. Effect of growth regulators on the postharvest longevity of cut flowers and leaves of the CALLA LILY (Zantedeschia Spreng.). Acta Agrobotanical 64 (4): 91–98.

Kazemi M, Hadavi E, Hekmati J. 2011. Role of salicylic acid in decreases of membrane senescence in Cut Carnation Flowers. J Agric Tech. 7(5): 1417-1425.

Nazari deljou MJ, Khalighi A, Arab M, Karamian R. 2011. Postharvest evaluation of vase life, stem bending and screening of cultivars of cut gerbera (Gerbera jamesonii Bolus ex. Hook f.) flowers. Afr J Biotechnol. 10 (4): 560-566.

Prashanth P, Chandra Sekhar R, Chandra Sekhar Reddy K. 2010. Influence of floral preservatives on scape bending, biochemical changes and post harvest vase life of cut gerbera (Gerbera Jamesonii bolus ex. Hook.). Asian J Hortic. 5(1): 1-6.

Qing Zhu L, Chao Han L, Xian Chang Y, Qing Hua S. 2011. Gibberellin A_3 pretreatment increased antioxidative capacity of cucumber radicles and hypocotyls under suboptimal temperature. Afr J Agric Res. 6(17): 4091-4098.

Singh A, Kumar J, Kumar P. 2008. Effects of plant growth regulators and sucrose on post harvest physiology, membrane stability and vase life of cut spikes of gladiolus. Plant Growth Regul. 55: 221–229.

Zamani S, Kazemi M, Aran M. 2011. Postharvest Life of Cut Rose Flowers as Affected by Salicylic Acid and Glutamin. World Appl Sci J. 12 (9): 1621-1624.