P-ISSN: 2305-6622; E-ISSN: 2306-3599

International Journal of

Agriculture and Biosciences

www.ijagbio.com; editor@ijagbio.com

Research Article

Effect of Ascorbic Acid and Acetyl Salicylic Acid on the Quality and Vase Life of Cut Flowers Gladiolus (*Gladiolus persicus*)

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Article History: Received: August 08, 2016 Revised: October 14, 2016 Accepted: November 11, 2016

ABSTRACT

Salicylic acid (SA) belongs to phenolic compound and is an endogenous growth regulator which participates in regulation of physiological processes in plants such as seed germination, fruit yield, glycolysis, flowering and heat production in thermo genic plants. Gladiolus is prized by florists for their showy flower spikes, and by growers for their relative ease of production. Like other flowers with spike inflorescences, gladiolus is normally harvested with relatively few open florets, and the life of the flower is a function both of the life of individual florets, and of the postharvest expansion and opening of the buds remaining on the spike. To evaluate the effect of ascorbic acid and acetyl salicylic acid on the quality and vase life of cut flowers gladiolus (*Gladiolus persicus*), this experiment as factorial in a randomized complete block design with four replications has been conducted. Ascorbic acid in concentrations of 0, 2, 4 and 6 mM as the first factor and salicylic acid in concentrations of 0, 50, 100 and 150 mg per liter were considered as the second factor. Analysis of variance showed that the effect of salicylic acid and ascorbic acid on all characteristics was significant.

Key words: Gladiolus, Ascorbic acid, Salicylic acid, Lifetime

INTRODUCTION

Salicylic acid (SA) belongs to phenolic compound and is an endogenous growth regulator which participates in regulation of physiological processes in plants such as seed germination, fruit yield, glycolysis, flowering and heat production in thermo genic plants (Delavari *et al*., 2010). Ion uptake and transport (Harper and Balke, 1981), photosynthesis rate, stomatal conductivity and transpiration (Khan *et al*, 2003) could also be affected by SA application. Several methods of SA application (seeds soaking prior to sowing, adding to the hydroponic solution, irrigating or spraying with SA solution) have been shown to protect various plant species against abiotic stress by inducing a wide range of processes involved in stress tolerance mechanisms (Horvath *et al*., 2007). Agarwal *et al*. (2005) demonstrated the enhanced chlorophyll levels and relative water content (RWC) as well as the lessened hydrogen peroxide (H2O2) and lipid peroxidation when the wheat leaves were treated with SA under water stress conditions. Application of SA significantly increased growth parameters, photosynthetic pigments and proline content and decreased lipid peroxidation in sweet basil under salinity stress condition (Delavari *et al*., 2010). In addition, Yazdanpanah *et al* (2011) reported that SA application declined adverse effect of drought in savory by increasing sugar, protein and proline accumulation and decreasing Malondialdehyde (MDA) and other aldehydes. Several studies also supported a major role of SA in modulating the plant response to several abiotic stresses including drought (Senaratna *et al*., 2000; Yazdanpanah *et al*., 2011). Delavari *et al.* (2010) also indicated that SA increases the leaf area in sweet basil plants, which is agreement of our results. Senaratna *et al.* (2000) have suggested a similar mechanism to be responsible for SA induced multiple stress tolerance in bean and tomato plants. In recent years, growing of non-traditional high value horticultural crops has become a popular way to fetch higher profits which may also help improve the economic livelihood of the growers by raising their living standards. However, to get maximum benefit of these crops, their production and postharvest handling technologies need to be optimized. Currently, there is dire

Cite This Article as: Ravanbakhsh A, HR Mobasser and MR Hasandokht, 2017. Effect of ascorbic acid and acetyl salicylic acid on the quality and vase life of cut flowers gladiolus (*Gladiolus persicus*). Inter J Agri Biosci, 6(1): 31-33. www.ijagbio.com (©2017 IJAB. All rights reserved)

need to standardize agro-techniques for potential cut flower crops for different regions, which are most suitable to local climatic and edaphic conditions (Ahmad *et al*., 2008). Both the soil and climatic conditions have profound effect on the nourishment, growth and subsequent survival of plants. Growth and yield performance of gladiolus is strongly influenced by different climatic conditions (Lu *et al*., 1996). Al-Humaid (2004) demonstrated that besides the genetic makeup, environmental conditions are also important factors which determine the growth and development of gladiolus under specific conditions. Many studies have reported the influence of climatic and edaphic factors on performance of different cultivars of gladiolus (Arora and Sandhu, 1987; Leena *et al*., 1993). Gladiolus is prized by florists for their showy flower spikes, and by growers for their relative ease of production. Like other flowers with spike inflorescences, gladiolus is normally harvested with relatively few open florets, and the life of the flower is a function both of the life of individual florets, and of the postharvest expansion and opening of the buds remaining on the spike. Ideally, many of the florets on the spike should open before the senescence of the bottom florets. Because the dead florets are unattractive, senescence of the bottom florets marks the end of the flower spike's commercial display life. The typical life of these florets on a spike placed in water is 4 to 6 days (Marousky, 1968; Mayak *et al*., 1973). Modest increases in the life of gladiolus flowers have been gained by pulsing with sucrose, or using vase preservatives containing sucrose (Marousky, 1971). Ascorbic acid (AA), the main source of vitamin C for humans, is a small and water-soluble antioxidant molecule. It is also an essential compound for plants, with important roles as an antioxidant and as a modulator of plant development through hormone signaling (Pastori *et al*., 2003). In addition, AA plays important roles in many physiological processes such as seed germination (Tavili *et al*., 2009), seedling growth, flowering (Barth *et al*., 2006), membrane permeability), ion intake to roots, photosynthesis, respiration, senescence (Kim *et al*., 2008), protein and nucleic acid contents and activities of enzymes as peroxidase, superoxide dismutase (Ejaz *et al*., 2012). On the other hand, there are few studies about the effects of AA on the seed germination and seedling growth under normal and saline conditions. Some experimental studies have shown that exogenous application of AA stimulates the germination percentage and early seedling growth of wheat (Afzal *et al*., 2006).

MATERIALS AND METHODS

Location of experiment

The experiment was conducted at the zahedan which is situated between 53° North latitude and 28° East longitude.

Composite soil sampling

Composite soil sampling was made in the experimental area before the imposition of treatments and was analyzed for physical and chemical characteristics.

Field experiment

The field experiment was laid out factorial with randomized complete block design with three replications.

Treatments

Treatments included factor a: Ascorbic acid (o, 2, 4 and 6 mM) and factor b consisted of salicylic acid (0, 50, 100, 150 mgl).

Data collect

Data collected were subjected to statistical analysis by using a computer program MSTATC. Least Significant Difference test (LSD) at 5% probability level was applied to compare the differences among treatments` means.

RESULTS AND DISCUSSION

Vase life

Analysis of variance showed that the effect of ascorbic acid on vase life of the flower was significant (Table 1). The maximum of vase life of the flower of treatments 6mM ascorbic acid was obtained (Table 2). The minimum of vase life of the flower of treatments 0mM ascorbic acid was obtained (Table 2). Analysis of variance showed that the effect of salicylic acid on vase life of the flower was significant (Table 1). The maximum of vase life of the flower of treatments 150 mgl salicylic acid was obtained (Table 2). The minimum of vase life of the flower of treatments 0 mgl salicylic acid was obtained (Table 2).

Number of yellow leaves

Analysis of variance showed that the effect of ascorbic acid on number of yellow leaves was not significant (Table 1). The maximum of number of yellow leaves of treatments 0 salicylic acid was obtained (Table 2). The minimum of number of yellow leaves of treatments 6 salicylic acid was obtained (Table 2). Analysis of variance showed that the effect of salicylic acid on number of yellow leaves was significant (Table 1). The maximum of number of yellow leaves of treatments 0 mgl salicylic acid was obtained (Table 2). The minimum of number of yellow leaves of treatments 150 mgl salicylic acid was obtained (Table 2).

Wilting percent

Analysis of variance showed that the effect of ascorbic acid on wilting percent was significant (Table 1). The maximum of wilting percent of treatments 0mM ascorbic acid was obtained (Table 2). The minimum of wilting percent of treatments 6mM ascorbic acid was obtained (Table 2). Analysis of variance showed that the effect of salicylic acid on wilting percent was significant (Table 1). The maximum of wilting percent of treatments 0 mg.l salicylic acid was obtained (Table 2). The minimum of wilting percent of treatments 150 mgl salicylic acid was obtained (Table 2).

Floret open (%)

Analysis of variance showed that the effect of ascorbic acid on floret open was significant (Table 1). The maximum of floret open of treatments 6mM ascorbic acid was obtained (Table 2). The minimum of floret open of treatments 0mM ascorbic acid was obtained (Table 2). Analysis of variance showed that the effect of salicylic acid on floret open was significant (Table 1). The maximum of floret open of treatments 150 mg.l salicylic acid was obtained (Table 2). The minimum of floret open of treatments 0 mgl salicylic acid was obtained (Table 2).

Table 1: Anova analysis of the gladiolus affected by ascorbic acid and salicylic acid

S.o.v	df	Vase life	Number of yellow leaves	Wilting percent	Floret open (%)
Ascorbic acid (A)	3	8.03^{*}	16.76^{ns}	7.22^{*}	47.02^{**}
Salicylic acid (B)	3	11.50^{**}	89.94^{**}	29.54^{**}	75.45^{**}
A*B	9	6.63^{**}	33.33^{ns}	10.58^{**}	37.58^{**}
Error	48	2.17	16.54	1.71	6.4
CV	-	23.81	27.62	18.15	16.29

*, **, ns: significant at P<0.05 and P<0.01 and non-significant, respectively.

Table 2: Comparison of different traits affected by Ascorbic acid and salicylic acid

Treatment	Vase life	Number of yellow leaves	Wilting percent	Floret open (%)
Ascorbic acid (A)				
0	5.15b	15.75a	8.08a	13.34c
2	6.37a	13.87a	7.17ab	16.47ab
4	6.53a	15.45a	7.10b	15.08bc
6	6.71a	13.81a	6.45b	17.24a
Salicylic acid				
0	5.08b	17.02a	8.60a	12.46b
50	6.13a	15.93a	7.94a	15.55a
150	7.11a	11.56b	5.51c	17.14a
200	6.44a	14.37ab	6.75b	16.99a

Any two means not sharing a common letter differ significantly from each other at 5% probability.

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