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EFFECT OF GROWTH REGULATORS ON THE POSTHARVEST LONGEVITY OF LEAVES OF SEA LAVENDER (*LIMONIUM LATIFOLIUM* (SM.) KUNTZE)

Summary. Conditioning of the leaves in gibberellic acid or placing without conditioning them in benzyladenine at concentrations of 25 and 50 mg/dm^3 extended the postharvest longevity of leaves of the *Limonium latifolium.* Conditioning of the leaves in gibberellic acid at the concentration of 25 and 50 mg/dm^3 influences the inhibiting effect on chlorophyll degradation.

Key words: sea lavender, leaves longevity, gibberellic acid, benzyladenine

Introduction

With the development of the art of arrangement of cut flowers, there has been a growing interest in florists' green, which is an indispensable element of floral compositions today. The popularity of *Asparagus* shoots, once extremely fashionable, has been falling from year to year. Today's bouquets contain leaves and shoots of greenhouse plants from both, the domestic production and from abroad. The leaves of perennial plants that are gaining in importance: the *Hosta*, *Bergenia*, *Dictamnus*, *Paeonia*, *Heuchera*, and many others (CZEKALSKI 2006). With the fuel and energy prices growing, this is economically sound. Since the knowledge of the longevity of leaves of perennial plants is scant, it is reasonable to carry out experiments giving an insight into the behaviour patterns of leaves of this group of plants after cutting.

Material and methods

Leaves of the *Limonium latifolium* (Sm.) Kuntze were conditioned and then placed in benzyladenine solutions. Conditioning in aqueous solutions of gibberellic acid at

concentrations of 25 and 50 mg/dm^3 lasted 4 h; was used of Gibrescol 10 MG containing 10% of gibberellic acid (GA_3). The leaves were then placed in water or in benzyladenine solutions (BA) at concentrations of 25 and 50 mg/dm^3. The control leaves were placed in water. The solutions were slightly acidic (pH ±5.0).

The postharvest longevity of the leaves was determined in a room with a temperature of 18-20°C, a 12-hour photoperiod, lighted by fluorescent lamps emitting white light with a quantum irradiance intensity of 25 μmol/m^2 per 1 s and a relative air humidity of 70%. Every day during the experiment water was changed and benzyladenine solutions replenished.

The longevity of the leaves was determined in days. The loss of ornamental value was set at that point in time when 30% of the area of leaf blades had turned yellow and/or wilted. After the experiment had finished, a Chlorophyll Meter SPAD-502 apparatus (Minolta) was used to determined the index of leaf greenness, which is correlated with chlorophyll content (GREGORCZYK and RACZYŃSKA 1997, GREGORCZYK et AL. 1998).

The experiment consisted of nine treatments with three replications, five leaves in each. Each treatment (a conditioning solution × benzyladenine concentration) included 15 leaves.

The results of the experiment were subjected to a two-factorial analysis of variance using Duncan's test at the $\alpha = 0.05$ significance level.

Results

The postharvest longevity of leaves of the *L. latifolium* depended significantly on both factors, the concentration of gibberellic acid and benzyladenine. Control leaves, i.e. those kept in water, maintained their ornamental value for the shortest period – six days (Table 1). Irrespective of the concentrations, the conditioning of leaves in the aqueous solutions of gibberellic acid extended leaf longevity by 20.0% and average. When comparing the interaction between the agents used, the longevity of the leaves was found to

Table 1. Effect of gibberellic acid and benzyladenine on the postharvest longevity of sea lavender leaves (days)
Tabela 1. Wpływ kwasu giberelinowego i benzyloadeniny na pozbiorczą trwałość liści zatrwianu szerokolistnego (dni)

Conditioning in GA_3 (mg/dm^3)	BA concentration			Mean for GA_3 concentration
	0 mg/dm^3	25 mg/dm^3	50 mg/dm^3	
0	6.0 a	12.1 b	11.5 b	9.9 a
25	11.7 b	12.8 b	11.2 b	11.9 b
50	11.6 b	12.5 b	11.9 b	12.0 b
Mean for BA concentration	9.8 a	12.5 b	11.5 b	

Means followed by the same letter do not differ significantly at $\alpha = 0.05$.

increase from 86.7 to 113.3% after the application of the growth regulators. In turn, no significant differences in effects were recorded between the concentrations of gibberellic acid and benzyladenine (Table 1).

The index of leaf greenness, depended only on the concentration of gibberellic acid (Table 2). The leaves conditioned in gibberellic acid at both concentrations, whether next placed in water or in benzyladenine at concentrations of 25 and 50 mg/dm^3, had a significantly higher index of leaf greenness than the leaves of control, which is correlated with a higher chlorophyll content.

Table 2. Index of leaf greenness (SPAD value) of sea lavender at the moment of loss of decorative value
Tabela 2. Indeks zazielenienia liści (SPAD) zatrwianu szerokolistnego w momencie utraty walorów dekoracyjnych

Conditioning in GA_3 (mg/dm^3)	BA concentration			Mean for GA_3 concentration
	0 mg/dm^3	25 mg/dm^3	50 mg/dm^3	
0	65.6 a	63.3 a	63.2 a	64.0 a
25	72.6 b	71.2 b	72.5 b	72.1 b
50	70.6 b	72.9 b	70.4 b	71.3 b
Mean for BA concentration	69.6 a	69.1 a	68.7 a	

Means followed by the same letter do not differ significantly at $\alpha = 0.05$.
Initial index of leaf greenness: 87.0.

Discussion

Leaves of the *L. latifolium* preserved their ornamental value for six days when placed in water. The use of gibberellic acid at concentrations of 25 and 50 mg/dm^3 to condition the leaves and in benzyladenine of the same concentrations as constant solution significantly extended their postharvest longevity. Moreover, the conditioning of leaves in gibberellic acid as well as placing them next in water or benzyladenine inhibited chlorophyll degradation. In the studies by JANOWSKA and SCHROETER-ZAKRZEWSKA (2008), an improvement in the longevity of leaves of the *Arum italicum* was obtained through the use of gibberellic acid for their conditioning and benzyladenine at concentrations of 50 and 100 mg/dm^3 at the late stage of extending their longevity. The efficiency of benzyladenine at a concentration of 100 mg/dm^3 was only visible in this species in leaves that had been conditioned in gibberellic acid. GA_3 also inhibited chlorophyll degradation in the senescent leaves of the *A. italicum*. A similar effect was recorded in leaves kept throughout the experiment in a BA solution at a concentration of 50 mg/dm^3. In a study by JANOWSKA and JERZY (2003), gibberellic acid had a favourable effect on the longevity of cut leaves of *Zantedeschia* with colourful spathes. In the cultivars 'Florex Gold' and 'Black Magic', ornamental value was preserved the longest by leaves conditioned in a solution of gibberellic acid at a concentration of 300 mg/dm^3.

Comparable longevity was displayed by leaves of 'Florex Gold' kept in water and first conditioned in GA_3 at a concentration of 200 mg/dm^3. The extension of longevity was connected, moreover, with the inhibition of chlorophyll degradation, as a result of which the leaves kept longer their green colour. Similarly, in *Z. aethiopica* gibberellic acid extended the postharvest longevity of its leaves as much as sixfold (ŁUKASZEWSKA 2000, SKUTNIK et AL. 2004). The response was similar in the leaves of *Hippeastrum hybridum* in which gibberellic acid prolonged longevity eightfold (SKUTNIK 1998, ŁUKASZEWSKA 2000). In a study by SKUTNIK et AL. (2004), gibberellic acid retarded chlorophyll degradation in leaves of the *Z. aethiopica* and *Z. elliottiana*, thus prolonging their postharvest longevity. In a research by SKUTNIK and RABIZA-ŚWIDER (2008), the soaking of shoots of the *Asparagus falcatus* in a 1 mmol/dm^3 BA solution and in a solution of gibberellic acid of the same strength increased their longevity 1.5 times, while the conditioning of shoots of this species in a BA solution proved ineffective, and in a solution of gibberellic acid even reduced the postharvest longevity of the shoots. In an earlier study by SKUTNIK et AL. (2006), the effectiveness of the growth regulators depended on both, the *Asparagus* species and cultivar, and on the form of application. The use of gibberellic acid extended the longevity of cut shoots of the *A. densiflorus* 'Myriocladus', but only when the shoots had been subjected to 24-hour conditioning in a 0.25 mmol/dm^3 solution. In the case of *A. densiflorus* 'Meyerii', both forms of gibberellic acid application, i.e. 24-hour conditioning and short soaking of shoots, prolonged the period of their ornamental value. In *A. setaceus*, both conditioning and soaking of shoots in a BA solution proved effective. Treatments which extended the postharvest longevity of the *Asparagus* shoots also inhibited chlorophyll degradation.

The results of the experiment carried out are inducing for offering GA_3 to producers at concentration 25 and 50 mg/dm^3 applied for conditioning of leaves of the *L. latifolium* as an effective method of extending their postharvest longevity.

Conclusions

1. Conditioning of the leaves in gibberellic acid or placing without conditioning them in benzyladenine at concentrations of 25 and 50 mg/dm^3 extended the postharvest longevity of leaves of the *Limonium latifolium*.

2. Conditioning of the leaves in gibberellic acid at concentration of 25 and 50 mg/dm^3 influences the inhibiting effect on chlorophyll degradation.

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WPŁYW REGULATORÓW WZROSTU NA POZBIORCZĄ TRWAŁOŚĆ LIŚCI ZATRWIANU SZEROKOLISTNEGO (*LIMONIUM LATIFOLIUM* (SM.) KUNTZE)

Streszczenie. Kondycjonowanie liści w kwasie giberelinowym lub umieszczenie ich bez kondycjonowania w benzyloadeninie o stężeniu 25 i 50 mg/dm^3 wydłuża pozbiorczą trwałość liści zatrwianu szerokolistnego. Kondycjonowanie liści w kwasie giberelinowym o stężeniu 25 i 50 mg/dm^3 hamuje rozpad chlorofilu.

Słowa kluczowe: zatrwian szerokolistny, trwałość liści, kwas giberelinowy, benzyloadenina

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