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EFFECT OF GROWTH REGULATORS ON THE POSTHARVEST LONGEVITY OF CUT FLOWERS AND LEAVES OF THE CALLA LILY (*Zantedeschia* Spreng.)

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A b s t r a c t

The conditioning of flowers of the calla lily cultivar 'Albomaculata' in BA at concentrations of 50-150 mg×dm^{-3} extends their postharvest longevity by 6.2-14.5 days. An extension of the longevity of the flowers by 15 days can be obtained after the application of a solution of 8HQS with saccharose on a continuous basis. Effective in improving the longevity of leaves of cultivar 'Sunglow' is GA_3 at a concentration of 400 mg×dm^{-3}. What is more, its application at concentrations of 300-400 mg×dm^{-3} boosts their greenness index. GA_3 at concentrations of 50 and 100 mg×dm^{-3} extends the postharvest longevity of leaves of the cultivar 'Black Eyed Beauty' by 18 and 11 days, respectively, while BA shortens it. A combined application of BA and GA_3 inhibits chlorophyll degradation, while GA_3 and a mixture of BA and GA_3 inhibit protein degradation.

Key words: *Zantedeschia,* flowers, florist' greens, vase-life, BA, GA_3, 8HQS

INTRODUCTION

In the recent years, research has increasingly focused on the postharvest longevity of both flowers and florist greens, which have become an indispensable element of modern flower arrangements. So far, only a few studies have been made on cut flowers and leaves of the calla lily. T j i a and F u n n e l l (1986) report that the vase life of *Zantedeschia aethiopica* flowers lasts 6-7 days after cutting, while in *Zantedeschia elliottiana* the spathes turn green after 7-8 days, which is a visible symptom of the advancing process of senescence. Besides, peduncles placed in pure water tend to split and, to prevent it, the authors recommend an addition of sugar and 8-hydroxyquinoline citrate. However, as Ł u k a s z e w s k a and K o k o s a (1997) report, in *Zantedeschia aethiopica* sugar added to the medium brings about a rapid drop in the hydration level of tissues and the appearance of necrotic spots on spathes. In a research by J a n o w s k a and J e r z y (2004), the splitting of peduncles was not observed in cultivars 'Florex Gold' and 'Black Magic', while the greening of spathes appeared only in the cultivar 'Florex Gold'. The authors also obtained very good postharvest longevity in flowers, which kept their ornamental qualities for about 3-4 weeks after being placed in water. However, an undesirable development was the rotting of peduncle ends in the cultivar 'Black Magic' as a result of conditioning in a solution of 8-hydroxyquinoline citrate. Moreover, this practice shortened the postharvest vase-life of flowers by 7-8 days. Ornamental qualities were preserved the longest by those flowers which had been placed after cutting in solutions of gibberellic acid at concentrations of 50 and 100 mg×dm^{-3}. In the cultivar 'Florex Gold', postharvest longevity was the best in flowers which had been conditioned in a solution of 8-hydroxyquinoline citrate for 2 hours. In this cultivar, gibberellic acid also proved effective in extending longevity, because irrespective of the duration of conditioning in the solution of 8-hydroxyquinoline citrate, the flowers that had been then placed in solutions of this acid preserved their ornamental qualities several days longer.

There has been little research so far on the postharvest longevity of leaves of the calla lily. J a n o w s k a and J e r z y (2003a) obtained the most extended vase-life in leaves of the cultivars 'Florex Gold' and 'Black Magic' by conditioning them in solutions of gibberellic acid at concentrations of 200 and 300 mg×dm^{-3}. Moreover, improved longevity also involved slower chlorophyll degradation (J a n o w s k a and J e r z y , 2003b). Similarly, in *Zantedeschia aethiopica* gibberellic acid proved effective in extending the postharvest longevity

of leaves: it caused leaf longevity to increase as much as sixfold (Łukaszewska, 2000; Skutnik et al. 2004).

The aim of the present research was to assess the effect of conditioning of flowers in a water solution of benzyladenine and a standard flower preservative, containing 8-hydroxyquinoline sulphate (8HQS) and 2% saccharose, on the postharvest longevity of calla lily flowers of the cultivar 'Albomaculata' and to assess the effect of benzyladenine and gibberellic acid on the postharvest longevity of leaves of the cultivars 'Sunglow' and 'Black Eyed Beauty'.

MATERIAL AND METHODS

The research was conducted in the Department of Ornamental Plants of the University of Life Sciences in Poznań from July to August 2007. The cultivars employed were 'Albomaculata' and 'Black Eyed Beauty' deriving from the spotted calla (*Zantedeschia albomaculata* /Hook./ Baill.) as well as 'Sunglow' deriving from *Zantedeschia* sp.

Flowers were conditioned for 4 hours in water solutions of benzyladenine at concentrations of 50, 100, and 150 mg×dm^{-3}. They were then placed in distilled water or in an water solution of 8-hydroxyquinoline sulphate (8HQS) at a concentration of 200 mg×dm^{-3} with an addition of 2% saccharose. The control was flowers put in distilled water. The acidity of the solutions was pH ±5. During the experiment, water was changed every day and the aqueous 8HQS solutions were supplemented with saccharose to fill up.

The experiment consisted of 8 treatments, each involving 5 plants in 3 replications. One treatment (BA concentration x the longevity-improving solution) consisted of 15 flowers.

The postharvest longevity of the flowers was determined in days. The loss of their ornamental qualities was set at that point in time when they had turned green or when the tops of the spathes had dried. In the calla lily, a "flower" is a conventional simplifying term used to describe the inflorescence on a peduncle – a spadix – surrounded by a spathe.

Leaves of the cultivar 'Sunglow' were conditioned for 4 hours in water solutions of GA_3 at concentrations of 300 and 400 mg×dm^{-3}. They were then placed in distilled water or in aqueous solutions of BA at concentrations of 50 and 100 mg×dm^{-3}. The control was leaves put in distilled water.

The experiment consisted of 9 treatments, each involving 5 leaves in 3 replications. One treatment (GA_3 concentration x BA concentration) consisted of 15 leaves.

Leaves of the cultivar 'Black Eyed Beauty' with petioles shortened to 40 cm were conditioned for 12 hours in a cold room at 5°C. The conditioning involved water solutions of benzyladenine and gibberellic acid at the same concentrations of 50 and 100 mg×dm^{-3} as well as those in which the growth regulators had a concentration of 50 or 100 mg×dm^{-3}. After conditioning, the leaves were placed in distilled water. The control was leaves put in distilled water.

The postharvest longevity of the leaves was determined in days. The loss of their ornamental qualities was set at that point in time when they had turned yellow or when 30% of the leaf blades had wilted. Their greenness index, measured in SPAD units using a SPAD-502 Chlorophyll Meter (Gregorczyk and Raczyńska, 1997; Gregorczyk et al. 1998), as well as their content of chlorophylls *a+b* and proteins were determined. Noted was the initial index of leaf greenness measured at the start of the experiment as well as the initial content of chlorophylls *a+b* and proteins in the leaves.

The chlorophyll level was determined using the method presented in Hiscox and Israelstam (1979). It allows extracting pigments from plant material with the help of dimethyl sulphoxide (DMSO) without tissue maceration. Weighted portions were treated with 15 ml DMSO and incubated in a water bath at 65°C for 60 minutes. In the extract thus obtained, the level of chlorophylls *a+b* was determined spectrophotometrically. The total of chlorophylls *a+b* was calculated following ARNON (1949). The amounts of the individual pigments were given in mg×g^{-1} fresh weight.

The determination of protein content in the leaves was made with the help of Bradford's (1976) method. 2 ml of a solution of Coomassie Brilliant Blue G-250 (CBB) in 85% orthophosphoric acid was added to 100 µl of a diluted extract, with the extraction in a phosphorate-potassium buffer (pH 7.0). After 10 minutes the absorbance was measured at a wavelength of 595 nm. Protein content was determined from a curve plotted for albumin.

The experiments were conducted at a temperature of 18-20°C and a 12-h photoperiod, employing white luminescence light with a quantum irradiance intensity of 25 µmol m^{2}s^{-1}. The relative air humidity was maintained at 70%.

The results were processed with the help of univariate analysis of variance. The means were grouped using Duncan's test at the $\alpha = 0.05$ significance level.

RESULTS

The postharvest longevity of flowers of the cultivar 'Albomaculata' depended on both the concentration of benzyladenine applied for conditioning and the solution used after it (Table 1). Whether the flowers

were placed in water after the conditioning or in a solution of 8-hydroxyquinoline sulphate with saccharose, the longest-lived were those which had been conditioned in benzyladenine at concentrations of 50 or 150 mg×dm^{-3}. When comparing interactions between the factors, it was found that the greatest effect on the longevity of cut flowers of the calla lily was produced by their four-hour conditioning in the solution of benzyladenine at a concentration of 50 mg×dm^{-3} and then putting them in water, as well as by their direct placement in the aqueous solution of 8-hydroxyquinoline sulphate with saccharose without conditioning. In both cases, the vase-life of the flowers was about 25 days. In comparison with the control, their longevity grew by 14.5 and 15.0 days, respectively. The combination of flower conditioning in the solution of benzyladenine at 50 mg×dm^{-3} followed by their placement in the solution of 8HQS with saccharose reduced the effectiveness of both practices and shortened the longevity of the flowers to 20.3 days. An extension of the vase--life of flowers by about 10-11 days was obtained by conditioning them in benzyladenine at 150 mg×dm^{-3}, irrespective of the kind of solution to which they had been transferred after the conditioning. The least effective was the conditioning of flowers in benzyladenine at 100 mg×dm^{-3}, because their longevity increased by a mere 7 days.

The postharvest longevity of leaves of the cultivar 'Sunglow' depended significantly only on the concentration of BA. Whether or not the leaves had been conditioned, their placement in a solution of benzyladenine at concentrations of 50 and 100 mg×dm^{-3} decreased their vase life by 5.3-5.8 days. Significantly longer-lasting leaves were obtained only when put in water after four-hour conditioning in gibberellic acid at a concentration of 400 mg×dm^{-3} (Table 2).

Table 1.
Postharvest flower longevity of *Zantedeschia* 'Albomaculata' (days) depending on concentration of benzyladenine and type of solution used after conditioning

Concentration of BA (mg×dm^{-3})	Water	8HQS (200 mg×dm^{-3}) +2% sucrose	Mean for concentration of BA
0	9.9 a	24.9 d	17.4 *a*
50	24.4 d	20.3 c	22.3 *b*
100	16.1 b	16.8 b	16.4 *a*
150	20.3 c	21.2 c	20.8 *b*
Mean	17.6 **a**	20.8 **b**	

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

Table 2.
Postharvest longevity of *Zantedeschia* 'Sunglow' (days) leaves depending on concentration of gibberellic acid and benzyladenine

Concentration of GA_3 (mg×dm^{-3})	Concentration of BA (mg×dm^{-3})			Mean for concentration of GA_3
	0	50	100	
0	9.3 b	3.5 a	4.0 a	5.6 *a*
300	10.0 b	3.6 a	3.7 a	5.8 *a*
400	12.0 c	3.6 a	3.7 a	6.4 *a*
Mean for concentration of BA	10.5 **b**	3.6 **a**	3.8 **a**	

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

When comparing the leaf greenness index, significant differences were noted in its dependence on the concentration of gibberellic acid used for their conditioning and on the concentration of benzyladenine applied at a further longevity-improving stage (Table 3). The conditioning in gibberellic acid had a good effect on the index of leaf greenness.

The postharvest longevity of leaves of the cultivar 'Black Eyed Beauty' depended significantly on both the type of growth regulators and their concentration (Table 4). Irrespective of their concentration, ornamental qualities were kept the longest by leaves conditioned in gibberellic acid; they lasted in a vase for an average of 21.7 days. Benzyladenine, irrespective of its concentration, significantly reduced the postharvest longevity of leaves. What proved ineffective was the combination of the two growth regulators at whatever concentration in a conditioning solution, because the vase life of the leaves was close in this case to that of the control. When

comparing interactions, ornamental qualities were found to be preserved the longest by those leaves which were conditioned in a 50 mg×dm^{-3} solution of gibberellic acid: their vase-life was 30 days. In comparison with the control, their postharvest longevity increased by 15 days. Gibberellic acid at 100 mg×dm^{-3} was less effective, as it extended the longevity of leaves by 11 days.

Table 3.
Index of leaf greenness of *Zantedeschia* 'Sunglow' (SPAD) depending on concentration of gibberellic acid and benzyladenine

Concentration of GA_3 (mg×dm^{-3})	Concentration of BA (mg×dm^{-3})			Mean for concentration of GA_3
	0	50	100	
0	15.7 a	17.7 ab	18..7 ab	17.4 *a*
300	24.6 c	19.1 b	19.5 b	21.1 *b*
400	25.7 c	18.7 ab	20.4 b	21.6 *b*
Mean for concentration of BA	22.0 **a**	18.5 **b**	19.5 **b**	

Means followed by the same letter do not differ significantly at $\alpha = 0.05$
Index of initial leaf greenness 68.8

Table 4.
Effect of conditioning in gibberellic acid and benzyladenine
on postharvest leaf longevity of *Zantedeschia* 'Black Eyed Beauty' (days)

Growth regulator	Concentration (mg×dm^{-3})	Postharvest longevity of leaves
GA_3	0	12.0 b
	50	30.0 d
	100	23.0 c
	mean	21.7 **c**
BA	0	12.0 b
	50	8.9 a
	100	8.2 a
	mean	9.7 **a**
GA_3 + BA	0	12.0 b
	50 +50	11.9 b
	100 +100	12.0 b
	mean	12.0 **b**
GA_3 + BA	0	12.0 b
	50 +100	12.4 b
	100 +50	13.4 b
	mean	12.6 **b**

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

The content of chlorophyll *a+b* in the leaves of cultivar 'Black Eyed Beauty' at the close of the experiment depended significantly on both the growth regulator contained in the conditioning solutions and their concentrations (Table 5). The lowest chlorophyll content was noted in the control leaves placed in water. The highest chlorophyll content was recorded in leaves conditioned in gibberellic acid at 50 mg×dm^{-3}. A significantly high chlorophyll content was also displayed by leaves conditioned in gibberellic acid at 100 mg×dm^{-3}. In the remaining treatments in which the leaves were conditioned in benzyladenine or its mixture with gibberellic acid, chlorophyll levels were lower, but even so significantly higher than in the control.

A consequence of the advancing process of leaf senescence is proteolysis, i.e. the degradation of proteins. The statistical analysis showed significant differences in protein content at the end of the experiment on application of growth regulators at various concentrations for conditioning of leaves of the cultivar 'Black Eyed Beauty' (Table 6). Irrespective of their

concentration, the highest final protein content was recorded in the leaves conditioned in aqueous solutions containing a mixture of gibberellic acid and benzyladenine. A significantly high protein content was also noted in leaves conditioned in gibberellic acid at whatever concentration. When comparing interactions, it was found that the protein level was the highest in the leaves conditioned in the solutions of GA_3 +BA at concentrations of 100+100 mg×dm^{-3} and 50+100 mg×dm^{-3}. A significantly high protein content was observed in the leaves conditioned in the 100 mg×dm^{-3} solution of GA_3 and in GA_3+BA at a concentration of 50+50 and 100+50 mg×dm^{-3}. In the remaining treatments, protein degradation looked similar.

Table 5.
Effect of conditioning in gibberellic acid and benzyladenine on chlorophyll a+b content in leaves of *Zantedeschia* 'Black Eyed Beauty' (mg×g^{-1} FW)

Growth regulator	Concentration (mg×dm^{-3})	Chlorophyll a+b content
GA_3	0	0.8 a
	50	2.2 d
	100	1.8 c
mean		1.6 **c**
BA	0	0.8 a
	50	1.3 b
	100	1.3 b
mean		1.1 **a**
GA_3 + BA	0	0.8 a
	50 +50	1.2 b
	100 +100	1.2 b
mean		1.1 **b**
GA_3 + BA	0	0.8 a
	50 + 00	1.4 b
	100 +50	1.4 b
mean		1.2 **ab**

Means followed by the same letter do not differ significantly at $\alpha = 0.05$
Initial content of chlorophyll a+b – 4.0 mg·g^{-1} FW

Table 6.
Effect of conditioning in gibberellic acid and benzyladenine on protein content in leaves of *Zantedeschia* 'Black Eyed Beauty' (mg×g^{-1} FW)

Growth regulator	Concentration (mg×dm^{-3})	Protein content
GA_3	0	4.4 a
	50	4.9 a
	100	6.0 b
mean		5.1 **b**
BA	0	4.4 a
	50	4.1 a
	100	4.8 a
mean		4.4 **a**
GA_3+BA	0	4.4 a
	50 + 50	7.5 c
	100 + 100	8.4 d
mean		6.8 **c**
GA_3+BA	0	4.4 a
	50 + 100	8.5 d
	100 + 50	7.4 c
mean		6.8 **c**

Means followed by the same letter do not differ significantly at $\alpha = 0.05$
Initial content of protein – 10.0 mg·g^{-1} FW

DISCUSSION

Cut flowers display various postharvest longevity depending on species, cultivar, harvesting stage, and cultivation conditions. The vase life of flowers is one of the criteria in assessing their quality. In the experiment reported, flowers of the cultivar 'Albomaculata' put in water preserved their ornamental qualities for a mere 10 days. The reason of such rapid senescence was the greening of spathes caused by the appearance of chlorophyll in them. This phenomenon has already been observed by Tjia and Funnell (1986), who emphasised that the greening of spathes in the calla lily was the prime reason of the short postharvest longevity of its cut flowers. Still, as shown in a study by Janowska and Jerzy (2004), it is not in all cultivars that the spathes turn green, and the postharvest longevity of flowers may even extend to 3-4 weeks.

Hydroxyquinoline esters combined with saccharose are the most popular preservative used to extend the longevity of cut flowers. In the case of geophytes, its effectiveness has been proved, e.g. in *Gladiolus* (Łukaszewska, 1978), *Hippeastrum x chmielii* (Łukaszewska and Ilczuk, 2001), and *Alstroemeria* (Goszczyńska et al. 1988). In the present study, this preservative applied as a holding solution also proved effective, because the postharvest longevity of 'Albomaculata' flowers improved by as many as 2 weeks. However, a research should be conducted on other cultivars because, as shown in the literature, they can display a variety of responses, as corroborated by Janowska and Jerzy (2004) as well as Tjia and Funnell (1986).

To extend the longevity of cut flowers, ever more frequent use is made of growth regulators from the group of cytokinins and gibberellins. In the research reported, the conditioning of flowers of the cultivar 'Albomaculata' in benzyladenine at concentrations of 50-150 mg×dm^{-3} improved their vase-life by 7-14 days.

The effectiveness of benzyladenine in extending the longevity of cut flowers has been proved, among others, in *Astilbe x arendsii* 'Amethyst' in which benzyladenine applied at a concentration of 400 mg×dm^{-3} for 2- and 6-hour conditioning doubled the longevity of inflorescence shoots if the conditioning was followed by a continuous action of a 8HQS solution at a concentration of 200 mg×dm^{-3} with an addition of 2% saccharose (Pogroszewska and Sadkowska, 2006). Jakubowska et al. (2000) report that *Lathyrus latifolius* flowers last longer after 24-hour conditioning in benzyladenine at concentrations of 5 and 10 mg×dm^{-3} and a continuous treatment with this growth regulator at 10 mg×dm^{-3}. A favourable response to benzyladenine has also been observed in *Anthurium* (Paull and Chantrachit, 2001) and carnations (Wawrzyńczak and Goszczyńska, 2003), while it has been found to have no effect on the postharvest longevity of *Ixia* (Brzezina et al. 1994).

The process of senescence is different in cut leaves than in flowers, so preparations improving the longevity of cut flowers are often of little effect for leaves (Łukaszewska, 2000; Skutnik et al. 2001); hence the attempts to extend the longevity of cut greenery with the help of growth regulators. The research on the regulation of postharvest longevity started in the 1960s when cytokinins attracted attention as possible factors prolonging the postharvest longevity of vegetables. They were shown to be effective in celeriac and endive (Guzman, 1963) as well as lettuce (Wittwer and Dedolph, 1962). Later, they began to be applied to cut flowers (Heide and Oydvin, 1969; Han, 1995) and then florist greens (Skutnik et al. 2001). Cytokinins are effective in many cases but, as Çelikel et al. (2002) report, their effectiveness declines if they are combined with gibberellin.

In the present research, when comparing the effectiveness of gibberellic acid and benzyladenine in improving the longevity of leaves of the cultivar 'Sunglow', only gibberellic acid turned out to have a good effect: the conditioning of leaves in this growth regulator at a concentration of 400 mg×dm^{-3} extended their longevity by 3 days. Moreover, at concentrations of 300-400 mg×dm^{-3} gibberellic acid boosted the index of leaf greenness. Similarly, only this acid proved effective in leaves of the cultivar 'Black Eyed Beauty': at concentrations of 50 and 100 mg×dm^{-3} it extended their postharvest longevity. The combination of the two growth regulators in various concentration variants had no effect on the longevity of the leaves. Still, both gibberellic acid and benzyladenine inhibited chlorophyll degradation in the leaves, while gibberellic acid and a GA_3+BA mixture slowed down the degradation of proteins. Janowska and Jerzy (2003a and b) confirmed the beneficial effect of gibberellic acid on the postharvest longevity of leaves and chlorophyll content in cultivars 'Black Magic' and 'Florex Gold'. Łukaszewska (2000) and Skutnik et al. (2001), in turn, observed gibberellic acid to have a good effect on *Zantedeschia aethiopica* leaves: their longevity increased sixfold in comparison with the control, and chlorophyll degradation was inhibited. Similar results were obtained in the leaves of *Hippeastrum x hortorum*: after conditioning in a solution of gibberellin, their longevity increased as much as eight times (Skutnik, 1998; Łukaszewska, 2000). Gibberellin applied in *Alstroemeria* effectively inhibited chlorophyll degradation in leaves (Dai and Paull, 1991; Hicklenton, 1991), while in cut leaves of *Lilium longiflorum* and *Lilium* sp. gibberellin slowed down their yellowing (Han, 1995); this

effect, however, was not observed in the leaves left on plants (Han, 1997).

The effectiveness of a given growth regulator depends on the species and mode of application. As Skutnik et al. (2004) report, benzyladenine turned out to be less effective than gibberellic acid in improving the longevity of leaves of *Zantedeschia aethiopica* and *Zantedeschia elliottiana*. Skutnik and Rabiza-Świder (2005) demonstrated that the conditioning of *Z. aethiopica* leaves in a solution of gibberellic acid, and *Hosta* leaves in a solution of benzyladenine mitigated detrimental effects of keeping *Z. aetiopica* leaves dry and in the dark, and keeping *Hosta* leaves dry, whether in the dark or light. Besides, in both species this practice greatly extends postharvest longevity. An earlier study of Skutnik (1998) shows benzyladenine to be effective in extending the longevity of *Hosta* leaves conditioned or soaked in this growth regulator, and this also holds for shoots of *Asparagus densiflorus* 'Sprengerii'. Benzyladenine is also effective in extending the longevity of *Arum italicum* leaves (Janowska and Schroeter-Zakrzewska, 2008).

A consequence of the advancing process of leaf senescence is proteolysis, i.e. the degradation of proteins. There is little information in the available literature on the inhibition of this process after the use of growth regulators. In a research by Rabiza-Świder et al. (2004), leaves of *Zantedeschia aethiopica* and *Zantedeschia elliottiana* were subjected to 24-hour conditioning in solutions of benzyladenine and gibberellic acid. In both species only gibberellic acid effectively retarded the degradation of soluble proteins. The standard medium employed to extend the longevity of cut flowers accelerated proteolysis in leaves of *Z. aethiopica*, but did not show the same unfavourable effect on those of *Z. elliottiana*. A decline in the content of soluble proteins was accompanied by an accumulation of free amino acids. Similarly, in a study by Rabiza-Świder and Skutnik (2008), the conditioning of leaves of *Hosta* 'Crispula' and 'Undulata Mediovariegata' in gibberellic acid and benzyladenine retarded the degradation of soluble proteins, especially readily visible after the use of benzyladenine. In turn, placing *Hosta* leaves in the standard medium used for cut flowers accelerated proteolysis.

CONCLUSIONS

1. BA and 8HQS influence the postharvest longevity of calla lily flowers, while GA_3 and BA affect the postharvest longevity and quality of its leaves.
2. The conditioning of flowers of cv. 'Albomaculata' in BA at concentrations of 50-150 mg×dm^{-3} extends their postharvest longevity by 6.2-14.5 days. An extension of the longevity of the flowers by 2 weeks can be obtained after the application of a solution of 8HQS with saccharose as a holding solution.
3. Effective in improving the longevity of leaves of cultivar 'Sunglow' is GA_3 at a concentration of 400 mg×dm^{-3}. What is more, its application at concentrations of 300-400 mg×dm^{-3} boosts their greenness index.
4. GA_3 at concentrations of 50 and 100 mg×dm^{-3} extends the postharvest longevity of leaves of the cultivar 'Black Eyed Beauty', while BA shortens it. A combined application of BA and GA_3 inhibits chlorophyll degradation, while GA_3 and a mixture of BA and GA_3 inhibit protein degradation.

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Wpływ regulatorów wzrostu na trwałość pozbiorczą ciętych kwiatów i liści cantedeskii (*Zantedeschia* Spreng.)

Streszczenie

Kondycjonowanie kwiatów cantedeskii odmiany 'Albomaculata' w roztworze BA o stężeniu 50-150 mg×dm^{-3} wydłuża ich pozbiorczą trwałość o 6,2-14,5 dni. Wydłużenie pozbiorczej trwałości kwiatów o 15 dni uzyskuje się po zastosowaniu roztworu 8HQS z sacharozą w sposób ciągły. W przedłużaniu trwałości liści odmiany 'Sunglow' skuteczny jest GA_3 o stężeniu 400 mg×dm^{-3}. Zastosowanie go w stężeniu 300-400 mg×dm^{-3} zwiększa ponadto indeks zazielenienia liści. GA_3 o stężeniu 50-100 mg×dm^{-3} wydłuża pozbiorczą trwałość liści odmiany 'Black Eyed Beauty' odpowiednio o 18 i 11 dni, a BA – obniża ją. Łączne stosowanie BA i GA_3 hamuje degradację chlorofilu, a GA_3 oraz mieszanina BA i GA_3 hamuje rozpad białka.