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POSTHARVEST LONGEVITY OF THE LEAVES OF THE CALLA LILY (*Zantedeschia* Spreng.)

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Abstract. Effect of growth regulators on postharvest longevity of *Zantedeschia albomaculata* /Hook/ Baill.) leaves was evaluated in studiem. The aim of 3 experiments to evaluate the effect of topolin used in two forms: *meta*-methoxytopolin (MemT) and its riboside (MemTR) on postharvest longevity of 'Albomaculata' leaves. In the first experiment, the topolins were used in water solutions at concentrations of 25, 50 and 75 mg·dm^{-3} for 4-hour conditioning of leaves, which were then placed in distilled water. In the second experiment, their solutions at concentrations of 25 and 50 mg·dm^{-3} were employed for 24-hour conditioning of leaves in a cold room at a temperature of 5°C and for a short, seconds-long immersion of leaf blades. In the third experiments, the scheme of the second experiment was employed again, except that here the solutions contained not only the topolins but also gibberellic acid at the same concentrations. In the experiments the control was leaves placed in distilled water after cutting. MemT and MemTR affect the postharvest longevity and quality of conditioned leaves of the cultivar Albomaculata. At concentrations of 25–75 mg·dm^{-3} they extend their longevity and inhibit protein degradation, but have no effect on their greenness index. Applied at concentrations of 25–50 mg·dm^{-3} to soak leaf blades for a few seconds, both growth regulators improve the longevity of the leaves more effectively than their 24-hour conditioning. The combination of MemT with GA_3 at concentrations of 25 + 25 and 50 + 50 mg·dm^{-3} to soak leaf blades for a few seconds extends the postharvest longevity of the leaves by an average of 14–24 days and inhibits protein degradation, but has unfavourable effect on their greenness index.

Key words: *Zantedeschia*, vase-life, topolins, gibberellic acid, SPAD

INTRODUCTION

Because of the high requirements that cut flowers are expected to meet, the assessment of their quality involves not only the external look, but also their postharvest longevity. This applies to 'florists' green' too. In the few studies on this problem conducted so far, gibberellic acid has been found to have a beneficial effect on the postharvest

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longevity of flowers and leaves of the calla lily [Janowska and Jerzy 2003a, 2003b, Skutnik et al. 2004]. The research reported here sought to assess the effect of gibberellic acid and *meta*-methoxytopolin (MemT) and its riboside (MemTR) as well as a mixture of those growth regulators on the postharvest longevity of leaves of the calla lily with colourful spathes. Gibberellins and cytokinins are both used in studies of the postharvest longevity of flowers and 'florists' green'. In many species the two groups of growth regulators affect postharvest longevity, inhibiting or accelerating senescence [Ferrante et al. 2003, Janowska and Jerzy 2003a, 2003b, 2004, Skutnik et al. 2004, Skutnik and Rabiza-Świder 2005, Pogroszewska and Sadkowska 2006]. Their effectiveness depends on the application method, concentration, species, and often also on the cultivar. The topolins applied in the research are a new group of endogenous aromatic cytokinins isolated from the poplar at the Palacký University and the Institute of Experimental Botany in the Czech Republic. They are derivatives of benzylaminopurine. They feature a hydroxyl group in the *ortho* or *meta* position in the benzene ring. In the few studies of topolins carried out so far, they have only been employed to test their usefulness in *in vitro* cultures. In standard biological tests they have been shown to have a strong anti-ageing effect on leaves [Palavan-Űnsal et al. 2002], which may suggest their use in extending the longevity of 'florists' green'.

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 in 2008 and 2009. The cultivar employed was 'Albomaculata' deriving from the spotted calla (*Zantedeschia albomaculata* /Hook./ Baill.).

Three experiments were set up in which topolin was assessed in two forms: *meta*-methoxytopolin and its riboside. In the first experiment, the topolins were used in water solutions at concentrations of 25, 50 and 75 mg·dm^{-3} for 4-hour conditioning of leaves, which were then placed in distilled water. In the second experiment, their solutions at concentrations of 25 and 50 mg·dm^{-3} were employed for 24-hour conditioning of leaves in a cold room at a temperature of 5°C and for a short, seconds-long immersion of leaf blades. In the third experiments, the scheme of the second experiment was employed again, except that here the solutions contained not only the topolins but also gibberellic acid at the same concentrations. In the experiments the control was leaves placed in distilled water after cutting.

The postharvest longevity of leaves was determined in days, their greenness index in SPAD units using a SPAD-502 Chlorophyll Meter [Gregorczyk and Raczyńska 1997, Gregorczyk et al. 1998], and their protein content. Also noted was the initial index of leaf greenness measured at the start of the experiment and the initial content of proteins in the leaves. The loss of ornamental value was indicated by the moment when 30% of the leaf blade area had yellowed and/or wilted.

The experiment consisted of 8 or 6 treatments with three replicates, with 5 leaves in each. One treatment embraced 15 leaves.

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 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 luminescence light with a quantum irradiance intensity of 25 µmol m^2s^{-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 α = 0.05 significance level.

RESULTS

The longevity of leaves of the cultivar Albomaculata significantly depended only on the topolin concentration employed. Irrespective of the concentration, *meta*-methoxytopolin and its riboside extended the longevity of leaves by an average of 8.2, 6.7 and 7.6 days, respectively (tab. 1). The index of leaf greenness depended significantly only

Table 1. Effect of topolin on postharvest longevity (days) and quality of the leaves of *Zantedeschia* 'Albomaculata'
Tabela 1. Wpływ topoliny na pozbiorczą trwałość (dni) i jakość liści cantedeskii 'Albomaculata'

Concentration – Stężenie ($mg \cdot dm^{-3}$)		Kind of topolin Rodzaj topoliny		Średnia dla stężenia topoliny Mean for concentration of topolin
		MemT	MemTR	
Postharvest longevity of leaves Pozbiorcza trwałość liści	0	6.9 a	6.9 a	6.9 a
	25	14.6 b	15.6 b	15.1 b
	50	15.1 b	12.2 b	13.6 b
	75	12.3 b	16.8 b	14.5 b
	mean for kind of topolin średnia dla rodzaju topoliny	12.2 a	12.9 a	
Index of leaf greenness (SPAD) Indeks zazielenienia liści (SPAD)	0	16.1 a	16.1 a	16.1 a
	25	29.5 c	24.0 b	26.7 b
	50	31.6 c	27.1 c	29.3 b
	75	25.9 b	30.6 c	28.2 b
	mean for kind of topolin średnia dla rodzaju topoliny	25.8 a	24.4 a	
Protein content ($mg \cdot g^{-1}$ FW) Zawartość białka ($mg \cdot g^{-1}$ ś.m.)	0	3.0 a	3.0 a	3.0 a
	25	4.3 b	4.1 b	4.2 b
	50	4.0 b	4.0 b	4.0 b
	75	4.0 b	3.9 b	3.9 b
	mean for kind of topolin średnia dla rodzaju topoliny	3.8 a	3.7 a	

Means followed by the same letter do not differ significantly at α = 0.05
Średnie oznaczone tą samą literą nie różnią się istotnie na poziomie istotności α = 0,05
Index of initial leaf greenness – 77.3 SPAD
Początkowy indeks zazielenienia – 77,3 SPAD
Initial content of protein – 12.0 $mg \cdot g^{-1}$ FW
Początkowa zawartość białka – 12,0 $mg \cdot g^{-1}$ św.m.

on the concentration of topolin. Whatever its form, the concentrations employed had a similar effect on the index, which on completion of the experiment was higher than in the control by 10.6, 13.2 and 12.1, respectively. When comparing interactions between treatment, in the case of *meta*-methoxytopolin the highest final index of leaf greenness was observed when this cytokinin was applied at concentrations of 25 and 50 mg·dm^{-3}, and in the case of *meta*-methoxytopolin riboside, at 50 and 75 mg·dm^{-3}. Advancing senescence was accompanied by proteolysis. Both topolins inhibited protein degradation in leaves (tab. 1).

The postharvest longevity of leaves of the cultivar Albomaculata depended on both, the concentration of *meta*-methoxytopolin and its application method (tab. 2). Irrespective of the conditioning, it was extended by an average of 12.0 and 11.8 days. More effective, irrespective of the topolin concentration, was the immersion of leaf blades in this growth regulator for a few seconds. When comparing interactions, the leaves subjected to 24-hour conditioning in MemT at concentrations of 25 and 50 mg·dm^{-3} were found to preserve their ornamental value 3.2 and 4.9 days longer, respectively. When MemT was used at those concentrations for immersing leaf blades for a few seconds, their longevity increased by 20.8 and 18.8 days, respectively. The index of leaf green-

Table 2. Effect of application method of *meta*-methoxytopolin on postharvest longevity (days) and quality of the leaves of *Zantedeschia* 'Albomaculata'

Tabela 2. Wpływ sposobu aplikacji *meta*-metoksytopoliny na pozbiorczą trwałość (dni) i jakość liści cantedeskii 'Albomaculata'

	Concentration of MemT Stężenie MemT (mg·dm^{-3})	24-hours conditioning of leaf Kondycjonowanie liści przez 24 godziny	Few seconds soaking of leaf blades Moczenie blaszek liściowych przez kilka sekund	Mean for concentration of MemT Średnia dla stężenia MemT
Postharvest longevity of leaves Pozbiorcza trwałość liści	0	10.9 a	10.9 a	10.9 a
	25	14.1 b	22.9 b	22.9 b
	50	15.8 b	22.7 b	22.7 b
	mean for method of application średnia dla sposobu aplikacji	13.6 a	18.8 b	
Index of leaf greenness (SPAD) Indeks zazielenienia liści (SPAD)	0	49.1 b	49.1 b	49.1 b
	25	44.2 ab	35.5 a	39.9 a
	50	39.6 ab	39.5 ab	39.5 a
	mean for method of application średnia dla sposobu aplikacji	44.3 a	41.4 a	
Protein content (mg·g^{-1} FW.) Zawartość białka (mg·g^{-1} ś.m.)	0	3.2 a	3.2 a	3.2 a
	25	4.5 b	4.9 b	4.7 b
	50	5.1 b	5.1 b	5.1 b
	mean for method of application średnia dla sposobu aplikacji	4.3 a	4.4 a	

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

Średnie oznaczone tą samą literą nie różnią się istotnie na poziomie istotności α= 0,05

Index of initial leaf greenness – 70.3 SPAD

Początkowy indeks zazielenienia liści – 70,3 SPAD

Initial content of protein – 10.0 mg·g^{-1} FW

Zawartość początkowa białka – 10,0 mg·g^{-1} św.m.

ness depended only on the concentration of *meta*-methoxytopolin (tab. 2). Irrespective of its concentration, a higher index was noted in the control leaves. However, their longevity was the shortest, terminated by the characteristic rolling of leaf blades that spoils the ornamental quality of leaves even without their yellowing. After the application of MemT, irrespective of the conditioning, the greenness index of the leaves was lower than in the control treatment, but their longevity was much longer. Protein content in the leaves depended significantly only on the concentration of *meta*-methoxytopolin (tab. 2). The use of *meta*-methoxytopolin, irrespective of the conditioning, caused the leaves to have a significantly higher protein content, which means slower protein degradation.

Table 3. Effect of application method of *meta*-methoxytopolin riboside on postharvest longevity (days) and quality of the leaves of *Zantedeschia* 'Albomaculata'
Tabela 3. Wpływ sposobu aplikacji rybozydu *meta*-metoksytopoliny na pozbiorczą trwałość (dni) i jakość liści cantedeskii 'Albomaculata'

Concentration of MemTR Stężenie MemTR (mg·dm^{-3})		24-hours conditioning of leaf Kondycjonowanie liści przez 24 godziny	Few seconds soaking of leaf blades Moczenie blaszek liściowych przez kilka sekund	Mean for concentration of MemTR Średnia dla stężenia MemTR
Postharvest longevity of leaves Pozbiorcza trwałość liści	0	10.9 b	10.9 b	10.9 a
	25	10.0 b	17.8 c	13.9 b
	50	5.5 a	25.8 d	15.6 c
	mean for method of application średnia dla sposobu aplikacji	8.8 a	18.2 b	
Index of leaf greenness (SPAD) Indeks zazielenienia liści (SPAD)	0	49.1 c	49.1 c	49.1 c
	25	43.7 bc	42.6 abc	43.2 b
	50	34.7 a	38.9 ab	36.8 a
	mean for method of application średnia dla sposobu aplikacji	42.5 a	43.6 a	
Protein content (mg·g^{-1} FW) Zawartość białka (mg·g^{-1} ś.m.)	0	3.2 a	3.2 a	3.2 a
	25	4.6 b	6.0 c	5.3 b
	50	5.0 b	5.3 b	5.2 b
	mean for method of application średnia dla sposobu aplikacji	4.3 a	4.8 a	

Means followed by the same letter do not differ significantly at $\alpha = 0.05$
Średnie oznaczone tą samą literą nie różnią się istotnie na poziomie istotności $\alpha = 0,05$
Index of initial leaf greenness –70.3
Początkowy indeks zazielenienia liści – 70,3
Initial content of protein – 10.0 mg·g^{-1} FW
Zawartość początkowa białka – 10,0 mg·g^{-1} św.m.

The postharvest longevity of leaves of the cultivar Albomaculata depended on both, the concentration of *meta*-methoxytopolin riboside and the method of application (tab. 3). Irrespective of the concentration employed, the only effective measure was the placing of leaf blades in the riboside for a few seconds. By treating the leaves in this way with MemTR at concentrations of 25 and 50 mg·dm^{-3}, an extension of their longevity was obtained, by 6.9 and 14.9 days, respectively. The conditioning for 24 hours in

MemTR at 25 mg·dm^{-3} had no effect on their postharvest longevity, and this mode of application of the regulator at 50 mg·dm^{-3} even shortened it. The index of leaf greenness depended only on the concentration of *meta*-methoxytopolin riboside (tab. 3). Irrespective of the conditioning, the highest index was obtained for the control treatment, and the lowest, for leaves treated with MemTR at a concentration of 50 mg·dm^{-3}. The reason might be sought in the response of the leaves to initial treatment after the harvest, because those whose leaves were soaked for 24 hours in a solution of MemTR at 50 mg·dm^{-3} lost longevity very quickly, and those whose leaf blades were put for a few seconds in this solution showed very great longevity. *Meta*-methoxytopolin riboside was shown to have an effect on protein content in 'Albomaculata' leaves (tab. 3): in the control treatment the content was lower, while the use of *meta*-methoxytopolin riboside inhibited protein degradation in any conditioning variant. When comparing interactions, the highest protein content was recorded in the treatment in which leaf blades were immersed for a few seconds in *meta*-methoxytopolin riboside at a concentration of 25 mg·dm^{-3}.

Table 4. Effect of application method of *meta*-methoxytopolin and gibberellic acid on postharvest longevity (days) and quality of the leaves of *Zantedeschia* 'Albomaculata'
Tabela 4. Wpływ sposobu aplikacji *meta*-metoksytopoliny i kwasu giberelinowego na pozbiorczą trwałość (dni) i jakość liści cantedeskii 'Albomaculata'

Concentration of MemT+GA_3 Stężenie MemT+GA_3 (mg·dm^{-3})		24-hours conditioning of leaf Kondycjonowanie liści przez 24 godziny	Few seconds soaking of leaf blades Moczenie blaszek liściowych przez kilka sekund	Mean for concentration of MemT+GA_3 Średnia dla stężenia MemT+GA_3
Postharvest longevity of leaves Pozbiorcza trwałość liści	0	10.9 a	10.9 a	10.9 a
	25+25	18.0 b	23.2 c	20.6 b
	50+50	8.5 a	34.8 d	21.6 b
	mean for method of application średnia dla sposobu aplikacji	12.5 a	23.0 b	
Index of leaf greenness (SPAD) Indeks zazielenienia liści (SPAD)	0	49.1 b	49.1 b	49.1 a
	25+25	35.9 a	44.5 b	40.2 a
	50+50	46.7 b	34.2 a	40.5 a
	mean for method of application średnia dla sposobu aplikacji	43.9 a	42.6 a	
Protein content (mg·g^{-1} FW) Zawartość białka (mg·g^{-1} ś.m.)	0	3.2 a	3.2 a	3.2 a
	25+25	6.2 d	6.3 d	6.2 c
	50+50	4.8 c	4.0 b	4.4 b
	mean for method of application średnia dla sposobu aplikacji	4.7 a	4.5 a	

Means followed by the same letter do not differ significantly at $\alpha = 0.05$
Średnie oznaczone tą samą literą nie różnią się istotnie na poziomie istotności $\alpha = 0,05$
Index of initial leaf greenness –70.3 SPAD
Początkowy indeks zazielenienia liści – 70,3 SPAD
Initial content of protein – 10.0 mg·g^{-1} FW
Zawartość początkowa białka – 10,0 mg·g^{-1} św.m.

The longevity of ‘Albomaculata’ leaves depended significantly on both, the concentration of *meta*-methoxytopolin and gibberellic acid, and on the method of applications (tab. 4). They kept their ornamental quality longer when leaf blades had been put in a mixture of the growth regulators irrespective of its concentration. When comparing interactions, after their use at a concentration of 25 + 25 mg·dm^{-3} for the immersion, the postharvest longevity of the leaves increased by 12.3 days, and at 50 + 50 mg·dm^{-3}, by as many as 23.9 days. The extension of longevity was less when the concentration of 25 + 25 mg·dm^{-3} of the growth regulators had been employed for 24-hour conditioning. The concentration of the MemT+GA$_3$ mixture was shown to have an effect on the greenness index of leaves in the cultivar Albomaculata (tab. 4). Irrespective of the conditioning, the index was higher in the control. When comparing protein content in the leaves, this feature was found to depended significantly only on the concentration of the mixture (tab. 4). The use of a MemT+GA$_3$ mixture, whatever the conditioning terms, inhibited protein degradation.

Table 5. Effect of application method of *meta*-methoxytopolin riboside and gibberellic acid on postharvest longevity (days) and quality of the leaves of *Zantedeschia* ‘Albomaculata’
Tabela 5. Wpływ sposobu aplikacji rybozydu *meta*-metoksytopoliny i w kwasu giberelinowego na pozbiorczą trwałość (dni) i jakość liści cantedeskii ‘Albomaculata’

Concentration of MemTR+GA$_3$ Stężenie MemTR+GA$_3$ (mg·dm^{-3})		24-hours conditioning of leaf Kondycjonowanie liści przez 24 godziny	Few seconds soaking of leaf blades Moczenie blaszek liściowych przez kilka sekund	Mean for concentration of MemTR+GA$_3$ Średnia dla stężenia MemTR+GA$_3$
Postharvest longevity of leaves Pozbiorcza trwałość liści	0	10.9 b	10.9 b	10.9 a
	25+25	10.2 b	23.6 c	16.9 b
	50+50	8.2 a	12.0 b	10.1 a
	mean for method of application średnia dla sposobu aplikacji	9.8 a	15.5 b	
Index of leaf greenness (SPAD) Indeks zazielenienia liści (SPAD)	0	49.1 b	49.1 b	49.1 b
	25+25	42.2 ab	45.3 ab	43.8 a
	50+50	40.4 a	59.3 c	49.9 b
	mean for method of application średnia dla sposobu aplikacji	43.9 a	51.2 b	
Protein content (mg·g^{-1} FW) Zawartość białka (mg·g^{-1} ś.m.)	0	3.2 a	3.2 a	3.2 a
	25+25	5.7 b	6.0 b	5.2 b
	50+50	6.8 c	8.4 d	5.9 b
	mean for method of application średnia dla sposobu aplikacji	5.2 a	7.6 c	

Means followed by the same letter do not differ significantly at α = 0.05
Średnie oznaczone tą samą literą nie różnią się istotnie na poziomie istotności α = 0,05
Index of initial leaf greenness – 70.3 SPAD
Początkowy indeks zazielenienia liści – 70,3 SPAD
Initial content of protein – 10.0 mg·g^{-1} FW
Zawartość początkowa białka – 10,0 mg·g^{-1} św.m.

When comparing the postharvest longevity of leaves, it was found that it depended significantly on both, the MemTR+GA_3 concentration and the method of applications (tab. 5). An extension of the longevity by 12.7 days was obtained only in the treatment in which leaf blades were placed in MemTR+GA_3 at a concentration of 25 + 25 mg·dm^{-3} for a few seconds. The greenness index was observed to depend significantly on both, the concentration of the growth regulator mixture and the method of application (tab. 5). Irrespective of the concentration of the mixture, the index was significantly higher when the leaf blades had been soaked for a few seconds in it. The lowest greenness index was recorded when the concentration of MemTR+GA_3 was 25 + 25 mg·dm^{-3}. Protein content in leaves depended on the concentration of *meta*-methoxytopolin riboside and gibberellic acid (tab. 5). The highest content, irrespective of the conditioning, was recorded in leaves treated with a mixture of the growth regulators at a concentration of 50 + 50 mg·dm^{-3}, and the lowest, in the control treatment.

DISCUSSION

In the present research, an attempt was made to extend the postharvest longevity of leaves of the cultivar Albomaculata using topolins. It was found that *meta*-methoxytopolin and its riboside had an effect on their longevity and quality. When applied at concentrations of 25–75 mg·dm^{-3} for 4-hour conditioning of the leaves, they extended their postharvest longevity while also inhibiting protein degradation, but did not improve their greenness index. At concentrations of 25–50 mg·dm^{-3} and used to immerse leaf blades for a few seconds, they improved their longevity more effectively than 24-hour leaf conditioning. In turn, *meta*-methoxytopolin combined with gibberellic acid at concentrations of 25 + 25 and 50 + 50 mg·dm^{-3} and used to immerse leaf blades for a few seconds extended the postharvest longevity of the leaves by an average of 14–24 days and inhibited protein degradation, but had no effect on the index of leaf greenness.

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 [Skutnik et al. 2001]; hence the attempts to extend the longevity of florist' green 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' green [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 conducted studies benzyladenine was mostly used from all cytokinins for post-harvest longevity of 'florist' green. As to florist' green, a favourable response to benzyladenine has been reported e.g. in *Cordyline* 'Glauca' [Koziara and Suda 2008], *Asparagus falcatus* [Skutnik and Rabiza-Świder 2008], *Spathiphyllum* [Koziara and Sikora 2006] and *Arum italicum* [Janowska and Schroeter-Zakrzewska 2008]. Like gibberellic acid, benzyladenine can have a retarding effect on chlorophyll degradation in leaves, which has been found e.g. in *Cordyline australis* 'Red Star' [Koziara and Suda 2008] and *Asparagus setaceus* [Skutnik et al. 2006].

The effectiveness of growth regulators depend on concentration and method of application. The positive effect of BA on postharvest longevity of *Hypericum inodorum* was observed after conditioning of shoots in concentration of solution 100 mg·dm^{-3} for 4 hours. Constant solution of BA in concentration 50 and 100 mg·dm^{-3} decreased the post-harvest longevity [Janowska and Śmigielska 2010].

Combining *meta*-methoxytopolin with gibberellic acid was shown to be effective only when they were used at a concentration of 25–50 mg·dm^{-3} to immerse leaf blades for a few seconds. The application of the two growth regulators in a mixture effectively inhibited protein degradation while having no effect on the index of leaf greenness.

So far there has been no research on extending the postharvest longevity of leaves with the help of topolins. However, the present results corroborate those obtained in studies of *in vitro* cultures. Palavan-Űnsal et al. [2002] report that *meta*-methoxytopolin elevates chlorophyll content, blocks the activity of proteases, and prevents DNA degradation, which indicates that it slows down the processes of senescence in plants.

The effectiveness of gibberellic acid in post-harvest longevity of florost' green reported Janowska and Schroeter-Zakrzewska [2008] and Janowska [2010] in *Arum italicum*, Janowska and Jerzy [2003a, 2003b] in *Zantedeschia* 'Black Magic' and 'Florex Gold', and Skutnik et al. [2001] in *Zantedeschia aethiopica*.

CONCLUSIONS

1. MemT and MemTR affect the postharvest longevity and quality of conditioned leaves of the *Zantedeschia albomaculata* 'Albomaculata'. At concentrations of 25–75 mg·dm^{-3} they extend their longevity and inhibit protein degradation, but have no effect on their greenness index.

2. Applied at concentrations of 25–50 mg·dm^{-3} to soak leaf blades for a few seconds, both growth regulators improve the longevity of the leaves more effectively than their 24-hour conditioning.

3. The combination of MemT with GA_3 at concentrations of 25 + 25 and 50 + 50 mg·dm^{-3} to soak leaf blades for a few seconds extends the postharvest longevity of the leaves by an average of 14–24 days and inhibits protein degradation, but has unfavourable effect on their greenness index.

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POZBIORCZA TRWAŁOŚĆ LIŚCI CANTEDESKII (*Zantedeschia* Spreng.)

Streszczenie. W badaniach oceniano wpływ regulatorów wzrostu na pozbiorczą trwałość liści cantedeskii biało nakrapianej (*Zantedeschia albomaculata* /Hook/ Baill.). Założono trzy doświadczenia, w których ocenie poddano wpływ topoliny w dwóch formach: *meta*-metoksytopoliny (MemT) i jej rybozydu (MemTR) na trwałość liści odmiany 'Albomaculata'. W doświadczeniu pierwszym topoliny o stężeniu 25, 50 i 75 mg·dm^{-3} zastosowano w wodnych roztworach do 4-godzinnego kondycjonowania liści, które po tym zabiegu umieszczono w wodzie destylowanej. W doświadczeniu drugim topoliny o stężeniu 25 i 50 mg·dm^{-3} zastosowano w formie roztworu do 24-godzinnego kondycjonowania liści w chłodni o temperaturze 5°C i do krótkotrwałego, kilkusekundowego, moczenia blaszek liściowych w roztworach topolin w wyżej podanych stężeniach. W doświadczeniu trzecim zastosowano schemat doświadczenia drugiego, ale do roztworów oprócz topolin dodano kwas giberelinowy w takich samych stężeniach. MemT i MemTR wywierają wpływ na pozbiorczą trwałość i jakość kondycjonowanych liści odmiany 'Albomaculata'. Topoliny o stężeniu 25–75 mg·dm^{-3} wydłużają ich pozbiorczą trwałość, hamując jednocześnie rozpad białka, nie mają jednak wpływu na indeks zazielenienia liści. Oba regulatory wzrostu o stężeniu 25–50 mg·dm^{-3}, zastosowane do kilkusekundowego moczenia blaszek liściowych, skuteczniej przedłużają trwałość liści odmiany 'Albomaculata' niż 24-godzinne ich kondycjonowanie. MemT w połączeniu z GA_3 o stężeniu 25 + 25 i 50 + 50 mg·dm^{-3} zastosowane do kilkusekundowego moczenia blaszek liściowych wydłużają pozbiorczą trwałość liści średnio o 14–24 dni, hamują degradację białka, wywierają jednak niekorzystny wpływ na indeks zazielenienia liści.

Słowa kluczowe: cantedeskia, pozbiorcza trwałość, topoliny, kwas giberelinowy, SPAD

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