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THE EFFECT OF 6-BENZYLADENINE ON *Astilbe × arendsii* ARENDS 'AMETHYST' FLOWERING CULTIVATED FOR CUT FLOWERS

Elżbieta Pogroszewska, Patrycja Sadkowska
Agricultural University in Lublin

Abstract. The effect of benzyladenine on *Astilbe* × *arendsii* Arends flowering was determined. The cultivation of *Astilbe* × *arendsii* in an unheated plastic tunnel reduces the inflorescence yield in the first and second year of flowering as compared to the field, but increases the fresh weight and lenght of inflorescence stems.

Key words: *Astilbe* × *arendsii*, benzyladenine, plastic tunnel, flowering

INTRODUCTION

Astilbe × *arendsii* Arends*,* which is a perennial plant with ornamental, fluffy panicles, can be cultivated for cut flowers. Growth regulators, such as cytokinine, which stimulate growth of many species, have a great effect on the flowering and growth of ornamental plants. Benzyladenine can increase the flowering abundance as well as positively affect the yield quality [Garner et al. 1997, Pobudkiewicz 2005]. Also the cultivation of plants in an unheated plastic tunnel ensures better yield quality [Nowak 1996, Pogroszewska 1998].

The aim of the research was to test the effect of benzyladenine applied in various concentrations on the flowering of *Astilbe* × *arendsii* Arends cultivated in a tunnel and in the field.

MATERIAL AND METHODS

The research was conducted between 2004 and 2005. *Astilbe* × *arendsii* Arends plants were planted in native soil in a plastic tunnel without heating, and in the field on 1.5 m wide patches in three rows. The research was conducted in the first and second

Corresponding author – Adres do korespondencji: Elżbieta Pogroszewska, Patrycja Sadkowska, Institute of Ornamental Plants and Landscape Architecture, Agricultural University in Lublin, Leszczyńskiego 58, 20-068 Lublin, Poland, e-mail: epogroszewska@autograf.pl, psadkowska@gazeta.pl

year of the plant flowering. Benzyladenine was applied in the concentrations of: 0, 100, 200 and 400 mg·dm^{-3}, on the leaf, twice, and the control plants were treated with distilled water. The first spraying took place when the plants produced 3 leaves, the second – when they were in the stage of producing 7th–8th leaf.

Morphological traits of the plants and flowering dynamics were observed. The study determined the percentage of inflorescence shoots ready to be cut on specific days. It was assumed that all the flowering shoots on the plants in a given combination stand for 100%. The shoots were cut after ¾ of the flowers in an inflorescence developed.

The experiment was set in random blocks, in 3 repetitions. Each repetition was a plot with 6 plants. The results were analyzed statistically by means of two-factor variance analysis. The evaluation of differences was done by means of Tukey's confidence intervals at the significance level of $\alpha = 0.05$.

RESULTS AND DISCUSSION

In 2004, the first plants to produce flowers were those that had been treated with benzyladenine in the concentration of 400 mg·dm^{-3}: in the tunnel – 03.07, and on the field – 06.07. In 2005, the first plants ready to be cut in the tunnel were the control plants (27.06), whereas in the field those that had been sprayed with BA regardless of the concentration (11.07). Due to a small number of shoots in 2004 (average of 2 shoots per plant), the dynamics of flowering has been presented only in the second year of flowering (fig. 1). Benzyladenine in the concentration of 100 mg·dm^{-3}, applied in the field, accelerated flowering by 2 weeks as compared to the control. Flowering in the tunnel was more even.

The cultivation site differentiated the number of inflorescence in the first year (tab. 1). Plants in the field produced 22.2% more shoots than in the tunnel. Benzyladenine in the concentration of 200 mg·dm^{-3} applied in the field increased the number of shoots by 19% as compared to the control.

The cultivation site affected the inflorescence length and its fresh weight (tab. 1). Inflorescence shoots in the tunnel in the first year of the experiment were 2.5% longer and had their fresh weight 10.3% bigger as compared to the shoots of plants cultivated in the field.

Benzyladenine applied in the tunnel did not affect the length of shoots in the first year. In the field, BA in the concentration of 100mg·dm^{-3} led to inflorescence elongation by 6.3%, however in the concentration of 400 mg·dm^{-3} it reduced the shoot length by 12% as compared to the control.

Benzyladenine in all the concentrations affected the fresh weight of the shoots in the tunnel and in the field (tab. 1). BA in the concentration of 400 mg·dm^{-3} increased the fresh weight most effectively: in the tunnel by 51.5%, in the field by 21.7% as compared to the control.

Age of the plants affected the number of shoots. Older plants produced more flowers. In the tunnel, in the second year of flowering the yield was 5 times greater as compared to the first year, whereas in field it was over 7 times greater.

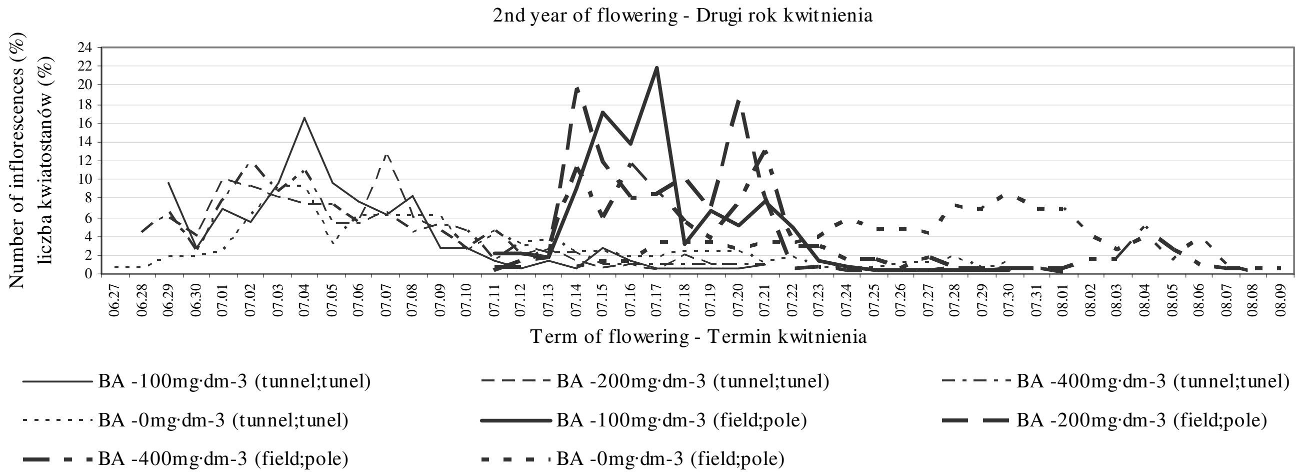

Fig. 1. The process of flowering of *Astilbe* × *arendsii* Arends cultivated in unheated plastic tunnel and in field in the second year of flowering

Ryc. 1. Przebieg kwitnienia tawułki Arendsa uprawianej w nieogrzewanym tunelu foliowym i w polu w II roku kwitnienia

Table 1. The effect of benzyladenine on morphological features of inflorescence stems of *Astilbe × arendsii* Arends

Tabela 1. Wpływ benzyloadeniny na cechy morfologiczne pędów kwiatostanowych tawułki Arendsa

Feature Cecha	BA concentration Stężenie BA ($mg \cdot dm^{-3}$)	1st year of flowering I rok kwitnienia		2nd year of flowering II rok kwitnienia	
		field – pole	tunnel – tunel	field – pole	tunnel –tunel
Number of inflorescence stems Liczba kwiatostanów	0	2.1 bc	1.8 cd	15.0 b	10.0 c
	100	2.1 bc	1.4 d	17.0 a	9.1 c
	200	2.5 a	2.0 bc	17.0 a	9.6 c
	400	2.2 ab	2.0 bc	15.6 b	9.0 c
	mean – średnio	2.2 a	1.8 b	16.1 a	9.5 b
Length of inflorescence stems (cm) Długość kwiatostanów (cm)	0	64.1 bc	65.0 a-c	73.5 d	81.0 a
	100	68.2 a	67.4 ab	72.3 d	79.4 ab
	200	61.6 c	62.5 c	74.1 cd	81.7 a
	400	56.4 d	63.5 c	74.4 cd	77.4 bc
	mean – średnio	63.1 b	64.7 a	73.6 b	80.0 a
Fresh weight of inflorescence stems (g) Świeża masa pędów kwiatostanowych (g)	0	30.3 c	26.4 d	20.0 d	30.6 bc
	100	28.2 d	35.4 b	24.0 d	35.8 b
	200	28.6 d	34.8 b	24.4 d	44.4 a
	400	36.9 b	40.0 a	26.5 cd	34.6 b
	mean – średnio	30.8 b	34.0 a	23.8 b	36.3 a

Means followed by the same letters are not significantly different at α = 0.05 level of probability. Means of each year were compared separately

Średnie oznaczone tą samą literą nie różnią się między sobą istotnie przy poziomie istotności α = 0,05. Ocena istotności różnic dla każdego roku została dokonana oddzielnie

The cultivation site affected the number of shoots in the second year. The number of shoots received in the tunnel was by 41% smaller than in the field, which is confirmed by Hetman and Pogroszewska [1997] in the research on *Liatris spicata*. Benzyladenine in the tunnel did not differentiate the yield of shoots, and in the lower concentrations (100 and 200 $mg \cdot dm^{-3}$) when applied to plants in the field, it increased the number of shoots by 13.3% as compared to the control which confirms research results by Garner et al. [1997] on *Hosta* and Pytlewski [1992] on *Cryptanthus*.

In the second year of the experiment the cultivation site affected the length of inflorescence shoots (tab. 1). Plants in the tunnel produced inflorescence shoots that were by 8.7% longer than in the field. Benzyladenine in the concentration of 400 $mg \cdot dm^{-3}$ applied in the tunnel led to the shortening of shoots by 4.4% as compared to the control, which confirms test results by Pobudkiewicz [2005], Pytlewski, Hetman [1985] and Kim et al. [2000] on other species of ornamental plants.

The cultivation site differentiated the fresh weight of shoots in the second year of flowering. Plants in the tunnel had their shoot fresh weight by 52.5% greater than those in the field (tab. 1). Benzyladenine in the concentration of 200 $mg \cdot dm^{-3}$ applied in the tunnel increased the fresh weight of shoots by 45% as compared to the control, though in the field it did not affect the fresh weight of inflorescence.

CONCLUSIONS

1. Benzyladenine applied in the concentration of 100 mg·dm^{-3} accelerates the flowering of *Astilbe* × *arendsii* Arends in the field by 2 weeks.

2. The use of plastic tunnel in the process of *Astilbe* × *arendsii* Arends cultivation reduces the inflorescence yield in the first and second year of plant flowering as compared to the cultivation in the field, but it leads to the elongation of the inflorescence shoots and to an increase in the fresh weight of inflorescence shoots.

3. Spraying plants with benzyladenine in the concentration of 200 mg·dm^{-3} increases the flowering abundance of *Astilbe* × *arendsii* Arends cultivated in the field in the first and second year of its flowering.

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WPŁYW 6-BENZYLOADENINY NA KWITNIENIE TAWUŁKI ARENDSA (*Astilbe* × *arendsii* ARENDS) 'AMETHYST' UPRAWIANEJ NA KWIAT CIĘTY

Streszczenie. Badano wpływ 6-benzyloadeniny na kwitnienie tawułki Arendsa 'Amethyst' uprawianej w nieogrzewanym tunelu foliowym i w gruncie. Benzyloadeninę zastosowano w stężeniach: 0, 100, 200 i 400 mg·dm^{-3}, dolistnie, dwukrotnie w obu latach trwania doświadczenia. Uprawa w nieogrzewanym tunelu foliowym obniża plon kwiatostanów w pierwszym i drugim roku kwitnienia w porównaniu do uprawy w gruncie, ale zwiększa świeżą masę i długość pędów kwiatostanowych. BA – 200 mg·dm^{-3} zastosowana na roślinach uprawianych w gruncie zwiększa plon pędów kwiatostanowych w obu latach kwitnienia.

Słowa kluczowe: *Astilbe* × *arendsii*, benzyloadenina, tunel foliowy, kwitnienie

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