



THE EFFECT OF FLURPRIMIDOL ON *ALLIUM ROSENBACHIANUM* REG. FORCED IN POTS

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Abstract. The effect of flurprimidol on *Allium rosenbachianum* (Reg.) flowering and forcing period was studied. Bulbs of 18-20 cm circumference were used in the experiment. Two methods of retardant application were used: bulbs soaking before planting and triple spraying of plants during the vegetation period (in the stage of leaf rosette, open leaves and in the phase of green, 'sitting' bud). Flurprimidol was used in the following doses: 15 mg · dm⁻³, 30 mg · dm⁻³, 45 mg · dm⁻³ and control (plants treated with distilled water). Bulbs were planted into pots on the 20th of October and 'wet cooled' for 14 weeks in the temperature of 9°C. During forcing in a greenhouse, morphological features of plants were observed. It was noted that flurprimidol may be effectively used for suppressing *A. rosenbachianum* forced in a greenhouse as a pot plant. Flurprimidol used in concentration of 45 mg · dm⁻³ significantly inhibited growth of shoots and length of flower pedicels and leaves and increased number of flowers in inflorescences at the same time. Soaking bulbs of *A. rosenbachianum* in flurprimidol solution before planting shortened forcing period by 4 days.

Key words: *Allium rosenbachianum*, ornamental allium, bulbs soaking, plants spraying, forcing, morphology, Topflor

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Introduction

Genus *Allium* L. is very numerous, it includes about 700 species with 80 recognized as ornamental plants. One of them is *A. rosenbachianum* Reg. characterized with big, violet, round inflorescences. It is cultivated in flowerbeds and borders, as well as in the ground and greenhouses for cut flower (KRZYMIŃSKA 2008; DE HERTOGH & ZIMMER 1993). Recently a hastened cultivation of alliums as a pot plants for indoor decoration has been proposed. *A. rosenbachianum* growths up to 50 cm. For smaller office arrangement inhibition of height of plants and flower pedicels is necessary, what can be obtained with the use of retardants. One of very effective retardants is «Topflor 015 SL», which active compound is flurprimidol. This retardant is proposed to inhibit growth of many ornamental species, for example *Viola ×witrockiana* Gams (STARTEK & WOLAŃSKA 1998), *Tagetes patula* L. and *Impatiens walleriana* Hook. f. (SCHROETER & JANOWSKA 2003), *Tulipa* sp. (STARTEK 2003; LASKOWSKA & SPRZĄCZKA 2005), *Narcissus* sp.

(KRZYMIŃSKA 2001). Flurprimidol influences plants depending on concentration of the solution and method of application.

The aim of the experiment was to establish the possibility to inhibit growth of *A. rosenbachianum* forced plants cultivated in pots, by use of flurprimidol (as a «Topflor 015 SL» preparation) in a form of soaking bulbs before planting and spraying plants during vegetation.

Material and methods

The research was conducted in the years 2009-2011 in a greenhouse at the Felin Research Station of the Department of Ornamental Plants of the University of Life Sciences in Lublin, Poland. The plant material was bulbs of *A. rosenbachianum* of the 18-20 cm circumference, soaked for 20 minutes in a mixture of 1% Kaptan and 0.7% Topsin. Two variants of flurprimidol application methods were used in the research: soaking bulbs before planting for 45 minutes or spraying plants for three times in the following stages of growth: leaf rosette, open

leaves and after green bud appearance. Plants were sprayed till they were completely covered with the retardant. Flurprimidol was used in the following concentrations: $15 \text{ mg} \cdot \text{dm}^{-3}$, $30 \text{ mg} \cdot \text{dm}^{-3}$, $45 \text{ mg} \cdot \text{dm}^{-3}$. Control plants were treated with distilled water only.

On the 20th of October, bulbs were planted into 13×12 cm pots filled with soil obtained from the top layer of arable land. Pots with planted bulbs were cooled for 14 weeks in the temperature of 9°C . At the end of January pots were moved into the greenhouse, where the air temperature was $18\text{-}20^\circ\text{C}$ and relative humidity was 70-80%.

The experiments were established in a completely randomized blocks method. There were 5 replications, where one replication was one pot with 5 bulbs.

The following features were analyzed: leaves length, plants height, flower pedicel length, inflorescence diameter, number of flowers per inflorescence and forcing period.

The results were analyzed statistically. Significance of differences was estimated with the analysis of variance with the Tuckey's confidence intervals at the 0.05 level of significance.

Results and discussion

Flurprimidol used in the research, influenced morphological features of *A. rosenbachianum* plants. The retardant used in a form of soaking solution in concentration of $30 \text{ mg} \cdot \text{dm}^{-3}$ and in the highest concentration ($45 \text{ mg} \cdot \text{dm}^{-3}$) with both forms of application effectively inhibited height of plants and length of flower pedicel (Tab. 1). Studies of POBUDKIEWICZ (1996) proved that tulips might be suppressed with flurprimidol used in high concentrations of $30 \text{ mg} \cdot \text{dm}^{-3}$ and $40 \text{ mg} \cdot \text{dm}^{-3}$. POGROSZEWSKA (2002) noted that with the use of flurprimidol in concentration of $30 \text{ mg} \cdot \text{dm}^{-3}$ it is possible to obtain *Spathiphyllum* plants that have flower shoots eight times shorter. Flurprimidol also inhibited growth of other plants, such as *Gladiolus* sp. (SEROCKA & ZALEWSKA 2001) and *Narcissus* sp. (KRZYMIŃSKA 2001). MROCZKO & SZLACHETKA (1999) investigating

methods of tulips growth suppression noted that the best effect could be obtained when plants were sprayed twice with flurprimidol in concentration of $40 \text{ mg} \cdot \text{dm}^{-3}$. Plants of oriental lilly 'Mona Lisa' also formed shorter pedicels after flurprimidol treatment in a form of spray (POBUDKIEWICZ & TREDER 2006). Pedicels length of *Pelargonium xhortorum* L.H. Bailey depended on concentration of flurprimidol used (POBUDKIEWICZ 2000a). The retardant used in low concentrations had no effect on pedicel length, but used in concentration of $22 \text{ mg} \cdot \text{dm}^{-3}$ inhibited their elongation, in comparison to control plants. Plants forming shorter pedicels have flowers positioned on the same level, what increases their decorative value (POBUDKIEWICZ 2008).

Flurprimidol together with inhibiting height of plants, caused reduction in inflorescence diameter, when plants were sprayed with solution of the highest concentration of the retardant in comparison to the control plants (Tab. 1). It confirms results obtained by other authors. SCHROETER & JANOWSKA (2003) observed that plants of *Begonia semperflorens* Link et Otto sprayed with flurprimidol solution formed flowers of smaller diameter. Flurprimidol caused reduction of flower diameter of other plants as well, such as Asiatic lilly 'Prima' (POBUDKIEWICZ & NOWAK 1992), *Alstroemeria 'Rosalina'* (POBUDKIEWICZ et al. 2000), *Cuphea* (Pobudkiewicz 2000b) and *Poinsettia* (POBUDKIEWICZ et al. 1995).

In the presented research, in case of *A. rosenbachianum*, an advantageous influence of retardant on number of flowers in inflorescence was observed (Tab. 1). Flurprimidol used in concentration of $45 \text{ mg} \cdot \text{dm}^{-3}$, used in a form bulbs soaking or spray, caused formation of more flowers per inflorescence respectively by 38% and 62%. Similar effect was observed when flurprimidol was used in cultivation of *Chrysanthemum zawadskii* Herbich (YOO & KANG 1999), *Ch. indicum* L. (JUNG et al. 2000) and *Lisianthus* (WHIPKER et al. 2000). The opposite results were obtained by HETMAN & WITEK (2008) in studies on *Kohleria amabilis* (Planch. & Linden) Fritsch. Plants treated with flurprimidol formed fewer flowers in

Table 1. The effect of flurprimidol on morphological features of inflorescence shoots of *Allium rosenbachianum* (two years means).

Flurprimidol concentration	Application method	Height of plants (cm)	Inflorescence diameter (cm)	Pedicle length (cm)	Number of flowers per inflorescence
0	bulbs soaking	43.9 _a *	10.2 _{ab}	38.9 _a	144.5 _c
	spraying	45.1 _a	10.3 _{ab}	39.8 _a	143.0 _c
15 mg · dm ⁻³	bulbs soaking	40.4 _{ab}	10.7 _a	34.9 _{ab}	158.2 _c
	spraying	44.8 _a	10.2 _{ab}	40.0 _a	169.5 _{bc}
30 mg · dm ⁻³	bulbs soaking	32.8 _c	10.1 _b	27.5 _{cd}	163.8 _c
	spraying	42.7 _a	10.2 _{ab}	37.5 _a	171.1 _{bc}
45 mg · dm ⁻³	bulbs soaking	31.5 _c	10.2 _{ab}	26.2 _d	199.8 _{ab}
	spraying	36.9 _{bc}	9.4 _c	31.7 _{bc}	231.2 _a

* means in the columns followed by the same letter do not differ significantly at $\alpha=0.05$.

Table 2. The effect of flurprimidol on length of leaves and forcing period of *Allium rosenbachianum* (two years means).

Flurprimidol concentration	Application method	Length of leaves (cm)	Number of days of forcing
0	bulbs soaking	36.2 _{ab} *	53.2 _{ab}
	spraying	37.0 _a	50.9 _{bcd}
15 mg · dm ⁻³	bulbs soaking	35.5 _{ab}	49.4 _{cd}
	spraying	36.1 _{ab}	51.0 _{bcd}
30 mg · dm ⁻³	bulbs soaking	33.8 _{bc}	49.3 _{cd}
	spraying	34.0 _{bc}	51.8 _{abc}
45 mg · dm ⁻³	bulbs soaking	31.7 _c	48.9 _d
	spraying	31.5 _c	54.4 _a

* means in the columns followed by the same letter do not differ significantly at $\alpha=0.05$.

inflorescence. Similar effect was observed in case of *Alstroemeria* (POBUDKIEWICZ *et al.* 2000) and *Pelargonium ×hortorum* (POBUDKIEWICZ 2000b) treated with retardants. Studies of LASKOWSKA *et al.* (2007) showed that plants of *Allium sphaerocephalon* L. formed more flowers in inflorescence if plants were sprayed with flurprimidol in concentration of 30 mg · dm⁻³ in comparison to bulbs soaking.

Decorative value of plants also depends on the length of leaves. In the presented work use of flurprimidol in high concentrations caused development of shorter leaves in plants treated with the retardant in the form of spraying or bulbs soaking (Tab. 2). The obtained results confirm the ones observed by STARTEK (2003), who studying tulips noted, that flurprimidol

caused forming of shorter and more stiff leaves.

Period of waiting for flowers from the moment of bulbs planting was about 50 days. Bulbs soaked in the flurprimidol solution bloomed a few days earlier than those soaked in distilled water (Tab. 2). Spraying plants with flurprimidol used in the concentration of 45 mg · dm⁻³ elongated the forcing for a few days. In case of ornamental plants, retardants may hasten or delay flowering from the moment of planting into pots. Delay in blooming is often observed, especially when growth inhibitors are used in high concentrations (POBUDKIEWICZ 2008). Flurprimidol applied in concentration of 30-50 mg · dm⁻³ delayed bloom of Asiatic lily 'Prima' (POBUDKIEWICZ & NOWAK 1992), and in concentration of 22.5 mg · dm⁻³

it delayed flowering of *Alstroemeria* (POBUDKIEWICZ *et al.* 2000).

Conclusions

1. Flurprimidol may be used for suppression of *Allium rosenbachianum* plants forced in a greenhouse as pot plants.

2. Flurprimidol used in the concentration of 45 mg · dm⁻³ efficiently inhibits elongation of shoots, pedicels and leaves and at the same time increases the number of flowers in inflorescence.

3. Soaking bulbs of *A. rosenbachianum* in solution of 45 mg flurprimidol per dm³ before planting shortens forcing period by 4 days.

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