



## DECORATIVE VALUE OF THREE DAHLIA CULTIVARS (*DAHLIA* × *CULTORUM* THORSR. ET REIS) TREATED WITH GIBBERELLIN

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**Abstract.** Dahlia (*Dalia* × *cultorum* Thorsr. et Reis) is a perennial that due to special decorative value, diversity of inflorescences colours and shapes as well as plants height, is widely planted in flowerbeds, borders and different garden containers. Growth regulators play a significant role in ornamental plants cultivation. They influence size and shape of plants, number of inflorescences and flowering earliness. Gibberellins are among substances that are commonly used in plants production. In the years 2010-2011 research on the effect of GA<sub>3</sub> on morphological features of 3 Polish dahlia cultivars of Top-Mix group was conducted.

**Key words:** *Dalia* × *cultorum*, dahlia, Polish cultivar, gibberellic acid, field production

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### Introduction

Dahlia is a valuable species in a group of flowering plants, used in landscape architecture. It was introduced in Europe in the XVII century from a mountainous region of Mexico and Guatemala, and became one of the most sought-after and fashionable plants (CLÉNET 1995). Currently, around 2000 cultivars of dahlia are classified as *Dalia* × *cultorum* Thorsr. et Reis (DE HERTOIGH & LE NARD 1993). In the Polish market, there are domestic cultivars available apart from the foreign ones, which win numerous diplomas and medals on national and international horticulture exhibitions (LEGUTKO 1995, 2012).

Gibberellins are growth regulators that have an advantageous influence on plants flowering (HOPKINS 1995; JANKIEWICZ 1997). They quicken flowers formation and enhance a number of flowers per plant in different species, such as *Tulipa* sp. (FRANSEN *et al.* 1997), *Gypsophila paniculata* L. (DAVIES *et al.* 1996), *Gerbera jamesonii* Bolus ex Hook. f. (NOWAK 2000), *Aquilegia hybrida* Sims (GIANFAGNA & MERRITT 1998), *Zinnia elegans* Jacq. (GRZESIK & CHOJNOWSKI 1992), *Iris nigricans* Dinsm. (AL-KHASSAWNEH *et al.* 2006). It also happens

that GA<sub>3</sub> used in different concentration worsen plants quality (NEUMAIER *et al.* 1987).

The aim of the research was to check the efficiency of GA<sub>3</sub> use on growth and flowering of three Polish cultivars of dahlia: 'Irma', 'Luna' and 'Rita', which reach 25-30 cm of height and produce inflorescences of 4 cm in diameter.

### Material and methods

The research was conducted in the years 2010-2011 at the Felin Research Station of the Institute of Ornamental Plants and Landscape Architecture of the University of Life Sciences in Lublin. A gibberellic acid (GA<sub>3</sub>) was used in concentrations of 50 or 100 mg · dm<sup>-3</sup> in a form of spray. The research material was plants of three Polish cultivars of dahlia of Top-Mix group: 'Irma', 'Luna' and 'Rita'. Plants obtained from soft cuttings were planted into field between the 15th and 20th of May in 50×50 cm spacing. Dahlias were sprayed with GA<sub>3</sub> solution 14 days after planting. A single plant was sprayed with 20 ml solution. Control plants were not sprayed with gibberellic acid.

The experiment was done in 3 replications, with 8 plants per replication. Measurements of number of inflorescences per plant, stalk

**Table 1.** Mean number of days from planting into the field till flowering.

Years	2010			2011		
	Concentration of GA <sub>3</sub> mg · dm <sup>-3</sup>					
Cultivar	0	50	100	0	50	100
'Irma'	48	53	48	48	53	48
'Luna'	48	68	48	48	68	48
'Rita'	45	50	66	45	50	60

and inflorescence diameter were done in the phase of full maturity, systematically during a whole flowering period. The plants height was estimated in September.

The obtained data was 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

In the years 2010-2011 it was observed, that chosen Polish cultivars of dahlia started flowering after 48-68 days from planting into the field (middle of May) after use of GA<sub>3</sub> (Tab. 1). Control plants, not treated with GA<sub>3</sub>, flowered after 45-48 days. Spraying dahlia with GA<sub>3</sub> in concentration of 50 mg · dm<sup>-3</sup> delayed flowering by 5 to 10 days, depending on a cultivar. 'Irma' and 'Lena' cultivars treated with GA<sub>3</sub> in higher concentration (100 mg · dm<sup>-3</sup>), started flowering at the same time as plants not sprayed with gibberellic acid. Plants of 'Rita' cultivar treated with GA<sub>3</sub> in concentration of 100 mg · dm<sup>-3</sup> in successive vegetative seasons delayed flowering by 15 to 21 days, in comparison to control plants.

Treating ornamental plants with gibberellic acid is one of the ways to stimulate flowering (KING *et al.* 2000; BROOKING & COHEN 2002; KURTAR & AYAN 2005). This growth regulator is necessary to induce plants flowering and plays an important role in flower bud development (SANIWESKI & KAWA-MISZCZAK 1992). In conducted research the influence of GA<sub>3</sub> on number of inflorescences in three dahlia cultivars was not observed (Tab. 2). However, plants sprayed with GA<sub>3</sub> in concentration of

100 mg · dm<sup>-3</sup> formed more inflorescences, especially 'Irma' (161-149) and 'Rita' (159-485), while dahlias treated with solution in concentration of 50 mg · dm<sup>-3</sup> and control plants, formed less inflorescences, especially 'Luna' cultivar (40-240). CORR & WIDMEM (1987) observed that GA<sub>3</sub> used as a spray had no influence on number of inflorescence stems of *Zantedeschia elliottiana* (W. Watson) Engl. and *Zantedeschia rehmannii* Engl., while CROZZA TALIA (1985) noted advantageous influence of GA<sub>3</sub> on *Freesia ×hybrida hort.* flowering without changes in flowers quality.

In the conducted research advantageous influence of GA<sub>3</sub> on morphological features of inflorescence (flower head diameter and stalk length) and plants (height) was not observed (Tabs. 3-5). The obtained results confirm the ones noted by KURTAR & AYAN (2005), who did not note influence of gibberellins on elongation of tulip. On the other hand gibberellic acid has a positive effect on inflorescence stems length of *Convallaria keiskei* Miq. (SANG YOUNG *et al.* 2002). It should be remembered that plants species may react in different way depending on growth regulator and used concentration (KING *et al.* 2000).

The results of the research on three dahlia cultivars show, that main factors that determine inflorescence features, diameter and stalk length, were conditions of cultivation (vegetative season) and genetic features of the cultivar. In the year 2011 dahlias formed bigger inflorescences and longer stalks in comparison to the 2010 season (1 cm and from 2.5 to 4 cm respectively). While evaluating stalk length a tendency to form longer stalk was observed at dahlias treated with GA<sub>3</sub> in higher concentration. The significant effect of GA<sub>3</sub> on height of dahlia

**Table 2.** Number of inflorescences of Polish dahlia cultivars.

Cultivar	2010			2011			2010	2011
	Concentration of GA <sub>3</sub> mg · dm <sup>-3</sup>							
	0	50	100	0	50	100		
'Irma'	157	140	161	248	350	497	153 C	365 A
'Luna'	40	40	42	240	218	418	40 D	292 B
'Rita'	117	94	159	209	216	485	123 C	303 B
Mean	105 C*	91 C	120 C	232 B	261 B	467 A	105 B	320 A

\*Means followed by the same letters are not significantly different at  $\alpha=0.05$ .

**Table 3.** Diameter of inflorescences of Polish dahlia cultivars.

Cultivar	2010			2011			2010	2011
	Concentration of GA <sub>3</sub> mg · dm <sup>-3</sup>							
	0	50	100	0	50	100		
'Irma'	3	2.7	3.3	4.5	4.2	4.5	3 D	4.4 BC
'Luna'	2.9	2.8	3	4.7	4.7	4.6	2.9 D	4.7 AB
'Rita'	3.9	4.2	4.8	4.6	4.9	4.9	4.3 C	4.8 A
Mean	3.3 C*	3.3 C	3.7 B	4.6 A	4.6 A	4.7 A	3.4 B	4.6 A

\*Means followed by the same letters are not significantly different at  $\alpha=0.05$ .

**Table 4.** Length of inflorescences stalks of Polish dahlia cultivars.

Cultivar	2010			2011			2010	2011
	Concentration of GA <sub>3</sub> mg · dm <sup>-3</sup>							
	0	50	100	0	50	100		
'Irma'	4.6	3.7	5	7.8	8.2	10.4	4.4	8.8
'Luna'	5.3	5.1	5.4	8.5	8.3	11.1	5.3	9.3
'Rita'	6.6	6.9	8.5	7.6	8	8.6	7.3	8.1
Mean	5.5	5.2	6.3	8	8.1	10	5.7	8.7

\*Means followed by the same letters are not significantly different at  $\alpha=0.05$ .

**Table 5.** Height of plants (cm) of Polish dahlia cultivars.

Cultivar	2010			2011			2010	2011
	Concentration of GA <sub>3</sub> mg · dm <sup>-3</sup>							
	0	50	100	0	50	100		
'Irma'	30.8	26.2	22.2	23.7	34.8	33	26.4 D	30.5 AB
'Luna'	19.8	20.5	23.7	29.7	25.2	32.5	21.3 E	29.1 BC
'Rita'	23.5	27	35.9	27.5	32.8	35	28.5 CD	31.8 A
Mean	24.7 B*	24.6 B	26.9 B	26.9 B	30.9 A	34 A	25.4 B	30.5 A

\*Means followed by the same letters are not significantly different at  $\alpha=0.05$ .

was not observed. However, plants sprayed with gibberellin were higher than control ones by 1 to 12 cm, depending on cultivar.

### Conclusions

1.  $GA_3$  used in different concentration in a form of spray influenced flowering of dahlia.  $GA_3$  used in concentration of  $50 \text{ mg} \cdot \text{dm}^{-3}$  delayed flowering of examined dahlia cultivars by 5-10 days.

2. Foliar use of  $GA_3$  had no effect on quality features of inflorescences (inflorescence diameter and stalk length) and plants height of three dahlia cultivars of Top-Mix group.

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