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THE EFFECT OF GIBBERELLIC ACID AND BENZYLADENINE ON THE YIELD OF (*Allium karataviense* Regel.) 'IVORY QUEEN'

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Abstract. The research focused on the effect of GA_3 and BA on the yield of *Allium karataviense* 'Ivory Queen'. The substances in concentration of 500 mg·dm^{-3} were applied in the form of a 60-minute bulb soaking prior to planting or plant spraying in the green bud phase. It was discovered that GA_3 applied in the both forms causes the inflorescence shoot elongation and the increased number of flowers in inflorescence, and increases the total yield expressed in the bulb weight. When applied in the form of plant spraying, it increases the number of bulbs in the total yield. Plant spraying with BA leads to the production of a greater number of flowers in inflorescence. BA application in the both forms increases the total yield expressed in the bulb weight.

Key words: *Allium*, growth regulators, gibberellic acid, benzyladenine

INTRODUCTION

Gibberellic acid and benzyladenine are used in the cultivation of ornamental plants in order to accelerate the flowering, increase the flower yield and improve flower quality. When exogenous gibberelline is applied onto bulb plants it stimulates their flowering, elongates stalks [Ashutosh et al. 2000, Dantuluri and Misra 2002, Dhiman et al. 2002] and increases the yield of bulbs [Shakhda and Gajipara 1998]. When BA is applied onto the tulip bulb it changes the appearance of the flowers [Saniewski et al. 1997], slows down stalk growth and increases stalk thickness [Kawa-Miszczak et al. 1992].

The aim of this research was to define the effect of gibberellic acid and benzyladenine on the yield of *Allium karataviense* 'Ivory Queen'.

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MATERIAL AND METHODS

The experiment was conducted within two vegetation seasons in the period of 2004–2006 on *Allium karataviense* 'Ivory Queen' plants. Gibberellic acid (GA_3) and benzyladenine (BA) were applied. The substances in the concentration of 500 $mg \cdot dm^{-3}$ were applied in the form of 60-minute bulb soaking prior to planting or plant spraying in the green bud phase. Bulbs with the circumference of 12 centimeters were planted on the 1 m^2 plots in three rows with 10 bulbs in each row. Three repetitions were applied. The plot served as the repetition. The research defined morphological traits of inflorescence in the period of full flowering. The tests focused on the yield of bulbs from the plot. The results were analysed statistically by means of variance analysis for double classification, evaluating the significance of differences by means of Turkey's confidence intervals at the level of significance of $\alpha = 0.05$.

RESULTS AND DISCUSSION

Gibberellic acid affected morphological traits of *Allium karataviense'*s inflorescence. In the two years of cultivation, the following was observed: the elongation of inflorescence shoots and an increased number of flowers in the inflorescence after the applications of this bio-regulator both in the form of bulb soaking prior to planting, and plant spraying on the green bud (tab. 1). A similar reaction (increased number of flowers) to the bulb soaking in GA_3 was observed in case of lily plant in the experiment by Dhimana et al. [2002]. The effect of inflorescence shoot elongation was noted by Dantuluri and Misra [2002] on *Lilium maculatum* and by Ashutosh et al. [2000] on *Haemanthus multiflorus*, although GA does not always cause the elongation of the bulbous plants' stalks [Kurtar and Ayan 2005].

In each year of the study, those plants that had been sprayed with GA_3 grew their inflorescence larger than the controlled ones. Spraying benzyladenine on the plants also had a positive effect on the number of flowers in inflorescence both in 2005 and 2006. BA afftected *Lilium maculatum* in a similar way, leading to the growth of the largest number of flowers per plant, in the experiment carried out by Dantuluri and Misra [2002]. No effect of the used bio-regulators on the diameter of inflorescence shoots was observed in either of the two years.

In the first year of the observation it was noted that GA_3 applied in the form of bulb soaking had a positive effect on the total yield expressed in the number of bulbs (tab. 2). In the second year of the research, both GA_3 and BA applied in both forms led to the greater number of bulbs in the total yield. The bio-regulators that were used in both years of the research led to an increase, compared to the control, of the total yield expressed in the bulb weight, in the both methods of application.

An increase in *Allium cepa* bulb yield after the application of GA_3 was observed by Shakhda and Gajipara [1998], Anant and Maurya [2001], Poonam et al. [2002], Subimal et al. [2003], although Kurtar and Ayan [2005] noted a decrease in the tulip bulb yield after the application of GA_3.

Table1. Morphological traits of *Allium karataviense* inflorescences cultivated in 2005 and 2006
Tabela 1. Cechy morfologiczne kwiatostanów *Allium karataviense* uprawianego w latach 2005 i 2006

Growth regulator Regulator wzrostu	Form of application Forma aplikacji	The height of inflorescence shoot, cm Wysokość pędu kwiatostanowego, cm			The diameter of inflorescence, cm Średnica kwiatostanu, cm			The number of flowers in inflorescence Liczba kwiatów w kwiatostanie			The diameter of inflorescence shoot, mm Średnica pędu kwiatostanowego, mm		
		2005	2006	mean średnio	2005	2006	mean średnio	2005	2006	mean średnio	2005	2006	mean średnio
GA_3 500 mg·dm^{-3}	Bulb soaking Moczenie cebul	24,7 a	26,6 a	25,7 A	7,2 b	10,0 ab	8,6 B	194,8 b	197,7 b	196,3 B	6,4 a	5,1 a	5,8 A
	Plant spraying Opryskiwanie roślin	24,3 ab	26,4 a	25,4 A	8,2 a	10,4 a	9,3 A	278,6 a	208,2 a	243,4 A	6,3 a	5,3 a	5,8 A
BA 500 mg·dm^{-3}	Bulb soaking Moczenie cebul	22,9 bc	26,2 ab	24,6 AB	7,2 b	10,3 ab	8,8 B	177,4 c	173,2 c	175,3 C	5,9 a	5,3 a	5,6 A
	Plant spraying Opryskiwanie roślin	23,8 abc	25,8 ab	24,8 AB	7,6 b	10,2 ab	8,9 AB	188,3 b	190,6 b	189,5 B	5,6 a	5,1 a	5,4 A
Control Kontrola		22,7 c	25,2 b	24,0 B	7,2 b	9,9 b	8,6 B	173,4 c	177,4 c	175,4 C	6,0 a	5,1 a	5,6 A

Means marked with the same letter do not differ significantly at $\alpha = 0.05$ level of probability. Means of each year were compared separately
Średnie oznaczone tą samą literą nie różnią się od siebie istotnie przy poziomie istotności $\alpha = 0,05$. Ocena istotności różnic dla każdego roku została dokonana oddzielnie

Table 2. The profile of *Allium karataviense* bulb yield cultivated in 2005 and 2006
Tabela 2. Charakterystyka plonu cebul *Allium karataviense* uprawianego w 2005 i 2006r

Growth regulator Regulator wzrostu	Form of application Forma aplikacji	Total yield of bulb number from m^2 Plon ogólny liczby cebul z m^2			Total yield of bulb weight from m^2, g Plon ogólny masy cebul z m^{-2}, g		
		2005	2006	mean średnio	2005	2006	mean średnio
GA_3 500 mg·dm^{-3}	Bulb soaking Moczenie cebul	39.2 a	32.6 c	35.9 A	2193.6 b	1748.5 b	1971,1 C
	Plant spraying Oprysk roślin	36.1 b	36.0 ab	36.1 A	2137.3 c	2103.5 a	2120,4 A
BA 500 mg·dm^{-3}	Bulb soaking Moczenie cebul	33.4 b	37.2 a	35.3 AB	2326.5 a	1771.5 b	2049,0 B
	Plant spraying Oprysk roślin	33.3 b	35.6 b	34.5 AB	2340.7 a	1844.5 b	2092,6 AB
Control Kontrola		36,0 b	31.0 d	33.5 B	2113.0 d	1628.5 c	1870.8 D

Means marked with the same letter do not differ significantly at $\alpha = 0.05$ level of probability. Means of each year were compared separately
Średnie oznaczone tą samą literą nie różnią się od siebie istotnie przy poziomie istotności $\alpha = 0,05$. Ocena istotności różnic dla każdego roku została dokonana oddzielnie

CONCLUSIONS

GA_3 applied in the form of bulb soaking prior to planting or plant spraying on the green bud leads to an inflorescence shoot elongation and to an increased number of flowers in inflorescence. When applied in the form of plant spraying it increases the diameter of inflorescence.

GA_3 applied in the form of bulb soaking increases bulb number in the total yield. When applied in the both forms, it increases the bulb weight of the total yield.

Spraying benzyladenine on the plant in the green bud phase leads to the production of greater number of flowers in inflorescence.

BA applied in the both forms increases the total yield expressed in the bulb weight.

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WPŁYW KWASU GIBERELINOWEGO I BENZYLOADENINY NA PLONOWANIE CZOSNKU KARATAWSKIEGO (*Allium karataviense* REGEL.) 'IVORY QUEEN'

Streszczenie. Zbadano wpływ GA_3 oraz BA na plonowanie *Allium karataviense* 'Ivory Queen'. Substancje w stężeniu 500 $mg \cdot dm^{-3}$ aplikowano w formie 60-minutowego moczenia cebul przed sadzeniem lub opryskiwania roślin w fazie zielonego pąka. Stwierdzono, że GA_3 aplikowany w obu formach powoduje wydłużenie pędu kwiatostanowego i zwiększenie liczby kwiatów w kwiatostanie oraz zwiększa plon ogólny wyrażony masą cebul. Podawany w postaci opryskiwania roślin zwiększa średnicę kwiatostanu, stosowany w formie moczenia cebul, zwiększa liczbę cebul w plonie ogólnym. Opryskiwanie roślin BA powoduje wytwarzanie większej liczby kwiatów w kwiatostanie. BA stosowana w obu formach zwiększa plon ogólny wyrażony masą cebul.

Słowa kluczowe: *Allium,* regulatory wzrostu, kwas giberelinowy, benzyloadenina

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