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THE INFLUENCE OF SELECTED GROWTH REGULATORS ON DEVELOPMENT, DECORATIVE VALUE AND YIELD OF CORMS OF EASY POT FREESIA (*Freesia* Eckl. ex Klatt). PART II. ETHEPHON

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Abstract. Ethylene is a plant hormone which play an important role in regulation of physiological plant processes. However, use of ethylene for practical purposes is restricted by its multilateral activity. Experiments were carried out in the years 2006–2007, in summer-autumn period to evaluate the influence of concentration of ethephon solution (125, 250, 500, 1000, 2000 mg dm^{-3}) on growth, flowering, decorative value and yield of the offspring corms of three cultivars of Easy Pot Freesia: 'Gompey', 'Popey' and 'Suzy' grown from cormlets. Soaking corms in ethephon solution had an effect on the delay of germination and prolongation of vegetative phase. Corms soaked in ethephon solution of the highest concentrations, i.e. 1000 and 2000 mg dm^{-3} did not blossom. Regardless the cultivar the use of ethephon had an effect on the decrease of number of leaves set on main shoot and greenness index of leaves but also on the increase of number of shoots. The concentration 2000 mg dm^{-3} showed the strongest effect on the vegetative traits of plants. Ethephon affected also decorative value of freesia. The use of ethephon solution in concentrations of 125, 250 and 500 mg dm^{-3} had an effect on the decrease of length of main inflorescence shoot, and in concentrations of 125 and 250 mg dm^{-3} caused the increase of number of flowers in first inflorescence. Soaking corms in ethephon solution had an effect on the increase of coefficient of corm number increase but also on the decrease of coefficient of corm weight increase.

Key words: cultivars, morphological traits, flowering, Ethrel 480 SL

INTRODUCTION

Ethylene is a compound of atmosphere affecting growth and flowering of ornamental plants. Its effect on bulbs and corms is different and depends usually on plant species [Kawa-Miszczak et al. 1997], cultivar, size of bulbs or corms and cultivation conditions

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[Imanishi et al. 1994, Mynett et al. 2001]. According to Uemura and Imanishi [1987] ethylene can be recommended for breaking dormancy of freesia corms. Lee et al. [1998] are of the opinion that treating corms with ethylene during storage affects acceleration of freesias flowering. However, Berghoef et al. [1986], Imanishi and Fortainier [1983] did not confirm that the use of ethylene during storage of freesia corms shortens vegetative phase of plants. Imanishi and Berghoef [1986] and also Startek and Żurawik [2005] are in agreement that treating corms with ethylene has an effect on the increase of number of shoots but the quality of inflorescences is poorer. This compound affects also size and quality of yield of bulbs and corms [Kawa-Miszczak et al. 1997, Żurawik and Startek 2007]. Ethephon is usually used in horticulture instead of gaseous ethylene. After the entering into the tissues ethephon breaks up and releases ethylene [Reid 1992].

The aim of the research was to examine the influence of ethephon solution on growth, flowering, decorative value and yield of the offspring corms of Easy Pot Freesia grown from adventitious corms.

MATERIAL AND METHODS

In the years 2006–2007 experiments with three cultivars of Easy Pot Freesia were conducted. Plant material was prepared and planted according to the methods described in Part I of the publication. Corms were soaked for 24 hours in solution of Ethrel 480 SL preparation (containing ethephon as the active ingredient). Ethylene releases from ethephon at pH 7.2, in air temperature of 35^{o}C, after 24 hours. Five concentrations of ethephon solution were used: 125, 250, 500, 1000, 2000 mg dm^{-3}. Control corms were soaked in water.

Duration of developmental phases was evaluated in the experiments. Observations were conducted every two days from the moment of corms planting to the end of vegetation period. Height of plants and number of shoots and leaves were evaluated a month after the beginning of germination (20th July) in control objects (all cultivars). In case of 'Popey' cultivar measurements were also conducted in treatments where corms were soaked in solution of ethephon in concentrations of 125 and 250 mg dm^{-3}. In case of 'Gompey' and 'Suzy' cultivars measurements were carried out also in treatments where solution of ethephon in concentration of 500 mg dm^{-3} was used (besides control objects). Plants did not germinate in the other treatments in that time. During flowering (24th September) and at the end of cultivation (18th December) measurements of plants traits: height of plant, number of shoots, number of leaves set on main shoot, total number of leaves, greenness index of leaves (SPAD), were conducted in each treatments. Freesias of 'Popey' cultivar grown from corms treated with ethephon solution did not blossom at all. However, freesias of 'Gompey' and 'Suzy' cultivars blossomed only in these treatments where corms were soaked in ethephon solution in concentrations of 125, 250 and 500 mg dm^{-3}. Their generative traits were measured (length of main inflorescence shoot, length of inflorescence, number of flowers in first inflorescence, number of flowers per plant, flower diameter, number of lateral inflorescence shoots) when first flower in inflorescence developed.

At the end of the experiments the coefficients of corm number and weight increase were calculated for all evaluated cultivars and concentrations of ethephon solution.

Experiments were carried out in total randomization. 18 treatments (3 cultivars × 6 concentrations of ethephon solution), each containing 20 corms in 4 replicates were evaluated in the experiments.

Because of the delay of germination as the effect of the use of ethephon, the results of morphological traits were verified statistically only for two dates of measurements (September and December). Only two from three evaluated cultivars blossomed (i.e. 'Gompey' and 'Suzy' cultivars) and therefore the results regarding generative traits were verified statistically only for these two cultivars. Results regarding coefficients of corm number and weight increase were verified statistically for all examined cultivars and concentrations of ethephon solution.

The results of each year of the study were subjected to an analysis of variance. The means of two years were evaluated using multiple Tukey's test at the significance level $\alpha = 0.05$.

RESULTS AND DISCUSSION

Results of experiments concerning the effect of ethylene on the duration of developmental phases of geophytes are equivocal [Kawa-Miszczak et al. 1997]. Shi et al. [1997] are of the opinion that the use of ethylene as a gaseous compound of smoke breaks dormancy of corms and acceleration of growth and flowering. However, Mynett et al. [2001] and also Startek and Żurawik [2005] used ethephon as a source of ethylene and obtained different results. According to these authors ethylene has a significant effect on the delay of germination, and also on the extension of germination phase and whole vegetation period. In the own experiments freesias germinated later when grown in the treatments where ethephon solution was used, regardless the cultivar (fig. 1). The higher was the concentration of ethephon solution, the later corms germinated. Ethephon solution in concentration of 2000 mg dm^{-3} delayed the beginning of vegetative phase of all evaluated cultivars by on average 26.1 days in comparison with control plants. According to Imanishi et al. [1994] gaseous ethylene shortens vegetative phase of irises grown from small bulbs. Those results were not confirmed in cultivation of Easy Pot Freesia from small adventitious corms. However, the obtained results are in agreement with results published by Halevy et al. [1970]. These authors are of the opinion that soaking bulbs and corms in ethephon solution considerably delays flowering of geophytes and according to Startek and Żurawik [2004, 2005] even causes a lack of flowering. In the own experiments the effect of growth regulator was dependent considerably on cultivar and concentration of ethephon solution. In the experiments with Easy Pot Freesia grown from large new corms [Żurawik et al. 2003] it was found that 'Suzy' cultivar blossomed at the earliest but the most shortly and 'Gompey' cultivar blossomed at the latest but for a long time. In the own experiments where adventitious corms were used in the control treatment 'Suzy' cultivar began its generative phase at the earliest. First flowers of that cultivar were observed on the average on 73.5th day of cultivation, by 6.2 days earlier than flowers of 'Popey' cultivar and by 21.2 days earlier than flow

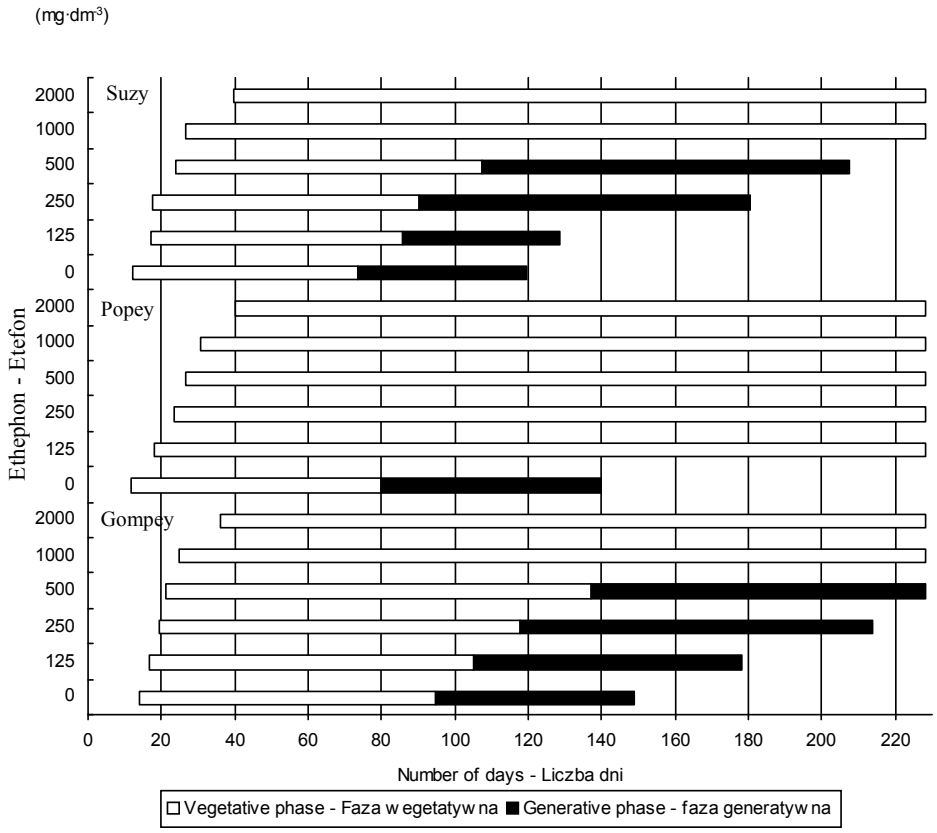

Fig. 1. Duration of vegetative and generative phase of Easy Pot Freesia depending on cultivar and concentration of ethephon solution (mean of the years 2006–2007)

Ryc. 1. Przebieg fazy wegetatywnej i generatywnej frezji z grupy Easy Pot w zależności od odmiany i stężenia roztworu etefonu (średnia z lat 2006–2007)

ers of 'Gompey' cultivar. In conducted experiments the greatest effect of ethephon was observed according to the cultivation of freesias of 'Popey' cultivar. Plants of that cultivar grown from corms treated with ethephon did not blossom. Freesias of 'Gompey' and 'Suzy' cultivars did not blossom when the highest concentrations of ethephon solution, i.e. 1000 and 2000 mg dm^{-3} were used. These cultivars were characterized by considerably elongated vegetative phase ('Suzy' cultivar on the average by 13.4 days and 'Gompey' cultivar on the average by 20.1 days, regardless of etephon concentration) when ethephon solution in concentrations of 125, 250 and 500 mg dm^{-3} was used in comparison with control plants. The use of ethephon in cultivation of 'Gompey' and 'Suzy' cultivars had an effect on the elongation of generative phase. The only exception was cultivar 'Suzy' where the ethephon was used in the concentration of 125 mg dm^{-3}. It resulted from very irregular formation of inflorescence shoots, not from abundant

flowering. The strongest effect of ethephon was found when solution in concentration of 500 mg dm^{-3} was used. Freesias of 'Suzy' cultivar were characterized by on the average 54.0 days longer generative phase in comparison with control treatment. However, not all plants of 'Gompey' cultivar blossomed during the experiments.

Authors are of the opinion that in cultivation of freesia from large new corms the use of ethephon considerably reduces height of freesia grown for cut flowers [Mynett et al. 2001] or in pots [Żurawik and Startek 2007]. These authors are in agreement that the higher is concentration of ethephon solution, the stronger is its influence. In the own experiments, regardless cultivar and date of measurement control plants and freesias grown form corms soaked in the solution of ethephon in the lowest concentration, i.e. 125 mg dm^{-3} did not differ significantly in plant height (tab. 1). The use of ethephon solution in higher concentrations, i.e. 250, 500, 1000 and 2000 mg dm^{-3} had a significant effect on the decrease of plant height. Plants obtained from corms soaked in solution of the highest concentration, i.e. 2000 mg dm^{-3} were lower by 61.6% in comparison with control freesias. Jankiewicz [1997] is of the opinion that ethylene affects only temporary plant growth. Results of the own experiments did not confirm these results. However, the obtained results are conformable with those published by Żurawik and Startek [2007] who showed that limited growth of plants under the influence of ethephon lasts to the end of vegetation. Easy Pot Freesias grown from new corms were characterized by similar growth dynamics, regardless cultivar [Żurawik et al. 2003]. In the own experiments where small adventitious corms were used freesias of 'Gompey' cultivar grew the most intensively. However, freesias of 'Popey' cultivar were characterized by the slowest growth. Also, interaction between cultivar and concentration of ethephon solution was found.

Many authors [Imanishi and Fortainier 1983, Berghoef et al. 1986] analyze the influence of ethylene or ethephon as a source of ethylene [Halevy et al. 1970, Żurawik and Startek 2007] on growth and flowering of geophytes. They are of the opinion that ethylene stimulates germination of greater number of buds and it increases number of vegetative shoots. Results of the own experiments confirmed stimulating influence of ethephon on the increase of number of shoots of Easy Pot Freesia (tab. 2). Plants had on the average only one shoot when were grown in the control treatment. Freesias obtained from corms soaked in ethephon solution in the lowest concentration (i.e. 125 mg dm^{-3}) were characterized by greater number of shoots than control plants but these differences were not confirmed statistically. The use of ethephon solution in higher concentrations, i.e. 250, 500, 1000 and 2000 mg dm^{-3} affected growth of shoots from lateral buds. The highest number of shoots were obtained in the treatment where ethephon solution in concentration of 2000 mg dm^{-3} was used. Freesias grown form corms soaked in solution of that concentration were characterized by on the average 78.0% greater number of shoots in comparison with control. According to Żurawik et al. [2003] in cultivation from new corms, freesias of 'Gompey' cultivar are characterized by the greatest number of shoots. However, in the own experiments plants of that cultivar grown from adventitious corms were characterized by the smallest number of shoots. Interaction between cultivar and concentration of ethephon solution was found.

In conducted experiments it was found that freesias obtained from corms soaked in ethephon solution in concentrations of 1000 and 2000 mg dm^{-3} were deformed. Their

Table 1. Dynamics of growth (cm) of Easy Pot Freesia depending on cultivar and concentration of ethephon solution (mean of the years 2006–2007)
Tabela 1. Dynamika wzrostu (cm) frezji z grupy Easy Pot w zależności od odmiany i stężenia roztworu etefonu (średnia z lat 2006–2007)

Cultivar Odmiana (C)	Date of measurement Termin pomiaru (T)		Ethephon – Etefon (E) (mg dm^{-3})						Mean Średnia
	IX*	XII	0	125	250	500	1000	2000	
Gompey	22.6	30.5	31.4	33.2	30.5	25.5	21.4	17.3	26.6
Popey	17.3	23.2	32.4	29.0	20.7	17.6	11.9	9.9	20.3
Suzy	20.6	26.3	34.5	34.5	26.3	20.1	14.7	10.5	23.4
Mean – Średnia	20.2	26.7	32.8	32.2	25.8	21.1	16.0	12.6	
$LSD_{0.05} – NIR_{0,05}$	C – 0.71	T – 0.48	E – 1.22	C(T) – 1.00	T(C) – 0.83	C(E) – 1.73	E(C) – 2.12	E(T) – 1.73	T(E) – 1.18

Table 2. Number of shoots (pcs.) of Easy Pot Freesia depending on cultivar and concentration of ethephon solution (mean of the years 2006–2007)
Tabela 2. Liczba pędów (szt.) u frezji z grupy Easy Pot w zależności od odmiany i stężenia roztworu etefonu (średnia z lat 2006–2007)

Cultivar Odmiana (C)	Date of measurement Termin pomiaru (T)		Ethephon – Etefon (E) (mg dm^{-3})						Mean Średnia
	IX*	XII	0	125	250	500	1000	2000	
Gompey	1.2	1.4	1.0	1.0	1.0	1.4	1.5	1.7	1.3
Popey	1.2	1.7	1.0	1.1	1.4	1.6	1.9	1.7	1.4
Suzy	1.2	1.6	1.0	1.0	1.2	1.5	1.7	1.9	1.4
Mean – Średnia	1.2	1.6	1.0	1.0	1.2	1.5	1.7	1.8	
$LSD_{0.05} – NIR_{0,05}$	C – 0.04	T – 0.03	E – 0.07	C(T) – 0.06	T(C) – 0.05	C(E) – 0.10	E(C) – 0.13	E(T) – 0.10	T(E) – 0.07

Table 3. Number of leaves set on main shoot (pcs.)of Easy Pot Freesia depending on cultivar and concentration of ethephon solution (mean of years 2006–2007)
Tabela 3. Liczba liści osadzonych na pędzie głównym (szt.) u frezji z grupy Easy Pot w zależności od odmiany i stężenia roztworu etefonu (średnia z lat 2006–2007)

Cultivar Odmiana (C)	Date of measurement Termin pomiaru (T)		Ethephon – Etefon (E) (mg dm^{-3})						Mean Średnia
	IX*	XII	0	125	250	500	1000	2000	
Gompey	4.8	6.1	6.5	6.1	5.7	5.7	4.7	3.9	5.4
Popey	3.9	5.3	5.8	5.2	4.6	4.6	4.3	3.3	4.6
Suzy	5.1	6.3	7.0	6.9	6.3	5.5	4.9	3.4	5.7
Mean – Średnia	4.6	5.9	6.4	6.1	5.5	5.3	4.6	3.5	
$LSD_{0.05} – NIR_{0,05}$	C – 0.09	T – 0.06	E – 0.15	C(T) – 0.12	T(C) – 0.10	C(E) – 0.21	E(C) – 0.26	E(T) – 0.21	T(E) – 0.14

*Explanations for Tables 1–3 – Objaśnienia dla tabel 1–3:
IX – September – wrzesień, XII – December – grudzień

Table 4. Total number of leaves (pcs.) of Easy Pot Freesia depending on cultivar and concentration of ethephon solution (mean of the years 2006–2007)

Tabela 4. Całkowita liczba liści (szt.) u frezji z grupy Easy Pot w zależności od odmiany i stężenia roztworu etefonu (średnia z lat 2006–2007)

Cultivar Odmiana (C)	Date of measurement Termin pomiaru (T)		Ethephon – Etefon (E) (mg dm^{-3})						Mean Średnia
	IX	XII	0	125	250	500	1000	2000	
Gompey	5.1	7.3	6.5	6.1	5.8	6.9	6.2	5.8	6.2
Popey	4.4	7.3	5.8	5.6	5.7	6.2	6.3	5.5	5.9
Suzy	5.4	7.9	7.0	6.9	7.0	6.7	6.6	5.6	6.7
Mean – Średnia	5.0	7.5	6.4	6.2	6.2	6.6	6.4	5.6	
$LSD_{0.05}$ – $NIR_{0,05}$	C – 0.13	T – 0.09	E – 0.22	C(T) – 0.18	T(C) – 0.15	C(E) – 0.31	E(C) – 0.37	E(T) – 0.31	T(E) – 0.21

*Explanations as in Table 1 – Objaśnienia jak w tabeli 1

Table 5. Greenness index of leaves (SPAD) of Easy Pot Freesia depending on cultivar and concentration of ethephon solution (mean of the years 2006–2007)

Tabela 5. Indeks zazielenienia liści (SPAD) u frezji z grupy Easy Pot w zależności od odmiany i stężenia roztworu etefonu (średnia z lat 2006–2007)

Cultivar Odmiana (C)	Date of measurement Termin pomiaru (T)		Ethephon – Etefon (E) (mg dm^{-3})						Mean Średnia
	IX	XII	0	125	250	500	1000	2000	
Gompey	45.2	46.4	47.9	45.1	45.5	43.8	46.6	45.8	45.8
Popey	46.5	50.9	51.6	48.0	48.7	48.0	48.9	47.0	48.7
Suzy	47.6	49.6	52.7	47.1	49.4	46.0	49.8	46.5	48.6
Mean – Średnia	46.4	49.0	50.7	46.7	47.9	45.9	48.4	46.4	
$LSD_{0.05}$ – $NIR_{0,05}$	C – 0.78	T – 0.53	E – 1.35	C(T) – 1.10	T(C) – 0.92	C(E) – 1.91	E(C) – 2.33	E(T) – 1.90	T(E) – 1.30

*Explanations as in Table 1 – Objaśnienia jak w tabeli 1

leaves were shorter, wider and thicker than leaves of control plants. Similar deformations of plants were observed also in the experiments with freesia grown for cut flowers [Mynett et al. 2001]. Regardless cultivar and date of measurement control plants had the most leaves on main shoot (tab. 3). The increase of concentration of ethephon solution resulted in the decrease of number of leaves. In the treatment where the highest concentration of ethephon solution was used (i.e. 2000 mg dm^{-3}) plants formed 45.8% leaves less than in control treatment. Freesias of 'Suzy' cultivar were characterized by the greatest number of leaves and freesias of 'Popey' cultivar had the least number of leaves among evaluated cultivars. Cultivars reacted differently to concentration of ethephon solution.

In experiments conducted by Żurawik and Startek [2007] Easy Pot Freesias grown from new corms soaked in ethephon solution were characterized by greater total number of leaves, regardless cultivar. These results were not confirmed in freesia grown from adventitious corms (tab. 4). Freesias obtained from corms soaked in ethephon solution in concentration of 500 mg dm^{-3} had the highest number of leaves. However, freesias obtained from corms soaked in ethephon solution in concentration of 2000 mg dm^{-3} were characterized by the smallest number of leaves. Also, cultivar traits affected total number of leaves of Easy Pot Freesia. Plants of 'Suzy' cultivar had the highest number of leaves and freesias of 'Popey' cultivar formed the least number of leaves. In conducted experiments interaction between cultivar and concentration of ethephon solution was found.

Some authors are of the opinion that ethephon affects chlorophyll degradation [Gepstein and Thimann 1981, Kao and Yang 1983]. Mynett et al. [2001] are of the opinion that in cultivation of freesia for cut flowers the use of ethephon as a source of ethylene decreases greenness index of leaves. Concentration of ethephon decreases greenness index of leaves, independently of cultivar. In the own experiments with Easy Pot Freesia cultivars reacted differently to concentration of ethephon solution (tab. 5). Regardless cultivar the use of ethephon solution affected the decrease of greenness index of leaves. Effect of the concentrations of 500 and 2000 mg dm^{-3} on that trait was the strongest. According to Żurawik and Startek [2007] developmental stage also affects greenness index of leaves. In the own experiments at the end of vegetation period, in December, regardless cultivar and concentration of ethephon solution freesias were characterized by a higher greenness index of leaves than in September. Freesias of 'Popey' and 'Suzy' cultivars were characterized by significantly darker leaves than plants of 'Gompey' cultivar. Also interaction between all evaluated experimental factors was found.

Żurawik et al. [2003] are of the opinion that cultivars of Easy Pot Freesia grown from new corms do not differ in flowers diameter. However, they differ in number of inflorescence shoots and number of flowers in inflorescence and per plant. In the own experiments, regardless of concentration of ethephon solution freesias of 'Gompey' cultivar were characterized by longer inflorescence shoots and inflorescences and also by greater number of flowers in inflorescence and per plant and by greater diameter of flowers and number of lateral inflorescence shoots than plants of 'Suzy' cultivar (tab. 6). Ethylene affects term of flowering but also affects quality of inflorescences [Berghoef et al. 1986]. In the own experiments reduction of length of inflorescence

Table 6. Characteristics of flowering of Easy Pot Freesia depending on cultivar and concentration of ethephon solution (mean of the years 2006–2007)

Tabela 6. Charakterystyka kwitnienia frezji z grupy Easy Pot w zależności od odmiany i stężenia roztworu etefonu (średnia z lat 2006–2007)

Trait Cecha	Cultivar Odmiana (C)	Ethephon – Etefon (mg dm^{-3}) (E)				Mean Średnia
		0	125	250	500	
Length of main inflorescence shoot (cm)	Gompey	31.8	27.1	22.9	21.9	25.9
Długość głównego pędu kwiatostanowego (cm)	Suzy	25.0	24.5	24.0	21.3	23.7
Mean – Średnia		28.4	25.8	23.5	21.6	
$LSD_{0.05}$ – $NIR_{0,05}$		C – 0.89	E – 1.70	C(E) – 0.89	E(C) – 2.41	
Length of inflorescence (cm)	Gompey	6.3	7.6	7.4	6.9	7.0
Długość kwiatostanu (cm)	Suzy	4.3	4.0	4.8	5.2	4.6
Mean – Średnia		5.3	5.8	6.1	6.0	
$LSD_{0.05}$ – $NIR_{0,05}$		C – 0.24	E – 0.45	C(E) – 0.24	E(C) – 0.64	
Number of flowers in first inflorescence (pcs.)	Gompey	11.0	12.7	12.1	10.3	11.5
Liczba kwiatów w kwiatostanie I rzędu (szt.)	Suzy	9.3	9.7	9.8	9.9	9.7
Mean – Średnia		10.2	11.2	11.0	10.1	
$LSD_{0.05}$ – $NIR_{0,05}$		C – 0.37	E – 0.70	C(E) – 0.37	E(C) – 1.00	
Number of flowers per plant (pcs.)	Gompey	18.7	19.6	18.2	15.4	18.0
Liczba kwiatów na roślinie (szt.)	Suzy	12.2	11.0	13.1	14.0	12.6
Mean – Średnia		15.5	15.3	15.7	14.7	
$LSD_{0.05}$ – $NIR_{0,05}$		C – 1.00	E – n.s.; r.n*.	C(E) – 1.00	E(C) – 2.69	
Flower diameter (cm)	Gompey	4.7	4.7	4.6	4.2	4.5
Średnica kwiatów (cm)	Suzy	4.0	4.2	4.1	4.1	4.1
Mean – Średnia		4.3	4.4	4.3	4.1	
$LSD_{0.05}$ – $NIR_{0,05}$		C – 0.12	E – 0.23	C(E) – 0.12	E(C) – 0.33	
Number of lateral inflorescence shoots (pcs.)	Gompey	0.9	1.3	1.2	0.9	1.1
Liczba bocznych pędów kwiatostanowych (pcs.)	Suzy	0.5	0.4	0.4	0.3	0.4
Mean – Średnia		0.7	0.8	0.8	0.6	
$LSD_{0.05}$ – $NIR_{0,05}$		C – 0.06	E – 0.12	C(E) – 0.06	E(C) – 0.17	

*Explanations – Objaśnienia: n.s.; r.n. – not significant difference; nie różnią się istotnie

shoots under the influence of ethephon was found. The higher was the concentration of ethephon solution, the shorter shoots were formed by plants. Shoots were shorter even by 23.9% when ethephon solution in concentration of 500 mg dm^{-3} was used in comparison with control plants. According to Jankiewicz [1997] it could have been caused by reduction of plant growth as a result of inhibition of DNA synthesis and cell division. Soaking corms in ethephon solution increased length of inflorescences in comparison with control plants. According to Startek and Żurawik [2005] soaking of new corms of freesia in ethephon solution decreases number of flowers. These results were not confirmed in cultivation of freesia from small adventitious corms. Regardless cultivar plants obtained from corms soaked in ethephon solution in concentrations of 125 and

250 mg dm^{-3} had more flowers in first inflorescence than control plants and freesias grown from corms soaked in ethephon solution in concentration of 500 mg dm^{-3}. No significant influence of ethephon on number of flowers per plant was found. However, the use of ethephon affected flower diameter and number of lateral inflorescence shoots. The use of ethephon solution in concentration of 125 mg dm^{-3} increased flower diameter only in comparison with plants obtained from corms soaked in ethephon solution in concentration of 500 mg dm^{-3}. Plants grown from corms soaked in ethephon solution in concentration of 500 mg dm^{-3} were characterized by smaller number of lateral inflorescence shoots than freesias grown in the other treatments.

Table 7. Coefficient of subsequent corm weight increase of Easy Pot Freesia depending on cultivar and concentration of ethephon solution (mean of the years 2006–2007)

Tabela 7. Współczynnik przyrostu masy bulw następczych frezji z grupy Easy Pot w zależności od odmiany i stężenia roztworu etefonu (średnia z lat 2006–2007)

Cultivar Odmiana (C)	Ethephon – Etefon (mg dm^{-3}) (E)						Mean Średnia
	0	125	250	500	1000	2000	
Gompey	2.39	2.04	1.41	1.29	1.14	0.54	1.47
Popey	2.04	1.49	1.03	0.90	0.86	0.56	1.15
Suzy	1.47	2.03	1.45	1.18	0.86	0.51	1.25
Mean – Średnia	1.97	1.85	1.30	1.12	0.95	0.54	
$LSD_{0.05} – NIR_{0,05}$	C – 0.126	E – 0.219	C(E) – 0.126	E(C) – 0.379			

Table 8. Coefficient of subsequent corm number increase of Easy Pot Freesia depending on cultivar and concentration of ethephon solution (mean of the years 2006–2007)

Tabela 8. Współczynnik przyrostu liczby bulw następczych frezji z grupy Easy Pot w zależności od odmiany i stężenia roztworu etefonu (średnia z lat 2006–2007)

Cultivar Odmiana (C)	Ethephon – Etefon (mg dm^{-3}) (E)						Mean Średnia
	0	125	250	500	1000	2000	
Gompey	1.00	1.00	1.00	1.50	1.55	1.90	1.33
Popey	1.00	1.20	1.45	1.80	2.05	2.35	1.64
Suzy	1.00	1.00	1.25	1.65	1.85	2.45	1.53
Mean – Średnia	1.00	1.07	1.23	1.65	1.82	2.23	
$LSD_{0.05} – NIR_{0,05}$	C – 0.064	E – 0.112	C(E) – 0.064	E(C) – 0.194			

Ethylene affects the yield of bulbs and corms of geophytes. Its effect depends on species and developmental stage of plant [Kawa-Miszczak et al. 1997] and also on temperature during cultivation [Żurawik and Startek 2007]. According to Startek and Żurawik [2005] ethylene stimulates formation of new corms but also inhibits the increase of their weight. In the own experiments these results were confirmed. The use of ethephon solution in concentrations of 250, 500, 1000 and 2000 mg dm^{-3} decreased coefficient of corm weight increase (tab. 7). In the own experiments, regardless of cultivar the effect of the highest concentration of ethephon solution (i.e. 2000 mg dm^{-3}) on

the yield of corms was the strongest. In the experimental object where ethephon solution in concentration of 2000 mg dm^{-3} was used the coefficient of corm weight increase was by 72.6% lower in comparison with control object. Among evaluated cultivars, the highest coefficient of corm weight increase was noted for cultivar 'Popey'. However, the least was found for cultivar 'Gompey'. Soaking corms before planting in solution of ethephon increased the number of the offspring corms of gladiolus [Halevy et al. 1970] and freesia [Startek and Żurawik 2005, Żurawik and Startek 2007]. These results were confirmed in cultivation of freesia from adventitious corms (tab. 8). The strongest effect of ethephon solution was found when its concentration was the highest, i.e. 2000 mg dm^{-3}. However, the smallest effect was observed when corms were soaked in water and in ethephon solution in concentration of 125 mg dm^{-3}.

RESULTS

1. Treating prepared corms of freesia with ethephon solution delays germination and inhibits plant development. The use of ethephon solution in the highest concentrations, i.e. 1000 and 2000 mg dm^{-3} causes the lack of flowering.

2. Soaking corms in ethephon solution has an effect on decrease of freesia height, number of leaves on main shoot and greenness index of leaves. However, it increases the number of shoots. The effect of the highest concentration, i.e. 2000 mg dm^{-3} is the strongest.

3. The use of ethephon solution affects also decorative value of Easy Pot Freesia. The use of solution in concentrations of 125, 250 and 500 mg dm^{-3} has an effect on decrease of main inflorescence shoot length but also increases inflorescence length. The use of solution in concentrations of 125 and 250 mg dm^{-3} increases the number of flowers in first inflorescence.

4. Ethephon, as a source of ethylene, used in concentrations of 250–2000 mg dm^{-3} has an effect on the decrease of corm weight. However, it increases coefficient of subsequent corm number increase. Among used in the experiment concentrations, the highest influence was noted for 2000 mg dm^{-3}.

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WPŁYW WYBRANYCH REGULATORÓW WZROSTU NA ROZWÓJ, WARTOŚĆ DEKORACYJNĄ I PLON BULW FREZJI (*Freesia* Eckl. ex Klatt) Z GRUPY EASY POT. CZĘŚĆ II. ETEFON

Streszczenie. Etylen jest hormonem roślinnym, który odgrywa ważną rolę w regulowaniu procesów fizjologicznych w roślinie, w praktyce jednak wielostronność jego działania jest ograniczona. W latach 2006–2007 w okresie letnio-jesiennym przeprowadzono doświadczenia, w których określono wpływ stężenia roztworu etefonu (125, 250, 500, 1000, 2000 mg dm^{-3}) na przebieg faz rozwojowych, wartość dekoracyjną i plon bulw potomnych trzech odmian frezji z grupy Easy Pot: 'Gompey', 'Popey' i 'Suzy' uprawianych z bulw przybyszowych. Zastosowany do moczenia bulw roztwór etefonu przyczynił się do opóźnienia wschodów i wydłużenia fazy wegetatywnej. W stężeniach największych, tj. 1000 i 2000 mg dm^{-3}, powodował natomiast całkowity brak kwitnienia. Niezależnie od odmiany związek ten przyczynił się do wytworzenia mniejszej liczby liści na pędach głównych, zmniejszenia natężenia zielonej barwy liści, a wykształcenia większej liczby pędów. Spośród porównywanych stężeń roztworu etefonu na cechy wegetatywne najsilniej oddziaływało 2000 mg dm^{-3}. Etefon wpływał na wartość dekoracyjną frezji. Zastosowanie roztworu etefonu w stężeniach 125, 250 i 500 mg dm^{-3} przyczyniło się do wytwarzania krótszych głównych pędów kwiatostanowych, a w stężeniach 125 i 250 mg dm^{-3} powodowało wykształcenia większej liczby kwiatów w kwiatostanie I rzędu. Moczenie bulw w roztworze etefonu przyczyniło się do uzyskania większego współczynnika przyrostu liczby bulw, a mniejszego współczynnika przyrostu masy bulw.

Słowa kluczowe: odmiany, cechy morfologiczne, kwitnienie, Ethrel 480 SL

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