Freesia Responds to Preplant Flurprimidol and Paclobutrazol Corm Soaks

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Abstract. Experiments conducted over 3 years have indicated the efficacy of preplant paclobutrazol or flurprimidol corm soaks for leaf and scape growth control in potted freesia (*Freesia hybrida*). A range of cultivars subjected to 30- to 60-min soaks in 60 to 120 mg·L⁻¹ paclobutrazol and 10- to 30-min soaks in 10 to 30 mg·L⁻¹ flurprimidol resulted in significant and commercially relevant height control without reducing the number of flowering scapes. Cultivars varied in their response to the plant growth regulators (PGRs), suggesting that individual grower trials will be necessary to develop an optimum treatment for each location.

Worldwide, freesia is mainly grown as a cut flower, and it is well-adapted to cooler climates. The plant is grown from corms. Using temperature treatments after lifting, flower induction and initiation can be controlled for year-round flowering.

Freesia is a niche crop for potted plant growers. In North America, most plants are grown in a narrow coastal band in California. The cool maritime climate allows outdoor production of compact, high-quality plants. There has long been interest in expanding production to other areas in North America, namely the upper midwest and northeast, where cool winters are ideal for the production of a low-energy, intensive crop. When grown in relatively low-light greenhouses (as in the northeast), however, freesia plants often elongate excessively and the plant quality suffers.

Gianfagna and Wulster (1986) first showed the efficacy of paclobutrazol or ancymidol for freesia growth control. Using five cultivars, drenches of these PGRs (5 mg a.i./pot) reduced plant height by 40% to 60% and inflorescences up to 93%. There was no effect on the number of flowering scapes, although the treated plants flowered ≈10 d after the controls. Preplant soaks in 250 mg·L⁻¹ paclobutrazol were even more effective than substrate drenches. Therefore, it was concluded that “reduced immersion times or rates should result in simple and inexpensive” height control for freesia Gianfagna and Wulster (1986).

Wulster et al. (1989) showed that an average daily temperature (ADT) of 20 °C in the greenhouse caused taller plants than did

lower temperatures (15 °C ADT), and plants grown at 10 °C ADT were even shorter. Clearly, forcing temperature is an important component of plant height, and temperature control is critical for potted freesia production. Ancymidol drenches (applied 1 week after planting) up to 3 mg/pot were effective, but less so at warmer temperatures, and the effects varied by cultivar. Regarding freesia production, “from a quality perspective, chemical height control is not an adequate substitute for appropriate greenhouse environment” Wulster et al. (1989).

Berghoef and Zevenbergen (1990) found that ancymidol drenches at 2 to 4 mg/pot applied 2 weeks after planting were effective for freesia height control in October plantings. Under similar growing conditions, the scape and leaf lengths decreased as the ancymidol concentration increased from 50 to 200 mg·L⁻¹ and as the soak length was increased from 1 to 10 h. Therefore, the concept of very long soaks may have been derived from their work.

De Hertogh and Milks (1990) found that freesia ‘Aida’ was responsive to ancymidol at a concentration of 200 mg·L⁻¹, but this is too expensive for commercial use because the full-strength commercial product is only available as 264 mg·L⁻¹. Paclobutrazol soaks (4-h soaks, cultivar Aida) were effective at 50 mg·L⁻¹, with increasing effects to 200 mg·L⁻¹. Drenches of 5 mg/pot a.i. were similar to 100-mg·L⁻¹ soaks. When soaked in 100 to 400 mg·L⁻¹ paclobutrazol, ‘Rossini’ plant height decreased as the soak length increased from 1 to 4 h. Finally, drying times after soaks of only 2 h were suggested because longer drying times resulted in unspecified “erratic” results.

Wulster and Gianfagna (1991) showed that preplant cold storage at 5 °C for 2 to 4 weeks reduced scape height, leaf length, and the number of days to flower after planting. The source material was Rutgers-grown corms that had been stored at 30 °C for 15 weeks to break dormancy before cold storage. They concluded that the time to flower

initiation needed to be determined, especially in relation to the cold treatment. Ancymidol was used as drenches of 1 to 3 mg/pot, but it is too expensive for commercial use. Ancymidol at 3 mg/pot reduced the scape height and leaf length by >50% and delayed flowering by ≈9 d.

De Hertogh (1996) listed preplant corm soak guidelines for a variety of freesia cultivars. Soaking for 1 h in 50 to 100 mg·L⁻¹ paclobutrazol was recommended for ≈40% of the cultivars; for ≈60% of the cultivars, the soak recommendations involved 200 to 300 mg·L⁻¹. These rates appeared to have been developed in a warm climate (i.e., North Carolina) (De Hertogh and Milks, 1990).

Cavins and Erickson (2004) reported that the temperature of the soaking solution affected the efficacy of flurprimidol corm soaks. When performing 30- to 60-min soaks, room temperature or warmer solutions (17 to 32 °C) were more effective than cold (7 °C) solutions. Flurprimidol at 54 mg·L⁻¹ and 77 mg·L⁻¹ caused a 30% reduction in height with tepid and cold solutions, respectively. The soak length had no effect on the concentration of flurprimidol that is needed to reduce height by a targeted 30%. As expected, the cultivar response varied significantly.

Much of the literature regarding freesia growth regulation involved now-extinct cultivars or warmer climates, where warmer greenhouse temperature interact with leaf and scape growth, thereby requiring greater PGR concentrations. Additional information about PGR use is needed to expand freesia production in greenhouses in the northern United States. The present work was performed to obtain PGR information regarding modern cultivars grown in northern greenhouse conditions and to further evaluate flurprimidol as a potential PGR for potted freesia.

Materials and Methods

Experiments were conducted during three growing seasons. Corms were obtained from The Netherlands (shipped by air freight) that had been given unspecified preshipment storage regimes. In all experiments, 9 corms were used per 15-cm pot, with 6 replications (pots) per treatment. Plants were initially grown pot-to-pot; then, they were spaced on 25-cm centers when the foliage was ≈15 cm tall. Each experiment was conducted as a completely randomized design. Data were collected on the anthesis date of each pot (when two or more scapes had at least one open flower), including scape length (pot rim to the top of the oldest flower petal part), typical leaf length (pot rim to the end of the leaf), and the number of flowering scapes per pot. Data from each experiment were analyzed using linear and quadratic regression (JMP; SAS Institute, Inc., Cary, NC).

PGR concentration experiments, years 1 and 2. Before planting, corms were soaked for 1 h in paclobutrazol (Fine Americas, Walnut Creek, CA) or flurprimidol (SePRO, Carmel, IN) solutions prepared with reverse-osmosis water at 20 °C. In year 1, concentrations of

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Table 1. Effects of flurprimidol and paclobutrazol preplant soaks (1 h) on growth and flowering of 5 freesia cultivars in year 1.

Chemical	Concn (mg·L ⁻¹)	Time to anthesis (d)	Ht at anthesis (cm)		No. of flowering scapes
			Scape	Leaf	
Albatros					
Control	0	60	23.3	24.3	3.5
Flurprimidol	25	60	18.2	21.8	5.5
	50	60	12.3	19.4	3.8
	75	61	7.6	19.5	3.8
	100	62	9.7	17.6	2.8
		NS ^z	L***Q*	L***Q ^{NS}	NS
Paclobutrazol	50	61	17.8	21.2	4.3
	100	61	13.8	20.7	3.7
	150	62	12.4	17.9	2.8
	200	60	14.2	19.8	4.0
		NS	L***Q*	L**Q ^{NS}	NS
Figaro					
Control	0	59	24.7	29.4	7.8
Flurprimidol	25	60	20.5	27.2	6.5
	50	61	16.2	22.8	6.3
	75	62	13.7	24.2	5.8
	100	62	10.7	21.1	5.2
		L***Q**	L***Q ^{NS}	L***Q ^{NS}	L***Q ^{NS}
Paclobutrazol	50	60	19.1	25.4	8.3
	100	60	16.6	23.1	7.2
	150	61	13.2	23.1	7.3
	200	61	12.9	21.1	7.0
		L***Q ^{NS}	L***Q*	L***Q ^{NS}	NS
Purple Rain					
Control	0	60	20.0	19.5	5.0
Flurprimidol	25	61	11.0	15.6	2.7
	50	62	5.5	14.0	3.0
	75	62	4.6	10.3	1.7
	100	64	5.5	4.5	1.0
		L*Q ^{NS}	L***Q**	L***Q ^{NS}	L**Q ^{NS}
Paclobutrazol	50	61	9.5	16.9	2.4
	100	60	10.4	14.5	2.8
	150	61	8.1	16.3	2.3
	200	61	3.9	15.4	3.3
		NS	L***Q ^{NS}	L*Q ^{NS}	L*Q*
Sandra					
Control	0	59	22.1	29.0	8.5
Flurprimidol	25	61	16.2	22.9	7.0
	50	61	10.7	18.8	6.2
	75	62	4.6	16.6	5.7
	100	61	5.3	18.3	4.8
		L**Q**	L***Q*	L***Q**	L***Q ^{NS}
Paclobutrazol	50	61	14.9	22.1	7.0
	100	60	10.1	20.2	7.0
	150	61	7.8	21.6	6.8
	200	61	6.1	22.3	6.2
		L*Q ^{NS}	L***Q*	L**Q***	L**Q ^{NS}
Yvonne					
Control	0	60	26.3	26.3	6.2
Flurprimidol	25	62	17.0	22.8	4.5
	50	63	10.1	20.3	2.8
	75	65	7.9	18.8	4.0
	100	65	2.0	15.5	1.0
		L***Q ^{NS}	L***Q ^{NS}	L***Q ^{NS}	L**Q ^{NS}
Paclobutrazol	50	62	17.9	25.3	4.5
	100	62	15.6	24.4	3.7
	150	63	9.8	22.6	3.4
	200	63	7.9	19.3	3.3
		L***Q ^{NS}	L***Q ^{NS}	L***Q ^{NS}	L**Q ^{NS}

^zSignificance of linear (L) or quadratic (Q) regression: NS, *, **, *** denotes nonsignificant or significant at $P \leq 0.05$, 0.01, or 0.001, respectively.

50 to 200 mg·L⁻¹ paclobutrazol and 25 to 100 mg·L⁻¹ flurprimidol were tested on cultivars Albatros, Figaro, Purple Rain, Sandra, and Yvonne. In year 2, concentrations were reduced to 30 to 120 and 15 to 60 mg·L⁻¹, respectively, and cultivars were Albatros, Blue Bayou, Figaro, Honeymoon, and Texas.

Corms were planted 29 Mar. or 4 Feb. (year 1 and year 2, respectively) using LM-111 substrate (Lambert Peat Moss, Inc.,

Riviere-Ouelle, Quebec) and grown in a glass greenhouse with normal cultural conditions. The greenhouse ADT averaged 16.1 °C in year 1 and 12.7 °C in year 2 based on 15-min readings from shielded and aspirated dataloggers (Onset Computer Corp., Bourne, MA) in an aspirated box 0.5 m above crop level.

Length of preplant soaks, year 2. The effects of the soak length were evaluated

using 60 mg·L⁻¹ flurprimidol and soak lengths of 10, 30, and 60 min. Controls were soaked in water for 10 min. Corms were allowed to drain and air dry for 1 h; then, they were planted as described previously. Soaking and planting were performed on 4 Feb.

PGR concentration, year 3. Corms were soaked on 23 Jan. in 10, 20, and 30 mg·L⁻¹ flurprimidol or 33, 66, and 99 mg·L⁻¹ paclobutrazol. The duration of preplant soaking

Table 2. Effects of 1-h preplant soaks in different concentrations of paclobutrazol and flurprimidol on growth and flowering of 5 freesia cultivars in year 2.

Chemical	Concn (mg·L ⁻¹)	Time to anthesis (d)	Ht at anthesis (cm)		No. of flowering scapes
			Scape	Leaf	
Albatros					
Control	0	125 ^z	32.4	18.8	2.5
Flurprimidol	15	128	27.5	16.8	1.0
	30	128	24.3	15.4	1.6
	60	126	22.0	14.3	2.0
		L**Q**	L**Q**	L**Q**	NS
Paclobutrazol	30	126	26.6	17.8	1.8
	60	124	24.8	16.2	2.2
	120	128	24.4	16.9	1.3
		NS ^y	L*Q*	NS	NS
Blue Bayou					
Control	0	126	41.4	30.7	8.2
Flurprimidol	15	127	35.8	27.1	7.2
	30	127	29.9	20.9	5.8
	60	128	26.8	22.3	4.5
		NS	L***Q***	L***Q***	L***Q***
Paclobutrazol	30	125	37.5	28.8	7.7
	60	125	35.5	28.2	7.7
	120	126	28.7	24.0	7.0
		NS	L***Q***	L***Q***	L*Q ^{NS}
Figaro					
Control	0	123	30.9	20.8	7.7
Flurprimidol	15	124	31.1	20.8	7.2
	30	125	27.3	17.9	6.5
	60	126	21.2	16.4	7.6
		L**Q*	L***Q***	L***Q**	NS
Paclobutrazol	30	123	30.3	20.3	7.0
	60	125	30.3	20.4	6.2
	120	125	27.8	20.0	7.5
		L**Q*	NS	NS	L ^{NS} Q*
Honeymoon					
Control	0	123	39.6	24.3	7.8
Flurprimidol	15	123	33.4	19.3	8.3
	30	125	28.3	15.9	7.2
	60	126	20.3	13.4	6.3
		L**Q*	L***Q***	L***Q***	L**Q*
Paclobutrazol	30	124	33.3	21.1	7.5
	60	126	26.7	18.9	5.8
	120	125	24.0	15.7	6.0
		NS	L***Q***	L***Q***	L**Q*
Texas					
Control	0	125	34.9	24.5	7.8
Flurprimidol	15	125	30.2	20.2	8.2
	30	125	26.9	18.3	6.0
	60	126	24.0	14.9	3.8
		NS	L***Q***	L***Q***	L***Q***
Paclobutrazol	30	125	33.4	24.0	7.5
	60	124	32.0	22.6	7.7
	120	125	26.0	20.1	6.3
		NS	L***Q***	L***Q**	L*Q ^{NS}

^zSignificance of linear (L) or quadratic (Q) regression: NS, *, **, *** denotes nonsignificant or significant at $P \leq 0.05$, 0.01, or 0.001, respectively.

was evaluated with 30 mg·L⁻¹ flurprimidol by soaking corms for 5, 10, or 30 min; controls were soaked in water for 10 min. The cultivars were Blue Bayou, Diamond Star, Figaro, Honeymoon, and Texas. Greenhouse ADT during the experiment was 13 °C.

Length of preplant soaks, year 3. The effects of the soak length were evaluated using 30 mg·L⁻¹ flurprimidol and soak lengths of 5, 10, and 30 min. Controls were soaked in water for 10 min. Soaking and planting were performed on 24 Jan. Corms were allowed to drain and air-dry for 1 h; then, they were planted as described previously.

Results

PGR concentration, year 1. Tested soak concentrations (1 h) were 50 to 200 mg·L⁻¹

paclobutrazol and 25 to 100 mg·L⁻¹ flurprimidol (1 h). For all cultivars, the scape and leaf length were highly affected by the PGR treatments (Table 1). Both flurprimidol and paclobutrazol corm soaks significantly reduced the scape and leaf height in a linear manner compared with the untreated control plants. In many cases, the quadratic effect was also significant, but generally less so than the linear component. In many cases, the amount of growth control was excessive and plants were aesthetically too small relative to the container when flowering. PGR treatments delayed flowering for four of the five cultivars, with the largest difference being 5 d, which was of little commercial significance. Four of five cultivars also showed a reduction in the number of flowering scapes as a result of the treatments. This happened

with both PGRs for 'Purple Rain', 'Sandra', and 'Yvonne', and with flurprimidol for 'Figaro'. The number of flowering scapes was unaffected in 'Albatros' (Table 1).

PGR concentration, year 2. Tested soak concentrations (1 h) were decreased from the previous year to 30 to 120 mg·L⁻¹ paclobutrazol and 15 to 60 mg·L⁻¹ flurprimidol. Both PGRs reduced the final scape and leaf length, with significant linear and quadratic responses (Table 2). Two exceptions were 'Albatros' (paclobutrazol had no effect on leaf length) and 'Figaro' (paclobutrazol had no effect on scape and leaf length). Three of the cultivars showed significant reductions in the number of flowering scapes by both chemicals; there was no effect on 'Albatros' and flurprimidol had no effect on 'Figaro'. There were inconsistent effects on days to

Table 3. Effects of preplant soaks in 60 mg·L⁻¹ flurprimidol on growth and flowering of 5 freesia cultivars in year 2.

Soak duration (min)	Time to anthesis (d)	Ht at anthesis (cm)		No. of flowering scapes
		Scape	Leaf	
Albatross				
0	124	32.4	18.8	2.5
10	127	25.2	15.6	2.3
30	127	21.0	15.0	0.8
60	128	22.0	14.3	2.0
	L*Q ^{NSz}	L*Q*	L*Q*	L ^{NS} Q*
Blue Bayou				
0	126	41.4	30.7	8.2
10	126	34.3	24.9	8.0
30	126	32.3	23.9	7.0
60	128	26.8	22.3	4.5
	L*Q ^{NS}	L***Q***	L***Q***	L***Q***
Figaro				
0	123	30.9	20.8	7.7
10	126	24.8	19.0	7.7
30	126	24.7	18.3	7.3
60	126	21.2	16.4	7.6
	L ^{NS} Q*	L**Q*	L**Q*	NS
Honeymoon				
0	123	39.6	24.3	7.8
10	123	28.3	16.8	6.5
30	126	21.9	13.0	5.5
60	126	20.3	13.4	6.3
	L**Q**	L***Q***	L***Q***	L ^{NS} Q**
Texas				
0	125	34.9	24.5	7.8
10	125	25.8	17.6	6.3
30	128	22.9	18.3	4.8
60	126	24.0	14.9	3.8
	L ^{NS} Q*	L**Q***	L***Q***	L***Q***

^zSignificance of linear (L) or quadratic (Q) regression: NS, *, **, *** denotes nonsignificant or significant at $P \leq 0.05$, 0.01, or 0.001, respectively.

flowering, but the largest delay was 4 d; however, this was of little commercial significance.

Length of preplant soaks, year 2. To explore the potential for decreasing the soak duration, corms were soaked for 10, 30, or 60 min in 60 mg·L⁻¹ flurprimidol. Results indicated that increasing the soak durations led to shorter scapes and leaves in all cultivars, and that longer soaks decreased the number of scapes to a greater degree than shorter soaks (Table 3). This was true for four of the five cultivars; however, with 'Figaro', the soak duration had no effect on the number of scapes. Increasing soak durations also delayed flowering, but the largest difference was only 4 d; again, this was of little commercial significance (Table 3).

PGR concentration, year 3. Tested soak concentrations were 33 to 99 mg·L⁻¹ paclobutrazol and 10 to 30 mg·L⁻¹ flurprimidol (30 min). For four of the cultivars, there were significant linear and quadratic decreases in the scape and leaf length as the concentration of either PGR increased (Table 4). For 'Figaro', paclobutrazol had no effect at the concentrations tested, and flurprimidol had no effect on leaf length (Table 4). In this experiment, two of the cultivars (Blue Bayou and Diamond Star) showed no response in number of scapes to the concentration of PGR (Table 4). 'Figaro' and 'Texas' exhibited a significant decrease in flower scapes as the flurprimidol concentration increased, but paclobutrazol had no effect (Table 4). As in past years, increasing soak durations delayed

flowering, but the largest difference was 6 d; this was probably of little commercial significance (Table 4).

Length of preplant soaks, year 3. Corms were soaked in 30 mg·L⁻¹ flurprimidol for 5 to 30 min. At this concentration, increasing the soak duration linearly and quadratically decreased the scape and leaf length in four of the five cultivars (Table 5). 'Figaro' was less responsive, and only the scape length was affected by the treatments. Four of the five cultivars showed no reduction in the number of scapes; however, Figaro was an exception. As in past years, the treatments caused slight delays in flowering as the soak duration increased.

Discussion

Effective and consistent growth regulation of greenhouse-grown potted freesia has been a topic of interest for more than 30 years (Gianfagna and Wulster, 1986). The optimum environmental conditions for potted freesia production (high levels of light and cool temperatures) are often difficult to achieve in northern greenhouses. In mid-winter, when temperature control is feasible, light levels are less than optimum; in early spring, when there is adequate natural light, outdoor temperatures can vary widely and can result in greenhouse air temperatures well above optimum. Wulster et al. (1989) cautioned that PGR use for height control is not a substitute for a proper greenhouse environment (in this case, cool temperatures);

however, there remains interest, especially as newer cultivars are developed, in PGR use for potted freesia.

The present work demonstrated that effective control of the scape and leaf elongation can be obtained with preplant corm soaks in paclobutrazol, with an effective range of 60 to 120 mg/L and soak times of 30 to 60 min. These concentrations are notably lower than those reported by many previous studies of freesia (De Hertogh, 1996; De Hertogh and Milks, 1990; Gianfagna and Wulster, 1986). This could be attributable to the use of different cultivars or to greenhouse environmental conditions and growing regions. Ultimately, it is not possible to know the specific reasons. For greenhouse growers in northern states, the present data represent an appropriate starting point for paclobutrazol treatment of this crop.

Cavins and Erickson (2004) found that the water temperature had a significant effect on the efficacy of flurprimidol soaks; a greater concentration was needed at lower temperatures (7 °C vs. 17 to 32 °C). Furthermore, the effects of soaks for 30 and 60 min did not differ. During our study, all corms were treated at 20 ± 2 °C. The lack of additional inhibition with longer soaks in the Cavins and Erickson work agreed with the results of the present work because few additional growth regulation effects were seen between 30- and 60-min soaks (Table 3).

The present results indicated the efficacy of flurprimidol at concentrations somewhat lower than those reported by Cavins and

Table 4. Effects of 30-min preplant soaks in different concentrations of paclobutrazol and flurprimidol on growth and flowering of 5 freesia cultivars in year 3.

Chemical	Concn (mg.L ⁻¹)	Time to anthesis (d)	Ht at anthesis (cm)		No. of flowering scapes
			Scape	Leaf	
Blue Bayou					
Control	0	91	42.9	33.9	9.0
Flurprimidol	10	93	42.7	32.8	13.6
	20	93	35.1	27.1	9.2
	30	95	31.2	25.4	8.8
		L***Q***	L***Q***	L***Q***	NS
Paclobutrazol	33	92	39.3	34.7	9.7
	66	94	32.2	29.1	8.5
	99	95	29.0	24.8	8.5
		L***Q**	L***Q***	L***Q***	NS
Diamond Star					
Control	0	90	43.7	30.5	8.7
Flurprimidol	10	92	40.5	29.4	8.7
	20	95	32.5	23.3	8.3
	30	94	26.3	22.4	8.2
		L***Q***	L***Q***	L***Q***	NS
Paclobutrazol	33	90	39.1	27.6	8.2
	66	93	33.1	24.7	8.5
	99	94	33.8	24.1	7.7
		L***Q**	L***Q***	L***Q***	NS
Figaro					
Control	0	94	35.5	30.6	9.2
Flurprimidol	10	95	35.1	30.0	7.0
	20	95	30.2	27.3	7.8
	30	97	30.3	29.4	6.3
		L*Q*	L*Q*	NS	L**Q*
Paclobutrazol	33	94	35.8	32.2	7.5
	66	95	35.9	27.7	8.3
	99	97	36.8	32.6	7.5
		L**Q*	NS	NS	NS
Honeymoon					
Control	0	90	47.8	32.8	11.3
Flurprimidol	10	93	41.2	28.8	9.7
	20	93	32.5	24.1	9.0
	30	96	34.8	21.8	10.0
		L***Q***	L***Q***	L***Q***	L ^{NS} Q*
Paclobutrazol	33	93	38.1	29.3	9.6
	66	95	31.0	25.8	9.8
	99	95	29.3	23.9	9.8
		L***Q***	L***Q***	L***Q**	L*Q*
Texas					
Control	—	94	45.8	34.4	9.0
Flurprimidol	10	93	36.9	28.8	8.8
	20	94	34.6	25.3	8.2
	30	97	32.9	23.9	8.0
		L**Q**	L***Q**	L***Q***	L**Q*
Paclobutrazol	33	93	37.5	33.6	8.6
	66	95	37.3	28.0	9.0
	99	95	33.3	27.1	8.3
		NS	L**Q**	L***Q***	NS

²Significance of linear (L) or quadratic (Q) regression: NS, *, **, *** denotes nonsignificant or significant at $P \leq 0.05$, 0.01, or 0.001, respectively.

Erickson (2004). For example, flurprimidol was effective in the range of 10 to 30 mg·L⁻¹ for 10 to 30 min in most of the present cultivars. Potential reasons for this could be the differences in corm preparation before delivery or differences in the growing environment (temperature and light level). Ultimately, although flurprimidol was more effective at lower concentrations than paclobutrazol was, the choice should be based on economic considerations.

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Table 5. Effects of preplant corm soaks in 30 mg·L⁻¹ flurprimidol on growth and flowering of 5 freesia cultivars in year 3.

		Ht at anthesis (cm)		
Soak duration (min)	Time to anthesis (d)	Scape	Leaf	No. of flowering scapes
Blue Bayou				
Control ^z	91	42.9	33.9	9.0
5	94	39.1	28.1	9.3
10	94	30.3	26.8	8.2
30	95	31.2	25.4	8.8
	L**Q*** ^y	L***Q***	L***Q***	NS
Diamond Star				
Control	90	43.7	30.5	8.7
5	93	29.2	21.4	8.2
10	93	33.9	22.6	8.3
30	94	26.3	22.4	8.2
	L*Q**	L***Q***	L*Q***	NS
Figaro				
Control	94	35.5	30.6	9.2
5	95	30.2	27.8	7.8
10	96	28.2	26.5	8.3
30	97	30.3	29.4	6.3
	L*Q*	L ^{NS} Q**	NS	L**Q**
Honeymoon				
Control	90	47.8	32.8	11.3
5	95	37.4	24.2	9.2
10	95	33.3	24.1	10.5
30	96	34.8	21.8	10.0
	L*Q***	L*Q***	L***Q***	NS
Texas				
Control	94	45.8	34.4	9.0
5	96	38.1	25.9	8.0
10	96	38.0	28.2	8.0
30	97	32.9	23.9	8.0
	L*Q*	L**Q**	L***Q***	NS

^zControls were soaked for 10 min in reverse-osmosis water.^ySignificance of linear (L) or quadratic (Q) regression: NS, *, **, *** denotes nonsignificant or significant at $P \leq 0.05$, 0.01, or 0.001, respectively.