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RESPONSE OF SEVENTEEN POINSETTIA CULTIVARS TO GROWTH REGULATORS

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Abstract. **Use of chemical growth regulators to retard plant height is an integral procedure in the production of quality potted poinsettia (*Euphorbia pulcherima* Willd.) plants in Florida, but not all poinsettia cultivars respond equally to the chemicals. Seventeen poinsettia cultivars, including eight of the Pelfi® series from Europe, were planted singly in 15-cm pots, pinched to six nodes, and drenched with water, ancymidol (0.375 mg ai/pot), paclobutrazol (0.25 mg ai) or uniconazole (0.125 mg ai). 'Peterstar', the topselling cultivar in Europe, produced plants 15.3, 11.6, 11.6, and 9.9 inches tall, respectively, when treated with the chemicals. 'Freedom', the top red cultivar grown in the U.S., had heights of 12.6, 10.2, 9.9, and 9.4 inches, respectively. Collectively, plants of the Pelfi® series were of a height similar to the 10 established cultivars, although individual cultivars showed a differential response to the growth regulators. 'Sonora', a dark green-leaved cultivar with deep red bracts, was as responsive to the growth regulators as 'Freedom'. Split applications of uniconazole should be considered.**

Poinsettia (*Euphorbia pulcherima* Willd.) production in Florida, the U.S., and throughout Europe has increased significantly over the past 10 years, resulting in the poinsettia occupying the top position of flowering potted plants. In 1995, 57.4 million flowering poinsettias were sold in containers in the United States (U.S. Dept. Agr., 1996), with a value of $209.5 million. Florida produced 3.98 million flowering poinsettias, with a value of $11.8 million, which was a 7.8 percent increase over 1994. The major red cultivars grown in Florida in 1995 were 'Eckespoint Freedom', 'Gross Supjibi', and 'Gutbier V-14 Glory'. The main white cultivars were 'Gutbier V-17 White' and 'Freedom White'; the top pink cultivar was 'Gutbier V-14 Pink'; and the most widely grown novelty type was 'Eckespoint Jingle Bells 3'. During the past two years, a large number of poinsettia cultivars have been introduced into the U.S. market from U.S. and European breeders, hoping to have their cultivars replace those currently grown. A new series of poinsettias, called Pelfi®, was developed by European breeders, introduced to the United States by Fischer in 1994, and made available in limited quantities to researchers and growers (Wilfret et al., 1995). Several of these cultivars, such as 'Bonita', 'Maren', and 'Nobelstar' are selections of mutant plants derived from irradiated 'Peterstar', which is a selection of 'Gutbier V-17 Angelika'. These cultivars have a growth habit similar to 'Peterstar' but have different bract colors, ranging from deep red to pink (Wilfret et al., 1995). Growth regulators, used to retard plant height, are an integral factor in the production of quality potted poinsettias in Florida. The major chemicals used are ancymidol (Besemer, 1971; Larson, 1978), and two triazole compounds, paclobutrazol and uniconazole (Barrett and Nell, 1989, 1990; Davis et al., 1988; Wilfret, 1993). Since the triazoles are xylem translocated (Barrett and Bartuska, 1982), they are more effective when applied as a soil drench than as a foliar spray (Barrett and Bartuska, 1982; Deneke and Keever, 1992; Murray et al., 1986). The purpose of this research was to evaluate cultivars of the Pelfi® series when treated with three growth regulators as a media drench and compare their growth response to established commercial cultivars grown in Florida.

Materials and Methods

Single poinsettia cuttings which were established in Oasis® blocks, were planted in 6-inch diameter plastic pots (1.6 qt) on 5 Sep. 1995, pinched to six nodes on 15 Sep., and provided long day photoperiods with incandescent lights (8 ft-c) from 2200 to 0200 hr from 15 Sep. to 5 Oct. Soil medium consisted of a mixture of Florida sedge peat, coarse vermiculite, coarse white builder's sand, and perlite (6:3:2:1, v/v). Soil medium amendments (per yd^3) were 18 lb of Nutricote® 13N-10.8P-5.6K (100 day), 7.5 lb of dolomitic limestone, 5 lb of single superphosphate, 7.5 lb of granular calcium carbonate, 3 lb of hydrated lime, and 1.5 lb of Nitritrace®, a minor element mixture. Initial pH was 6.2 after planting the cuttings. The medium was drenched with 5 oz of Banrot® [5-ethoxy-3-trichloromethyl-1,2,4-thiadiazole (15%) plus dimethyl 4,4-0-phenylenebis (25%)] at 7.8 oz/100 gal. Plants were grown at ambient temperatures on capillary mat beds in a shadehouse covered with black polypropylene mesh to exclude 25% of ambient light. Light intensity was between 6,000 and 7,000 ft-c during the crop cycle. Plants were spaced three across on 15-inch centers on 2.8-foot wide beds, with the center row staggered from the two outer rows. Once the pots were placed on the capillary mat, the medium was drenched with 5 oz/pot of a soluble 20N-16.6P-8.7K fertilizer. Plants were protected from insects, mites, and diseases by a standard weekly spray program. In addition, one quarter teaspoon of Marathon® insecticide (imidocloprid, 1-[(6-chloro-3-pyridingl) methyl]-N-nitro-2-imidazolidinimine) was applied to the medium on 22 Sep. to control the whitefly population. Growth regulators were applied as a medium drench in 5 oz/pot aliquots on 10 Oct. Treatments included a water control, ancymidol (A-Rest® I-cyclopropyl-I-(p-methyxyphenyl)-5-pyrimidine-methanol) at 0.375 mg ai/pot, paclobutrazol (Bonzi® (2RS,3RS)-1-(4-chlorophenyl)-4,4-dimethyl-2-(1,2,4-triazole-1-yl) pentan-3-ol) at 0.25 mg ai/pot, and uniconazole (Sumagic® (E)-(p-chlorophenyl)-4,4-dimethyl-2-(1,2,4 triazole-1-yl)-1-pentene-3-ol) at 0.125 mg ai/pot. Quantity of each growth regulator was determined from previous research using these chemicals on commercial poinsettia cultivars (Wilfret, 1993). The experimental design was a randomized complete block within each cultivar, with five replications of one pot each. Vegetative and floral measurements, which included plant height and diameter and inflorescence diameter were taken on 4 and 5 Dec. ANOVA was computed for recorded data and means were separated by Duncan's multiple range test (I = 0.05). A Chi square analysis was computed for composite height comparisons of the Pelfi® cultivars compared to the established commercial cultivars.

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Table 1. Composite effect of growth regulators on plant height of Pelfi® poinsettia cultivars compared to commercially established cultivars.

Cultivar Source	Growth Regulator (mg ai/pot)[z]			
	Control (0)	Ancymidol (.375)	Paclobutrazol (.25)	Uniconazole (.125)
Pelfi Cultivars				
Height (inches)	15.0	13.0	11.9	10.7
% of Height	100	86.7	79.3	71.3
% Retardation	0	13.3	21.7	28.7
Established Cultivars				
Height (inches)	14.8	12.1	11.2	10.0
% of Height	100	81.8	75.7	67.6
% Retardation	0	18.2	24.3	32.4

[z]Differences between cultivar source within each growth regulator treatment not significant by Chi Square Test ($\alpha = 0.05$).

Results and Discussion

The fall of 1995 was characterized by warm, wet weather from August through October and unseasonably cold weather starting the last 10 days of November and continuing through December (Stanley, 1996). Plant growth was inhibited by frequent cold fronts moving through the area and bract development was delayed significantly between Thanksgiving and Christmas. Some of the later flowering cultivars, such as 'Gutbier V-14 Glory, were marketable 10 to 15 days later and were shorter than in previous years (Wilfret, 1993). Effectiveness of the three growth regulators on both the Pelfi® and the established poinsettia cultivars was, in order, uniconazole, paclobutrazol, and ancymidol, where plants treated with ancymidol were the tallest (Table 1). Percent height retardations for uniconazole, paclobutrazol, and ancymidol were 28.7, 21.7, and 13.3 for the Pelfi® cultivars, and 32.4, 24.3, and 18.2 for the established cultivars, respectively. None of the differences were significant between the cultivar source within each growth regulator. The uniconazole amount was excessive regardless of cultivar source, probably due to a combination of cool temperatures late in the crop season that inhibited stem elongation and the persistence of uniconazole in the media. Optimum plant height of a poinsettia grown in a 6-inch pot would be 12 ± 1 inches, but mean height of all cultivars treated with uniconazole in this study was 10.4 inches. In the future, the amount of uniconazole applied initially on poinsettias should be reduced, with a second application if necessary to allow for cool temperatures. Although the Pelfi® cultivars generally responded to the growth regulators in a manner similar to the established cultivars, there were differences in how individual cultivars responded to the growth regulators.

Pelfi® Cultivars. Heights of 'Puebla' and 'Dark Puebla' were not significantly retarded by ancymidol in this study (Table 2). A possible explanation would be that these cultivars develop later than the others in this series and growth continued after ancymidol no longer remained active in the medium; however, the two triazoles continued to retard plant height late in the season due to their longer persistence. 'Sonora', which is not a mutant of 'Peterstar' but developed through hybridization of unrelated genotypes, was very responsive to both paclobutrazol and uniconazole. This dark oak-leaved cultivar averaged only 9.5 inches tall when treated with the triazoles and were too short to be accepted commercially. The remaining cultivars, 'Bonita', 'Flirt', 'Maren', 'Nobelstar', and 'Picacho', responded to the growth regulators in a similar manner, but 'Bonita' plants treated with uniconazole were too short. Plant and inflorescence diameter of most cultivars did not show the differential response of ancymidol compared to the triazoles. Only 'Dark Puebla', 'Puebla' and 'Picacho' plants had smaller diameters when treated with uniconazole compared to ancymidol. 'Sonora' plants treated with the triazoles were too compact and were not acceptable.

Established Cultivars. 'Freedom' and 'Freedom White' were of an acceptable height when untreated (water drench) (Table 3). When any of the growth regulators were applied, the plants were too short and had reduced plant diameters. Inflorescence diameter of 'Freedom White' was significantly less when plants were treated with uniconazole. These data support the judicious use of growth regulators on plants of the 'Freedom' lineage especially if growing temperatures are

Table 2. Effect of growth regulators on vegetative and floral characteristics of eight Pelfi® poinsettia cultivars.

Cultivar	Plant Height (inches)[z]				Plant Diameter (inches)				Inflorescence Diameter (inches)			
	Control	Ancymidol	Paclobutrazol	Uniconazole	Control	Ancymidol	Paclobutrazol	Uniconazole	Control	Ancymidol	Paclobutrazol	Uniconazole
Bonita	14.4 a[y]	11.6 b	11.6 b	9.7 c	19.4 a	17.4 ab	16.9 b	17.1 ab	9.8 a	9.9 a	10.3 a	9.8 a
Dark Puebla[x]	14.9 a	13.8 a	11.8 b	11.0 b	18.2 a	18.0 a	17.2 ab	16.0 b	—	—	—	—
Flirt	13.6 a	12.3 b	11.9 bc	10.6 c	18.6 a	17.5 ab	17.5 ab	16.3 b	9.4 a	9.7 a	9.7 a	8.7 a
Maren	16.0 a	13.7 b	12.8 bc	12.1 c	18.4 a	19.0 a	18.4 a	17.3 a	10.1 a	10.4 a	10.2 a	10.1 a
Nobelstar	15.6 a	13.4 b	12.2 c	11.4 c	19.3 a	18.5 a	17.5 a	17.4 a	9.6 b	10.6 a	10.0 ab	9.4 b
Picacho	15.7 a	13.2 b	13.1 b	11.4 c	20.6 a	18.8 b	17.2 b	15.3 c	10.0 a	9.4 a	9.6 a	9.0 a
Puebla	15.8 a	15.2 a	12.1 b	10.2 c	21.6 a	20.2 a	17.3 b	15.9 b	10.3 a	10.6 a	10.1 a	9.1 b
Sonora	14.1 a	11.2 b	9.5 c	9.5 c	18.5 a	15.8 b	14.6 b	14.6 b	9.9 a	9.6 a	9.0 a	9.4 a

[z]Chemicals applied at 5 mg/6-inch pot; chemical mg active ingredient per pot was ancymidol (0.375), paclobutrazol (0.25), and uniconazole (0.125).
[y]Mean separation within cultivars and within measured parameters by Duncan's Multiple Range Test ($\alpha = 0.05$).
[x]Inflorescence diameter not measured.

Table 3. Effect of growth regulators on vegetative and floral characteristics of nine established commercial poinsettia cultivars.

Cultivar	Plant Height (inches)[z]				Plant Diameter (inches)				Inflorescence Diameter (inches)			
	Control	Ancymidol[z]	Paclobutrazol	Uniconazole	Control	Ancymidol	Paclobutrazol	Uniconazole	Control	Ancymidol	Paclobutrazol	Uniconazole
A. Hegg Hot Pink	16.4 a[y]	11.9 b	10.4 b	10.6 b	17.0 a	15.0 b	14.0 b	14.4 b	8.0 a	7.6 a	7.0 a	7.4 a
A. Hegg Top White	13.8 a	10.9 b	9.1 c	9.0 c	16.5 a	14.3 b	12.4 c	12.8 c	8.0 a	7.8 a	8.0 a	8.1 a
Freedom	12.6 a	10.2 b	9.9 b	9.4 b	18.8 a	15.8 b	15.5 b	14.5 b	9.5 ab	10.2 a	9.3 ab	9.0 b
Freedom White	12.4 a	10.4 b	9.9 b	8.6 c	16.8 a	15.7 ab	14.5 b	12.4 c	9.4 a	9.5 a	8.8 a	7.7 b
Peterstar	15.3 a	11.6 b	11.6 b	9.9 c	18.6 a	17.0 ab	15.5 bc	14.8 c	9.6 a	10.5 a	10.5 a	9.7 a
Supjibi	14.9 a	12.6 b	12.8 b	10.8 b	20.4 a	18.5 b	17.8 b	14.4 c	8.8 a	9.2 a	8.9 a	8.9 a
V-14 Glory	15.2 a	12.9 b	11.6 a	10.4 d	17.3 a	16.5 a	16.3 a	13.6 b	10.4 a	10.3 a	10.9 a	10.7 a
V-14 Pink	16.8 a	14.3 b	12.5 c	10.6 d	19.9 a	17.3 b	16.7 b	14.5 c	10.2 a	9.8 a	9.7 a	10.0 a
V-14 White	15.5 a	14.1 b	12.5 c	10.3 d	18.2 a	17.8 a	16.2 ab	15.3 b	10.2 a	10.4 a	10.6 a	10.6 a

[z]Chemicals applied at 5 mg/6-inch pot; chemical mg active ingredient per pot was ancymidol (0.375), paclobutrazol (0.25), and uniconazole (0.125).
[y]Mean separation within cultivars and within measured parameters by Duncan's Multiple Range Test ($\alpha = 0.05$).

cool. Split applications of growth regulators should be practiced with these cultivars. 'Supjibi' plants were of an acceptable height and diameter when treated with all growth regulators. 'Peterstar', which is of the same ancestry as many of the Pelfi® cultivars, was an acceptable height when treated with ancymidol or paclobutrazol, but was too short when drenched with uniconazole. Plant diameter was too small with the latter treatment. The white and pink cultivars of 'Gutbier V-14' series, when treated with ancymidol, were shorter than the control plants but were a little too tall for mass market outlets; however, they could be usable for specialty markets where a taller plant would be desirable. 'V-14 Glory Red' plants were 12.9 and 11.6 inches tall when treated with ancymidol and paclobutrazol, respectively. All plants of the V-14 lineage were too short when drenched with uniconazole. Heights of the 'A. Hegg Hot Pink' plants were not significantly different when treated with any of the growth regulators, but plants of 'A. Hegg Top White' were shorter when drenched with the triazoles compared to ancymidol. The triazoles also retarded plant diameter but not inflorescence diameter of this cultivar.

Although plants of the Pelfi® series generally responded to growth regulators in a manner similar to established cultivars, growers need to be aware that individual cultivars, such as 'Sonora', can be too short when treated with growth regulator amounts acceptable for many other cultivars. Response of 'Sonora' is similar to plants of the 'Freedom' lineage. Uniconazole, which is the most active chemical of those used in this study, should be applied in split applications in case cool weather prevails during the crop cycle.

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