

Table 3. Preemergent control of *Phyllanthus urinaria* in a soilless medium after two applications.

Herbicide	kg/ha	Weeks after 2nd application <sup>2</sup>				
		5		10		Dry wt (g)
		Number	Percent coverage	Number	Percent coverage	
Control	---	38.1 a	81 a	33.9 a	100 a	31.8 a
Oxadiazon	4.5	0.3 f	<1 e	0.7 f	15 bc	1.0 e
Dithiopyr	2.2	3.8 e	2 e	2.0 de	22 b	1.4 e
Isoxaben	1.1	17.6 b	74 b	18.2 b	98 a	26.6 b
Isoxaben + metolachlor	1.1 + 2.2	7.6 d	9 de	7.5 c	97 a	13.0 d
Isoxaben + trifluralin	0.9 + 3.6	17.6 b	30 c	18.0 b	100 b	22.6 b
Isoxaben + trifluralin	1.1 + 4.5	18.4 b	14 de	19.5 b	99 a	17.2 cd
Isoxaben + oryzalin	0.9 + 3.6	10.0 cd	20 cd	10.5 c	98 a	17.6 c
Prodiamine + metolachlor	2.2 + 2.2	6.1 de	1 e	3.4 d	8 c	0.4 e
Prodiamine	2.2	3.4 e	1 e	1.6 ef	1 c	<0.1 e
Metolachlor	2.2	16.1 bc	19 cd	17.4 b	98 a	14.2 cd

<sup>2</sup>Mean separation (in columns) by Duncan's multiple range test (5% level) after square root (Number) or arcsine (Percent coverage) transformation; however, untransformed means are reported.

duced the number of *P. urinaria* from 5 to 10 WAT. Good control of *P. tenellus* was obtained with prodiamine, although it was not as effective as oxadiazon after the second application (Tables 2, 4). Metolachlor at 2.2 kg ai/ha proved to be antagonistic to prodiamine at 2.2 kg ai/ha. The number/pot of both species was greater in pots treated with the tank mix than in pots treated with prodiamine alone (Tables 1, 3, 4).

Dithiopyr at 2.2 kg ai/ha provided good control of *P. tenellus* 10 weeks after one application but only 5 weeks after the second application. However, it took two applications of dithiopyr to achieve good control of *P. urinaria* for 10 weeks.

Isoxaben formulated with oryzalin or tank-mixed with metolachlor provided good to excellent control of both species 10 weeks after the first application but not after two applications. The lack of control by these treatments after the second application may have been due to additional pressure resulting from self-seeding, the increased

Table 4. Preemergent control of *Phyllanthus tenellus* in a soilless medium after two applications.

Herbicide	kg/ha	Weeks after 2nd application <sup>2</sup>				
		5		10		Dry wt (g)
		Number	Percent coverage	Number	Percent coverage	
Control	---	92.2 a	88 a	90.4 a	100 a	26.2 a
Oxadiazon	4.5	0 f	0 e	7.2 d	2 e	<0.1 e
Dithiopyr	2.2	3.2 e	1 e	51.9 b	7 e	0.1 e
Isoxaben	1.1	74.2 b	88 a	76.3 a	99 a	25.9 a
Isoxaben + metolachlor	1.1 + 2.2	14.3 d	22 d	28.2 c	61 c	8.9 d
Isoxaben + trifluralin	0.9 + 3.6	92.5 a	94 a	91.5 a	100 a	25.8 a
Isoxaben + trifluralin	1.1 + 4.5	81.1 ab	82 ab	88.1 a	100 a	24.7 a
Isoxaben + oryzalin	0.9 + 3.6	26.9 c	40 c	33.7 c	85 b	14.5 c
Prodiamine + metolachlor	2.2 + 2.2	11.7 d	3 e	49.1 b	25 d	1.8 e
Prodiamine	2.2	5.4 de	1 e	24.4 c	5 e	0.2 e
Metolachlor	2.2	86.7 a	82 b	88.2 a	100 a	20.2 b

<sup>2</sup>Mean separation (in columns) by Duncan's multiple range test (5% level) after square root (Number) or arcsine (Percent coverage) transformation; however, untransformed means are reported.

irrigation, and/or a greater disturbance of the herbicidal barrier due to more weeds being removed as compared to treatments where only a few small weeds were present. Major disturbance of the medium surface of ineffective treatments may also have precluded a carryover effect of these treatments.

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Proc. Fla. State Hort. Soc. 106:294-297. 1993.

## COMPARATIVE EFFECT OF GROWTH REGULATORS ON POINSETTIA

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Additional index words. chlormequat, daminozide, paclobutrazol, uniconazole, *Euphorbia pulcherrima*.

**Abstract.** Poinsettia (*Euphorbia pulcherrima* Willd.) cvs. 'Gutbier V-14 Glory' and 'Gross Supjibi', grown in 6-inch pots in a shadehouse during the fall of 1992, were treated with plant growth regulators (PGRs). PGRs were applied as a foliar spray (2 qt/100 gal), as a soil drench (5 oz/pot), or as a paclobutrazol impregnated spike when the uppermost lateral was 2 to 2.5 inches long. Single foliar sprays of uniconazole (10 ppm a.i.), paclobutrazol (60 ppm a.i.), or a combination of chlormequat (2000 ppm a.i.) plus daminozide (1000 ppm a.i.) yielded 'Glory' plants 11.9 to 13.2 inches tall, compared

Florida Agricultural Experiment Station Journal Series No. N-00835.

to water-sprayed plants which were 15.8 inches tall. Drench applications of uniconazole (0.0625 mg a.i./pot) or paclobutrazol (0.25 mg a.i./pot) produced plants 12.2 to 12.6 inches tall. Plants which had the two or four paclobutrazol sticks inserted in the medium at 0.25 mg a.i./pot were of similar height as those drenched with paclobutrazol to provide the same amount of active ingredient. No differences in plant growth were observed between a 0.128% and a 0.4% formulation of paclobutrazol, applied either as a foliar spray or medium drench.

Poinsettias grown in 2 to 14-inch diameter containers are the number one selling potted flowering plant in the United States, with a wholesale value in 1992 over 193 million dollars (Anon., 1993). In Florida, where poinsettias are produced as single stem or pinched plants in 4-to 10-inch containers, in hanging baskets, or as trees, the 1992 value was over 11 million dollars. The majority of Florida sales were generated from single pruned plants grown in 6 to 6.5 inch pots (2.8 million), but 1992 sales represented a decline of 17% from 1991 due to destruction of the crop in South Florida by Hurricane Andrew in Aug., 1992. The predominant cultivars grown were 'Gutbier V-14 Glory' and 'Gross Supjibi', but 'Eckespoint Freedom', introduced in 1992, is rapidly replacing 'Gross Supjibi' in Florida. Plants grown in shadehouses in central and south Florida and pruned to five to six nodes on 15 Sep. generally require only one or two applications of a growth regulator to attain the proper plant:pot ratio (Wilfret, 1984). Chloromequat (Cycocel®) applied as a foliar spray is used most frequently to retard poinsettia plant growth (Cathey and Taylor, 1963; Conover and Vines, 1972; Tjia et al., 1976). Ancymidol (A-Rest®) is useful as a soil drench but can be phytotoxic as a foliar spray (Besemer, 1971; Larson, 1978). Paclobutrazol (Bonzi®) and uniconazole (Sumagic®) are two new triazole compounds that are very effective in retarding poinsettia growth (Barrett and Nell, 1989, 1990; Davis et al., 1988). Since these 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). Research has demonstrated that various application methods of growth retardants can be utilized, such as impregnating chemicals into clay pots (Einert, 1976), injecting the chemicals in the irrigation water (Holcomb and White, 1970), or soaking the roots of rooted cuttings prior to transplanting (Bearce and Singha, 1992). Encapsulated solids, gels, tablets (Sanderson and Drane, 1990; Sanderson et al., 1988, 1989, 1990; Read et al., 1974), and granules (Wilfret et al., 1978; Murray et al., 1986) have been evaluated as a preplant incorporation in the medium to control plant height. The objective of this research was to compare the efficacy of the triazol compounds when applied as a foliar spray, a soil drench or as a solid spike which was impregnated with paclobutrazol and inserted into the soil media of poinsettia plants.

#### Materials and Methods

Single poinsettia cuttings of cultivars 'Gutbier V-14 Glory' and 'Gross Supjibi', which were established in Oasis® blocks, were planted on 27 Aug. 1993, in 6-inch diameter plastic pots (1.6 qt). Soil medium consisted of a mixture of Florida sedge peat, coarse white builder's sand, coarse ver-

miculite, and perlite (5:3:3:1, v/v). Soil medium amendments, (per yd<sup>3</sup>) were 18 lb of Nutricote 13N-10.8P-5.6K (100 day), 7.5 lb of dolomitic limestone, 7.5 lb of granular calcium carbonate, 3 lb of hydrated lime, 5 lb of single superphosphate, and 1.5 lb of Nutritrace®, a minor element mixture. Initial pH was 6.2. After planting the cuttings, the medium was drenched with 6 oz of Banrot® (5-ethoxy-3-trichloromethyl-1,2,4-thiadiazole (15%) plus dimethyl 4,4'-0-phenylenebis (25%)) at 4 oz/100 gal. Plants were grown on capillary mat beds in a shadehouse covered with black polypropylene mesh to exclude 25% of ambient light. Plants were placed three across on 15-inch centers on 3.3-foot wide beds and the medium was drenched on 28 Aug. with 6 oz of a soluble 20N-16.6P-8.7K fertilizer. Incandescent lights, which provided a minimum of 10 ft. c. at plant level, were illuminated from 2200 to 0200 hr daily from 15 Sep. through 4 Oct. Plants were pinched to six nodes on 15 Sep. Growth regulators were applied on 8 and 21 Oct. Foliar spray applications were made at 2 qt/100 ft<sup>2</sup> and medium drenches were applied in 5 fl oz aliquots per container. Treatments included: uniconazole (Sumagic®) sprays at 0, 5, 5(2×), or 10 ppm for 'Supjibi' and 0, 10, 10(2×), or 20 ppm for 'Glory'; uniconazole drenches for both cvs. at 0.0625 or 0.125 mg a.i. per pot; paclobutrazol (Bonzi®) sprays for both cvs. at 60 ppm (using a 0.128% or 0.4% formulation) and drenches at 0.25 (0.128%), 0.25 (0.4%), or 0.5 (0.128%) mg a.i. per pot; a mixture of chlormequat (Cycocel®) at 2000 ppm and daminozide (B-Nine®) at 1000 ppm (one or two times); and paclobutrazol impregnated spikes at 0.25 or 0.5 mg a.i. per pot. Treatments with the spikes were 4 spikes/pot of a 0.005% formulation, 2 half spikes/pot of a 0.02% formulation, and 2 spikes/pot of the 0.02% formulation. The spikes were the type used to manufacture Jobe's Fertilizer Spikes® (Weatherly Consumer Products, Lexington, KY) but without the fertilizer. Plants were protected from insects, mites, and disease causing organisms by a weekly spray program. Plants were measured on 3 Dec. The experimental design was a randomized complete block design, with each cultivar analyzed separately. Each treatment was replicated four times with three pots per replicate. ANOVA was computed for recorded data on plant height above the pot rim and plant diameter. Means were separated at the 5% level by least significant differences (LSD).

#### Results and Discussion

The 1992 poinsettia season started with very wet weather during Aug. and continued with hot days (above 90°F) and warm nights (above 70°F) through Sep. These conditions contributed to long internodes, especially the basal two to three of each lateral, which made the plants not treated with growth regulators tall and weak. Plants treated with the proper concentration of growth retardants when the laterals were 2 to 3 inches long were shorter and stronger. None of the treatments had any effect on flower development, time to marketability, or inflorescence diameter (data not included).

'Gutbier V-14 Glory': The plants sprayed with water were 15.8 inches tall and were not a marketable size, which was defined as 11 to 13 inches above the pot rim (Table 1). Plants sprayed with uniconazole at 10 ppm once were slightly taller than desired but plants sprayed twice at this concen-

Table 1. Effect of growth regulator application method and concentration on poinsettia 'Gutbier V-14 Glory'.

Treatment	No. of applications	Plant height (inches)	Plant diameter (inches)
Control - water	1	15.8	18.9
Uniconazole spray <sup>2</sup> @ 10 ppm	1	13.4	18.3
Uniconazole spray @ 10 ppm	2	10.6	16.4
Uniconazole spray @ 20 ppm	1	11.9	17.9
Uniconazole drench <sup>3</sup> @ 0.0625 mg ai	1	12.2	19.0
Uniconazole drench @ 0.125 mg ai	1	12.7	17.8
Chlormequat spray @ 2000 ppm + Daminozide spray @ 1000 ppm	1	12.0	19.0
Chlormequat spray @ 2000 ppm + Daminozide spray @ 1000 ppm	2	11.9	18.5
Paclobutrazol (0.4%) spray @ 60 ppm	1	13.2	18.3
Paclobutrazol (0.128%) spray @ 60 ppm	1	12.5	18.7
Paclobutrazol (0.4%) drench @ 0.25 mg ai	1	12.5	17.4
Paclobutrazol (0.128%) drench @ 0.25 mg ai	1	12.6	18.4
Paclobutrazol (0.128%) drench @ 0.5 mg ai	1	9.8	17.0
Paclobutrazol stick @ 0.25 mg ai (4-0.005% sticks/pot)	1	12.6	19.6
Paclobutrazol stick @ 0.25 mg ai (2-1/2 sticks of 0.02%/pot)	1	11.6	19.3
Paclobutrazol stick @ 0.5 mg ai (2-0.02% sticks/pot)	1	8.9	14.8
LSD ( $\alpha = 0.05$ )		1.1	1.7

<sup>2</sup>Spray volume of 2 qt/100 ft<sup>2</sup>.

<sup>3</sup>Drench volume of 5 oz/pot.

tration were too short. A single application of 20 ppm uniconazole was less effective than two sprays at 10 ppm but the former plants were within the desirable height range. Both of the uniconazole drench treatments yielded plants between 12 and 13 inches tall. The mixture of chlormequat and daminozide applied as a foliar spray produced plants about 12 inches tall and no differences were evident between one or two sprays. No chlorosis of the leaf margins was observed with this combination spray as has been reported with chlormequat when used alone (Larson, 1978). Plants treated with paclobutrazol as a foliar spray of 60 ppm or as a soil drench at 0.25 mg a.i./pot were between 12.5 and 13.2 inches tall, with no differences due to formulation. Plants drenched with paclobutrazol at 0.5 mg a.i./pot were very short, had dark green, ruffled foliage, and were not marketable. Use of the paclobutrazol impregnated sticks yielded plants similar to those from the soil drench treatments at the same amount of active ingredient.

No differences were evident between 2 or 4 sticks/pot. Comparison of the two triazoles indicates that uniconazole applied as a foliar spray is about six times more effective than paclobutrazol but is only four times more effective as a medium drench.

'Gross Supjibi': Growth of this cultivar appeared to be inhibited by the high fall temperatures and the plants were uneven within the experiment and did not grow as well as in previous years. Plants sprayed with water were an acceptable height but the laterals tended to droop. The large bracts also contributed to this cascading habit. Use of the growth regulators appeared to make the laterals more upright and shorter and produced a higher quality plant. Although the plants were shorter than desired, many of them were marketable due to the nature of the growth and bract development of this cultivar. With its large inflorescence, a compact plant would be useful for table decorations or in areas where a smaller plant would be preferred. Two

Table 2. Effect of growth regulator application method and concentration on poinsettia 'Supjibi'.

Treatment	No. of applications	Plant height (inches)	Plant diameter (inches)
Control - water	1	11.8	18.9
Uniconazole spray <sup>2</sup> @ 5 ppm	1	10.9	17.3
Uniconazole spray @ 5 ppm	2	8.9	16.3
Uniconazole spray @ 10 ppm	1	9.2	16.6
Uniconazole drench <sup>3</sup> @ 0.0625 mg ai	1	8.8	16.9
Uniconazole drench @ 0.125 mg ai	1	8.2	16.5
Chlormequat spray @ 2000 ppm + Daminozide spray @ 1000 ppm	1	9.1	16.1
Chlormequat spray @ 2000 ppm + Daminozide spray @ 1000 ppm	2	8.7	16.5
Paclobutrazol (0.4%) spray @ 60 ppm	1	9.4	17.9
Paclobutrazol (0.128%) spray @ 60 ppm	1	9.4	17.1
Paclobutrazol (0.4%) drench @ 0.25 mg ai	1	8.8	16.2
Paclobutrazol (0.128%) drench @ 0.25 mg ai	1	8.9	17.4
Paclobutrazol (0.128%) drench @ 0.5 mg ai	1	8.7	16.3
Paclobutrazol stick @ 0.25 mg ai (4-0.005% sticks/pot)	1	9.6	16.7
Paclobutrazol stick @ 0.25 mg ai (2-1/2 sticks of 0.02%/pot)	1	9.6	17.2
Paclobutrazol stick @ 0.5 mg ai (2-0.02% sticks/pot)	1	8.4	15.3
LSD ( $\alpha = 0.05$ )		1.3	2.1

<sup>2</sup>Spray volume of 2 qt/100 ft<sup>2</sup>.

<sup>3</sup>Drench volume of 5 oz/pot.

applications of 5 ppm uniconazole were more effective than one but no different than a single spray at 10 ppm (Table 2). Likewise, no difference in plant growth was evident between the uniconazole drenches at 0.0625 or 0.125 mg a.i./pot. The foliar spray of chlormequat plus damin-ozide produced plants of a similar height with one or two applications and a height equivalent to the paclobutrazol and uniconazole sprays. No differences in plant growth were evident between the formulations of paclobutrazol when used as a foliar spray or a medium drench. The paclobutrazol sticks were as effective as the soil drenches at the same amount of chemical per pot regardless of number of sticks used per pot. The efficacy of uniconazole compared to paclobutrazol was similar with 'Supjibi' as with 'Glory'.

This research demonstrates that several growth regulators, alone or in combination, can effectively control height of poinsettias when grown in a shadehouse in central Florida. Use of the triazole growth regulators needs to be more precise than with chlormequat, as too high a concentration or too great a volume of uniconazole or paclobutrazol could produce plants too short to be marketable. The spike formulation of paclobutrazol is as effective as the spray or drench application methods and could reduce exposure of the ecosystem to the chemicals. Previous research (not published) has shown that at least two spikes per pot are necessary to get even growth of pruned poinsettia plants, especially with the use of subsurface irrigation.

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Proc. Fla. State Hort. Soc. 106:297-298. 1993.

## MEDIA LIME RATE AND PRUNING AFFECT LEAF MOTTLING OF *EPIPREMNUM AUREUM* 'MARBLE QUEEN'

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Additional index words. micro-nutrients, manganese, pothos

**Abstract.** Leaf mottling on *Epipremnum aureum* (Lind. & Andre) Bunt. 'Marble Queen' was affected by media lime rate and pruning. Rooted cuttings, planted in 6-inch azalea pots, were grown in media amended with either 1, 3, 5, 7, 9, or 11 lbs/yard<sup>3</sup> dolomitic limestone. After 6 weeks, plants to be pruned

were cut back, and the experiment was terminated after 13 weeks. Number of mottled leaves was much greater with 3, 5 or 7 lb/yard<sup>3</sup> lime rates than mottling on plants with 1, 9, or 11 lb/yard<sup>3</sup> rates. Leaf mottling was also more severe on pruned plants compared to unpruned plants. No differences were found in fresh plant weights for lime rate or pruning treatments. Leaf tissue manganese concentrations ranged from 913 to 1331 ppm suggesting possible manganese toxicity.

*Epipremnum aureum* (pothos) is one of Florida's most commonly produced foliage plants, grown mainly as totems and hanging baskets. Growers obtain these plants as either rooted or unrooted cuttings from various domestic and international sources. Once plants are well established in hanging baskets, vines are often pruned back to improve

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