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Efficacy and Postharvest Persistence of Uniconazole Treatment on *Hypoestes phyllostachya*

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Abstract. **The effectiveness of uniconazole for height control of *Hypoestes (Hypoestes phyllostachya* Bak. 'Pink Splash') was determined, and the persistence of uniconazole with chlormequat and daminozide for limiting stem elongation in a low-light interior environment was compared. Spray and drench applications of uniconazole decreased plant height linearly with increased concentration. Two uniconazole sprays at 5.0 mg·liter^{-1}, 0.05 mg a.i./pot uniconazole drench, or two chlormequat sprays at 2500 mg·liter^{-1} resulted in equally aesthetic plant size for 0.4-liter pots. Chlormequat was more effective than uniconazole for reducing rate of growth in the postharvest environment. No difference in postproduction rate of growth occurred between two sprays at 5.0 mg·liter^{-1} and 0.05 or 0.10 mg a.i./pot drench treatments of uniconazole. Chemical names used: 2-chloro- *N,N,N*- trimethylethanaminium chloride (chlormequat chloride); butanedioic acid mono(2,2-dimethylhydrazide) (daminozide); *(E)-(S)* -1-(4-chlorophenyl)-4,4-dimethyl-2-(1,2,4-triazol-1-yl)-pent-l1ene-3-ol (uniconazole).**

Hypoestes is a perennial herb, native to Madagascar, with ovate leaves marked with lavender-pink spots. When grown as a potted plant, a growth regulator is normally used to control plant size. α -Cyclopropyl- α -(4-methoxyphenyl)-5-pyrimidinemethanol (ancymidol) as a foliar spray at 200 mg·liter^{-1} was found to give good height control of *Hypoestes* (Armitage and Carlson, 1980). Reports of height control with daminozide vary from none or uneven control (Schultz, 1977), intermediate control (Armitage and Carlson, 1980), to good control (Sallee, 1989). Chlormequat was reported to be effective at rates ranging from 750 to 5000 mg·liter^{-1} (Armitage and Carlson, 1980; Hentig, 1985; Sallee, 1989). Chlormequat as a 1% solution at 50 ml/pot caused phytotoxic yellowing of leaves of *Hypoestes* (Schultz, 1977) and needed to be applied two to four times to achieve a lasting effect (Sallee, 1989).

Persistent effect of growth retardant use on *Hypoestes* would be desirable since well-grown, potted plants that are of suitable market height in the greenhouse often become excessively tall when placed in retail shops and home interiors. The objective of this research project was to determine the effectiveness of uniconazole on *Hypoestes* and to compare the effect and persistence of uniconazole with chlormequat and daminozide for limiting stem elongation during postproduction, low-light conditions.

Seeds of *Hypoestes phyllostachya* 'Pink Splash' (Ball Seed, West Chicago, Ill.) were sown 12 June 1989 in rows in bedding-plant flats containing Jiffy Mix (Jiffy Products of America, West Chicago). The flats were placed under intermittent mist until emergence. Seedlings were transplanted to cell packs (36 cells/flat) containing ProMix BX (Premier Brands, New Rochelle, N.Y.) on 3 July. On 14 July, one seedling was transplanted per 0.4-liter plastic pot in the same medium. Plants were grown in a 24/18C (venting/night set points) glasshouse and fertilized at each irrigation with 20N-4.4P-16.6K with N at 205 mg·liter^{-1}.

Growth retardant treatments included uniconazole as a spray at 0, 5, 10, or 20 mg·liter^{-1} applied once or twice. Spray volume was 204 ml of solution sprayed evenly over 1 m^2 of bench space. At initial treatment time, the plant canopy diameter was 15 cm; therefore, each pot received ≈3.6 ml of spray. Uniconazole as a drench was applied at 125 ml/pot at 0.025, 0.05, and 0.10 mg a.i./pot. Both chlormequat and daminozide were applied as foliar sprays to runoff, twice at 2500 or once at 5000 mg·liter^{-1}. First sprays were applied on 26 July and second applications 2 weeks later (9 Aug.).

Plants were considered marketable on 29 Aug., at which time plant height and diameter were measured. Plant height was measured from the bottom of the pot (pot height was 10 cm) to the top of the plant. Plant diameter was measured across the top of the plant in one direction.

The experiment consisted of 14 treatments using 10 one-plant replicates and a completely randomized design. Data were subjected to one-way analysis of variance (ANOVA), and single-degree-of-freedom contrasts were conducted for appropriate comparisons. Orthogonal polynomial coefficients were obtained from a table of unequally spaced treatment coefficients (Little and Hills, 1978).

Growth retardant treatments reduced plant height compared to controls (Table 1). The height of plants treated with uniconazole decreased linearly with increased concentration. Reductions in plant diameter were linear with increasing concentration for all spray and drench applications, and quadratic for two-spray applications (Table 1). Chlormequat exceeded daminozide in retarding plant

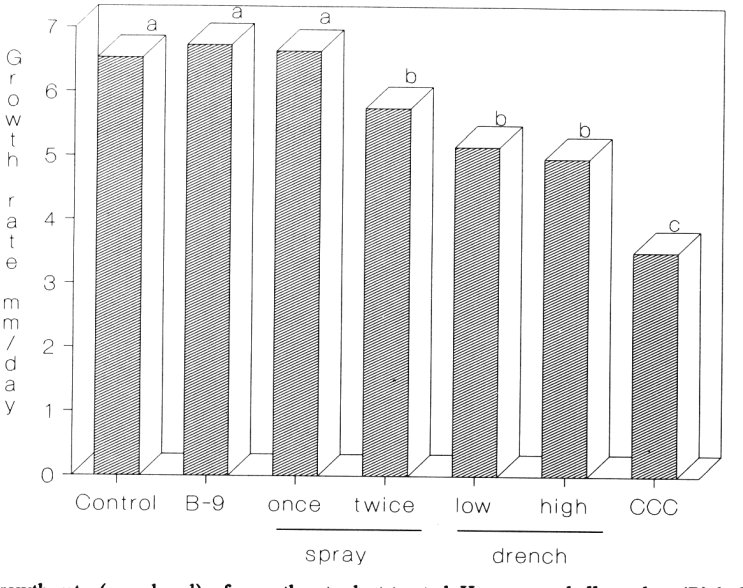

Fig. 1. Growth rate (mm·day^{-1}) of growth retardant-treated *Hypoestes phyllostachya* 'Pink Splash' during 7 weeks in a postproduction low-light environment. Treatments (left to right): control, two daminozide sprays at 2500 mg·liter^{-1} (B-9), one uniconazole spray at 5.0 mg·liter^{-1}, two uniconazole sprays at 5.0 mg·liter^{-1}, uniconazole drench at 0.05 mg a.i./pot, uniconazole drench at 0.10 mg a.i./pot, and two chlormequat sprays at 2500 mg·liter^{-1} (CCC).

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Table 1. Effects of the growth retardants chlormequat, daminozide, and uniconazole on *Hypoestes phyllostachya* 'Pink Splash' plant size characteristics.

Treatment	Plant ht (cm)	Plant diam (cm)
Control	35.7	35.5
Uniconazole		
Foliar spray (mg·liter^{-1})		
One application		
5.0	24.4	29.4
10.0	23.5	28.4
20.0	18.3	22.1
Two applications		
5.0	21.8	26.4
10.0	18.5	21.7
20.0	17.1	20.8
Medium drench (mg a.i./pot)		
0.025	22.7	33.2
0.05	20.9	29.5
0.10	18.4	25.6
Chlormequat		
Foliar spray (mg·liter^{-1})		
2500, twice	22.2	27.1
5000, once	22.5	25.1
Daminozide		
Foliar spray (mg·liter^{-1})		
2500, twice	28.0	32.8
5000, once	28.3	33.6
Contrasts		
Control vs. treatment	***	***
One spray uniconazole		
Linear	***	***
Quadratic	NS	NS
Two spray uniconazole		
Linear	***	***
Quadratic	NS	**
Uniconazole drench		
Linear	***	***
Quadratic	NS	NS
Chlormequat vs. daminozide	***	***

NS,**,***Treatment effect or contrast nonsignificant or significant at $P = 0.01$ or 0.001, respectively.

height and diameter. Chlormequat resulted in a 38% reduction in plant height and a 24% reduction in plant diameter compared to controls. Similar plant size control was obtained with uniconazole applied as two sprays at 5.0 mg·liter^{-1} or a 0.05-mg a.i./pot drench. These treatments resulted in the most aesthetically pleasing 0.4-liter potted plants at harvest.

When plants reached marketability, five plants of each of seven treatments were placed in a completely randomized design in a low-light simulated interior environment (SIE) similar to a retail sales or home condition. The optimum chlormequat (two sprays at 2500 mg·liter^{-1}) and uniconazole (two sprays at 5.0 mg·liter^{-1} and 0.05 mg a.i./pot drench) treatments were selected for plants placed in the SIE. Additionally, one uniconazole spray at 5 mg·liter^{-1} and drench at 0.10 mg a.i./pot were selected for comparing single to double spray applications and low to high drench rates. Daminozide applied twice as a foliar spray at 0 and 2500 mg·liter^{-1} also was included. The SIE was maintained at 23 ± 1C, 60% ± 10% relative humidity, 15 µmol·s^{-1}·m^{-2}, and a 16-h photoperiod from cool-white fluorescent lights. Plant height was taken at weekly intervals from harvest until 12 Oct.

A linear relationship was observed between plant height and weeks in the SIE between week 1 and 7. To estimate the rate of growth, the best-fitting line was determined via regression analysis for each plant. These coefficients were evaluated using ANOVA to test the hypothesis that there were no differences among the estimates for rate of growth. From this ANOVA, highly significant differences between rates of growth were ascertained. Differences were partitioned with Duncan's multiple range test.

Plants treated with one uniconazole spray at 5.0 mg·liter^{-1} grew at the same rate in the SIE as control and daminozide-treated plants (Fig. 1). There was no difference in growth rate due to treatment between two uniconazole sprays at 5.0 mg·liter^{-1} and the drenches. Thus, no more inhibitor reserve for gibberellin biosynthesis suppression was maintained with drench applications than with two sprays. Apparently, the reservoir behind the growing apex is replenished as effectively from repeated exogenous spray application as from continual internal translocation from the roots following a single drench application.

Chlormequat was the most effective growth retardant for reducing rate of growth in the SIE. Although persistent height reduction was achieved, chlormequat had a phytotoxic effect on *Hypoestes* foliage. Some plant leaves became chlorotic after treatment and those leaves remained yellow until plants were placed in the low-light environment. During the low-light conditions, these leaves abscised. However, leaf abscission was not severe enough to leave noticeable gaps in the foliage. The greater magnitude of continued activity with chlormequat compared to uniconazole may be due in part to induced plant injury and slow recovery rather than solely to a direct growth regulator effect.

Results of this study demonstrate *H. phyllostachya* is yet another species in which uniconazole controls height effectively. Uniconazole is effective on *Hypoestes* at a low dosage and is not phytotoxic. Most persistent postproduction growth control was obtained with two sprays or drench rather than a single spray application. However, uniconazole treatments were not as effective as chlormequat in reducing the rate of Hy *poestes* growth under postproduction, low-light conditions.

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