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GROWTH CONTROL OF *PSEUDERANTHEMUM*

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ABSTRACT

Studies to produce a more compact potted plant of Pseuderanthemum laxiflorum showed that pinching alone was not satisfactory. Initial treatment with chlormequat as a 2500 ppm spray or as a 500 mg/15-cm (1.1 liter) container produced excessive growth reduction and phytotoxicity. Treatment with chlormequat at 100 mg/15-cm container gave satisfactory results as was paclobutrazol and flurprimidol at the lower rates used. Chemical names used: -[(4-chlorophenyl) methyl]- (1,1-dimethylethyl)-1H-1,2,4-triazole-1-ethanol (paclobutrazol); (2-chloroethyl) trimethyl ammonium chloride (cycocel) ;-(1-methylethyl) -[4-(trifluoromethoxy)phenyl]-5-pyrimidinemethanol (flurprimidol).

KEYWORDS: *P. laxiflorum, P. species, pinching, chlormequat, paclobutrazol, flurprimidol.*

INTRODUCTION

Previous studies and observations with *Pseuderanthemum laxiflorum* and an unknown species of pseuderanthemum showed that they grew too tall and leggy as commercial potted plants (Rodrigues and Rauch, 1986; Rodrigues and Rauch, 1987). Criley (1981) has shown that a variety of species belonging to the family Acanthaceaes respond to the growth regulator chlormequat. Sanderson et al. (1987) reported that dipping cuttings of *Pseuderanthemum atropurpureum* in solutions of chlormequat prior to propagation had no effect on height control. These experiments were initiated to look at some possible cultural and chemical methods that might be effective in producing a more compact potted plant while permitting a high degree of flowering.

MATERIALS AND METHODS

Uniform, well-rooted, 15-cm, terminal cuttings of the two species of *Pseuderanthemum*, *Pseuderanthemum laxiflorum* and *Pseuderanthemum* sp., were potted into 15-cm (1.1 liter) plastic containers in a 1:1 peat:perlite mix. The medium was amended with Osmocote

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18N-2.6P-10K,dolomitic lime, treble superphosphate and Micromax at 5.0, 5.9, 0.6 and 1.0kg/m3, respectively. The plants were grown in the University ofHawaii-Manoa shade house under 30% shade. Daily irrigation was provided by overhead spray stakes.

Experiment 1. Plants of the two *Pseuderanthemum* species, potted singly, were allowed to become established and were divided into 5 treatments with 6 single plant replicates in a randomized complete block design. The treatments were an untreated control (C), a single hard terminal pinch (P), a terminal pinch followed by a second pinch one month later (RP), a terminal pinch followed by a 2500 ppm chlormequat spray one week later (S), and a 500 mg/15-cm pot chlormequat drench followed by a terminal pinch after one week (D). The chlormequat spray was made up in demineralized water and the plants were sprayed until runoff. The chlormequat drench was applied in 200 ml of water with no additional water applied until the following day.

Evaluation of plant growth 2 months after treatment application was plant height (measured from the pot rim to the shoot tip), number of laterals, average spread (w+w/2), and growth index (w+w+h/3). The plants were evaluated for expressions of phytotoxicity and flower productivity was determined using the following rating: 1 = no flowers, 2 = 1-5 flowers, 3 = 6-15 flowers, 4 = 16-40 flowers, and 5 = >40 flowers.

Experiment 2. Treatments consisted of three growth retardants at three rates of each; chlormequat (100, 200 and 400 mg/15 cm (1.1 liter) pot), paclobutrazol (.25, .50 and 1.00 mg/15 cm pot), and flurprimidol (.25, .50 and 1.00 mg/pot); plus a nontreated control. The retardants were applied as a drench in 200 ml of solution 14 days after pinching, when the new growth was between 1 and 3 cm in length. The plants of *Pseuderanthemum laxiflorum*, established 3/container, were arranged in a randomized block design with 7 replications.

Plants were evaluated for signs of phytotoxicity at 1 and 4 weeks after retardant application. Open flower counts were made at weeks 4 and 6, while plant growth was determined with growth index, GI, (h+w+w/3) measurements at weeks 4, 6 and 16 and top dry weight at the conclusion of the study after 16 weeks. The plants were evaluated at weeks 4 and 6 for quality or saleablity using the following rating scale:

1. poor balance (top to pot size) and/or abundant toxic symptoms.
2. satisfactory balance, few toxic symptoms, < 20 flower.
3. satisfactory balance, few toxic symptoms, > 20 flower.
4. exceptionally well balanced, few toxic symptoms, < 20 flowers.
5. exceptionally well balanced, few toxic symptoms, > 20 flowers.

RESULTS AND DISCUSSION

Experiment 1. The pinching treatments had little effect on the overall growth of either species of *Pseuderanthemum* (Tables 1, 2). The pinching treatments did not influence the flowering of *P. laxiflorum* but the repeat pinch treatment reduced flowering on *Pseuderanthemum* sp.

Significant reductions in the growth of both P. species resulted from both chlormequat treatments. However, there was also a reduction in the flowering for these two species. The reduction in growth from the chlormequat treatments appeared to be greater for P. laxiflorum than for *Pseuderanthemum* sp. and that the drench treatments were more effective than the spray application, especially for *Pseuderanthemum* sp.

Observations of the *P. laxiflorum* plants sprayed with 2500 ppm chlormequat two weeks after treatment showed some brown and yellow spotting on the foliage. There was yellowing and some leaf distortion of the new leaves one month after treatment.

New leaves of *P. laxiflorum* plants drenched with 500 mg chlormequat developed a strong purple color and chlorosis along the main veins. This intensified after one month with chlorosis of the main vein on some of the older leaves. There appeared to be some reduction in flower size, but this was not measured.

The *Pseuderanthemum* sp. sprayed with chlormequat showed some foliage discoloration and slight chlorosis along the leaf margins. Plants with the chlormequat drench treatment were a darker purple color than the controls, especially along the main veins.

In summary, pinching alone did not result in satisfactory growth control for these two species of *Pseuderanthemum*. The use of chlormequat at the concentrations used in this trial resulted in excessive reduction in growth and symptoms of phytotoxicity.

Experiment 2. All chemical treatments significantly reduced the growth of *P. laxiflorum* compared to the nontreated control plants as shown by the growth index ratings and top dry weight of the plants after 16 weeks (Table 3). The growth regulator concentrations used for each chemical in this study did not result in significant growth differences, except for chlormequat which resulted in a significant reduction in dry weight with increase in chemical concentration. A comparison of the dry weight means showed no difference in growth reduction between paclobutrazol and flurprimidol but a significant difference between these chemicals and chlormequat. None of the treatments had an effect on flowering when the number of open flowers was determined after 4 weeks. This was also true after 6 weeks with the exception of the highest rate (1.0 mg/pot) of flurprimidol which reduced the flower count.

The new growth of *P. laxiflorum* normally has a purple color, turning to a medium green color as the foliage matures. All of the plants treated with the 3 growth regulators tended to retain the purple color in the mature foliage. This was judged not to detract from the appearance of the plants. The purpling appeared to be slightly more intense on plants treated with flurprimidol. Several of the plants treated with chlormequat, especially at the higher rates, showed a chlorotic symptom along the main vein. This was still evident on 2 of the 7 pots treated with 400 mg chlormequat 16 weeks after treatment.

When the overall plant quality was judged, 6 weeks after treatment, all treatments were found to give superior results over the untreated control with the exception of the high rates (1 mg/pot) of paclobutrazol and flurprimidol (Table 3). There was a decrease in quality with these two chemicals with an increase in concentration. The best quality was at the lowest rate (.25 mg/pot). There was no significant difference in quality at the rates of chlormequat used with all treatments giving satisfactory results. However, the two higher rates of chlormequat tended to

induce chlorosis along the main vein while this was not present on plants treated with 100 mg of chlormequat.

Some variability among the three plants in each pot was observed. This is possibly due to an uneven application of the chemical and might be corrected by increasing the volume of water used to drench the medium.

CONCLUSIONS

The results of the first trial showed the pinching alone did not result in satisfactory growth control for these two species of *Pseuderanthemum*. The use of chlormequat at the concentrations used resulted in excessive reduction in growth along with phytotoxic symptoms. The follow up trial showed that reducing the rate of chlormequat can effectively control the growth of *P. laxiflorum* with little adverse effect on overall flowering. The other two chemicals used in this trial were also effective in reducing the growth of *P. laxiflorum*. The lower rates of each chemical would be recommended for further trials.

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Table 1. The influence of growth control treatments on *P. laxiflorum*, after 2 months.

Treatment	Height cm	Spread cm	Growth index cm	Laterals #	Flower[x] rating
Control	18.4 b[y]	23.1 a	22.3 a	20.7 ab	4.6 a
Pinch	23.9 a	21.7 a	22.3 a	24.6 a	4.8 a
Repeat pinch	20.7 ab	20.1 a	20.3 a	20.2 b	4.8 a
Chlormequat spray	4.2 c	3.2 b	3.4 b	6.3 c	3.3 b
Chlormequat drench	2.5 c	0.2 b	0.9 b	5.3 c	2.8 b

[x] Flower rating: 1=no flowers, 2=1-5 flowers, 3=6-15 flowers, 4=16- 40 flowers, 5=>40 flowers.

[y] Mean separation in columns by Duncan's multiple range test, 5% level.

Table 2. The influence of growth control treatments on *Pseuderanthemum* sp., after 2 months.

Treatment	Height cm	Spread cm	Growth index cm	Laterals #	Flower[x] rating
Control	46.9 a[y]	28.9 a	34.8 a	12.5 a	3.8 a
Pinch	40.0 a	25.9 ab	29.9 ab	10.0 ab	3.5 a
Repeat pinch	35.1 a	25.7 ab	28.8 ab	12.0 a	2.0 b
Chlormequat spray	44.4 a	16.6 b	26.0 b	6.3 bc	2.0 b
Chlormequat drench	21.1 b	4.9 c	9.2 c	2.2 c	1.2 b

[x] Flower rating: 1=no flowers, 2=1-5 flowers, 3=6-15 flowers, 4=16-40 flowers, 5=>40 flowers.

[y] Mean separation in columns by Duncan's multiple range test, 5% level.

Table 3. The effect of growth retardant drenches and rates on growth and quality of *P. laxiflorum*, weeks after treatment.

Chemical	Rate mg/pot	Growth index[x]		Top dry wt. g	Flowers/pot		Quality 6 wk
		6 wk	16 wk		4 wk	6 wk	
Control	-----	30.7 a[y]	37.3 a	21.9 a	8.7	15.9 a	1.0 c
Chlormequat	100	26.8 b	26.6 b	12.8 b	8.3	13.4 ab	2.6 ab
Chlormequat	200	25.2 bc	26.1 b	11.7 bc	6.4	14.7 ab	3.1 a
Chlormequat	400	24.4 c	24.3 bc	10.6 cde	5.7	12.7 ab	2.4 ab
Paclobutrazol	0.25	24.0 c	25.7 bc	10.7 cd	10.1	17.3 a	3.6 a
Paclobutrazol	0.50	25.0 bc	26.5 b	11.0 cd	6.9	13.6 ab	2.4 ab
Paclobutrazol	1.00	24.5 c	25.5 bc	9.6 de	6.3	12.1 ab	1.7 bc
Flurprimidol	0.25	24.0 c	24.4 bc	9.4 de	7.1	10.7 ab	3.1 a
Flurprimidol	0.50	24.0 c	23.5 c	10.0 cde	8.0	12.3 ab	2.7 ab
Flurprimidol	1.00	24.9 c	24.3 bc	8.8 e	8.0	6.3 b	1.6 bc

[x] Growth index = h+w+w/3

[y] Mean separation in columns by Duncan's multiple range test, 5% level.