

# Bioregulators and poinsettia plant quality<sup>1</sup>

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## ABSTRACT

Paclobutrazol at 0, 12.5, 25 and 37.5 mg/L and uniconazole at 0, 5, 10 and 15 mg/L were applied both as a foliar spray and as a soil drench to 'Eckespoint Freedom Red' and 'Gross Supjibi Red' poinsettia plants. In both poinsettia cultivars plant size was effectively reduced by paclobutrazol and uniconazole as soil drenches at all concentrations. Applying paclobutrazol (12.5 mg/L) or uniconazole (5 mg/L) as a soil drench reduced poinsettia plant size for a longer period of time than applying either as foliar spray. Growth regulators applied as a soil drench also reduced the bract diameter of both cultivars. The use of growth regulators such as paclobutrazol and uniconazole on poinsettia production can improve plant quality (size) in Puerto Rico.

**Key words:** *Euphorbia pulcherrima*, growth regulators, paclobutrazol, uniconazole

## RESUMEN

### Bioreguladores y la calidad de la planta de pascua

Se aplicó paclobutrazol a 0, 12.5, 25 y 37.5 mg/L y uniconazole a 0, 5, 10 y 15 mg/L a las plantas de pascua 'Eckespoint Freedom Red' y 'Gross Supjibi Red', mediante aspersiones al follaje o empapando el suelo. En ambos cultivares el tamaño de las plantas de pascua se redujo significativamente cuando el suelo se empapó con cualesquiera de las tres concentraciones de paclobutrazol o uniconazole. Cuando se empapó el suelo con paclobutrazol (12.5 mg/L) o uniconazole (5 mg/L) se redujo el tamaño de la planta de pascua por un período más prolongado que cuando se asperjó el follaje. Los reguladores de crecimiento aplicados empapando el suelo causaron una reducción en el diámetro de las bracteas de ambos cultivares. El uso de reguladores de crecimiento como paclobutrazol y uniconazole en la planta de pascua puede mejorar la calidad (tamaño) de éstas en Puerto Rico.

## INTRODUCTION

Poinsettia (*Euphorbia pulcherrima* Willd ex Klotzch) culture has gone through many changes in Puerto Rico. Poinsettias used to be grown as shrubs or small trees in the landscapes of many rural and ur-

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ban homes. By the 70s imported new poinsettia cultivars were sold as potted plants for Christmas. Improved cultural practices, warm, tropical weather and high light intensity cause an increase in plant height compared to that of poinsettia produced in the northern United States and Europe. However, tall poinsettia plants are usually undesirable as potted plants and should be avoided in commercial production.

Poinsettia height and width (measures of quality) can be controlled either by cultural practices or by the use of growth regulators. Cultural size control includes the use of short cuttings, late propagation, pinching, increased spacing, and selection of appropriate cultivars for Puerto Rico. Growers have used improved cultural practices, but very few have used growth regulators to control poinsettia height and thus improve quality.

Many plant growth regulators have been tested on poinsettia in the United States (Bailey and Miller, 1991; Besemer, 1969; Larson, 1967; Lewis, 1983). MacDaniel (1986) reported that paclobutrazol (0.50 mg per pot—soil drench and 25-50 mg/L—foliar spray), flurprimidol (0.03-0.06 mg per pot—soil drench and 25 mg/L—foliar spray) and tetcyclasis (10-20 mg per pot—soil drench) provided similar effective results in restricting poinsettia plant height.

The efficacy of growth retardants can be correlated with the method of application (Barret and Bartuska, 1982). Cycocel sprays were not as effective as soil drench treatments for 'Indianapolis Red' and 'Paul Mikkelsen' (Larson, 1967). Paclobutrazol applied as a soil drench was more effective than when applied as a spray in controlling 'Gutbier V-10 Amy' plant height (L.R.S., unpublished data). Uniconazole root-zone soak was a potentially effective method for applying growth retardants to 'Annette Hegg Brilliant Diamond' poinsettia (Bearce and Singha, 1992).

The objective of this study was to determine the more effective and economical use of growth regulators (paclobutrazol or uniconazole) and method of application (foliar spray or soil drench) to improve poinsettia plant size and quality.

## MATERIALS AND METHODS

Rooted cuttings of 'Eckespoint Freedom Red' and 'Gross Supjibi Red' poinsettia were purchased from a local grower and transplanted in 15-cm azalea pots 26 August 1994. Pots were arranged in groups of four, with 38 cm between pots and 29 cm between groups along the bench. Poinsettia plants were grown and then pinched at the eighth node 16 September 1994.

Plant height was measured 21 October 1994. The same day, paclobutrazol (Bonzi)<sup>6</sup> at 12.5, 25 and 37.5 mg/L, and uniconazole (Sumagic) at 5, 10 and 15 mg/L were applied as either a foliar spray or a soil drench to poinsettia plants. Untreated control plant (no paclobutrazol nor uniconazole) was also included.

Plants were watered with a drip spaghetti tubing system and a commercial fertilizer 20-10-20 (3.7 g/L) was applied twice a week. Supplementary incandescent light from 10:00 PM to 2:00 AM was used to prevent premature flower induction on poinsettia from 1 September 1994 to 14 October 1994. Plants were grown under a corrugated fiberglass greenhouse with sides covered with screens for ventilation. Fans were also used to cool the greenhouse.

Freedom Red and Supjibi Red plant height (from pot rim), width and bract diameter were measured on 8 December 1994. A randomized split-split plot arrangement of treatments with five blocks was used. Poinsettia cultivars were main plots, method of application was subplots and growth regulator concentrations were sub, subplots (with four plants). Data were submitted to Analysis of Variance for balanced data (SAS, 1985) and means separation was accomplished by Tukey's test.

## RESULTS AND DISCUSSION

There were no statistical differences between cultivars for height and width, so data for both cultivars were combined. Application by treatment interaction was statistically significant for all variables; data are presented in those terms by figures. Freedom Red and Supjibi Red poinsettia plant size was effectively controlled by paclobutrazol and uniconazole applied as a soil drench (Figures 1 and 2). The lowest concentration of paclobutrazol (12.5 mg/L) and uniconazole (5 mg/L) as a soil drench reduced plant height and width of both cultivars (Figures 1 and 2).

When growth regulators were applied as foliar spray a reduction in plant height was observed after two weeks. However, as poinsettia plants developed further, the reduction in growth rate was less noticeable. Paclobutrazol as a foliar spray did not control poinsettia plant size at any concentration (Figures 1 and 2). In contrast, uniconazole applied as foliar spray at the highest concentration (15 mg/L) reduced Freedom Red and Supjibi Red plant height and width, compared with the control, but not as much as soil drenches (Figures 1 and 2). This finding

<sup>6</sup>Trade names in this publication are used to provide specific information. Mention of a trade name does not constitute a warranty of materials by the UPR/AES, nor is this mention a statement of preference over other materials.

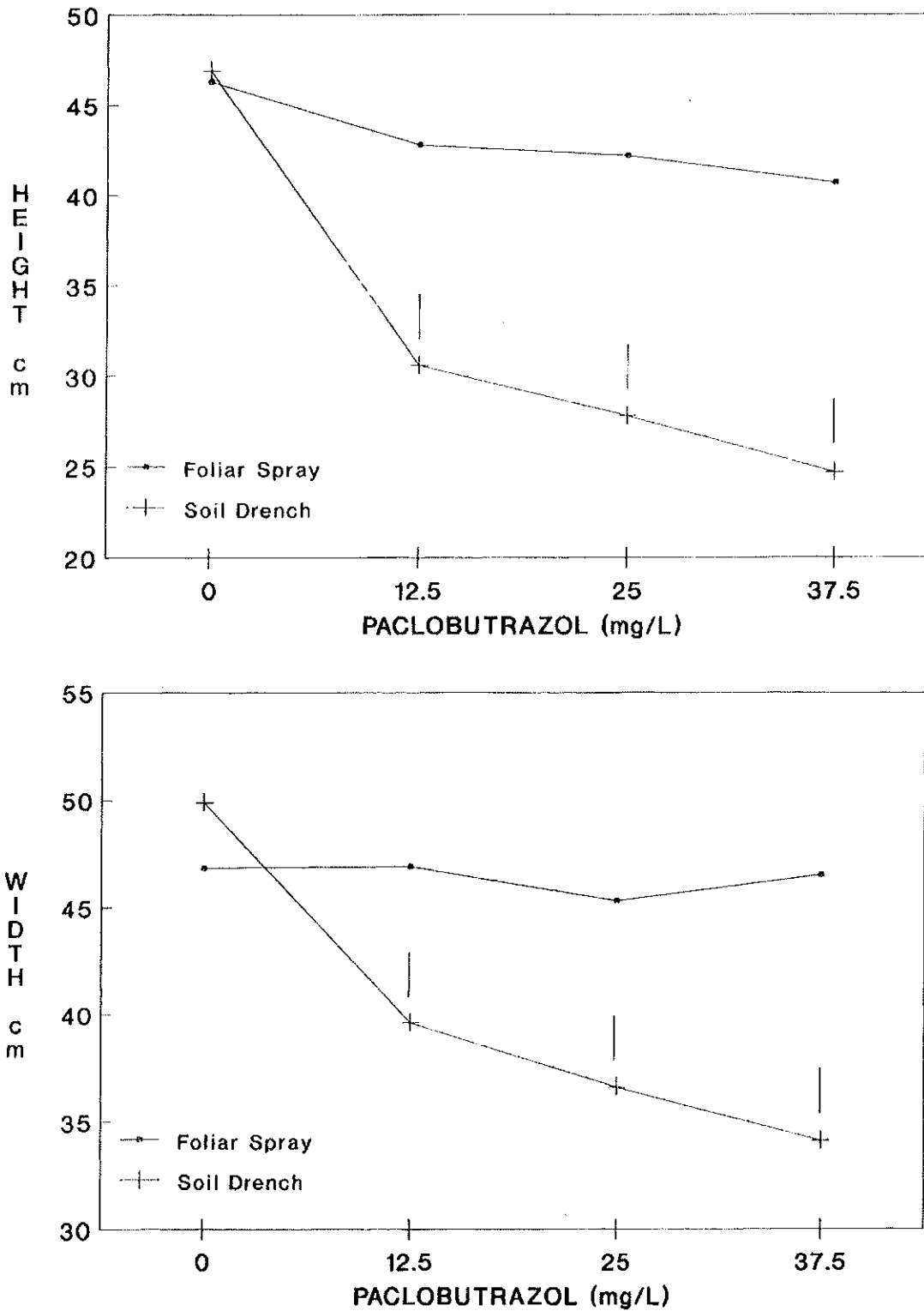


FIGURE 1. Poinsettia plant (a) height and (b) width control by paclobutrazol (0, 12.5, 25 and 37.5 mg/L) applied as a foliar spray and as a soil drench. The vertical bars are significant Tukey's values at  $P = 0.01$ . Data from both Freedom Red and Supjibi Red were combined, and means are the average of 20 plants.

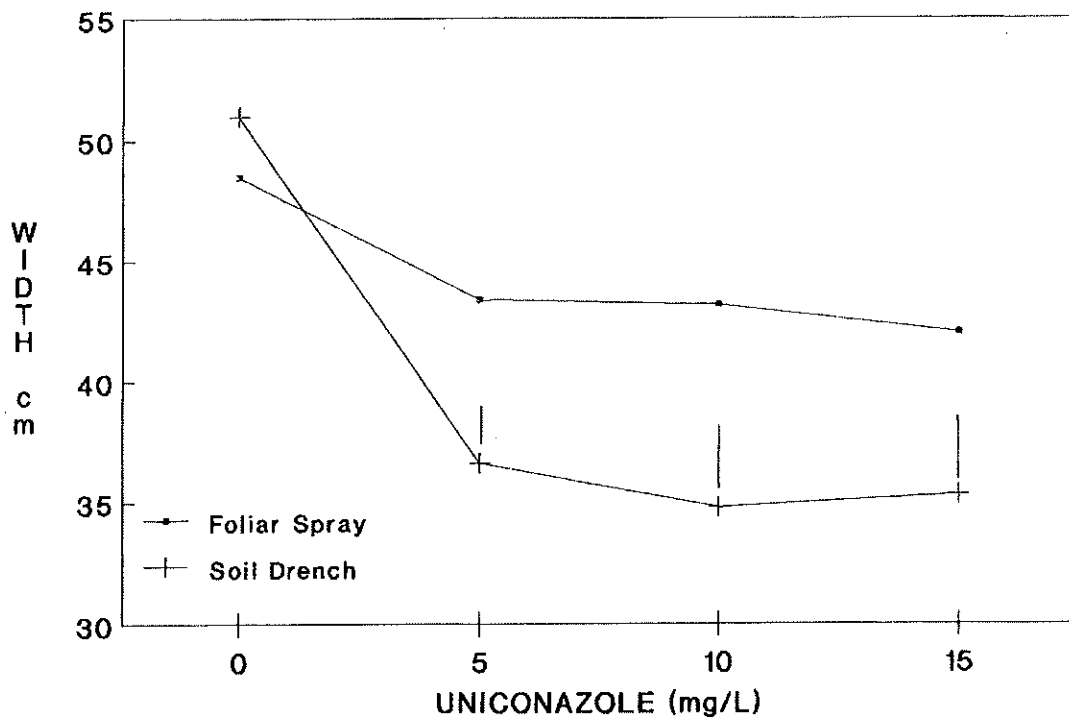
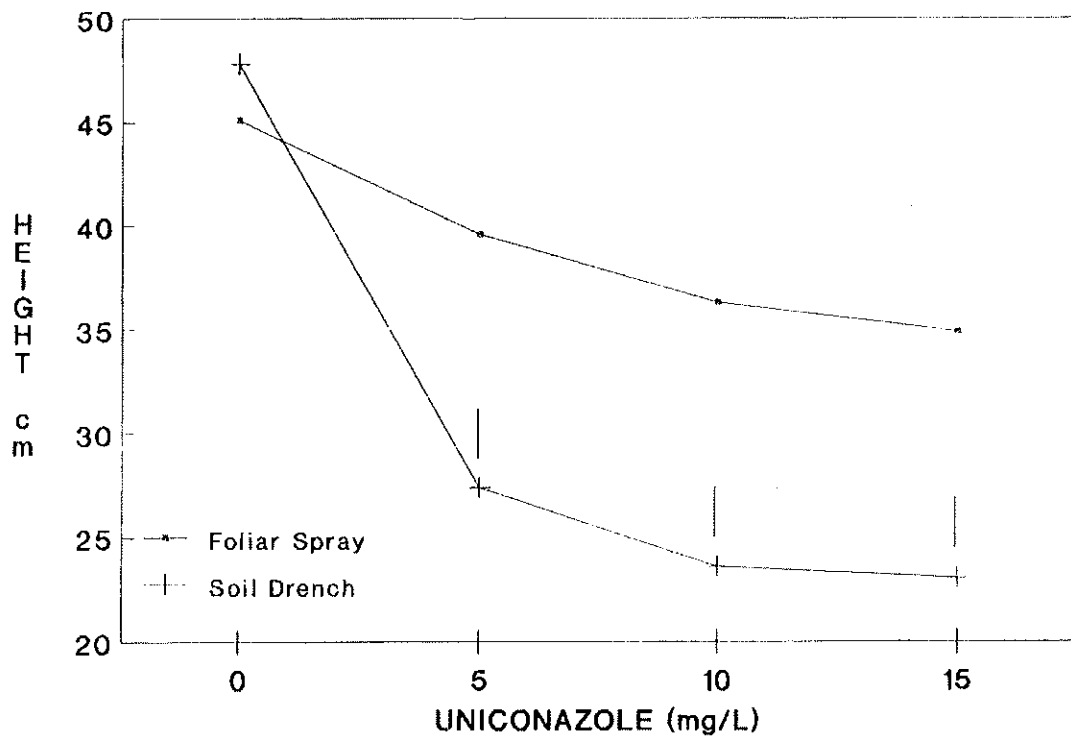


FIGURE 2. Poinsettia plant (a) height and (b) width control by uniconazole (0, 5, 10 and 15 mg/L) applied as a foliar spray and as a soil drench. The vertical bars are significant Tukey's values at  $P = 0.01$  except for width at 5 mg/L which was at  $P = 0.05$ . Data for both Freedom Red and Supjibi Red were combined and means are the average of 20 plants.

suggests that if growth regulators are applied as a spray, a second application may be needed. Larson (1967) found that a single application of Cycocel as a soil drench was adequate for most poinsettia cultivars, whereas repeated applications were required when B-nine and Cycocel were applied as sprays.

Both poinsettia cultivars grew only 6.9 cm and 5.3 cm after paclobutrazol (37.5 mg/L) and uniconazole (15 mg/L), respectively, were applied as a soil drench (Figure 3). Application of growth regulators as a foliar spray did not control poinsettia height as much as soil drenches (Figure 3). Poinsettia root uptake of growth regulators may be greater than uptake by stem and leaves. Lewis (1983) argued that the failure of all spray material to contact leaf tissue, as well as incomplete foliar uptake are the most probable reasons for the ineffective responses of poinsettia plants to growth regulators as foliar sprays. Furthermore, paclobutrazol has exhibited poor translocation out of the leaves of some poinsettia plant cultivars (McDaniel, 1986).

Applying growth regulators as a soil drench requires more labor than applying them as a foliar spray; thus the cost of applying growth regulators increases. If growth regulators are applied as a soil drench, however, only a single application is needed. If applied as a foliar spray, a second or even a third application may be necessary. A second or third application of foliar spray may increase the cost of application and make foliar application as expensive as a soil drench. Soil drench is efficient in controlling plant size at lower concentrations and can reduce the cost of chemical application in poinsettia plant production.

Growth regulators applied as a soil drench also reduced the cultivars' bract diameter (Figure 4). In contrast, neither paclobutrazol nor uniconazole as a foliar spray reduced poinsettia bract diameter at any concentration (Figure 4). Similarly, Lewis (1983) found that 'Eckespoint C-1 Red' bract diameter was not significantly reduced when ancymidol was applied as a foliar spray at any concentration. Ancymidol (0.72 mg) granular 'slow release' incorporated in the media caused marked reduction in Eckespoint C-1 Red bract diameter (Einert et al., 1978). Bearce and Singha (1992) also reported that preplant root-zone soaked in uniconazole at 10 mg/L reduced 'Brilliant Diamond' poinsettia bract size. Paclobutrazol and uniconazole should be applied at less than 12.5 mg/L and 5 mg/L, respectively, to prevent a reduction in bract size when these growth regulators are applied as a soil drench.

In general, Supjibi Red poinsettia bract diameter (18.9 cm) was smaller than that of Freedom Red (20.2 cm). Besemer (1973) also found that bract size reduction was less when Stabilan, Cycocel and A-Rest were used on Eckespoint C-1 Red than when used on 'Annette Hegg Supreme Red'.

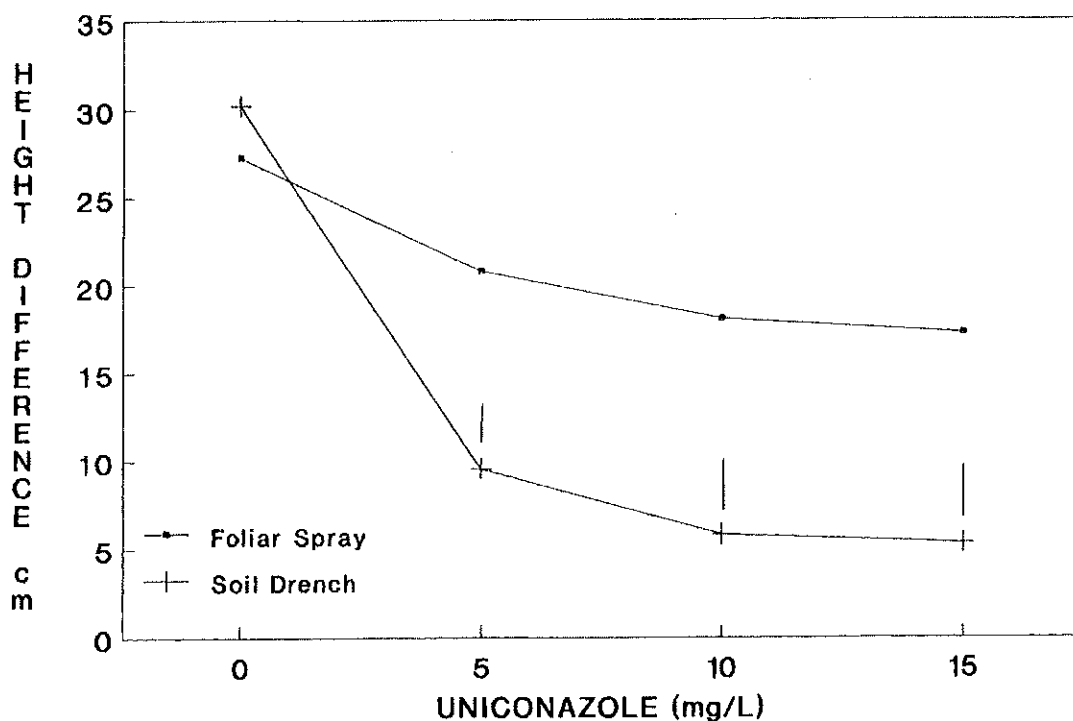
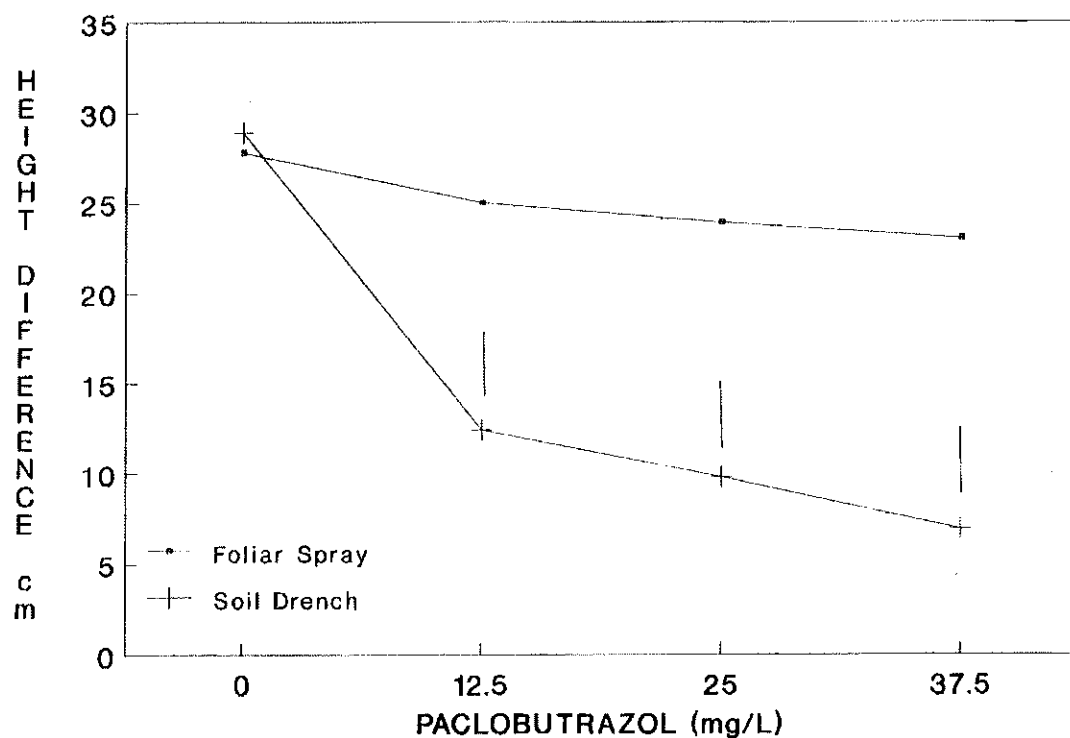


FIGURE 3. Poinsettia cultivar height difference (obtained by measuring before treatments were applied and when data were taken) in response to (a) paclobutrazol (0, 12.5, 25 and 37.5 mg/L) and (b) uniconazole (0, 5, 10 and 15 mg/L) applied as a foliar spray and as a soil drench. The vertical bars are significant Tukey's values at  $P = 0.01$  except for 5 mg/L which was at  $P = 0.05$ . Data for both Freedom Red and Supjibi Red were combined and means are the average of 20 plants.

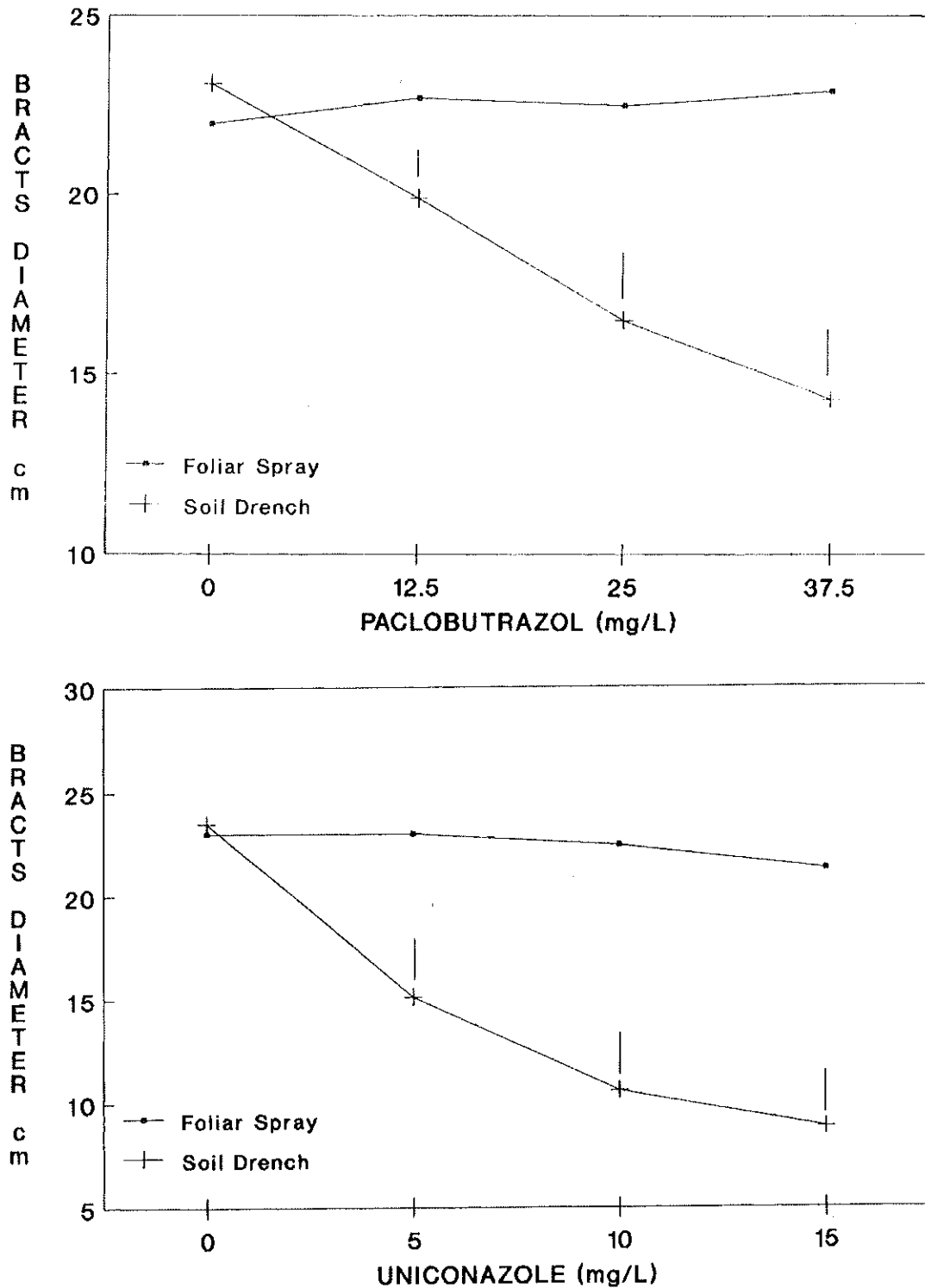


FIGURE 4. Poinsettia plants bract diameter response to (a) paclobutrazol (0, 12.5, 25 and 37.5 mg/L) and (b) uniconazole (0, 5, 10 and 15 mg/L) applied as a foliar spray and as a soil drench. The vertical bars are significant Tukey's values at  $P = 0.01$  except for 12.5 mg/L which was at  $P = 0.05$ . Data for both Freedom Red and Supjibi Red were combined and means are the average of 20 plants.



Delayed flowering was observed and more noticeable in Supjibi Red and Freedom Red when growth regulators were applied as a soil drench than when applied as a foliar spray. However, Lewis (1983) found that ancymidol applied at 1 mg active ingredient delayed flowering of Annette Hegg when applied either as a foliar spray or as a soil drench. Application of paclobutrazol and uniconazole as a soil drench was more effective than as a foliar spray in restricting plant size and bract diameter and, as a consequence, delayed bract and flower formation. Delay in flowering may be correlated with greater amounts of active ingredients actually being taken up by the plant (Lewis, 1983). Furthermore, flowering was delayed up to one week with higher rates of tetcyclasis applied as a soil drench (McDaniel, 1986).

The results of this experiment suggest that when paclobutrazol and uniconazole are applied as a soil drench to Freedom Red and Supjibi Red a concentration lower than 12.5 mg/L and 5 mg/L, respectively, could be used. A lower concentration of these growth regulators will mean reduced cost of application, effective growth control, limiting the effect of bract diameter reduction and preventing delays in flower formation. Further research is needed to fine-tune the best growth regulator concentration to produce high quality poinsettia plants in Puerto Rico.

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