

COMPARING PACLOBUTRAZOLS

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ABSTRACT

The paclobutrazols Bonzi[®] and Piccolo[®] were compared for their efficacy as foliar sprays on 'Majestic Giant Yellow Blotch' pansies (2.5 to 15 mg·L⁻¹) and 'Noblesse' geraniums (5 to 40 mg·L⁻¹) and as a substrate drench to 'Pacino' pot sunflowers (1 to 4 mg of active ingredient per pot). Over the concentrations trialed, both paclobutrazols provided a similar degree of control of plant height and plant diameter. Based on our results with the three plants, Bonzi and Piccolo were found to have a similar degree of activity.

INTRODUCTION

To control excessive plant growth, many crops require the use of a chemical plant growth regulators (PGRs) (Whipker et al., 2003). Most of the commercially available PGRs are anti-gibberellins which work by inhibiting gibberellin synthesis within the plant. The paclobutrazol Bonzi (Syngenta, Greensboro, NC) is one of the more active PGRs and has been commercially available for a number of years. It is effective at controlling excessive growth of a wide array of plants. In 2003, a generic paclobutrazol named Piccolo (Fine Agrochemicals Ltd., Whittington, UK) was introduced to the U.S. market. Piccolo has been available in Europe since the 1980s. Although both paclobutrazols contain 0.4% active ingredient, they have not been compared for their efficacies. Therefore, this study was conducted to determine the efficacy of Bonzi and Piccolo applied as a foliar spray and substrate drench on plant growth.

MATERIALS AND METHODS

The following procedures were used in each of the experiments. Plants were fertilized at each irrigation with 150 mg·L⁻¹ N from Excel[®] 15-5-15 Cal-Mag (Scotts, Marysville, Ohio) (15N-2.1P-12.5K). Greenhouse temperature day/night set points were 24/18 °C and the plants were grown under natural daylength. Data were tested by analysis of variance by general linear model (SAS Inst., Cary, NC). Values were regressed using the PROC REG procedure (SAS Inst.) to determine the best-fit linear or quadratic model for both paclobutrazols.

Experiment 1

'Majestic Giant Yellow Blotch' pansy (*Viola x wittrockiana*) plugs (288-cell) were transplanted into 1801-cell packs (8 x 8 x 6 cm cells) containing Fafard 4P (Fafard, Agawam, MA) on 6 Sept. Bonzi and Piccolo foliar sprays of 0, 2.5, 5, 7.5, 10, or 15 mg·L⁻¹ were applied using a volume of 204 mL·m⁻² on 20 Sept. This corresponded to when the leaves had expanded to the edge of the pot. The experiment was a completely randomized design with 8 single-plant replications of the six treatments. On 22 Oct., plant height (measured from the substrate surface to the uppermost part of the foliage) and plant diameter (measured at the widest dimension and turned 90°, and averaged) were recorded.

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Experiment 2

'Noblesse' geranium (*Pelargonium x hortorum*) cuttings were transplanted into 15.3-cm-diameter round plastic pots with a volume of 1.2-liter containing Fafard 4P on 13 Feb. Foliar sprays of Bonzi and Piccolo were applied on 11 Mar. when the leaves had expanded to the edge of the pot using the volume of 204 mL·m⁻². Foliar spray treatments included: 5, 10, 20, 30, or 40 mg·L⁻¹, and an untreated control. There were 6 replications of each treatment. Data for plant height (measured from the soil line to the highest growing point), canopy height (measured from the soil line to the highest leaf), and plant diameter (measured at the widest point and then turned 90°) were recorded on 30 Apr.

Experiment 3

Pot sunflower 'Pacino' (*Helianthus annuus*) seeds were sown in 1203 cell packs [a 36-cell flat, (8 x 4 x 5.5 cm cells)] on 20 Sept. The seedlings were transplanted into 15.3-cm-diameter round plastic pots with a volume of 1.2-liter containing Fafard 4P on 10 Oct. Substrate drenches of Bonzi and Piccolo were applied on 25 Oct. when the leaves had expanded to the edge of the pot using the volume of 118 ml per pot. Substrate drench treatments in mg of active ingredient per pot included: 1, 2, 3, or 4, and an untreated control. There were 7 replications of each treatment. Data for plant height (measured from the soil line to the highest growing point) and plant diameter (measured at the widest point and then turned 90°) were recorded at anthesis.

RESULTS AND DISCUSSION

Pansy

As the foliar spray concentrations increased to 15 mg·L⁻¹, both paclobutrazols were similar in their efficacy of controlling plant height and plant diameter. Statistically, the response of 'Majestic Giant Yellow Blotch' pansies to paclobutrazol foliar sprays were best described with quadratic models (Fig. 1 and 2). Adding separate variables to differentiate between the two paclobutrazol types was not significant. Plant height and plant diameter were 46% and 32% smaller, respectively, with the application of 15 mg·L⁻¹ paclobutrazol, as compared to the untreated control. Researchers have reported success in controlling pansy plant growth with paclobutrazol foliar sprays of 5 to 15 mg·L⁻¹ (Latimer and Whipker, 2004).

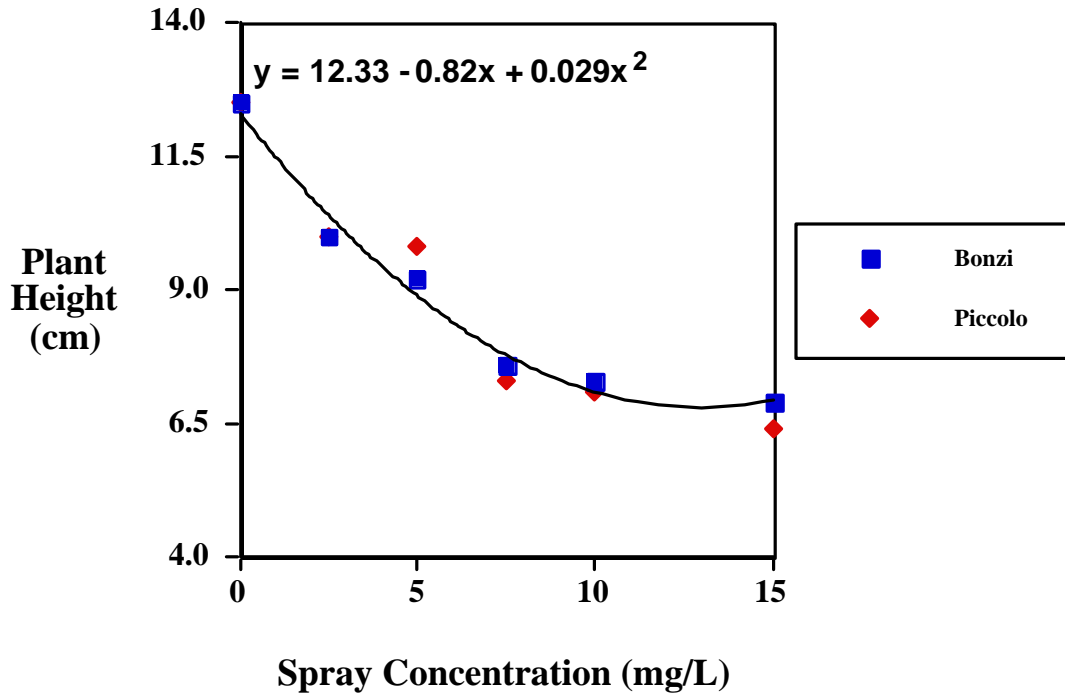


Figure 1. Response of 'Majestic Giant Yellow Blotch' pansies plant height to Bonzi and Piccolo foliar sprays of 0 to 15 mg·L⁻¹ (adjusted $R^2 = 0.60$).

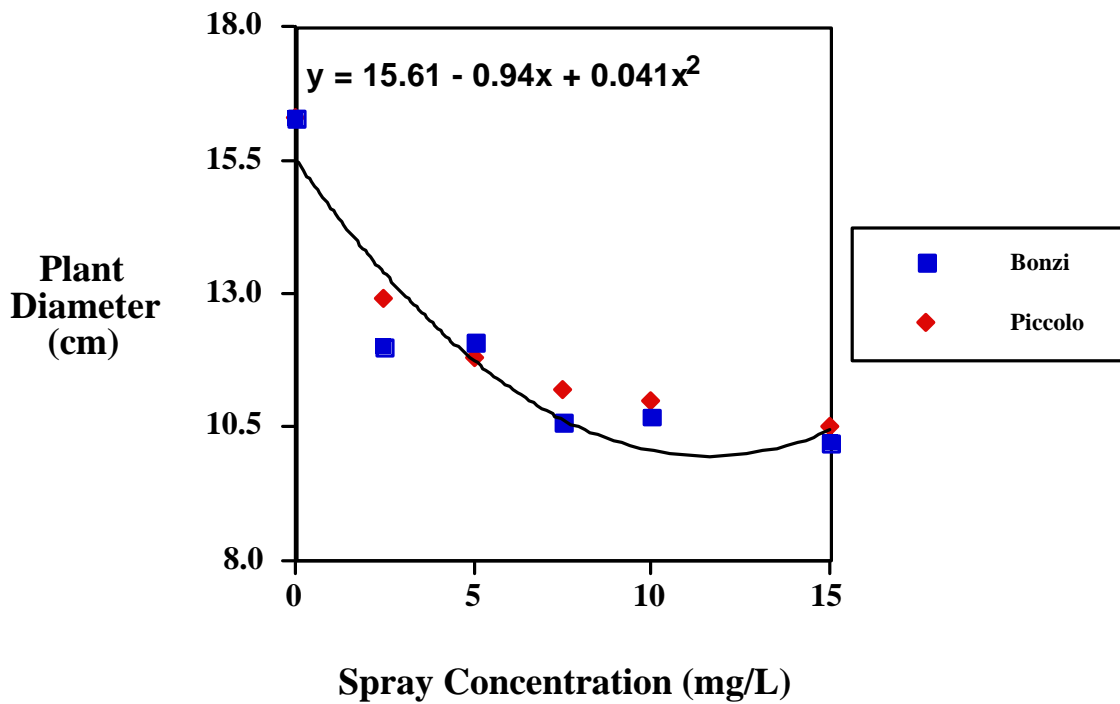


Figure 2. Response of 'Majestic Giant Yellow Blotch' pansies plant diameter to Bonzi and Piccolo foliar sprays of 0 to 15 mg·L⁻¹ (adjusted $R^2 = 0.66$).

Geranium

As the foliar spray concentrations increased to 40 mg·L⁻¹, both paclobutrazols were similar in their efficacy of controlling plant height, canopy height, and plant diameter. Statistically, the response of 'Noblesse' geraniums to paclobutrazol foliar sprays were best described with quadratic models (data not shown). Adding separate variables for either paclobutrazol type was not significant. Plant height, canopy height, and plant diameter were 27.5%, 28.0%, and 21.5% smaller, respectively, with the application of 40 mg·L⁻¹ paclobutrazol as compared to the untreated control. Flowering was delayed slightly with the higher spray rates. Commercial recommendations for paclobutrazol foliar sprays on geraniums are 5 to 20 mg·L⁻¹ (Whipker et al., 2003).

Sunflowers

As the drench concentrations increased to 4 mg, both paclobutrazols were similar in their efficacy of controlling plant height and plant diameter (Fig. 3 and 4). Statistically, the response of 'Pacino' to paclobutrazol substrate drenches were best described with quadratic models. Adding separate variables for each of the paclobutrazol types was not significant. Plant height and plant diameter were 29% and 23% smaller, respectively, with the application of 4 mg paclobutrazol as compared to the untreated control. Flowering was not affected by paclobutrazol type or drench concentration. Paclobutrazol drenches of 2 mg are the commercially recommended rate for growers (Dasoju et al., 1998).

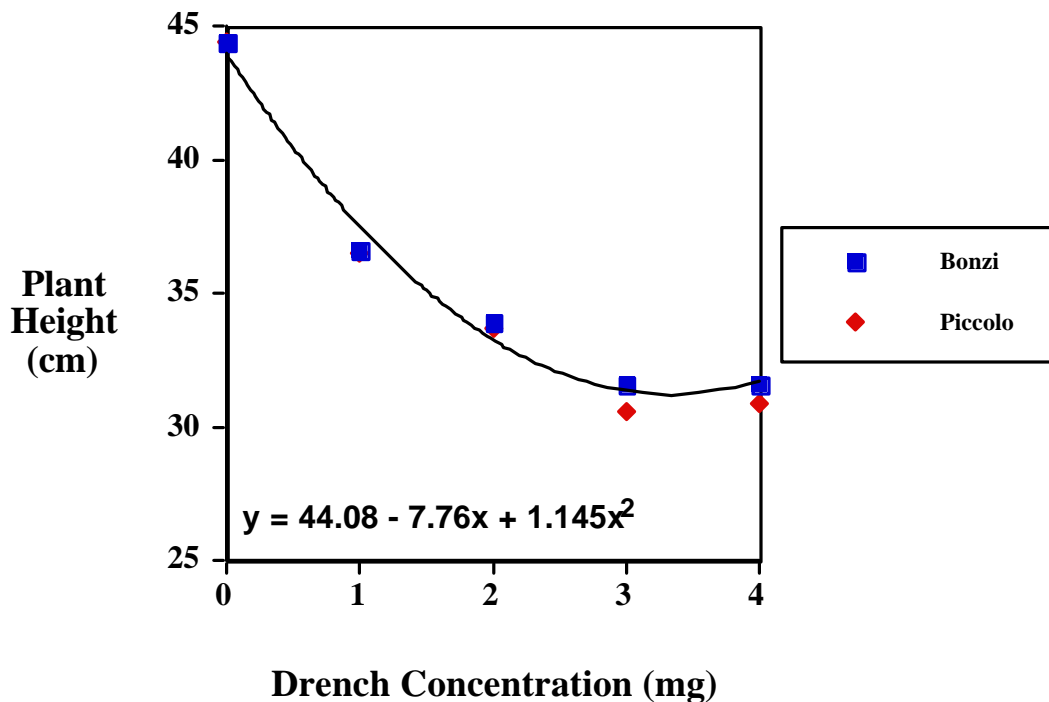


Figure 3. Response of pot sunflower plant height to Bonzi and Piccolo substrate drenches of 0 to 4 mg (adjusted $R^2 = 0.82$).

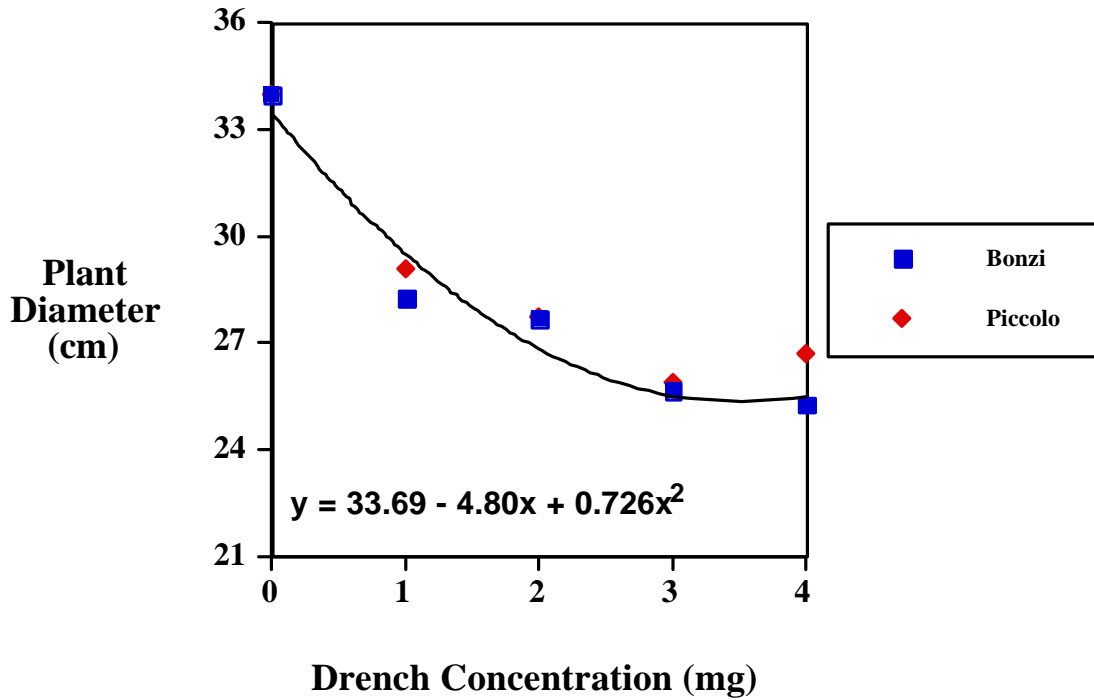


Figure 4. Response of pot sunflower plant diameter to Bonzi and Piccolo substrate drenches of 0 to 4 mg (adjusted $R^2 = 0.75$).

CONCLUSIONS

Based on these results with foliar sprays on pansies (Fig. 5) and geraniums (Fig. 6) and substrate drenches on pot sunflowers (Fig. 7), it appears both Bonzi and Piccolo have similar efficacies.

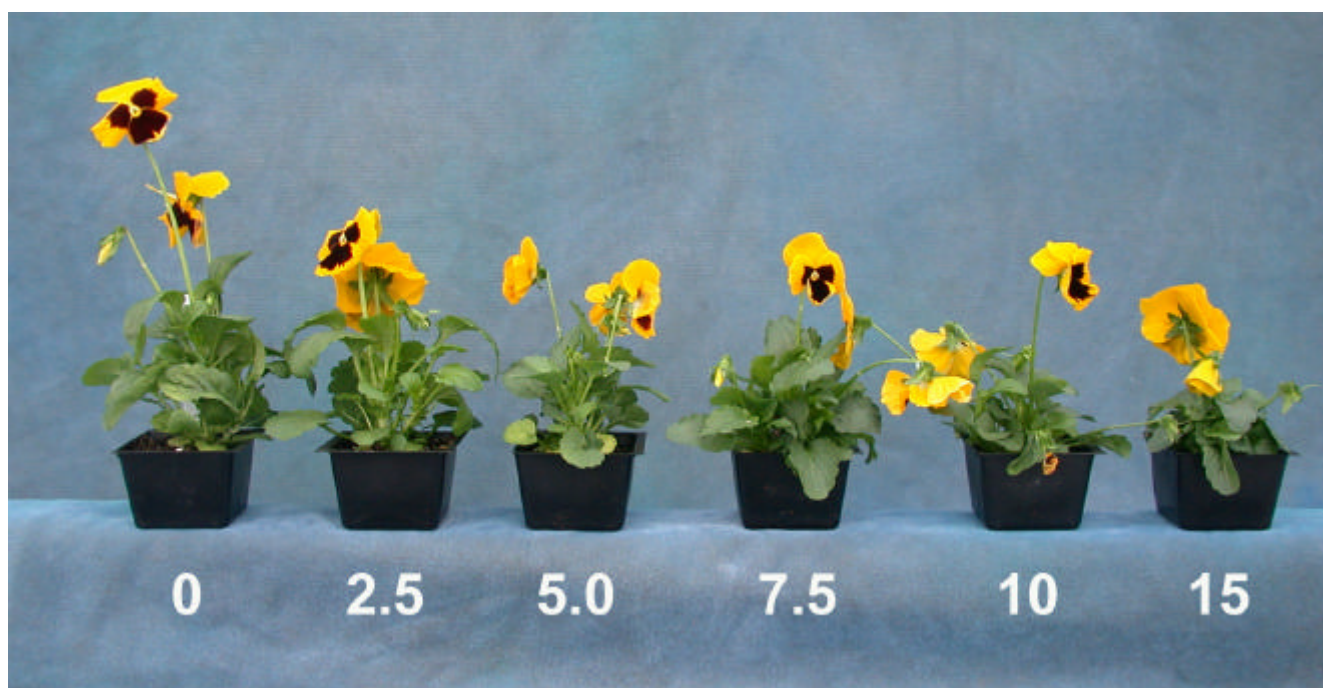
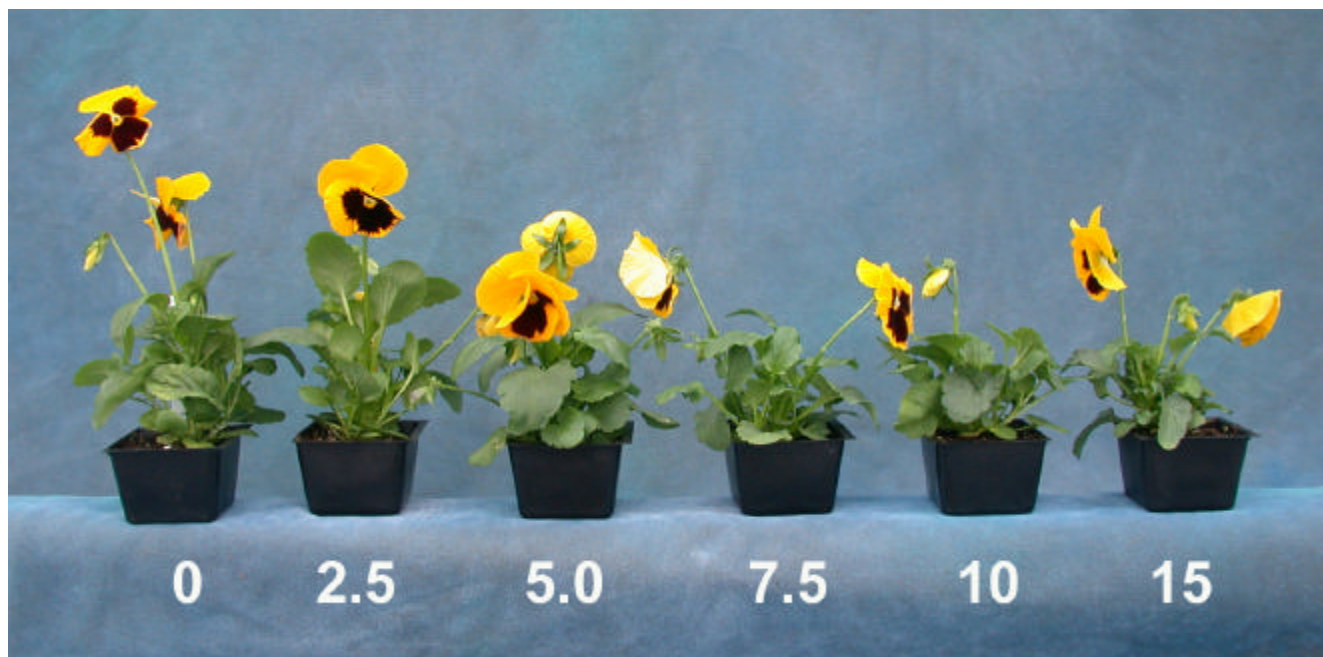


Figure 5. Response of 'Majestic Giant Yellow Blotch' pansies plant growth to Bonzi (top) and Piccolo (bottom) foliar sprays of 0 to 15 mg·L⁻¹.



Figure 6. Response of 'Noblesse' geranium plant growth to Bonzi (top row) and Piccolo (bottom row) foliar sprays of 0 to 40 mg·L⁻¹.



Figure 7. Response of pot sunflower plant growth to Bonzi (top row) and Piccolo (bottom row) substrate drenches of 0 to 4 mg.

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