Paclobutrazol produced shorter plants without side-effects.

A new growth regulator for greenhouse plants

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Produces more compact ornamentals

Author Gary Hickman applies plant growth regulator spray treatment.

Compactness is often desired in greenhouse-grown ornamental plants, because such plants are aesthetically pleasing and have a long salable period after they reach market size. Also, efficient marketing and transportation may require shorter plants.

Commercial growers usually achieve compactness in ornamentals by applying chemical growth regulators. These chemicals reduce cell elongation, often by interfering with synthesis of a naturally occurring hormone, gibberellin. Since chlorophyll-containing cells are much denser in treated plants, the leaves appear darker green. The shorter stem lengths between nodes of plants treated with these gibberellin biosynthesis inhibitors also result in stems that are better able to support leaves and flowers.

Several chemicals are currently available to shorten overall plant height, but some problems exist. Leaf scorch, marginal yellowing, and leaf curling have been reported on some ornamental crops following application at effective rates. Growers generally reduce this injury by applying growth regulators more frequently but at reduced concentrations of

active ingredient. This practice substantially increases labor costs for application.

A new growth regulator, paclobutrazol (Bonzi; formerly PP333), has been shown in tests to provide the positive benefits but few of the problems associated with other available regulators. Paclobutrazol inhibits internode elongation, produces darker green leaves, and has been found to reduce water use in some plants.

In initial screening trials to develop appropriate application rates for several plant species, 17 greenhouse foliage varieties were tested at seven rates. With this preliminary information, more detailed studies were undertaken.

Growth regulator studies

Nine species were selected as the ones likely to benefit from growth regulation from both a cultural and a marketing perspective: schefflera, rubber plant, fiddleleaf fig, grape ivy, German violet, orange meillandina miniature rose, standard floribunda 'Garnet' rose, wax plant, and dipladenia. Trials utilizing ten replicates were established for the nine species.

TABLE 1. Average plant height four weeks after treatment with paclobutrazol plant growth regulator

Species (and pot size)	Spray treatment (ppm)			Drench treatment (mg/pot)*		
	Control	62.5	125	0.75 or 1	1.5 or 2	3 or 4
	cm					
Fiddleleaf fig (6") *(Ficus lyrata)*	57.5 a	38.3 b	35.0 c	34.9 c	36.8 bc	34.5 c
Fiddleleaf (fig (4")	30.0 a	17.7 b	20.3 b	18.7 b	19.0 b	17.0 b
Rubber plant (6") *(Ficus elastica)*	53.6 a	45.5 b	46.8 b	48.1 b	48.4 b	46.8 b
Schefflera (6") *(Brassaia actinophylla)*	38.0 a	33.7 bc	35.6 ab	33.0 bc	32.0 c	31.8 c
Grape ivy (4") *(Cissus rhombifolia)*	35.4 a	33.0 a	30.5 a	31.6 a	30.6 a	30.2 a
German violet (4") *(Exacum)*	22.8 a	21.9 ab	22.4 a	20.8 bc	20.1 c	20.2 c
Miniature rose (4") *(Rosa* var. meijikata)	30.2 a	27.6 a	27.4 a	28.6 a	26.8 a	26.6 a
Standard rose (8") *(Rosa)*	65.0 a	68.4 a	69.2 a	73.2 a	63.4 a	65.0 a
Wax plant (4") *(Hoya carnosa* 'Tricolor')	20.6 a	16.9 a	17.0 a	17.3 a	16.1 a	18.8 a
Dipladenia (6") *(Mandevilla)*	96.3 abc	84.8 bc	80.4 c	106.0 a	108.9 a	99.9 ab

NOTE: Values are means of 10 replications. Means in a row followed by same letter are not significantly different, p = 0.05, Duncan's multiple range test (DMRT).
* In drench treatments, 6" and 8" pots received 1, 2, or 4 mg active ingredient in 120 ml of water-diluted solution per pot; 4" pots received 0.75, 1.5, or 3 mg active ingredient in 90 ml of solution per pot.

TABLE 2. Average plant height eight weeks after treatment with paclobutrazol

Species (and pot size)	Spray treatment (ppm)			Drench treatment (mg/pot)*		
	Control	62.5	125	0.75 or 1	1.5 or 2	3 or 4
	cm					
Grape ivy (4")	48.4 a	43.3 ab	38.9 bc	32.4 c	30.4 c	30.2 c
German violet (4")	31.1 a	29.1 b	27.1 c	24.5 d	22.2 e	21.8 e
Miniature rose (4")	40.4 a	38.0 a	40.2 a	38.0 a	36.4 a	31.0 b
Standard rose (8")	89.6 a	84.8 ab	86.6 ab	81.0 bc	77.0 cd	70.8 d
Wax plant (8")	26.4 a	21.9 a	20.1 a	21.3 a	17.6 a	21.9 a

NOTE: DMRT, p = 0.05
* 8" pots — 1, 2, and 4 mg active ingredient drench per pot.
4" pots — 0.75, 1.5, and 3 mg active ingredient drench per pot.

TABLE 3. Average plant height 12 weeks after treatment with paclobutrazol

Species (and pot size)	Spray treatment (ppm)			Drench treatment (mg/pot)*		
	Control	62.5	125	0.75	1.5	3
	cm					
Grape ivy (4")	54.6 a	47.3 ab	44.4 b	32.7 c	31.0 c	30.2 c
German violet (4")	32.7 a	30.8 b	28.5 c	24.6 d	23.4 d	21.8 e
Miniature rose (4")	42.0 a	38.0 ab	41.2 a	38.0 ab	36.4 b	34.4 b

NOTE: DMRT, p = 0.05.

In a completely randomized design, each replicate was treated in one of six ways — two foliar spray rates, three soil drench rates, and an untreated control (table 1). All treatments were applied on the basis of active ingredient. Spray treatments were applied with a hand-pump mister to the point of runoff. The soil drench treatments were applied to the plants in 6- and 8-inch pots.

Except for grape ivy, the plants were well established in the pots and were within six weeks of market maturity. Grape ivy plants were rooted cuttings, established in pots three weeks before treatment. Greenhouses were maintained near 28°C (82°F) during the day and 20°C (68°F) at night. Irrigations were applied as needed, with the first post-treatment water application at least three days after treatment. A complete fertilizer solution was applied with each irrigation.

Results

Plant height reduction depended on treatment rates and species tested. Five of the nine species showed significant height reduction after four weeks with one or more of the treatments (table 1). After eight weeks, all species, except wax plant, were significantly shorter than untreated control plants with at least one treatment rate (table 2).

Three species — grape ivy, miniature rose, and German violet — were observed for 12 weeks and continued to show height differences similar to the measurements at eight weeks (table 3). No plant injury resulted from any of the treatments at the rates tested, except on grape ivy, where severe leaf curling occurred following drench treatments. After 12 weeks, these plants again started producing normal leaves. Foliar sprays did not produce the curling but were less effective in height control.

Conclusions

In these tests, paclobutrazol effectively reduced overall height of several species of greenhouse-grown ornamental plants for at least 12 weeks. In general, drench treatments were more effective than foliar sprays in reducing internode length. No consistent pattern developed between treatment rates and growth response. Further studies will be conducted to determine responses of other species to this growth regulator and to test different application rates.

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