

Herbaceous Perennials: Plant Growth Regulators

Part five of our 12-part series on herbaceous perennials takes a look at the response of selected plants to plant growth retardants.

by **DAVID JOERIGHT, CATHY WHITMAN, ROYAL HEINS, ART CAMERON, and WILL CARLSON**

HEIGHT control is an important part of producing many herbaceous perennials because species are quite tall when they bloom, making them difficult and expensive to manage and ship. Their height must be controlled during production.

Although there are several cultural and environmental strategies available to control a plant's height, growth regulators often prove to be the most reliable for many perennial species.

Some plant species simply do not respond to certain growth regulators, while others may be sensitive to the same chemicals. As perennials become more popular and new species make their way into the market, a lack of data on each growth retardant's effectiveness presents a problem for growers trying to avoid using chemicals that do not work on a particular crop.

At Michigan State University (MSU), we yearly select perennial species and test the effectiveness of the most commonly used growth regulators on each species. Our goal is to

(Continued on page 88)

Table 1. Effect Of Six Growth Regulators On Height Of Selected Perennials

Species	A-Rest 100 ppm	B-Nine 5000 ppm	Bonzi 60 ppm	Cycocel 1500 ppm	Florel 500 ppm	Sumagic 15 ppm
<i>Aquilegia x hybrida</i> 'Music Pink & White' (72-cell starting material)						
<i>Campanula glomerata</i> 'Superba' (32-cell)						
<i>Ceratostigma plumbaginoides</i> (72-cell)						
Clematis 'Madam Baron Veillard'						
Delphinium 'Pacific Giants' (128-cell)						
<i>Gaura lindheimeri</i> 'Whirling Butterflies' (32-cell)						
<i>Geranium himalayense</i> (two-inch pot)						
<i>Geum coccineum</i> 'Borrisii' (128-cell)						
<i>Iberis sempervirens</i> 'Snowflake' (72-cell)						
<i>Lychnis coronaria</i> 'Angel Blush' (72-cell)						
<i>Monarda didyma</i> 'Marshall's Delight' (72-cell)						
<i>Oenothera fruticosa</i> 'Youngii-lapsley' (72 cell)						
Penstemon 'Garnet Red' (32-cell)						
<i>Phlox paniculata</i> 'Mt. Fuji' (50-cell)						
<i>Scabiosa caucasica</i> 'Blue Butterfly' (50-cell)						
<i>Sedum spectabile</i> 'Autumn Joy' (55-cell)						
Solidago 'Golden Fleece' (72-cell)						
<i>Stokesia laevis</i> 'Klaus Jelitto' (72-cell)						
<i>Tricyrtis hirta</i> 'Miyazaki' (72-cell)						
LEGEND: Reduction in final plant height at flower	ineffective		slightly ineffective		effective	severe phytotoxicity

Table 1. Plants were sprayed with the indicated growth retardant chemical every two weeks starting two weeks after transplanting and start of greenhouse forcing. We intentionally selected high growth retardant rates in an attempt to identify the sensitivity of each species to each growth retardant. The rates shown should not be considered the optimal application concentration.

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determine effectiveness, not specific rates of each growth regulator. However, the relative response to each chemical, at the rates we apply, does provide a starting point for commercial application.

MSU Growth Regulator Trials

The 1999-2000 MSU perennial growth regulator trial was conducted from February through April 2000 and included 19 perennial species and six growth regulators. The protocol was to use a high rate and apply each of the six growth regulators to all species every two weeks until flower (Figures 1 to 9). The growth regulators and rates used were as follows: A-Rest (100 ppm); B-Nine (5,000 ppm); Bonzi (60 ppm); Cycocel (1,500 ppm); Florel (500 ppm); and Sumagic (15 ppm).

Upon arrival, all plants were cold treated for 10 to 12 weeks at 41°F (5°C). On February 14, all plants were transplanted into five-inch pots and grown in a greenhouse at 68°F (20°C) under a 16-hour photoperiod provided by morning and evening lighting at 10 to 30 footcandles from high-pressure sodium lamps. Lamps were turned on from 6 a.m. to 8 a.m. and again from 5 p.m. to 10 p.m. There were 10 plants of each species in each treatment.

The first spray took place on February 29, and sprays were repeated every two weeks until flower or until a maximum of four applications was reached. The devel-



Figure 1. Effect of growth regulators on aquilegia plant height and flowering. B-Nine, Sumagic, and Florel delayed flowering about two to four days.

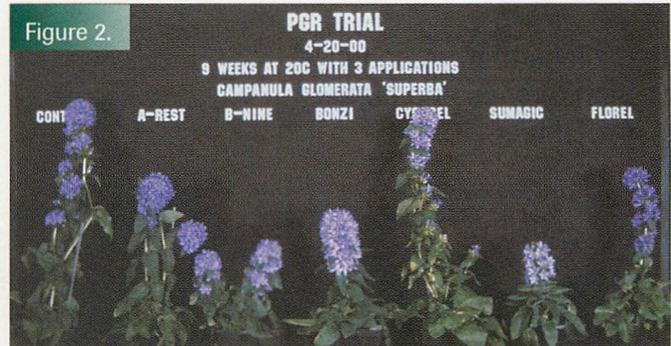


Figure 2. Effect of growth regulators on *Campanula glomerata* 'Superba' height and flowering. Flowering was not delayed by any of the growth retardants.

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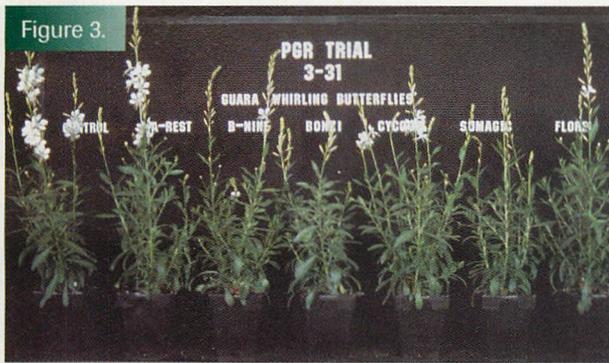


Figure 3. Effect of growth regulators on *Gaura lindheimeri* 'Whirling Butterflies' height and flowering. B-Nine and Sumagic delayed flowering by about two days.



Figure 4. Effect of growth regulators on *Geranium himalayense* height and flowering. Florel was the only growth regulator that affected time to flower, causing a delay of about nine days.

opment of the untreated or control plants was monitored, and flowering data of these plants was used to determine when sprays would be terminated on each species. No species received more than four applications, regardless of flowering. The spray volume for all applications was approximately two liters per 100 square feet.

Height was measured on each plant when its first flower opened. Measurements were taken from the bench surface to the highest point on the plant. For plants that did not flower, height was measured at the end of the experiment. Height data were analyzed upon completion of the trial by comparing average heights of flowering plants within each treatment to the average of the untreated plants' and calculating the

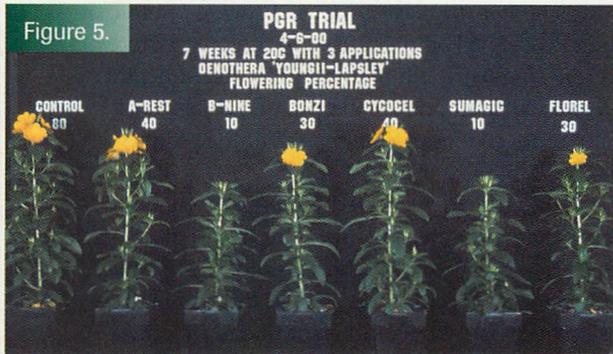
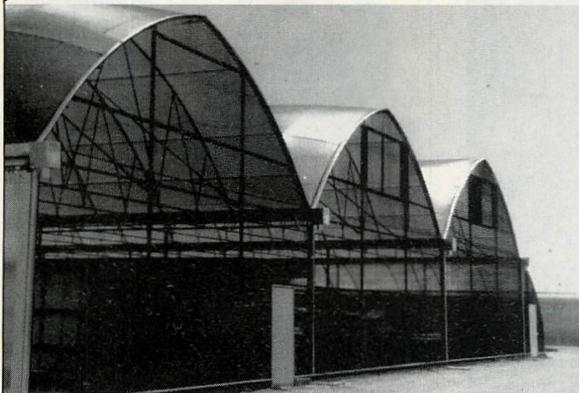


Figure 5. Effect of growth regulators on *Oenothera fruticosa* 'Youngii-lapsley' height and flowering. B-Nine and Sumagic delayed flowering up to five days.

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height reduction percentage caused by the growth retardant. After analyzing the height reduction percentage of each species, we categorized each growth regulator as being effective, slightly effective, or ineffective, based on reduction in final plant height. A reduction of 0% to 10% was ineffective, 10% to 20% was slightly effective, and more than 20% was effective.

Plants in some treatments exhibited phytotoxicity as a result of the growth retardant applications. Cycocel applications on aquilegia, ceratostigma, and *Geranium himalayense* caused severe phytotoxicity. Cycocel on *lychnis* caused moderate phytotoxicity. No single growth regulator controlled height on all species, but Bonzi at 60 ppm or Sumagic at 15 ppm reduced elongation in most of the plants we tested (Table 1).

We intentionally selected high growth retardant rates in an attempt to identify the sensitivity of each species to each growth retardant, not the optimal application concentration. Unless the photos suggest otherwise, we would recommend that most growers start applications at half the rates we used, especially for Bonzi and Sumagic, to avoid excessive stunting. It is easier to apply a second dose

Figure 6.

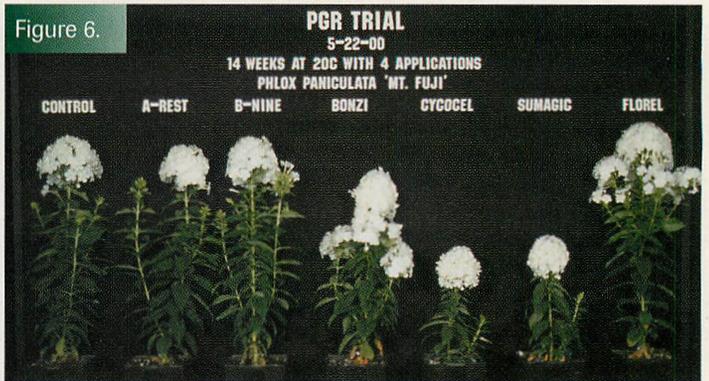


Figure 6. Effect of growth regulators on *Phlox paniculata* 'Mt. Fuji' height and flowering. Flowering was not delayed by any of the growth retardants.

Figure 7.

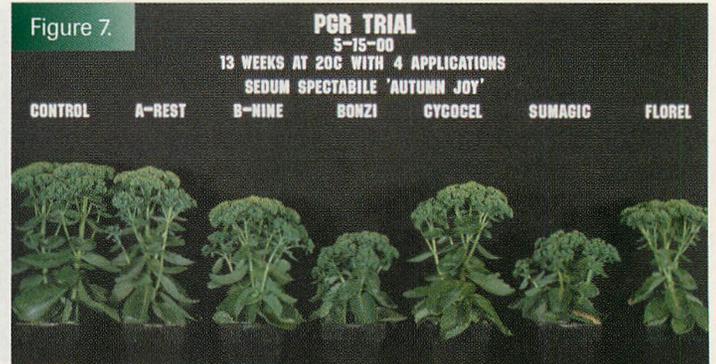


Figure 7. Effect of growth regulators on *Sedum spectabile* 'Autumn Joy' height and flowering. B-Nine, Bonzi, and Sumagic delayed flowering about a week.

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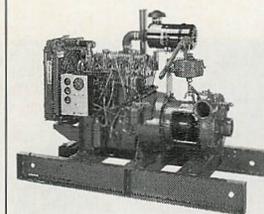
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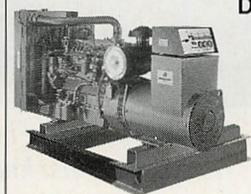
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than to reverse an overdose.

Early application of growth retardants is important for effective height control of some herbaceous perennials, especially species that bolt with a tall flowering spike. Examples include delphinium and echinacea. For species like these, the first growth retardant application must be applied just as the spike begins to elongate (i.e., before it is one-inch long). This is because the spike elongates rapidly, and even being a few days late can result in several inches of undesired height.

For many herbaceous perennials, growth retardants delay flowering when applied at a rate that controls

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height sufficiently. If you do not have specific experience with a particular crop and growth retardant, it is probably best to expect some delay, especially if the crop needs to be in flower on a specific date.

Florel did not affect height or flowering for most species in this experiment. In a previous experiment, Florel had little effect on flowering of several herbaceous perennials, although height was reduced in most. In that experiment, however, Florel was applied at 1,000 ppm. Although higher Florel rates may effectively control height, at least one other growth re-

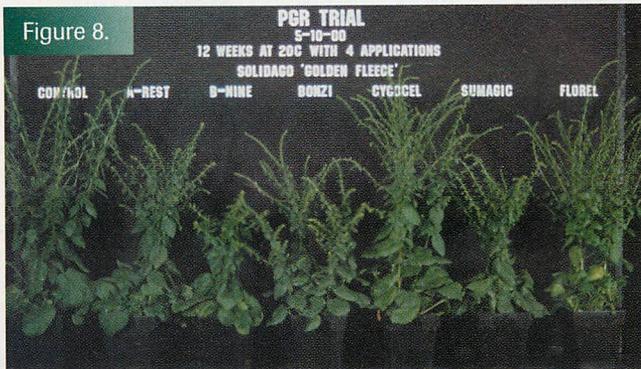


Figure 8. Effect of growth regulators on height of solidago 'Golden Fleece.'

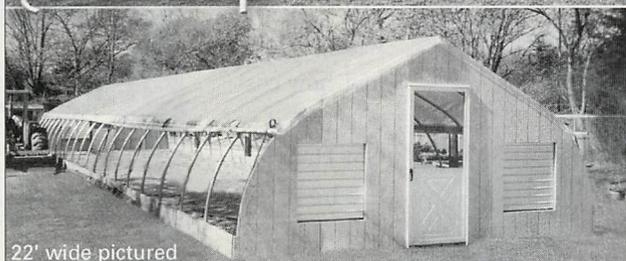
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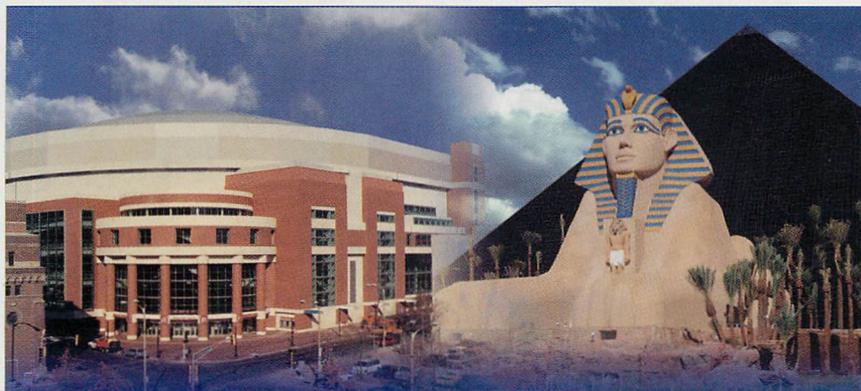


Figure 9. Effect of growth regulators on *Stokesia laevis* 'Klaus Jelitto' height and flowering. Flowering was not delayed by any of the growth retardants.

tardant was effective for each species in this trial.

Effectiveness of growth regulators is influenced by many factors in addition to sensitivity of the plant, including temperature and application volume. We encourage growers to experiment, using our results to select a growth retardant as a starting point and adjusting rates and number of applications to determine the best strategy for their own growing conditions. **GG**

About the authors: David Joeright and Cathy Whitman are technicians, and Royal Heins, Arthur Cameron, and Will Carlson are professors, Department of Horticulture, Michigan State University, East Lansing, MI 48824.



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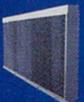
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