PERENNIALS SERIES

Herbaceous Perennials: Plant Growth Retardants

by **MIKE OLRICH, DAVID JOERIGHT, ROYAL HEINS, ERIK RUNKLE,** and **ART CAMERON**

Schedule

Michigan State University researchers' seven-part series on herbaceous perennials covers topics from *Phlox paniculata* to chemical height control.

June: *Phlox paniculata*
July: Delphinium
August: Plant Growth Retardants
September: Digitalis
October: Aquilegia
November: Campanula
December: Summary Tables

HEIGHT control is an important aspect of forcing herbaceous perennials because many species are quite tall when they bloom, which can make them difficult and expensive to manage and ship. Therefore, plant height must be controlled during production. Although there are several cultural and environmental strategies available to control a plant's height, growth retardants often prove to be the most reliable for many perennial species.

Some plant species simply do not respond to certain growth retardants, while others may be sensitive to every common chemical. 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

Table 1. The efficacy of plant growth retardants on reducing plant height of various herbaceous perennial species. Plants were sprayed with indicated plant growth retardants and rates every week, for up to six weeks, beginning one week after the start of forcing. High growth retardant rates were used to identify the sensitivity of each species to each growth retardant, and are not necessarily those recommended.

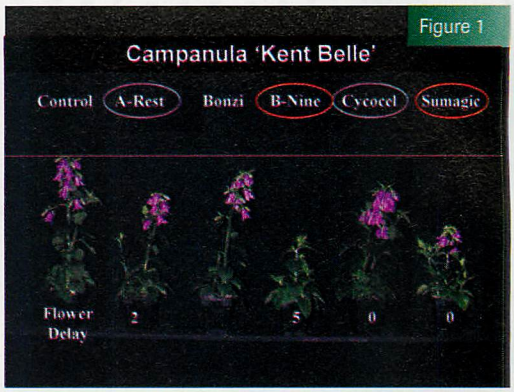
growers trying to avoid using chemicals that do not work on a particular crop.

At Michigan State University (MSU), each year we select perennial species and test the effectiveness of the most commonly used growth retardants on each species. Our goal is to determine effectiveness, not specific rates of each growth retardant. However, the relative response to each chemical, at the rates we apply, provide a starting point for commercial application.

Experimental Setup

The 2001-2002 MSU perennial growth retardant trial was conducted from February through April 2002 and included nine perennial species and five growth retardants. The protocol was to use a high rate and apply each of the five growth retardants to all species every week, from forcing until flowering. The growth retardants and rates used were as follows: A-Rest (100 ppm); B-Nine (5,000 ppm); Bonzi (90 ppm); Cycocel (1,500 ppm); and Sumagic (15 ppm).

Upon arrival, plants were placed in a cold frame and naturally cooled for 14 weeks. On February 18, 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 230 to 380 footcandles (30 to 50 µmol·m-2·s-1) from high-pressure sodium lamps. Lamps were turned



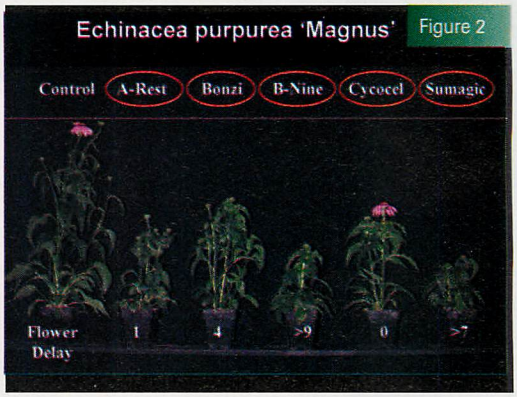
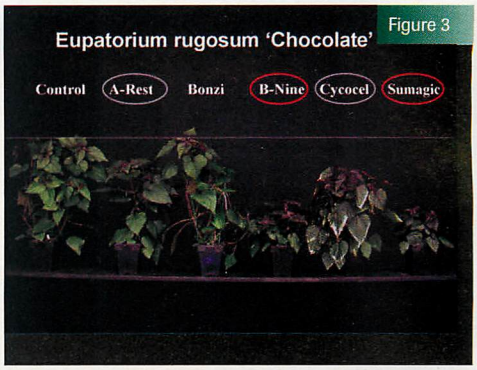


Figure 1. Effect of growth retardants on plant height and flowering of campanula 'Kent Belle.' B-Nine and Sumagic were most effective for height control; A-Rest and B-Nine delayed flowering by 2 to 5 days.
Figure 2. Effect of growth retardants on plant height and flowering of *Echinacea purpurea* 'Magnus.' All growth retardants were effective for height control. B-Nine and Sumagic delayed flowering by at least 7 days.

on from 6 to 8 a.m. and again from 5 to 10 p.m. There were 10 plants of each species in each treatment.

The first spray took place on February 25, and sprays were repeated every week until flowering or until a maximum of six applications was reached. The development of the untreated (control) plants was monitored, and flowering data of these plants was used to determine when sprays would be terminated on each species. 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 height reduction percentage caused by the growth retardant. After analyzing the height reduction percentage of each species, we categorized each growth retardant 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.



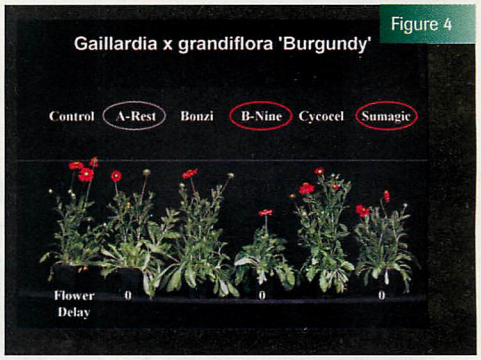
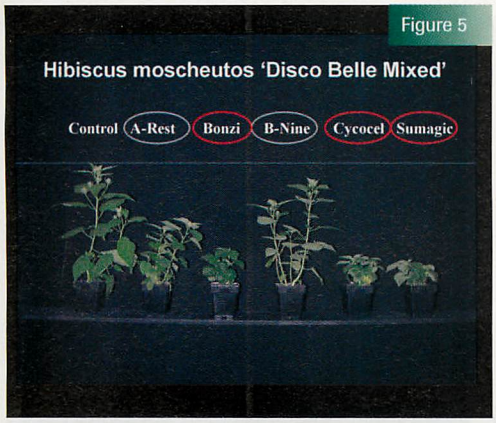


Figure 3. Effect of growth retardants on plant height of *Eupatorium rugosum* 'Chocolate.' B-Nine and Sumagic were most effective, and Cycocel caused severe marginal leaf chlorosis.
Figure 4. Effect of growth retardants on plant height and flowering of *Gaillardia x grandiflora* 'Burgundy.' B-Nine and Sumagic were the only growth retardants effective at applied rates.

What We Observed

No single growth retardant con-

For Details Circle No. 11 on Postcard →



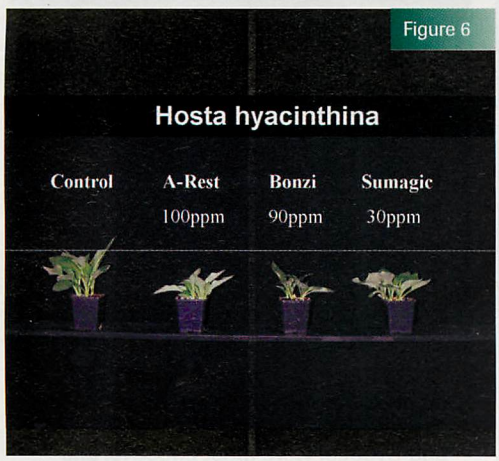


Figure 5. Effect of growth retardants on plant height and flowering of Hibiscus moscheutos 'Disco Belle Mixed.' Bonzi, B-Nine, and Sumagic were most effective, but also delayed flowering.
Figure 6. A-Rest, Bonzi, and Sumagic were effective at controlling petiole length (and therefore height) of hosta, but they must be applied when the shoots just start to emerge to be effective.

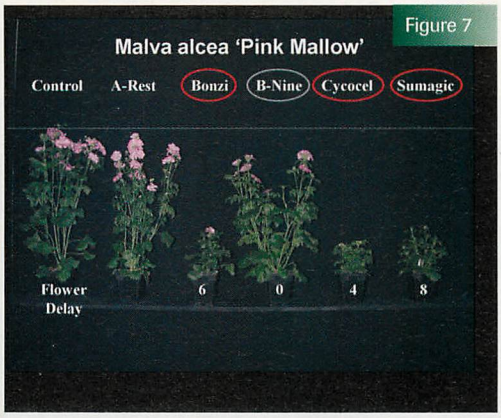


Figure 7. Effect of growth retardants on plant height and flowering of *Malva alcea* 'Pink Mallow.' Bonzi, Cycocel, and Sumagic were all very effective and delayed flowering by at least four days.

trolled height on all species, but Sumagic and B-Nine reduced elongation in most of the plants we tested this year (Table 1). Plants in some treatments exhibited phytotoxicity as a result of the growth retardant applications. Cycocel applications on eupatorium caused severe phytotoxicity; Cycocel on campanula and hibiscus caused moderate phytotoxicity.

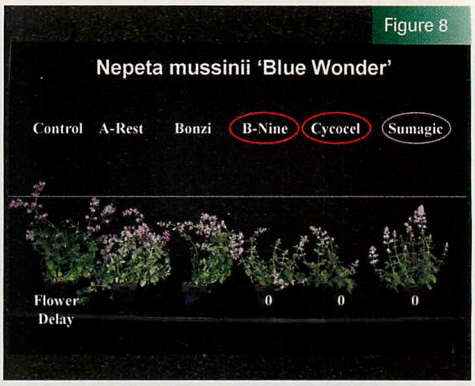
We intentionally selected high growth retardant rates to identify the sensitivity of each species to each growth retardant, not the optimal application concentration (Figures 1-9). Unless the photos suggest otherwise, we suggest that growers in the Northern United States and Canada begin with applications at half the rates we used, especially for Bonzi and Sumagic, to avoid excessive stunting. It is easier to apply a second dose than to reverse an overdose. For growers in

the Southern United States, or for all growers in the heat of the summer, the rates we used in our trials may be more appropriate.

Early application of growth retardants is important for effective height control of some herbaceous perennials, especially species that bolt with a tall flowering spike (e.g., echinacea, Figure 2). For species like these, the first growth retardant application must be applied just as the spike begins to elongate (before it is one inch long). Flower spikes elongate rapidly, and delayed applications for even a few days can result in several inches of undesired height.

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

Effectiveness of growth retardants are 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**



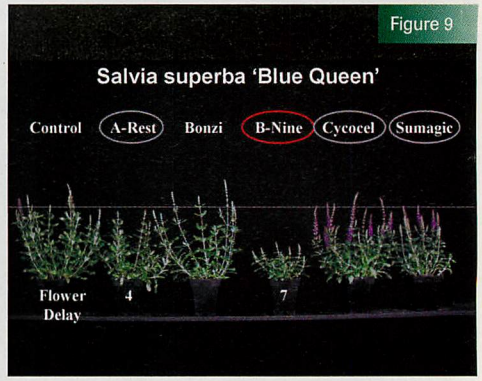


Figure 8. Effect of growth retardants on plant height and flowering of *Nepeta mussinii* 'Blue Wonder.' B-Nine and Cycocel were most effective, and flowering was not delayed by any of the growth retardants.
Figure 9. Effect of growth retardants on plant height and flowering of *Salvia x superba* 'Blue Queen.' B-Nine was the most effective growth retardant.

About the authors: Mike Olrich and David Joeright are technicians, Erik Runkle is an assistant professor and extension specialist, and Royal Heins and Arthur Cameron are professors, Department or Horticulture, Michigan State University, East Lansing, MI 48824.