Using growth regulators to control height of herbaceous perennials

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Keep perennial height in check with these guidelines

Anyone familiar with flowering herbaceous perennials knows they include a range of species that grow very tall, especially when forced in a greenhouse. Shorter species also may develop flowers on extremely tall spikes. When in flower, these plants can be very difficult to ship and display. Retailers find that a good-looking perennial plant in flower sells; customers prefer a plant in bloom for the immediate show that its flowers provide in the garden. However, even when in flower, a tall or floppy plant is not as appealing.

As part of ongoing research in perennials at Michigan State University, we have screened growth regulators to determine their effectiveness on a variety of herbaceous perennials. The objective has been to determine whether a growth regulator was

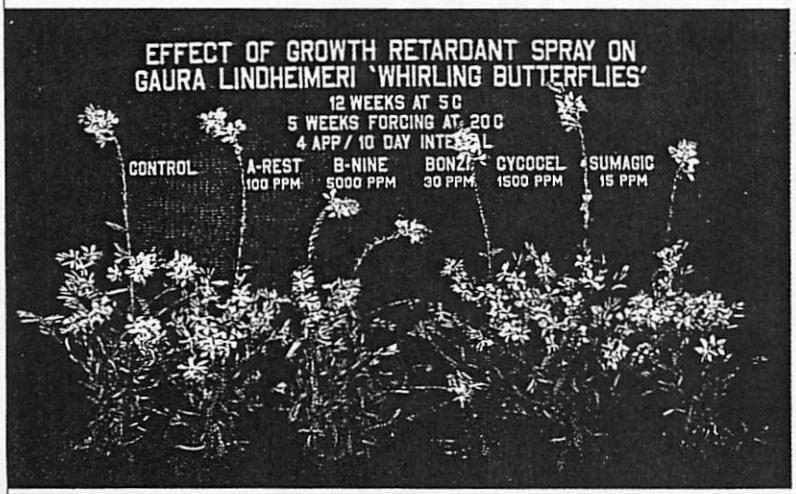

Figure 1: Whirling Butterflies *Gaura lindheimeri* was unresponsive to all chemical growth regulators.

Table 1: Species where flowering was delayed by five or more days by applications of 5,000 ppm B-Nine every 10 days when compared to untreated plants.

Scientific name	Common name
Achillea millefolium Summer Pastels	Common yarrow
Alcea rosea Chater's Double Mix	Hollyhock
Aster alpinus Alpine Mix	Alpine aster
Campanula carpatica Blue Clips	Carpathian harebell
Chrysanthemum coccineum J. Kelway	Painted daisy
Coreopsis grandiflora Sunray	Tickseed
Coreopsis verticillata Moonbeam	Threadleaf coreopsis
Heuchera sanguinea Bressingham	Coralbells
Lavandula angustifolia Munstead Dwarf	Lavender
Lobelia x *hybrida* Queen Victoria	Cardinal flower
Lobelia x *speciosa* Compliment Scarlet	Sweet lobelia
Perovskia atriplicifolia	Russian sage
Salvia x *superba* Blue Queen	Sage

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Table 2: The relative effectiveness of repeated applications of 100 ppm ancydimol (A-Rest), 5,000 ppm daminozide (B-Nine), 30 ppm paclobutrazol (Bonzi), 1,500 ppm chlormequat (Cycocel) or 15 ppm uniconazole (Sumagic) on 35 species of herbaceous perennials. The rates tested were high to determine qualitative plant response and are not necessarily recommended for use in commercial industry.

Herbaceous perennial response to growth regulators

Species		Growth regulators				
Scientific name	Common name	A-Rest	B-Nine	Bonzi	Cycocel	Sumagic
Achillea millefolium Summer Pastels	Common yarrow					
Alcea rosea Chater's Double Mix	Hollyhock					
Asclepias tuberosa	Butterfly weed					
Aster alpinus Alpine Mix	Alpine aster					
Astilbe x *arendsii* Bressingham Beauty	Astilbe					
Campanula carpatica Blue Clips	Carpathian harebell					
Campanula persicifolia Blue	Bellflower					
Centaurea montana Violet	Mountain bluet					
Chelone glabra	Turtlehead					
Chrysanthemum coccineum J. Kelway	Painted daisy					
Coreopsis grandiflora Sunray	Tickseed					
Coreopsis verticillata Moonbeam	Threadleaf coreopsis					
Delphinium elatum Mix	Delphinium					
Echinacea purpurea Bravado	Purple coneflower					
Gaillardia x *grandiflora* Burgundy	Blanket flower					
Gaura lindheimeri Whirling Butterflies	Gaura					
Gypsophila paniculata Double Snowflake	Baby's-breath					
Helenium autumnale	Sneezeweed					
Hemerocallis Hall's Pink	Daylily					
Heuchera sanguinea Bressingham	Coralbells					
Hibiscus x *hybrida* Disco Belle Mix	Mallow					
Lavandula angustifolia Munstead Dwarf	Lavender					
Leucanthemum x *superbum* Marconii	Shasta daisy					
Linum perenne Saphire	Flax					
Lobelia x *hybrida* Queen Victoria	Cardinal flower					
Lobelia x *speciosa* Compliment Scarlet	Sweet lobelia					
Perovskia atriplicifolia	Russian sage					
Phlox paniculata Eva Cullum	Summer phlox					
Physostegia virginiana Summer Snow	Obedient plant					
Rudbeckia fulgida Goldsturm	Black-eyed Susan					
Salvia x *superba* Blue Queen	Sage					
Sedum spurium Dragon's Blood	Sedum					
Veronica longifolia Red Fox	Speedwell					
Veronica longifolia Sunny Border Blue	Speedwell					
Veronica spicata, Blue	Speedwell					

no response | slight response | moderate response | strong response

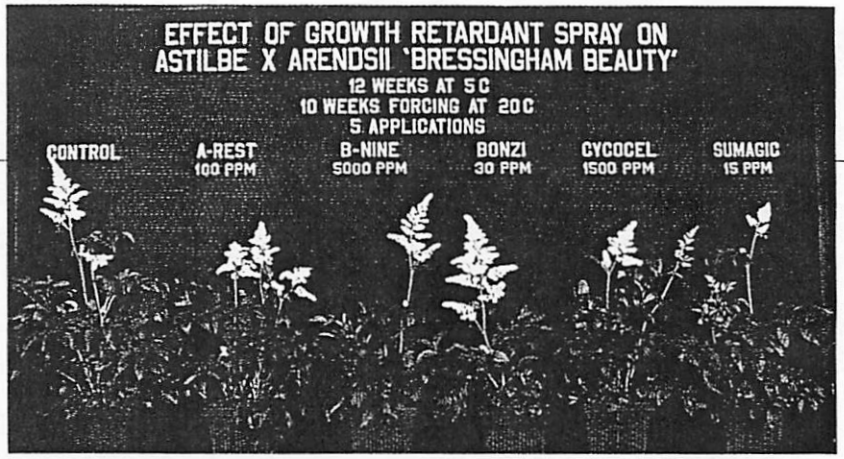

Figure 2: Bressingham Beauty *Astilbe* x *hybrida* was only slightly responsive to growth regulators probably because the sequence of applications missed the rapid elongation phase.

effective on a particular species, not to determine recommended rates for that species.

While all five of the common growth regulators used in the floricultural industry, ancydimol (A-Rest), daminozide (B-Nine), paclobutrazol (Bonzi), chlormequat (Cycocel) and uniconazole (Sumagic), reduce stem elongation of some floricultural crops, none reduces stem elongation of all species and little is known about their effectiveness on perennials. How will they work on perennials?

The five growth regulators we tested as spray applications were 100 ppm A-Rest, 5,000 ppm B-Nine, 30 ppm Bonzi, 1,500 ppm Cycocel and 15 ppm Sumagic. The rates used during testing were high to assure plant response; they are not necessarily recommended for commercial height-control programs.

A single growth regulator did not effectively control the height of every species, although most species responded to at least one chemical.

During the last three years, we've been able to determine growth response of 35 species to these five chemicals. Field-grown divisions or 50-cell plugs were planted into 1 gal. containers or 4- or 5-in. pots, respectively. All plants were grown at 68F under a 4-hour night interruption delivered from 10 p.m. to 2 a.m. by high pressure sodium lamps. Transplants were given time for establishment and then were sprayed with the growth regulators at 10-day intervals until flower. We

measured height every 10 days. Time to visible bud and flower, number of inflorescenses and final plant height were recorded for each treatment. We treated 10 plants with each growth regulator and compared them to untreated plants. If there was no discernable difference in height between treated and

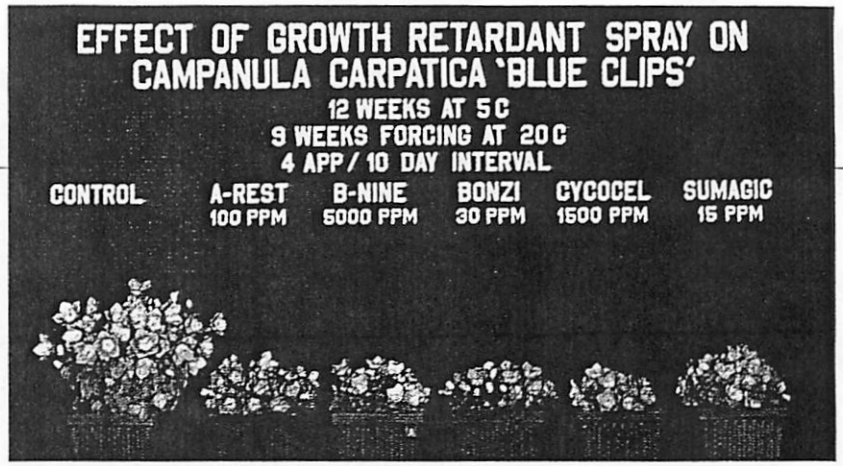

Figure 3: Species such as Blue Clips *Campanula carpatica* respond dramatically to chemical growth regulators. The excessive response of *C. carpatica* can be prevented through lower application rates or fewer applications.

untreated plants after at least three applications, we concluded that the growth regulator was not effective in controlling that species stem elongation.

Plant response varied among growth regulators (Table 2). A single growth regulator did not effectively control the height of every species, although most species responded to at least one chemical. B-Nine and Sumagic were the most effective growth regulator tested; reducing the height of 23 and 24 species, respectively. A-Rest, Bonzi and Cycocel were effective on 20, 21 and 13 species, respectively.

Seven species responded in some degree to all growth regulators. Unfortunately, four of the taller species, *Chelone glabra*, *Gaillardia* x *grandiflora*, *Gaura lindheimeri* (Figure 1) and *Physostegia virginiana*, were unresponsive to any spray treatments. Higher rates than those we used may be necessary to control the height of these species. The timing of a growth regulator application is critical on species that bolt or have extremely fast developmental rates from visible bud to flower, such as *Aster alpinus*, *Astilbe* x *arendsii* (Figure 2) and *Echinacea purpurea*. For these species, the growth regulator must be applied just at or just before the rapid elongation phase of development.

Another factor to consider is the degree to which some species' growth must be retarded. Rates used in this trial were designed to determine efficacy, and applications at the experimental rates may result in excessive height

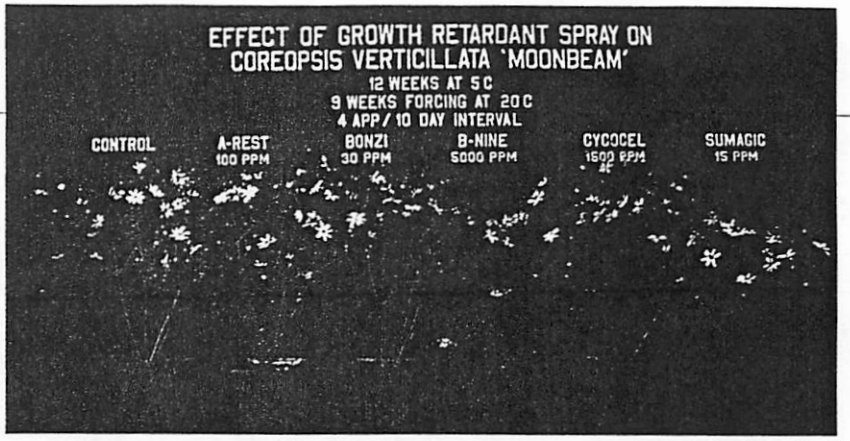

Figure 4: Growth regulators occasionally cause flowering delay. Applications of 5,000 ppm B-Nine effectively reduced height of Moonbeam *Coreopsis verticillata*, but delayed flowering compared to other treatments.

control. For example, Blue Clips *Campanula carpatica* (Figure 3) was severely stunted. However, it is possible to reduce the final height of a species slightly using growth regulators at lower rates.

Also included in the evaluation of responsiveness to different growth regulators were timing of bloom, flower number and physiological disorders caused by sensitivity to a specific growth regulator. In our experience, treating with 5,000 ppm B-Nine occasionally caused a flowering delay (Table 1), such as those of *Achillea millefolium* and *Coreopsis verticillata* (Figure 4). As is well documented on other species, Cycocel causes foliar chlorosis on a number of herbaceous perennials. Species with the most severe chlorosis were *Chelone glabra* and *Hibiscus* x *hybrida*.

The use of growth regulators to control the height of larger unruly species may be an effective strategy to increase their attractiveness. Specific application rates are difficult to recommend because of differences in climate, greenhouse, species, pot size, growing technique and final desired height. If you do test any of these growth regulators, we suggest initial applications be made at 50 ppm A-Rest, 2,500 ppm B-Nine, 15 ppm Bonzi, 1,500 ppm Cycocel or 10 ppm Sumagic. If height is shorter or taller than desired, adjust application frequency and rates based on your experience. ❑

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