



Hosta 'Jade Cascade'



Aquilegia 'Musik'

Advanced Height Control of **PERENNIALS**

Utilizing tank mixes can help minimize excessive plant height.

By Paul Pilon

Growers concerned about controlling plant height have traditionally used chemical plant growth regulators (PGRs) to maintain plants at a certain size. The usual approach has been to apply one or more applications of a single PGR of a predetermined concentration to a given crop. With traditional greenhouse crops such as bedding plants, poinsettias, mums or lilies, this approach of controlling plant height has



Aquilegia 'Biedermeier' control no PGR applied (left) and after three applications of the tank mix B-Nine 2,500 ppm + Bonzi 30 ppm (right). (Photos courtesy of Paul Pilon)

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Hosta 'Royal Standard' control (left) and after three applications of the tank mix B-Nine 1,875 ppm + Bonzi 15 ppm (right).

largely been successful and is still widely used. Unlike most greenhouse crops, perennials consist of a diverse array of plant species (literally thousands of them). Until recently, relatively little research has been conducted with perennials; therefore, the availability of high-quality cultural information is almost nonexistent. Consumer popularity, increased competition and stricter quality specifications have helped make controlling the height of perennials a real challenge for today's growers.

For perennials, as supported by university research, B-Nine and Sumagic seem to show the most response across the widest range of plant species. Historically, up to 25 percent of all PGR applications at Sawyer Nursery were B-Nine and nearly 70 percent were Sumagic. This provided us with the most effective chemical height control available at the time. When PGRs were applied, we also observed improved crop uniformity, longer shelf life (both in the greenhouse and at retail) and less shrinkage (plants thrown away). However, for several of the species, these growth regulators have not provided us with sufficient levels of control.

Each year at Sawyer Nursery, we conduct several trials to determine if more suitable height control strategies exist. Because 95 percent of all our PGR applications consisted of two chemicals (B-Nine and Sumagic), we began testing combinations of these two products. But we didn't stop there; we looked at tank mixing nearly every commer-



Coreopsis 'Early Sunrise' control (left) and after three applications of the tank mix B-Nine 1,875 ppm + Cycocel 1,000 ppm (right).

cially available PGR to observe any potentially useful combinations that could easily be implemented into production, thus enhancing crop quality. This research has changed our overall strategy and approach to controlling the height of perennials.

To simulate the most extreme commercial perennial production scenario, all of the varieties were produced in quart-sized containers at pot-tight spacing. Each treatment was applied three times at 1-week intervals. Evaluations

were conducted each week to determine the plant response to the applications.

The plants were evaluated and given a preference rating and an effectiveness rating. The preference rating was a subjective visual

rating that used such physical attributes as plant shape, size and leaf color to determine which treatments produced the most desirable-looking plants. The effectiveness rating evaluated the height of the plant, the distance

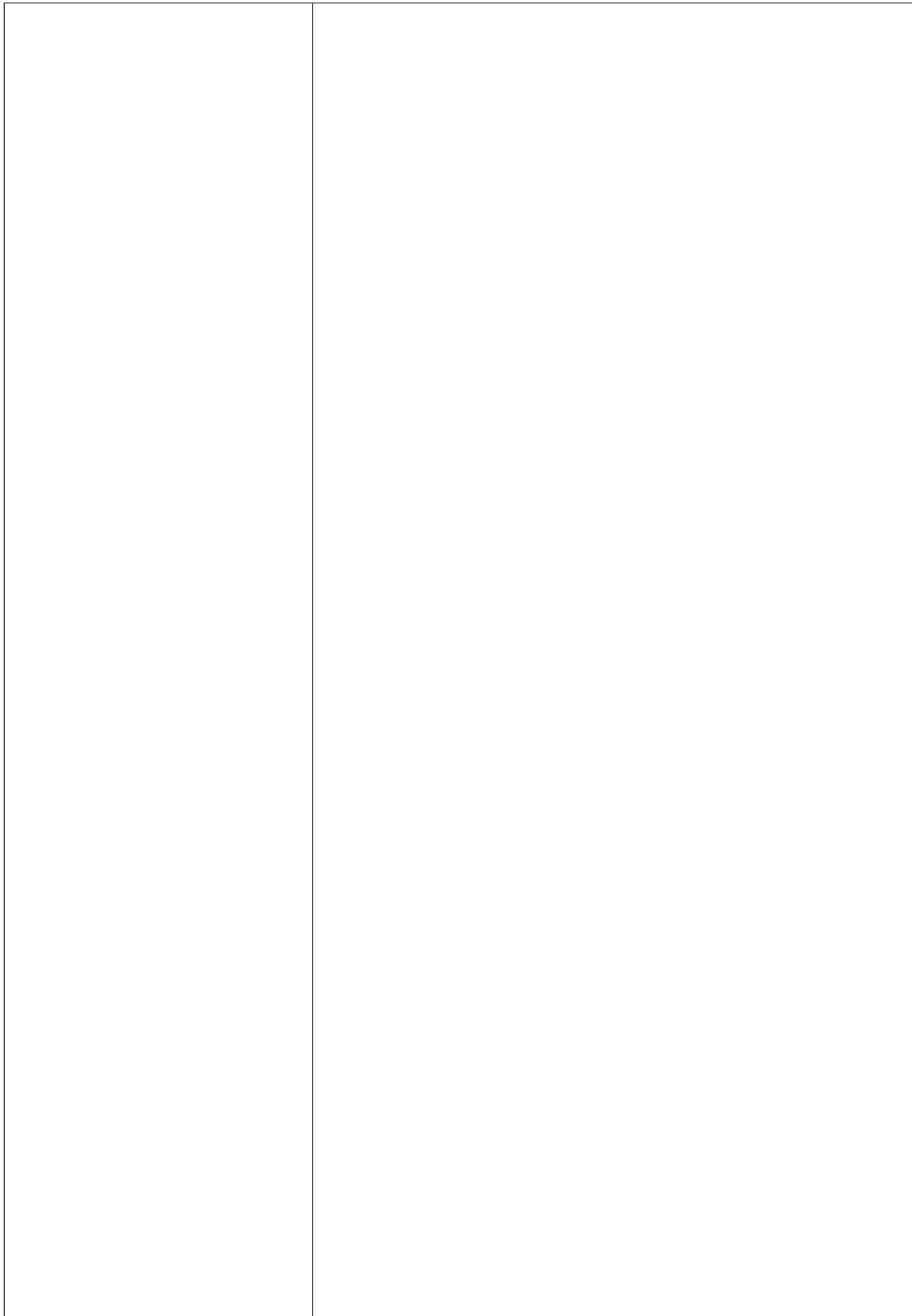
SYNERGY

All of the commercially available plant growth regulators essentially control plant height by interfering with the biosynthesis of gibberellins within the plant. Gibberellins promote cell elongation, which contributes to the plant's overall height. Each plant growth regulator interferes with the biosynthesis process at a different site. Thus, quite often, when two different growth regulators are combined, there's a greater response than when a single chemical is used. This heightened response to the combination is often referred to as synergy.

The level of synergy observed depends on many factors, such as the chemicals that were combined, the rates of each chemical used, the plant they're being applied to and the age or stage of development of the plant. With true synergy, a greater response is achieved while using lower rates of each chemical in the combination. Most often, what is observed is enhanced activity or an additive effect of the individual products. The research we conducted was to determine if any synergistic activity exists from a particular combination that would be beneficial to controlling the height of perennial crops.

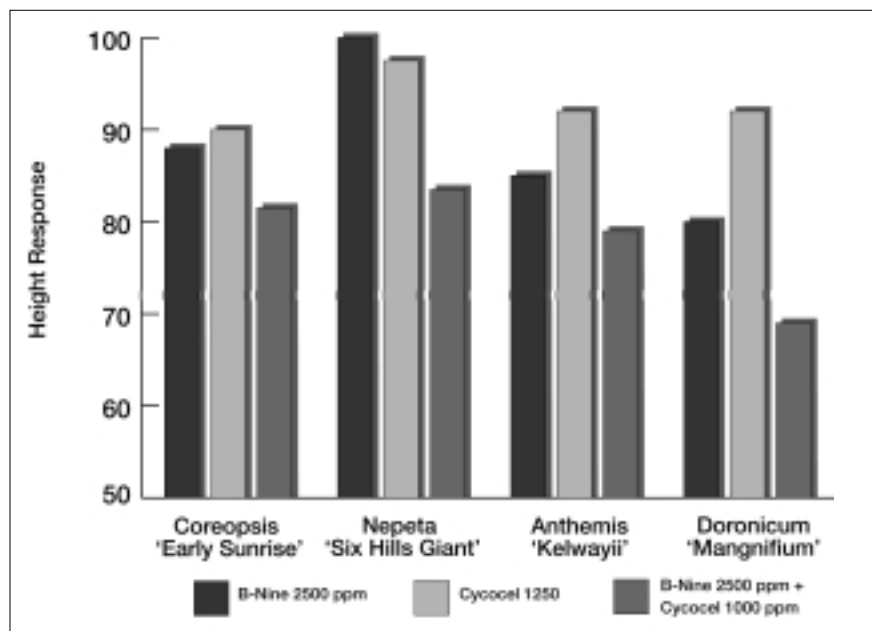
RESEARCHING TANK MIXES

The trials at Sawyer Nursery were designed to determine which combinations of commercially available PGRs, if any, would give adequate height control on some of the more "difficult" varieties. Typically, during greenhouse production, we have found that it takes 2-3 applications of a PGR to reach satisfactory levels of control. Many species have required more than three applications. We have concentrated our research efforts toward these species.



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Figure 1. B-Nine + Cycocel tank mixtures. Lower numbers represent more control.



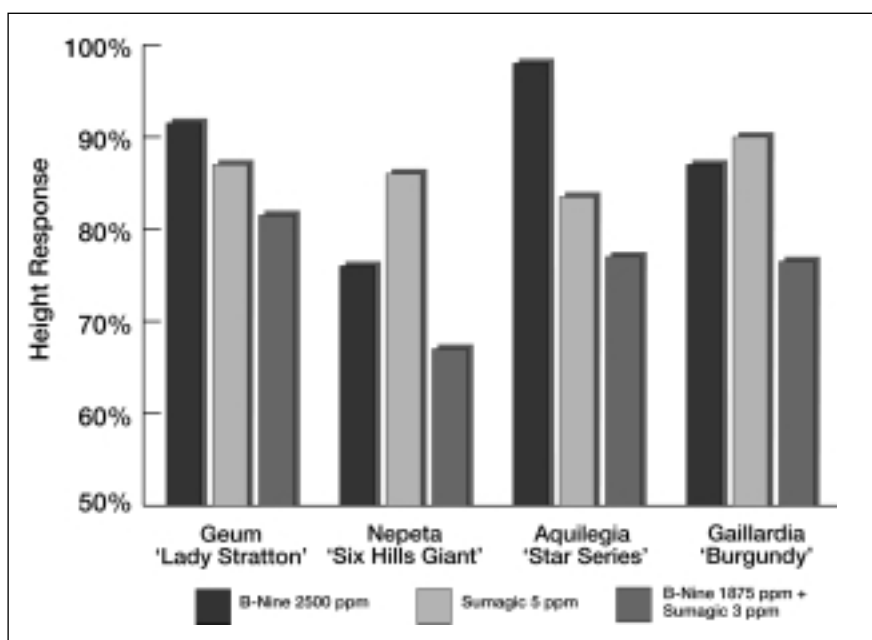
between internodes, the petiole length and the physical appearance to determine the level of control achieved for each treatment. Two rating scales were used to create a balance between effectiveness and salability. For example, the most effective treatment usually provides too much height control and plants that are stunted or too short for adequate sales. Growers need to obtain adequate levels of control while still developing attractive plants. Keep this in mind: The most effective treatment is not always what is best for the plants or the customer. A grower's goal should be to obtain a balance between height control and physical appearance when using plant growth regulators.

In our trials, the tank mixes that were most effective on the broadest range of plant species, listed in order of effectiveness, are: B-Nine + Sumagic, B-Nine + Cycocel and A-Rest + B-Nine. Many other combinations have been trialed with limited success. Usually, in these cases, their effectiveness is limited to only a few plant species.

INTERPRETING THE RESULTS

The charts on this page and on page 68 and above show the height response of a particular plant variety to the individual chemicals and to a tank mixture of these chemicals. The tank mixture contains both of the individual chemicals, usually at a lower rate than the treatments where they are used alone. To interpret the charts, consider the following: The control treatment, regardless of the actual height of

Figure 2. B-Nine + Sumagic tank mixtures. Lower numbers represent more control.



the plant, is always 100 percent. This is the plant with no PGR applied and measures the maximum height possible. The bars shown on the charts represent the treatments. A bar at 90 percent means that the treated plants were 90 percent the height of the control group (or 10 percent height reduction was achieved).

In most cases, there is a reduction in height from each of the individual products when they are applied alone. The magnitude of the height reduction is usually greater when these products are combined, even at lower rates than when used individually. This heightened response is probably achieved from reducing gibberellin biosynthesis at multiple sites within the plant. When controlling cell elongation (plant height) from two or more points within the plant, a greater response is generally observed, and lower rates can be used to accomplish adequate height control.

The charts on pages 67 and 68 demonstrate several examples of plants that responded only slightly with individual products but had greater response from tank mixtures.

For example, the height of Nepeta 'Six Hills Giant' showed no response to three applications of B-Nine at 2,500 parts per million (ppm), and only 3-percent reduction in height

from three applications of Cycocel at 1,250 ppm. However, three applications of the tank mixture of B-Nine at 2,500 ppm + Cycocel at 1,000 ppm reduced the height by 27 percent. ▶

For more information on the products mentioned in this article, contact the following manufacturers:

B-Nine

Uniroyal Chemical
(203) 573-2400

Cycocel

Olympic
Horticultural Products
(800) 659-6745

A-Rest

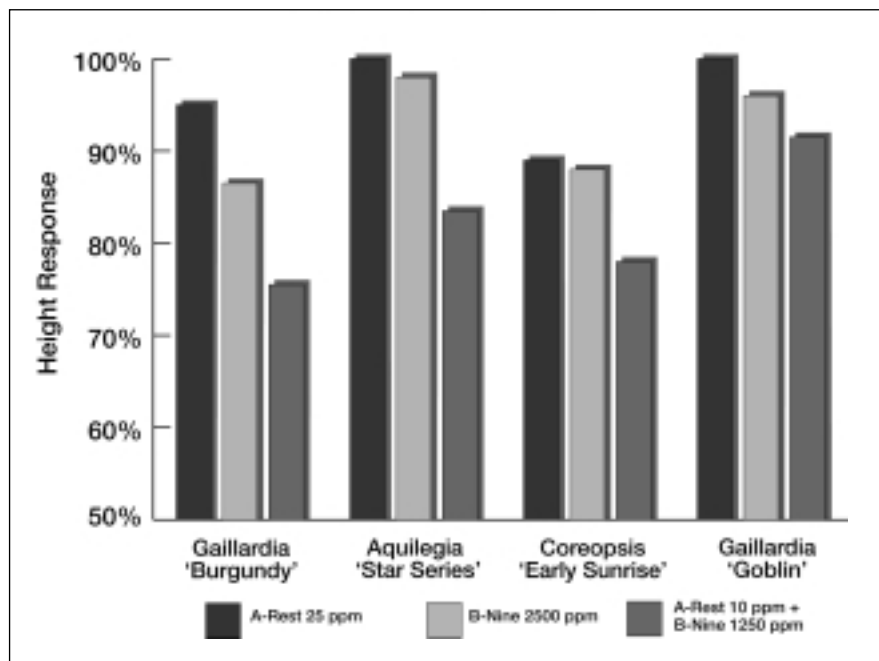
SePRO
(317) 580-8297

Sumagic

Valent U.S.A. Corp.
(800) 89-VALENT

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Figure 3. A-Rest + B-Nine tank mixtures. Lower numbers represent more control.



MIXING THEM INTO PRODUCTION

Tank mixing plant growth regulators offers growers the opportunity to more effectively control plant height and quite frequently control costs. A grower who typically applies Sumagic at 5 ppm can now apply B-Nine at 1,875 ppm + Sumagic at 3 ppm for practically the same cost of the 5 ppm Sumagic application. This grower may potentially experience greater height control without increasing the cost of application. Generally speaking, growers who use PGRs also receive secondary advantages such as improved plant color and quality, longer shelf life of their products, disease control (See page 14 for more information) and less shrinkage.

Until further research is conducted and distributed, controlling the height of perennials is going to be a major challenge today's producers must face. For growers with relatively little experience using PGRs or new producers of perennials, I would recommend sticking with traditional, single-product applications. Sumagic and B-Nine used individually show the greatest response across the broadest range of plant genetics. Always start with these products. With plant varieties that do not exhibit a satisfactory response to B-Nine or Sumagic, begin looking at tank mixes to deliver a greater height reduction.

Always begin using tank mixes on a small scale to determine their effectiveness before making any major applications. Remember, no one growth regulator will control plant height on all plant varieties; similarly, no single combination of these products is likely to yield comparable results on all species of plants. Don't make drastic changes to your height control strategies until you have tried tank mixtures on a small scale and are comfortable using them. GPN

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