

GROWERTALKS

Growth Regulators for Containerized Herbaceous Perennial Plants

A Guide to Growing High-Quality Perennials

By Joyce G. Latimer, Department of Horticulture, Virginia Polytechnic Institute and State University, Blacksburg, Virginia

Dear Perennial Growers,

Year after year, perennial growers provide a variety of colors, textures, forms and plant sizes to their customers. That uniform palette of beauty and plant structure often is the result of plant growth regulators (PGRs).

And to maintain attractive and hearty perennials, turf and ornamental professionals don't want just any PGRs—they want the best. That's why growers trust Fine Americas' line of PGRs to assist in maintaining and expanding perennial production.

Again this year, Fine Americas is proud to sponsor the *GrowerTalks* Guide for Growing Top-Quality Perennials to continue its ongoing commitment to grower education. By collaborating with some of the industry's leading experts, such as Joyce Latimer, professor and extension specialist for greenhouse crops at Virginia Tech, Fine Americas helps bring you timely topics, such as:

- **Maximizing the efficacy of Collate (ethephon) in the greenhouse**—How to use different applications for different crops
- **Integrated growth regulation of herbaceous perennials**—Covering PGR basics for perennial crops
- **The availability of a wide assortment of PGRs**—Descriptions and characteristics of each type of PGR available on the market

Additionally, the rate chart by crop and the dilution table are included in the 2016 Guide.

At Fine Americas, products like Piccolo, Piccolo 10 XC, Dazide 85 WSG, Concise, Configure, Collate and many more help us to bring the very best PGRs to commercial perennial growers. By continuing to partner with *GrowerTalks* and leading university specialists, we also bring you reliable, up-to-date information on PGR use for perennial production. We hope you find this Guide helpful . . . here's to growing the perfect perennials!



Sincerely,

Gregory Johnson, President
Fine Americas, Inc.

fine
Excellence in PGR Technology

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GROWERTALKS

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Maximizing the Efficacy of Collate in the Greenhouse

By Joyce G. Latimer, Margaret G. Aiken & Holly L. Scoggins, Virginia Tech

Ethephon has been a staple growth regulator in greenhouse floriculture for many years. Thanks to the exhaustive research conducted by Dr. Peter Konjoian in the 1990s, Florel (3.9% ethephon, Southern Agricultural Insecticides, Inc.) was introduced into floriculture production of liners, plugs and a variety of finished plants. Ethephon served as a growth retardant, a branching enhancer and a flower abortion product for many of these crops (Figure 1).

In 2013, Fine Americas, Inc. introduced Collate, a higher concentration ethephon product (21.7% vs. the 3.9% active ingredient in Florel) into the floriculture market. With the new ethephon formulation and the fresh eyes of a plant growth regulator (PGR) company, new research

found different application methods and crop uses. However, before we go there, let's recap how ethephon works.

Ethephon taken up by the plant is broken down inside the plant to produce ethylene gas. Ethylene gas is a natural plant hormone that influences fruit ripening, senescence, branching and growth. Many producers use it to manage flower abortion or timing, to increase branching and to manage plant growth. Probably the most common usage is to maintain stock plants in a vegetative state by aborting flowers. In many crops, not only do the stock plants remain vegetative, but they may also produce a greater number of lateral branches providing an increase in harvestable cuttings.

Foliar applications of Collate

Currently Collate (as with Florel) is only labeled for application as a foliar spray, but recent work has found that ethephon has a significant amount of substrate activity when applied as a drench. Many growers would prefer a substrate application method, especially if the product can be delivered through the automated application system. Foliar applications in particular are affected to a greater extent by solution pH, plant coverage and the environmental conditions during and after application.

First, the pH—or more accurately, the alkalinity of the mixing water—is critical to maintaining the efficacy of Collate in solution. In general, if you have to add ▶



Figure 1. Lantana liners untreated (left) or treated with a foliar spray of 500 ppm Florel (right). Treated liners had fewer flowers and more branches during propagation than untreated liners.

Photo courtesy of Dr. Peter Konjoian.

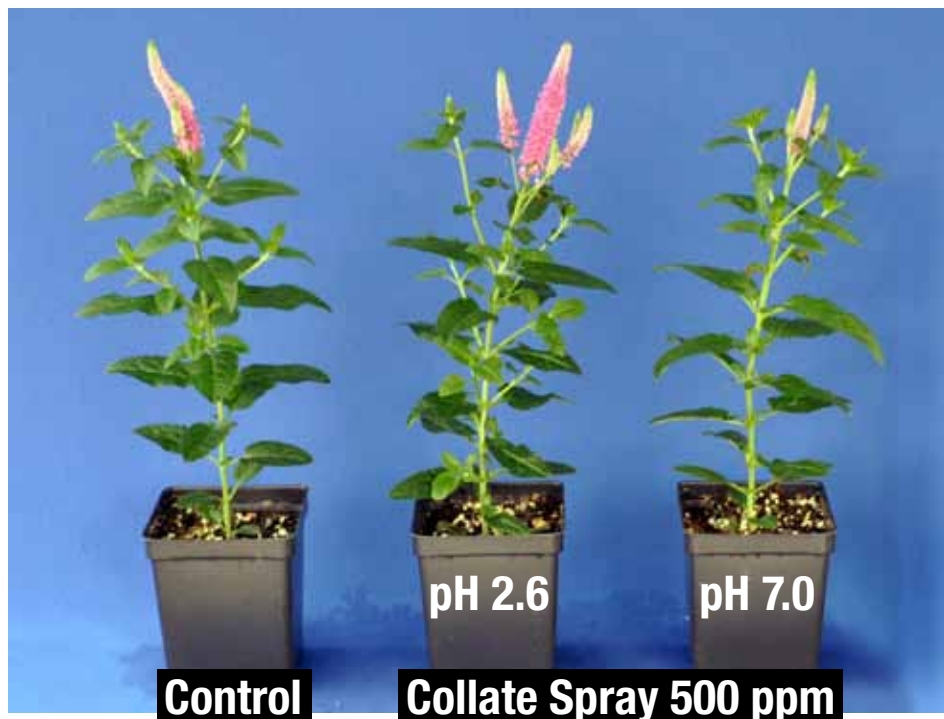


Figure 2. Veronica First Love (left to right): Untreated or treated with foliar sprays of 500 ppm Collate at pH 2.6 or pH 7.0. Collate was applied two days after transplanting finished liners. Note the increase in branching of plants treated with Collate at pH 2.6, especially near the base of the plant as compared to those treated with Collate at pH 7.0. Photo at three weeks after treatment.

acid into your irrigation water to neutralize the alkalinity, you should use that adjusted water for making your ethephon solutions. Otherwise, the ethephon may be rapidly inactivated. Collate contains acidifiers to assist in this pH adjustment. Check the pH of your solution with a pH meter as you adjust it or use a product like Indicate 5 (Brandt), which acidifies the water and changes the water color to pink to indicate when the pH reaches the 4.5 to 5.5 range. Then check the final solution pH to verify that it's below 5.5. Paying attention to this detail will make a big difference in the efficacy and consistency of your foliar sprays (Figure 2). However, also be careful

to avoid getting the solution pH too low, as leaf damage can occur when the pH is below 3.

In addition, since ethephon is poorly translocated within the plant, thorough spray coverage of the plant is important to obtain uniform growth control and to improve lateral branching throughout the plant. Notice in Table 2 of the “Wide Assortment of Available PGRs” article on page 11 of this PGR Guide, Collate is one of the PGR products that has a long absorption time—12 to 16 hours. Therefore, environmental conditions that increase drying time, such as high humidity, limited air movement, moderate temperatures and

sunlight, such as found in early mornings or late afternoons, enhance ethephon uptake by providing a longer length of time for absorption. In fact, ethephon may be inactivated by high (greater than 95F/35C) or low (lower than 60F/15C) air temperatures during application. Never apply ethephon to plants under environmental or drought stress, as it exacerbates that stress and causes more leaf senescence and other symptoms of ethephon phytotoxicity.

Drench applications of Collate

Research sponsored by Fine Americas over the last few years has shown that Collate drenches work quite well to manage plant

Table 1. Collate substrate drench rates effective in controlling growth of herbaceous perennials in Virginia Tech research trials. Adjust rates for your growing conditions.

Crop	Collate drench rate	Notes
<i>Caryopteris x clandonensis</i> Longwood Blue	100 ppm	
<i>Euphorbia x martinii</i> Ascot Rainbow	50 to 100 ppm	Little response
<i>Gaura lindheimeri</i> Siskiyou Pink	50 ppm	Higher rates delayed flowering
<i>Heliopsis</i> Lorraine Sunshine	50 ppm	
<i>Hypericum</i> Hypearl Jacqueline	50 to 100 ppm	
<i>Nepeta x faassenii</i> Walkers Low	50 to 100 ppm	Better control when applied after transplanting
<i>Salvia coccinea</i> Hummingbird Coral Nymph	50 to 100 ppm	
<i>Verbena bonariensis</i> Buenos Aires	Less than 200 ppm	
<i>Verbena bonariensis</i> Lollipop	100 ppm	
<i>Verbena canadensis</i> Homestead Purple	100 ppm	
<i>Veronica</i> First Love	50 to 100 ppm	
<i>Veronica</i> Goodness Grows	100 ppm	

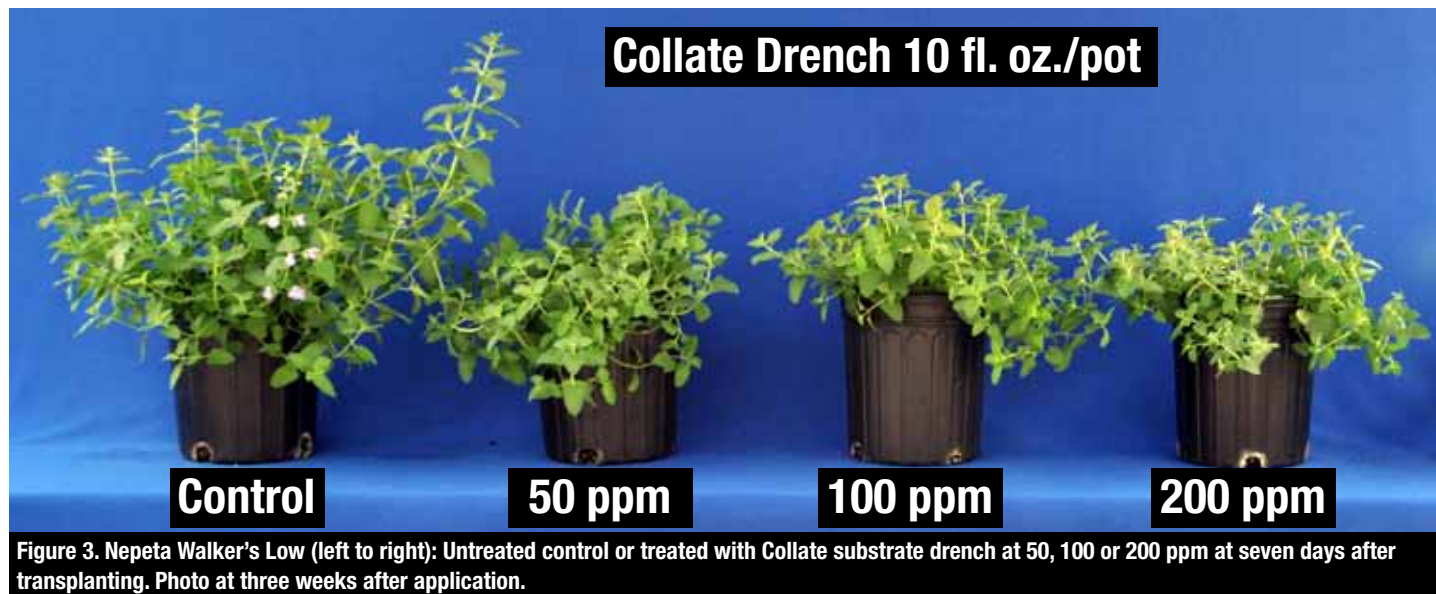


Figure 3. Nepeta Walker's Low (left to right): Untreated control or treated with Collate substrate drench at 50, 100 or 200 ppm at seven days after transplanting. Photo at three weeks after application.

growth and development. In addition, applying Collate as a substrate drench may eliminate many of the application concerns we have with foliar sprays and, therefore, eliminate many of the inconsistent responses to ethephon applications. In our research and screening trials, we've identified responsive crops and rates, which will be used to justify the current application for the Collate label expansion to include substrate drenches (Figure 3). Effective drench rates have varied in our trials from 50 ppm to 200 ppm with different crops (Table 1), so onsite testing will still be important before adopting this new application method for Collate.

NOTE: These are research results. Although Fine Americas had applied for a Collate label expansion at the time of this publication, you must verify that drench applications have been approved and added to the label for your state before using this application method.

So what factors affect the efficacy of Collate drenches?

Be aware that Collate solution pH is still critical to efficacy of drench applications.

Since application rates are a lot lower than foliar spray application rates, pay extra attention to final solution pH. In our initial studies using unadjusted irrigation water (alkalinity ~55 mg/L CaCO₃) to make our solutions, a 500 ppm Collate solution for a foliar spray had a pH of 2.0, while the 50 ppm Collate drench solution had a pH of about 5.2. The amount of the acidifiers added to the Collate solution is directly proportional to the ethephon concentration of the final solution. High solution pH will cause rapid deactivation of Collate in the spray tank or bucket.

Does substrate pH affect efficacy of a Collate drench?

So we know that solution pH affects the stability of ethephon in solution; i.e., a properly adjusted solution pH prevents the inactivation of the ethephon. And we know that solution pH affects the efficacy of foliar sprays. Wouldn't we expect substrate pH to affect the efficacy of a drench application? So we tested it.

MATERIALS AND METHODS. We purchased unrooted cuttings of *Verbena bonariensis* Lollipop and *Veronica spicata*

Goodness Grows, which we rooted to produce our own liners. After bulking, the veronica liners were vernalized for six weeks prior to the study. The liners were potted into trade gallon pots filled with a blended substrate of 85% Canadian sphagnum peat moss, 15% coarse perlite with the addition of gypsum, Micromax granular micronutrients and a wetting agent.

Based on preliminary studies, we adjusted the substrate pH with dolomitic lime to achieve target pH values of 4.5, 5.0, 5.5, 6.0, 6.5 or 7.0. The substrates were allowed to equilibrate for one week before plants were potted. Collate was applied at 100 ppm as a substrate drench in 10 fl. oz. per pot one week after liners were transplanted. We used eight replicates of each substrate pH for Collate-treated and untreated plants. To simulate the application of the acidic Collate solution, untreated control plants, grown under the same substrate pH conditions, were treated with 10 fl. oz. of tap water acidified to pH 4.2 (same as our Collate solution) using Indicate 5 (Brandt). The substrate pH was monitored over the next four weeks and remained stable and relatively close to our target pH values. ▶

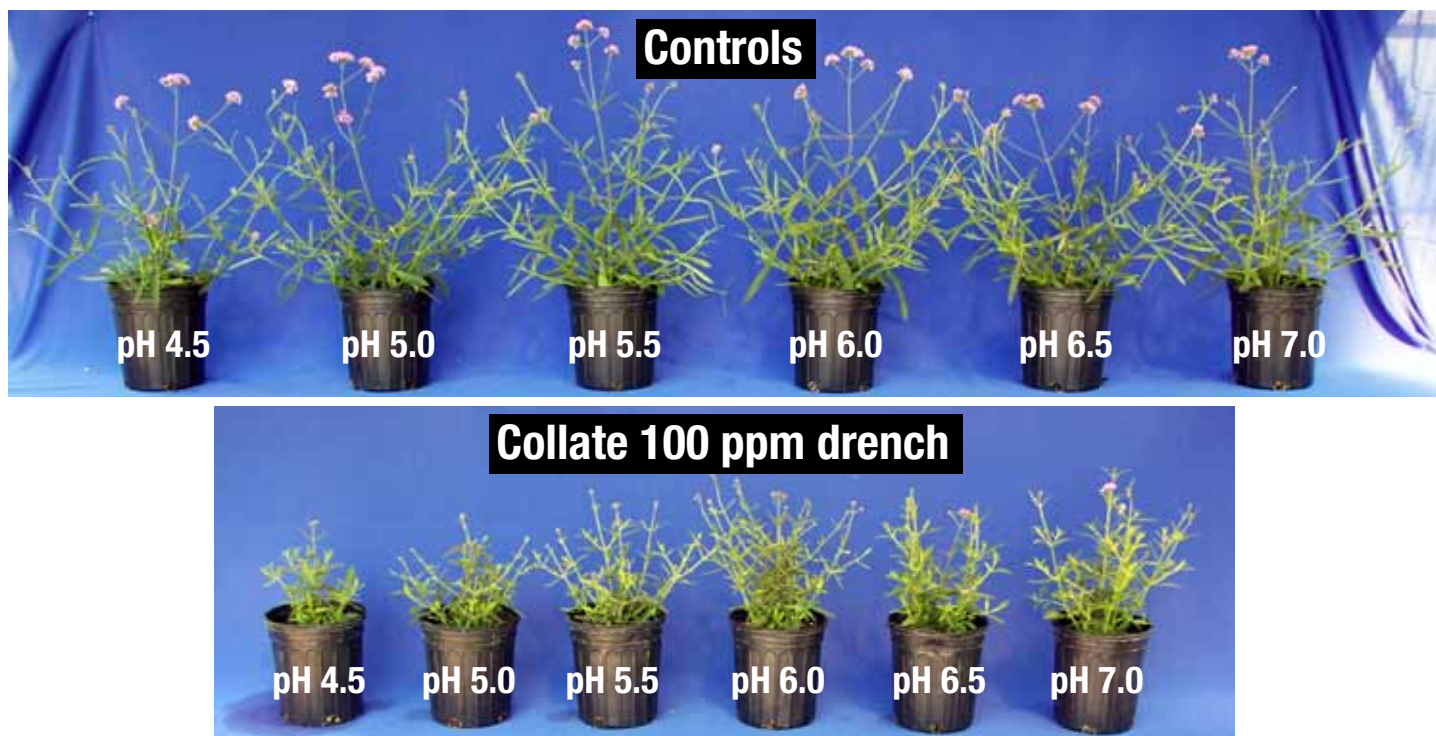


Figure 4. The effect of substrate pH on efficacy of Collate drench applications to *Verbena bonariensis* Lollipop. Top row is control plants grown at the same substrate pH as the plants on the bottom row, which were drenched with 100 ppm Collate (10 fl. oz. per pot). Note that photos are sized to approximately the same pot size to accurately depict differences in plant size. Photo at four weeks after application.

RESULTS. Substrate pH did not affect the growth of untreated control plants of either crop over this short production period. Collate controlled growth of both crops, but the interaction between substrate pH and the Collate treatment varied in the crops. For veronica, Collate controlled plant growth to a similar degree at all substrate pH values. However, there was a significant interaction between the Collate drench and substrate pH in the verbena study (Figure 4). The efficacy of the Collate drench was reduced as the substrate pH increased from 4.5 to 7.0. However, even at a substrate pH of 7.0, Collate-treated plants were shorter, had smaller width and shoot dry weight and delayed flowering as compared to the untreated control plants grown at pH 7.0.

The good news is that within the normal growing range for substrate pH, 5.5 to 6.5, there was little difference in the effect of Collate on verbena growth. However, if you're growing plants in the extremes of this pH range, you can expect more or less efficacy due to the interaction with substrate pH. And, as we see with foliar spray applications of ethephon, there are differences in crop responses to substrate drenches.

What about substrate temperature?

We know that ambient temperatures during application of foliar sprays of Collate can affect efficacy. So what about early spring applications to cooler substrates as compared to later applications to warm substrate?

MATERIALS AND METHODS. We have access to a temperature gradient table that allowed us to measure plant response to Collate drenches at root zone temperatures of 55F (13C), 64F (18C), 73F (23C) or 82F (28C). Air temperature was constant for all treatments at 70F (21C). After preliminary studies to identify responsive crops and Collate drench rates, we evaluated Petunia Hurrah White (sorry about the annual), *Salvia coccinea* Hummingbird Coral Nymph and *Verbena bonariensis* Buenos Aires. We grew our plugs from seeds in Fafard 1P filled 72-size cells.

When plants and roots were well established (four to six weeks after sowing), plants were placed in the gradient table and allowed to equilibrate for one day before applying a Collate or acidified water substrate drench (2.8 was the pH of the unadjusted Collate solution, volume 7 ml/cell). Plants were maintained at the application temperature for six days after the drench application. After removal from the table, plants were potted into trade gallon pots and grown on in the greenhouse for evaluation of growth and flowering.

RESULTS. Collate substrate drenches controlled plant growth compared to untreated control plants, but substrate temperature over the range of 55F to 82F had no effect on the efficacy of the Collate drench (Figure 5). Our application temperature range covered those expected during spring and into early summer. We urge you to conduct your own rate trials if you're making drench applications in mid-summer with substrate temperatures over 90F (32C) to 95F (35C).

Summary

With the planned label expansion, Collate will be the ethephon of choice for greenhouse applications. In research trials, effective drench rates have been between 50 ppm to 200 ppm, so you will still need to run your own rate trials under your conditions. However, we anticipate that the consistency of response to these substrate applications will be much greater than we see with foliar spray applications. With our herbaceous perennial trials, we haven't seen flower abortion (even when we'd like to have that effect), but we typically see a slight delay of three to six days in days to first open flower.

One other point that's still under investigation is the impact of ethephon drenches on root growth and development. In some crops during early liner production, we've seen significant retardation of root growth with ethephon drenches. Therefore, until we have more data, we recommend that Collate drenches only be applied to well-rooted liners or to plants in the transplant container after roots are well established.

For a concise summary of how to use Collate safely and effectively, check out our Collate Use Tips at the back of this PGR Guide. **GT**

Joyce Latimer is a professor of horticulture at Virginia Tech; **Margaret Aiken** is the manager of the floriculture research facilities in horticulture at Virginia Tech; **Holly Scoggins** is an associate professor of horticulture at Virginia Tech, Blacksburg, Virginia.



Figure 5. *Verbena bonariensis* Buenos Aires (left to right): Untreated control held at substrate temperature of 64F (18C) for seven days; plants subjected to a 200 ppm Collate drench applied to liners at substrate temperatures of 55F (13C) 64F (18C), 73F (23C) or 82F (28C). Liners were held at these temperatures for six days after application, potted into trade gallon pots and grown out in the greenhouse. Photo at six weeks after Collate application.

Integrated Growth Regulation of Herbaceous Perennials

By Joyce G. Latimer, Virginia Tech

There is a tremendous diversity of herbaceous perennial plant species being grown for both the retail and landscaping sectors of the industry. Growth regulation of these containerized plants is of particular concern. In production settings, as well as in retail locations, herbaceous perennials grown in pots tend to stretch and become leggy or simply overgrow their pots before their scheduled market date. These plants are less marketable and harder to maintain.

Plant growth regulators (PGRs) are chemicals that are designed to affect plant growth and/or development. Most of the PGRs used in the greenhouse or nursery are used to regulate shoot growth of containerized crops by inhibiting the production of gibberellins—the primary plant hormones responsible for cell elongation. Therefore, these growth retardant effects are primarily seen in stem, petiole and flower stalk tissues. Lesser effects are seen in reductions of leaf expansion, resulting in thicker leaves with a darker green color.

Plant growth retardants also increase the tolerance of plants to temperature and drought stress, as well as to the stresses of shipping and handling, thereby improving shelf life and extending plant marketability. Other benefits of using these PGRs in plant production include improved plant appearance by maintaining plant size and shape in proportion with the pot, and increased shipping capacity with the smaller plants.

Although there is much scientific information on using PGRs on ornamental plants, it's not an exact science. Achieving the best results with PGRs is a combination of art and science—science tempered with a lot of trial and error, and a good understanding of plant growth and development under your environmental and production conditions.

Integrated growth regulation

For best results, PGRs should be handled as production tools, like water and fertilizer. PGRs should be an integrated part

of your crop production cycle, used in conjunction with a number of non-chemical control options to manipulate plant growth, so well-proportioned, compact plants are produced. Selecting shorter-growing cultivars is often the first step available to growers for reducing the occurrence of overgrown plants. However, customer demand for specific color or growth form characteristics may limit your choices. More so than with bedding plants, the response of herbaceous perennials to PGRs depends on the species and cultivar selection.

However, in general, slow-growing or dwarf cultivars will require less PGRs than more vigorous cultivars. Some plant species or cultivars are responsive to specific PGRs, but not all PGRs. Research your crop, including its responsiveness to PGRs.

Environment and cultural practices can be manipulated in the greenhouse or nursery to reduce plant growth and consequently affect the need for chemical growth regulation. Root restriction can be used to control plant growth by utilizing smaller containers or by increasing the number of plants per pot. However, this method works well only when other production parameters, such as ample light, i.e., wide spacing and proper nutrition, are provided. Plants grown in small pots at close spacing will require more chemical growth regulation for adequate growth control than those receiving ample light.

Reducing or withholding water or fertilizer is a traditional method of controlling plant growth. Allowing plants to wilt slightly will lead to shorter plants, but excessive stress or drought stress of sensitive crops may have the undesirable effects of reduced plant quality and delayed flower-



Good growers use all the tools at their disposal to grow the healthiest and most uniform crops they can.

ing. Limiting the amount of nitrogen, or using high nitrate and/or low phosphorous fertilizers, may also help control plant height, but tends to produce thin, leggy perennials. Growers who tend to run their plants “dry” and/or “hungry” will need less PGRs to manage plant growth. Never apply PGRs to plants that are wilted as the risk of phytotoxicity increases with stress.

Growing conditions affect plant height and PGR needs. Higher light quality tends to limit plant elongation, thus resulting in shorter plants. Low-light quality caused by inadequate spacing or crowding of the crop or too many hanging baskets overhead can lead to leggy plants. Light quantity also affects plant growth. Higher light levels improve plant growth and quality as well as branching. Spacing will often determine the need for, and amount of, additional chemical control necessary for optimum height control. Lower temperatures can be used to reduce plant growth; this, however, may also reduce development, which can delay flowering. So you may need to adjust your crop schedules to hit your market window. Lower rates of PGRs are required for plants grown under lower temperatures. ▶

However, in general, higher rates of PGRs will be needed for plants grown outdoors under nursery conditions than for those grown in the greenhouse.

Pinching can be used to improve the shape of the plant, increase branching and control excessive stretch. However, the labor costs of pinching and the subsequent delay in plant development may not make it an economically feasible option of controlling growth of many crops. The chemical branching enhancers, Configure and Augeo, are effective on a wide variety of herbaceous perennials in both plug/liner and finished plant stages. Growers should test multiple applications to improve plant shape and eliminate pinching. Watch for new research results on ethephon (Collate, Florel) as a branching enhancer for perennial plants.

Optimizing plant growth control requires an understanding of the effects of environmental and cultural conditions on plant growth. Experience and on-site trials will allow you to combine chemical PGRs with a number of non-chemical control options to manipulate plant growth to produce high quality, compact plants. The PGR rate table (starting on page 14)

contains results of university PGR research, published reports from growers, chemical companies and plant suppliers, as well as label recommendations for herbaceous perennials. These rates should be used as guidelines for your own trials. Adjust the rates based on your location (higher rates in the Sunbelt and lower rates in northern areas), growing conditions and cultural practices, and the vigor of your crop or cultivar. Keep records of your results, including details on the stage of development of the crop, fertilization and irrigation programs, and environmental conditions.

Applying PGRs to herbaceous perennials

Generally, growth-retarding PGRs should be applied just prior to rapid shoot growth. For most spring-planted perennials, this is one to two weeks after transplanting a plug or liner, where the roots are established and the plant has resumed active growth. On pinched plants, apply PGRs after the new shoots are visible and starting to elongate. For overwintered perennials, apply the PGR shortly after new shoots emerge (2 to 4 in. tall) or laterals begin to elongate. Under warm spring conditions, especially

in a covered cold frame, these shoots can elongate very rapidly. This is where the art of plant growth regulation is most important. You must learn how your crop grows and when to intervene to obtain the desired results. Remember to note details of crop development in your records of PGR treatments. You must gauge when rapid elongation will likely occur and treat to counter it. Early intervention manages plant growth and quality better than late applications.

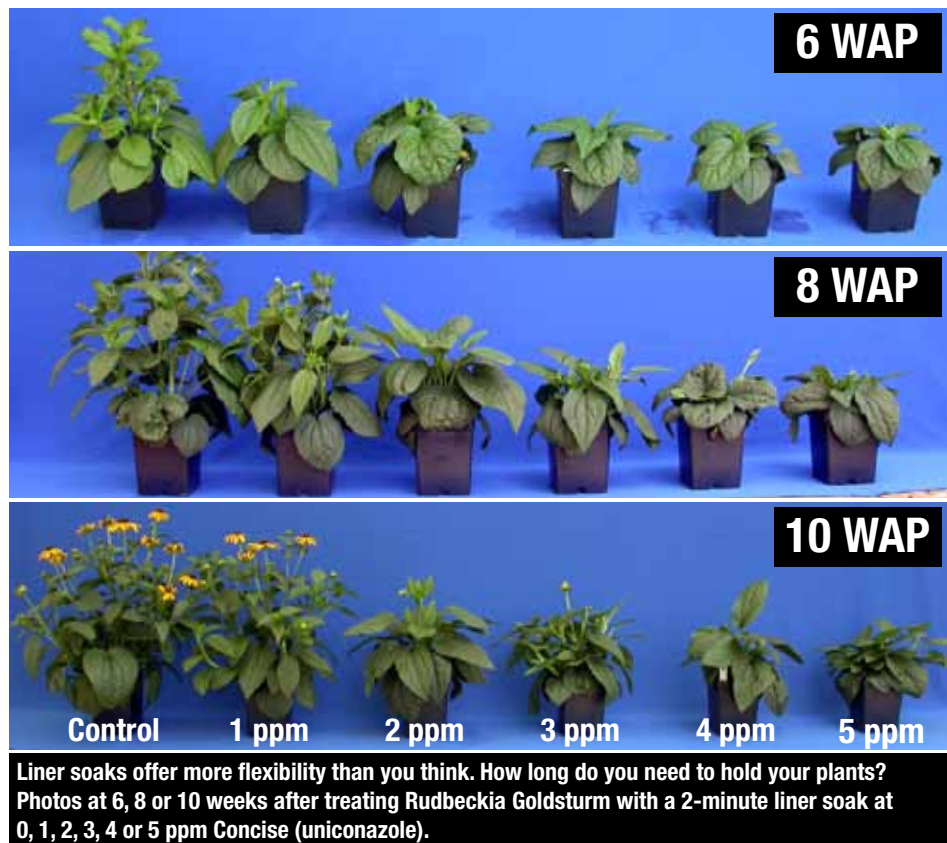
Liner soaks or media sprays can be very effective in controlling early growth of vigorous cultivars or providing season-long control. See labels for application guidelines. Test rates suggested in the table starting on page 14. These applications are intended to provide early control; higher-rates and/or subsequent spray or drench applications may be necessary for season-long control.

Many growers, especially northern growers, prefer to use multiple applications of growth retardants to better control plant growth. A single application at a high rate early in the plant production cycle may be excessive if growing conditions are not as good as expected. An early application at a lower rate provides more flexibility, but the tradeoff is the additional labor involved with multiple applications. Be aware that excessive rates of many of these PGRs can cause persistent growth reductions in the container or even in the landscape. It's always a good idea to evaluate the long-term effects of your treatments by growing some out for yourself or talking with your customers. Be careful to avoid late applications, especially of paclobutrazol or uniconazole, as they may delay flower opening.

Check plants

How well does the PGR really work? The only way to confirm the efficacy of a PGR is to leave a few representative plants untreated for comparison. These "check plants" offer a valuable insight into ways to adjust future PGR applications.

Integrating chemical growth regulators into your production practices will help control undesirable plant stretch and help ensure a well-proportioned, highly marketable crop. **GT**



Liner soaks offer more flexibility than you think. How long do you need to hold your plants? Photos at 6, 8 or 10 weeks after treating Rudbeckia Goldsturm with a 2-minute liner soak at 0, 1, 2, 3, 4 or 5 ppm Concise (uniconazole).

The Power of PGRs on Perennials

NO MATTER WHICH PERENNIAL YOU'RE GROWING, PGRS CAN HELP YOU GROW THEM BETTER

Did you know that Fine Americas, Inc. offers products for managing plant growth for nearly every ornamental crop on the market, including bedding plants, flower and foliage crops, bulb crops, woody ornamentals and perennials?

With a focus on perennials in this year's Guide, plant growth regulators (PGRs) from Fine Americas help ornamental growers put more profit in their operations while showcasing plants that are consistent in size, shape and color. And growers continue to trust Fine Americas as the leader in PGR development and marketing – it's 100% of what they do 100% of the time.

"Fine Americas offers the most complete line of PGRs in the industry, including advanced research to bring new active ingredients, formulations and expanded uses no one else provides," said Gregory Johnson, president, Fine Americas, Inc. "And every PGR sold by Fine Americas is manufactured under ISO 9001-2008 standards, which are the most stringent quality control standards in our industry."

In addition to top-notch quality control, the power and consistency of Fine Americas PGRs speak for themselves:

PICCOLO® 10 XC has become the grower standard in ornamental PGRs. It is the only 4% paclo PGR formulated in a crystal-clear true solution. Unlike the old murky suspension products, Piccolo® 10 XC will stay in solution, resulting in consistent laser-like height control in a wide range of ornamental plants. Piccolo® 10 XC offers easier handling and mixing plus a lower carbon footprint than other 0.4% paclo formulations.

Additionally, Piccolo® – one of the most popular PGRs on the market today – brings out the best in ornamentals by making it easier for growers to economically produce compact, consistent-quality plants. The results include more compact growth, darker green foliage, improved water retention and increased shelf life.

DAZIDE® 85 WSG produces greener, stronger and more compact plants with a greater resilience to the rigors of shipping and handling, resulting in improved marketability and more satisfied customers. In helping growers manage plant growth and development, Dazide® 85 WSG helps ensure plants are more compact and better suited to cope with transportation and transplanting.

CONCISE® currently is considered Fine Americas' strongest, longest lasting growth retardant for ornamental crops. The most common use for Concise® is on more aggressive growth varieties or in environmental growing conditions, such as high temperatures that produce rapid vegetative growth. Concise® helps growers produce denser plants by limiting internode elongation. The results include more compact growth, darker green foliage, improved water retention and increased shelf life. It even increases flower number and size in some varieties.

CONFIGURE® improves plant quality by increasing lateral branching and flower production as the only pure 2% 6-BA PGR registered for ornamentals. Additionally, Configure® may reduce the height of treated plants, resulting in more compact and marketable crops. It is registered for use on many containerized perennial flowering plants.

COLLATE® offers all the proven benefits of ethephon in a concentrated liquid formulation while promoting increased lateral branching, reduced plant height and delayed flowering in a wide range of ornamental crops. In addition, Collate® has been proven effective in controlling stem topple in daffodils and hyacinth.

"Growers want to understand the science of our products," Johnson explained. "Fine Americas works with several of the nation's leading ornamental researchers to thoroughly evaluate each new PGR before it comes to market. But we don't stop there. The staff of Fine Americas, Inc. continues to develop our currently registered products by collaborating with university researchers and extension specialists to expand product labels and add value to our product line."

And just as important as educating growers on our products, Fine Americas also knows the importance of ongoing field support from its technical and sales support staff.

“At Fine Americas,
we promise service
after the sale.”

"At Fine Americas, we promise service after the sale," Johnson added. "We offer outstanding technical and sales support from the beginning of the sale and beyond. When customers buy products with the Fine Americas label, they know it's an innovative PGR that will work for their plants and that the technology, science and sales force behind it are there to support them."

To pack more power in your perennials or to find the nearest Fine Americas distributor to you, visit www.fine-americas.com or call 888-474-FINE (3463) toll-free.

Wide Assortment of Available PGRs

By Brian E. Whipker, North Carolina State University & Joyce G. Latimer, Virginia Tech

Here's an overview of PGRs now available for use on ornamental crops

The number of options available for controlling plant growth has greatly expanded over the past few years (Table 1). There are now options for controlling growth, expanding growth and encouraging branching. Each label has specific recommended dose ranges, recommendations and precautions (Table 2). Below

is an overview of the PGRs now available for use on ornamental crops.

Ancymidol

(Commercial names: **Abide** and **A-Rest**)

Ancymidol readily moves through the plant and is usually used on crops where other chemicals are not effective (most notably in bulb crops) or on very high-value crops (i.e., plugs). Growers often prefer the use of ancymidol on plugs because of the lack of phytotoxicity and it's a "safer" PGR to apply (because its limited residual activity allows the plugs to grow out of the growth control effects after being transplanted).

Chlormequat chloride

(Commercial names: **Citadel** and **Cycocel**)

For ornamental crops, it's most commonly used on poinsettias, geraniums, osteospermum and hibiscus. Foliar chlormequat chloride applications can result in a phytotoxic response (chlorosis), but the symptoms are acceptable because they're usually covered up with new leaf growth. In certain crops (i.e., poinsettias, geraniums and herbaceous perennials), a mixture of daminozide and chlormequat chloride (both may be used or applied at reduced rates) may be used. This usually provides for greater height control and reduces the potential for phytotoxicity. Substrate drenches are also effective, but not cost effective.

Table 1. The wide assortment of plant growth regulators available for ornamental crops.

Chemical	Products
Ancymidol	Abide , A-Rest
Chlormequat chloride	Citadel , Cycocel
Daminozide	Dazide , B-Nine
Dikegulac sodium	Augeo
Ethephon	Collate , Florel
Flurprimidol	Topflor
Paclobutrazol	Piccolo , Piccolo 10 XC , Bonzi, Paczol, Downsize (drenches only)
Uniconazole	Concise , Sumagic
Benzyladenine (BA)	Configure
Gibberellin (GA ₃)	Florgib , ProGibb T&O
BA+GA ₄₊₇	Fresco , Fascination

Daminozide

(Commercial names: **Dazide** and **B-Nine**)

This material is applied only as a foliar spray because it's rapidly broken down when applied to the substrate. It's highly mobile in the plant and will rapidly move from the point of application to all parts of the plant. Daminozide is effective on most crops except lilies. It's highly effective in controlling growth of seedlings in plug flats and it's most effective in cooler climates.

Dikegulac sodium

(Commercial name: **Augeo**)

Augeo is registered for greenhouse and nursery use. Augeo temporarily stops shoot elongation, thereby promoting lateral branching. It's thus a pinching agent for ornamental crops including azaleas, bougainvillea, clerodendron, fuchsia, grape ivy, geranium, lantana, lipstick vine, verbena and some of the herbaceous perennials. Some phytotoxicity and distorted growth can occur with Augeo, so sufficient time is required to allow new plant growth to cover any damaged leaves. ▶

Table 2. Comparing Attributes of Plant Growth Regulators

ATTRIBUTES	PLANT GROWTH REGULATOR							
	Chemical	Ancymidol	Chlormequat chloride	Daminozide	Daminozide + Chlormequat chloride	Ethephon	Flurprimidol	Paclobutrazol
Trade name(s)	Abide, A-Rest	Citadel, Cycocel	Dazide, B-Nine	—	Collate, Florel	Topflor	Piccolo, Piccolo 10 XC, Bonzi, Downsize, Paczol	Concise, Sumagic
Active ingredient (%)	0.0264%	11.8%	85%	—	21.7%/3.9%	0.38%	0.4% 4% (Piccolo 10 XC)	0.055%
Activity level	++	+	+	++	+	+++	+++	+++
Multiple applications needed	++	+++	+++	++	++	+	+	+
Application type¹								
Foliar spray	yes	yes	yes	yes	yes	yes	yes ¹	yes
Substrate drench	yes	yes	no	no	no	yes	yes	yes
Dips/Soaks	plugs/liners	plugs/liners	cuttings	-	plugs/liners	bulbs, plugs/liners	bulbs, plugs/liners	bulbs, plugs/liners
Chemical absorption								
Ease of absorption	+++	+	+	+	++	+++	+++	+++
Time (hours)	0.5-1.0	4	18-24	18-24	12-16	0.5-1.0	0.5-1.0	0.5-1.0
Factors that improve absorption	high humidity, limited air movement, cloudy days, early morning or late afternoon applications							
Translocation within the plant	+++	+++	+++	+++	—	+	+	+
Absorption sites								
Leaves	+++	+++	+++	+++	+++	++	++	++
Stems	+	+	—	+	—	++	++	++
Roots	++	+	—	—	+	+++	+++	+++
Typical concentrations								
Foliar sprays (ppm or mg/L)	15-50	1,000-3,000	1,250-5,000	Daminozide: 750-5,000 + Chlormequat 750-1,500	250-1,000	1-80	1-200	0.5-50
Drench (mg active ingredient per pot)	0.15-4.0 (1.25 to 33.8 ppm)	177-355 (1,500 to 3,000 ppm)	—	—	6-30 ² (50 to 250 ppm)	0.01-2.0 (0.08 to 17 ppm)	0.01-8.0 (0.1 to 68 ppm)	0.01-1.0 (0.1 to 11 ppm)
Other factors								
Does pine bark substrates affect drenches?	++	—	—	—	—	++	++	++
Phytotoxicity potential	+	+++	+	+	++ (Do not apply to stressed plants)	+	+	+
Overdose potential	+	+	++	++	++	+++	+++	+++
Optimum water pH	5.5-6.5	3.0-7.0	5.0-9.0	—	below 5.0	—	4.0-9.0	5.5-6.5
Shelf life								
In the bottle (years)	<3	<2	<2	—	indefinite	<4	<4	<2
Mixed solution	within 24 hours	within 24 hours	within 24 hours	within 24 hours	within 4 hours	within 24 hours	within 1 week	within 24 hours

-- = Not applicable.

Degree of activity: (+) least to (+++) greatest

¹ Check label for legal uses

² Not yet available; pending label revision.

Ethephon phosphonic acid (Commercial names: **Collate** and **Florel**)

This material is absorbed by the plant tissue, and due to a change in pH once absorbed into the plant cells, releases ethylene. Collate and Florel are used to promote flower bud abortion and vegetative branching in crops. Collate and Florel are applied as a foliar spray at concentrations of 250 to 500 ppm. Drenches are also effective, but ethephon is not labeled for this use as of January 2016. See page 3 for the latest research on using drenches.

Flurprimidol (Commercial name: **Topflor**)

Flurprimidol is a relatively recent introduction into the U.S. market, although it's been available in Europe since the 1990s. Flurprimidol is chemically closely related to ancymidol, but it has a greater degree of activity. Flurprimidol is also one of the most cost-effective growth retardants to use as a drench, with recommended use rates in a range similar to uniconazole on most plants. Flurprimidol is also available in a granular formulation for containerized ornamentals.

Paclobutrazol (Commercial names: **Piccolo**, **Piccolo 10 XC**, **Bonzi**, **Downsize** [labeled for drench applications only] and **Paczol**)

Paclobutrazol is the most widely used growth retardant for greenhouse-grown floriculture crops in the U.S. It's commonly applied as a foliar spray or a substrate drench. It can be applied as a single high-dose drench to provide season-long control of growth or as a low-dose drench of 0.1 to 1 ppm to provide temporary control of plant growth.

Uniconazole (Commercial names: **Concise** and **Sumagic**)

Uniconazole is applied as a foliar spray or as a substrate drench. As a drench, uniconazole is applied at rates 50% lower than those recommended for paclobutrazol. This chemical is commonly used on perennials because it's highly effective on a very broad range of plant species.

Both paclobutrazol and uniconazole are triazole-type chemicals. Ancymidol and flurprimidol are in a different chemical class, but have similar characteristics. These chemicals don't readily move within the plant since they're transported in the xylem and not in the phloem. Therefore, these four chemicals are absorbed by the leaves, but aren't readily transported out of the leaves to other parts of the plant. Thus, foliar sprays are applied with sufficient volume of water (2 qt. per 100 sq. ft.) to have some stem and soil activity. The activity of flurprimidol, paclobutrazol and uniconazole are long lasting and at very low rates, thus the potential for error and crop overdose is greater than with other PGRs. Also note, ancymidol, flurprimidol, paclobutrazol and uniconazole are persistent on plastic surfaces and in soil. Do not reuse flats, pots or soil from treated plants, especially for plug production of sensitive crops.

Not all plant growth regulators are used to control plant height. Others are used to cause flower bud abscission, increase branching, promote flowering and stimulate shoot elongation.

Benzyladenine (Commercial name: **Configure**)

Benzyladenine (BA) is used to promote branching and increase flower set. Configure has specific label recommendations for Christmas cactus, echinacea and hostas, as well as use directions for experimental applications on any annual, perennial, foliage or tropical plant grown in a greenhouse. Optimal results occur when the plant is actively growing and is physiologically receptive for growth or flower promotion. Configure has been very effective in improving branching of many herbaceous perennial crops, as both liners and finished plants. Benzyladenine does not readily move within the plant, therefore complete coverage is required.

Gibberellins (Commercial names: **Florgib** and **ProGibb T&O**)

Gibberellins can be applied to promote growth and overcome an over-application of gibberellin-inhibiting plant growth retardants. They're also used to promote stem elongation for tree forms of plants.

Benzyladenine + Gibberellin Combinations (Commercial names: **Fresco** and **Fascination**)

These combination products are used on potted lilies as foliar sprays to avoid lower leaf yellowing and leaf drop, plus prolonging flower life. They are also used to overcome the effects of an over-application of gibberellin-inhibiting plant growth retardants. **GT**





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Growth Regulators for Containerized Herbaceous Perennial Plants

By Joyce G. Latimer, Department of Horticulture, Virginia Tech, Blacksburg, Virginia

This table lists label rates, when available, and includes recommendations based on research from Virginia Tech and other published sources, as well as from plant suppliers and growers. Spray rates listed are recommended as applications at the label-recommended volume of 1 gal. per 200 sq. ft. unless otherwise stated. Use the rates listed as starting points for your own PGR trials. Note: Not all uses are listed on the label; always check the product label before using. Consult product labels for a complete listing of precautions and recommended use rates. When using any PGR for the first time, always test the rate on a few plants and compare the results to untreated plants before treating an entire crop. Keep in mind that Sunbelt growers use higher rates than Northern growers.

Please note: Recommendations are color-coded according to source. Those in yellow are from Sunbelt sources; blue are from northern sources; green are from sources that do not specify area of the country, including product labels, many producer websites and cultural guides; and pink are recommendations related to increasing plant branching.

For product mixing instructions, see the PGR Dilution Table on page 59.

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Achillea millefolium (Common Yarrow)	To control plant growth	Abide/A-Rest	Greater than 1.5 mg a.i. drench x 1	Moderate control of Summer Pastels; Test higher drench rates (3.3 fl. oz./pot); Drench volume and mg a.i. vary with pot size (<i>Tenn. Tech. Univ.</i>)	South
			1 to 2 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>SePro Specific Species and Application Rates</i>)	Unspecified
			50 to 100 ppm spray x 1	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
		Collate/Florel	500 or 1,000 ppm spray x 1 to 3	Higher rates or more frequent treatment gave moderate growth control; All treatments increased number of inflorescences with slight delay in flowering (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine	5,000 ppm spray x 2	Good control of Red Beauty and Paprika with 2 applications 2 weeks apart, but Moonshine was not responsive at 5,000 ppm x 2 (<i>Univ. Georgia, Virginia Tech</i>)	South
			7,650 ppm spray x 1	Good control of Coronation Gold with a single application applied 2 weeks after removal from vernalization cooler (<i>Auburn Univ.</i>)	South
			2,500 ppm spray x 2 to 3	Tutti Frutti responsive to 2,500 ppm daminozide or a tank mix of 2,000 ppm daminozide and 3 ppm uniconazole applied at weekly intervals until desired control is established (<i>Pilon, GPN 2007</i>)	North
			2,500 to 5,000 ppm spray	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION		
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Good control on Paprika (<i>Univ. Georgia</i>)	South		
			3,000 + 1,500 ppm spray x 4	Good control on Summer Pastels with 4 applications at 2-week intervals (<i>Michigan State Univ.</i>)	North		
			5,000 + 1,500 ppm spray x 1	Label rate for Paprika (<i>Cycocel</i>)	Unspecified		
		Citadel /Cycocel	NR at 5,000 ppm spray x 1	Coronation Gold not responsive (<i>Univ. Georgia</i>)	South		
			1,500 ppm spray x 4	Good control on Summer Pastels with 4 applications at 2-week intervals (<i>Michigan State Univ.</i>)	North		
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	96 to 120 ppm spray x 1	Moderate control of height of Coronation Gold with a single application of 96 ppm applied 2 weeks after removal from vernalization cooler (<i>Auburn Univ.</i>); Good control on Summer Pastels with 120 ppm spray (<i>Virginia Tech</i>)	South		
			60 ppm spray x 4	Excellent control of Summer Pastels with 4 applications at 2-week intervals (<i>Michigan State Univ.</i>)	North		
			1.0 mg a.i. drench x 1	Good control on Summer Pastels with a 1.0 mg a.i. drench (3.3 fl. oz./pot); Drench volume and mg a.i. vary with pot size (<i>Tenn. Tech. Univ.</i>)	South		
		Concise /Sumagic	10 to 15 ppm spray x 1	Excellent response with Paprika and Coronation Gold, however, Red Beauty and Moonshine were not responsive at 60 ppm spray x 1 (<i>Univ. Georgia and Virginia Tech</i>)	South		
			30 ppm spray x 1	Moderate control of height of Coronation Gold with a single application applied 2 weeks after removal from vernalization cooler (<i>Auburn Univ.</i>)	South		
			0.25 mg a.i. drench x 1	Moderate control of Summer Pastels; Higher drench rates significantly reduced number of flowers (3.3 fl. oz./pot); Drench volume and mg a.i. vary with pot size (<i>Tenn. Tech. Univ.</i>)	South		
			7 to 15 ppm spray x 1 to 4	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>). Excellent control of Summer Pastels with 4 applications of 15 ppm sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North		
			Topflor	150 ppm spray x 1	Moderate control of height of Coronation Gold with one application; Multiple applications may be required; Tested under nursery conditions (<i>Auburn Univ.</i>)	South	
		To increase lateral or basal branching	Augeo	800 ppm spray x 2	70% increase in branching when applied to Moonshine as liner (21 days after sticking) and again at 5 days after transplanting, but caused significant stunting; Single application not effective and no effect at 400 ppm x 2 (<i>Virginia Tech</i>)	Branching	
			Configure	600 ppm spray x 2	60% increase in branching when applied to Moonshine as liner (21 days after sticking) and again at 5 days after transplanting; No phytotoxicity (<i>Virginia Tech</i>)	Branching	
		Agastache hybrids (Anise Hyssop)	To control plant growth	Collate /Florel	500 ppm spray x 4	Excessive height control of Blue Fortune, but no delay in flowering with 4 applications at 2-week intervals (<i>Michigan State Univ.</i>)	North
				Dazide /B-Nine	5,000 ppm spray x 2 to 3	Based on research results with Blue Fortune (<i>Univ. Georgia, Virginia Tech</i>)	South
					1,200 to 1,500 ppm spray	For all hybrids (<i>Pacific Plug & Liner Production Info</i>)	North
					2,500 to 5,000 ppm spray x 2 to 3	Weekly applications as necessary (<i>Pilon 2012</i>)	North
	Dazide /B-Nine + Citadel /Cycocel Tank Mix			5,000 + 1,500 ppm spray x 1	Based on research results with Blue Fortune (<i>Univ. Georgia</i>)	South	
2,500 + 1,000 ppm spray to 5,000 + 1,500 ppm spray x 2 to 3				Weekly applications as necessary (<i>Pilon 2012</i>)	North		

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Agastache hybrids (Anise Hyssop) <i>continued</i>	To control plant growth <i>continued</i>	Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	1 to 2 ppm drench x 1	Drench volume and mg a.i. vary with container size (<i>Pacific Plug & Liner Production Info</i>)	North
			30 to 60 ppm spray x 1	Good control (<i>Pilon 2012</i>)	North
		80 to 160 ppm spray x 1 less than 5 ppm drench x 1	Good control of Tutti Frutti with 80 ppm spray, but excessive growth reduction with 5 ppm drench at 2 fl.oz. per quart pot Higher spray rate required for Purple Haze; Multiple applications may be required. An 8 ppm drench at 10 fl.oz. per trade gallon pot gave excellent control of Purple Haze; Drench volume and mg a.i. vary with container size (<i>Virginia Tech</i>)	South	
		Concise/Sumagic	10 to 30 ppm spray x 1 2 ppm drench x 1	Cultivar variation, use lower rates with Blue Fortune, which is very sensitive to uniconazole (<i>Univ. Georgia</i>); Higher rate and drench with Purple Haze; Drench at 10 fl. oz. per trade gallon pot; Drench volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	South
	5 to 10 ppm spray x 1		Good control (<i>Pilon 2012</i>)	North	
To enhance lateral branching	Configure	300 to 500 ppm spray x 1 on liners	Purple Haze treated with 300 ppm approximately 4 days after liners were removed from mist increased lateral branching; Multiple applications during liner production or higher rates decreased root growth. Treatment of Tutti Frutti with 500 ppm spray the day after removal from mist increased branching of liners (3 weeks after treatment) and finished plants (8 weeks after treatment) (<i>Virginia Tech</i>)	Branching	
Alcea hybrids (Hollyhock)	To control plant growth	Abide/A-Rest	100 ppm spray x 6	Good height control of Chaters Doubles with 6 weekly sprays (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine	5,000 ppm spray x 6	Good height control of Chaters Doubles with 6 weekly sprays (<i>Michigan State Univ.</i>)	North
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	15 ppm spray x 1 early in crop or 3 to 6 ppm drench x 1 late in crop	Early spray treatment effective; Drench to counter rapid elongation that occurs as the plants approach flowering (<i>Pilon 2012</i>)	North
		Concise/Sumagic	2.5 ppm spray x 1 early in crop	Early treatment effective (<i>Pilon 2012</i>)	North
Ajuga reptans (Bugleweed)	To control plant growth	Concise/Sumagic	2.5 ppm spray x 1	Not generally required (<i>Pilon 2006</i>)	North
Alchemilla mollis (Lady's Mantle)	To control plant growth	Dazide/B-Nine	NR at 5,000 ppm spray x 2	Not responsive (<i>Virginia Tech</i>)	South
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Multiple applications at 10- to 14-day intervals may be necessary (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	NR at 200 ppm spray x 1	Not responsive (<i>Virginia Tech</i>)	South
		30 ppm spray x 1 to 3 6 ppm drench x 1	Multiple applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)	Unspecified	
		Concise/Sumagic	NR at 90 ppm spray x 1	Not responsive (<i>Virginia Tech</i>)	South
Aquilegia caerulea	To control plant growth	Dazide/B-Nine	2,500 ppm spray x 1	Origami series: PGRs are more effective in the early stages of production (<i>Syngenta Culture Sheet</i>).	Unspecified
Aquilegia x hybrida (Hybrid Columbine)	To control plant growth, apply as flower stalks get above foliage (<i>Pilon 2006</i>)	Abide/A-Rest	25 ppm spray x 2 to 3	Or apply a tank mix of 10 ppm ancymidol + 2,000 ppm daminozide as 2 to 3 weekly sprays (<i>Pilon 2006</i>)	North
			25 to 50 ppm spray x 1	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			65 to 132 ppm spray x 1 2 to 4 ppm drench x 1	Apply when plants are well-rooted with 5 to 8 leaves; Also for Star series, recommends tank mix 10 ppm ancymidol + 1,875 ppm daminozide as needed (<i>SePro Specific Species and Application Rates</i>)	Unspecified
		Collate/Florel	NR at 750 ppm sprays x 5	Pink & White height and flowering not responsive to 5 weekly sprays (<i>Michigan State Univ.</i>)	North

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
		Dazide /B-Nine	5,000 ppm spray x 2	Effective on McKana Giants (<i>Univ. Georgia</i>)	South
			5,000 ppm spray x 4 to 5	Excellent control of Music Pink & White with 4 applications at 2-week intervals and of Origami Blue & White and Pink & White with 5 weekly applications (<i>Michigan State Univ.</i>)	North
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	2,500 ppm + 1,000 ppm spray x 2 to 3	Apply as flower stalks get above foliage; 2 to 3 weekly applications (<i>Pilon 2006</i>)	North
		Piccolo/Piccolo 10 XC /Bonzi/Paczol	NR at 240 ppm spray x 1	McKana Giants was not responsive to a single spray application of 240 ppm (<i>Univ. Georgia</i>)	South
			30 ppm spray x 2 to 3	Apply weekly applications (<i>Pilon 2006</i>); However, Origami Blue & White and Pink & White were not responsive at 90 ppm sprays x 5 weekly applications (<i>Michigan State Univ.</i>)	North
			30 ppm spray x 1 to 3 6 ppm drench x 1	Multiple applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)	Unspecified
		Concise /Sumagic	NR at 120 ppm spray x 1	McKana Giants was not responsive to a single spray application of 120 ppm (<i>Univ. Georgia</i>)	South
			5 to 15 ppm spray x 2 to 4	Apply 5 ppm sprays 2 to 3 weekly applications; Or make 2 to 3 weekly applications of a tank mix of 3 ppm uniconazole + 2,000 ppm daminozide sprays (<i>Pilon 2006</i>). Good control with 15 ppm sprays applied 4 to 5 times on Music Pink & White and Origami Blue & White, but not effective on Pink & White (<i>Michigan State Univ.</i>)	North
Aquilegia flabellate (Columbine)	Induce lateral or basal branching	Configure	NR at 50 to 1,600 ppm spray x 1	No effect of single foliar spray applied 2 weeks after potting (<i>NC State Univ.</i>)	Branching
Aquilegia vulgaris (Columbine)	Induce lateral or basal branching	Configure	NR at 600 ppm spray x 1	No effect with our screening rate on Winky Purple White; Test multiple applications or higher rates (<i>Virginia Tech</i>)	Branching
Arenaria montana (Sandwort)	To control plant growth	Piccolo/Piccolo 10 XC /Bonzi/Paczol	5 ppm spray x 1 applied to liners	Liners of Avalanche were responsive (<i>Univ. Calif.</i>)	South
Artemisia arborescens (Powis Castle)	To control plant growth	Piccolo/Piccolo 10 XC /Bonzi/Paczol	5 to 40 ppm spray x 1	Responsive to 5 to 40 ppm paclobutrazol sprays (<i>Ball Hort</i>)	Unspecified
Artemisia schmidtiana (Wormwood, White Sage)	To control plant growth	Dazide /B-Nine	5,000 ppm spray x 2	Moderate control of Silver Mound with multiple applications (<i>Virginia Tech</i>)	South
			Dazide /B-Nine + Citadel /Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Moderate control of Silver Mound; Multiple applications may be required (<i>Virginia Tech</i>)
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	200 ppm spray x 1	Moderate control of Silver Mound with 200 ppm sprays; May require multiple applications (<i>Virginia Tech</i>)	South
			40 to 50 ppm spray	Responsive to 40 to 50 ppm paclobutrazol sprays (<i>Ball Hort</i>)	Unspecified
			6+ ppm drench x 1	Responsive to a single 6+ ppm drench; Volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North
			50 ppm spray x 1	Silver Mound in 1-gal. containers (<i>Univ. Calif.</i>)	South
		Concise /Sumagic	30 to 60 ppm spray x 1	Moderate control of Silver Mound with 45 ppm spray, but the hybrid Oriental Limelight was more sensitive; use 30 ppm sprays; And the hybrid Powis Castle was less responsive; test 60 ppm sprays; Multiple applications may be necessary (<i>Virginia Tech</i>)	South

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Asclepias tuberosa (Butterfly Weed)	To control plant growth To control plant growth	Abide/A-Rest	25 to 50 ppm spray x 1 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			26 ppm spray 2 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>SePro Specific Species and Application Rates</i>)	Unspecified
		Dazide/B-Nine	NR at 5,000 ppm spray x 3	Not responsive (<i>Univ. Georgia</i>)	South
			3,750 to 5,000 ppm spray	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	NR at 5,000 + 1,500 ppm spray x 1	Not responsive (<i>Univ. Georgia</i>)	South
			2,500 + 1,500 ppm spray x 1	Label rate for Royal Red (<i>Cycocel</i>)	Unspecified
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	NR at 50 ppm spray x 1 NR at 2 ppm drench x 1	No effect on plant height, but reduced width of Hello Yellow 10% to 18%; Drenches applied at 2 fl. oz. per quart pot; Volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	South
			10 to 20 ppm spray	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			30 to 60 ppm spray x 1	Label rate	Unspecified
	Concise/Sumagic	45 ppm spray x 1	Good control (<i>Univ. Georgia</i>)	South	
5 to 10 ppm spray		Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North		
To induce lateral branching	Configure	Not responsive at 600 ppm spray x 1	No effect with our screening rate; Higher rates or multiple applications may be effective (<i>Virginia Tech</i>)	Branching	
Aster dumosus (Bushy Aster)	To control plant growth	Dazide/B-Nine	5,000 ppm spray x 2	Apply first application after pinching when new shoots are approximately 1-in. long; <i>Aster x frikartii</i> cvs. Monarch and Monch were responsive to 2-spray application of daminozide, but <i>A. dumosus</i> Sapphire was not responsive to this rate (<i>Virginia Tech</i>)	South
2,500 to 4,000 ppm spray			Apply first application after pinching when new shoots are approximately 1-in. long; 2,500 ppm spray is a starting test point; Rates vary depending on variety vigor, temperature and growth stage of the crop; Do not apply daminozide after buds reach pea size to avoid flower discoloration and delay; <i>A. novae-angliae</i> Purple Dome is responsive to 2,500 to 4,000 ppm sprays (<i>Ball Hort</i>)	Unspecified	
			2,500 ppm spray x 2	Also recommends tank mix of 2,000 ppm daminozide + 3 ppm uniconazole (<i>Pilon 2006</i>)	North
Dazide/B-Nine + Citadel/Cycocel Tank Mix		Not responsive at 5,000 + 1,500 ppm spray x 1	<i>A. dumosus</i> Sapphire was not responsive to this rate (<i>Virginia Tech</i>)	South	
Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)		80 ppm spray x 1 2 to 16 ppm drench x 1	80 ppm spray controlled width of <i>A. dumosus</i> Sapphire, but had little effect on height; <i>A. x frikartii</i> Monarch and Monch were not responsive to one spray application of 240 ppm, but were responsive to a drench application; Drench applied at 2 fl. oz. per quart pot; Volume and mg a.i. vary with pot size (<i>Virginia Tech, Univ. of Georgia</i>)	South	
		30 ppm spray x 1 to 2 6+ ppm drench x 1	1 or 2 spray applications 7 to 10 days apart; Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North	
		30 to 50 ppm sprays 2 ppm drench x 1	Some growers use a paclobutrazol drench to hold their crop at a given height; Drench volume and mg a.i. vary with pot size (<i>Syngenta Culture Sheets</i>)	Unspecified	

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
		Concise /Sumagic	30 ppm spray x 1	Moderate width control of <i>A. dumosus</i> Sapphire, but little effect on height; <i>A. x frikartii</i> Alpine Mix, Monarch and Monch were not responsive to one spray application of 60 ppm or a drench of 4 ppm; Drench applied at 2 fl. oz. per quart pot; volume and mg a.i. vary with pot size (<i>Virginia Tech, Univ. Georgia</i>)	South
			2.5 to 10 ppm spray 0.1 to 1.0 ppm drench x 1	Uniconazole is also very effective, but results have been quite variable; Drench volume and mg a.i. vary with pot size (<i>Syngenta Culture Sheets</i>)	Unspecified
			10 to 50 ppm spray	<i>A. dumosus</i> Purple Dome is responsive to uniconazole (<i>Ball Hort</i>)	
		Topflor	Not responsive at 60 ppm spray x 1	No response in fall trial with <i>A. dumosus</i> Sapphire (<i>Virginia Tech</i>)	South
	To induce lateral branching	Augeo	1,600 ppm spray x 1 on liners	Reduced plug height, but increased branching; No effect on root growth or finished plant quality (<i>Virginia Tech</i>)	Branching
		Configure	Phytotoxic	Significant phytotoxic response at a single spray of 600 ppm applied to liners (<i>Virginia Tech</i>)	Branching
<i>Astilbe x arendsii</i> (False Spirea)	To control plant growth	Abide /A-Rest	100 ppm spray x 6	Weekly applications resulted in good control of <i>A. thunbergii</i> Ostrich Plume, but 4 applications at 2-week intervals gave no control of <i>A. arendsii</i> Granat (<i>Michigan State Univ.</i>)	North
<i>Astilbe chinensis</i> (Chinese Astilbe)		Collate /Floreel	500 ppm spray x 4	Excessive growth regulation of Granat with 4 sprays at 2-week intervals; Did not delay flowering (<i>Michigan State Univ.</i>)	North
<i>Astilbe thunbergii</i> (False Spirea)		Dazide /B-Nine	5,000 ppm spray x 2	To control plant height on taller cultivars, apply 2 applications of daminozide as a foliar spray 1 week apart beginning soon after inflorescences begin to elongate; Michigan State Univ. studies have shown that the timing of the application is critical; Growth regulators were ineffective at limiting plant height when they were applied prior to inflorescence elongation (<i>Walters Cultural Sheets</i>)	North
			Less than 5,000 ppm spray x 2	Excessive height reduction of <i>A. chinensis</i> Purpurkerze; Use lower rate and/or fewer applications; However, <i>A. x arendsii</i> Elizabeth Bloom was not responsive to these rates (<i>Virginia Tech</i>)	South
			5,000 ppm spray x 6	Weekly applications resulted in good control of <i>A. thunbergii</i> Ostrich Plume, but 4 applications at 2-week intervals gave no control of <i>A. arendsii</i> Granat (<i>Michigan State Univ.</i>)	North
Dazide /B-Nine + Citadel /Cycocel Tank Mix		Less than 5,000 + 1,500 ppm spray x 1	Excessive height reduction of <i>A. chinensis</i> Purpurkerze; Reduce both daminozide and chlormequat rates (<i>Virginia Tech</i>)	South	
Citadel /Cycocel		1,500 ppm spray x 1	Moderate control of <i>A. chinensis</i> Purpurkerze (<i>Virginia Tech</i>)	South	
		1,500 ppm spray x 6	Weekly applications resulted in good control of <i>A. thunbergii</i> Ostrich Plume but 4 applications at 2-week intervals gave no control of <i>A. arendsii</i> Granat (<i>Michigan State Univ.</i>)	North	
		750 to 1,000 ppm spray	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)		
Piccolo / Piccolo 10 XC /Bonzi/ Paczol /Downsize (drenches only)		40 to 80 ppm spray x 1 to 2	40 ppm x 1 resulted in good control of <i>A. chinensis</i> Purpurkerze; However, 80 ppm x 1 resulted in only short term height control of <i>A. x arendsii</i> Elizabeth Bloom; Plan on multiple applications (<i>Virginia Tech</i>)	South	
		30 ppm spray x 2	Treat after inflorescences begin to elongate, apply sprays 7 days apart; Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North	
		6+ ppm drench x 1			
		90 ppm spray x 6	Weekly applications resulted in good control of <i>A. thunbergii</i> Ostrich Plume, but 4 applications at 2-week intervals gave no control of <i>A. arendsii</i> Granat (<i>Michigan State Univ.</i>)		
15 to 30 ppm spray		Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)			

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Astilbe x arendsii (False Spirea)	To control plant growth <i>continued</i>	Concise/Sumagic	25 to 35 ppm spray x 1 to 2	Good control of <i>A. chinensis</i> Purpurkerze; Short-term response on <i>A. x arendsii</i> Elizabeth Bloom; Plan on multiple applications (<i>Virginia Tech</i>)	South
			15 ppm spray x 6	Weekly applications resulted in excellent control of <i>A. thunbergii</i> Ostrich Plume, but 4 applications at 2-week intervals resulted in excessive height reduction of <i>A. arendsii</i> Granat (<i>Michigan State Univ.</i>)	North
			5 ppm spray x 2 to 3	Apply to <i>A. arendsii</i> 2 to 3 weeks after transplant; Multiple applications at 7- to 10-day intervals as necessary (<i>Pilon, Sumagic Advisor 2006</i>)	
Astilbe chinensis (Chinese Astilbe)					
Astilbe thunbergii (False Spirea) <i>continued</i>					
Baptisia australis and Baptisia hybrids	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize (drenches only)	6 to 10 ppm drench x 1	Apply at 6-in. height for good control of Baptisia hybrids (<i>Grower Recommendation</i>).	North
			45 to 60 ppm spray x 2 to 3 or 12 to 18 ppm drench x 1	Drench is more effective than sprays (<i>Pilon 2012</i>)	North
		Concise/Sumagic	Not responsive to 60 ppm spray x 1 or to 1.5 ppm drench x 1	Test higher rates or multiple spray applications (<i>Virginia Tech</i>)	South
Buddleia davidii (Butterfly Bush)	To control plant growth	Dazide/B-Nine	5,000 ppm spray x 2	Moderate control of Royal Red; Apply at 10- to 14-day intervals (<i>Univ. Georgia</i>); This rate resulted in no control of Pink Delight (<i>Virginia Tech</i>)	South
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	Not responsive at 5,000/1,500 ppm spray x 1	No height control of Royal Red or Pink Delight (<i>Univ. Georgia, Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize (drenches only)	Not responsive at 160 ppm spray x 1 Not responsive at 10 ppm drench x 1	No height control of Royal Red in Virginia Tech trials; Drench applied at 10 fl. oz. per trade gal. pot; Volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	South
			10 mg a.i. drench x 1	Excellent control of Dubonnet under nursery conditions with drench (3.3 fl. oz./2.8-L pot); Drench volume and mg a.i. vary with pot size (<i>Univ. Georgia</i>)	
			6 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North
		Concise/Sumagic	60 ppm spray x 1 0.025 ppm drench x 1	Moderate control of Royal Red; Multiple applications may be required; Drench applied at 10 fl. oz. per trade gal. pot; Volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	South
			20 ppm spray x 2	Moderate height control of Pink Delight with 2 applications 7 days apart; Additional applications may be necessary (<i>Louisiana State Univ.</i>)	
			15 to 30 ppm spray x 1	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
		Topflor	125 ppm spray x 1	Good control of growth of Royal Red with no delay in flowering (<i>Auburn Univ.</i>)	South
	To increase lateral branching	Augeo	532 to 1,600 ppm spray x 1 to 2	Sprays should be applied to unpinched shoots when they reach 1 to 3 in. or at 3 days after pinching; 2 applications may be required (<i>Label</i>)	Branching
Buddleia fallowiana Lochinch (Butterfly Bush)	To control plant growth	Concise/Sumagic	60 ppm spray x 1 1.5 ppm drench x 1	Short-term height control with sprays and drenches; Multiple applications required; Drench applied at 10 fl. oz. per trade gal. pot; Volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	South
Buddleia weyeriana Honeycomb (Butterfly Bush)	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	4 ppm liner soak x 1	Good control (<i>Virginia Tech</i>)	South
		Concise/Sumagic	2 ppm liner soak x 1	Moderate control (<i>Virginia Tech</i>)	South

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Caladium bicolor	To control plant growth	Dazide /B-Nine	2,500 ppm spray x 6 to 8	As needed at 5- to 7-day intervals (<i>Pilon 2012</i>)	North
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	8 ppm drench x 1 30 ppm spray x 1	Drench when shoots have emerged but before leaves unfold (approximately 2 to 3 weeks after potting) or apply foliar spray near end of crop cycle to improve shelf life (<i>Pilon 2012</i>)	North
Calamagrostis x acutifolia Karl Foerster (Feather Reed Grass)	To control plant growth	Dazide /B-Nine	Not responsive at 5,000 ppm spray x 2	(<i>Virginia Tech</i>)	South
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	5,000+1,500 ppm spray x 2	Good height control with Karl Foerster (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC /Bonzi/Paczol	Not responsive to 160 ppm spray x 1	(<i>Virginia Tech</i>)	South
		Concise /Sumagic	Not responsive to 60 ppm spray x 1 1 ppm liner soak x 1	(<i>Virginia Tech</i>) Good height control with a 2-minute liner soak (<i>Virginia Tech</i>)	South South
		Topflor	Not responsive to 120 ppm spray x 1	(<i>Virginia Tech</i>)	South
Campanula carpatica (Carpathian Bellflower) Campanula glomerata (Clustered Bellflower) Campanula persicifolia (Peach-leaved Bellflower)	To control plant growth C. carpatica cultivars usually do not require PGRs, but are responsive to most of them. Under low-light conditions or for toning and shaping, one application is usually sufficient. If necessary, make a second application 7 to 10 days after the first (<i>Pilon 2006</i>)	Abide /A-Rest	25 to 50 ppm spray x 1	One application at 25 ppm is usually sufficient; If necessary, make a second application 7 to 10 days after the first (<i>Pilon 2006</i>) C. carpatica or C. persicifolia may require 50 ppm sprays, especially later in the spring; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			100 ppm spray x 6	C. glomerata: Very good control on Kent Belle and Birch Hybrid with weekly applications; However, this treatment was not effective on Superba and caused excessive growth reduction of Cherry Bells (<i>Michigan State Univ.</i>)	
		Collate /Florel	500 ppm spray x 4	Good growth control of C. glomerata Superba with 4 sprays at 2-week intervals; No delay in flowering. All sprays phytotoxic to Campanula Kent Belle; Did not reduce flower buds; Reduced growth (<i>Michigan State Univ.</i>)	North
		Dazide /B-Nine	2,500 to 3,750 ppm spray x 2	C. carpatica may require 2,500 ppm for control under low-light conditions (<i>Pilon 2006</i>) C. carpatica or C. persicifolia may require 3,750 ppm sprays, especially later in the spring; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			Citadel /Cycocel	750 ppm spray x 1	C. carpatica (<i>Pilon 2006</i>); Multiple applications may be required (<i>Univ. Minnesota</i>)
		Less than 1,500 ppm spray x 3		Label rate C. carpatica; Excessive height reduction; Reduce rate or frequency (<i>Cycocel</i>)	Unspecified
		Piccolo/Piccolo 10 XC /Bonzi/Paczol	10 to 20 ppm spray x 1	C. carpatica cultivars are very sensitive to paclobutrazol, recommends 15 ppm spray (<i>Pilon 2006</i>); C. carpatica may require 10 to 20 ppm sprays, especially later in the spring; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			15 ppm spray x 1 to 3 3 ppm drench x 1	C. carpatica: Multiple spray applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)	Unspecified
		Concise /Sumagic	2 to 4 ppm spray x 1	C. carpatica cultivars are very sensitive to uniconazole, recommends 2.5 ppm; (<i>Pilon 2006</i>); C. carpatica may require 2 to 4 ppm sprays, especially later in the spring; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
		Topflor	10 to 30 ppm spray x 1	Rate range determined largely under mid-Atlantic conditions using medium-vigor cultivars; Adjust for your area (<i>Label</i>)	Unspecified

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Canna x generalis Canna x orchiodes (Hybrid Canna)	To control plant growth	Dazide/B-Nine	Not responsive at 7,500 ppm spray x 1	No growth reduction, but delayed flowering (<i>Auburn Univ.</i>)	South
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	66 to 99 ppm spray x 1	C. x orchiodes requires higher rates (<i>Auburn Univ.</i>)	South
			1 to 4 ppm drench x 1	For height control of Cannova series; apply 2 weeks after transplant at volume appropriate for the growing container (<i>Ball Hort</i>)	Unspecified
		Topflor	Less than 50 ppm spray x 1	50 ppm spray reduced vegetative height of C. x orchiodes approximately 40% up to 8 weeks after treatment; No delay in flowering (<i>Auburn Univ.</i>)	South
			50 to 80 ppm spray x 1	Rate range determined largely under mid-Atlantic conditions using medium-vigor cultivars; Adjust for your area (<i>Label</i>)	Unspecified
Carex buchananii	To control plant growth	Concise/Sumagic	20 ppm spray x 1	Moderate height control of C. flagellifera Toffee Twist with an increase in early tillers. Use lower rate on C. buchananii and C. comans Frosted Curls, this rate reduced height excessively on both cultivars and reduced number of tillers on Frosted Curls (<i>Univ. Florida</i>)	South
Carex comans	To increase tillering	Configure	Not responsive at 500 or 1,000 ppm spray x 1	No increase in number of tillers on C. buchananii, C. comans Frosted Curls, C. flagellifera Toffee Twist up to 8 weeks after treatment; No effect on plant height (<i>Univ. Florida</i>)	Branching
Carex flagellifera (Sedges)					
Caryopteris x clandonensis (Bluebeard)	To control plant growth	Dazide/B-Nine	NR at 5,000 ppm spray x 2	Dark Knight not responsive (<i>Virginia Tech</i>)	South
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	NR at 5,000/1,500 ppm spray x 1	Dark Knight not responsive (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC/Bonzi/Paczo	NR at 160 ppm spray x 1	Dark Knight not responsive (<i>Virginia Tech</i>)	South
		Concise/Sumagic	30 ppm spray x 1	Good control of Dark Knight (<i>Virginia Tech</i>)	South
Centaurea montana	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
		Concise/Sumagic	7 to 15 ppm spray	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
Coreopsis grandiflora (Tickseed)	To control plant growth	Abide/A-Rest	0.375 mg a.i. drench x 1	Moderate growth control of Early Sunrise and enhanced flowering with 3.3 fl. oz./pot; Drench volume and mg a.i. vary with pot size (<i>Tenn. Tech. Univ.</i>)	South
			100 ppm spray x 3	3 applications at 10-day intervals resulted in moderate control of Sunray (<i>Michigan State Univ.</i>)	North
			25 to 50 ppm spray x 2 to 3	Apply at weekly intervals (<i>Pilon 2006</i>)	
		Dazide/B-Nine	5,000 ppm spray x 2	Good control of Sunray with multiple applications to 10- to 14-day intervals under nursery conditions (<i>Virginia Tech</i>)	South
			2,500 to 5,000 ppm spray x 2 to 3	Apply 2,500 ppm at weekly intervals; Also recommends tank mix 2,000 ppm daminozide + 15 ppm paclobutcazol x 2 to 3 or a tank mix of 2,000 ppm daminozide + 3 ppm uniconazole (<i>Pilon 2006</i>); Apply 3,750 ppm early in production and 5,000 ppm later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); 5,000 ppm spray x 3 applications at 10-day intervals resulted in excessive growth reduction of Sunray (<i>Michigan State Univ.</i>)	North
			2,500 ppm spray	Control of Heliot and Santa Fe (<i>Syngenta Culture Sheets</i>)	Unspecified
			5,000 ppm spray x 2	Foliar sprays at 5,000 ppm applied twice after transplant work well; First application can be done 2 weeks after transplant followed by a second application 2 weeks later; Early Sunrise requires more PGRs than Rising Sun or Sunfire (<i>Ball Hort</i>)	
2,500 ppm spray x 1 to 2	Good control with Baby Sun liners in California (<i>Univ. Calif.</i>)	South			

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION		
		Citadel/Cycocel	1,250 ppm spray x 2 to 3 1,500 ppm spray x 3	Apply at weekly intervals (<i>Pilon 2006</i>); 3 applications of 1,500 ppm at 10-day intervals resulted in moderate growth reduction of Sunray (<i>Michigan State Univ.</i>)	North		
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Moderate control of Sunray; Multiple applications may be required (<i>Univ. Georgia, Virginia Tech</i>)	South		
			2,500 + 1,000 ppm spray x 2 to 3	Apply at weekly intervals (<i>Pilon 2006</i>)	North		
			2,500 + 1,250 ppm spray x 1	Excessive control with Baby Sun liners in California (<i>Univ. Calif.</i>)	South		
			Greater than 2,500 + 1,500 ppm spray x 1	Label rate: Increase daminozide rate for better control of Baby Sun and Sunray (<i>Cycocel</i>)	Unspecified		
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	80 to 100 ppm spray x 1 5 to 10 ppm drench x 1	Sunray and Baby Sun responsive to sprays or drench; Drenches applied at 2 fl. oz. per qt. pot; Volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	South		
			2.5 mg a.i. drench x 1	Applied as 3.3 fl. oz./pot; Moderate growth control of Early Sunrise and enhanced flowering; Drench volume and mg a.i. vary with pot size (<i>Tenn. Tech. Univ.</i>)	South		
			30 to 45 ppm spray x 2 to 3 6 ppm drench x 1	Treat as leaves reach edge of pot; Spray applications at weekly intervals; Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>) 3 applications of 30 ppm at 10-day intervals resulted in good control of Sunray (<i>Michigan State Univ.</i>)	North		
			3 to 6 ppm spray 2 ppm drench x 1	Control of Heliot and Santa Fe; Drench volume and mg a.i. vary with pot size (<i>Syngenta Culture Sheets</i>)	Unspecified		
			Less than 5 ppm spray x 1 for liners	Excessive control with Baby Sun plugs in California (<i>Univ. Calif.</i>)	South		
			Concise/Sumagic	40 ppm spray x 1 15 ppm spray x 2	May delay flowering of Sunray (<i>Univ. Georgia, Virginia Tech</i>)	South	
		0.25 mg a.i. drench x 1		Moderate growth control of Early Sunrise and enhanced flowering with 3.3 fl. oz./pot; Drench volume and mg a.i. vary with pot size (<i>Tenn. Tech. Univ.</i>)	South		
		5 ppm spray x 2 to 3		Excellent control of Early Sunrise; Also recommends tank mix of 3 ppm uniconazole + 2,000 ppm daminozide (<i>Pilon 2006</i>)	North		
		5 to 10 ppm spray		Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North		
		2 to 4 ppm spray		Control of Heliot and Santa Fe (<i>Syngenta Culture Sheets</i>)	Unspecified		
		Topflor		150 ppm spray x 1	Reduced height and days to flower of Early Sunrise (<i>Auburn Univ.</i>)	South	
		Coreopsis rosea (Pink Coreopsis)	To control plant growth	Dazide/B-Nine	1,500 to 2,500 ppm spray x 1	Effective on American Dream (<i>Ball Hort</i>)	Unspecified
					5,000 to 7,500 ppm spray x 1	Good growth control of American Dream with little effect on flowering (<i>Auburn Univ.</i>)	South
				Citadel/Cycocel	1,500 ppm spray x 6	Good control of growth of Sweet Dreams and the hybrid Limerock Ruby with 6 weekly applications (<i>Michigan State Univ.</i>)	North
				Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	4 to 8 ppm liner soak x 1	Moderate response to lower rate with Sweet Dreams; Rates up to 8 ppm resulted in good control (<i>Virginia Tech</i>)	South
6 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)				North		
90 ppm spray x 6	Good control of growth of Sweet Dreams and the hybrid Limerock Ruby with 6 weekly applications (<i>Michigan State Univ.</i>)				North		
40 ppm spray x 1 2 ppm drench x 1	Results on finished plants in California; Drench volume and mg a.i. vary with container size (<i>Univ. Calif.</i>)				South		

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Coreopsis rosea (Pink Coreopsis) <i>continued</i>	To control plant growth <i>continued</i>	Concise/Sumagic	40 ppm spray x 1	Moderate control of American Dream; Multiple applications may be required (<i>Auburn Univ.</i>)	South
			0.5 ppm liner soak x 1	Good growth control of Sweet Dreams (<i>Virginia Tech</i>)	
			2 to 4 ppm spray x 1	Effective on American Dream (<i>Ball Hort</i>)	Unspecified
		Topflor	75 to 100 ppm spray x 1	Moderate control of American Dream; Multiple applications may be required (<i>Auburn Univ.</i>)	South
Coreopsis verticillata (Thread Leaf Coreopsis)	To control plant growth	Abide/A-Rest	6 ppm drench x 1	Drench applied at 2 fl. oz. per 4-in. pot; Volume and mg a.i. vary with pot size (<i>Auburn Univ.</i>)	South
		Collate/Florel	500 to 1,000 ppm spray x 1 to 3	No effect on Moonbeam plant growth or days to flower, but 40% increase in number of flower inflorescences. With stock plants, good growth control of Moonbeam with 4 biweekly sprays of 600 ppm; Increased branching; Removed flower buds (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine	5,000 ppm spray x 2 to 3	Good control, but slight flower delay with Moonbeam and overwintered Golden Gain; Apply at 10- to 14-day intervals (<i>Univ. Georgia and Virginia Tech</i>)	South
			5,100 ppm spray x 1	Moderate control of Moonbeam (<i>Auburn Univ.</i>)	
			2,500 to 5,000 ppm spray	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>). Good control of Cruizin' Main Street (<i>Pilon 2015</i>)	North
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	1,500 to 2,500 ppm spray	Effective on Moonbeam and Zagreb (<i>Ball Hort</i>)	Unspecified
			5,000 + 1,500 ppm spray x 1	Effective on overwintered Golden Gain (<i>Virginia Tech</i>)	South
			Greater than 2,500 + 1,500 ppm spray x 1	Label rate: Increase daminozide rate for better control of Zagreb and Golden Gain (<i>Cycocel</i>)	Unspecified
		Citadel/Cycocel	Not responsive at 1,500 ppm spray x 1	Overwintered Golden Gain not responsive (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	Not responsive at 160 ppm spray x 1 Less than 6 ppm drench x 1	Spray application not effective on Moonbeam (<i>Univ. Georgia</i>) or overwintered Golden Gain (<i>Virginia Tech</i>); Drench applied to Moonbeam at 2 fl. oz. per 4-in. pot; Volume and mg a.i. vary with pot size; Some distortion of laterals with this drench rate (<i>Auburn Univ.</i>)	South
			30 to 60 ppm spray x 1	Good control of Cruizin' Main Street (<i>Pilon 2015</i>)	North
			1 to 2 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>Pacific Plug & Liner Production Info</i>)	North
		Concise/Sumagic	15 to 20 ppm spray x 1 Less than 1 ppm drench x 1	Good control of Moonbeam with spray application, but excessive growth reduction at 1 ppm drench; Test rates approximately 0.5 ppm; Drench applied as 2 fl. oz. per qt. pot; Volume and mg a.i. vary with pot size; Growth of overwintered Golden Gain was moderately responsive at 45 ppm spray x 1; Multiple applications necessary (<i>Virginia Tech</i>)	South
			2 to 4 ppm spray	Effective on Moonbeam and Zagreb (<i>Ball Hort</i>)	Unspecified
			5 to 10 ppm spray	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>). One 5 to 7 ppm spray of uniconazole or 1 or 2 weekly applications of a tank mix of 3 ppm uniconazole + 2,000 ppm daminozide sprays gives good control for Cruizin' Main Street (<i>Pilon 2015</i>)	North
		Topflor	75 to 100 ppm spray x 1	Good growth control of Moonbeam with no delay in flowering; Higher rates resulted in high-quality ratings (<i>Auburn Univ.</i>)	South
Coreopsis	Induce lateral or basal branching on liners or finished plants	Configure	300 to 600 ppm spray x 1	Various cultivars including American Dreams, Sweet Dreams, Moonbeam, Rum Punch and Zagreb are responsive to a single foliar application to increase lateral and basal branching in liners and finished plants; Multiple applications may improve response (<i>Virginia grower, Virginia Tech</i>)	Branching

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Cortaderia selloana (Pampas Grass)	To control plant growth	Abide/A-Rest	4 mg a.i. drench x 1	Moderate growth control, but may not be an economical treatment; Drench volume and mg a.i. vary with pot size (<i>NC State Univ.</i>)	South
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	1 to 2 mg a.i. drench x 1	Good control of plant growth, shorter, but less diameter as well; Volume and mg a.i. vary with pot size (<i>NC State Univ.</i>)	South
		Concise/Sumagic	Less than 1 mg a.i. drench x 1	This rate resulted in continued growth regulation under landscape conditions; Test lower rates; Volume and mg a.i. vary with pot size (<i>NC State Univ.</i>)	South
			40 ppm spray x 1	Good height control of Rosea with no effect on tiller number (<i>Univ. Florida</i>)	South
	To increase tillering	Configure	Not responsive to 500 or 1,000 ppm spray x 1	Rosea not responsive in increasing number of tillers (<i>Univ. Florida</i>)	Branching
Delosperma cooperi	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	80 ppm spray x 1 Less than 10 ppm drench x 1	Short term control of Table Mountain with spray application; Multiple applications required. Excessive reduction in growth with 10 ppm drench at 2 fl. oz. per quart pot (<i>Virginia Tech</i>)	South
	To enhance lateral branching	Augeo	Not responsive at 400 to 1,600 ppm spray x 2	Not responsive to our screening rates; No phyto (<i>Virginia Tech</i>)	Branching
		Configure	Not responsive at 600 ppm spray x 2	Not responsive to our screening rate; Higher rates may be effective (<i>Virginia Tech</i>)	Branching
	Delphinium x elatum (Larkspur, Hybrid Bee Delphinium)	To control plant growth	Abide/A-Rest	4 ppm drench x 1	Apply as flower stalks start to elongate; Good control of Blue Bird; Drench applied at 10 fl. oz. per trade gal. pot; Volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)
100 ppm spray x 3 to 6				Applications 7 to 14 days apart resulted in stunting of Volkerfreiden; Good control of Magic Fountain and Pacific Giants (<i>Michigan State Univ.</i>)	North
5 ppm drench x 1				Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	
Collate/Florel			750 ppm spray x 4	Good growth control of Guardian with weekly sprays; Some flower delay. No control of Pacific Giants with 500 ppm sprays x 4 at 2-week intervals; Delayed flowering (<i>Michigan State Univ.</i>)	North
Dazide/B-Nine			Not responsive at 5,000 ppm spray x 2	Astolat not responsive (<i>Virginia Tech</i>)	South
			5,000 ppm spray x 3 to 6	Applications 7 to 14 days apart gave moderate control of Volkerfreiden; Good control of Guardian and Magic Fountain, but no control of Pacific Giants (<i>Michigan State Univ.</i>)	North
Dazide/B-Nine + Citadel/Cycocel Tank Mix			Not responsive at 5,000/1,500 ppm spray x 1	Astolat not responsive (<i>Virginia Tech</i>)	South
Citadel/Cycocel			1,500 ppm sprays x 4 to 6	Weekly applications gave moderate control of Volkerfreiden and Guardian, but were not effective on Magic Fountain and Pacific Giants (<i>Michigan State Univ.</i>)	North
Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)			40 to 100 ppm spray x 1	Moderate control of Astolat at lower rates and of Black Knight at higher rates; Multiple applications may be necessary; Blue Bird height not responsive to 60 ppm spray x 1; Slight reduction in width (<i>Virginia Tech</i>)	South
			Less than 2 ppm drench x 1	Blue Bird was very sensitive to drenches; Drench applied at 10 fl. oz. per qt. pot; Volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	
			30 ppm spray x 1 to 2	For the Guardian series, make first application just as the flower stem is just beginning to rise above the basal foliage and second application 7 to 10 days later if necessary (<i>Pilon, GPN 2005</i>) Rates greater than 30 ppm sprays or more frequent applications resulted in stunting of other cultivars (<i>Michigan State Univ.</i>)	North

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION	
Delphinium x elatum (Larkspur, Hybrid Bee Delphinium <i>continued</i>	To control plant growth <i>continued</i>		20 ppm spray x 1 or 2	Apply first spray at 12-in. tall; Apply second spray 2 weeks later if needed; Apply drench 1 week after transplant; Volume and mg a.i. vary with pot size (<i>OHP PGR Solutions</i>)	Unspecified	
			2 to 4 ppm drench x 1			
			15 ppm spray x 1 to 2			
			30 to 60 ppm spray x 2			
		Concise/Sumagic	30 to 45 ppm spray x 1	For Astolat, multiple applications may be required (<i>Virginia Tech</i>)	South	
			1 ppm drench x 1	Very short-term response with Blue Bird; Multiple applications or higher rate required; Drench applied at 10 fl. oz. per trade gal. pot; Volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	South	
			5 ppm spray x 1 to 2	For the Guardian series, make first application just as the flower stem is just beginning to rise above the basal foliage and second application 7 to 10 days later if necessary (<i>Pilon, GPN 2005</i>)	North	
			1 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)		
			Topflor	15 ppm spray x 1	Good control of Blue Bird (<i>Virginia Tech</i>)	South
				6 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North
To increase branching	Configure	Not responsive at 600 ppm spray x 1	Galahad not responsive to our screening rate; Higher rates may be effective (<i>Virginia Tech</i>)	Branching		
Delphinium grandiflorum	To control plant growth	Abide/A-Rest	25 to 50 ppm spray x 2	Make first application just as the flower stem is beginning to rise above the basal foliage and second application 7 days later if necessary (<i>Pilon 2006</i>)	North	
			100 ppm spray x 4 to 5	Applications 7 to 14 days apart gave excellent control of Summer Blues, but caused stunting of Sky Blue and Summer Nights; Reduce frequency of application (<i>Michigan State Univ.</i>)		
		Collate/Florel	500 ppm spray x 4	Good growth control of Sky Blue with 4 sprays at 2-week intervals; Little flower delay (<i>Michigan State Univ.</i>)	North	
		Dazide/B-Nine	2,500 ppm spray x 2	Make first application just as the flower stem is beginning to rise above the basal foliage and second application 7 days later if necessary; Also recommends 2 spray applications of 2,000 ppm daminozide + 15 ppm paclobutrazol or 2,000 ppm daminozide + 3 ppm uniconazole (<i>Pilon 2006</i>)	North	
			Not responsive at 5,000 ppm spray x 4 to 5	Applications 7 to 14 days apart gave no control of Summer Blues, Sky Blue or Summer Nights (<i>Michigan State Univ.</i>)		
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	2,500 + 1,000 ppm spray x 2	Make first application just as the flower stem is beginning to rise above the basal foliage and second application 7 days later if necessary (<i>Pilon 2006</i>)	North	
		Citadel/Cycocel	1,500 ppm spray x 4 to 5	Applications 7 to 14 days apart gave good control of Summer Blues, but no control of Sky Blue or Summer Nights (<i>Michigan State Univ.</i>)	North	
		Piccolo/Piccolo 10 XC/Bonzi/Paczol	30 ppm spray x 2	Make first application just as the flower stem is beginning to rise above the basal foliage and second application 7 days later if necessary (<i>Pilon 2006</i>)	North	
				Rates greater than 30 ppm sprays or more frequent applications resulted in stunting of some cultivars (<i>Michigan State Univ.</i>)		
			15 ppm spray x 1 to 2	For Delfix series, apply 1 or 2 applications 10 to 14 days apart (<i>Syngenta Culture Sheets</i>)	Unspecified	
		Concise/Sumagic	5 ppm spray x 2	Make first application just as the flower stem is beginning to rise above the basal foliage and second application 7 days later if necessary (<i>Pilon 2006</i>) A single application of 5 ppm spray at 10 days after potting gave excellent control of Summer Blues, but the 15 ppm spray rate with more frequent applications resulted in stunting of Sky Blue and Summer Nights and 10 ppm spray applied twice stunted Pacific Giants (<i>Michigan State Univ.</i>)	North	

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION		
<i>Dianthus gratianopolitanus</i> (Cheddar Pinks)	To control plant growth	Dazide /B-Nine	2,500 ppm spray	Growth regulators typically not required, but daminozide can be applied if growing conditions cause stretch (<i>Ball Hort</i>)	Unspecified		
				Or a single spray of 2,000 ppm daminozide + 3 ppm uniconazole (<i>Pilon 2006</i>)	North		
<i>Dianthus barbatus</i> (Sweet William)	To control plant growth	Abide /A-Rest	100 ppm spray x 4	4 spray applications at 2-week intervals gave moderate control (<i>Michigan State Univ.</i>)	North		
		Collate /Florel	Not responsive at 500 ppm spray x 4	No response to 4 spray applications at 2-week intervals (<i>Michigan State Univ.</i>)	North		
		Dazide /B-Nine	2,500 ppm spray	Effective on Barbarini hybrids (<i>Syngenta Culture Sheets</i>)	Unspecified		
			2,500 to 3,750 ppm spray x 2 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); No response to 4 spray applications of 5,000 ppm at 2-week intervals (<i>Michigan State Univ.</i>)	North		
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	2,500 ppm spray x 1	Good control of liners of Stagirond (Rondo mix) (<i>Univ. Calif.</i>)	Unspecified		
		Citadel /Cycocel	Not responsive at 1,500 ppm spray x 4	No response to 4 spray applications at 2-week intervals (<i>Michigan State Univ.</i>)	North		
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	20 ppm spray	Effective on Barbarini hybrids (<i>Syngenta Culture Sheets</i>)	Unspecified		
			60 ppm spray x 4 6 ppm drench x 1	4 spray applications at 2-week intervals gave excellent control (<i>Michigan State Univ.</i>); Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North		
			5 ppm spray x 1	Good control of liners of Stagirond (Rondo mix) (<i>Univ. Calif.</i>)	South		
			45 ppm spray x 1 to 3 6 ppm drench x 1	Multiple spray applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)	Unspecified		
			Concise /Sumagic	3 to 5 ppm spray	Effective on Barbarini hybrids (<i>Syngenta Culture Sheets</i>)	Unspecified	
		15 ppm spray x 1		Single application early in production (<i>Oklahoma grower, Sumagic Advisor 2004</i>)	South		
		15 ppm spray x 4 1 ppm drench x 1		4 spray applications at 2-week intervals gave excellent control (<i>Michigan State Univ.</i>); Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North		
		<i>Dicentra spectabilis</i> (Common Bleeding Heart)	To control plant growth, make first spray application as soon as shoot growth is visible; Second application 5 days later (<i>NC State Univ.</i>)	Abide /A-Rest	Less than 50 ppm spray x 2	This rate was phytotoxic causing leaf tip chlorosis; Higher rates reduced number of flowers (<i>NC State Univ.</i>)	South
					50 to 100 ppm spray x 1 to 2	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
26 ppm spray 2 ppm drench x 1	Spray rates above 132 ppm cause curling and burn of foliage; Drench volume and mg a.i. vary with pot size (<i>SePro Specific Species and Application Rates</i>)				Unspecified		
Dazide /B-Nine	3,000 ppm spray x 2			Slight (approximately 4 days) delay in flowering (<i>NC State Univ.</i>)	South		
	2,000 to 2,500 ppm x 2			Begin applications when Valentine plants reach 3-in. tall and reapply as needed at 7- to 10-day intervals (<i>Pilon 2013</i>)	North		
Citadel /Cycocel	Not responsive at 2,000 ppm spray x 2			(<i>NC State Univ.</i>)	South		
Piccolo/Piccolo 10 XC /Bonzi/Paczol	50 ppm spray x 2			No effect on plant flowering (<i>NC State Univ.</i>)	South		
Concise /Sumagic	1 to 5 ppm spray x 2	Excellent growth control with no delay in flowering (<i>NC State Univ.</i>)	South				

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Digiplexis Illumination Flame	To control plant growth	Concise /Sumagic	10 ppm spray x 1	Spray just as the flower spikes are beginning to elongate (<i>Pilon 2014</i>)	North
	To enhance lateral branching	Configure	600 ppm spray x 1	Enhanced lateral branching; This was our test rate; Lower rates may be effective (<i>Virginia Tech</i>)	Branching
Digitalis purpurea (Foxglove)	To control plant growth	Abide /A-Rest	25 ppm spray x 2 to 3 5 ppm drench x 1	To control plant growth, apply just as inflorescence begins to elongate above foliage; 2 to 3 spray applications 7 days apart; Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North
			Rates not tested	For Camelot series, Syngenta only recommends application before elongation of flower spike; Will respond to ancymidol (<i>GreenLeaf Plants Technical Guide</i>)	Unspecified
			15 ppm spray x 1 4 ppm drench x 1	Effective on Foxy; Drench volume and mg a.i. vary with pot size (<i>Univ. Calif.</i>)	South
		Collate /Floreel	500 ppm spray x 4	Good growth control of Foxy with 4 sprays at 2-week intervals; Delayed flowering (<i>Michigan State Univ.</i>)	North
		Dazide /B-Nine	Not responsive at 5,000 ppm spray x 4	Foxy not responsive to multiple applications (<i>Univ. Georgia</i>)	South
			5,000 ppm spray x 4	Good control of Foxy with 4 applications at 2-week intervals (<i>Michigan State Univ.</i>)	North
			2,500 ppm spray x 2 to 3	Weekly applications as necessary (<i>Pilon 2006</i>)	North
			2,500 ppm spray	Virtuoso hybrids: Apply just as the flower spike begins to elongate	Unspecified
			2,500 to 3,500 ppm spray on plugs	PGRs applied to Camelot in the plug stage will produce a more compact plant that is easier to ship (<i>Syngenta Crop Growing Guidelines</i>)	
			Rates not tested	For Camelot series, Syngenta only recommends application before elongation of flower spike; Will respond to daminozide (<i>GreenLeaf Plants Technical Guide</i>)	
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	Not responsive at 5,000/1,500 ppm spray x 1	Foxy not responsive (<i>Univ. Georgia</i>)	South
		Citadel /Cycocel	1,500 ppm spray x 4	Good control of Foxy with 4 applications at 2-week intervals (<i>Michigan State Univ.</i>)	North
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	30 ppm spray x 2 to 3 6 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North
			45 ppm spray x 1 to 3 10 ppm drench x 1	Multiple spray applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)	Unspecified
			80 to 160 ppm spray x 1 2 to 4 ppm drench x 1	Label rate: Drench volume and mg a.i. vary with pot size	Unspecified
		Concise /Sumagic	30 ppm spray x 1	Excellent height control of Foxy; Moderate width reductions (<i>Univ. Georgia</i>)	South
			5 ppm spray x 2 to 3 1 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North
			5 ppm spray	Recommendations for Virtuoso hybrids; Apply just as the flower spike begins to elongate (<i>Syngenta Crop Growing Guidelines</i>)	Unspecified
			3 ppm spray x 1 on plugs	PGRs applied in the plug stage will produce a more compact plant that is easier to ship; Camelot will respond to uniconazole (<i>Syngenta Flowers Growing Guidelines</i>)	
			Rates not tested	For Camelot series, Syngenta only recommends application before elongation of flower spike; Will respond to uniconazole (<i>GreenLeaf Plants Technical Guide</i>)	
Topflor	6+ ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North		

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Echinacea purpurea	To control plant growth	Abide/A-Rest	25 ppm spray x 2 to 3	Apply sprays weekly beginning when flower stalks are near leaf canopy and beginning to elongate (<i>Pilon 2006</i>)	North
			50 to 100 ppm spray x 2	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); 6 weekly applications at 100 ppm stunted Magnus (<i>Michigan State Univ.</i>)	
Echinacea hybrids (Purple Coneflower)	To control plant growth	Collate/Florel	500 ppm spray x 1	Moderate growth control of White Swan; No flower data (<i>Virginia Tech</i>)	South
			500 ppm spray x 3	Biweekly sprays gave moderate growth regulation of Bravado with no effect on flower date or number of inflorescences or branches; 1,000 ppm x 3 reduced growth and delayed flowering slightly (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine	5,000 ppm spray x 2	Apply at 10- to 14-day intervals for control of Bravado and Magnus (<i>Virginia Tech</i>)	South
			5,000 ppm spray x 6	Weekly applications gave good control of Magnus (<i>Michigan State Univ.</i>)	North
			2,500 ppm spray x 2 to 3	Apply sprays weekly beginning when flower stalks are near leaf canopy and beginning to elongate (<i>Pilon 2006</i>)	
		Citadel/Cycocel	1,250 to 1,500 ppm spray x 2 to 6	Apply 1,250 ppm sprays weekly 2 to 3 times beginning when flower stalks are near leaf canopy and beginning to elongate (<i>Pilon 2006</i>); 6 weekly applications at 1,500 ppm gave excellent control of Magnus (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1 to 2	Good control of Magnus; May require multiple applications at 10- to 14-day intervals (<i>Virginia Tech</i>)	South
			2,500 + 1,250 ppm spray x 2 to 3	Apply weekly sprays beginning when flower stalks are near leaf canopy and beginning to elongate (<i>Pilon 2006</i>)	North
			2,500 + 750 ppm spray x 1	Recommends after using Configure (see below), if additional height control is necessary on tissue culture echinacea (<i>Fifo, GrowerTalks, 2010</i>)	Unspecified
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	120 ppm spray x 1	Moderate control of Doubledecker; Multiple applications required (<i>Virginia Tech</i>)	South
			15 ppm spray x 3 to 4	First spray before budding; Evaluate weekly to determine need for additional control (<i>Virginia grower</i>)	
			30 to 90 ppm spray x 2 to 6	Apply 30 ppm sprays 2 to 3 times weekly beginning when flower stalks are near leaf canopy and beginning to elongate (<i>Pilon 2006</i>). 6 weekly applications at 90 ppm gave good control of Magnus (<i>Michigan State Univ.</i>)	North
			6 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	Unspecified
15 ppm spray x 2 2 to 3 ppm drench x 1	Use multiple spray applications or a single drench for Prairie Splendor; Drench volume and mg a.i. vary with pot size (<i>Syngenta Culture Sheets</i>)				
30 to 40 ppm spray x 1 to 2 4 to 6 ppm drench x 1 2 to 4 ppm liner soak x 1	If second spray application is needed, use half the rate listed; Drench volume and mg a.i. vary with pot size; soak liners for 30 sec (<i>OHP</i>)				
45 ppm spray x 1 to 3 6 ppm drench x 1	Multiple spray applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)		Unspecified		

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Echinacea purpurea Echinacea hybrids (Purple Coneflower) <i>continued</i>	To control plant growth <i>continued</i>	Concise/Sumagic	30 ppm spray x 1 to 2	Multiple applications may be required for Ruby Star; Bravado sensitive, test rates less than 30 ppm (<i>Virginia Tech</i>)	South
			5 to 10 ppm spray x 2 to 3 1 ppm drench x 1	Apply 5 ppm sprays weekly beginning when flower stalks are near leaf canopy and beginning to elongate; Also recommends 2,500 ppm daminozide + 5 ppm uniconazole applied 2 to 3 times at weekly intervals; Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>); Three 10 ppm sprays applied at 2-week intervals beginning at bolting provided good control of Magnus with no effect on flowering (<i>Michigan State Univ.</i>)	North
			30 to 40 ppm spray x 1	Multiple applications of lower rate may be applied as necessary (<i>Label</i>)	Unspecified
	To increase basal branching	Topflor	45 ppm spray x 1 22 ppm spray x 2	Short-term control of Ruby Star; Multiple applications may be required (<i>Virginia Tech</i>)	South
			22 ppm spray x 2 to 3	Apply weekly sprays beginning when flower stalks are near leaf canopy and beginning to elongate (<i>Pilon 2006</i>)	North
		Augeo	800 ppm spray x 1 on finished plants	Increased lateral branching of Sombrero Hot Pink; This rate did not increase branching when applied to Sundown or White Swan liners (<i>Virginia Tech</i>)	Branching
		Configure	300 to 600 ppm spray x 1 to 2 on liners or finished plants	Increases basal branching; Multiple applications may be required; Little effect on plant height. Do NOT use on cultivars in the Sombrero or Pow Wow series (<i>Virginia Tech</i>)	Branching
Erysimum linifolium (Wallflower)	To control plant growth	Dazide/B-Nine	5,000 ppm spray x 2	Multiple applications at 10-14 day intervals (<i>Virginia Tech</i>).	South
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	May require multiple applications (<i>Virginia Tech</i>).	South
		Piccolo/Piccolo 10XC/Bonzi/Paczol	80 to 120 ppm spray x 1	Moderate control (<i>Virginia Tech</i>).	South
		Concise/Sumagic	15 ppm spray x 1	Good control (<i>Virginia Tech</i>).	South
		Topflor	30 ppm spray x 1	Good control (<i>Virginia Tech</i>).	South
Eupatorium coelestinum (Hardy Ageratum)	To control plant growth	Dazide/B-Nine	NR @ 5,000 x 2	Not responsive (<i>Univ. Georgia</i>).	South
		Piccolo/Piccolo 10XC/Bonzi/Paczol	NR @ 240 ppm spray x 1 8 to 10 ppm drench x 1	Moderate control with drenches applied at 2 fl. oz. per quart pot (<i>Univ. Georgia</i>).	South
		Concise/Sumagic	60 ppm spray x 1 NR @ 1 ppm drench x 1	Drench applied at 4 fl. oz. per quart pot (<i>Univ. Georgia</i>).	South
Eupatorium rugosum (Chocolate Bonset, White Snake Root)	To control plant growth	Concise/Sumagic	60 ppm spray x 1 4 ppm drench x 1 2 ppm liner soak x 1	Moderate growth control. Multiple applications may be required. Drench applied at 2 fl. oz. per quart pot (<i>Virginia Tech</i>).	South
Euphorbia dulcis (Purple Spurge)	To increase branching	Configure	600 ppm spray x 1	Chameleon: This rate was our screening rate. Lower rates may be effective (<i>Virginia Tech</i>).	Branching
Euphorbia hybrid (Wood Spurge)	To control plant growth	Dazide/B-Nine	NR @ 5,000 ppm spray x 3	Efanthia and Despina: Not responsive (<i>Virginia Tech</i>).	South
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	NR @ 5,000 + 1,500 ppm spray x 2	Efanthia and Despina: Not responsive (<i>Virginia Tech</i>).	South
		Piccolo/Piccolo 10XC/Bonzi/Paczol	40 to 80 ppm spray x 1	Efanthia and Despina: Good control (<i>Virginia Tech</i>).	South
			30 ppm spray	(<i>Pilon 2012</i>)	North
		Concise/Sumagic	30 ppm spray x 1	Efanthia and Despina: Good control (<i>Virginia Tech</i>).	South
			5 ppm spray x 1 to 2	Multiple applications may be required (<i>Pilon 2012</i>)	North
		Topflor	30 ppm spray x 1	Efanthia and Despina: Good control (<i>Virginia Tech</i>).	South
45 ppm spray x 1	Good control (<i>Pilon 2012</i>)		North		

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION	
Gaillardia x grandiflora (Blanket Flower)	To control plant growth	Abide/A-Rest	50 ppm spray x 3	Begin weekly applications when stems are rapidly elongating and before flower buds appear (<i>Pilon 2006</i>)	North	
			Tank mix	Spray tank mix of 15 ppm ancymidol + 2.5 ppm uniconazole as needed (<i>SePro Specific Species and Application Rates</i>)	Unspecified	
		Collate/Florel	500 ppm spray x 4	Growth control and delayed flowering of Burgundy with 4 sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North	
		Dazide/B-Nine	5,000 ppm spray x 3	Burgundy responsive; Apply at 10- to 14-day intervals; Goblin (Gold Kobold) not responsive at 5,000 ppm spray x 2 (<i>Univ. Georgia</i>)	South	
			3,750 ppm spray x 2 to 3	Begin weekly applications when stems are rapidly elongating and before flower buds appear; Also recommends tank mixes of 2,500 ppm daminozide + 30 ppm paclobutrazol x 3 or 2,500 ppm daminozide + 5 ppm uniconazole x 3 (<i>Pilon 2006</i>)	North	
			5,000 ppm spray x 4	Four applications at 2-week intervals gave excellent control of Burgundy (<i>Michigan State Univ.</i>)		
			Tank mix	A tank mix of 3,750 ppm daminozide + 15 ppm paclobutrazol is effective at controlling height (<i>Walters Gardens Cultural Sheets</i>)		
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Burgundy responsive to a single application; Goblin (Gold Kobold) not responsive (<i>Univ. Georgia</i>)	South	
			3,000 + 1,250 ppm spray x 3	Begin weekly applications when stems are rapidly elongating and before flower buds appear (<i>Pilon 2006</i>)	North	
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	Not responsive at 160 ppm spray x 1 Not responsive at 5 ppm drench x 1	Goblin (Gold Kobold) not responsive at 160 ppm spray x 1 or 5 ppm drench applied at 4 fl. oz. per qt. pot; Drench volume and mg a.i. vary with pot size (<i>Univ. Georgia</i>)	South	
			45 ppm spray x 3	Begin weekly applications when stems are rapidly elongating and before flower buds appear (<i>Pilon 2006</i>)	North	
			60 ppm spray x 4	Four applications at 2-week intervals gave excellent control of Burgundy (<i>Michigan State Univ.</i>)		
			15 to 30 ppm spray x 2	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)		
		Concise/Sumagic	60 ppm spray x 1	Moderate control of Burgundy; May require multiple applications; Goblin (Gold Kobold) not responsive to uniconazole applied as a 60 ppm spray, a 5 ppm liner soak or a 2 ppm drench applied at 4 fl. oz. per qt. pot (<i>Univ. Georgia, Virginia Tech</i>)	South	
			7 to 15 ppm spray x 2 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Begin weekly applications of 10 ppm sprays when stems are rapidly elongating and before flower buds appear (<i>Pilon 2006</i>)	North	
			Not responsive at 60 ppm spray x 1 Not responsive at 2 ppm drench x 1	Goblin (Gold Kobold) not responsive at 60 ppm spray x 1 or 2 ppm drench applied at 4 fl. oz. per qt. pot; Drench volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	South	
		To increase branching	Augeo	400 ppm spray x 1 on liners or finished plants	For finished plants: Increased lateral branching on Gallo Yellow; For liners: Single 400 ppm spray at 21 days after sticking increased branching of finished Gallo Red plants (<i>Virginia Tech</i>)	Branching
			Configure	600 ppm spray x 1 or 2 on liners or finished plants	Gallo Yellow, Dazzler and Gallo Red had increased branching, but EXCESSIVE DELAYS in flowering (<i>Virginia Tech</i>)	Branching

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Gaura lindheimeri (White Gaura, Wand Flower, Butterflies)	To control plant growth	Abide/A-Rest	100 ppm spray x 4 to 5	Sprays at 7- to 14-day intervals gave excellent control of Rose, no control of Whirling Butterflies and stunted Blush; Reduce number of applications (<i>Michigan State Univ.</i>)	North
			50 ppm spray x 2	Multiple applications may be required (<i>Univ. Minnesota</i>)	
			1 to 2 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>SePro Specific Species and Application Rates</i>)	Unspecified
		Collate/Florel	500 ppm spray x 4	No growth control of Whirling Butterflies with 4 sprays at 2-week intervals, but appeared to increase branching; Slight delay in flowering (<i>Michigan State Univ.</i>)	North
			500 ppm spray x 2	Moderate growth control of Corrie's Gold with 2 sprays at 2-week interval (<i>Virginia Tech</i>)	South
		Dazide/B-Nine	5,000 ppm spray x 2	Effective on Siskiyou Pink and Whirling Butterflies; Apply at 10- to 14-day intervals (<i>Virginia Tech</i>) and Corrie's Gold (<i>Auburn Univ.</i>)	South
			5,000 ppm spray x 4 to 5	Multiple applications at 7- to 14-day intervals gave good control of Blush and Rose, but were not effective on Whirling Butterflies (<i>Michigan State Univ.</i>)	North
			3,000 to 4,000 ppm spray x 2	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	
			2,500 ppm spray x 1 to 3	More upright cultivars will require multiple applications; Also recommends tank mix 2,000 ppm daminozide + 30 ppm paclobutrazol (<i>Pilon 2006</i>)	
			3,000 ppm spray	Effective growth control (<i>Univ. Calif.</i>)	South
			2,500 to 4,000 ppm spray x 1 to 3	The first application should be 7 to 10 days after the first pinch (<i>Ball Hort</i>)	Unspecified
			Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Good control of Corrie's Gold; Moderate control of Whirling Butterflies; Multiple applications may be required (<i>Virginia Tech</i>)
		2,000 + 1,000 ppm spray x 1 to 3		More upright cultivars will require multiple applications (<i>Pilon 2006</i>)	North
		Citadel/Cycocel	1,250 to 1,500 ppm spray x 1 to 5	More upright cultivars will require multiple applications (<i>Pilon 2006</i>); 5 weekly sprays at 1,500 ppm gave good control of Blush and Rose while 4 sprays at 2-week intervals were not effective on Whirling Butterflies (<i>Michigan State Univ.</i>)	North
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	80 to 100 ppm spray x 1 15 ppm drench x 1 2 to 4 ppm liner soak x 1	80 ppm resulted in good growth control on Corrie's Gold, but 100 ppm gave only moderate growth control of Siskiyou Pink; Test multiple applications or higher rate; Drench applied at 2 fl. oz. per qt. pot; Volume and mg a.i. vary with pot size. Good growth control of Pink Fountain with liner soak (<i>Virginia Tech</i>).	South
			60 to 90 ppm spray x 4 to 5	Weekly applications of 90 ppm spray gave good control of Blush and Rose while 60 ppm sprays at 2-week intervals gave good control of Whirling Butterflies (<i>Michigan State Univ.</i>)	North
			20 to 30 ppm spray x 1 to 2 6+ ppm drench x 1	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); More upright cultivars will require multiple applications of 30 ppm sprays; Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	
			30 to 50 ppm spray	Will control unwanted growth (<i>Ball Hort</i>)	Unspecified
			50 ppm spray x 1	Effective growth control (<i>Univ. Calif.</i>)	South

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
		Concise /Sumagic	15 to 60 ppm spray x 1	Significant cultivar differences in response: Height of Whirling Butterflies was excessively reduced by 15 ppm, but 30 ppm gave short-term growth regulation of Corrie's Gold; Dauphin was only moderately controlled by 60 ppm and Siskiyou Pink was not responsive to a 60 ppm spray (<i>Virginia Tech</i>)	South
			10 to 20 ppm spray x 2	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			5 to 15 ppm spray x 1 to 5	One 5 ppm spray controls compact cultivars; More upright cultivars will require multiple applications; Also recommends tank mix 2,000 ppm daminozide + 5 ppm uniconazole (<i>Pilon 2006</i>); 5 weekly applications of 15 ppm spray stunted Blush and Rose, while two 10 ppm sprays at 2-week intervals gave good control of Whirling Butterflies without affecting flowering (<i>Michigan State Univ.</i>)	North
			30 to 50 ppm spray x 1	Will control unwanted growth (<i>Ball Hort</i>)	Unspecified
		Topflor	100 ppm spray x 1	Moderate height control of Corrie's Gold; Test multiple applications or higher rate (<i>Auburn Univ.</i>)	South
	To increase branching	Configure	500 to 600 ppm spray x 1 300 ppm spray x 1 to 2 on liners	Siskiyou Pink: Increased branches and shoots; Increased number of flower stalks; This was our screening rate—lower rates may be effective; For liners, single or multiple foliar sprays applied approximately 27 days after sticking (plants moderately rooted) increased lateral and basal branching with no adverse effects on rooting. Treatment of Whirling Butterflies with 500 ppm spray the day after removal of cuttings from mist increased branching of liners (3 weeks after treatment) and finished plants (8 weeks after treatment). Snow Fountain was not responsive to 600 ppm spray x 1 applied in the liner stage (<i>Virginia Tech</i>)	Branching
Geranium Rozanne (Cranesbill Geranium)	To induce lateral branching	Configure	NR @ 600 ppm spray x 1	This rate was our screening rate. Higher rates or multiple applications may be effective (<i>Virginia Tech</i>).	Branching
Helenium autumnale (Sneezeweed)	To control plant growth	Dazide /B-Nine	2,500 ppm spray x 1	Mariachi Salsa may require higher rates in the South (<i>Pilon 2014</i>)	North
			2,500 ppm spray x 2 to 4	For Mardi Gras, apply weekly prior to bud set (GL Culture Sheet)	Unspecified
			2,500 ppm spray x 2	Moderate height control of Coppelia (<i>Virginia Tech</i>)	South
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	Not responsive at 5,000+1,500 ppm spray x 1	Reduced width of Coppelia but no height control (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC /Bonzi/Paczol	Not responsive to 160 ppm spray x 1	No effect on growth of Coppelia (<i>Virginia Tech</i>)	South
	Concise /Sumagic	Not responsive to 60 ppm spray x 1	No effect on growth of Coppelia (<i>Virginia Tech</i>)	South	
	To induce lateral branching	Configure	Not responsive to 600 ppm spray x 1	This was our test rate on Coppelia; Higher rates or multiple applications may be more effective (<i>Virginia Tech</i>)	Branching
Heliopsis helianthoides (False Sunflower, Sunflower Heliopsis)	To control plant growth	Dazide /B-Nine	Less than 5,000 ppm spray x 2	Summer Sun was very sensitive to daminozide under nursery conditions; Test at lower rates (<i>Virginia Tech</i>)	South
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	5,000+1,500 ppm spray x 1	Persistent control of Summer Sun under nursery conditions; Test lower rates (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	Not responsive at 160 ppm spray x 1	Summer Sun was not responsive under nursery conditions (<i>Virginia Tech</i>)	South
			6 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North
		Concise /Sumagic	Not responsive at 60 ppm spray x 1	Summer Sun was not responsive under nursery conditions (<i>Virginia Tech</i>)	South

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION	
Helleborus x hybridus (Lenten Rose)	Induce lateral or basal branching	Configure	50 to 800 ppm spray x 1	Foliar spray applied every 2 weeks for 12 weeks during the summer; Some increase in branching; No phytotoxicity, but leaves are feathered (<i>NC State Univ.</i>)	Branching	
Hemerocallis	To control plant growth	Abide/A-Rest	2 ppm drench x 1	Moderate control of height of Happy Returns, but significant reduction of flower stalk height; Use care with higher rate; Applied at 10 fl. oz. per trade gal. pots; Volume and mg a.i. will vary with pot size (<i>Virginia Tech</i>)	South	
			50 to 100 ppm spray x 2	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North	
			5+ ppm drench x 1	Applied to overwintered plants at shoot emergence; Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)	North	
		Dazide/B-Nine	3,750 ppm spray x 2 to 3	2 to 3 weekly spray applications of daminozide or tank mix of 3,750 daminozide + 5 ppm uniconazole (<i>Pilon 2006</i>)	North	
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	2,500 + 1,250 ppm spray x 2 to 3	Weekly spray applications (<i>Pilon 2006</i>)	North	
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	160 to 180 ppm spray x 1 2 ppm drench x 1	Spray applications gave moderate height control of Mary Todd and Hyperion, but no control on Black Eyed Stella or Prairie Blue Eyes; Drench application gave moderate control of height of Happy Returns, Hyperion and Prairie Blue Eyes, but significantly reduced flower stalk height; Use care with higher rates; Applied at 10 fl. oz. per trade gal. pots; Volume and mg a.i. will vary with pot size (<i>Virginia Tech</i>)	South	
			45 ppm spray x 2 to 3 6+ ppm drench x 1	Spray applications at weekly intervals; Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)	North	
			50 ppm spray x 1	Irish Elf responsive to single spray application (<i>Univ. Calif.</i>)	South	
		Concise/Sumagic	0.5 to 0.1 ppm drench x 1	Moderate control of height of Butter Pat, Sammy Russell, Happy Returns and Frankly Scarlet, but significant reduction of flower stalk height; Use care with higher rate; Applied at 10 fl. oz. per trade gal. pots; Volume and mg a.i. will vary with pot size (<i>Virginia Tech</i>)	South	
			5 to 10 ppm spray x 2 to 3 1.0 ppm drench x 1	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)	North	
			Not responsive at 60 ppm spray x 1 Not responsive at 1 ppm drench x 1 Not responsive at 2 ppm liner soak x 1	Bare root liners of Pink Song not responsive to uniconazole; Drench applied at 2 fl. oz. per qt. pot; Drench volume and mg a.i. will vary with pot size (<i>Virginia Tech</i>)	South	
		To increase basal branching	Configure	Not responsive at 600 ppm spray x 1	Strutters Ball was not responsive to our screening rate of 600 ppm; Higher rates or multiple applications may be effective (<i>Virginia Tech</i>)	Branching
				2,500 ppm spray x 1 to 3	Weekly applications increased the number of ramets (basal plantlets) (<i>Auburn Univ.</i>)	
	Heuchera (Coral Bells)	To control plant growth	Abide/A-Rest	100 ppm spray x 6	Good control of Bloody Mary with weekly applications (<i>Michigan State Univ.</i>)	North
Dazide/B-Nine			3,750 to 5,000 ppm spray x 2	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Good control of Bloody Mary with 6 weekly applications of 5,000 ppm (<i>Michigan State Univ.</i>)	North	
Citadel/Cycocel			1,500 ppm spray x 6	Good control of Bloody Mary with weekly applications (<i>Michigan State Univ.</i>)	North	

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION		
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	Not responsive at 120 ppm spray x 1	Silver Lode not responsive (<i>Virginia Tech</i>)	South		
			30 ppm spray x 2 6 ppm drench x 1	Spray at weekly intervals; Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>). Height of flower stems can also be reduced by applying when flower buds approach the top of the canopy, may require two weekly applications (<i>Pilon 2015</i>)	North		
			10 to 25 ppm spray x 1	Generally not needed (<i>Ball Culture Sheets</i>)	Unspecified		
		Concise /Sumagic		5 to 15 ppm spray x 2 to 6	Spray 5 ppm at weekly intervals (<i>Pilon 2006</i>); Height of flower stems can also be reduced by applying when flower buds approach the top of the canopy, may require two weekly applications (<i>Pilon 2015</i>). Apply 5 ppm sprays early in production and 10 ppm sprays later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Excellent control of Bloody Mary with 6 weekly applications of 15 ppm spray (<i>Michigan State Univ.</i>)	North	
				2 to 4 ppm spray x 1	Generally not needed (<i>Ball Culture Sheets</i>)	Unspecified	
		To increase basal branching	Configure	600 ppm spray x 1	Raspberry Ice and Silver Lode increased basal branching at our screening rate; Lower rates may be effective (<i>Virginia Tech</i>)	Branching	
		Hibiscus moscheutos (Hardy Hibiscus Rose Mallow)	To control plant growth	Abide /A-Rest	100 ppm spray x 5 or 6	Excellent control of Disco Belle Mix, but not effective on Luna Blush or Luna Red (<i>Michigan State Univ.</i>)	North
				Collate /Florel	Less than 500 ppm spray x 4	Biweekly sprays excessively reduced growth of Pink Champagne without increasing branching; Reduce number of applications (<i>Michigan State Univ.</i>)	North
				Dazide /B-Nine	5,000 ppm spray x 5 to 6	Moderate control of Disco Belle Mix, but not effective on Luna Blush or Luna Red (<i>Michigan State Univ.</i>)	North
	3,750 ppm spray x 6 to 8				Treat about 1 week after pinch with weekly sprays as necessary (<i>Pilon 2006</i>)	North	
Dazide /B-Nine + Citadel /Cycocel Tank Mix	3,750 + 1,000 ppm spray x 2			For best results, begin PGR applications about 3 to 5 days following a pinch—use at 7-day intervals if additional control is needed (<i>Walters Gardens Cultural Sheets</i>)	North		
	2,500 + 1,250 ppm spray x 2 to 3			Treat about 1 week after pinch, weekly sprays as necessary (<i>Pilon 2006</i>)			
	Unspecified			Dazide /B-Nine can delay flowering; Only use when Citadel /Cycocel rate must exceed 750 ppm for adequate control (<i>GreenLeaf Technical Guide</i>)	Unspecified		
Citadel /Cycocel	500 ppm spray x 2 Less than 2,000 ppm drench x 1			Good control of Lord Baltimore with spray applications, but excessive growth reduction with 2,000 ppm drenches applied at 4 fl. oz. per 6-in. pot; Reduce drench rate; Volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	South		
	750 to 1,000 ppm spray x 3			Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Multiple sprays with 1,500 ppm caused excessive stunting of Disco Belle Mix, Luna Blush and Luna Red (<i>Michigan State Univ.</i>)	North		
	Up to 750 ppm spray x 1			Do not apply until length of new shoots (after pinch) is 0.5 to 1.0 inch. Do not apply after visible bud. (<i>GreenLeaf Technical Guide</i>)	Unspecified		
Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)				10 ppm spray x 6 to 8	For best results, begin PGR applications about 3 to 5 days following a pinch, use at 7-day intervals if additional control is needed (<i>Walters Gardens Cultural Sheets</i>)		
				90 ppm spray x 5 to 6	Excessive control of Disco Belle Mix, but excellent on Luna Blush and Luna Red (<i>Michigan State Univ.</i>)	North	
				45 ppm spray x 6 to 8 5 ppm drench x 1	Treat about 1 week after pinch, one drench or weekly sprays as necessary; Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)		
				50 ppm spray x 1 to 2 5 ppm drench x 1	Apply second spray 2 weeks later if needed; Drench volume and mg a.i. will vary with pot size (<i>OHP PGR Solutions 2011</i>)	Unspecified	

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Hibiscus moscheutos (Hardy Hibiscus Rose Mallow) <i>continued</i>	To control plant growth <i>continued</i>	Concise/Sumagic	10 to 20 ppm spray x 1 0.5 ppm drench x 1	Good control of Grenache with 20 ppm spray; Sensitive to uniconazole drenches; Drench applied at 10 fl. oz. per trade gal. pot; Volume and mg a.i. vary with pot size (<i>Virginia Tech</i>) Sprays at 10 to 20 ppm x 1 once resulted in good control in Florida (<i>Univ. Florida</i>)	South
			7.5 ppm spray x 6 to 8	For best results, begin PGR applications about 3 to 5 days following a pinch, use at 7-day intervals if additional control is needed (<i>Walters Gardens Cultural Sheets</i>)	North
			10 ppm spray x 2	Effective height control on Luna Blush; Make second application 2 to 3 weeks after first, if necessary (<i>Louisiana State Univ.</i>)	South
			5 to 10 ppm spray x 6 to 8 1 ppm drench x 1	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Treat about 1 week after pinch, 1 drench or weekly 7.5 ppm sprays as necessary; Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>); Multiple applications of 15 ppm spray resulting in severe stunting of Disco Belle Mix, Luna Blush and Luna Red (<i>Michigan State Univ.</i>)	North
	To increase branching	Configure	500 ppm spray x 4	Biweekly sprays increased branching of Pink Champagne with reduction in plant height (<i>Michigan State Univ.</i>)	North
Hosta	To control plant growth, spray when leaves begin to unfold (<i>Pilon 2006</i>)	Abide/A-Rest	25 to 50 ppm spray x 2 to 3 5 ppm drench x 1	Spray when leaves begin to unfold; Drench after first few leaves have expanded; Volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>); Sprays of 100 ppm x 4 to 6 stunted Gold Standard and H. hyacinthia, but gave excellent control of Royal Standard (<i>Michigan State Univ.</i>)	North
		Collate/Florel	500 ppm spray x 4	Biweekly sprays increased branching of Royal Standard with slight reduction in plant height (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine	5,000 ppm spray x 4 to 6	Good control of Royal Standard, but not effective on Gold Standard (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	3,000 + 1,500 ppm spray x 4 to 6	Good control of Royal Standard (<i>Michigan State Univ.</i>)	North
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	6 to 10 ppm drench x 1	Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>) Sprays of 90 ppm x 4 to 6 stunted H. hyacinthia, but had no effect on Gold Standard or Royal Standard (<i>Michigan State Univ.</i>)	North
			30 ppm spray x 1 to 3 6 ppm drench x 1	Multiple spray applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)	Unspecified
		Concise/Sumagic	5 to 15 ppm spray x 2 to 3 or 1 ppm drench x 1	15 ppm x 4 to 6 applications gave good control of H. hyacinthia, Gold Standard and Royal Standard (<i>Michigan State Univ.</i>) May also use 2,500 ppm daminozide + 5 ppm uniconazole; H. undulata is more sensitive, reduce rates to 5 ppm uniconazole or 2,000 ppm daminozide + 3 ppm uniconazole; Drench volume and mg a.i. will vary with pot size (<i>Pilon 2005</i>)	North
			20 ppm spray x 1	Single application early in production (<i>Oklahoma grower, Sumagic Advisor 2004</i>)	South
	To increase basal branching	Configure	500 to 3,000 ppm spray x 1 to 2	See Configure Product Information guide for detailed application instructions and cultivar responses (<i>Fine Americas 2010</i>)	Branching
			500 ppm spray x 4	Biweekly sprays increased branching of Royal Standard with little reduction in plant height (<i>Michigan State Univ.</i>)	Branching
Hypericum calycinum (Aaron's Beard, St. John's Wort)	To control plant growth	Dazide/B-Nine	Not responsive at 5,000 ppm spray x 2	Not responsive in nursery trials (<i>Virginia Tech</i>)	South
			2,500 ppm spray x 2 to 3	(<i>Pilon 2005</i>)	North
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	Not responsive at 5,000 + 1,500 ppm spray x 1	Not responsive in nursery trials (<i>Virginia Tech</i>)	South
			2,500 + 1,000 ppm spray x 2 to 3	Weekly applications (<i>Pilon 2005</i>)	North

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	120 to 160 ppm spray x 1 4 ppm drench x 1	Moderate control with a single spray application under greenhouse conditions; Not responsive in nursery trials; Excellent control with 4 ppm drench at 10 fl. oz. per trade gallon pot under greenhouse conditions; Drench volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	South
			30 ppm spray x 2 to 3	Weekly applications (<i>Pilon 2005</i>)	North
		Concise /Sumagic	30 ppm spray x 1 1 ppm drench x 1	Good growth regulation; Drench applied at 10 fl. oz. per trade gallon pot; Drench volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	South
			5 ppm spray x 2 to 3	Weekly applications (<i>Pilon 2005</i>)	North
Iris germanica Iris hybrids (Tall Bearded Iris)	To control plant growth	Abide /A-Rest	Not responsive at 100 ppm spray x 6	Weekly sprays had no effect on Immortality (<i>Michigan State Univ.</i>)	North
		Dazide /B-Nine	Not responsive at 5,000 ppm spray x 6	Weekly sprays had no effect on Immortality (<i>Michigan State Univ.</i>)	North
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	Not responsive at 5,000 + 1,500 ppm spray x 6	Weekly sprays had no effect on Immortality (<i>Michigan State Univ.</i>)	North
		Citadel /Cycocel	Not responsive at 1,500 ppm spray x 6	Weekly sprays had no effect on Immortality (<i>Michigan State Univ.</i>)	North
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	90 ppm spray x 6	Weekly sprays gave good control of Immortality (<i>Michigan State Univ.</i>)	North
			6 to 10 ppm drench x 1	Not very responsive to spray applications; Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)	
	Concise /Sumagic	Not responsive at 15 ppm spray x 6	Weekly sprays had no effect on Immortality (<i>Michigan State Univ.</i>)	North	
To increase basal branching	Configure	100 ppm spray x 1	Slight increase in basal branching (<i>Miss. State Univ.</i>)	Branching	
Iris siberica (Siberian Iris)	To control plant growth	Dazide /B-Nine	Tank mix	2 to 3 weekly applications of tank mix of 2,500 ppm daminozide + 5 ppm uniconazole (<i>Pilon 2005</i>)	North
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	90 ppm spray x 1 Less than 2 to 4 ppm drench x 1	A single spray controlled growth of Caesar's Brother, but 180 ppm spray x 1 did not control Chilled Wine; Use lower drench rates on Caesar's Brother and higher rates on Chilled Wine; Drench applied at 10 fl. oz. per trade gal. pot; Drench volume and mg a.i. vary with pot size (<i>Virginia Tech</i>)	South
Kniphofia uvaria (Torch lily, Red hot poker)	To control plant growth	Dazide /B-Nine	Not responsive at 5,000 ppm spray x 2	Bressingham Comet not responsive (<i>Virginia Tech</i>)	South
			Not responsive at 160 ppm spray x 1	Bressingham Comet not responsive (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC /Bonzi/Paczol	30 to 45 ppm spray x 1	Echo series: Multiple applications required to obtain adequate height control (<i>Pilon 2013</i>)	North
			45 ppm spray x 1	Bressingham Comet good control (<i>Virginia Tech</i>)	South
		Concise /Sumagic	5 to 7.5 ppm spray x 1	Echo series: Multiple applications required to obtain adequate height control (<i>Pilon 2013</i>)	North
Lamiastrum galeobdolon (Yellow Archangel, Golden Dead Nettle)	To control plant growth	Dazide /B-Nine	5,000 ppm spray x 2	Excellent control of Hermann's Pride runners. Apply at 10-14 day intervals (<i>Virginia Tech</i>).	South
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	2,500 + 1,500 ppm spray x 1	Excellent control of Hermann's Pride runners (<i>Virginia Tech</i>).	South
		Piccolo/Piccolo 10XC /Bonzi/Paczol	80 ppm spray x 1	Moderate width control of Hermann's Pride (<i>Virginia Tech</i>).	South
		Concise /Sumagic	15 ppm spray x 1	Moderate width control of Hermann's Pride (<i>Virginia Tech</i>).	South
		Topflor	45 ppm spray x 1	Moderate width control of Hermann's Pride. May need multiple applications (<i>Virginia Tech</i>).	South

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Lamium maculatum (Spotted Dead Nettle)	To control plant growth	Abide/A-Rest	50 ppm spray x 2 to 3	Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			Less than 100 ppm spray x 4	Excessive width reduction of Orchid Frost with 4 sprays at 2-week intervals; Reduce rate or frequency (<i>Michigan State Univ.</i>)	
		Dazide/B-Nine	5,000 ppm spray x 2	Moderate control of Pink Pewter, but no control of Beacon Silver under nursery conditions (<i>Virginia Tech</i>)	South
			5,000 ppm spray x 4	Good width reduction of Orchid Frost with 4 sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North
			2,500 ppm spray x 2 to 3	Begin applications when canopy starts to close (<i>Pilon 2006</i>)	
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Moderate control of Pink Pewter; Multiple applications may be required; No control of Beacon Silver under nursery conditions (<i>Virginia Tech</i>)	South
			Not responsive at 3,000 + 1,500 ppm spray x 4	No control of width of Orchid Frost with 4 sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North
		Citadel/Cycocel	750 ppm spray x 2 to 3	Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			1,250 to 1,500 ppm spray x 2 to 3	Good width reduction of Orchid Frost with 1,500 ppm sprays x 4 at 2-week intervals (<i>Michigan State Univ.</i>)	
		Piccolo/Piccolo 10 XC/Bonzi/Paczol	40 ppm spray x 1	Good control of Pink Pewter, but multiple applications may be necessary; No control of Beacon Silver with 160 ppm spray x 1 under nursery conditions (<i>Virginia Tech</i>)	South
			30 to 60 ppm spray x 2 to 3	Lower rate recommended at weekly intervals (<i>Pilon 2006</i>); Good width reduction of Orchid Frost with 60 ppm sprays x 4 at 2-week intervals (<i>Michigan State Univ.</i>)	North
			30 ppm spray x 1 to 3 3 ppm drench x 1	Multiple spray applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)	Unspecified
		Concise/Sumagic	30 ppm spray x 1	Moderate control of Pink Pewter; Multiple applications may be required; No control of Beacon Silver with 60 ppm x 1 under nursery conditions (<i>Virginia Tech</i>)	South
			5 to 15 ppm spray x 2 to 3	Lower rate rec (<i>Pilon 2006</i>) Excellent width reduction of Orchid Frost with 15 ppm sprays x 4 at 2-week intervals (<i>Michigan State Univ.</i>)	North
		Lantana camara	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/Paczol	40 to 50 ppm spray x 1 4 to 8 ppm liner soak x 1
Concise/Sumagic	20 to 30 ppm spray x 1			Moderate growth control (<i>Fine 2012</i>)	Unspecified
Lavandula angustifolia (Lavender)	To control plant growth	Abide/A-Rest	25 ppm spray x 2 to 3	Weekly applications as necessary (<i>Pilon 2006</i>)	North
			5,000 ppm spray x 1	Moderate control of Province applied once in liner stage (<i>Virginia Tech</i>)	South
		Dazide/B-Nine	2,500 ppm spray x 2	Weekly applications as necessary (<i>Pilon 2006</i>)	North
			3,750 to 5,000 ppm spray x 2 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	30 ppm spray x 2 6 ppm drench x 1	Weekly applications as necessary; Drench volume and mg a.i. vary with pot size (<i>Pilon 2006</i>)	North
			15 ppm spray	For Blue Scent (<i>Syngenta Culture Sheets</i>)	Unspecified
		Concise/Sumagic	5 to 10 ppm spray x 1 to 3	Apply to Hidcote Blue or Munstead as needed (<i>Ball Hort</i>)	Unspecified
			15 to 30 ppm spray x 1	For control of flower stalk height on Phenomenal, apply when flower stalk reaches the top of the foliage. Higher rate delayed flower opening by 5 days (<i>Virginia Tech</i>)	South
5 to 10 ppm spray x 2	Weekly applications at 5 ppm as necessary (<i>Pilon 2006</i>) Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)		North		

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION	
Lavandula x intermedia (Lavandin)	To control plant growth	Dazide /B-Nine	5,000 ppm spray x 2	Good control of Silver Edge (Walvera); Apply at 10- to 14-day intervals (<i>Virginia Tech</i>)	South	
			2,500 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North	
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Good control of Silver Edge (Walvera; Virginia Tech)	South	
			2,500 + 1,000 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North	
		Piccolo/Piccolo 10 XC /Bonzi/Paczol	Not responsive at 160 ppm spray x 1	Silver Edge (Walvera) not responsive (<i>Virginia Tech</i>)	South	
			30 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North	
		Concise /Sumagic	Not responsive at 60 ppm spray x 1	Silver Edge (Walvera) not responsive to 60 ppm spray x 1 (<i>Virginia Tech</i>)	South	
			5 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North	
		To increase lateral branching of liners	Configure	300 ppm spray x 2 for liners	2 foliar sprays applied to Provence, first at approximately 34 days after sticking and again 2 weeks later; Increased lateral and basal branching with slight reduction in root growth; Apply after liners are well rooted (<i>Virginia Tech</i>)	Branching
		Leucanthemum x superbum (Shasta Daisy)	To control plant growth	Abide /A-Rest	25 ppm spray x 2 to 3	Weekly sprays as necessary; Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>); Excessive reductions in growth of Becky with 100 ppm spray x 6 (<i>Michigan State Univ.</i>)
5 ppm drench x 1						
Collate /Floreil	750 ppm spray x 4			Weekly sprays reduced growth of Ice Star while increasing the number of inflorescences. Biweekly sprays of 500 ppm x 3 gave moderate growth control of Thomas Killen, but reduced number of inflorescences per shoot and number of shoots per pot (<i>Michigan State Univ.</i>)	North	
	Not responsive at 5,000 ppm spray x 2			Alaska and Becky not responsive (<i>Univ. Georgia</i>)	South	
Dazide /B-Nine	5,000 ppm spray x 4 to 6			Good control of Becky and Ice Star with weekly sprays (<i>Michigan State Univ.</i>)	North	
	2,500 ppm spray x 1 to 2			Also recommends 1 to 2 spray applications of tank mix 2,500 ppm daminozide + 15 ppm paclobutrazol or 2,000 ppm daminozide + 3 ppm uniconazole (<i>Pilon 2006</i>)		
Dazide /B-Nine + Citadel /Cycocel Tank Mix	Not responsive at 5,000 + 1,500 ppm spray x 1			Becky not responsive; Test increased daminozide rate (<i>Univ. Georgia</i>)	South	
	Citadel /Cycocel			Not responsive at 4,000 ppm spray x 1	Becky not responsive (<i>Univ. Georgia</i>)	South
1,500 ppm spray x 4 to 6				Good control of Becky and Ice Star with weekly sprays (<i>Michigan State Univ.</i>)	North	
Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	Less than 40 ppm spray x 1			Alaska is sensitive to paclobutrazol; Test rates below 40 ppm (<i>Univ. Georgia</i>); Becky had a moderate, short-term response to 120 ppm spray x 1; Multiple applications or higher rates required (<i>Virginia Tech</i>)	South	
	10 to 20 ppm spray x 2 to 3			Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North	
	30 ppm spray x 1 to 2			Weekly sprays as necessary; Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)		
	6 ppm drench x 1			Excessive reductions in growth of Becky and Ice Star with 90 ppm spray x 6 (<i>Michigan State Univ.</i>)		

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Leucanthemum x superbum (Shasta Daisy) <i>continued</i>	To control plant growth <i>continued</i>	Concise /Sumagic	Less than 15 ppm spray x 1	Alaska is sensitive to uniconazole; Test rates below 15 ppm (<i>Univ. Georgia</i>); Becky was not responsive to 60 ppm spray x 1; Multiple applications or higher rates required (<i>Virginia Tech</i>)	South
			10 to 20 ppm spray x 2 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			5 ppm spray x 1 to 2	Weekly sprays as necessary (<i>Pilon 2006</i>)	
		Topflor	6 ppm drench x 1	Excessive reductions in growth of Becky and Ice Star with 15 ppm spray x 6 (<i>Michigan State Univ.</i>) Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)	North
	To increase basal branching	Configure	300 ppm spray x 1 to 2 for liners	Single or multiple foliar sprays applied approximately 27 days after sticking (plants moderately rooted) increased basal branching of Snowcap, but slightly reduced root growth; Apply after liners are well rooted; Applied to finish plants, Configure increased branching of Becky and Alaska short term, but doubled the number of flowers of Alaska; 600 ppm was our screening rate; Higher rates or multiple applications may be more effective (<i>Virginia Tech</i>)	Branching
			600 ppm spray x 1 to 2 on finished plants		
Liatris spicata (Spike Gayfeather)	To control plant growth	Abide /A-Rest	50 ppm spray x 2 to 3	Weekly applications (<i>Pilon 2005</i>) Excessive reductions in growth of Kobold Blue with 100 ppm spray x 6 (<i>Michigan State Univ.</i>)	North
		Collate /Florel	Not responsive at 500 to 1,000 ppm spray x 1 to 3	Biweekly sprays had no effect on Kobold (<i>Michigan State Univ.</i>)	North
		Dazide /B-Nine	3,750 ppm spray x 2 to 3	Weekly applications; Also recommends 2,500 ppm daminozide + 5 ppm uniconazole spray x 2 to 3 (<i>Pilon 2005</i>); Kobold Blue not responsive to 5,000 ppm sprays x 6 weekly (<i>Michigan State Univ.</i>)	North
		Citadel /Cycocel	Not responsive at 1,500 ppm spray x 6	Kobold Blue not responsive to weekly applications (<i>Michigan State Univ.</i>)	North
		Piccolo/Piccolo 10 XC /Bonzi/ Paczol	Not responsive at 160 ppm spray x 1	Floristan Violet not responsive (<i>Virginia Tech</i>)	South
			90 ppm spray x 6	Weekly applications gave good control of Kobold Blue (<i>Michigan State Univ.</i>)	North
		Concise /Sumagic	Not responsive at 60 ppm spray x 1	Floristan Violet not responsive (<i>Virginia Tech</i>)	South
			15 ppm spray x 6	Weekly applications gave good control of Kobold Blue (<i>Michigan State Univ.</i>)	North
Lobelia cardinalis (Cardinal flower)	To control plant growth	Abide /A-Rest	25 ppm spray x 2 to 3 5 ppm drench x 1	Weekly sprays (<i>Pilon 2005</i>); Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)	North
		Dazide /B-Nine	Not responsive at 5,000 ppm spray x 2	Not responsive (<i>Virginia Tech</i>)	South
			3,750 to 5,000 ppm spray x 2 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			2,500 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2015</i>)	North
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	Not responsive at 5,000 + 4,000 ppm spray x 1	Not responsive (<i>Virginia Tech</i>)	South
			2,500 + 1,000 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North
		Citadel /Cycocel	1,250 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
		Piccolo/Piccolo 10 XC /Bonzi/ Paczol/Downsize (drenches only)	Not responsive at 60 ppm spray x 1	Not responsive (<i>Virginia Tech</i>)	South
			30 ppm spray x 2 to 3 6 ppm drench x 1	Weekly sprays (<i>Pilon 2005</i>); Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)	North
		Concise /Sumagic	30 ppm spray x 1	Good control (<i>Virginia Tech</i>)	South
			5 ppm spray x 2 to 3 1 ppm drench x 1	Weekly sprays (<i>Pilon 2005</i>); Good height control with 2 to 3 weekly applications of a tank mix of 3 ppm uniconazole, plus 2,000 ppm daminozide (<i>Pilon 2014</i>). Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)	North
			Topflor	6 ppm drench x 1	Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)
To increase lateral branching	Configure	600 ppm spray x 1	This rate was our screening rate; Lower rates may be effective (<i>Virginia Tech</i>)	Branching	
Lobelia x speciosa (Hybrid Lobelia)	To control plant growth	Abide /A-Rest	50 to 100 ppm spray x 2 to 3	Apply lower spray rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			25 to 50 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	
		Dazide /B-Nine	3,750 to 5,000 ppm spray x 2 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			2,500 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	
		Citadel /Cycocel	1,250 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North
			1,500 ppm spray x 3	Label rate: Compliment Scarlet and Queen Victoria (<i>Cycocel</i>)	Unspecified
		Piccolo/Piccolo 10 XC /Bonzi/ Paczol	120 ppm spray x 1	Fan Deep Rose had moderate response; Multiple applications required (<i>Virginia Tech</i>)	South
			30 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North
		Concise /Sumagic	5 to 10 ppm spray x 2 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Weekly sprays at 5 ppm (<i>Pilon 2005</i>)	North
		To increase lateral branching	Configure	600 ppm spray x 1	Increased number of shoots, not branches, on Fan Deep Rose; Moderate response; This rate was our screening rate; Higher rates may be more effective (<i>Virginia Tech</i>)
Lysimachia (Loosestrife)	To control plant growth	Dazide /B-Nine	5,000 ppm spray x 2	Moderate control of Snow Candles. Apply at 10- to 14-day intervals (<i>Virginia Tech</i>).	South
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	2,500 + 1,500 ppm spray x 1	Moderate control of height and width of Snow Candles (<i>Virginia Tech</i>).	South
		Piccolo/Piccolo 10 XC /Bonzi/ Paczol	120 ppm spray x 1	Moderate height and width control of Snow Candles (<i>Virginia Tech</i>).	South
		Topflor	30 ppm spray x 1	Moderate height and width control (<i>Virginia Tech</i>).	South
Malva alcea (Hollyhock Malva)	To control plant growth	Dazide /B-Nine	Not responsive to 5,000 ppm spray x 2	(<i>Univ. Georgia</i>)	South
		Citadel /Cycocel	750 to 1,500 ppm spray x 1	(<i>Univ. Georgia</i>)	South
		Piccolo/Piccolo 10 XC /Bonzi/ Paczol	Much less than 40 ppm spray x 1	Very sensitive; Test rates around 10 to 20 ppm (<i>Univ. Georgia</i>).	South
		Concise /Sumagic	Much less than 15 ppm spray x 1	Very sensitive; Test rates around 2 to 5 ppm (<i>Univ. Georgia</i>).	South

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Miscanthus sinensis (Maiden grass)	To control plant growth	Citadel/Cycocel	1,500 ppm spray x 4	Weekly sprays reduced plant height moderately (<i>Michigan State Univ.</i>)	North
		Collate/Florel	750 ppm spray x 4	Weekly sprays reduced plant height and increased number of tillers (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine	Not responsive at 5,000 ppm spray x 2	Gracillimus not responsive (<i>Virginia Tech</i>)	South
			5,000 ppm spray x 4	Weekly sprays reduced plant height moderately (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	Not responsive at 5,000 + 1,500 ppm spray x 2	Gracillimus not responsive (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC/Bonzi/Paczol	Not responsive at 160 ppm spray x 1	Gracillimus not responsive (<i>Virginia Tech</i>)	South
		Concise/Sumagic	Not responsive at 60 ppm spray x 1	Gracillimus not responsive to sprays, but very responsive to liner soaks (<i>Virginia Tech</i>)	South
			2 ppm liner soak x 1		
			40 ppm spray x 1	Moderate height control of Gracillimus only at 2 weeks after treatment; Multiple applications may provide control (<i>Univ. Florida</i>)	South
			15 ppm spray x 4	Excessive growth regulation with weekly sprays; Reduce spray frequency (<i>Michigan State Univ.</i>)	North
		Topflor	Not responsive at 120 ppm spray x 1	Gracillimus not responsive (<i>Virginia Tech</i>)	South
	To increase tillering	Configure	Not responsive 500 or 1,000 ppm spray x 1	Gracillimus not responsive (<i>Univ. Florida</i>)	Branching
Monarda didyma (Bee Balm)	To control plant growth	Abide/A-Rest	25 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North
			1 to 2 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>SePro Specific Species and Application Rates</i>)	Unspecified
		Collate/Florel	500 ppm spray x 2	Good growth control of Gardenview Scarlet; No flower data (<i>Virginia Tech</i>)	South
			500 ppm spray x 3	Biweekly sprays gave moderate growth control of Blue Stocking with slight delay in flowering and moderate reduction in the number of inflorescences; No effect on branching. Four biweekly sprays at 500 ppm caused excessive growth reduction of Marshall's Delight and delayed flowering (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine	5,000 ppm spray x 2 to 3	Good control of Mahogany, Marshall's Delight and Raspberry Wine, but no control of Blue Stocking (<i>Virginia Tech, Univ. Georgia</i>)	South
			2,500 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>); Also recommends tank mix 2,000 ppm daminozide + 3 ppm uniconazole (<i>Pilon 2005; Walters Gardens Cultural Sheets</i>); Marshall's Delight not responsive at 5,000 ppm spray x 4 at 2 week intervals (<i>Michigan State Univ.</i>)	North
		Citadel/Cycocel	Not responsive at 4,000 ppm spray x 1	Blue Stocking not responsive (<i>Univ. Georgia</i>)	South
			1,500 ppm spray x 4	Excellent control of Marshall's Delight with sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Good control of Mahogany and Marshall's Delight; Multiple applications may be required (<i>Virginia Tech</i>)	South
			2,500 + 1,000 ppm spray x 2 to 3	Weekly applications (<i>Pilon 2005</i>)	North

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION		
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	100 ppm spray x 1 6 ppm drench x 1 16 ppm liner soak x 1	Good control of Raspberry Wine, but no control of Blue Stocking, Jacob Kline or Mahogany with 160 ppm spray x 1 (<i>Virginia Tech, Univ. Georgia</i>); Good control of Raspberry Wine with 6 ppm drench x 1 applied as 2 fl. oz. per qt. pot. Moderate control of Jacob Kline with 8 ppm drench x 1 applied as 10 fl. oz. per trade gal. pot, but reduced the number of flowers. Drench volume and mg a.i. vary with pot size; Good but short-term control of Raspberry Wine with liner soak at 16 ppm (<i>Virginia Tech</i>)	South		
			30 to 60 ppm spray x 2 to 4	Weekly 30 ppm sprays (<i>Pilon 2005</i>); Excellent control of Marshall's Delight with 60 ppm sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North		
			45 ppm spray x 1 to 3 6 ppm drench x 1	Multiple spray applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)	Unspecified		
		Concise /Sumagic		15 to 30 ppm spray x 1 1 ppm drench x 1	Good control of Mahogany, Marshall's Delight, Blue Stocking and Jacob Cline; Drench applied to Jacob Cline at 4 fl. oz. per qt. pot; Drench volume and mg a.i. vary with pot size (<i>Virginia Tech, Univ. Georgia</i>)	South	
				5 to 15 ppm sprays x 2 to 4	Weekly sprays at 5 ppm (<i>Pilon 2005</i>); Excessive control of Marshall's Delight with 4 applications of 15 ppm sprays at 2-week intervals; Reduce rate or frequency (<i>Michigan State Univ.</i>)	North	
				15 to 30 ppm spray x 1	Multiple applications of lower rate may be applied as necessary (<i>Label</i>)	Unspecified	
				Topflor	Less than 37 ppm spray x 1	Excessive control of Jacob Cline (<i>Virginia Tech</i>)	South
			To increase lateral branching	Augeo	Not responsive at 1,600 ppm spray x 1	Limited height control of Beauty of Cobham under nursery conditions with no increase in branching (<i>Virginia Tech</i>)	Branching
		Muhlenbergia capillaris (Pink Muhlygrass)	To control plant growth	Concise /Sumagic	40 ppm spray x 1	Early control of growth; Multiple applications may be required (<i>Univ. Florida</i>)	South
	To increase tillering		Configure	Not responsive at 500 or 1,000 ppm spray x 1	Small early increase in number of tillers that did not persist after 2 weeks after treatment (<i>Univ. Florida</i>)	Branching	
Nepeta x faassenii (Catmint)	To control plant growth	Abide /A-Rest	25 ppm spray x 2 to 3	Weekly applications (<i>Pilon 2005</i>)	North		
		Dazide /B-Nine	2,500 to 5,000 ppm spray x 5	Weekly applications at 2,500 ppm; Also recommends tank mix 2,000 ppm daminozide + 3 ppm uniconazole (<i>Pilon 2005</i>) 5 weekly sprays of 5,000 ppm gave good control of Walker's Low (<i>Michigan State Univ.</i>)	North		
		Citadel /Cycocel	1,500 ppm spray x 5	Weekly applications gave good control of Walker's Low (<i>Michigan State Univ.</i>)	North		
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Good control of Six Hills Giant; Multiple applications may be required (<i>Virginia Tech</i>)	South		
			2,500 + 1,000 ppm spray x 3	Excellent control of Six Hills Giant (<i>Pilon, GPN 2002</i>)	North		
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	15 ppm spray x 1	For Walker's Low, single application at 3 weeks after planting gave good control (<i>Virginia grower</i>)	South		
			Not responsive at 100 ppm spray x 2 5 ppm drench x 1 Greater than 20 ppm liner soak x 1	For Walker's Low: Sprays at 1 and 3 weeks after planting gave little control; Good control with drench of 4 fl. oz. per 5.5-in. pot at 1 week after planting; Drench volume and mg a.i. affected by pot size; Higher drench rates resulted in leaf necrosis; Liner soak gave only 3 weeks control; Test higher rate (<i>Michigan State Univ.</i>)	North		
			30 ppm spray x 2 to 3	For Walker's Low, repeat at 7- to 10-day intervals beginning when plants are 4- to 6- in. high (<i>Pilon, GPN 2007</i>)			
30 ppm spray x 1 to 3 6 ppm drench x 1	Multiple spray applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)	Unspecified					

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Nepeta x faassenii (Catmint) <i>continued</i>	To control plant growth <i>continued</i>	Concise /Sumagic	5 to 15 ppm spray x 1 to 3	For Walker's Low, a single spray of 15 ppm at 8 days after planting or 2 sprays of 10 ppm (at 1 and 3 weeks after planting) gave excellent control (<i>Michigan State Univ.</i>) For Walker's Low, repeat 5 ppm sprays x 3 at 7- to 10-day intervals beginning when plants are 4- to 6-in. high (<i>Pilon, GPN 2007</i>)	North
	To increase lateral branching	Augeo	800 ppm spray x 1	For Walker's Low, one application at 5 days after transplanting increased branching without reducing plant growth; Higher rates or multiple applications stunted plants (<i>Virginia Tech</i>)	Branching
		Configure	600 ppm spray x 1 to 2 on liners	Applied once at 5 days after transplant or twice at plug stage (7 days after sticking) and at 5 days after transplant; Increased number of lateral branches (75%); Slight reduction in plant growth (<i>Virginia Tech</i>)	Branching
Paeonia (Peony)	To control plant growth	Concise /Sumagic	Not responsive at 0.75 ppm drench Not responsive at 3 to 6 ppm sprench x 1 (4x volume)	High rate of sprench reduced width and eliminated flowering (<i>Virginia Tech</i>)	South
	Induce basal branching	Configure	100 to 1,600 ppm root soak x 1	BA applied as a 5-minute pre-plant soak of peony root divisions in the fall, caused buds to sprout about 20 days earlier and over a shorter time period; 400 ppm optimal (<i>NC State Univ.</i>)	Branching
Panicum virgatum (Switchgrass)	To control plant growth	Abide /A-Rest	Not responsive at 100 ppm spray x 4	Biweekly sprays caused little growth control of Heavy Metal (<i>Michigan State Univ.</i>)	North
		Collate /Florel	Not responsive at 500 ppm spray x 4	Biweekly sprays had no effect plant height of Heavy Metal, but plants were thinner (<i>Michigan State Univ.</i>)	North
		Dazide /B-Nine	Not responsive 5,000 ppm spray x 2	Shenandoah not responsive (<i>Virginia Tech</i>)	South
			5,000 ppm spray x 4	Little effect of biweekly sprays on Heavy Metal (<i>Michigan State Univ.</i>)	North
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	5,000 + 1,500 ppm spray x 2	Shenandoah moderate response to biweekly sprays (<i>Virginia Tech</i>)	South
			Not responsive at 3,000 + 1,500 ppm spray x 4	Biweekly sprays had no effect on height of Heavy Metal (<i>Michigan State Univ.</i>)	North
		Piccolo / Piccolo 10 XC /Bonzi/Paczol	80 ppm spray x 1	Shenandoah moderate response (<i>Virginia Tech</i>)	South
			Less than 60 ppm spray x 4 12 to 18 ppm drench x 1	Biweekly sprays caused excessive growth reduction of Heavy Metal with little height control; Plants were very thin; Reduce frequency of application (<i>Michigan State Univ.</i>). Drenches are more effective; Drench volume and mg a.i. affected by pot size (<i>Pilon 2012</i>)	North
		Concise /Sumagic	Not responsive at 60 ppm spray x 1	Shenandoah not responsive (<i>Virginia Tech</i>)	South
	15 ppm spray x 4 1 to 2 ppm drench x 1		Biweekly sprays caused excessive growth reduction of Heavy Metal with little height control; Plants were very thin; Reduce frequency of application (<i>Michigan State Univ.</i>). Drenches are more effective; Drench volume and mg a.i. affected by pot size (<i>Pilon 2012</i>)	North	
Topflor	60 ppm spray x 1	Shenandoah moderate response (<i>Virginia Tech</i>)	South		
	10 to 15 ppm drench x 1	Drenches are more effective; Drench volume and mg a.i. affected by pot size (<i>Pilon 2012</i>)	North		
To increase tillering	Configure	Not responsive at 500 ppm spray x 4	Heavy Metal not responsive to biweekly sprays; Plants much thinner than untreated (<i>Michigan State Univ.</i>)	Branching	
Papaver orientale (Oriental Poppy)	To control plant growth	Dazide /B-Nine	2,500 ppm spray x 2 to 3	Weekly sprays; Also recommends tank mix of 2,000 ppm daminozide + 3 ppm uniconazole (<i>Pilon 2005</i>).	North
		Piccolo / Piccolo 10 XC /Bonzi/Paczol	160 ppm spray x 1	Growth reduction of Royal Wedding was moderate and short term; Princess Victoria was not responsive under nursery conditions (<i>Virginia Tech</i>)	South
		Concise /Sumagic	30 to 45 ppm spray x 1	Growth reduction of Royal Wedding and Princess Victoria was moderate under nursery conditions (<i>Virginia Tech</i>)	South

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Penstemon barbatus (Beardlip Penstemon, Bearded Tongue) Penstemon digitalis Penstemon x mexicali hybrids"	To control plant growth	Collate /Florel	500 ppm spray x 1	Moderate control of plant height, increased branching but delayed flowering by 7 days for Pike's Peak Purple (<i>Virginia Tech</i>)	South
			2,500 ppm spray	For Pinacolada (<i>Syngenta Culture Sheets</i>)	Unspecified
			1,500 to 2,500 ppm spray x 1	Effective on Husker Red or Firebird (<i>Ball Hort</i>)	Unspecified
		Dazide /B-Nine	5,000 ppm spray x 1	Moderate height control of Pike's Peak Purple, but reduced flowering (<i>Virginia Tech</i>)	South
			2,500 ppm spray	Pensham Laura or Red Riding Hood may require multiple applications (<i>Pilon 2012</i>)	North
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	2,500 + 1,000 ppm spray x 2	Multiple applications required for hybrids (<i>Fischer</i>)	Unspecified
			Piccolo/Piccolo 10 XC /Bonzi/ Paczol/Downsize (drenches only)	Less than 160 ppm spray x 1 Less than 8 ppm drench x 1 10 to 16 ppm liner soak x 1 2 ppm liner drench x 1	Excessive growth regulation of Husker Red with 160 ppm spray x 1 or 8 ppm drench x 1; Drench applied at 10 fl. oz. per trade gallon pot. Drench volume and mg a.i. will vary with pot size. Moderate growth regulation of Laura with liner soak; May need additional control; Moderate height control of Pike's Peak Purple with 80 ppm spray x 1; Good growth regulation of Red Rocks or Pike's Peak Purple with 2 ppm liner drench at 10 ml per liner (<i>Virginia Tech</i>)
		30 ppm spray x 1 to 2		Pensham Laura or Red Riding Hood may require multiple applications (<i>Pilon 2012</i>)	North
		15 ppm spray x 1 2 to 3 ppm drench x 1		For Pinacolada; Drench volume and mg a.i. vary with pot size (<i>Syngenta Culture Sheets</i>)	Unspecified
		5 to 10 ppm spray x 1		Effective on Husker Red or Firebird (<i>Ball Hort</i>)	Unspecified
		Concise /Sumagic	5 ppm spray x 1 to 2	Pensham Laura or Red Riding Hood may require multiple applications (<i>Pilon 2012</i>)	North
			30 ppm spray x 1	Good growth regulation of Pike's Peak Purple (<i>Virginia Tech</i>)	South
			5 to 10 ppm spray x 1 to 3	Multiple applications required for hybrids (<i>Fischer</i>)	Unspecified
		To increase basal branching	Configure	600 ppm spray x 1	Increased basal branching of Husker Red and vernalized Prairie Dusk; Increased lateral branching and number of flower stalks of unpinched Pike's Peak Purple; Increased lateral branching of Red Rocks (<i>Virginia Tech</i>)
	Perovskia atriplicifolia (Russian Sage)	To control plant growth	Abide /A-Rest	25 to 100 ppm spray x 3	Weekly 25 to 50 ppm sprays (<i>Pilon 2005</i>). Apply 50 ppm sprays early in production and 100 ppm sprays later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>). Excellent control with three 100 ppm sprays at 10 day intervals (<i>Michigan State Univ.</i>)
5,000 ppm spray x 2				Apply at 10- to 14-day intervals; Slight delay in flowering (<i>Virginia Tech</i>)	South
Dazide /B-Nine			3,750 to 5,000 ppm spray x 2 to 3	Apply 3,750 ppm sprays early in production and 5,000 ppm sprays later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>) Excellent control with three sprays of 5,000 ppm at 10 day intervals (<i>Michigan State Univ.</i>)	North
			2,500 ppm spray x 2 to 3	Also recommends tank mix of 2,500 ppm daminozide + 3 ppm uniconazole for Lacey Blue (Pilon, GPN 2011)	North
			2,000 to 4,000 ppm spray	(<i>Ball Hort</i>)	Unspecified
Citadel /Cycocel			1,250 to 1,500 ppm spray x 3	Good control with three 1,500 ppm sprays at 10-day intervals (<i>Michigan State Univ.</i>); Weekly 1,250 ppm sprays (<i>Pilon 2005</i>)	North

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Perovskia atriplicifolia (Russian Sage) <i>continued</i>	To control plant growth <i>continued</i>	Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Good control; Multiple applications may be necessary (<i>Virginia Tech, Auburn Univ.</i>)	South
			2,500 + 1,000 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North
			2,000 to 4,000 + 1,000 to 1,500 ppm spray	(<i>Ball Hort</i>)	Unspecified
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize (drenches only)	30 to 40 ppm spray x 1 2 ppm liner soak x 1	Longin required higher rate of 80 ppm sprays; May require multiple applications (<i>Virginia Tech</i>)	South
			30 to 45 ppm spray x 2 to 3 6 ppm drench x 1	Three 30 ppm sprays at 10-day intervals gave excellent control (<i>Michigan State Univ.</i>) Weekly sprays (<i>Pilon 2005</i>); Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)	North
		Concise/Sumagic	15 to 30 ppm spray x 1 1 ppm liner soak x 1	Good control; Multiple spray applications may be necessary (<i>Virginia Tech</i>)	South
			20 ppm spray x 2	Moderate height control with 2 applications 7 days apart (<i>Louisiana State Univ.</i>)	
			5 to 15 ppm spray x 2 to 3	Apply 5 ppm sprays early in production and 10 ppm sprays later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); 15 ppm spray x 3 at 10-day intervals gave excessive growth regulation (<i>Michigan State Univ.</i>)	North
		Topflor	5 to 20 ppm spray	(<i>Ball Hort</i>)	Unspecified
			35 to 45 ppm spray x 1 Less than 2 ppm liner soak x 1	This liner soak rate gave excessive early height reduction, but plants grew out by 7 weeks after treatment (<i>Virginia Tech</i>)	South
Persicaria microcephala (Knotweed, Fleece Flower)	To control plant growth	Concise/Sumagic	45 ppm spray x 1 0.5 ppm drench x 1	Good control of Red Dragon. Drench applied as 10 fl. oz. per trade gallon pot (<i>Virginia Tech</i>)	South
Phlox paniculata (Garden Phlox)	To control plant growth	Abide/A-Rest	Not responsive at 100 ppm spray x 4	Mt. Fuji not responsive to 4 sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North
		Collate/Florel	Not responsive at 500 ppm spray x 1 Not responsive at 40 ppm liner soak x 1	Starfire liners treated just after removal of cuttings from mist were not responsive to sprays or liner soaks; No effect on finished plants (<i>Virginia Tech</i>)	South
			500 or 1,000 ppm spray x 1 to 3	Biweekly sprays provided no growth control nor increased branching, but increased the number of inflorescences per pot for Mt. Fuji (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine	5,000 ppm spray x 2	Moderate response with Blue Boy, Bright Eyes and David, but Charles Curtis was not responsive; Apply at 10- to 14-day intervals (<i>Virginia Tech</i>)	South
			3,750 ppm spray x 2 to 3	To control plant growth, begin applications early in crop cycle as stems are rapidly elongating; Also recommends tank mix of 2,500 ppm daminozide + 5 ppm uniconazole x 2 to 3 (<i>Pilon 2006</i>) Mt. Fuji was not responsive to 5,000 ppm spray x 4 applications at 2-week intervals (<i>Michigan State Univ.</i>)	North
		Citadel/Cycocel	Not responsive at 4,000 ppm spray x 1	Blue Boy and Charles Curtis were not responsive (<i>Virginia Tech</i>)	South
750 to 1,250 ppm spray x 2 to 3	Apply 750 ppm early in production and 1,000 ppm later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Weekly sprays of 1,250 ppm (<i>Pilon 2005</i>); Mt. Fuji was stunted with 4 applications of 1,500 ppm at 2-week intervals (<i>Michigan State Univ.</i>)		North		

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION	
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	5,000 + 4,000 ppm spray x 1	Good control of Blue Boy and Charles Curtis; Multiple applications required; David was not responsive (<i>Virginia Tech</i>)	South	
			5,000 + 1,500 ppm spray x 1	Label rate: Blue Boy and Charles Curtis; Multiple applications may be required (max 3) (<i>Cycocel</i>)	Unspecified	
		Piccolo/Piccolo 10 XC /Bonzi/Paczol/Downsize (drenches only)	Not responsive at 160 ppm spray x 1 4 ppm liner soak x 1	Blue Boy not responsive to spray, but moderate growth control of Blue Boy and Bright Eyes with liner soak (<i>Virginia Tech</i>)	South	
			45 to 60 ppm spray x 2 to 3	To control plant growth, begin applications early in crop cycle as stems are rapidly elongating; Weekly 45 ppm sprays as necessary (<i>Pilon 2006</i>); Good control of Mt. Fuji with 60 ppm spray applied 4 times at 2-week intervals (<i>Michigan State Univ.</i>)	North	
			10 ppm drench x 1	Control with single drench (<i>Pilon 2012</i>)	North	
			3 to 4 ppm drench x 1	For Peacock; Drench volume and mg a.i. vary with pot size (<i>Syngenta Culture Sheets</i>)	Unspecified	
			45 ppm spray x 1 to 3 10 ppm drench x 1	Multiple spray applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)		
			Concise /Sumagic	60 ppm spray x 1 2 ppm liner soak x 1	Moderate control of David, but Blue Boy and Charles Curtis were not responsive to sprays; However, Blue Boy, Bright Eyes and David had moderate growth control with liner soaks (<i>Virginia Tech</i>)	South
		5 to 10 ppm spray x 2 to 3		Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Weekly 10 ppm sprays (<i>Pilon 2006</i>); Mt. Fuji was stunted with 4 applications of 15 ppm at 2-week intervals (<i>Michigan State Univ.</i>). Or multiple applications of a tank mix of 3 ppm uniconazole plus 2,000 ppm daminozide (<i>Pilon 2012</i>)	North	
		Topflor		75 ppm spray x 1	Moderate growth control of David; Multiple applications may be required (<i>Virginia Tech</i>)	South
	To increase lateral branching	Augeo	1,600 ppm spray x 1 to 2 on liners and finished plants	Single sprays on finished plants: Laura had a short-term increase in lateral branching with no effect on growth or flowering, while Franz Schubert was not responsive; Multiple applications may improve response; On liners: Bright Eyes treated twice (26 days after sticking and 5 days after transplant) had double the number of shoots and lateral branches with no reduction in growth or flowering (<i>Virginia Tech</i>)	Branching	
			Configure	600 ppm spray x 1 to 2 on liners and finished plants	Single sprays on finished plants: Franz Schubert had an increased number of shoots; David and Laura were not responsive; This rate was our screening rate; Higher rates or multiple applications may be effective; On liners: Bright Eyes treated twice (26 days after sticking and 5 days after transplant) had increased lateral branches with no reduction in growth or flowering (<i>Virginia Tech</i>)	Branching
	Phlox subulata (Thrift, Moss Pink, Creeping Phlox)	To control plant growth	Abide /A-Rest	Less than 100 ppm spray x 6	Excessive growth reduction of Emerald Blue; Reduce rate or frequency (<i>Michigan State Univ.</i>)	North
				Dazide /B-Nine	Not responsive at 5,000 ppm spray x 2	Apple Blossom not responsive (<i>Virginia Tech</i>)
			5,000 ppm spray x 6		Good control of Emerald Blue with weekly applications (<i>Michigan State Univ.</i>)	North
Citadel /Cycocel			1,500 ppm spray x 6	Stunting of Emerald Blue; Reduce rate or frequency (<i>Michigan State Univ.</i>)	North	
Dazide /B-Nine + Citadel /Cycocel Tank Mix			5,000 + 1,500 ppm spray x 1	Moderate control of Apple Blossom (<i>Virginia Tech</i>)	South	
			2,500 + 1,000 ppm spray	(<i>Syngenta Culture Sheets</i>)	Unspecified	

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Phlox subulata (Thrift, Moss Pink, Creeping Phlox) <i>continued</i>	To control plant growth <i>continued</i>	Piccolo/Piccolo 10 XC/Bonzi/Paczol	120 ppm spray x 1	Moderate control of Apple Blossom; Multiple applications may be required (<i>Virginia Tech</i>)	South
			Less than 90 ppm spray x 6	Excessive growth reduction of Emerald Blue; Reduce rate or frequency (<i>Michigan State Univ.</i>)	North
		Concise/Sumagic	15 ppm spray x 1	Good control of Apple Blossom (<i>Virginia Tech</i>)	South
			Less than 15 ppm spray x 6	Stunting of Emerald Blue; Reduce rate or frequency (<i>Michigan State Univ.</i>)	North
		Topflor	30 ppm spray x 1	Good control of Apple Blossom (<i>Virginia Tech</i>)	South
Platycodon grandiflorus (Balloon Flower)	To control plant growth	Abide/A-Rest	25 to 100 ppm spray x 1 to 4	25 to 50 ppm sprays applied once or twice at weekly intervals (<i>Pilon 2006</i>) Excellent growth control of Sentimental Blue with 4 applications at 2-week intervals (<i>Michigan State Univ.</i>)	North
			Collate/Florel	500 ppm spray x 4	Biweekly sprays reduced growth of Sentimental Blue with slight delay in flowering (<i>Michigan State Univ.</i>)
		Dazide/B-Nine	2,500 to 3,750 ppm spray x 2 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); 4 applications of 5,000 ppm spray at 2-week intervals caused excessive growth reduction of Sentimental Blue; Reduce rate or frequency (<i>Michigan State Univ.</i>); 2,500 ppm sprays once or twice; Also recommends 2,000 ppm daminozide + 3 ppm uniconazole x 1 to 2 (<i>Pilon 2006</i>)	North
			1,000 ppm spray	For Miss Tilly, multiple applications as needed to control plant habit; Higher rates may burn leaf edges; Begin applications 2 to 3 weeks after transplant (<i>Syngenta Culture Sheets</i>)	Unspecified
		Citadel/Cycocel	750 to 1,500 ppm spray x 1	(<i>Auburn Univ.</i>)	South
			1,500 ppm spray x 4	4 applications at 2-week intervals provided good growth control of Sentimental Blue (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	3,000 + 1,500 ppm spray x 4	4 applications at 2-week intervals caused excessive growth reduction of Sentimental Blue; Reduce frequency or rate (<i>Michigan State Univ.</i>)	North
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	30 to 60 ppm spray x 1 to 4	30 ppm sprays applied once or twice at weekly intervals or a single drench; Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)	North
			4 ppm drench x 1	4 applications of 60 ppm spray at 2-week intervals provided excellent growth control of Sentimental Blue (<i>Michigan State Univ.</i>)	
		Concise/Sumagic	5 ppm spray x 1 to 2	Weekly sprays (<i>Pilon 2006</i>)	North
				4 applications of 15 ppm spray at 2-week intervals caused excessive growth reduction of Sentimental Blue; Reduce frequency or rate (<i>Michigan State Univ.</i>)	
		Induce lateral or basal branching	Configure	Phyto	Single foliar spray at 300 ppm resulted in significant phytotoxicity to liners (<i>Virginia Grower</i>)
	Polemonium caeruleum (Jacob's Ladder)	To control plant growth	Dazide/B-Nine	2,500 to 3,750 ppm spray x 2 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Weekly applications of 2,500 ppm (<i>Pilon 2005</i>); 3 weekly applications of a tank mix of 1,250 ppm daminozide + 3.75 ppm uniconazole gave excellent control of Heavenly Blue (<i>Pilon 2006</i>)
Dazide/B-Nine + Citadel/Cycocel Tank Mix				2,500 + 1,500 ppm spray x 1	Label rate (<i>Cycocel</i>)
Piccolo/Piccolo 10 XC/Bonzi/Paczol			30 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North
Concise/Sumagic			5 ppm sprays x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North
Topflor			6 ppm drench x 1	Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>)	North

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Primula polyanthus (Polyanthus Primrose)	To control plant growth	Concise /Sumagic	5 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North
Rosmarinus officinalis (Rosemary)	To control plant growth	Collate /Florel	Not responsive at 500 ppm spray x 1 500 ppm drench x 1	Hill Hardy liners treated 2 weeks after removal from mist; Liners not responsive to spray; Moderate height reduction with drench; No significant increase in branching on liners or finished plants (<i>Virginia Tech</i>)	South
		Dazide /B-Nine	2,500 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North
			5,000 ppm spray x 2	Moderate growth control of Hill Hardy (<i>Virginia Tech</i>)	South
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	2,000 + 1,000 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North
		Piccolo/Piccolo 10 XC /Bonzi/Paczol	30 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North
		Concise /Sumagic	5 ppm spray x 2 to 3	Weekly sprays (<i>Pilon 2005</i>)	North
	To increase lateral or basal branching	Augeo	400 to 800 ppm spray x 1 on liners	Applied approximately 28 days after sticking, moderately rooted, increased numbers of shoots and branches without reducing growth of liners (<i>Virginia Tech</i>)	Branching
		Configure	300 ppm spray x 2 on liners	Applied approximately 28 days after sticking, moderately rooted, increased numbers of shoots and branches and shoot growth of liners (<i>Virginia Tech</i>)	Branching
Rosa Knock Out (Knock Out Rose)	To control plant growth	Piccolo/Piccolo 10 XC /Bonzi/Paczol	60 ppm sprays x 2 to 6	Multiple applications required (<i>Pilon 2012</i>)	North
		Concise /Sumagic	45 to 60 ppm spray x 1 or 0.25 ppm drench x 1	Short-term response to sprays; Multiple spray applications required; Drench controlled growth through 6 weeks after treatment, reduced height 35% without reducing width; Drench applied at 10 fl. oz. per trade gal. pot; Drench volume and mg a.i. will vary with pot size (<i>Virginia Tech</i>)	South
	To increase lateral branching	Augeo	800 to 1,200 ppm spray x 1	Apply when shoots are 2- to 3-in. long, early in production to allow new growth to cover yellowed leaves. Increased branching and improved symmetry over hand pruning; Some growth control. Delays flowering about 10 days (<i>Auburn Univ.</i>)	Branching
Rudbeckia fulgida var. sullivantii Goldsturm (Orange Coneflower, Black-eyed Susan)	To control plant growth, begin applications as flower stalks near leaf canopy as they bolt rapidly	Abide /A-Rest	50 ppm spray x 2 to 3	Begin applications as flower stalks near leaf canopy, as they bolt rapidly (<i>Pilon 2006; Univ. Minnesota</i>); 6 weekly 100 ppm sprays stunted plants; Reduce rate or frequency (<i>Michigan State Univ.</i>)	North
		Collate /Florel	Not responsive at 500 ppm spray x 1	No growth control and no flowering data (<i>Virginia Tech</i>)	South
		Dazide /B-Nine	3,750 to 5,000 ppm spray x 2 to 6	Apply 2 to 3 weekly applications of 3,750 ppm spray or of a tank mix of 2,500 ppm daminozide + 5 ppm uniconazole (<i>Pilon 2006</i>) Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); 6 weekly sprays at 5,000 ppm gave excellent control (<i>Michigan State Univ.</i>)	North
			Not responsive at 4,000 ppm spray x 1	Not responsive (<i>Virginia Tech</i>)	South
		Citadel /Cycocel	1,000 to 1,500 ppm spray x 2 to 3	Apply 1,000 ppm early in production and 1,250 ppm later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); 6 weekly sprays at 1,500 ppm gave excellent control (<i>Michigan State Univ.</i>)	North
			Dazide /B-Nine + Citadel /Cycocel Tank Mix	1,250 to 2,500 + 1,000 to 1,250 ppm spray x 2 to 3	Apply 2 to 3 weekly sprays of 2,500 + 1,250 ppm (<i>Pilon 2006</i>); Apply 1,250 + 750 ppm early in production and 2,500 + 1,000 ppm later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Rudbeckia fulgida var. sullivantii (Orange Coneflower, Black-eyed Susan) <i>continued</i>	To control plant growth, begin applications as flower stalks near leaf canopy as they bolt rapidly <i>continued</i>	Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	80 to 120 ppm spray x 1	Multiple applications may be necessary (<i>Virginia Tech</i>)	South
			10 to 45 ppm spray x 2 to 3	Apply 10 ppm early in production and 20 ppm later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Weekly 45 ppm sprays as necessary (<i>Pilon 2006</i>); 6 weekly sprays at 90 ppm gave excellent control (<i>Michigan State Univ.</i>)	North
			6 to 10 ppm drench x 1	Drench volume and mg a.i. will vary with pot size (<i>Pilon 2012</i>);	North
		Concise/Sumagic	30 ppm spray x 1 1 ppm liner soak x 1 2 ppm drench x 1	Good control; Drench applied as 2 fl. oz. per qt. pot; Drench volume and mg a.i. will vary with pot size (<i>Virginia Tech</i>)	South
	10 ppm spray x 2 to 3		Apply 2 to 3 weekly sprays (<i>Pilon 2006</i>); 6 weekly sprays at 15 ppm caused excessive growth reduction; Reduce rate or frequency (<i>Michigan State Univ.</i>) Or apply 2,500 ppm daminozide + 5 ppm uniconazole x 1 to 2 (<i>Pilon 2012</i>)	North	
	Induce lateral or basal branching on liners	Configure	300 ppm spray x 1	Single foliar spray increased basal branching with significant early phytotoxicity (<i>Virginia grower</i>)	Branching
600 ppm spray x 1 on liners			No increased branching of <i>Viette's Little Suzie</i> , but decreased plant width (<i>Virginia Tech</i>)	Branching	
Rudbeckia hirta (Black-eyed Susan)	To control plant growth, apply PGRs just after bloom initiation, but before bud has formed to reduce flower delay (<i>Benary, GrowerTalks 2010</i>)	Dazide/B-Nine	2,500 to 5,000 ppm spray x 1	For Denver Daisy, apply just after bloom initiation, but before bud has formed to reduce flower delay (<i>Benary, GrowerTalks 2010</i>)	Unspecified
			2,500 to 5,000 ppm spray x 1	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
		Citadel/Cycocel	Phyto at 1,500 ppm spray x 1	Excessive phytotoxicity on Indian Summer (<i>Virginia Tech</i>)	South
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	Phyto at 5,000 + 1,500 ppm spray x 1	Excessive phytotoxicity on Indian Summer (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	160 ppm spray x 1	Little control of Indian Summer; Multiple applications or higher rates required (<i>Virginia Tech</i>)	South
			30 ppm spray x 1 1 to 5 ppm drench x 1	For Denver Daisy, apply just after bloom initiation, but before bud has formed to reduce flower delay; Apply drench at 4 to 6 weeks after transplant; Drench volume and mg a.i. vary with pot size (<i>Benary, GrowerTalks 2010</i>)	Unspecified
		Concise/Sumagic	10 ppm spray x 1	For Denver Daisy (<i>Benary, GrowerTalks 2010</i>)	Unspecified
	25 ppm spray x 1		Good control under outdoor conditions (<i>Clemson Univ.</i>)	South	
	To increase basal branching	Configure	200 ppm spray x 1	For Denver Daisy, spray to glisten (<i>Benary, GrowerTalks 2010</i>)	Branching
	Salvia leucantha (Velvet Sage, Mexican Sage)	To control plant growth	Dazide/B-Nine	5,000 ppm spray x 3	Apply at 10- to 14-day intervals (<i>Univ. Georgia</i>)
Dazide/B-Nine + Citadel/Cycocel Tank Mix			5,000 + 1,500 ppm spray x 1	(<i>Univ. Georgia</i>)	South
Citadel/Cycocel			2,250 ppm spray x 1	(<i>Univ. Georgia</i>)	South
Piccolo/Piccolo 10 XC/Bonzi/Paczol			60 ppm spray x 1	(<i>Univ. Georgia, Virginia Tech</i>)	South
Concise/Sumagic			30 ppm spray x 1	No landscape persistence at 30 ppm (<i>Univ. Georgia</i>)	South
Topflor			30 ppm spray x 1	(<i>Virginia Tech</i>)	South

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Salvia x sylvestris Salvia nemorosa Salvia hybrids Meadow Sage) Salvia officinalis (Garden sage)	To control plant growth	Abide/A-Rest	25 to 100 ppm spray x 2 to 6	2 to 3 sprays at 25 to 50 ppm (<i>Pilon 2006</i>); 2 to 3 sprays at 50 ppm (<i>Univ. Minnesota</i>); Good control of growth of Blue Queen with 6 weekly spray applications of 100 ppm (<i>Michigan State Univ.</i>)	North
			1 to 2 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>SePro Specific Species and Application Rates</i>)	Unspecified
		Collate/Florel	Not responsive at 400 ppm spray x 4	All sprays phytotoxic to May Night; Did not reduce flower buds; Reduced growth (<i>Michigan State Univ.</i>)	North
			125 to 500 ppm spray x 1 or 2 on liners and finished plants 10 to 40 ppm liner soaks x 1 on liners	Treatment of Aurea liners just after removal from mist with 125 to 500 ppm sprays or 10 to 40 ppm liner soaks gave no growth control and only 10 ppm liner soak x 1 increased branching of liners; There were no persistent effects on finished plants. Biweekly 500 ppm sprays gave moderate growth control and increased number of inflorescences of May Night (<i>Virginia Tech</i>)	South
			5,000 ppm spray x 2	Indigo Spires not responsive, but this rate stunted and delayed flowering of Blue Queen, and controlled growth and increased flower number of May Night (<i>Virginia Tech</i>)	South
		Dazide/B-Nine	2,500 to 5,000 ppm spray x 2 to 3	Daminozide has shown the most effectiveness of all PGRs on salvia; Apply 2,500 ppm sprays 2 to 3 times weekly; Also recommends 2 to 3 sprays of tank mix of 2,000 daminozide + 3 ppm uniconazole (<i>Pilon 2006</i>); Apply 3,750 ppm early in production and 5,000 ppm later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); 6 weekly 5,000 ppm sprays stunted Blue Queen; Reduce rate or frequency (<i>Michigan State Univ.</i>)	North
			1,500 to 2,500 ppm spray	Generally not needed, but 1,500 to 2,500 ppm sprays are effective (<i>Ball Hort</i>); Sprays at 2,500 ppm effective on Bordeaux (<i>Syngenta Culture Sheets</i>); 2,500 to 3,750 ppm sprays effective on S. officinalis Aurea (<i>PW Culture Sheets</i>)	Unspecified
		Citadel/Cycocel	750 to 1,500 ppm spray x 2 to 6	Apply 750 ppm early in production and 1,000 ppm later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Apply 2 to 3 weekly 1,250 ppm sprays (<i>Pilon 2006</i>); Good control of growth of Blue Queen with 6 weekly spray applications of 1,500 ppm (<i>Michigan State Univ.</i>)	North
			80 ppm spray x 1	Cultivar differences: Good control of Blue Queen with single spray at 80 ppm; Indigo Spires not responsive at 60 ppm x 1; Blue Hill and May Night not responsive at 160 x 1 (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	30 ppm spray x 2 to 3 6+ ppm drench x 1	Weekly sprays as necessary; Drench volume and mg a.i. will vary with pot size (<i>Pilon 2006</i>); Blue Queen not responsive with 6 weekly spray applications of 90 ppm (<i>Michigan State Univ.</i>)	North
			10 to 15 ppm spray 40 to 60 ppm spray x 1	Generally not needed, but paclobutrazol is effective (<i>Ball Hort</i>) 40 to 60 ppm spray is the label rate.	Unspecified
			15 to 60 ppm spray x 1	Indigo Spires very responsive at 15 ppm, but may require multiple applications; Good control of Blue Queen with a single 60 ppm spray; May Night not responsive to a single 20 ppm spray (<i>Virginia Tech</i>)	South
		Concise/Sumagic	5 to 15 ppm spray x 2 to 6	2 to 3 weekly sprays at 5 ppm (<i>Pilon 2006</i>). Excellent control of growth of Blue Queen with 6 weekly spray applications of 15 ppm (<i>Michigan State Univ.</i>). Apply 5 ppm early in production and 10 ppm later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
			10 ppm spray x 1	Single application early in production (<i>Oklahoma grower, Sumagic Advisor 2004</i>)	South
			Configure	300 ppm spray x 1 or 2 on liners	Single or multiple foliar sprays applied to May Night approximately 34 days after sticking increased basal branching; Apply after liners are well rooted (<i>Virginia Tech</i>)
	400 ppm spray x 1 on finished plants	Single foliar spray applied 2 weeks after potting; Branching increased; Flowering delayed with higher rates (<i>NC State Univ.</i>)		Branching	

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION	
Scabiosa columbaria (Pincushion Flower)	To control plant growth, apply PGRs as flower stalk starts to elongate or if rosette appears to be elongating with flowers (<i>Pilon 2006</i>)	Abide/A-Rest	25 to 50 ppm spray x 2 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); No control of Butterfly Blue with four 100 ppm sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North	
			1 to 2 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>SePro Specific Species and Application Rates</i>)	Unspecified	
		Collate/Florel	Not responsive at 400 ppm spray x 4	All sprays phytotoxic to Giant Blue; Reduced growth. Four biweekly 500 ppm sprays had no effect on Butterfly Blue (<i>Michigan State Univ.</i>)	North	
			500 ppm spray x 2	Biweekly sprays gave moderate growth control and slightly delayed flowering of Butterfly Blue (<i>Virginia Tech</i>)	South	
		Dazide/B-Nine	5,000 ppm spray x 3 to 4	Good growth control of Butterfly Blue (<i>Univ. Georgia</i>) and moderate control of overwintered Pink Mist (<i>Virginia Tech</i>)	South	
			2,500 to 5,000 ppm spray x 2 to 3	Weekly 2,500 ppm sprays (<i>Pilon 2006</i>); Apply 2,500 ppm early in production and 3,750 ppm later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Good control of Butterfly Blue with four 5,000 ppm sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North	
			2,500 to 4,000 ppm spray	Scabiosa is responsive to daminozide (<i>Ball Hort</i>)	Unspecified	
		Citadel/Cycocel	Not responsive at 1,500 ppm spray x 1	Pink Mist not responsive (<i>Virginia Tech</i>)	South	
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Moderate control of Butterfly Blue, but little control of overwintered Pink Mist; Test multiple applications (<i>Virginia Tech</i>)	South	
			2,500 to 4,000 + 1,000 to 1,500 ppm spray	Scabiosa is responsive to tank mix (<i>Ball Hort</i>)	Unspecified	
		Piccolo/Piccolo 10 XC/Bonzi/Paczol	60 ppm spray x 1	Moderate control of Pink Mist (<i>Virginia Tech</i>)	South	
			30 ppm spray x 2 to 3	Weekly applications (<i>Pilon 2006</i>); Excessive growth reduction of Butterfly Blue with four 60 ppm sprays at 2-week intervals; Reduce rate or frequency (<i>Michigan State Univ.</i>)	North	
			30 ppm spray x 1 to 3 3 ppm drench x 1	Multiple spray applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)	Unspecified	
		Concise/Sumagic	20 to 30 ppm spray x 1	Good growth regulation of Butterfly Blue with 20 ppm (<i>Univ. Georgia</i>), but higher rates or multiple applications necessary for Pink Mist (<i>Virginia Tech</i>)	South	
			5 ppm spray x 2 to 3	Weekly sprays at 5 ppm (<i>Pilon 2006</i>); Excessive growth reduction of Butterfly Blue with four 15 ppm sprays at 2-week intervals; Reduce rate or frequency (<i>Michigan State Univ.</i>)	North	
			10 to 20 ppm spray	Scabiosa is responsive to uniconazole (<i>Ball Hort</i>)	Unspecified	
		Topflor	30 to 45 ppm spray x 1	Moderate control of Pink Mist; Test multiple applications as necessary; High rates (60 to 75 ppm) reduced flowering (<i>Virginia Tech</i>)	South	
		Induce lateral or basal branching	Configure	Not responsive at 50 to 800 ppm spray x 1	Single foliar spray applied 2 weeks after potting had no effect on branching (<i>NC State Univ.</i>)	Branching

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Sedum x Autumn Joy (Sedum)	To control plant growth	Abide/A-Rest	Not responsive at 100 ppm spray x 4	Autumn Joy not responsive to 4 sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North
		Collate/Florel	500 ppm spray x 4	Moderate growth control of Autumn Joy with biweekly sprays (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine	5,000 ppm spray x 2	Moderate control of Autumn Joy; Apply at 10- to 14-day intervals (<i>Univ. Georgia, Virginia Tech</i>)	South
			2,500 to 5,000 ppm spray x 2 to 4	2 to 3 weekly sprays at 2,500 ppm; Also recommends tank mix of 2,000 ppm daminozide + 15 ppm paclobutrazol (<i>Pilon 2006</i>) Good control of Autumn Joy with four 5,000 ppm sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North
		Citadel/Cycocel	Not responsive at 4,000 ppm spray x 1	Autumn Joy not responsive (<i>Virginia Tech</i>)	South
			Not responsive at 1,500 ppm spray x 4	Autumn Joy not responsive to 4 sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North
		Collate/Florel	300 to 500 ppm x 1	To help control growth and increase branching or delay flowering (<i>Ball Hort</i>)	Unspecified
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Moderate control of Autumn Joy; Multiple applications may be required (<i>Virginia Tech</i>)	South
			2,000 + 1,000 ppm spray x 2 to 3	Weekly applications (<i>Pilon 2006</i>)	North
			2,500 to 3,500 + 750 to 1,000 ppm spray	Tank mix will help control growth (<i>Syngenta Culture Sheets</i>)	Unspecified
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	80 to 160 ppm spray x 1 to 2 Less than 10 ppm drench x 1	Good control of Autumn Joy with a single 80 ppm spray, but Matrona requires multiple applications at higher rates; Excessive growth regulation of Autumn Joy with 10 ppm drench at 2 fl. oz. per quart pot (<i>Virginia Tech</i>)	South
			30 to 60 ppm spray x 2 to 4 6 to 10 ppm drench x 1	2 to 9 weekly 30 ppm sprays (<i>Pilon 2006</i>) or single drench; Drench volume and mg a.i. vary with pot size (<i>Pilon 2012</i>); Excellent control of Autumn Joy with four 60 ppm sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North
		Concise/Sumagic	15 to 45 ppm spray x 1	Rates higher than 30 ppm on Autumn Joy caused persistent reductions in plant growth in the landscape (<i>Univ. Georgia</i>); Matrona requires higher rates and/or multiple applications (<i>Virginia Tech</i>)	South
			5 to 15 ppm spray x 2 to 4	2 to 3 weekly 5 ppm sprays (<i>Pilon 2006</i>); Excellent control of Autumn Joy with four 15 ppm sprays at 2-week intervals (<i>Michigan State Univ.</i>)	North
			Topflor	37 to 60 ppm spray x 1	Good control of Autumn Joy with a single 37 ppm spray; May require multiple applications; Matrona height was not reduced with a single 120-ppm spray, but width was reduced with a single 60-ppm spray (<i>Virginia Tech</i>)
To increase lateral branching	Augeo	400 ppm spray x 2 on liners	On liners: Autumn Joy treated twice (18 days after sticking and 5 days after transplant) had double the number of shoots and 3 times as many lateral branches with no reduction in growth (<i>Virginia Tech</i>)	Branching	
	Configure	600 ppm spray x 2 on liners	On liners: Autumn Joy treated twice (18 days after sticking and 5 days after transplant) had double the number of shoots and 3 times as many lateral branches with no reduction in growth (<i>Virginia Tech</i>)	Branching	
Sedum spurium	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/Paczol	10 to 20 ppm spray x 2 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North
		Concise/Sumagic	5 to 10 ppm spray x 2 to 3	Apply lower rates early in production and higher rates later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>)	North

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Sempervivum (Hens and Chicks)	To increase number of offsets	Configure	200 to 400 ppm spray x 1	Increased offsets; Did not affect subsequent rooting of offsets; Cultivars varied in the number of offsets produced (<i>NC State Univ.</i>)	Branching
Sorghastrum nutans (Indiangrass)	To control plant growth	Dazide /B-Nine	5,000 ppm spray x 2	Moderate growth response with Indian Steel (<i>Virginia Tech</i>)	South
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	5,000 + 1,500 ppm spray x 2	Good height control with Indian Steel (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC /Bonzi/Paczol	160 ppm spray x 1	Moderate growth response with Indian Steel (<i>Virginia Tech</i>)	South
		Concise /Sumagic	45 ppm spray x 1	Moderate growth response with Indian Steel; May require multiple applications (<i>Virginia Tech</i>)	South
Stokesia laevis (Stokes Aster)	To control plant growth	Abide /A-Rest	100 ppm spray x 4	Biweekly sprays gave excellent growth control of Klaus Jelitto (<i>Michigan State Univ.</i>)	North
		Collate /Florel	500 ppm spray x 4	Biweekly sprays gave excellent growth control of Klaus Jelitto and plants appear more well branched (<i>Michigan State Univ.</i>)	North
		Citadel /Cycocel	1,500 ppm spray x 4	Moderate growth control of Klaus Jelitto (<i>Michigan State Univ.</i>)	North
		Dazide /B-Nine	5,000 ppm spray x 2	Purple Parasols and Klaus Jelitto responsive; Apply at 10- to 14-day intervals (<i>Univ. Georgia, Virginia Tech</i>)	South
			5,000 ppm spray x 4	Biweekly sprays gave excellent growth control of Klaus Jelitto (<i>Michigan State Univ.</i>)	North
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	5,000 + 1,500 to 2,250 ppm spray x 1	Purple Parasols and Klaus Jelitto responsive; May require multiple applications (<i>Univ. Georgia, Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC /Bonzi/Paczol	40 to 80 ppm spray x 1	Good control of Purple Parasols. Klaus Jelitto was not responsive at 80 ppm spray x 1 or 2 ppm drench x 1 applied at 2 fl. oz. per quart pot; Drench volume and mg a.i. vary with pot size (<i>Univ. Georgia, Virginia Tech</i>)	South
			Less than 60 ppm spray x 4	Biweekly sprays gave excessive growth reduction of Klaus Jelitto; Reduce frequency (<i>Michigan State Univ.</i>)	North
		Concise /Sumagic	Less than 60 ppm spray x 1	Excessive control of Silver Moon at 60 ppm, but Purple Parasols and Klaus Jelitto were not responsive at this rate (<i>Univ. Georgia, Virginia Tech</i>)	South
			Less than 15 ppm spray x 4	Biweekly sprays gave excessive growth reduction of Klaus Jelitto; Reduce frequency (<i>Michigan State Univ.</i>)	North
		To induce lateral branching	Configure	Not responsive at 600 ppm spray x 1	Silver Moon not responsive; This rate was our screening rate; Higher rates may be effective (<i>Virginia Tech</i>)
	Tradescantia virginiana (Virginia Spiderwort)	To control plant growth	Dazide /B-Nine	5,000 ppm spray x 2	Moderate growth control Red Cloud and Blue Stone. Multiple applications necessary (<i>Virginia Tech</i>)
Dazide /B-Nine + Citadel /Cycocel Tank Mix			5,000 + 1,500 ppm spray x 2	Moderate growth control Red Cloud; Multiple applications necessary. Blue Stone not responsive at 5,000 + 1,500 ppm spray x 1 (<i>Virginia Tech</i>)	South
Piccolo/Piccolo 10 XC /Bonzi/Paczol			40 to 80 ppm spray x 1	Use higher rate for Red Cloud (<i>Virginia Tech</i>)	South
Concise /Sumagic			15 to 30 ppm spray x 1	Use higher rate for Red Cloud (<i>Virginia Tech</i>)	South
Topflor			15 to 45 ppm spray x 1	Red Cloud responsive to low rate. Use higher rate for Blue Stone (<i>Virginia Tech</i>)	South

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Verbena bonariensis (Tall Verbena, Brazilian Verbena)	To control plant growth	Collate /Florel	500 ppm spray x 1 on liners	Spray applied 2 days after removal of cuttings from mist; Increased lateral branching (3.5 times) of Lollipop liners with moderate growth regulation (3 weeks after treatment); No persistent effects on finished plants (8 weeks after treatment) (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC /Bonzi/ Paczol/Downsize (drenches only)	80 ppm spray x 1 10 ppm drench x 1	Moderate height control of Lollipop with single treatment; Drench at 2 fl. oz. per quart pot; Drench volume and mg a.i. will vary with pot size (<i>Virginia Tech</i>)	South
	To induce lateral branching	Configure	300 ppm spray x 2 on liners	Increased lateral branching (2.5 times) of Lollipop liners; First spray applied 13 days after sticking, second spray 14 days later; No persistent effect on finished plants (<i>Virginia Tech</i>)	Branching
		Augeo	400 ppm spray x 1 on liners 800 ppm spray x 2 on stock plants	Spray applied 2 days after removal of cuttings from mist; Increased lateral branching (7 times) of Lollipop liners with moderate growth regulation (3 weeks after treatment); No persistent effects on finished plants (8 weeks after treatment). Delayed flowering of Lollipop stock plants and produced 50% more tip cuttings, which rooted and flowered normally (<i>Virginia Tech</i>)	Branching
Verbena canadensis (Clump Verbena)	To control plant growth	Collate /Florel	500 ppm spray x 1 to 2	Moderate growth reduction of Homestead Purple and Taylortown Red with no negative effects (<i>Virginia Tech</i>)	South
			500 ppm spray x 1	Moderate growth control of Homestead Purple with delayed flowering (<i>Auburn Univ.</i>)	South
		Dazide /B-Nine	Not responsive at 5,000 ppm spray x 2	Homestead Purple not responsive (<i>Virginia Tech</i>)	South
		Dazide /B-Nine + Citadel /Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Good control of Homestead Purple, but multiple applications may be required (<i>Virginia Tech</i>)	South
			2,000 + 1,000 ppm spray x 2 to 3	Weekly sprays as necessary (<i>Pilon 2005</i>)	North
		Piccolo/Piccolo 10 XC /Bonzi/ Paczol/Downsize (drenches only)	45 ppm spray x 2 to 3 4 ppm drench x 1	Weekly sprays as necessary; Drench volume and mg a.i. will vary with pot size (<i>Pilon 2005, 2006</i>)	North
			120 to 160 ppm spray x 1 Greater than 3 ppm drench x 1	Drench volume and mg a.i. vary with pot size (<i>Label rate</i>)	Unspecified
	Concise /Sumagic	15 to 60 ppm spray x 1 8 ppm drench x 1 2 ppm liner soak x 1	A 15 ppm spray application had very short-term effect on Homestead Purple; Multiple applications required; A 60-ppm spray application gave moderate control of Homestead Red Carpet; 2 applications of 60-ppm caused excessive growth reduction; An 8-ppm drench or 2-ppm liner soak gave moderate control of Homestead Red Carpet; Test higher rates; Drench applied at 10 fl. oz. per trade gal. pot, drench volume and mg a.i. will vary with pot size (<i>Virginia Tech</i>)	South	
Induce lateral or basal branching	Configure	250 to 1,000 ppm spray x 1	Single foliar sprays immediately after pinching increased lateral branching; 1,000 ppm controlled shoot elongation by 19% (<i>Virginia Tech</i>)	Branching	
Verbena rigida (Clump Verbena)	Induce lateral or basal branching	Augeo	800 ppm spray x 1	Increased branching; Little height reduction (<i>Virginia Tech</i>).	Branching
		Configure	600 ppm spray x 1	Increased number of shoots and branching (<i>Virginia Tech</i>).	Branching
		Collate /Florel	NR @ 500 ppm spray x 2	Higher rates reduced height slightly, but there was no increased branching (<i>Virginia Tech</i>).	Branching

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
Veronica spicata (Spike speedwell) Veronica longifolia (Speedwell) Veronica hybrids™	To control plant growth	Abide/A-Rest	25 to 100 ppm spray x 2 to 4	One or two weekly sprays at 25 ppm (<i>Pilon 2006</i>); Apply 50 ppm early in production and 75 ppm later under better growing conditions; Multiple applications may be required (<i>Univ. Minnesota</i>); Three 100-ppm sprays at 10-day intervals gave excellent control of Blue (<i>Michigan State Univ.</i>)	North
			Collate/Florel	125 to 500 ppm spray x 1 on liners 10 to 40 ppm liner soak x 1 on liners	Treatments applied the day after removal of cuttings from mist. No height control of Goodness Grows liners or finished plants, but liners had 4 times the number of basal branches with 500-ppm spray; No persistent increase in branching on finished plants. First Love liners showed no response to 125- to 500-ppm spray or 10- to 40-ppm liner soak treatments, but the finished plants had 3 times the number of leaders and a greater number of lateral branches (<i>Virginia Tech</i>)
		500 ppm spray x 4		Biweekly sprays did not significantly affect height, but increased branching and flowering of Icicle. Weekly sprays of 750 ppm x 4 caused excessive growth reduction and delayed flowering of Blue Bouquet (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine	5,000 ppm spray x 2	Good control of Red Fox (<i>Univ. Georgia</i>)	South
			2,500 to 5,000 ppm spray x 1 to 4	1 or 2 weekly 2,500 ppm sprays as necessary (<i>Pilon 2006</i>)	North
				Three 5,000 ppm sprays at 10-day intervals gave moderate control of Blue, while 4 weekly sprays gave excellent control of Blue Bouquet (<i>Michigan State Univ.</i>)	
		2,000 to 3,000 ppm spray	Effective on Red Fox (<i>Ball Hort</i>)	Unspecified	
		Citadel/Cycocel	Not responsive at 4,000 ppm spray x 1	Red Fox not responsive (<i>Univ. Georgia</i>)	South
			1,500 ppm spray x 3 to 4	4 weekly sprays gave good control of Blue Bouquet, while 3 sprays at 10-day intervals gave no control of Blue (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm sprays x 2	Red Fox responsive (<i>Univ. Georgia</i>)	South
			2,000 + 1,000 ppm spray x 1 to 2	Weekly sprays (<i>Pilon 2006</i>)	North
			2,500 + 1,000 ppm spray	Effective on Red Fox (<i>Ball Hort</i>)	Unspecified
		Piccolo/Piccolo 10 XC/Bonzi/Paczol/Downsize (drenches only)	Less than 40 ppm spray x 1	Red Fox sensitive; Test lower rates (<i>Univ. Georgia</i>)	South
			30 ppm spray x 1 to 2	Weekly sprays (<i>Pilon 2006</i>); Three 60 ppm sprays at 10-day intervals were not effective on Blue, while 4 weekly 90-ppm sprays severely stunted Blue Bouquet (<i>Michigan State Univ.</i>)	North
			Not responsive at 80 ppm spray x 1 2 to 3 ppm liner soak x 1 Less than 4 ppm drench x 1	Pink Panther not responsive to spray, but moderate growth control with liner soak; Use lower drench rates; Drench applied at 10 fl. oz. per trade gallon pot; Drench volume and mg a.i. will vary with pot size (<i>Virginia Tech</i>)	South
			15 to 20 ppm spray	Effective on Red Fox (<i>Ball Hort</i>)	Unspecified
			30 ppm spray x 1 to 3 6 ppm drench x 1	Multiple spray applications may be necessary; Drench volume and mg a.i. vary with pot size (<i>Syngenta Guide to Protecting Perennials 2009</i>)	Unspecified
			Concise/Sumagic	10 ppm spray x 1	Red Fox very sensitive (<i>Univ. Georgia</i>)
		5 ppm spray x 1 to 2		1 or 2 weekly sprays (<i>Pilon 2006</i>); Multiple spray applications at 15 ppm severely stunted Blue and Blue Bouquet (<i>Michigan State Univ.</i>)	North
	To increase lateral branching	Augeo	400 ppm spray x 1 on liners	Goodness Grows treated once approximately 28 days after sticking had 8 times the number of lateral branches, but shoot height was significantly reduced on liners; Plants grew out normally (<i>Virginia Tech</i>)	Branching

CROP	PURPOSE	PRODUCT	APPLICATION RATE (PPM) X NUMBER OF APPLICATIONS*	PRECAUTIONS OR REMARKS	REGION
		Configure	500 ppm spray x 4	Biweekly sprays increased branching of Icicle with moderate reduction in plant height (<i>Michigan State Univ.</i>)	Branching
			300 ppm spray x 2 on liners	Goodness Grows treated twice (approximately 28 days after sticking and 2 weeks later) had 4 times the number of lateral branches; Shoot height was slightly reduced on liners; No effect on finished plants (<i>Virginia Tech</i>)	Branching
Veronica x Sunny Border Blue (Hybrid Speedwell)	To control plant growth	Collate/Florel	500 ppm spray x 1 on liners	No effect on growth or branching of liners or finished plants (<i>Virginia Tech</i>)	South
			400 ppm spray x 4	Weekly sprays reduced growth and flower buds, but increased branching of Sunny Border Blue stock plants; Higher rates were phytotoxic (<i>Michigan State Univ.</i>)	North
		Dazide/B-Nine	5,000 ppm spray x 2	Multiple applications required; Apply at 10- to 14-day intervals (<i>Univ. Georgia, Virginia Tech</i>)	South
			Tank mix	Tank mix of 2,500 ppm daminozide + 20 ppm paclobutrazol gave good control (<i>Univ. Calif.</i>)	
		Citadel/Cycocel	750 to 1,000 ppm spray x 1	Higher rates cause persistent delay of growth in the landscape (<i>Univ. Georgia</i>)	South
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Good control; Multiple applications may be required (<i>Univ. Georgia, Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC/Bonzi/Paczol	20 ppm spray x 1	Very sensitive (<i>Univ. Georgia</i>)	South
		Concise/Sumagic	10 ppm spray x 1 Less than 1 ppm drench x 1	Very sensitive; Persistent reductions in plant growth continue in the landscape at 15 ppm; Drench applied at 4 fl. oz. per qt. pot; Drench volume and mg a.i. will vary with pot size (<i>Univ. Georgia</i>)	South
Topflor	30 ppm spray x 1	Moderate control; Multiple applications may be required (<i>Virginia Tech</i>)	South		
Vinca minor (Lesser Periwinkle)	To control plant growth	Dazide/B-Nine	5,000 ppm spray x 2	Excessive reductions under nursery conditions; Reduce rate or frequency (<i>Virginia Tech</i>)	South
		Dazide/B-Nine + Citadel/Cycocel Tank Mix	5,000 + 1,500 ppm spray x 1	Moderate reductions under nursery conditions; May require multiple applications (<i>Virginia Tech</i>)	South
		Piccolo/Piccolo 10 XC/Bonzi/Paczol	40 ppm spray x 1	Moderate effect under nursery conditions; May require multiple applications (<i>Virginia Tech</i>)	South
		Concise/Sumagic	15 ppm spray x 1	Moderate effect under nursery conditions; May require multiple applications (<i>Virginia Tech</i>)	South
	To increase lateral branching	Configure	Not responsive at 1,200 ppm spray x 1	Sterling Silver was not responsive (<i>Virginia Tech</i>)	Branching

* Spray rates given are for spray applications at label recommended volumes unless stated otherwise. Not all uses listed are on the label. Check product label before using.

General Resources

Virginia Tech Floriculture website: www.hort.vt.edu/floriculture/pubs.html

Michigan State University PGR website: hrt.msu.edu/florae/pgrinfo

North Carolina State University Floriculture website: www.floricultureinfo.com

Pilon, P. 2006. "Perennial Solutions"; Ball Publishing, West Chicago, Illinois

Latimer, J. and B. Whipker (eds.). 2010. Configure Product Information and University Results.

Fine Americas, Inc., Walnut Creek, California: <http://bit.ly/1TODUKO>

Collate Use Tips

By Brian E. Whipker, North Carolina State University

In greenhouse floriculture production, Florel has been the go-to ethephon formulation for years. It's available as a 3.9% active ingredient solution. Fine Americas introduced Collate in 2013, which is a higher-concentration (21.7%) product. Greenhouse label uses for Collate include inducing flowering of ornamental bromeliads; avoidance of stem topple of potted hyacinths; height control of potted daffodils; and flower inhibition, increase in axillary shoot development and height control in a variety of ornamental crops. In order to get the most out of your Collate applications, below are some use tips to consider.

Application parameters. Collate breaks down and becomes inactive with water pH conditions greater than 6.1. While all of the registered ethephon products contain acidifiers, in areas with high levels of alkalinity, the alkalinity will need to be neutralized BEFORE mixing the solution. The ideal endpoint pH for a Collate solution is -4.5 to 5.0. Be careful to avoid getting the solution pH too low, though—leaf phytotoxicity can occur with ethephon applications when the pH is below 3.

Temperatures. In addition, Collate activity is linked to active plant growth. Applications made when temperatures are below 60F (15.5C) or higher than 95F (35C) will be less effective. Therefore, during times when temperatures are excessive, make applications either early in the morning or late at night.

Timing. When used to promote axillary branching, the plants should be well-rooted in the container. Typically, rooting to the side of the pot will occur within two weeks. Applications made before plugs or plants are well-rooted can result in retarded root development.

When used for prevention of early flowering, it should be noted that the last Collate application should be made six to eight weeks prior to the intended sales date. Late spray applications will result in flower delay.

Suitable application windows should also be noted with stock plants. Ethylene can inhibit rooting, so applications shouldn't be made within seven days of harvesting cuttings.

Avoid applications to stressed plants. When used correctly, Collate applications will result in enhanced plant growth. Because ethylene produced by Collate is a stress enhancer, it's important to have the plants actively growing and not under suboptimal conditions (heat, drought, environmental or disease stress). Lower leaf yellowing typically occurs when Collate is applied to drought-stressed plants.

Optimal concentrations. For most plants, Collate spray rates are typically at 500 ppm. Complete spray coverage is required because Collate isn't translocated in the plant. This is especially important for plants such as garden mums. Incomplete spray applications will result in

uneven growth and flowering. Research has shown that drench and pre-plant liner soak application rates are lower—in the range of 50 to 250 ppm. While a label amendment has been applied for to allow drench applications of Collate, it has not yet been approved.

Phytotoxicity. Some cultivars have a greater sensitivity to Collate. Cupping and distortion of the young expanding leaves can occur. In addition, over-application can also result in distortion and leaf bleaching.

Protective equipment and REI. Collate is acidic, and because of this, it's a minor eye and skin irritant. That's the reason it has a longer REI of 48 hours. In addition, it should be noted that eye protection is required, along with protective gloves, coveralls, apron, shoes and headgear for overhead applications. A box of baking soda should be handy to neutralize the acidity of Collate in case it comes in contact with your skin.

In summary, Collate is effective in controlling excessive growth of many greenhouse plants. Collate is an excellent and cost-effective option for improving plant structure, preventing early flowering and controlling excessive plant growth. It's easy to see why Collate has become an essential component of the floriculture PGR toolbox. **GT**



Effect of a Collate foliar spray on Coleus Oxford Street

0

Collate (ppm)

250

500

Dilution Table

Formulated product per gallon of solution

PPM AI	Abide/ A-Rest (milliliters)	Dazide/ B-Nine (grams)	Citadel/ Cycocel (milliliters)	Collate (milliliters)	Concise/ Sumagic (milliliters)	Piccolo/ Bonzi/ Paczol (milliliters)	Piccolo 10 XC (milliliters)	Topflor (milliliters)	Configure (milliliters)	Augeo (milliliters)
0.5	7				4	0.5	0.05	0.48		
1.0	14				8	1.0	0.1	0.96		
5.0	72				38	5.0	0.5	4.8		
10	143				76	10	1.0	9.6		
25	359				189	25	2.5	23.9		
30	430				227	30	3.0	28.7		
40	573				303	40	4.0	38.2		
50	717			0.8	379	50	5.0	47.8	9.0	
100	1433			1.6	758	100	10.0	95.5	18	
200			6.5	3.1		200	20.0	191.0	36	
400			13	6.2					72	7.3
500			16	7.8					90	9.1
800			26	12.5					144	14.7
1,000		4.5	32	15.6					180	18.2
1,250		5.6	40	19.5						22.8
1,500		6.8	48	23.5						27.3
2,000		9.0	64	31.2						36.4
2,500		11.1	80	39.3						45.5
5,000		22.3		79.4						91.0

When mixing PGRs, great care needs to be given to accurately measure and apply the chemical. Drench applications vary by pot size and desired dose, so refer to the product label for exact mixing instructions. As always, the label contains the legal mixing information. North Carolina State University and the University of New Hampshire have a free web-based PGR calculator to assist with calculating PGR rates:
https://extension.unh.edu/Agric/AGGHFL/pg_calc.cfm

Foliar sprays require a uniform application to obtain consistent results. For foliar sprays, measure out a known amount of chemical, add it to a known volume of water, and apply the spray to a known bench area. Most sprays are applied at 1 gal. per 200 sq. ft. of bench area.

For drench applications, measure out a known amount of chemical, add it to a known volume of water, and apply a known volume of the drench to each pot. The volume of drench applied increases with the pot size (specifics are listed on each product label). **GT**



PUT THESE PROVEN PLANT MANAGERS TO WORK IN YOUR GREENHOUSES.

Fine Americas offers the most complete line of plant manager PGRs in the industry, including some active ingredients and formulations not available from any other source. In addition, all of our products are manufactured under strict ISO 9001:2008 standards, assuring you of outstanding performance each and every time.

abide®

*Same active ingredient as ARest®

Abide® is a broad-spectrum PGR offering consistent results in container-grown ornamental plants. Applied as a foliar spray or drench, Abide effectively reduces internode elongation, leading to more compact and sturdier plants.

citadel®

*Same active ingredient as Cycocel®

Citadel® generates effective PGR activity on a wide variety of containerized crops. When applied according to label directions, it produces more compact and marketable plants with darker foliage and thicker leaves.

collate®

*Same active ingredient as Florel®

Collate® promotes increased lateral branching, reduces plant height and delays flowering in a wide range of ornamental crops. In addition, it has been proven effective in controlling stem topple in daffodils and hyacinth.

concise®

*Same active ingredient as Sumagic®

Concise® helps ornamental growers produce denser plants with more compact growth, darker green foliage, improved water retention and increased shelf life. It even increases flower number and size in some varieties.

configure®

The only pure 2% 6-BA PGR

As the only pure 2% 6-BA plant growth regulator registered for ornamentals, Configure® improves plant quality by increasing lateral branching and flower production. Registered for use on many containerized annual and perennial flowering and foliage crops as well as popular tropical plants.

dazide®

*Same active ingredients as B-NINE®

Dazide® 85 WSG produces greener, stronger and more compact plants with a greater resilience to the rigors of shipping and handling, resulting in improved marketability and more satisfied customers.

florgib®

*Same active ingredient as ProGibb®

Florgib® offers a wide variety of useful applications, including elongation of peduncles in Pompom Chrysanthemums, earlier flowering and increased yield in Statice, and accelerated plant growth with increased flowering in Gypsophila.

fresco®

*Same active ingredient as Fascination®

Fresco® is a proven plant growth regulator for the reduction of lower leaf yellowing in lilies. By making plants more presentable, Fresco helps growers produce even greater number of top-quality plants.

piccolo®

*Same active ingredient as Bonzi®

One of the most popular PGRs on the market today, Piccolo® brings out the best in ornamentals by making it easier for growers to produce compact, consistent quality plants.

piccolo® 10XC

*Same active ingredient as Bonzi®

As the only 4% paclo PGR formulated in a crystal clear solution, Piccolo® 10 XC is quickly becoming the grower standard for laser-like height control in a wide range of ornamental plants. In addition, Piccolo® 10 XC offers easier handling and mixing plus a lower carbon footprint than older 0.4% paclo formulations.

For the distributor nearest you, visit www.fine-americas.com or call 888-474-FINE (3463) toll free.

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