GROWERRESINCE 1937

PLANT GROWTH REGULATOR GUIDE

By Brian E. Whipker, North Carolina State University

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Gregory Johnson, President Fine Americas. Inc.



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New PGR Information Resources

By Brian E. Whipker, North Carolina State University

A number of online and electronic information sources are now available for growers. Below is an overview of the latest information about PGRs utilized for ornamental crops.

Multi-touch iBook for the iPad

Selecting and Using Plant Growth Regulators on Floricultural Crops This 76-page iBook was created by Mark Sumner of Virginia Tech. Content authors were Joyce Latimer of Virginia Tech and Brian Whipker of North Carolina State



University. The iBook covers the foundation of PGRs, has videos, photo galleries and rate tables. The book is a free download and works on an iPad version 2 or greater. Available at http://pubs.ext.vt.edu/HORT/HORT-43P/HORT-43P.html.

Apps PGR Mix Master Brian Krug of the

Brian Krug of the University of New Hampshire partnered with Fine Americas to develop a mobile app for calculating PGR mixing rates. PGR Mix Master is available for the iPhone, Android and Blackberry. It calculates PGR mixing rates for sprays and drenches for most of the common chemicals available for ornamentals. A more detailed article about the apps was written by Dr. Krug as an e-GRO Alert. The article also has an embedded video with instructions about how to use the app. This article is number 1.11 and is available at http://www.e-gro.org/alert.php.

> (A computer-based alternative rate calculator called PGRCalc is also available for calculating mixing rates at http://extension.unh.edu/Agric/ AGGHFL/growing_tools.htm.)



OHP PGR Rate Calculator

OHP was first to develop an app for iPhone, iTouch and iPad users. The PGR Calculator from OHP provides mixing rates for Augeo, B-Nine, Cycocel and Paczol. You must have iTunes installed to be able to download the app. Details about the app and a direct link to download it can be found at http://www.ohp.com/ News/?p=100.

Scan the QR codes to get the PGR Mix Master mobile app.



Podcasts

A collection of 20 podcasts (videos) that cover a wide array of PGR-related subjects is available free on the *Greenhouse Grower* website. Most videos are around five minutes in length. View them at http://www. greenhousegrower.com/ video/c:94/pgrs/.

PGR mixing rates, called

Blackberry.

PGR Mix Master, is available for the iPhone. Android and

Websites

Purdue University has some excellent PGR publications—*Plant Growth Regulators Pocket Reference* and *Applying Plant Growth Retardants for Height Control*—listed on this website: https:// sharepoint.agriculture.purdue.edu/agriculture/ flowers/bulletins.aspx.

Michigan State University has an extensive collection of PGR articles listed at their website: http://www.flor.hrt.msu.edu/PGRs/.

Virginia Tech also lists a few publications at http://www.hort.vt.edu/floriculture/pubs.html.

Fine Americas has an extensive listing of PGR research reports and supportive documentation at http://www.fine-americas.com/Content/News. asp?arch=1. GT

Wide Assortment of Available PGRs

By Brian E. Whipker, North Carolina State University and Joyce 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 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 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		
Fluprimidol	Topflor		
Paclobutrazol	Piccolo, Piccolo 10 XC, Bonzi, Paczol, Downsize (drenches only)		
Uniconazole	Concise, Sumagic		
Benzyladenine (BA)	Configure		
Gibberellin (GA3)	Florgib, ProGibb T&O		
BA+GA4+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 GROW	TH REGULATOR			
Chemical	Ancymidol	Chlormequat chloride	Daminozide	Daminozide + Chlormequat chloride	Ethephon	Flurprimidol	Paclobutrazol	Uniconazole
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%	—	3.9%	0.38%	0.4% 4% (Piccolo 10 XC)	0.055%
Activity level	++	+	+	++	+	+++	+++	+++
Multiple applications needed	++	+++	+++	++	++	+	+	+
Application type ¹								
Foliar spray	yes	yes	yes	yes	yes	yes	yes ¹	yes
Substrate drench	yes	yes	no	no	yes	yes	yes	yes
Dips	plugs/liners	plugs/liners	cuttings	-	plugs/liners	bulbs, plugs/liners	bulbs, plugs/liners	bulbs, plugs/liner
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 absor	ption	high hui	midity, limited air mo	wement, cloudy day	s, early morning or	late afternoon appli	cations	
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)	_	_	_2	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	+	+	++	++	++	+++	+++	+++
Influence of water pH	-	_	_	-	pH 4.0 optimal	-	_	_
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

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; current research is evaluating application rates.

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.

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 gt. 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 gibberellininhibiting 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**

Brian Whipker is a professor of floriculture, North Carolina State University, Raleigh, North Carolina, and Joyce Latimer is a professor of horticulture at Virginia Tech, Blacksburg, Virginia.



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Additional Benefits of PGRs

By Brian E. Whipker, North Carolina State University

Plant growth regulators provide more than just growth control better water utilization, disease suppression and greener color make PGRs a best management strategy!

Greenhouse growers use plant growth regulators (PGRs) to control excessive plant growth. But did you know PGRs also provide additional benefits? This article highlights one of the best-kept secrets in floriculture about the additional advantages of using plant growth regulators to improve your crop quality.

So to be clear, the PGRs that I'm referring to are ones with a mode of action that block the biochemical pathway leading to the production of gibberellins (GA) (Figure 1). GA is the hormone that encourages cell elongation. By blocking that pathway, the plants are naturally **1. Greener leaves**

Have you ever noticed how the plant leaves become greener after you apply a PGR? The darker green color suggests that the plant has a higher chlorophyll content. Why does this occur? There are two reasons.

First of all, with a PGR application, the new plant cells don't expand as much, so they're smaller. Smaller cells mean that the chlorophyll contained in the leaves is more densely packed, which makes the leaves darker green. In addition, applying a PGR—which blocks the GA pathway results in some secondary effects. In this case, an up-regulation, or increase, in the amount of chlorophyll produced by the plant (Figure 1).

This illustration will explain how the GA pathway is blocked and how additional chlorophyll is produced. The GA pathway is a series of biochemical reactions in the leaf, which results in the production of gibberellins. Gibberellins encourage cell expansion. By blocking the pathway, plants are then more compact. That's why we use PGRs to manage growth.

So why do leaves become greener? Let's use the example of a beaver dam to explain it: When beavers build a dam on a creek, they don't totally stop the flow of water; some water still spills over the main part of the dam. That occurs when PGRs are used. You still get some plant growth, just not as much. The other thing that occurs is the water is diverted elsewhere by the beaver dam. The water backs up and then it spills over at some secondary place.

That also occurs with the GA pathway. With the blockage, other secondary biochemical reactions are then increased. One up-regulated reaction is an increase in the production of chlorophyll (Figure 1, see #1). So that's why plants become greener after a PGR application (Figure 2).

block the GA pathway include: ancymidol (Abide/A-Rest), chlormequat chloride (Citadel/Chlormequat E-Pro/ Cycocel), daminozide (B-Nine/Dazide), flurprimidol (Topflor), and uniconazole (Concise/Sumagic). Chemicals that have a different mode of actionsuch as Augeo, Configure, Florel, Collate, Fascination or Fresco-don't have these added attributes so this article doesn't apply to them.

shorter. The PGRs that

There are three additional benefits of applying PGRs: 1) greener leaves, 2) less water use and 3) greater disease suppression.



2. Water use

Reduced water stress is also a secondary effect when one applies PGRs. It all goes back to the blocked GA pathway and upregulation of the natural plant hormone abscisic acid (ABA), which helps plants control water loss through their leaves.

On the bottom of plant leaves there are doughnut-like openings in the leaf called stomates, which regulate gas exchange and water loss. An increase in ABA encourages the stomates to close and avoid water loss. Less water loss means it takes more time for the plants to wilt.

Utilizing the illustration of the GA pathway again (Figure 1, see #2), with the blockage of the pathway there's an up-regulation of ABA, which is beneficial to plants. In addition, there's also an upregulation in the biochemical pathway of chemicals, which block the breakdown of ABA. So this also leads to an increased accumulation of ABA to help the plant better manage water loss. The end result is plants treated with PGRs use less water. In fact, a recent study at North Carolina State University by Ahmad et al. found that water use was 33% less when zinnia plants were treated with 1 mg a.i. drenches of paclobutrazol when compared with the untreated control (Figure 3). Being able to apply a water conservation treatment is an excellent best-management practice.



Figure 2. The plant on the left did not have a PGR application, while the plant on the right did. The use of anti-GA PGRs resulted in darker green plants.

Paclobutazol Effect on Total Water Use by Zinnia



Figure 3. Data from a recent study at North Carolina State University in which the use of 1 mg a.i. palcobutrazol drenches resulted in zinnia plants requiring 33% less water over the production season as compared with the untreated control.

Data source: Ahmad, Whipker and Dole, NCSU

3. Disease reduction

A third attribute of PGRs is disease reduction. This attribute applies to paclobutrazol and flurprimidol and to a lesser extent—to ancymidol, daminozide or chlormequat. It doesn't apply to uniconazole because of how it's manufactured by selecting for greater PGR activity; that process removes most of the disease reduction ability.

A side effect of the blocked GA pathway is also the blockage of a secondary pathway used by fungi (Figure 1, see #3). Paclobutrazol and flurprimidol act similarly as the mode of action as sterol biosynthesis inhibitor class of fungicides (SBIs). A secondary pathway leading off the GA pathway produces the building blocks used by fungi. Paclobutrazol and flurprimidol block that pathway, so the essential chemicals needed by fungi to grow aren't available. Therefore, the occurrence of disease is reduced (Figure 4).

So in summary, there are a number of biochemical reactions always occurring in plants. With the use of GA-blocking PGRs, there's a resulting up-regulation and downregulation of a number of other reactions. Of course, plant growth is more compact. Plants are also greener because of an increased concentration of chlorophyll.



Figure 4. Based on a height control experiment, one can clearly see powdery mildew starting to infect the untreated plant on the left, while the plant on the right had been given a PGR drench about 4 weeks prior to this date and a powdery mildew infection had been reduced. PGRs will not provide season-long protection against foliar diseases, but it turns out they can offer a first line of protection.

Plants are healthier because of the ability to reduce foliar diseases.

Finally, plants use less water, which helps avoid drought stress. There are additional benefits besides controlling excessive stretch when it comes to PGRs. This makes the use of PGRs a key component when it comes to bestmanagement practices for floriculture crops. Please keep in mind that no plant growth regulators are labeled for control or supression of plant diseases. **GT**

By Brian E. Whipker, Department of Horticultural Science, North Carolina State University

This table lists labeled rates of plant growth regulators (PGRs) for greenhouse crops, as well as recommendations based on research at North Carolina State University and recommendations by suppliers. Read the label for a complete listing of precautions. The degree of control can vary depending on a number of factors, including plant type, cultivar, stage of development, fertilization program, growing temperatures and crop spacing. When using a PGR for the first time, it's good to test the rate on a few plants prior to spraying the entire crop. Keep accurate records and adjust rates for your location. Also keep in mind as a general rule, sunbelt growers should consider the upper half of the rate range, while northern growers especially under lower light conditions should begin trials at the lower end of the rate range. Additional information about plant growth regulators is available at www. pgrinfo.com.

General recommendations: Plug culture and flat culture have different recommended rates. The rates in this table include recommendations for both plug (lower rates) and flat culture (higher rates). Apply ALL foliar sprays of plant growth regulators using 0.5 gal. per 100 sq. ft. of bench area.

Growth Regulators for Floricultural Crops in Greenhouses

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
ABUTILON	To control plant growth	Citadel/Cycocel	750 ppm spray	
ACHILLEA	To control plant	Dazide/B-Nine	2,500 ppm spray	One or 2 sprays may be needed to keep plants more compact.
	growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.5 to 1 ppm drench	Apply to moderately moist substrate.
AGASTACHE	To control plant growth	Citadel+Dazide/Cycocel+B-Nine	3,000 ppm + 1,500 ppm spray	Rates for compact genetics needing slight growth control.
AGERATUM	To control plant	Dazide/B-Nine	2,500 to 5,000 ppm spray	
(growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	15 to 45 ppm spray	High rates of Piccolo 10 XC may delay flowering. Late applications and overdosing may cause slow growth on transplantation. This can be avoided by using multiple applications of 25% to 50% of the specified rate and monitoring plant growth.
		Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	
		Concise/Sumagic	20 to 30 ppm spray	
		Topflor	20 to 60 ppm spray	Based on NC State University trials. Adjust rates for other locations.
AGERATUM, Plugs	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 10 ppm spray	Timing of application should normally begin at the 1 to 2 true leaf stage.
ALCEA ROSEA	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	30 to 50 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/ Downsize	0.12 to 0.24 mg a.i. (1 to 2 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	

Disclaimer: The information and listed table rates of plant growth regulators are current as of January 2013. They are based on label rates, research-based articles from North Carolina State University, other university researchers and recommendations by suppliers. These recommendations may not be appropriate for all conditions and locations and may not comply with laws and regulations in every state. Individuals who use agricultural chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain current information about usage regulations and examine a current product label before purchasing or applying any chemical. The use of brand trade names and any mention or listing of commercial products or services in this publication does not imply endorsement by Ball Publishing, the author, or North Carolina State University, nor discrimination against similar products or services not mentioned.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
ALTERNANTHERA	To control plant	Abide/A-Rest	25 to 132 ppm spray	
(Joseph's coat)	growth	growth	0.25 to 0.5 mg a.i. (2 to 4 ppm) for a 6-in. pot (1 to 2 fl. oz./gal of drench solution: apply 4 fl. oz./6-in. pot)	Drench volumes and mg a.i. vary with pot size.
		Citadel /Chlormequat E-Pro/ Cyclocel	Spray	Apply only if needed. Not recommended on some cultivars.
		Dazide/B-Nine	5,000 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	4 ppm drench	To keep plants more compact. Apply to moderately moist substrate.
ALYSSUM	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	40 to 60 ppm spray	See AGERATUM.
		Concise/Sumagic	5 to 25 ppm spray	
		Dazide/B-Nine	2,500 ppm spray	
ALYSSUM, Plugs	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	10 to 20 ppm spray (0.32 to 0.64 fl. oz./gal.)	Timing of application should normally begin at the 1 to 2 true leaf stage.
AMARYLLIS To control plant growth		Piccolo/Piccolo 10 XC /Bonzi/ Paczol	23.66 mg a.i. (200 ppm) drench for a 6-in. pot (6.4 fl. oz./gal. of drench solution; apply 4 fl. oz./6-in. pot)	Drench volumes and mg a.i. vary with pot size.
			100 ppm bulb soak	
ANAGALLIS	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.5 ppm drench	To keep plants more compact. Apply to moderately moist substrate.
ANGELONIA	To control plant growth	Citadel + Dazide /Cycocel + B-Nine	1,500 to 3,000 ppm + 750 to 1,000 ppm Cycocel applied as a tank-mix spray	At planting, soft pinch to promote lateral shoot development.
		Concise/Sumagic	10 to 20 ppm spray	Based on NC State University trials.
		Topflor	45 to 60 ppm spray	Based on NC State University trials.
		Florel/Collate	Spray	Not recommended.
ARGYRANTHEMUM	To control plant	Citadel/Cycocel	750 to 1,500 ppm spray	
	growth	Citadel+Dazide/Cycocel+B-Nine	750 to 1,000 ppm + 1,000 to 2000 ppm spray	Rates for compact genetics needing slight growth control.
		Concise/Sumagic	3 to 40 ppm spray	Based on NC State University trails conducted during late spring. Trial rates of 3 to 5 ppm for compact genetics.
		Piccolo/Piccolo 10 XC/Bonzi/	5 to 10 ppm spray	Rates for compact genetics needing slight growth control.
		Paczol	2 to 5 ppm drench	Rates for compact genetics needing slight growth control.
			Topflor	50 to 75 ppm spray
ASCLEPIAS	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	30 to 60 ppm spray	
ASTER	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	See AGERATUM

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
ASTER, Cut (Callistephus chinensis)	To promote stem elongation and break dormancy	Florgib/ProGibb T&O	50 to 100 ppm spray	Make one to three applications during the early vegetative period at 2- to 3-week intervals. Apply when plants are 2 to 6 in. tall.
ASTERISCUS	To control plant	Dazide/B-Nine	750 to 1,500 ppm spray	
<i>MARITIMUS</i> (Compact Gold	growth	Citadel/Cycocel	800 to 1,500 ppm spray	
Coin)		None	None	Plants grown with good light and optimal growing conditions generally do not need PGRs.
AZALEA	To control plant	Abide/A-Rest	26 ppm spray	
	growth	Concise	5 to 15 ppm spray	Apply as a uniform spray at a volume of 1.5 qt. per 100 sq. ft. of bench area approximately 4 to 6 weeks after the final pinch. Shorter-growing cultivars (Gloria, Solitaire): use 10 ppm. If a second application is required 2 to 3 weeks later, use 5 to 10 ppm. Taller-growing cultivars (Prize): use 10 ppm. If a second application is required 2 to 3 weeks later, use 10 to 15 ppm.
	To promote flower initiation	Dazide/B-Nine	1,500 to 2,500 ppm spray	Apply solution when new growth from final pinch is 1 to 2 in. long.
		Citadel/Chlormequat E-Pro/Cycocel	1,000 to 4,000 ppm spray	Optimum rates are generally between 1,000 and 2,000 ppm. Two to six multiple sprays may be needed. Make first application when new growth is approximately 2 in. long.
	To prevent flower	GibGro	130 to 850 ppm spray	Apply two to three sprays at 2- to 3-week intervals.
	bud initiation during vegetative growth	Florgib/ProGibb T&O	100 to 750 ppm spray	Apply a first application beginning 2 to 3 weeks after pinching. Weekly applications can continue for 1 to 2 additional weeks, for a maximum of three total applications.
	For partial or full substitution of cold treatment	GibGro	265 to 1,055 ppm spray	Spray timing, concentration and number of applications vary with cultivar, as well as intended degree of cold substitution. Consult label for exact recommendations. Not labeled for California.
		Florgib/ProGibb T&O	250 to 500 ppm spray	Spray timing, concentration and number of applications vary with cultivar, as well as intended degree of cold substitution. Consult label for exact recommendations.
	To promote lateral shoot growth on vegetative plants	Off-Shoot-O	Use a 3 to 5% solution in greenhouses; use a 5 to 7% solution outdoors. Apply as a foliar spray.	Efficacy is related to relative humidity and temperature. Spray a few plants to check activity prior to treating the entire crop; effect should be visible in about 1 hr. Be certain chemical covers shoot tip. Ineffective if microscopic flower buds are present.
	To increase	Augeo	3,125 to 6,250 ppm spray	
	lateral branching	Florel/Collate	2,500 to 5,000 ppm spray	
	To control plant growth, reduce bypass shoot elongation and promote flower	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	100 to 200 ppm spray	To control plant growth and promote flower bud initiation, apply after final shaping when new growth is 1.5 to 2 in. long. To reduce bypass shoot development, apply after bud set wher bypass shoots are barely visible, or about 5 to 7 weeks prior to cooling.
	bud initiation	Piccolo/Piccolo 10 XC/Bonzi/ Paczol/ Downsize	0.59 to 1.77 mg a.i. (5 to 15 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot)	Drench volumes mg a.i. vary with pot size.
	To control plant growth	Concise /Sumagic	10 to 15 ppm spray	Apply at 1.5 qt per 100 sq. ft. of bench area.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
BACOPA (SUTERA)	To control plant growth	Dazide/B-Nine	750 to 1,500 ppm spray	At planting, soft pinch to promote lateral shoot development. Initially try with lower rate.
		Piccolo	4 to 8 ppm liner root soak	Irrigation of the liners occured within 24 hours prior to application, which results in a moderately dry substrate (the stage the plants would be watered but not wilted). Soak for a minimum of 30 to 60 seconds. Transplant after 3-hour waiting period. Rates based on Michigan State University trials.
		Florel/Collate	150 to 200 ppm spray	Early spray will increase branching and reduce early flowering.
	To increase lateral branching	Florel/Collate	150 to 200 ppm spray	
BEDDING PLANTS (Not specifically listed in this table)	To control plant growth	Abide/A-Rest	6 to 66 ppm spray; use 15 ppm spray as a base rate and adjust as needed	See AGERATUM.
			0.06 to 0.12 mg a.i. drench for a 4-in. pot; apply 2 fl. oz./4-in. pot)	Drench volumes and mg a.i. vary with pot size.
		Citadel + Dazide/Cycocel + B-Nine	800 to 5,000 ppm + 1,000 to 1,500 ppm Cycocel applied as a tank-mix spray	Use the highest rate of Cycocel that doesn't cause excessive leaf yellowing, and then adjust the B-Nine/Dazide rate up and down within the labeled range to attain the desired level of height control.
		Piccolo/Bonzi/Paczol	5 to 90 ppm spray. Use 30 ppm spray as a base rate and adjust as needed.	Conduct trials on a small number of plants, adjusting the rates as needed for desired final plant height and duration of height control. Not recommended for use on fibrous begonia or vinca
		Piccolo/Bonzi/Paczol/ Downsize	0.118 mg a.i. drench for a 6-in. pot; apply 4 fl. oz./6-in. pot)	Drench applications are recommended only for bedding plants in 6-in. or larger containers. Not recommended for use on fibrous begonia or vinca.
		Citadel/Cycocel	800 to 1,500 ppm spray	Conduct trials on a small number of plants, adjusting the rates as needed for desired final plant height and duration of height control.
		Concise /Sumagic	1 to 50 ppm spray	Conduct trials on a small number of plants, adjusting the rates as needed for desired final plant height and duration of height control. Apply spray as elongation begins (plant height about 2 to 4 in.).
			0.1 to 2 ppm drench	
		Piccolo 10 XC	15 to 30 ppm spray	General starting point for conducting trials for plants not specifically on the label. Use lowest rate in the Northern Belt Region and the upper rate in the Sunbelt Region.
			1 ppm drench	General starting point for conducting trials for plants not specifically on the label.
	To promote plant growth and overcome over-application of gibberellin- inhibiting PGRs	Florgib/ProGibb T&O	1 to 25 ppm spray	Conduct trials on a small number of plants initially using 1 ppm unless previous experience warrants higher use rates. Following assessment of plant response, and if desired results were not evident, reapplication or an increase in rate may be warranted. Consult the label for additional precautions.
		Fascination	1 to 25 ppm spray	Conduct trials on a small number of plants initially using 1 ppm unless previous experience warrants higher use rates. Following assessment of plant response, and if desired results were not evident, reapplication or an increase in rate may be warranted. The most common rates for use are 3 to 5 ppm. SEE LABEL FOR ADDITIONAL PRECAUTIONS BEFORE USE.
	To induce lateral or basal branching	Configure	50 to 500 ppm spray	The supplemental label allows legal use on greenhouse-grown plants not specifically listed on the original label. See label for trialing suggestions and precautions.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
BEDDING PLANT	To control plant	Abide/A-Rest	3 to 35 ppm spray	See AGERATUM.
PLUGS (Not specifically listed in this table)	growth	DWIN	Drench plug flats with a 0.5 to 1 ppm solution	For uniform application, use a subirrigation delivery system. Plug trays should not be excessively dry prior to the subirrigation treatment. Plants should develop one to two true leaves prior to first application.
		Dazide/B-Nine	1,500 to 2,500 ppm spray	Conduct trials on a small number of plants, adjusting the rate as needed for desired final plant height and duration of height control. Can be used at the beginning of the true first leaf stage through the finishing stage.
		Citadel + Dazide/Cycocel + B-Nine	800 to 5,000 ppm +1,000 to 1,500 ppm Cycocel applied as a tank-mix spray	Use the highest rate of Cycocel that doesn't cause excessive leaf yellowing, and then adjust the B-Nine/Dazide rate up and down within the labeled range to attain desired level of height control.
BEDDING PLANT PLUGS (Not specifically listed in this table)	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	1 to 20 ppm spray. Use 5 ppm spray as a base rate and adjust as needed.	Conduct trials on a small number of plants, adjusting the rate as needed for desired final plant height and duration of height control. Plants should develop one to two true leaves prior to first application.
		Cycocel	400 to 1,500 ppm spray	Conduct trials on a small number of plants, adjusting the rates as needed for desired final plant height and duration of height control.
		Concise/Sumagic	0.5 to 10 ppm spray	Conduct trials on a small number of plants, adjusting the rates as needed for desired final plant height and duration of height control. Plugs can be especially sensitive to Concise/Sumagic.
BEGONIA, Seed	To control plant growth	Abide/A-Rest	3 to 15 ppm spray	See AGERATUM.
		Dazide/B-Nine	2,500 to 5,000 ppm spray	
		Florel/Collate	500 ppm spray	Apply to increase lateral branching, prevent flower initiation and development, and inhibit internode elongation.
BEGONIA, Vegetative	To control plant growth	Citadel/Cycocel	750 to 1,000 ppm spray	
BEGONIA, Vegetative (Dragon Wing)	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	3 to 5 ppm spray	For 4-in. pots, apply a weekly 3 ppm spray starting 2 weeks after transplanting for 3 weeks. For 6-in. pots, use 5 ppm starting 2 weeks after transplant. A second and third application may be useful.
BEGONIA, Elatior	To increase lateral branching	Augeo	781 to 1,562 ppm spray	
BIDENS	To control plant	Dazide/B-Nine	1,500 to 2,500 ppm spray	At planting, soft pinch to promote lateral shoot development.
	growth	Concise/Sumagic	1 to 5 ppm spray	Rates for genetics needing slight growth control.
			0.25 ppm drench	Rates for genetics needing slight growth control.
	To increase lateral branching	Florel/ Collate	300 to 500 ppm spray	
BLEEDING HEART	To control plant	Abide/A-Rest	65 to 132 ppm spray	
	growth		0.25 to 0.5 mg a.i. drench for a 6-in. pot; apply 4 fl. oz./6-in. pot)	Drench volumes and mg a.i. vary with pot size.
BOUGAINVILLEA	To increase lateral branching	Augeo	1,562 ppm spray	
BRACHYSCOME	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	

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CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
BRACTEANTHA,	To control plant	Piccolo/Bonzi/Paczol	20 to 30 ppm spray	
BRACTEATA	growth	Concise/Sumagic	10 to 20 ppm spray	
	To increase lateral branching	Florel/Collate	300 to 500 ppm	
BROMELIAD	To promote flower initiation	Florel/Collate	2,471 ppm spray	
BROWALLIA	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	See AGERATUM.
BULB CROPS (Not	To control plant	Abide/A-Rest	25 to 50 ppm spray	
specifically listed in this table)	growth		0.25 mg a.i. (2 ppm) drench for a 6-in. pot; apply 4 fl. oz./ 6-in. pot)	Drench volumes and mg a.i. vary with pot size.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	100 ppm spray	Conduct trials on a small number of plants, adjusting the rate as needed for desired final plant height and duration of height control.
			1.183 mg a.i. (10 ppm) drench for a 6-in. pot; apply 4 fl. oz./ 6-in. pot)	Drench volumes and mg a.i. vary with pot size.
			20 ppm bulb soak	Soak for 15 min. Conduct trials on a small number of bulbs, adjusting the rate and soaking period (up to 1 hour) as neede for desired final plant height.
		Concise /Sumagic	2.5 to 20 ppm spray	Conduct trials on a small number of plants, adjusting the rate as needed for desired final plant height and length of height control.
			1 to 3 ppm drench	Drench volumes and mg a.i. vary with pot size. Application should be made when newly emerged shoots are 1 to 2 in. ta
			1 to 10 ppm bulb soak	Soak for 1 to 5 min. Conduct trials on a small number of bulbs, adjusting the rate and soaking period as needed for desired final plant height.
	To promote plant growth and overcome over-application of gibberellin- inhibiting PGRs.	Fascination	1 to 25 ppm spray	Conduct trials on a small number of plants initially using 1 ppm, unless previous experience warrants higher use rates. Following assessment of plant response, and if desired result were not evident, reapplication or an increase in rate may be warranted. The most common rates for use are 3 to 5 ppm. SEE LABEL FOR ADDITIONAL PRECAUTIONS BEFORE USE.
CALADIUM	To control plant	Dazide/B-Nine	2,500 to 5,000 ppm spray	See AGERATUM.
	growth	Piccolo/Bonzi/Paczol/ Downsize	100 to 200 ppm spray (3.2 to 6.4 fl oz/gal)	Make first spray application when plants are 2 to 4 in. tall.
			0.24 to 1.77 mg a.i. (5 to 15 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot)	Make first spray application when plants are 1 to 2 in. tall. Drench volumes and mg a.i. vary with pot size.
		Piccolo/Bonzi/Paczol	60 ppm tuber soak	Soak tubers for 30 min. prior to planting.
		Piccolo 10 XC	100 to 200 ppm spray	Spray applications of Piccolo 10 XC are the least desirable method for controlling bulb plant height and must be applied sequentially to maximize uniformity of the crop. Begin spray applications when plants reach a height of 2 to 4 in.
			2 to 16 ppm drench	Drench volume varies with pot size. Begin drench applications when plants reach a height of 1 to 2 in.
		Topflor	0.5 to 2 mg a.i. drench for a 6-in. pot	Based on NC State University trials. Adjust rates for other locations. Use lower rates for less vigorous cultivars.
CALENDULA	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
CALIBRACHOA	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	At planting, soft pinch to promote lateral shoot development. Multiple applications may be required.
		Citadel + Dazide /Cycocel + B-Nine	2,500 ppm + 500 ppm Cycocel applied as a tank-mix spray	
		Concise/Sumagic	10 to 25 ppm spray	Try lower rate initially. Apply 2 weeks after transplanting.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	3 to 50 ppm spray	Use rates of 3 to 5 ppm for compact genetics needing slight growth control.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	3 to 8 ppm drench	Rates for compact genetics needing slight growth control.
		Florel/Collate	300 to 500 ppm spray	Early spray will increase branching and reduce early flowering.
CALLA LILY	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.59 to 1.77 mg a.i. (5 to 15 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	See CALADIUM.
		Piccolo/Bonzi/Paczol	20 ppm rhizome/tuber soak	Soak the rhizomes/tubers for 15 min. prior to planting.
		Concise /Sumagic	1 to 2 mg a.i. drench (8.45 to 16.9 ppm); apply 4 fl. oz./6-in. pot)	Optimal rate based on NC State University trials. Adjust rate for plant vigor. Drench volumes and mg a.i. vary with pot size.
		Topflor	1 to 2.25 mg a.i drench for a 6-in. pot	Based on NC State University trials. Adjust rates for other locations.
	To promote flowering	Florgib/ProGibb T&O	500 ppm rhizome/tuber soak	Soak the rhizomes or tubers for 10 min. prior to planting. See label for details.
CAMPANULA	To control plant growth	Topflor	10 to 30 ppm spray	
CANNA LILY	To control plant growth	Topflor	50 to 80 ppm spray	
CELOSIA	To control plant	Abide/A-Rest	7 to 26 ppm spray	See AGERATUM.
	growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	15 to 45 ppm spray	
		Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	
		Concise/Sumagic	10 to 20 ppm spray	
		Topflor	10 to 40 ppm spray	Based on NC State University trials. Adjust rates for other locations.
CELOSIA, Plugs	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 10 ppm spray	Timing of application should normally begin at the 1 to 2 true leaf stage.
CENTAUREA	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	
CENTRADENIA Hybrid	To control plant growth	None	None	Plants grown with good light and optimal growing conditions generally do not need PGRs.
CHINA ASTER	To control plant growth	Abide/A-Rest	7 to 26 ppm spray	

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
CHRISTMAS CACTUS (Schlumbergera spp.)	To increase branching under vegetative conditions	Configure	100 ppm spray	After planting when new vegetative growth begins, uniformly apply 1 to 2 quarts of finished spray solution to 100 sq. ft. of area.
	To increase the number of flower buds under reproductive conditions	Configure	100 to 200 ppm spray	Apply as a uniform foliar spray after the start of short days following leveling, or when flower buds become visible. See the label for specific guidelines based on lighted or natural-season growth plants.
CHRYSANTHEMUM, Cut	To reduce "neck" stretching	Dazide/B-Nine	2,500 ppm spray	Spray upper foliage 5 weeks after start of short-day treatment.
	To elongate peduncles of pompom-type mums	Florgib/ProGibb T&O	25 to 60 ppm spray	Use a single application 4 to 5 weeks after initiation of short days. Direct spray solution towards the flower buds. See label for precautions.
CHRYSANTHEMUM, Perennial	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	50 to 200 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.12 to 0.48 mg a.i. (1 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	
CHRYSANTHEMUM,	To control plant	Abide/A-Rest	25 to 50 ppm spray	
Potted	growth		0.25 to 0.5 mg a.i. drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Apply when plants are 2 to 6 in. in height (about 2 weeks after pinch). Drench rates and application volumes vary with pot size.
		Dazide/B-Nine	1,000 ppm preplant foliar dip	Rooted cuttings can be dipped in solution to thoroughly wet leaves and stems and then potted. Allow foliage to dry before watering in. For unrooted cuttings, dip stems in solution, remove to flat, cover to prevent dehydration and hold overnight under cool conditions. Stick the next day.
			2,500 to 5,000 ppm spray	Spray when new growth from pinch is 1 to 2 in. long. Some varieties may require another application 3 weeks later.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	50 to 200 ppm spray	Applications should begin when axillary shoots are 2 to 3 in. long. Sprays can be applied earlier to vigorous cultivars if additional control is desired. Sequential applications of lower rates generally provide more uniformly shaped plants than single-spray applications. Uniform application of both sprays and drenches is critical for uniform crop development.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.118 to 0.473 mg a.i. (1 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size. Begin when the axillary shoots are to 2 to 3 in. long. Uniform application is required.
		Concise	5 to 10 ppm dip treatment on cuttings	Apply when the lateral shoots are 1.5 to 2.0 in. tall (about 7 to 14 days after pinching). Test for cultivar sensitivity. Multiple applications of the lower label rate may elicit a more satisfactory response and/or increasing the spray volume from 2 qts/100 sq. ft. to 3 qts/100 sq. ft. For Florida only: use a foliar spray concentration between 5 to 10 ppm (1.3 to 2.56 fl oz./gal). For medium to tall cultivars, increase the spray volume to 3 qts/100 sq. ft.
			2.5 to 10 ppm spray	Apply as a dip treatment on unrooted cuttings followed by a foliar spray in the low rate range. On rooted cuttings, use a solution of 2.5 ppm or less, followed by a foliar spray in the low rate range.
		Concise/Sumagic	2.5 to 10 ppm spray	
		Topflor	7.5 to 25 ppm spray	Based on NC State University trials. Adjust rates for other locations. Use lower rates for less vigorous cultivars.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
CHRYSANTHEMUM, Garden	To control plant growth	Concise	5 to 10 ppm dip treatment on cuttings	Apply when the lateral shoots are 1.5 to 2.0 in. tall (about 7 to 14 days after pinching). Test for cultivar sensitivity. Multiple applications of the lower label rate may elicit a more satisfactory response and/or increasing the spray volume from 2 qts/100 sq. ft. to 3 qts/100 sq. ft. For Florida only: use a foliar spray concentration between 5 to 10 ppm (1.3 to 2.56 fl. oz./gal). For medium to tall cultivars, increase the spray volume to 3 qts/100 sq. ft.
		Concise/Sumagic	2.5 to 10 ppm spray	
	To increase lateral branching	Florel/ Collate	500 ppm spray	Florel and Collate applications will provide some growth retardant effects and delay flowering. Read the label for restrictions on timing of applications.
CHRYSOCEPHALUM APICULATUM	To control plant growth	None	None	Plants pinched and grown with good light and optimal growing conditions generally do not need PGRs.
CLEMATIS	To control plant	Abide/A-Rest	25 to 132 ppm spray	
	growth		0.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
CLEOME	To control plant	Abide/A-Rest	7 to 26 ppm spray	See AGERATUM.
	growth	Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	
CLERODENDRUM	To increase lateral branching	Augeo	1,042 to 2,083 ppm spray	
COLEUS PLUGS, Seed	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 10 ppm spray	Timing of application should normally begin at the 1 to 2 true leaf stage.
COLEUS, Seed	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	See AGERATUM.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	15 to 30 ppm spray	
		Citadel/Chlormequat E-Pro/Cycocel	400 to 3,000 ppm spray	
		Concise/Sumagic	10 to 20 ppm spray	
		Topflor	20 to 40 ppm spray	Based on NC State University trials. Adjust rates for other locations.
COLEUS, Vegetative	To control plant growth	Citadel + Dazide /Cycocel + B-Nine	2,500 to 4,000 ppm + 1,000 to 1,500 ppm Cycocel applied as a tank-mix spray	See General Recommendations. Scheduling the crop to avoid excessive stretch is the most effective means of controlling growth.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 30 ppm spray	
		Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	
		Concise/Sumagic	5 to 20 ppm spray	Use rates of 5 to 10 ppm for compact genetics needing slight growth control.
COLUMBINE	To control plant	Abide/A-Rest	65 to 132 ppm spray	
	growth		0.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
CONEFLOWER (Echinacea spp.)	To control plant growth	Concise/Sumagic	30 to 40 ppm spray	
	To increase branching	Configure	300 to 900 ppm spray	Apply after plant establishment and resumption of growth (i.e., approximately 2 weeks after potting). Apply in a uniform spray volume of 2 qts/100 sq. ft. of area. Application timing and rate may vary with cultivar.

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CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
COREOPSIS	To control plant	Concise/Sumagic	2 to 4 ppm spray	Rates for compact genetics needing slight growth control.
	growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	3 to 100 ppm spray	Use rates of 3 to 6 ppm for compact genetics needing slight growth control.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.59 to 1.18 mg a.i. (5 to 10 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Rates for vigorous genetics needing moderate growth control.
		Topflor	2 to 4 ppm spray	Rates for compact genetics needing slight growth control.
CORNFLOWER	To control plant	Abide/A-Rest	7 to 26 ppm spray	See AGERATUM.
(Centaurea)	growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	
COSMOS	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	See AGERATUM.
CROSSANDRA	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	See AGERATUM.
CUPHEA	To control plant	Dazide/B-Nine	1,500 to 2,500 ppm spray	PGRs not required on compact cultivars.
	growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	1 to 5 ppm spray	Initially, test on a few plants to determine rate for optimum control. Cuphea is sensitive to excessive rates.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.25 to 2 ppm drench	Use rates of 0.25 to 0.5 ppm for compact genetics needing slight growth control. Use 2 ppm for vigorous cultivars grown in the south.
DAFFODIL	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	2.37 to 4.73 mg a.i. (20 to 40 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	See CALADIUM.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	80 ppm bulb soak	Soak bulbs for 1 hr. prior to planting. Ten minute soaks of 400 ppm provided excellent results in NC State University trials.
		Florel/Collate	2,000 ppm spray	Controls plant height and stem topple. Apply when shoots are 3 to 4 in. tall. See label for cultivar differences in rates.
DAHLIA, Bedding	To control plant	Abide/A-Rest	7 to 26 ppm spray	See AGERATUM.
Plant	growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	
		Citadel + Dazide /Cycocel + B-Nine	2,500 to 4,000 ppm + 1,000 to 1,500 ppm Cycocel applied as a tank-mix spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	15 to 45 ppm spray	
		Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	
		Concise/Sumagic	10 to 20 ppm spray	
DAHLIA PLUGS, Bedding Plant	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 10 ppm spray	Timing of application should normally begin at the 1 to 2 true leaf stage.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
DAHLIA, Tuberous	To control plant growth	Abide/A-Rest	0.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	1.18 to 4.73 mg a.i. (10 to 40 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	Greater than 40 ppm tuber soak	Soak tubers for 20 min. prior to planting.
		Concise /Sumagic	0.25 to 0.5 mg a.i. drench (2.1 to 4.2 ppm); apply 4 fl. oz./6-in. pot	Optimal rate based on NC State University trials. Adjust rate for plant vigor. Drench volumes and mg a.i. vary with pot size.
		Topflor	0.25 to 2 mg a.i. (2.1 to 16.9 ppm) drench for a 6-in. pot	Based on NC State University trials. Adjust rates for other locations. Use lower rates for less vigorous cultivars.
DELPHINIUM	To control plant growth	Abide/A-Rest	35 to 132 ppm spray 0.25 to 0.5 mg a.i. drench for a 6-in. pot (1 to 2 fl. oz./gal of drench solution; apply 4 fl. oz./6-in. pot)	See AGERATUM.
				Drench volumes and mg a.i. vary with pot size.
		Dazide/B-Nine	2,500 to 5,000 ppm spray	See AGERATUM.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	30 to 60 ppm spray	
DELPHINIUM, Cut	To promote plant growth and stem elongation	Florgib/ProGibb T&O	50 to 100 ppm spray	Apply when plants are 4 to 8 in. tall. More than one application is possible at 2- to 3-week intervals. See label for precautions.
DIANTHUS,	To control plant growth	Abide/A-Rest	7 to 26 ppm spray	See AGERATUM.
Bedding Plant		Dazide/B-Nine	2,500 to 5,000 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	20 to 60 ppm spray	
		Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	
DIANTHUS PLUGS, Bedding plant	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	10 to 20 ppm spray	Timing of application should normally begin at the 1 to 2 true leaf stage.
DIANTHUS, Cut	To promote plant growth and stem elongation	Florgib/ProGibb T&O	50 to 100 ppm spray	Apply when plants are 4 to 8 in. tall. More than one application is possible at 2- to 3-week intervals. See label for precautions.
DIASCIA Hybrid	To control plant growth	Dazide/B-Nine	1,250 to 5,000 ppm	At planting, soft pinch to promote lateral shoot development. Use higher rates on vigorous cultivars.
		Florel/Collate	200 to 500 ppm spray	Use 2 weeks after pinch.
DIASCIA, Seed	To control plant growth	Abide/A-Rest	20 ppm spray	Start application 7 to 10 days after transplant. Repeat 7 days later.
		Concise /Sumagic	5 to 10 ppm spray	To hold plants under warm conditions. Use caution, plants very responsive.
		Dazide/B-Nine	3,000 to 5,000 ppm spray	Start application 7 to 10 days after transplant.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	10 to 20 ppm spray	To hold plants under warm conditions. Use caution, plants very responsive.
DICHONDRA ARGENTEA	To control plant growth	Citadel+Dazide/Cycocel+B-Nine	1,000 ppm + 5,000 ppm spray	Also increases branching and improves silver color.
DIGITALIS	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	80 to 160 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.24 to 0.48 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
DOROTHEANTHUS BELLIDIFORMIS	To control plant growth	None	None	Plants pinched and grown with good light and optimal growing conditions generally do not need PGRs.
DRACAENA	To control plant	Abide/A-Rest	25 to 132 ppm spray	
	growth		0.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
DUSTY MILLER	To control plant	Dazide/B-Nine	2,500 to 5,000 ppm spray	See AGERATUM.
	growth	Concise/Sumagic	30 ppm spray	
EASTER LILY (See Lily, Easter)				
ECHEVERIA spp	To induce offsets and induce flower development	Configure	100 to 400 ppm spray	Based on NC State University trials when applied 2 weeks after potting. A slight increase in offsets occured along with the induction of flowering.
EGGPLANT	To control plant growth	Concise /Sumagic	2 to 10 ppm spray	See label for application suggestions and precautions. Make initial foliar applications when 2 to 4 true leaves are present. Apply uniformly as a foliar spray using 2 qt/100 sq. ft. Sequential applications at lower recommended rates will generally provide more growth control than a single high rate application. First-time users should apply the lowest recommended rate in order to determine optimal rate for individual cultivars under local environmental conditions. If additional growth control is required, a sequential spray application at the lowest recommended rate should be made 7 to 14 days after the initial application. If multiple applications are made to the transplants, the total amount of Sumagic applied may not exceed that from a single application of a 10 ppm spray. The final application may not occur later than 14 days after the 2 to 4 true leaf stage.
ERYSIMUM	To control plant growth	None	None	Plants grown with good light and optimal growing conditions generally do not need PGRs.
EUPATORIUM	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	>240 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.96 to 1.18 mg a.i. (8 to 10 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	
EUPHORBIA	To control plant	Dazide/B-Nine	2,500 ppm spray	Plant growth slow early on. Apply PGRs once control is needed.
HYPERICIFOLIA HYBRID	growth	Citadel+Dazide/Cycocel+B-Nine	750 ppm + 2,500 ppm spray	
		Florel/Collate	Spray	Not recommended.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	1 to 2 ppm drench	Can be applied 3 to 4 weeks before finish, using the lower rate in the North and higher rate in the South.
EVOLVULUS	To control plant growth	None	None	Plants grown with good light and optimal growing conditions generally do not need PGRs.
EXACUM	To control plant	Dazide/B-Nine	2,500 to 5,000 ppm spray	
	growth	Topflor	25 to 50 ppm spray	Based on NC State University trials. Adjust rates for other locations.
			0.01 to 0.03 mg a.i. (0.08 to 0.25 ppm) drench for a 6-in. pot	Based on NC State University trials. Adjust rates for other locations. Exacum is very responsive to Topflor drenches, so start trials with lower rates.
FATSHEDERA	To control plant	Abide/A-Rest	65 to 132 ppm spray	
	growth		0.25 to 0.5 mg a.i. drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
FELICIA	To control plant growth	Citadel+Dazide/Cycocel+B-Nine	1,000 to 1,500 ppm + 2,500 to 4,000 ppm spray	Pinch plant as needed to improve shape.
FLOWERING/ FOLIAGE PLANTS, Herbaceous Species (Not specifically listed in this table)	To control plant growth	Abide/A-Rest	20 to 50 ppm spray	Recommended starting rate for an Abide/A-Rest spray on a new herbaceous flowering or foliage species is 33 ppm (16 fl. oz./gal).
			0.125 to 0.25 mg a.i. (1 to 2 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	30 ppm spray	Conduct trials on a small number of plants, adjusting the rate as needed for desired final plant height and length of height control.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.118 mg a.i. (1 ppm) drench for a 6-in. pot; apply 4 fl. oz./ 6-in. pot	Drench volumes and mg a.i. vary with pot size. Conduct trials on a small number of plants.
		Citadel /Cycocel	800 to 3,000 ppm spray	Optimum rate depends on species, desired amount of height control and environmental conditions. The suggested initial rate for small-scale trials is 1,250 ppm. Example: herbaceous species known to respond to Cycocel are—Achimenes, Aster, Astilbe, Begonia (hiemalis), Begonia (tuberous), Calceolaria, Carnation, Chrysanthemum, Columbine, Easter lily, <i>Gynura aurantiaca</i> , Ivy, Kalanchoe, <i>Lilium spp.</i> , Morning glory, Pachystachys, <i>Pilea spp.</i> , Pentas, <i>Salvia spp.</i> , Schefflera, <i>Sedum spp.</i> and Sunflower.
			2,000 to 4,000 ppm drench	Drench volumes vary with pot size. See label for recommended volumes. Herbaceous species known to respond to Cycocel are listed above.
		Concise/Sumagic	5 to 40 ppm spray	Conduct trials on a small number of plants, adjusting the rate as needed for desired final plant height and length of height control.
			0.1 to 1 ppm drench	Drench volumes and mg a.i. vary with pot size.
	To promote plant growth and overcome over-applications of gibberellin- inhibiting PGRs	Florgib/ProGibb T&O	1 to 25 ppm spray	Conduct trials on a small number of plants initially using 1 ppm, unless previous experience warrants higher use rates. Following assessment of plant response, and if desired results are not evident, reapplication or an increase in rates may be warranted. Consult the label for additional precautions.
		Fascination	1 to 25 ppm spray	Conduct trials on a small number of plants initially using 1 ppm, unless previous experience warrants higher use rates. Following assessment of plant response, and if desired results were not evident, reapplication or an increase in rate may be warranted. The most common rates for use are 3 to 5 ppm. SEE LABEL FOR ADDITIONAL PRECAUTIONS BEFORE USE.
	To induce lateral or basal branching	Configure	50 to 500 ppm spray	The supplemental label allows legal use on greenhouse grown plants not specifically listed on the original label. See label for trialing suggestions and precautions.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
FLOWERING/	To control plant	Abide/A-Rest	50 ppm spray	
FOLIAGE PLANTS, Woody Species (Not specificallylisted	growth		0.25 mg a.i. (2 ppm) drench for a 6-in. pot; apply 4 fl. oz./ 6-in. pot	Drench volumes and mg a.i. vary with pot size.
in this table)		Dazide/B-Nine	2,500 to 7,500 ppm spray	Two or more applications may be necessary if new growth begins to stretch or for enhanced coloration.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	50 ppm spray	Conduct trials on a small number of plants, adjusting the rate as needed for desired final plant height and length of height control.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.237 mg a.i. drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
		Citadel/Cycocel	800 to 3,000 ppm spray	Optimum rate depends on species, desired amount of height control and environmental conditions. The suggested initial rate for small-scale trials is 1,250 ppm. Example: woody species known to respond to Cycocel are— <i>Barleria cristata</i> , Bougainvillea, Camellia, Gardenia, Fuchsia, Hollies, Hydrangea, Lantana, <i>Pseuderanthemum lactifolia</i> , Rhododendron and Roses (potted).
			2,000 to 4,000 ppm drench	Drench volumes vary with pot size. See label for recommended volumes. Woody species known to respond to Cycocel are listed above.
		Concise/Sumagic	20 to 50 ppm spray	Conduct trials on a small number of plants, adjusting the rate as needed for desired final plant height and length of height control.
			0.5 to 2 ppm drench	Drench volumes and mg a.i. vary with pot size.
FREESIA	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.22 to 0.48 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	To increase lateral branching.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	100 to 300 ppm corm soak	Soak corms in the solution for 1 hr. before planting.
FUCHSIA	To control plant growth	Dazide/B-Nine	1,250 to 2,500 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 10 ppm spray	Make applications prior to visible bud to avoid delay.
		Concise/Sumagic	2 to 5 ppm spray	Make applications prior to visible bud to avoid delay.
	To increase	Augeo	781 to 2,343 ppm spray	
	lateral branching	Florel/ Collate	500 ppm spray	Florel and Collate applications will provide some growth retardant effects and delay flowering. Read the label for restrictions on timing of applications.
GARDENIA	To control plant	Abide/A-Rest	50 ppm spray	
	growth		0.25 mg a.i. (2 ppm) drench for a 6-in. pot; apply 4 fl. oz./ 6-in. pot	Drench volumes and mg a.i. vary with pot size.
		Dazide/B-Nine	5,000 ppm spray	Spray when plants are at two-thirds final market size.
	To increase lateral branching	Augeo	2,343 to 4,687 ppm spray	Labeled for ivy geraniums only. Avoid treating plants
GAURA	To control plant	Dazide/B-Nine	3,000 to 4,000 ppm spray	
	growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	30 to 50 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	3.54 mg a.i. (30 ppm) drench for a 6-in. pot; apply 4 fl. oz./ 6-in. pot	
		Concise/Sumagic	10 to 30 ppm spray	

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
GAZANIA	To control plant growth	Citadel /Chlormequat E-Pro/ Cyclocel	1,500 ppm spray	Make applications prior to visible bud to avoid delay.
		Dazide/B-Nine	2,500 ppm spray	Make applications prior to visible bud to avoid delay.
GERANIUM	To control plant	Abide/A-Rest	26 to 66 ppm spray	See AGERATUM.
	growth	Piccolo/Bonzi/Paczol	5 to 30 ppm spray	Apply to zonal geraniums when new growth is 1.5 to 2 in. long. Apply to seed geraniums approximately 2 to 4 weeks after transplanting.
		Concise	3 to 8 ppm spray	Use lower rates for less vigorous plants and higher rates for more vigorous growing plants. Flower delay on some cultivars can occur when using rates >6 ppm.
		Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	Make first application 2 to 4 weeks after planting plugs or rooted cuttings (after stems have started elongating). Multiple applications may be needed.
		Piccolo 10 XC	10 to 30 ppm spray	See Piccolo remarks for GERANIUM. Early applications may require lower rates to avoid overdosing. Piccolo 10 XC will reduce late stretch when applied as the flower stems begins to elongate.
		Concise /Sumagic	3 to 6 ppm spray for cutting geraniums and 2 to 4 ppm spray for seed geraniums	See AGERATUM.
		Topflor	15 to 25 ppm spray	Apply to zonal geraniums when new growth is 1.5 to 2 in. long
	To promote earlier flowering in seed geraniums	Citadel/Chlormequat E-Pro/Cycocel	1,500 ppm spray	Make two applications at 35 and 42 days after seeding. Treated plants should flower earlier and be more compact and more well-branched than untreated plants.
		Florgib/ProGibb	5 to 15 ppm spray (0.02 to 0.06 fl. oz./gal)	Make a single foliar application when first flower bud set is noted. Spray the entire plant until runoff. See label for precautions.
	To increase flower number and size in cutting geranium	Florgib/ProGibb T&O	1 to 5 ppm spray	Make a single foliar application when first flower bud set is noted. Spray the entire plant until runoff. See label for precautions.
	To increase	Augeo	1,562 ppm spray	Labeled for ivy geraniums only.
	lateral branching	Florel/ Collate	300 to 500 ppm spray	Labeled for zonal and ivy geraniums. Use the lower concentration for ivy geraniums. Florel and Collate will also provide some growth retardant effect and delay flowering. Read the label for restrictions on timing of applications.
GERANIUM, IVY	To control plant growth	Citadel /Chlormequat E-Pro/ Cyclocel	750 to 1,500 ppm spray	
	To increase branching	Florel/ Collate	200 to 300 ppm spray	
GERANIUM, Seed	To promote earlier flowering	Citadel	1,500 ppm spray	See label. Make two spray applications at 35 and 42 days after seeding. Plants flower quicker, are compact and have increased lateral breaks.
	To control plant growth	Concise	2 to 4 ppm spray	Apply when plant height is approximately 4 in. tall.
GERBERA DAISY	To control plant	Abide/A-Rest	25 to 132 ppm spray	
	growth		0.25 to 0.5 mg a.i. drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
		Dazide/B-Nine	1,200 to 5,000 ppm spray	
GLOXINIA	To control peduncle length	Dazide/B-Nine	1,250 ppm spray	Phytotoxicity may occur at rates >1,250 ppm.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS						
GOMPHRENA	To control plant	Dazide/B-Nine	2,500 to 5,000 ppm spray	See AGERATUM.						
	growth	Citadel/Chlormequat E-Pro/Cycocel	800 to 1,5,00 ppm spray							
GOODENIA	To control plant growth	None	None	Plants grown with good light and optimal growing conditions generally do not need PGRs.						
GRAPE IVY	To increase lateral branching	Augeo	781 to 1,562 ppm spray							
GROUNDCHERRY	To control plant growth	Concise /Sumagic	2 to 10 ppm spray	See precautions listed with EGGPLANT.						
gypsophila	To accelerate plant growth, increase stem and flower number and increase flower uniformity	Florgib/ProGibb T&O	150 to 500 ppm spray	Make 3 to 4 foliar applications after 4 weeks of new growth has occurred after pinching. Use 2-week intervals between sprays. See label for precautions.						
HELICHRYSUM PETIOLARE/	To control plant growth	None	None	Plants grown with good light and optimal growing conditions generally do not need PGRs.						
H. ITALICUM (Licorice plant)	To increase lateral branching	Florel/Collate	300 to 500 ppm spray							
HELIOTROPE ARBORESCENS	To control plant growth	Citadel /Chlormequat E-Pro/ Cyclocel	500 ppm spray	Rate for compact genetics needing slight growth control.						
		Citadel+Dazide/Cycocel+B-Nine	750 to 1,000 ppm + 1,500 to 3,000 ppm spray	Rate for compact genetics needing slight growth control.						
HIBISCUS	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray							
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	30 to 150 ppm spray	Application should be made when laterals are 1 to 4 in. long. Single applications control lateral growth for 3 to 6 weeks.						
		Concise	10 ppm spray	Apply within 7 days after pruning. Make additional applications as necessary to obtain desired results. Florida only: use a foliar spray concentration between 5 to 10 ppm (1.3 to 2.56 fl. oz./ gal) and apply a uniform spray volume of 3 qts/100 sq. ft.						
		Citadel/Chlormequat E-Pro/Cycocel	200 to 600 ppm spray	Multiple applications starting prior to first pinch are recommended. See label for additional precautions.						
		Concise/Sumagic	10 ppm spray	Treat within 7 days of pruning. Multiple applications may be required.						
HOLLY	To control plant							Abide/A-Rest	50 ppm spray	
	growth		0.25 mg a.i. (2 ppm) drench for a 6-in. pot; apply 4 fl. oz./ 6-in. pot	Drench volumes and mg a.i. vary with pot size.						
HOLLYHOCK	To control plant	Piccolo/Bonzi/Paczol	30 to 50 ppm spray							
	growth	Concise/Sumagic	5 to 40 ppm spray							
HOSTA	To promote lateral growth on finished plants	Configure	1,000 to 3,000 ppm spray	Apply in a uniform spray volume. Application is most effective when plants are fully established prior to application (i.e. at least 3 to 4 weeks after potting), when there is evidence of surface root development but before flower initiation.						
	To increase production of offsets for propagation	Configure	1,000 to 3,000 ppm spray	Apply in a uniform spray volume to fully established, actively growing stock plants. Repeat the application at 30-day intervals during the growing season. Offsets may be harvested at any time. Treatment effects may vary by Hosta cultivar and may respond differently to a given rate. Multiple applications a 30-day intervals using lower rates may be more effective than a single application at a higher rate. Conduct trials on a small number of plants under actual use conditions to establish the proper use rates and timings.						

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
HYACINTH	To reduce stem topple	Florel/Collate	1,000 ppm spray	To reduce stem topple at time of full flower, apply foliar spray before florets have opened.
	To control plant growth	Piccolo/Bonzi/Paczol	100 ppm bulb soak	Ten minute soaks provided excellent results in NC State University trials. Cultivar response varied.
		Concise/Sumagic	20 to 40 ppm bulb soak	Two to ten minute preplant soaks provided excellent results in NC State University trials. Cultivar response varied.
		Topflor	0.5 to 1 mg a.i. (4.2 to 8.45 ppm) drench for a 6-in. pot	Based on NC State University trials. Adjust rates for other locations.
			10 to 25 ppm bulb soak	Two to ten minute preplant soaks provided excellent results in NC State University trials. Cultivar response varied.
HYBRID LILY (See Lily, Hybrid)				
HYDRANGEA	To control plant	Abide/A-Rest	50 ppm spray	
	growth		0.25 mg a.i. (2 ppm) drench for a 6-in. pot; apply 4 fl. oz./ 6-in. pot	Drench volumes and mg a.i. vary with pot size.
		Dazide/B-Nine	2,500 to 7,500 ppm spray	Use lower rate in spring when 4 to 5 pairs of leaves are visible and new growth is starting to unfold, but not later than 4 weeks after initiation of forcing. Use higher rate for summer when regrowth after pinching is 1 to 2 in. long.
HYPOESTES	To control plant	Chlormequat E-Pro	800 to 1,500 ppm spray	
	growth	Citadel/Cycocel	400 to 1,500 ppm spray	See AGERATUM.
IMPATIENS, Seed	To control plant growth	Abide/A-Rest	10 to 44 ppm spray	See AGERATUM.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	10 to 45 ppm spray	
		Concise/Sumagic	5 to 10 ppm spray	
		Topflor	20 to 60 ppm spray	Based on NC State University trials. Adjust rates for other locations.
	To increase branching	Florel/Collate	100 to 300 ppm spray	Use if better branching needed.
IMPATIENS PLUGS, Seed	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	0.5 to 10 ppm spray (0.015 to 0.32 fl. oz./gal)	Timing of application should normally begin at the 1 to 2 true leaf stage.
IMPATIENS, Vegetative	To control plant growth	Piccolo/Bonzi/Paczol	2 to 15 ppm spray	Cultivars' response to PGRs varies, so test a few plants to determine rate for optimum control.
			0.5 to 1 ppm drench	Drench volumes and mg a.i. vary with pot size. See label for recommended volumes.
		Florel/Collate	100 to 300 ppm spray	Will improve branching.
IMPATIENS, Seashell-type	To control plant growth	Piccolo/Bonzi/Paczol	5 to 8 ppm spray	Apply when plants have reached 75% of finished height. Don't apply to plants under stress. Recommendations based on Michigan trials.
IRESINE HYBRID	To control plant growth	Citadel+Dazide/Cycocel+B-Nine	1,000 to 1,500 ppm + 2,500 to 4,000 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 10 ppm spray	
		Piccolo/Piccolo 10XC/Bonzi/ Paczol/Downsize	1 to 3 ppm drench	
IPOMEA	To control plant growth	Concise/Sumagic	10 to 25 ppm spray	Not needed if optimal scheduling is used. If needed, apply when plants have reached 75% of finished growth. Recommendations based on NC State University trials.

Green = University Research Trials Yellow = Supplier/Grower Trials

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
JACOBINIA (Pink)	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 10 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.06 to 0.12 mg a.i. (0.5 to 1 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	
JERUSALEM	To control plant	Citadel/Chlormequat E-Pro	800 to 1,500 ppm spray	
CHERRY	growth	Citadel/Cycocel	400 to 1,500 ppm spray	See AGERATUM.
KALANCHOE	To increase lateral branching	Augeo	1,042 to 2,343 ppm spray	
	To control peduncle length	Dazide/B-Nine	1,200 to 5,000 ppm spray	Phytotoxicity possible if B-Nine/Dazide accumulates in cupped areas of certain cupped-leafed varieties.
LANTANA	To control plant growth	Citadel + Dazide /Cycocel + B-Nine	2,500 to 5,000 ppm + 1,000 to 1,500 ppm Cycocel applied as a tank-mix spray	Cultivar response varies.
		Piccolo/Bonzi/Paczol	20 to 40 ppm spray	
		Concise/Sumagic	10 to 20 ppm spray	
	To increase	Augeo	781 to 1,562 ppm spray	
	lateral branching	Florel/ Collate	500 ppm spray	Florel and Collate applications will provide some growth retardant effects and delay flowering. Read the label for restrictions on timing of applications.
LARKSPUR, Cut	To promote growth and stem elongation	Florgib/ProGibb T&O	50 to 100 ppm spray	Apply when plants are 4 to 8 in. tall. Apply at 2- to 3-week intervals. See label for precautions.
LIATRIS	To control plant growth	Abide/A-Rest	25 to 132 ppm spray	
		owth	0.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot)	Drench volumes and mg a.i. vary with pot size.
		Dazide/B-Nine	2,500 to 5,000 ppm spray	
LILY, Easter	To control plant growth	Abide/A-Rest	30 to 132 ppm spray. Use 50 ppm spray as a base rate and adjust as needed.	Apply when newly developing shoots are 2 to 3 in. long; a second application when shoots average 6 in. long may be needed.
			0.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Single drench should be applied when shoots average 3 to 5 in. long. Drench volumes and mg a.i. vary with pot size.
		Concise	3 to 15 ppm spray	Apply when shoots average 3 in. tall. It is best to make only one foliar application per crop.
			0.03 to 0.06 mg a.i. (0.23 to 0.5 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Apply when shoots average 3 in. tall. Use lower rates on cultivars such as Nellie White and higher rates for Ace. For Florida only: use a solution concentration of between 0.05 to 0.12 mg a.i. (0.4 to 1.0 ppm) drench for a 6-in. pot (0.11 to 0.26 fl. oz./gal of drench solution, apply 4 fl. oz./6-in. pot).
		Concise/Sumagic	3 to 15 ppm spray	Apply when shoots average 3 in. tall.
			0.03 to 0.06 mg a.i. (0.25 to 0.5 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
	To prevent leaf yellowing	Fresco/Fascination	5 to 10 ppm spray	Apply early season (7 to 10 days PRIOR to visible bud stage) and mid-season (7 to 10 days AFTER visible bud stage). Apply spray only to lower leaves to minimize stem elongation. See label.
	To prevent leaf yellowing and prolong flowering	Fresco/Fascination	100 ppm spray	Apply late season (when first bud reaches at least 3 in. in length) and no more than 14 days prior to placement in a cooler or shipping. Apply to foliar and flower buds. See label.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
LILY, Hybrid	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	200 to 500 ppm spray	See CALADIUM.
		Piccolo/Bonzi/Paczol	5 to 30 ppm bulb soak	Soak bulbs in the solution for 15 min. prior to planting.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.25 to 0.5 mg a.i. (4 to 30 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Single drench should be applied when shoots average 3 to 5 in. long. Drench volumes and mg a.i. vary with pot size and cultivar.
		Concise	2.5 to 20 ppm spray	Conduct a trial to determine optimal rates for each cultivar and adjust the rate as needed. Spray when shoots average 3 in. tall. If a second application is needed or a split application is made, it should be applied when the shoots average 6 in. tall. Usually two applications of foliar sprays at a lower rate are more effective than one application at a higher rate. Avoid applications after visible bud stage.
			1 to 3 ppm drench	Drench volume varies with pot size. Applications should be made when newly emerged shoots are 1 to 2 in. tall.
			1 to 10 ppm bulb soak	Treatment soak time should range from 1 to 5 minutes. Soak time will vary depending on bulb size, cultivar, and final desired height. Lower rates may require longer soak times (5 to 10 minutes) than higher rates (1 minute).
		Concise/Sumagic	3 to 15 ppm spray	Apply when shoots average 3 in. tall.
			0.03 to 0.06 mg a.i. (0.25 to 0.5 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
		Topflor	0.25 to 0.5 mg a.i. (2.1 to 4.2 ppm) drench for a 6-in. pot	Based on NC State University trials. Adjust rates for other locations and plant response.
	To prevent leaf yellowing	Fresco/Fascination	5 to 10 ppm spray	Apply early season (7 to 10 days PRIOR to visible bud stage) and mid-season (7 to 10 days AFTER visible bud stage). Apply spray only to lower leaves to minimize stem elongation. See label.
	To prevent leaf yellowing and prolong flowering	Fresco/Fascination	100 ppm spray	Apply late season (when first bud reaches at least 3 in. in length) and no more than 14 days prior to placement in a cooler or shipping. Apply to foliar and flower buds. See label.
LILY, Oriental	To control plant growth	Piccolo/Bonzi/Paczol	100 to 200 ppm bulb soak	Ten minute preplant soaks provided excellent results in NC State University trials. Cultivar response varied.
		Concise	2.5 to 10 ppm spray	See Concise label comments for Hybrid lilies.
			1 to 10 ppm bulb soak	See Concise label comments for Hybrid lilies.
		Concise/Sumagic	1 to 10 ppm bulb soak	See Concise label comments for Hybrid lilies. Ten minute preplant soaks of 5 ppm provided excellent results in NC State University trials. Cultivar response varied.
		Piccolo 10 XC	200 to 500 ppm spray	Begin spray applications when plants reach a height of 2 to 4 inches.
			4 to 30 ppm drench	Drench volume varies with pot size. Begin drench applications when plants reach a height of 1 to 2 inches.
		Topflor	0.5 mg a.i. drench (4.2 ppm); apply 4 fl. oz./6-in. pot	Optimal rate based on NC State University trials. Adjust rate for plant vigor. Drench volumes and mg a.i. vary with pot size.
			25 ppm bulb soak	Ten minute preplant soaks provided excellent results in NC State University trials. Cultivar response varied.
	To prevent leaf yellowing	Fresco/Fascination	100 ppm spray	Apply early season (7 to 10 days PRIOR or AFTER visible bud stage). Apply spray only to lower leaves to minimize stem elongation. See label.
	To prevent leaf yellowing and prolong flowering	Fresco/Fascination	100 ppm spray	Apply late season (no more than 14 days prior to placement in a cooler or shipping). Apply to foliar and flower buds. See label

Green = University Research Trials Yellow = Supplier/Grower Trials

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
LINER DIPS	To control plant growth	Piccolo	0.5 to 8 ppm preplant liner dip	See label: for detailed recommendations for chemical application techniques, adjusting rates for northern or southern locations, and the specific rates for achieving the desired level of activity.
LIPSTICK VINE	To increase lateral branching	Augeo	521 to 1,042 ppm spray	
LISIANTHUS	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	
LOBULARIA	To control plant growth	Piccolo	4 to 8 ppm liner root soak	See BACOPA. Rate based on North Carolina State University trials with Snow Princess.
			75 to 100 ppm spray	Sprays less effective than preplant liner soaks or substrate drenches. Rate based on North Carolina State University trials with Snow Princess.
			2 to 4 ppm drench	Drench volume varies with pot size. Rate based on North Carolina State University trials with Snow Princess.
		Concise	0.5 to 1 ppm liner root soak	See BACOPA. Rate based on North Carolina State University trials with Snow Princess.
			20 to 25 ppm spray	Sprays less effective than preplant liner soaks or substrate drenches. Rate based on North Carolina State University trials with Snow Princess.
			1 to 2 ppm drench	Drench volume varies with pot size. Rate based on North Carolina State University trials with Snow Princess.
<i>MANDEVILLA SANDERI</i> (Dipladenia)	To control plant growth	None	None	Plants grown with good light and optimal growing conditions generally do not need PGRs.
MARIGOLD	To control plant growth	Abide/A-Rest	13 to 33 ppm spray	See AGERATUM.
		Dazide/B-Nine	2,500 to 5,000 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	15 to 60 ppm spray	See remarks for AGERATUM. Use 15 to 30 ppm for French type and 30 to 60 ppm for African type (apply at an early stage of plant growth for African type with good stem coverage, especially for vigorous varieties).
		Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	
		Concise/Sumagic	10 to 20 ppm spray	
		Topflor	20 to 60 ppm spray	Based on NC State University trials. Adjust rates for other locations.
MARIGOLD PLUGS	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 20 ppm spray	Timing of application should normally begin at the 1 to 2 true leaf stage. Use 5 to 10 ppm for French types and 10 to 20 ppm for African types.
MATTHIOLA, Cut (Stock)	To promote growth and stem elongation	Florgib/ProGibb T&O	50 to 100 ppm spray	Apply when plants are 4 to 8 in. tall. Apply at 2- to 3- week intervals. See label for precautions.
MONARDA	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	60 to 160 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	>0.48 mg a.i. (>4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	
		Concise/Sumagic	15 to 30 ppm spray	
MONSTERA	To control plant	Abide/A-Rest	25 to 132 ppm spray	
	growth		0.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
MONTBRETIA	To control plant growth	Piccolo/Bonzi/Paczol	20 to 30 ppm corm soak	Soak corms in the solution for 15 min. prior to planting.
NASTURTIUM	To control plant growth	Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	See AGERATUM.
NEMESIA	To control plant	Dazide/B-Nine	2,500 to 5,000 ppm spray	Use on compact varieties to tone and hold crop.
	growth	Piccolo/Bonzi/Paczol	10 to 20 ppm spray	Based on NC State University trials.
		Florel/Collate	250 to 500 ppm spray	
		Concise/Sumagic	3 to 30 ppm spray	In NC State University trials, 5 ppm worked well on Vanilla Sachet.
		Topflor	2.5 to 5 ppm spray	Recommendation based on NC State University trials with Vanilla Sachet.
NEPTHYTIS, Green	To control plant	Abide/A-Rest	25 to 132 ppm spray	
and Green Gold	growth		0.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
NEW GUINEA IMPATIENS	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	0.25 to 15 ppm spray	Apply 2 to 4 weeks after transplanting. Cultivars' response to PGRs varies greatly. Test a few plants to determine rate for optimal control.
		Piccolo/Bonzi/Paczol	0.25 to 2 ppm drench	Drench volumes vary with pot size. See label for recommendations. Cultivars response to PGRs varies greatly. Test a few plants to determine rate for optimal control.
		Florel/Collate	100 to 300 ppm spray	To increase lateral branching and reduce premature flowering, don't apply within 8 weeks of desired flower date.
			Topflor	5 to 15 ppm spray
NEW GUINEA IMPATIENS, Plugs	To control plant growth	Piccolo 10 XC	0.25 to 5 ppm spray	See Piccolo remarks for AGERATUM, Plugs.
ORNAMENTAL CABBAGE and KALE (Non-food)	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	Use the higher rates for more vigorous types/cultivars. Multiple applications may be needed. Recommendation based on North Carolina conditions.
		Concise/Sumagic	2.5 to 8 ppm spray	Use higher rates for more vigorous cultivars. Recommendation based on North Carolina conditions.
ORNAMENTAL PEPPERS	To control plant growth	Piccolo/Bonzi/Paczol	20 ppm foliar spray	Recommendation based on North Carolina conditions for a moderately vigorous cultivar.
(Non-food)		Concise/Sumagic	5 to 15 ppm spray	
ORNAMENTAL VEGETABLES (Non-food)	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	Use the higher rates for more vigorous types/cultivars like kale Red Bor. Multiple applications may be needed. Recommendation based on North Carolina conditions.

10 to 25 ppm spray

Growth Regulators for Floricultural Crops in Greenhouses

Concise/Sumagic

Use higher rates for more vigorous cultivars. Recommendation

based on North Carolina conditions.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
OSTEOSPERMUM	To control plant growth	Citadel/Cycocel	750 to 1,500 ppm spray	Two applications may be required. Two applications of 1,500 ppm (with the first applied at the start and the second at the end of the vernalization period) provided excellent results in NC State University trials.
			1,500 to 3,000 ppm drench	Drench volumes vary with pot size. See label for recommended volumes.
		Concise/Sumagic	8 ppm spray	Recommendation based on European trials on a cultivar with prostrate growth. Rates less than 24 ppm were not effective in NC State University trials.
			0.25 to 2 ppm drench; apply 3 fl. oz./5-in pot	One application of 1 to 2 ppm (at the start of vernalization) or two applications of 1 ppm (at the start of vernalization) and 0.5 ppm (at the end of the vernalization period) provided excellent results in NC State University trials for 4.5-in. production.
		Dazide/B-Nine	2,500 to 4,000 ppm spray	
		Dazide + Citadel/B-Nine + Cycocel	1,500 to 3,000 ppm+ 1,000 to 1,500 ppm Citadel/Cycocel applied as a tank-mix spray	Multiple sprays required. Stop applications after visible bud to avoid flower delay and smaller flowers. Not effective in NC State University trials.
		Piccolo	4 to 8 ppm liner root soak	See BACOPA. Rate based on Michigan State University trials.
		Piccolo/Bonzi/Paczol	27 to 54 ppm drench (8 to 16 mg a.i.) during production	Drench volumes vary with pot size. See label for recommended volumes. (based on NC State University trials)
			2 to 3 ppm drench (0.236 to 0.35 mg a.i.) for holding plants	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	15 to 30 ppm spray	
		Topflor	20 to 60 ppm spray	
			1 to 2 ppm drench; apply 3 fl. oz./5-in pot	One application of 1 to 2 ppm (at the start of vernalization) or two applications of 1 ppm (at the start of vernalization) and 0.5 ppm (at the end of the vernalization period) provided excellent results in NC State University trials for 4.5-in. production.
OTACANTHUS	To control plant growth	Dazide/B-Nine	2,500 ppm spray	Make first application when new growth appears after pinching. A second application may be used if a second pinch is planned.
PANSY	To control plant	Abide/A-Rest	3 to 15 ppm spray	See AGERATUM.
	growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 15 ppm spray	Apply when plants are 2 in. in diameter. Use higher rates for higher temperatures and more vigorous cultivars. Late applications may delay flowering.
		Concise/Sumagic	1 to 6 ppm spray	Apply when plants are 3 to 4 in. tall. Use higher rates for higher temperatures and more vigorous cultivars. Late applications may delay flowering.
		Topflor	2.5 to 7.5 ppm spray	Based on NC State University trials. Adjust rates for other locations. Pansies are very responsive to Topflor, so start trials with lower rates.
PANSY PLUGS	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	1 to 5 ppm spray	Timing of application should normally begin at the 1 to 2 true leaf stage. Pansies are sensitive as plugs, so determine optimal rates.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS			
PENSTEMON HARTWEGII	To control plant growth	Citadel+Dazide/Cycocel+B-Nine	1,000 ppm + 2,500 ppm spray	Rates for moderately vigorous cultivars. Up to 2 sprays may be needed.			
		Concise/Sumagic	5 to 10 ppm spray	Rates for moderately vigorous cultivars. Up to 2 sprays may be needed.			
		Dazide/B-Nine	2,500 ppm spray	Rates for moderately vigorous cultivars. Up to 2 sprays may be needed.			
		Florel/Collate	Spray	Not recommended because of flower delay.			
PEPINO	To control plant growth	Concise/Sumagic	2 to 10 ppm spray	See precautions listed with EGGPLANT.			
PEPPER	To control plant growth	Concise/Sumagic	2 to 10 ppm spray	See precautions listed with EGGPLANT.			
PERENNIALS (Not specifically listed in this table)	To induce lateral or basal branching	Configure	50 to 500 ppm spray	The supplemental label allows legal use on greenhouse grown plants not specifically listed on the original label. See label for trialing suggestions and precautions.			
PERILLA	To control plant	Dazide/B-Nine	2,000 to 4,000 ppm spray	Apply 1 to 3 times as needed.			
	growth	Dazide + Citadel/B-Nine + Cycocel	2,500 to 4,000 ppm + 1,000 to 1,500 ppm Citadel/Cycocel applied as a tank-mix spray				
		Piccolo/Bonzi/Paczol	10 to 20 ppm spray				
PETUNIA, Seed	To control plant	Abide/A-Rest	10 to 26 ppm spray	See AGERATUM.			
	growth	Dazide/B-Nine	2,500 to 5,000 ppm spray				
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	15 to 45 ppm spray				
		Concise/Sumagic	25 to 50 ppm spray				
		Topflor	20 to 60 ppm spray	Based on NC State University trials. Adjust rates for other locations.			
PETUNIA PLUGS, Seed	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 10 ppm spray	Timing of application should normally begin at the 1 to 2 true leaf stage.			
PETUNIA,	To control plant growth	Abide/A-Rest	10 to 26 ppm spray	Multiple applications may be required.			
Vegetative		Dazide/B-Nine	2,500 to 5,000 ppm spray				
		Dazide + Bonzi/Piccolo/B-Nine/ Paczol	2,500 ppm spray + 40 ppm Bonzi/Piccolo/Paczol applied as a tank-mix spray	Recommendation based on NC State University trials.			
		Dazide + Topflor/B-Nine	2,500 ppm spray + 15 to 30 ppm Topflor applied as a tank- mix spray	Recommendation based on NC State University trials.			
		Piccolo/Bonzi/Paczol	5 to 45 ppm spray	An application at 2 to 4 ppm can be made 1 to 2 weeks after transplanting, followed by a 20 to 30 ppm spray 2 to 3 weeks later. Cultivars' responses to PGRs vary. Test a few plants to determine rate for optimal control. Finished plants can be maintained and have prolonged shelf life when 5 to 10 ppm sprays are applied on full-grown, mature plants. Recommendations based on Michigan conditions.			
		Concise/Sumagic	20 to 50 ppm spray	20 ppm worked well in NC State University trials.			
		Piccolo	12 ppm liner root soak	See BACOPA. Rate based on Michigan State University trials with petunia multiflora prostrate Wave Purple.			
		Topflor	15 to 60 ppm spray	Recommendation based on NC State University trials.			
	To increase lateral branching	Florel/Collate	300 to 500 ppm spray				

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
PHILODENDRON	To control plant	Abide/A-Rest	25 to 132 ppm spray	
	growth		0.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
		Dazide/B-Nine	2,500 to 7,500 ppm spray	
PHLOX	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	See AGERATUM.
PILEA	To control plant	Abide/A-Rest	25 to 132 ppm spray	
	growth		0.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
PLECTRANTHUS	To control plant growth	Dazide + Citadel/B-Nine + Cycocel	1,500 to 2,500 ppm + 750 to 1,000 ppm Citadel/Cycocel applied as a tank-mix spray	Cultivars' responses to PGRs vary. Test a few plants to determine rate for optimal control. See label.
		Piccolo/Bonzi/Paczol	5 to 20 ppm spray	
POINSETTIA	To control plant growth	Abide/A-Rest	0.06 to 0.25 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volume and mg a.i. vary with pot size. Start with lower rates.
		Dazide/B-Nine	2,000 to 3,000 ppm spray	Not effective in NC State University studies.
		Dazide + Citadel/B-Nine + Cycocel	800 to 2,500 ppm + 1,000 to 1,500 ppm Citadel/Cycocel applied as a tank-mix spray	Use the higher rates of this tank-mix spray on stock plants and for finishing crops in very warm regions. Outside of very warm areas, use the lower rates. Late applications can delay flowering and reduce bract size.
		Piccolo/Bonzi/Paczol	10 to 30 ppm spray	Use higher rates of 15 to 45 ppm in southern Florida. Applications to slower-growing cultivars in cool climates should begin when axillary shoots are 2 to 3 in. long. For vigorous growing cultivars in warm climates, applications should begin when axillary shoots are 1.5 to 3 in. long. See label for other precautions.
		Piccolo/Bonzi/Paczol/Downsize	0.237 to 0.473 mg a.i. (0.25 to 3 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drenches generally have less of an effect on bract size than sprays. Drench volume and mg a.i. vary with pot size. Start with lower rates.
		Concise	2.5 to 10 ppm spray	Apply when the lateral shoots are 1.5 to 2.5 in. tall (about 10 to 14 days after pinching). Test for cultivar sensitivity. Multiple applications of the lower label rate may elicit short days. For Florida only: use a foliar spray concentration between 10 to 15 ppm (2.5 to 3.8 fl. oz./gal) and do not apply after October 25.
		Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	For natural season crops in N.C., don't apply Cycocel after mid-October to November 1. Late applications can reduce bract size and delay flowering.
			3,000 to 4,000 ppm drench	Drench volume varies with pot size. Consult the label for recommended volumes.
		Concise/Sumagic	2.5 to 10 ppm spray	
		Topflor	2.5 to 80 ppm spray	Use lower rates for less vigorous cultivars. SEE LABEL FOR ADDITIONAL RATE RECOMMENDATIONS.
			0.03 to 0.5 mg a.i. (0.25 to 4.2 ppm) drench for a 6-in. pot	
	To promote plant growth	Fascination	3 ppm spray	Use an early-season application during vegetative growth prior to the start of short days and flower initiation if promoting vegetative growth. SEE LABEL FOR ADDITIONAL PRECAUTIONS BEFORE USE.
		Fresco/Fascination	3 to 10 ppm spray	Use a late-season application to promote bract expansion. SEE LABEL FOR ADDITIONAL PRECAUTIONS BEFORE USE.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
POINSETTIA, Tree	To control plant growth	Concise	2 to 3 ppm drench for a 6-in. pot	For use in Florida only: Apply when the lateral shoots are 1.5 to 2.5 in. tall (about 10 to 14 days after pinching). Test for cultival sensitivity. Do not apply after October 25.
<i>PORPHYROCOMA POHLIANA</i> (Brazilian Fireworks)	To improve foliage color and for earlier flowering	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	3 to 5 ppm spray	Height control generally not needed and rates above 5 ppm can cause leaf puckering.
PORTULACA	To control plant	Abide/A-Rest	7 to 26 ppm spray	See AGERATUM.
	growth	Concise/Sumagic	15 to 30 ppm spray	
	To increase lateral branching	Florel/ Collate	300 to 500 ppm spray	Recommendations based on Michigan conditions.
POTHOS	To control plant	Abide/A-Rest	25 to 132 ppm spray	
	growth		.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
		Dazide/B-Nine	2,500 to 7,500 ppm spray	
PURPLE Coneflower	To control plant growth	Concise /Sumagic	30 to 40 ppm spray	
PURPLE PASSION	To control plant	Abide/A-Rest	26 to 132 ppm spray	
	growth		0.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
SALVIA, Annual	To control plant growth	Abide/A-Rest	10 to 26 ppm spray	See AGERATUM.
		Dazide/B-Nine	2,500 to 5,000 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	20 to 60 ppm spray	
		Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	
		Concise/Sumagic	5 to 10 ppm spray	
		Topflor	20 to 80 ppm spray	Based on NC State University trials. Adjust rates for other locations.
SALVIA PLUGS, Annual	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 10 ppm spray	Timing of application should normally begin at the 1 to 2 true leaf stage.
SALVIA FARINACEA	To control plant growth	Citadel+Dazide/Cycocel+B-Nine	1,000 ppm + 2,500 ppm spray	Apply if growth control is needed.
		Florel/Collate	Spray	Not recommended because of flower delay.
SALVIA GUARANITICA	To control plant growth	Citadel+Dazide/Cycocel+B-Nine	1,000 to 1,500 ppm + 2,000 to 3,500 ppm spray	
SALVIA HYBRID	To control plant	Dazide/B-Nine	1,500 to 2,500 ppm spray	
	growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.5 to 1 ppm drench	
SALVIA LONGISPICATA x FARINACEA	To control plant growth	Dazide/B-Nine	2,500 to 3,000 ppm spray	
SALVIA PATENS	To control plant growth	Citadel+Dazide/Cycocel+B-Nine	1,000 ppm + 2,500 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	1 ppm drench	Trial rate before use.
SALVIA, Perennial	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	40 to 60 ppm spray	

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS			
SALVIA, Vegetative	To control plant	Dazide/B-Nine	1,000 to 2,000 ppm spray	Multiple applications may be needed to tone crop.			
	growth	Dazide + Citadel/B-Nine + Cycocel	2,000 to 3,500 ppm + 1,000 to 1,500 ppm Citadel/Cycocel applied as a tank-mix spray				
SANVITALIA	To control plant growth	Dazide/B-Nine	1,200 to 5,000 ppm spray	Use to tone plants. Cultivars' response to PGRs varies. Test a few plants to determine rate for optimal control.			
SCAEVOLA AEMULA	To control plant growth	Concise /Sumagic	30 ppm spray	Based on NC State University trials, 30 ppm worked well. Adjust rates to other locations; test on a few plants to determine rate for optimal control.			
			0.125 ppm drench (0.011 mg a.i.) for a 5-in. pot; apply 3 fl. oz./5-in. pot	Drench volumes vary with pot size. See label for recommende volumes. Scaevola is very responsive to Concise/Sumagic drenches. Test on a few plants to determine rate for optimal control. Recommendations based on NC State University trials			
		Dazide/B-Nine	2,500 ppm spray				
		Piccolo/Bonzi/Paczol	20 to 40 ppm spray				
			1 to 3 ppm drench (0.12 to 0.35 mg a.i.)	Drench volumes vary with pot size. See label for recommende volumes. Cultivars' response to PGRs varies.			
		Topflor	45 to 60 ppm spray	Recommendations based on NC State University trials.			
			0.79 to 2.25 ppm drench (0.075 to 0.2 mg a.i.)	Drench volumes will vary with pot size. See label for recommended volumes. Scaevola is very responsive to Topflor Test the lower rates on a few plants. Recommendations based on NC State University trials.			
			2 to 4 ppm liner dip	Scaevola is very responsive to Topflor. Test the lower rates on a few plants. Recommendations based on NC State University trials.			
	To increase lateral branching	Florel/Collate	300 to 500 ppm spray				
SCHEFFLERA	To control plant	Abide/A-Rest	25 to 132 ppm spray				
	growth		0.25 to 0.5 mg a.i. (2 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. may vary with pot size.			
		Dazide/B-Nine	2,500 to 7,500 ppm spray				
	To increase lateral branching	Augeo	3,125 ppm spray	Labeled for Schefflera arboricola only.			
		100 to 400 ppm spray	Based on NC State University trials when applied 2 weeks after potting. For retail sales, 400 ppm produced the most offsets. For stock plant production, 100 to 200 ppm provided a balance between an increase in offset number and a larger offset size.				
SHASTA DAISY	To control plant growth	Concise/Sumagic	15 to 30 ppm spray				
SHRIMP PLANT	To increase lateral branching	Augeo	781 to 1,562 ppm spray				
SNAPDRAGON,			To control plant		Abide/A-Rest	10 to 26 ppm spray	See AGERATUM.
Seed	growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	30 to 90 ppm spray	Apply at an early stage of plant growth with good stem coverage, especially for vigorous varieties.			
		Concise/Sumagic	25 to 50 ppm spray				
SNAPDRAGON PLUGS, Seed	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	10 to 20 ppm spray	Timing of application should normally begin at the 1 to 2 true leaf stage.			

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
SNAPDRAGON,	To control plant	Piccolo/Bonzi/Paczol	30 to 60 ppm spray	
Vegetative	growth	Concise/Sumagic	20 to 45 ppm spray	
	To control plant growth and peduncle stretch	Dazide/B-Nine	1,500 ppm spray	Use during periods of high temperatures.
Spathiphyllum	To induce flowering	GibGro	265 ppm spray	Apply one full-coverage spray during non-seasonal bloom period (June through January). Some cultivars exhibit distorted blooms, increased petiole length and narrow leaves.
	To accelerate bloom and increase flower number	Florgib/ProGibb T&O	150 to 250 ppm spray	Use a single application approximately 9 to 12 weeks prior to expected sale date. Spray to the point of runoff and thoroughly wet all growing points.
STATICE, Cut (Limonium)	To promote plant growth and stem elongation	Florgib/ProGibb T&O	50 to 100 ppm spray	Apply when plants are 4 to 8 in. tall. Other applications can be made at 2- to 3-week intervals. See label.
	For earlier flowering and increased flowering	Florgib/ProGibb T&O	400 to 500 ppm spray	Give each plant 0.33 fl. oz. (10 ml) of solution. Use when plants are 10 in. or more in diameter (approximately 90 to 100 days after sowing). See label.
STOKESIA	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	40 to 80 ppm spray	
STREPTOCARPUS	To control plant growth	Topflor	5 to 20 ppm spray	
<i>STROBILANTHES DYERIANUS</i> (Persian Shield)	To control plant growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	
SUNFLOWER	To control plant growth	Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	See AGERATUM.
		Piccolo/Bonzi/Paczol	2 to 4 mg a.i. drench; apply 4 fl. oz./6-in. pot	Optimal rate based on NC State University trials. Adjust rate for plant vigor. Drench volumes and mg a.i. vary with pot size.
		Concise/Sumagic	16 to 32 ppm sprays	Optimal rate based on NC State University trials. Adjust rate for plant vigor.
		Topflor	30 to 50 ppm spray	See AGERATUM.
			1 to 2 mg a.i. (8.45 to 16.9 ppm) drench for a 6-in. pot	
TOMATILLO	To control plant growth	Concise/Sumagic	2 to 10 ppm spray	See precautions listed with EGGPLANT.
ТОМАТО	To control plant growth	Concise/Sumagic	2 to 10 ppm spray	See precautions listed with EGGPLANT.
TORENIA	To control plant	Concise/Sumagic	5 ppm spray	Apply if growth control is needed.
FOURNIERI	growth	Dazide/B-Nine	1,500 to 2,500 ppm spray	Apply if growth control is needed.
TORENIA spp.	To control plant growth	Florel/Collate		
TROPICAL PLANTS (Not specifically listed in this table)	To induce lateral or basal branching	Configure	50 to 500 ppm spray	The supplemental label allows legal use on greenhouse-grown plants not specifically listed on the original label. See label for trialing suggestions and precautions.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS
TULIP	To control plant growth	Abide/A-Rest	0.125 to 0.5 mg a.i. (1 to 4 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size.
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.591 to 4.732 mg a.i. (5 to 40 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	Drench volumes and mg a.i. vary with pot size. Apply drenches 1 to 5 days after forcing begins.
		Piccolo/Bonzi/Paczol	2 to 5 ppm bulb soak	Soak bulbs for 1 hr. prior to planting. Ten-minute soaks of 50 ppm (1.6 oz./gal.) provided excellent results in NC State University trials. Cultivar response varied.
		Concise/Sumagic	10 ppm bulb soak	Ten minute preplant soaks provided excellent results in NC State University trials. Cultivar response varied.
		Topflor	0.5 to 1 mg a.i. (4.2 to 8.45 ppm) drench for a 6-in. pot	Based on NC State University trials. Adjust rates for other locations.
			80 to 100 ppm spray	
			10 to 40 ppm bulb soak	Ten minute preplant soaks provided excellent results in NC State University trials. Cultivar response varied.
VERBENA, Annual	To control plant	Dazide/B-Nine	2,500 to 5,000 ppm spray	See AGERATUM.
	growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	15 to 30 ppm spray	
		Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	
		Concise/Sumagic	15 to 30 ppm spray	
	To increase	Augeo	521 to 1,042 ppm spray	
	lateral branching	Florel/ Collate	500 ppm spray	Florel and Collate applications will provide some growth retardant effects and delay flowering. Read the label for restrictions on timing of applications.
VERBENA PLUGS, Annual	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 10 ppm spray	Timing of application should normally begin at the 1 to 2 true leaf stage.
VERBENA, Perennial	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	120 to 160 ppm spray	
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	>0.36 mg a.i. (>3 ppm) drench for a 6-in. pot; apply 4 fl. oz./6-in. pot	
VERBENA, Vegetative	To control plant growth	Dazide + Citadel/B-Nine + Cycocel	2,000 to 3,500 ppm + 750 to 1,000 ppm Citadel/Cycocel applied as a tank-mix spray	See General Recommendations.
		Piccolo	8 to 12 ppm liner root soak	See BACOPA. Rate based on Michigan State University trials.
		Citadel/Chlormequat E-Pro/ Cyclocel	1,500 to 2,000 ppm spray	
		Dazide/B-Nine	1,500 to 2,500 ppm spray	Do not apply within 2 weeks of a Florel or Collate application.
		Florel/Collate	250 to 300 ppm spray	
VERONICA	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	20 to 40 ppm spray	
		Concise/Sumagic	20 to 40 ppm spray	
VINCA	To control plant	Abide/A-Rest	5 to 18 ppm spray	See AGERATUM.
(Catharanthus)	growth	Dazide/B-Nine	2,500 to 5,000 ppm spray	
		Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray	
		Concise/Sumagic	1 to 3 ppm spray	Apply after plants reach a height of 4 in.
		Topflor	2.5 to 7.5 ppm spray	Based on NC State University trials. Adjust rates for other locations. Vinca is very responsive to Topflor, so start trials with lower rates.

CROP	PURPOSE	CHEMICAL	RATE*	PRECAUTIONS AND REMARKS		
VINCA VINE (Vinca spp.)			500 ppm spray	Florel and Collate applications will provide some growth retardant effects and delay flowering. Read the label for restrictions on timing of applications.		
VIOLA	To control plant growth	Concise/Sumagic	1 to 5 ppm spray	See AGERATUM.		
WANDERING JEW	To control plant growth	Abide/A-Rest	26 to 132 ppm spray			
WOODY	To control plant	Abide/A-Rest	50 ppm spray			
LANDSCAPE PLANT (Not specifically listed in this table)	growth		0.25 mg a.i. (2 ppm) drench for a 6-in. pot; apply 4 fl. oz./ 6-in. pot	Drench volumes and mg a.i. vary with pot size.		
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	100 ppm spray	See BEDDING PLANTS.		
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol/Downsize	0.47 mg a.i. (4 ppm) drench for a 6-in. pot; apply 4 fl. oz/ 6-in. pot			
		Concise/Sumagic	10 to 50 ppm spray	See AGERATUM.		
			1 to 2 ppm drench			
ZINNIA	To control plant	Abide/A-Rest	7 to 26 ppm spray			
	growth	Dazide/B-Nine	2,500 to 5,000 ppm spray			
		Piccolo/Piccolo 10 XC/Bonzi/ Paczol	15 to 45 ppm spray			
		Citadel/Chlormequat E-Pro/Cycocel	800 to 1,500 ppm spray			
ZINNIA PLUGS	To control plant growth	Piccolo/Piccolo 10 XC/Bonzi/ Paczol	5 to 10 ppm spray	Timing of application should normally begin at the 1 to 2 true leaf stage.		

Dilution Table

Formulated product per gallon of solution

PPM AI	Abide/ A-Rest (milliliters)	Dazide/ B-Nine (grams)	Citadel/ Cycocel (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			379	50	5.0	47.8	9.0	
100	1433			758	100	10.0	95.5	18	
200			6.5		200	20.0	191.0	36	
400			13					72	7.3
500			16					90	9.1
800			26					144	14.7
1,000		4.5	32					180	18.2
1,250		5.6	40						22.8
1,500		6.8	48						27.3
2,000		9.0	64						36.4
2,500		11.1	80						45.5
5,000		22.3							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: http://extension.unh.edu/agric/AGGHFL/Plantgrowthregulatorcalculator.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**

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