

# Chemical Height Control of Greenhouse Ornamentals

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**G**rowers now have greater freedom to experiment with chemical height control agents than ever before. The labels for A-Rest, B-Nine, Bonzi, and Cycocel have all been re-written over the past few years so that the use of these compounds is no longer restricted to a few specific crops. With regard to height control agents, only Sumagic continues to specify rates and species on the label.

The new general-use labeling format provides the grower with a useful tool. Instead of being frustrated by label uses restricted to major crops (because minor crops aren't listed on the label), growers can now conduct their own trials, determine the optimal rate, and legally use the PGR to control plant height.

Specific height control recommendations are still available for many crops (Table 1). Information on useful or effective rates can be found on both product labels and in published research reports. Growers should exercise care when experimenting with a new chemical or on a crop they are not yet familiar. Similarly, regard the information in published research reports with equal caution since reliable recommendations typically result when extensive trials are conducted under a variety of environmental conditions and on a number of cultivars.

If you can not find a specific recommendation in Table 1, start testing using the general guidelines in Table 2. Start with the lowest rates and gradually increase the rate as needed. Lower rates are generally used in northern climates and higher rates are generally used in the sunbelt.

When using PGRs be careful to apply the recommended coverage. Coverage refers to the volume of solution drenched per quart of potting medium, or sprayed per square foot of bench. Crop coverage is critical since it directly affects the total chemical dosage received by a plant.

Specific spray coverage rates vary between PGR products. Recommended carrier volumes for sprays are 1 quart per 100 sq.ft. for A-Rest and B-Nine, 2 quarts per 100 sq.ft. for Sumagic, and 2 to 3

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Table 1: Recommended application rates and method of application for various ornamental species. Rates are based on label recommendations from commercial products or published data. Drench treatments are typically applied at 2 to 2 1/2 fluid ounces of solution per quart of potting medium (65 ml per liter). Recommended carrier volumes for sprays are 1 quart per 100 sq.ft. for A-Rest and B-Nine 2 quarts per 100 sq.ft. for Sumagic, and 2 to 3 quarts per 100 sq.ft. for Cycoel and Bonzi. (Note: 1 quart per 100 sq.ft. is equivalent to approximately 100 ml per sq. meter). Application methods include: foliar spray (Sp), soil drench (Dr), bulb soak (BS), or cutting dip (Dip). EX denotes experimental rates used to achieve 25-50% reduction in elongation.  
+ denotes the use of a 50% higher concentrations to hold finished plants.

Ornamental crop	A-Rest	Cycoel	B-Nine	Bonzi	Sumagic
Common name	Concentrations (ppm of active ingredient) and method of application				
Achimenes		1250 Sp 2000-4000 Dr			
Ageratum	Ageratum houstonianum (mill.)	10-15 Sp +	800-1500 Sp	2500-5000 Sp	15-45 Sp 20-30 Sp
Alternanthera	Alternanthera bettzickiana	25-132 Sp 2-4 Dr			
Amaryllis	Hippeastrum vittatum			200 Dr	
Aster	Aster novi-belgii L. & A. spp.		1250 Sp 2000-4000 Dr	5000 Sp-EX	20 Sp-EX
Astilbe	Astilbe x arendsii		1250 Sp 2000-4000 Dr		
Azalea (Florist)	Rhododendron x Sp. & R. obtusum	26 Sp	1000-2000 Sp	2500 Sp	100-200 Sp 5-15 Dr 10-15 Sp
Bachelor's Buttons, Cornflower, Centurea	Centurea cyanus L. & C. sp.	10-15 Sp +		2500-5000 Sp	
Begonia, Tuberous, Rex or Non-stop	Begonia x tuberhybrida B. x hiemalis B. rex		800-1500 Sp		
Begonia, Wax or Fibrous	Begonia x semperflorens-cultorum	6-12 Sp +		2500-5000 Sp	Warning Warning

Black-eyed Susan	<i>Rudbeckia hirta</i>	50 Dr-EX				
Bleeding heart	<i>Dicentra spectabilis</i>	65-132 Sp 2-4 Dr				
Bougainvillea	<i>Bougainvillea glabra</i> & cvs		1250 Sp 2000-4000 Dr			
Bouvardia	<i>Bouvardia humboldtii</i> Hort.				1000 Sp-EX 25 Dr-EX 3-8 Dr-EX	0.4-0.7 Dr-EX
Brassia	<i>Brassia actinophylla</i>			2500-5000 Sp		
Browallia	<i>Browallia speciosa</i>					
Caladium	<i>Caladium x hortulanum</i> Birdsey				100-200 Sp 2-16 Dr 60 BS	
Calendula	<i>Calendula officinalis</i>			2500-5000 Sp		
Calla Lily	<i>Zantedeschia sp.</i> <i>Z. eliotiana</i> W. Wats <i>Z. rehmannii</i> Engl.				10-30 Dr 20 BS	
Camellia	<i>Camellia x williamsii</i>		1250 Sp 2000-4000 Dr		500 Sp-EX	
Carnation (cut)	<i>Dianthus caryophyllus</i>		1250 Sp 2000-4000 Dr			
Celosia	<i>Celosia argentea</i> L.	10-15 Sp +	800-1500 Sp	2500 Sp	15-45 Sp	10-20 Sp
China Aster	<i>Callistephus chinensis</i> (L.) Nees.	10-15 Sp +		2500-5000 Sp		
Chrysanthemum	<i>Dendranthema x grandiflora</i> (Ramat.) Kitamura	25-50 Sp 2-4 Dr	1250 Sp 2000-4000 Dr	1250-5000 Sp 1000 Dip	50-200 Sp 1-4 Dr	2.5-10 Sp
Cineraria	<i>Senecio cruentus</i> (L'Herit.)		1250 Sp 2000-4000 Dr			
Clematis	<i>Clematis tangutica</i>	25-132 Sp 2-4 Dr				

Ornamental crop Common name	Scientific name	A-Rest	Cycocel	B-Nine	Bonzi	Sumagic
		Concentrations (ppm of active ingredient) and method of application				
Cleome	<i>Cleome spinosa</i> Jacq.	10-15 Sp + 5 Dr-EX	800-1500 Sp			
Clerodendron, Southern bleeding heart	<i>Clerodendron thomasoniae</i> Ball				4 Dr-EX	
Coleus	<i>Coleus blumei</i> Benth.	10-15 Sp +	800-1500 Sp	2500-5000 Sp	15-45 Sp	10-20 Sp
Columbine	<i>Aquilegia x hybrida</i> & <i>A. sp.</i>	65-132 Sp 2-4 Dr	1250 Sp 2000-4000 Dr			
Cordylone	<i>Cordylone terminalis</i>				200 Sp-EX 200 Dr-EX	
Cosmos	<i>Cosmos bipinnatus</i>			2500-5000 Sp		
Crossandra	<i>C. infundibuliformis</i>			2500-5000 Sp		
Croton	<i>Codiaeum variegatum</i>				12 Sp-EX 1-4 Dr-EX	0.7-2.5 Dr-EX
Daffodil	<i>Narcissus</i>				20-40 Dr	
Dahlia (rhizome)	<i>Dahlia variabilis</i> Willd. (from rhizome)	2-4 Dr			10-40 Dr	
Dahlia (seed)	<i>Dahlia pinnata</i> (from seed)	10-15 Sp +	800-1500 Sp	2500-5000 Sp	15-45 Sp	10-20 Sp
Delphinium	<i>Delphinium sp.</i>	35-132 Sp 2-4 Dr		2500-5000 Sp		
Dracaena	<i>Dracaena deremensis</i> <i>var Wameckii</i> & <i>D. sp.</i>	25-132 Sp 2-4 Dr				
Dumb cane	<i>Dieffenbachia maculata</i>	1-4 Dr-EX				
Dusty Miller	<i>Senecio cineraria</i>			2500-5000 Sp		
English ivy	<i>Hedera helix</i> L.		1250 Sp 2000-4000 Dr			
Episca	<i>Episcia cupreata</i> (Hook.) Hanst.				7 Dr-EX	

Exacum, Persian violet	<i>Exacum L.</i>				2500-5000 Sp			
False dragonhead	<i>Physostegia virginiana</i>							45-75 Dr-EX
Fatsy	<i>Fatsyhedera</i>	65-132 Sp 2-4 dr						
Flowering kale	<i>Brassica oleracea L.</i>							
Freesia	<i>Freesia x hybrida</i> Bailey	3 Dr-EX			2500-5000 Sp	15 Sp-EX 100-300 BS		5 Sp-EX
Fuchsia	<i>Fuchsia x hybrida</i>		1250 Sp 2000-4000 Dr			2.5 Dr-EX		
Gardenia	<i>Gardenia jasminoides</i>		1250 Sp 2000-4000 Dr		5000 Sp			
Geranium, seed	<i>Pelargonium x hortorum</i> (seed propagated)	33-66 Sp	1500 Sp			10-30 Sp		2-4 Sp
Geranium, zonal	<i>Pelargonium x hortorum</i> (asexually propagated)	33-66 Sp	800-1500 Sp			10-30 Sp		3-6 Sp
Gerbera, Transvaal daisy	<i>Gerbera jamesonii</i>	25-132 Sp 2-4 Dr			1200-5000 Sp			
Gladiolus	<i>Gladiolus x hortulanus</i>	6-12 Dr-EX						
Globe Amaranth, Gomphrena	<i>Gomphrena globosa</i>		800-1500 Sp		2500-5000 Sp			
Gloxinia	<i>Sinningia speciosa</i>				1250 Sp			
Hibiscus	<i>Hibiscus rosa-sinensis</i>		200-600 Sp		2500-5000 Sp	30-150 Sp 1-2 Dr		5-15 Sp-EX 0.4-1.6 Dr-EX
Hollyhock	<i>Alcea rosea L.</i>					50 Sp-EX 2 Dr-EX		
Hydrangea	<i>Hydrangea macrophylla</i>		1250 Sp 2000-4000 Dr		5000 Sp			10 Sp-EX
Hypoestes, Polka Dot plant	<i>Hypoestes phytlostachya</i> Bak.		800-1500 Sp					5-10 Sp-EX 0.4-0.8 Dr-EX
Impatiens	<i>Impatiens wallerana L.</i> Hock.	20-26 Sp +				15-45 Sp		5-10 Sp

Ornamental crop	A-Rest	Cyoccel	B-Nine	Bonzi	Sumagic
Common name	Concentrations (ppm of active ingredient) and method of application				
Scientific name					
Jerusalem Cherry	<i>Solanum psuedo-capsicum</i>	800-1500 Sp			
Kalanchoe	<i>Kalanchoe blossfeldiana</i>	1250 Sp 2000-4000 Dr	1200-5000 Sp		
Lantana	<i>Lantana camara</i>	25-132 Sp 2-4 Dr	1250 Sp 2000-4000 Dr		100-200 Sp-EX 4-8 Dr-EX
Liatris, Gayfeather	<i>Liatris spicata</i>	25-132 Sp 2-4 Dr			
Lily, Easter	<i>Lilium longiflorum</i>	1250 Sp 2000-4000 Dr			10-25 Sp 0.25-0.5 Dr
Lily, Hybrid or colored	<i>Lilium sp. (Hybrid lilies)</i>	1250 Sp 2000-4000 Dr		250-500 Sp 4-30 Dr 20-30 BS	10-50 Sp-EX 1-5 Dr-EX
Lisianthus, gentian	<i>Eustoma grandiflorum</i> (Raf.) Shinn.	66 Sp-EX	2500-5000 Sp		10 Sp-EX 13 Dr-EX
Mandevilla	<i>Mandevilla sp.</i>				5-20 Sp-EX
Marigold	<i>Tagetes erecta L.</i> <i>T. patula L.</i>	18-26 Sp +	800-1500 Sp	15-60 Sp 10-20 Dr-EX	10-20 Sp
Monstera	<i>Monstera deliciosa</i>	25-132 Sp 2-4 Dr			
Morning glory	<i>Convolvulus sp.</i>		1250 Sp 2000-4000 Dr		
Nasturtium	<i>Tropaeolum majus</i>		800-1500 Sp		
Nepthytis	<i>Nephtytis gravenreuthii</i>	25-132 Sp 2-4 Dr			
Painted tongue, velvet flower, Salpiglossis	<i>Salpiglossis sinuata</i> <i>R. &amp; P.</i>		1000-5000 Sp-EX		
Pansy	<i>Viola x wittrockiana</i>	8-10 Sp +		5-15 Sp	1-6 Sp **

Pentas	<i>Pentas lanceolata</i>		1250 Sp 2000-4000 Dr			
Peony	<i>Paeonia suffruticosa</i> Andr.					25-50 Sp-EX
Pepper, Ornamental	<i>Capsicum annuum</i> L.					25-50 Dr-EX
Petunia	<i>Petunia x hybrida</i> Vilm.	15-20 Sp +		2500-5000 Sp	30-60 Sp	25-50 Sp
Philodendron	<i>Philodendron scandens</i>	25-132 Sp 2-4 Dr				
Phlox, Annual	<i>Phlox drummondii</i>			2500-5000 Sp		
Pilea, Artillery plant	<i>Pilea cadierei</i>	25-132 Sp 2-4 Dr	1250 Sp 2000-4000 Dr		25-50 Sp-EX	
Pinks, Carnations, Dianthus	<i>Dianthus sp.</i>	10-15 Sp +	800-1500 Sp	2500-5000 Sp	20-60 Sp	
Poinsettia	<i>Euphorbia pulcherrima</i> Willd.	0.5-2 Dr	800-1500 Sp 3000-4000 Dr	2000-3000 Sp	10-30 Sp 1-3 Dr	2.5-10 Sp
Portulaca	<i>Portulaca grandiflora</i>	10-15 Sp +				
Pothos	<i>Epipremnum aureum</i> (Linden & Andre) Bunt.	25-132 Sp 2-4 Dr			50-200 Sp-EX 1-1.5 Dr-EX	25 Sp-EX 0.5-1 Dr-EX
Princess flower, Glory bush, Tibouchina	<i>Tibouchina urvilleana</i>		3000-6000 Dr-EX		2.5 Dr-EX	
Purple passion	<i>Gynura aurantiaca</i>	25-132 Sp 2-4 Dr	1250 Sp 2000-4000 Dr			
Rose	<i>Rosa hybrids</i> (potted)		1250 Sp 2000-4000 Dr			
Salvia	<i>Salvia splendens</i> & <i>S. spp.</i>	18-26 Sp +	1250 Sp 2000-4000 Dr	2500-5000 Sp	20-60 Sp	5-10 Sp
Snapdragon	<i>Antirrhinum majus</i> L.	15-20 Sp +				
Schefflera	<i>Schefflera arboricola</i>	25-132 Sp 2-4 Dr	1250 Sp 2000-4000 Dr		45-90 Sp	25-50 Sp
Sedum	<i>Sedum spp.</i>		1250 Sp 2000-4000 Dr			

Ornamental crop	A-Rest	Cycocel	B-Nine	Bonzi	Sumagic
Common name	Scientific name Concentrations (ppm of active ingredient) and method of application				
Shrimp plant, Cardinals guard		1250 Sp 2000-4000 Dr			
Stock				10 Dr-EX	
Sunflower	66 Sp-EX	800-1500 Sp		15-60 Dr-EX	
Swedish Ivy				1.3 Dr-EX	0.1 Dr-EX
Syngonium	6-18 Dr-EX			1.4-2.8 Dr-EX	0.7 Dr-EX
Tritonia, Ixia				20-30 BS	
Tulip	1-4 Dr			5-40 Dr 2-5 BS	
Verbena		800-1500 Sp	2500-5000 Sp		
Vinca (flowering or annual)	8-13 SP +	800-1500 Sp	2500-5000 Sp		1-3 Sp
Viola, Johnny Jump up					
Zinnia	10-15 SP +	800-1500 Sp	2500-5000 Sp	15-45 Sp	1-5 Sp

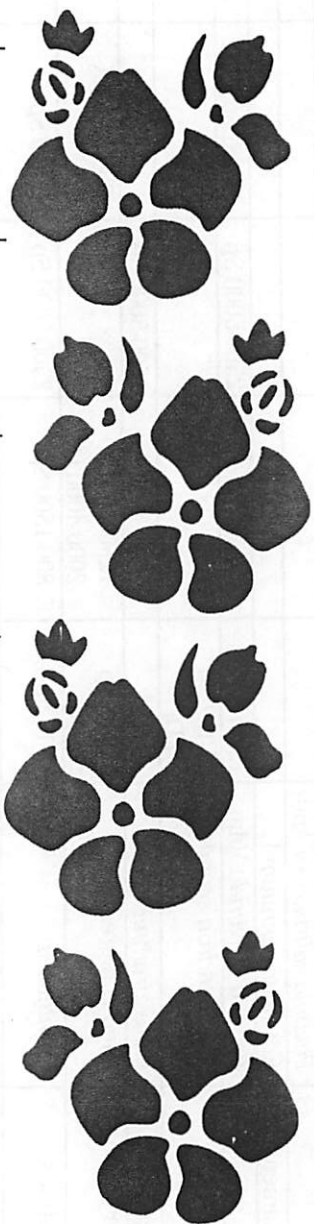




Table 2: Test rates to be used on species not specifically listed on product labels but where use is permitted on a general group of ornamentals. Drench treatments are typically applied at 2 to 2 1/2 fluid ounces of solution per quart of potting medium (65 ml per liter). Recommended carrier volumes for sprays are 1 quart per 100 sq.ft. for A-Rest and B-Nine, 2 quarts per 100 sq.ft. for Sumagic, and 2 to 3 quarts per 100 sq.ft. for Cycocel and Borzi. (Note: 1 quart per 100 sq.ft. is equivalent to approximately 100 ml per sq. meter). Application methods include: foliar spray (Sp), soil drench (Dr), and bulb soak (BS).

Ornamental crop	A-Rest	Cycocel	B-Nine	Bonzi	B-Nine/ Cycocel mix
Bedding plant plugs (many species)	3-35 Sp	400-750 Sp	1500-2500 Sp	1-20 Sp	
	0.5-1 Dr				
Bedding plants in final containers (many species)	6-66 Sp	800-1500 Sp	2500-5000 Sp	5-90 Sp	1250 ppm Sp Cycocel plus 1250-2500 ppm B-Nine
	1-2 Dr			0.5-1 Dr	
Bulb crops (many species)	25-50 Sp			50 Sp	
	2 Dr			5 Dr	
Foliage (many species)	20-50 Sp		2500-7500 Sp	15-30 Sp	
	1-2 Dr			0.5-1 Dr	
Herbaceous perennials (many species)	20-50 Sp	1250 Sp 2000-4000 Dr		15-30 Sp	
	1-2 Dr			0.5-1 Dr	

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quarts per 100 sq.ft. for Cycocel and Bonzi. (Note: 1 quart per 100 sq.ft. is equivalent to approximately 100 ml per sq. meter). As a general rule for drench treatments, apply 2 to 2 1/2 fl. oz. per qt. of potting medium.

The use of tank mixed PGRs or combination sprays with two different chemical compounds represent the latest trend in ornamental height control. The Cycocel plus B-Nine combination has been used successfully on poinsettia for many years. This combination can now be used by growers on a trial basis on bedding plants. In addition, researchers have been reporting good results with a combination of B-Nine plus Bonzi. As a general rule for using a B-Nine/Cycocel tank mix, use Cycocel at the highest rate that does not cause injury (i.e. 1250 ppm) and enough B-Nine to attain the desired level of height control.