

Growth Retardant Rates for Bedding Plant Production in Northern Climates

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Introduction:

Growth retardant application can be complicated. There are new growth regulators, new species and cultivars, and new ways of applying regulators that can greatly affect the rates, frequency and kind of growth retardant that is used. To make things more complicated, most growth retardant recommendations are written for regions that have significantly warmer day and night temperatures, i.e. the south. As a result, recommended rates are often too high for commercial production in the northern United States. In addition, the rates of application in the northern United States during the spring change substantially as weather conditions change dramatically from March to May.

The table below summarizes growth retardants that are effective for control of stem elongation for each species listed during March, April and May. Rates are based on effective rates in the north. Presented rates are based on results of various reports (from a variety of sources), reduced rates from reports for crops produced in the south, and personal experience. Additional growth retardants may be effective, but may not have been tested to date or I may not have observed whether they are effective or not.

Application technique has a huge impact on the effectiveness of a growth retardant application on a crop. This is especially the case with Bonzi and Sumagic where effectiveness can vary substantially based on how a plant is sprayed and whether and retardant drips onto the media. Because the effectiveness of each of these growth retardants varies with application technique and the greenhouse in which the plants are grown, recommended rates should be viewed as a starting point. Also, it is also best to start at a lower rate and increase the application

rate, or frequency, until a desired level of inhibition of stem elongation is reached.

Common Growth Retardants:

There are five primary growth retardants commonly used in commercial bedding plant production: A-Rest, B-9, Cycocel, Bonzi, and Sumagic. Differences between each of the retardants are presented below.

B-Nine – B-9 is perhaps the most widely used growth retardant. Key characteristics of B-9 include broad efficacy, spray volume is not as critical as other retardants (not active in the media), typical concentrations are from 1,000 – 5,000 ppm, little or no phytotoxicity, takes 3-5 hours for complete absorption, ‘greens’ foliage.

Cycocel – Cycocel is widely used to control stem elongation of geraniums, hibiscus and begonias. Key characteristics of Cycocel include broad efficacy, spray volume is not as critical as other retardants (not active in the media), typical concentrations are from 500 – 1,500 ppm, foliar phytotoxicity (yellowing) can occur when >1,000 ppm is applied, takes 3-5 hours for complete absorption, ‘greens’ foliage.

A-Rest – A-Rest is an older growth retardant that has been used primarily to control stem elongation in Easter lilies. Although it is effective on a number of species, its use has been limited because of the cost of A-Rest. However, often A-Rest a viable option when B-9 or Cycocel are not effective and when a grower does not want the degree of stem elongation inhibition that that can occur after a Bonzi or Sumagic application. In addition, A-Rest use in the plug industry is increasing in combination with other growth retardants, i.e. in a tank mix. Key characteristics of A-Rest include

broad efficacy, spray volume is not as critical as other retardants (not active in the media), typical concentrations are from 25-100 ppm, little or no phytotoxicity, takes 3-5 hours for complete absorption, ‘greens’ foliage.

Bonzi – Bonzi is a newer growth retardant that is one of a new class of materials that have broad efficacy at much reduced concentrations compared to B-9 and Cycocel. Key characteristics of Bonzi include broad efficacy, material is effective when absorbed through the stem or root (not leaves!), spray volume is very important, typical rates are from 5 – 20 ppm when applied as a spray, effectiveness is doubled when the chemical is applied to the media, foliar phytotoxicity is exhibited on vinca, it is absorbed in 5 – 10 minutes.

Sumagic – Sumagic is also newer growth retardant that is one of a new class of materials that have broad efficacy at much reduced concentrations compared to B-9 and Cycocel. Key characteristics of Sumagic include broad efficacy, material is effective when absorbed through the stem or root (not leaves!), spray volume is very important, typical rates are from 1/4 – 8 ppm when applied as a spray, effectiveness is doubled when the chemical is applied to the media, it is absorbed in 5 – 10 minutes.

Application Techniques:

The way a retardant is applied can greatly affect how much inhibition of elongation you get. In particular, mixing some growth retardants together or applying them to the media can greatly increase their efficacy.

Tank Mixes:

When the resulting inhibition of stem elongation from applying two

growth retardants together is greater than the inhibition in elongation that would have resulted from applying each retardant separately we say there is a 'synergistic' effect. When we mix two growth retardants together to increase the effectiveness of each we call it a 'tank mix'. Tank mixes can help reduce growth retardant costs and can increase the effectiveness of growth retardants dramatically. The most common tank mix in northern climates is a combination of B-9 + Cycocel. Note that some tank mixes are listed below.

Drenching:

Drenching with Bonzi or

Sumagic dramatically increases their inhibition of stem elongation. Growers can get into trouble when they allow these growth retardants to drip on media when doing a spray application. Therefore, it is very important that the most experienced sprayer apply these growth retardants and that a sprayer that delivers very uniform coverage be used. Very few drenches are listed below. However, postharvest drenches will be discussed in the future as a means to improve garden performance of some container and basket crops.

Rates listed below are only suggestions. The mention of these

materials and rates in no way represents an endorsement of these products by the University of Minnesota.

NOTE - the table below lists all the options available to a grower for height control. You choose which one you prefer! The presence of a '+' notes that that retardant should be added to the retardant immediately below it in that column. For instance, for Ageratum in May, 750 ppm B-9 can be added to 500 ppm Cycocel (retardant immediately below it) to make a tank mix.

Species	Common	March	April	May	Hold
Achillea millefolium	Achillea	25 ppm A-Rest 2,500 ppm B-9	50 ppm A-Rest 2,500 ppm B-9 7 ppm Sumagic	100 ppm A-Rest 5,000 B-9 15 ppm Sumagic	
Ageratum houstonianum	Ageratum	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 5 ppm Bonzi 2 ppm Sumagic 7 ppm Arest 500 ppm B-9 + 500 ppm Cycocel	10 ppm Bonzi 4 ppm Sumagic 10 ppm Arest 750 ppm B-9 + 500 ppm Cycocel	8 ppm Sumagic
Alcea rosea	Hollyhock	2,500 ppm B-9 500 ppm Cycocel	3,750 ppm B-9 750 ppm Cycocel 10 ppm Bonzi 5 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel	5,000 B-9 750 ppm Cycocel 20 ppm Bonzi 10 ppm Sumagic 1,250 ppm B-9 + 750 ppm Cycocel	1000 ppm B-9 + 750 ppm Cycocel 2,500 ppm B-9 + 1,000 ppm Cycocel
Amaranthus tricolor	Amaranthus	2,500 ppm B-9 1/2 ppm Sumagic	2,500 ppm B-9 2 ppm Sumagic	3,750 ppm B-9 4 ppm Sumagic	
Anchusa capensis	Forget-Me-Not	2,500 ppm B-9	2,500 ppm B-9	3,750 ppm B-9	
Angelonia spp.	Angelonia	1,500 ppm B-9 500 ppm Cycocel	2,500 ppm B-9 750 ppm Cycocel	3,750 ppm B-9 750 ppm Cycocel	
Antirrhinum majus	Snapdragon	2500 ppm B-9 1/2 ppm Sumagic	1,250 ppm B-9 + 500 ppm Cycocel 2500 ppm B-9 2 ppm Sumagic 5 ppm Bonzi 750 ppm B-9 + 500 ppm Cycocel	1,500 ppm B-9 + 750 ppm Cycocel 3,750 ppm B-9 4 ppm Sumagic 10 ppm Bonzi 1,250 ppm B-9 + 750 Cycocel 1,250 ppm B-9 + 10 ppm Bonzi	2,500 ppm B-9 + 1,000 ppm Cycocel 2,500 ppm B-9 + 1,000 ppm Cycocel 2,500 ppm B-9 + 20 ppm Bonzi

Species	Common	March	April	May	Hold
<i>Antirrhinum majus</i> (veg)	Trailing Snap	5 ppm Sumagic	10 ppm Bonzi 10 ppm Sumagic	20 ppm Bonzi 20 ppm Sumagic	
<i>Aqueligia hybrida</i>	Columbine		25 ppm A-Rest	50 ppm A-Rest	
<i>Arabis alpina</i>		2,500 ppm B-9 500 ppm Cycocel 25 ppm A-Rest	2,500 ppm B-9 750 ppm Cycocel 50 ppm A-Rest 750 ppm B-9 + 500 ppm Cycocel	3,750 ppm B-9 1,000 ppm Cycocel 50 ppm A-Rest 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
<i>Argyranthemum frutescens</i>		2,500 ppm B-9 750 ppm Cycocel	2,500 ppm B-9 750 ppm Cycocel	3,750 ppm B-9 1,000 ppm Cycocel	
<i>Asclepias tuberosa</i>	Butterfly Weed	2,500 ppm B-9	3750 ppm B-9 5 ppm Sumagic 10 ppm Bonzi 25 ppm A-Rest	5,000 ppm B-9 10 ppm Sumagic 20 ppm Bonzi 50 ppm A-Rest	
<i>Aster alpinus</i>	Alpine Aster	2,500 ppm B-9	3,750 ppm B-9	5,000 ppm B-9	
<i>Astilbe x Arendsii</i>	Astilbe		15 ppm Bonzi 750 ppm Cycocel	30 ppm Bonzi 1,000 ppm Cycocel	
<i>Astilbe tacquetii</i>		2,500 ppm B-9 500 ppm Cycocel 25 ppm A-Rest	2,500 ppm B-9 750 ppm Cycocel 50 ppm A-Rest 750 ppm B-9 + 500 ppm Cycocel	3,750 ppm B-9 750 ppm Cycocel 50 ppm A-Rest 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
<i>Begonia x tuberhybrida</i>	Tuberous Begonia	500 ppm Cycocel	750 ppm Cycocel	750 ppm Cycocel + 500 ppm B-9 2,500 ppm B-9	1 ppm Bonzi
<i>Begonia semperflorens</i>	Fibrous Begonia	500 ppm Cycocel	750 ppm Cycocel	750 Cycocel + 500 ppm B-9	
<i>Bracteantha</i>		5 ppm Bonzi 2 ppm Sumagic	10 ppm Bonzi 10 ppm Sumagic	20 ppm Bonzi 15 ppm Sumagic	
<i>Brachycome iberidifolia</i>	Swan River Daisy	2,500 ppm B-9	2,500 ppm B-9	3,750 ppm B-9	
<i>Brassica oleracea</i>	Flowering Cabbage	2500 ppm B-9	10 ppm Bonzi	20 ppm Bonzi	
<i>Browallia speciosa</i>	Browallia	2500 ppm B-9	2500 ppm B-9	3,750 B-9	
<i>Buddleia davidii</i>	Buttergly Bush	2500 ppm B-9	15 ppm Sumagic	30 ppm Sumagic	
<i>Caladium spp.</i>	Caladium	2,500 ppm B-9	2500 ppm B-9 25 ppm Bonzi	3,750 B-9 50 ppm Bonzi	
<i>Calendula officinalis</i>	Calendula	2,500 ppm B-9	2500 ppm B-9	3,750 B-9	

Species	Common	March	April	May	Hold
Calibrachoa spp.	Million Bells	2,500 ppm B-9 5 ppm Bonzi 5 ppm Sumagic	3,750 ppm B-9 10 ppm Bonzi 10 ppm Sumagic	5,000 ppm B-9 20 ppm Bonzi 15 ppm Sumagic	
Calistephus chinensis	Annual Aster	2500 ppm B-9	2500 ppm B-9 5 ppm A-Rest	3,750 B-9 10 ppm Arest	
Campanula carpatica		2,500 ppm B-9 500 ppm Cycocel 25 ppm A-Rest	2,500 ppm B-9 750 ppm Cycocel 50 ppm A-Rest 2 ppm Sumagic 10 ppm Bonzi	3,750 ppm B-9 750 ppm Cycocel 50 ppm A-Rest 4 ppm Sumagic 20 ppm Bonzi	
Campanula isophylla		2,500 ppm B-9	2,500 ppm B-9	3,750 ppm B-9	
Campanula persicifolia		2,500 ppm B-9 25 ppm A-Rest	2,500 ppm B-9 50 ppm A-Rest	3,750 ppm B-9 50 ppm A-Rest	
Campanula rotundifolia		2,500 ppm B-9 500 ppm Cycocel 25 ppm A-Rest	2,500 ppm B-9 750 ppm Cycocel 50 ppm A-Rest 750 ppm B-9 + 500 ppm Cycocel	3,750 ppm B-9 750 ppm Cycocel 50 ppm A-Rest 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
Canna x generalis					
Catharanthus roseus	Periwinkle	2500 ppm B-9 500 ppm Cycocel 1/2 ppm Sumagic	2500 ppm B-9 750 ppm Cycocel 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel	3,750 ppm B-9 750 ppm Cycocel 4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
Celosia spp.	Celosia	2500 ppm B-9 1/2 ppm Sumagic 750 ppm Cycocel	2500 ppm B-9 2 ppm Sumagic 5 ppm Bonzi 750 ppm Cycocel 750 ppm B-9 + 500 ppm Cycocel	4 ppm Sumagic 10 ppm Bonzi 1,250 ppm B-9 + 750 Cycocel	8 ppm Sumagic 2,500 ppm B-9 + 1,000 ppm Cycocel
Centaurea cyanus	Bachelor's Buttons	2,500 ppm B-9 1/2 ppm Sumagic	2,500 ppm B-9 2 ppm Sumagic	5,000 B-9 4 ppm Sumagic	
Centaurea montana		2,500 ppm B-9	2,500 ppm B-9 7 ppm Sumagic	5,000 B-9 15 ppm Sumagic	
Chelone glabra		no growth retardant effect			
Chrysanthemum coccineum	Painted Daisy	500 ppm Cycocel 2,500 ppm B-9	750 ppm Cycocel 3,750 ppm B-9 750 ppm B-9 + 500 ppm Cycocel	1,000 ppm Cycocel 5,000 ppm B-9 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
Chrysanthemum morifolium	Chrysanthemum	2,500 ppm B-9	2,500 ppm B-9	3,750 ppm B-9	

Species	Common	March	April	May	Hold
Cleome hasslerana	Cleome	2500 ppm B-9 500 ppm Cycocel	2500 ppm B-9 5 ppm Bonzi 750 ppm Cycocel 750 ppm B-9 + 500 ppm Cycocel	3,750 ppm B-9 10 ppm Bonzi 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
Clematis spp.	Clematis		10 ppm A-Rest	20 ppm A-Rest	
Coleus x hybridus (seed)	Coleus	2500 ppm B-9	2500 ppm B-9 750 ppm B-9 + 500 ppm Cycocel 250 ppm Florel	3,750 ppm B-9 1,250 ppm B-9 + 750 Cycocel 400 ppm Florel	2,500 ppm B-9 + 1,000 ppm Cycocel
Coleus x hybridus (veg)	Veg. Coleus	2500 ppm B-9	2500 ppm B-9 750 ppm B-9 + 500 ppm Cycocel 250 ppm Florel 10 ppm Bonzi	3,750 ppm B-9 1,250 ppm B-9 + 750 Cycocel 400 ppm Florel 20 ppm Bonzi	2,500 ppm B-9 + 1,000 ppm Cycocel
Coreopsis grandiflora	Coreopsis	2,500 ppm B-9	3,750 ppm B-9 5 ppm Sumagic	5,000 ppm B-9 10 ppm Sumagic	15 ppm Sumagic
Coreopsis verticillata		2,500 ppm B-9	3,750 ppm B-9 5 ppm Sumagic	5,000 ppm B-9 10 ppm Sumagic	15 ppm Sumagic
Cosmos bipinnatus	Cosmos	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel	3,750 ppm B-9 4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
Cosmos sulphureus		2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel	3750 ppm B-9 4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
Cuphea platycentra	Cuphea	2500 ppm B-9	2500 ppm B-9	3750 ppm B-9	
Cynoglossum amabile	Chinese Forget- Me-Not	2500 ppm B-9	2500 ppm B-9	3,750 B-9	
Dahlia x hybrida	Dahlia	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel	3,750 ppm B-9 4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
Dahlia x hybrida (veg)	Dahlia		2,500 ppm B-9 + 1000 ppm Cycocel	3,000 ppm B-9 + 1,250 ppm Cycocel	
Dahlia x hybrida (tuber)	Dahlia	2 ppm Sumagic	4 ppm Sumagic 10 ppm Bonzi	20 ppm Bonzi	

Species	Common	March	April	May	Hold
<i>Delphinium x cultorum</i>	Delphinium	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel 25 ppm A-Rest 10 ppm Bonzi	3,750 ppm B-9 4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel 50 ppm A-Rest 20 ppm Bonzi	2,500 ppm B-9 + 1,000 ppm Cycocel
<i>Dianthus barbatus</i>	Sweet William	2,500 ppm B-9 25 ppm A-Rest	2,500 ppm B-9 50 ppm A-Rest	3,750 ppm B-9 50 ppm A-Rest	
<i>Diascia barberae</i>	Diascia	2,500 ppm B-9	3,500 ppm B-9	5,000 ppm B-9	
<i>Dianthus chinensis</i>	Dianthus	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel 5 ppm Bonzi	3,750 ppm B-9 4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel 10 ppm Bonzi	2,500 ppm B-9 + 1,000 ppm Cycocel
<i>Dicentra spp.</i>	Bleeding Heart		25 ppm A-Rest	50 ppm A-Rest	
<i>Dimorphotheca aurantiaca</i>	African Daisy	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic	3,750 ppm B-9 4 ppm Sumagic	
<i>Eschscholzia californica</i>	California Poppy	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic	3,750 ppm B-9 4 ppm Sumagic	
<i>Echinacea purpurea</i>	Coneflower	750 ppm Cycocel	1,000 ppm Cycocel 50 ppm A-Rest	1,000 ppm Cycocel 100 ppm A-Rest	
<i>Echinops ritro</i>	Globe Thistle	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
<i>Eupatorium coelestimum</i>			30 ppm Sumagic	60 ppm Sumagic	
<i>Fuchsia x hybrida</i>	Fuchsia	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel	3,750 ppm B-9 4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
<i>Gaillardia x grandiflora</i>	Gaillardia	2,500 ppm B-9	3,750 ppm B-9 15 ppm Bonzi 7 ppm Sumagic	5,000 ppm B-9 30 ppm Bonzi 15 ppm Sumagic	
<i>Galium odoratum</i>		500 ppm Cycocel	750 ppm Cycocel	750 ppm Cycocel	
<i>Gaura lindheimeri</i>	Gaura	25 ppm A-Rest 5 ppm Sumagic 2,500 ppm B-9 10 ppm Bonzi	50 ppm A-Rest 10 ppm Sumagic 3,000 ppm B-9 20 ppm Bonzi	50 ppm A-Rest 20 ppm Sumagic 4,000 ppm B-9 30 ppm Bonzi	
<i>Gazania splendens</i>	Gazania	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
<i>Gerbera jamesonii</i>	Gerbera	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic	3750 ppm B-9 4 ppm Sumagic	

Species	Common	March	April	May	Hold
<i>Godetia whitneyi</i>	Satin Flower	2500 ppm B-9	2500 ppm B-9	3750 ppm B-9	
<i>Gomphrena globosa</i>	Globe Amaranth	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel	3750 ppm B-9 4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
<i>Gypsophila paniculata</i>	Baby's Breath	750 ppm Cycocel	1,000 ppm Cycocel 10 ppm Bonzi	1,250 pm Cycocel 20 ppm Bonzi	
<i>Helichrysum bracteatum</i>	Strawflower	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic	3750 ppm B-9 4 ppm Sumagic	
<i>Heliotropium arborescens</i>	Heliotrope	2,500 ppm B-9	1,500 ppm B-9 + 750 ppm Cycocel	2,000 ppm B-9 + 1,000 ppm Cycocel	
<i>Helenium autumnale</i>		2,500 ppm B-9	3,750 ppm B-9	5,000 ppm B-9	
<i>Helianthus annuus</i>	Sunflower	2500 ppm B-9 500 ppm Cycocel 1/2 ppm Sumagic	2500 ppm B-9 750 ppm Cycocel 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel	3750 ppm B-9 750 ppm Cycocel 4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
<i>Hemerocallis</i> spp.	Daylily	25 ppm A-Rest	50 ppm A-Rest 5 ppm Sumagic	100 ppm A-Rest 10 ppm Sumagic	
<i>Heuchera sanguinea</i>	Coral Bells	2,500 ppm B-9	3,750 ppm B-9 5 ppm Sumagic	5,000 ppm B-9 10 ppm Sumagic	
<i>Hibiscus coccineus</i>			20 ppm Bonzi 750 ppm Cycocel 5 ppm Sumagic	40 ppm Bonzi 1000 ppm Cycocel 10 ppm Sumagic	
<i>Hibiscus moscheutos</i>	Perennial Hibiscus	500 ppm Cycocel	750 ppm Cycocel 5 ppm Sumagic	1,000 ppm Cycocel 10 ppm Sumagic	
<i>Hibiscus roseus</i>	Hibiscus	500 ppm Cycocel	750 ppm Cycocel	750 ppm Cycocel	
<i>Hypoestes phyllostachya</i>	Hypoestes	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel	3,750 ppm B-9 4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
<i>Impatiens hawkeri</i>	New Guinea Impatiens	2 ppm Bonzi Spray	4 ppm Bonzi Spray 0.25 ppm Bonzi drench	6 ppm Bonzi spray 1 ppm Bonzi Drench	
<i>Impatiens wallerana</i>	Impatiens	1/2 ppm Sumagic 5 ppm Bonzi	2 ppm Sumagic 10 ppm Bonzi	4 ppm Sumagic 15 ppm Bonzi 1,250 ppm B-9 + 5 ppm Bonzi	

Species	Common	March	April	May	Hold
<i>Impatiens wallerana</i> (dbl veg)	Double Impatiens	5 ppm Bonzi	7 ppm Bonzi 0.5 ppm Bonzi Drench	10 ppm Bonzi 1 ppm Bonzi Drench	
<i>Ipomea alba</i>	Moonflower	2500 ppm B-9	2500 ppm B-9	3,750 B-9	
<i>Jamesbrittenia</i> spp.		1,000 ppm B-9	1,500 ppm B-9	2,500 ppm B-9	
<i>Lamium</i> spp.		500 ppm Cycocel 25 ppm A-Rest	750 ppm Cycocel 50 ppm A-Rest	750 ppm Cycocel 50 ppm A-Rest	
<i>Lantana camara</i>	Lantana	2500 ppm B-9	3750 ppm B-9	5000 ppm B-9	
<i>Lantana camara</i> (veg)	Vegetative Lantana	10 ppm Bonzi 5 ppm Sumagic 1,500 ppm B-9 + 500 ppm Cycocel	20 ppm Bonzi 10 ppm Sumagic 2,500 ppm B-9 + 1000 ppm Cycocel	30 ppm Bonzi 15 ppm Sumagic 3,000 ppm B-9 + 1,250 ppm Cycocel	
<i>Lavandula angustifolia</i>	Lavender	2,500 ppm B-9	3,750 ppm B-9 5 ppm Sumagic	5,000 ppm B-9 10 ppm Sumagic	
<i>Lavatera trimestris</i>		2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
<i>Leucanthemum x superbum</i>	Shasta Daisy		10 ppm Bonzi 5 ppm Sumagic	20 ppm Bonzi 10 ppm Sumagic	
<i>Limonium sinuata</i>	Statice	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
<i>Linum perenne</i>		25 ppm A-Rest	50 ppm A-Rest 10 ppm Bonzi 750 ppm Cycocel	100 ppm A-Rest 20 ppm Bonzi 750 ppm Cycocel	
<i>Lobelia erinus</i>	Lobelia	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 5 ppm Bonzi	3,750 ppm B-9 4 ppm Sumagic 10 ppm Bonzi	
<i>Lobelia x hybrida</i>		2,500 ppm B-9	5 ppm Sumagic 3,750 ppm B-9 50 ppm A-Rest	10 ppm Sumagic 5,000 ppm B-9 100 ppm A-Rest	
<i>Lobelia x speciosa</i>		2,500 ppm B-9	5 ppm Sumagic 3,750 ppm B-9 50 ppm A-Rest	10 ppm Sumagic 5,000 ppm B-9 100 ppm A-Rest	
<i>Lobularia maritima</i>	Sweet Alyssum	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic	5,000 ppm B-9 4 ppm Sumagic	
<i>Lupinus polyphyllus</i>	Lupine	500 ppm Cycocel 25 ppm A-Rest	750 ppm Cycocel 50 ppm A-Rest	750 ppm Cycocel 50 ppm A-Rest	
<i>Matthiola incana</i>	Stock	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
<i>Melampodium paludosum</i>	Melampodium	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic	3,750 ppm B-9 4 ppm Sumagic	

Species	Common	March	April	May	Hold
Mimulus x hybridus	Monkeyflower	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Mirabilis jalapa	Four O'Clock	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Myosotis alpestris		2,500 ppm B-9 25 ppm A-Rest	2,500 ppm B-9 50 ppm A-Rest	3,750 ppm B-9 50 ppm A-Rest	
Nemesia fruticans	Nemesia	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic	3,750 ppm B-9 4 ppm Sumagic	
Nemesia strumosa	Nemesia	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic	3,750 ppm B-9 4 ppm Sumagic	
Nemophila menziesii	Nemophila	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Nicotiana alata	Flowering Tobacco	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Nierembergia caerulea	Blanketflower	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Nigella damascena	Love-in-the-Mist	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Tropaeolum majus	Nasturtium	500 ppm Cycocel 1/2 ppm Sumagic	750 ppm Cycocel 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel	750 ppm Cycocel 4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel
Oenothera fruticosa	Evening Primrose	2,500 ppm B-9	3,750 ppm B-9 5 ppm Sumagic	5,000 ppm B-9 10 ppm Sumagic	
Papaver orientalis	Oriental Poppy	2,500 ppm B-9	2,500 ppm B-9	3,750 ppm B-9	
Pelargonium x hortorum	Geranium	500 ppm Cycocel 1/2 ppm Sumagic	750 ppm Cycocel 2 ppm Sumagic	1,000 B-9 + 500 ppm Cycocel 4 ppm Sumagic	1,500 ppm B-9 + 750 ppm Cycocel 8 ppm Sumagic
Pelargonium peltatum	Ivy Geranium	500 ppm Cycocel 1/2 ppm Sumagic	750 ppm Cycocel 2 ppm Sumagic	1,000 B-9 + 500 ppm Cycocel 4 ppm Sumagic	1,500 ppm B-9 + 750 ppm Cycocel 8 ppm Sumagic
Penstemon digitalis	Penstemon	25 ppm A-Rest	10 ppm Bonzi 5 ppm Sumagic 50 ppm A-Rest	20 ppm Bonzi 10 ppm Sumagic 100 ppm A-Rest	
Perovskia atriplicifolia	Russian Sage	2,500 ppm B-9 25 ppm A-Rest	3,750 ppm B-9 50 ppm A-Rest 5 ppm Sumagic	5,000 ppm B-9 100 ppm A-Rest 10 ppm Sumagic	
Platycodon grandiflorus	Balloon Flower	2,500 ppm B-9	2,500 ppm B-9	3,750 ppm B-9	
Plectranthus spp.	Plectranthus	1,250 ppm B-9 + 500 ppm Cycocel	1,500 ppm B-9 + 750 ppm Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel	

Species	Common	March	April	May	Hold
Polemonium caeruleum		2,500 ppm B-9	2,500 ppm B-9	3,750 ppm B-9	
Salvia leucantha			10 ppm Sumagic	20 ppm Sumagic	
Senecio cineraria	Dusty Miller	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 3-5 ppm Bonzi	2500 ppm B-9 4 ppm Sumagic 3-5 ppm Bonzi	5,000 ppm B-9 6 ppm Sumagic
Solidago canadensis			30 ppm Bonzi 15 ppm Sumagic	60 ppm Bonzi 30 ppm Sumagic	
Tagetes erecta	African Marigold	2500 ppm B-9 1/2 ppm Sumagic	5,000 ppm B-9 2 ppm Sumagic 5 ppm Bonzi	5,000 ppm B-9 4 ppm Sumagic 10 ppm Bonzi	15 ppm Bonzi
Tagetes patula	French Marigold	2500 ppm B-9	2500 ppm B-9	2500 ppm B-9	5,000 ppm B-9
Tagetes tenuifolia	Signata Marigold	2500 ppm B-9	2500 ppm B-9	2500 ppm B-9	5,000 ppm B-9
Petunia x hybrida - dwarf	Milliflora Petunia	2500 ppm B-9	2500 ppm B-9	2500 ppm B-9	5,000 ppm B-9
Petunia x hybrida - multiflora	Multiflora Petunia	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 750 ppm B-9 + 5 ppm Bonzi 750 ppm B-9 + 500 ppm Cycocel	5,000 ppm B-9 4 ppm Sumagic 1,250 ppm B-9 + 10 ppm Bonzi 1,250 ppm B-9 + 750 Cycocel	6 ppm Sumagic 15 ppm Bonzi 2,500 ppm B-9 + 1,000 ppm Cycocel
Petunia x hybrida - Wave	Wave Petunias	2500 ppm B-9 1/2 ppm Sumagic	5,000 ppm B-9 2 ppm Sumagic 10 ppm Bonzi 1,250 ppm B-9 + 750 Cycocel	4 ppm Sumagic 15 ppm Bonzi 2,500 ppm B-9 + 1,000 ppm Cycocel	5 ppm Bonzi drench
Pharbitis nil	Morning Glory	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Phlox drummondii		2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Phlox paniculata		500 ppm Cycocel	750 ppm Cycocel 5 ppm Sumagic	1,000 ppm Cycocel 10 ppm Sumagic	
Portulaca grandiflora	Portulaca	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel	4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel	6 ppm Sumagic 2,500 ppm B-9 + 1,000 ppm Cycocel
Rudbeckia fulgida	Black-Eyed Susan	2,500 ppm B-9 750 ppm Cycocel 25 ppm A-Rest	3,750 ppm B-9 1,000 ppm Cycocel 10 ppm Bonzi 50 ppm A-Rest	5,000 ppm B-9 1,250 ppm Cycocel 20 ppm Bonzi 50 ppm A-Rest 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel

Species	Common	March	April	May	Hold
Rudbeckia hirta	Rudbeckia	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Salpiglossis sinuata	Salpiglossus	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Salvia coccinea		2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Salvia farinacea	Blue Salvia	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Salvia splendens	Salvia	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 5 ppm Bonzi 750 ppm B-9 + 500 ppm Cycocel	2500 ppm B-9 4 ppm Sumagic 5 ppm Bonzi 1,250 ppm B-9 + 750 Cycocel	3 ppm Bonzi drench 2,500 ppm B-9 + 1,000 ppm Cycocel
Salvia x superba		2,500 ppm B-9 25 ppm A-Rest 500 ppm Cycocel	3,750 ppm B-9 5 ppm Sumagic 50 ppm A-Rest 750 ppm Cycocel	5,000 ppm B-9 10 ppm Sumagic 50 ppm A-Rest 1,000 ppm Cycocel	
Saponaria ocymoides		500 ppm Cycocel	750 ppm Cycocel	1,000 ppm Cycocel	
Scabiosa caucasica	Scabiosa	2,500 ppm B-9 25 ppm A-Rest	2500 ppm B-9 50 ppm A-Rest	3,750 ppm B-9 50 ppm A-Rest	
Scaveola aemula	Scaveola		10 ppm Bonzi 1 ppm Bonzi drench	20 ppm Bonzi 2 ppm Bonzi drench	
Sedum spurium	Sedum		5 ppm Sumagic 10 ppm Bonzi	10 ppm Sumagic 20 ppm Bonzi	
Sutera cordata	Bacopa	1,250 ppm B-9	1,500 ppm B-9	2,500 ppm B-9	
Tanacetum spp.		2,500 ppm B-9 25 ppm A-Rest	2,500 ppm B-9 50 ppm A-Rest	3,750 ppm B-9 50 ppm A-Rest	
Thunbergia alata	Black-Eyed-Susan Vine	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Tithonia rotundifolia	Mexican Sunflower	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Torenia fournieri	Torenia	2500 ppm B-9	2500 ppm B-9	3,750 ppm B-9	
Verbena x hybrida (ssed)	Verbena	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 5 ppm Bonzi 750 ppm B-9 + 500 ppm Cycocel	2500 ppm B-9 4 ppm Sumagic 10 ppm Bonzi 1,250 ppm B-9 + 750 Cycocel	2 ppm drench Sumagic 2,500 ppm B-9 + 1,000 ppm Cycocel
Verbena x hybrida (veg.)	Verbena	1/2 ppm Sumagic	2 ppm Sumagic 5 ppm Bonzi 750 ppm B-9 + 500 ppm Cycocel	4 ppm Sumagic 10 ppm Bonzi 1,250 ppm B-9 + 750 Cycocel	2,500 ppm B-9 + 1,000 ppm Cycocel

Species	Common	March	April	May	Hold
Veronica longifolia		2,500 ppm B-9 25 ppm A-Rest	3,750 ppm B-9 5 ppm Sumagic 50 ppm A-Rest 10 ppm Bonzi	5,000 ppm B-9 10 ppm Sumagic 75 ppm A-Rest 20 ppm Bonzi	
Veronica spicata	Veronica	25 ppm A-Rest	50 ppm A-Rest 5 ppm Sumagic	75 ppm A-Rest 10 ppm Sumagic	
Viola x wittrockiana	Pansy/Viola	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel 5 ppm Bonzi	4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel 10 ppm Bonzi	6 ppm Sumagic 2,500 ppm B-9 + 1,000 ppm Cycocel 15 ppm Bonzi
Zinnia angustifolia		2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic	3,750 ppm B-9 4 ppm Sumagic	
Zinnia elegans	Zinnia	2500 ppm B-9 1/2 ppm Sumagic	2500 ppm B-9 2 ppm Sumagic 750 ppm B-9 + 500 ppm Cycocel 5 ppm Bonzi	4 ppm Sumagic 1,250 ppm B-9 + 750 Cycocel 10 ppm Bonzi	6 ppm Sumagic 2,500 ppm B-9 + 1,000 ppm Cycocel 15 ppm Bonzi



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