

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