

# FLOWERS

## COMMERCIAL GREENHOUSE INSECT CONTROL

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**NOTE:** The following list of pesticides are labeled for the uses listed, however, there are different formulations of particular compounds and you must make sure the pesticide used is properly labeled. All pesticides must be handled and applied in strict accordance with the label on the pesticide container. The plant which is being damaged and the site where the plant is located (greenhouse) must be listed on the label. The pests (a compound is registered for) are also listed on the label. The pesticides below are listed by common name and by a formulation name which is used as an example of the formulations available. Many insecticides are now off patent and there are new trade names available for these active ingredients. There are also mixtures of active ingredients plus synergist available which are not listed. For example, there are several formulations of pyrethrum combined with other active ingredients and synergists available in spray concentrates, aerosols, and space release canisters for the control of several pests. Some chemicals are labeled for use in low volume spray equipment. Proper rates must be determined by applying the proper amount of active ingredient for the area treated. The rates given below are for high volume spray equipment. Many insects are developing resistance to pesticides available on the market. Practice resistance management and rotate the insecticides used to manage a pest. With most pesticides, you should rotate the compounds used at least once during a generation time for that insect. In addition, it is desirable to rotate mode of action of compounds used. A guide to rotating modes of action is the Insecticide Resistance Action Committee (IRAC) classification of the different mode of action sites and a letter for sub-groups. In resistance management rotations these number/letter codes can be used to determine which compounds are different modes of action. These are listed in the table under the column heading 'Mode of Action No.' (un=unknown)

Some of the insecticides listed are extremely toxic. Handle with caution and use protective equipment required by the label. A minimum interval between application and reentry has been established. Make sure of the proper reentry period for the insecticide has been observed before allowing people without label, prescribed personal protective equipment to enter the treated area. These are listed in the table under the column heading 'REI.'

Phytotoxicity (damage to the plant as the result of the application of a chemical) is an important consideration in controlling pests of ornamentals. Phytotoxicity is generally expressed as damage to the leaves, flowers, or stems and is observed as "burn" (browning of tissue), "chlorosis" (yellowing or bleaching of tissue), or modification of growth by deformation or stunting. There are many species and cultivars of ornamental plants with varying sensitivity to chemicals. Other environmental conditions, such as your particular growing conditions, will also effect phytotoxicity. You are encouraged to evaluate a pesticide for phytotoxicity on a few plants under your particular conditions before treating all plants.

COMMERCIAL GREENHOUSE INSECT CONTROL (continued)

PLANT	INSECT OR MITE	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALS. WATER	REI	MODE OF ACTION	COMMENTS
(Many flower and foliage plants)	Aphids	abamectin (Avid) .15EC	8 oz.	12 hr.	6	Apply as needed and repeat application at 7 day intervals or as necessary. Do not apply more than 16 fl. oz. per acre. Use in sufficient water to obtain uniform plant coverage. Phytotoxicity has been observed in certain species of ferns.
		acephate (Orthene TT&O, Pro 75) PT 1300 TT&O 97	% lb. Aerosol 8 oz.	24 hr.	1B	<b>Caution:</b> Phytotoxicity has occurred on the following plants: <i>Blechnum gibbum</i> , <i>Cissus antarctica</i> , <i>Ficus triangularis</i> , <i>Fittonia verschaffeltii</i> , <i>Maranta leuconeura kerchoveana</i> , <i>Pachystachya lutea</i> , <i>Placetranthus australis</i> , <i>Polypodium aureus</i> , <i>Polystichum</i> , <i>Pteris ensiformis</i> , <i>Tolmiea menziesii</i> . Before treating large plantings spray only a few plants and observe 2 weeks for varietal phytotoxicity.
		acetamiprid (TriStar 70WSP)	1 soluble bag	24 hr.	4A	Apply as a full coverage foliar spray.
		TriStar 30SG	1.3 oz.	12 hr.		Apply as a full coverage foliage spray the use of a non-ionic sp reader-sticker adjuvant may improve control.
		azadirachtin (Azatin 3.0 % XL, Align-XL) (Neemazad 4.5 EC) (Ornazin 3%)	10-16 oz. 2.25-4.5 oz. 8 oz.	4 hr. 12 hr. 12 hr.	18B	Must get full coverage for control but avoid excess runoff. Use fine spray; can also be applied as drench.  Addition of 0.5-1.0% non-phytotoxic oil will enhance efficiency.
		<i>Beauveria bassiana</i> (Naturalis-O) (BotaniGard ES)	30-100 fl. oz. 16-32 fl. oz.	4 hr. 12 hr.	4 hr. 12 hr.	Wait 48 hrs. before applying fungicides.
		bifenthrin (Talstar T&O or Attain) 10 WP 7.9% .67 F (Attain)	6-32 oz. 25-50 fl. oz. 8-40 oz. aerosol	12 hr.	3A	Apply as a full coverage foliage spray.
		chlorpyrifos (Dursban) 50WP 4E (DuraGuard) 20% ME	½ lb. 0.5-1.0 pt. 0.25-0.5 oz./gal.	12 hr.	1B	
		cyfluthrin (Decathlon) 2E 20WP	1-2 oz. 1.9 oz.	12 hr.	3A	Good coverage is necessary to provide most effective control. Addition of a spreader/sticker may enhance control of insects on some plants.
		dinotefuran (Safari 20SG)	¼-½ lb for foliar ¾-1 ½ lbs. for drench	12 hr.	4A	For drench apply 4 fl. oz. finished solution per 6" pot. See label for ebb and flood rates.
		endosulfan 50W 3E	1 lb. % qt.	24 hrs.	2A	Apply when insects first appear and repeat as necessary. Do not exceed a maximum of 6 pounds per acre/year. Coverage of upper and lower leaf surface is essential.
fenpropathrin (Tame) 2.4EC	10 % oz.	24 hr.	3A			
flonicamid 50 WDG (Aria 0.7 oz. package)	1-3 packets (0.7-2.1 oz.)	12 hr.	9C	Repeat application every 7-28 days as necessary.		

COMMERCIAL GREENHOUSE INSECT CONTROL (continued)

PLANT	INSECT OR MITE	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALS. WATER	REI	MODE OF ACTION	COMMENTS	
(Many flower and foliage plants) (cont.)	Aphids (cont.)	fluvalinate (Mavrik) 2E	2-5 ozs.	12 hr.	3A		
		imidacloprid (Marathon 1G, 60WP)	9-15 oz./1000 sq. ft.	12 hr.	4A	Use 60WP as drench.	
		Marathon II	1.7 fl. oz.				
		Insecticidal Soap (M-pede) (Olympic)	1-2% (1-2 gal.)	12 hr.			Repeat spray in 2 or 3 days. Thoroughly wet both surfaces of infested leaves. Use soft water when possible.
		kinoprene (Enstar II) 5EC	8-20 oz.	4 hr.	7A		Complete coverage of foliage is essential for control. Phytotoxicity has been observed under certain conditions.
		lambda-cyhalothrin (Scimitar GC)	1.5-5 oz.	24 hr.	3A		
		methiocarb (Mesurool 75W)	0.5-1 lb.	24 hr.	1A		
		pymetrozine (Endeavor) 50WG	2.5-5 oz.	12 hrs.	9B		
		pyrethrum (X.Clude) (Pyrenone, Natural Plus)	Follow label	12 hrs.	3A		Follow label directions.
		spirotetramat (Kontos) 2F	1.7 fl.ozs.	24 hrs.	23		See label for drench instructions.
	thiamethoxam (Flagship 25WG)	2-4 oz.	12 hrs.	4A		Medium treatment may take 1-2 weeks for activity, do not leach for 7 days.	
	(Flagship 0.22G)	Follow label					
	Armyworms	azadirachtin (Azatin 3.0% E) (Neemazad 4.5 EC) (Oranzin 3%)	10-16 oz. 2.25-4.5 oz. 8 oz.	4 hr. 12 hr. 12 hr.	18B		Must get full coverage for control but avoid excess runoff. Use fine spray; can also be applied as drench. Spray when pests first appear.
		<i>Bacillus thuringiensis</i> (Dipel, Thuricide, MVP, Sok-Bt, Biobit)	1-4 qts.	4 hr.	11B2		
		<i>Beauveria bassiana</i> (Naturalis-O)	30-100 fl. oz.	4 hr.			Wait 48 hours before applying a fungicide.
		bifenthrin (Talstar T&O) 10 WP 7.9% .67F	6-32 oz. 25-50 fl. oz. 8-40 oz.	12 hr.	3A		Apply as a full coverage foliar spray.
		chlorpyrifos (Dursban) 50WP 4E (DuraGuard 20% ME)	1 lb. 0.5-1 pt. 0.5 oz./gal.	12 hr.	1B		
		chlorfenapyr (Pylon)	2.6-6.4 fl. oz.	12 hr.	13		
		diflubenzuron (Adept) 25W	½-1 lb.	12 hr.	15		Apply on chrysanthemums when larvae appear and repeat at weekly intervals as required.
		fenpropathrin (Tame) 2.4EC	10 % oz.	24 hr.	3A		
lambda-cyhalothrin (Scimitar GC)		1.5-5 oz.	24 hr.	3A			

COMMERCIAL GREENHOUSE INSECT CONTROL (continued)

PLANT	INSECT OR MITE	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALS. WATER	REI	MODE OF ACTION	COMMENTS
(Many flower and foliage plants) (cont.)	Armyworms (cont.)	novaluron (Pedestal 10%SC)	6-8 fl. oz.	12 hr.	15	Do not apply more than once every 30 days nor more than 2 applications per crop. Do not apply to poinsettias.
		pyrethrum (X.Clude) (Pyrenone, Natural Plus)		12 hr.	3A	Follow label directions.
		pyridalyl (Overture) 35WP	8 oz.	12 hr.	un	2 oz. Soluble packets, do not get wet.
		tebufenozide (Confirm T/O)	4 to 8 fl. oz.	4 hr.	18A	For best results, begin applications when larvae are first observed or at first sign of feeding.
		acetamiprid (TriStar 30SG)	2.7-5 .3 oz.	12 hr.	4A	Apply as a full coverage foliage spray the use of a non-ionic sp reader-sticker adjuvant may improve control.
		chlorpyrifos (Dursban 50WP) 4E (Duraguard 20% ME)	1 lb. 0.5-1 pt. 0.25-0.5 oz./gal.	12 hr.	1B	
		dinotefuran (Safari 20SG)	¼-½ lb for foliar ¾-1 ½ lbs. for drench	12 hr.	4A	For drench apply 4 fl. oz. finished solution per 6" pot. See label for ebb and flood rates.
		horticultural oils (Sunspray ultrafine, Saf-T-Side, Triact)	1-2% (1-2 gal.)	4 hr.		Care must be taken because some plants are sensitive to oils. Through coverage is necessary but do not over apply and get excessive runoff. Use fine spray.
		imidacloprid (Marathon 1G) 60WP, Marathon II	9-15 oz./1000 sq. ft. Follow label	12 hr.	4A	
		lambda-cyhalothrin (Scimitar GC)	1.5-5 oz.	24 hr.	3A	
	methiocarb (Mesurol 75WP)	0.5-1 lb.	24 hr.	1A	Apply during early evening when foliage is dry. Keep greenhouse closed at least 2-4 hours.	
	thiamethoxam (Flagship 25WG)	2-4 oz.	12 hrs.	4A		
	Cabbage looper	Insecticidal Soap (M-Pede) (Olympic)	1-2% (1-2 gal.)	12 hr.		Repeat spray weekly for 2 or 3 weeks. Thoroughly wet both surfaces of infested leaves. Use soft water when possible.
		azadirachtin (Azatin) (Neemazad) (Ornazin 3%)	10-16 oz. 2.25-4.5 fl. oz. 8 oz.	4 hr. 12 hr. 12 hr.	18B	Must get full coverage for control but avoid excess runoff. Use fine spray; can also be applied as drench. Spray when pests first appear.
		<i>Bacillus thuringiensis</i> (Dipel, Thuricide, MVP, Sok-Bt, Biobit)	1-4 qts.	4 hr.	11B2	Follow manufacturer's suggestions.
		chlorfenapyr (Pylon)	2.6-6 .4 fl. oz.	12 hr.	13	
		pyrethrum (X.Clude) (Pyrenone)	Aerosol 2-12 oz/ acre	12 hr.	3A	Follow label directions.
		pyridalyl (Overture) 35WP	8 oz.	12 hr.	un	2 oz. Soluble packets, do not get wet.
		spinosad (Conserve SC)	6 fl. oz.	4 hr.	5	
		tebufenozide (Confirm T/O)	4 to 8 fl. oz.	4 hr.	18A	For best results, begin applications when larvae are first observed or at first sign of feeding.

COMMERCIAL GREENHOUSE INSECT CONTROL (continued)

PLANT	INSECT OR MITE	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALS. WATER	REI	MODE OF ACTION	COMMENTS
(Many flower and foliage plants) (cont.)	Cutworm	<i>Bacillus thuringiensis</i> (Dipel, Thuricide, MVP, Sok-Bt, Biobit)	1-4 qts.	4 hr.	11B2	Follow manufacturer's suggestions.
		carbaryl (Sevin) 50WP	2 lbs.	12 hr.	1A	Apply to soil surface beneath plants. Sevin injures Boston Ivy, Virginia Creeper and maidenhair fern.
		cyfluthrin (Decathlon) 2EC 20WP	1-2 oz. 1.3 oz.	12 hr.	3A	(see aphids)
		lambda-cyhalothrin (Scimitar GC)	1.5-5 oz.	24 hr.	3A	
		spinosad (Conserve SC)	6 fl. oz.	4 hr.	5	
		tebufenozide (Confirm T/O)	4 to 8 fl. oz.	4 hr.	18A	For best results, begin applications when larvae are first observed or at first sign of feeding.
	Fungus gnats	acetamiprid (TriStar 30SG)	2.7-5 .3 oz.	12 hr.	4A	Apply as a directed spray to thoroughly wet the upper ½ to 1 inch of soil medium.
		azadirachtin (Azatin 3.0% E)	8 oz.	4 hr.	18B	
		<i>Bacillus thuringiensis</i> H-14 (Gnatrol)	1 to 8 pts. .5 to 4 pts.	4 hr.	11B2	Apply as a soil drench or spray for larvae. Thoroughly wet the first 3 to 4 cm of soil. Under benches should also be treated.
		Chlorfenapyr (Pylon)	5.2-10 fl. oz.	12 hr.	13	
		chlorpyrifos (DuraGuard) 20% ME	0.25-0.5 oz./gal.	12 hr.	1B	Shake concentrate well before diluting.
		cyromazine (Citation) 75WP	Follow label	12 hr.	17	
		diflubenzuron (Adept) 25W	Follow label	12 hr.	15	Do not use on poinsettias, Reiger begonias, and hibiscus.
		dinotefuran (Safari 20SG)	¾-1 ½ lbs.	12 hr.	4A	Drench applying 4 fl. oz. finished solution per 6" pot. See label for ebb and flood rates.
		<i>Steinernema feltiae</i> (Entonem, NemaShield, Nemasys, ScanMask)	Follow label	4 hr.		Apply when small larvae first appear. Moisture and temperature are critical.
		kinoprene (Enstar II) 5EC	1 oz./5 gal.	4 hr.	7A	Drench by submersion in solution until no more air bubbles escape.
		pyriproxyfen (Distance)	2-6 fl. oz. (see comments)	12 hr.	7C	New supplemental label changes rates to a 2 oz. drench and 3-6 oz. drench.
		resmethrin 2EC resmethrin PT 1200	1-2 pts. aerosol	12 hr.	3A	Spray soil surface until thoroughly wet. Repeat at 10 day intervals, if necessary. Aerosol for adults only.
		thiamethoxam (Flagship 25WG)	Follow label for drench	12 hrs.	4A	Drench may take 1-2 weeks for activity, do not leach for 7 days.

COMMERCIAL GREENHOUSE INSECT CONTROL (continued)

PLANT	INSECT OR MITE	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALS. WATER	REI	MODE OF ACTION	COMMENTS
(Many flower and foliage plants) (cont.)	Leafminer	abamectin (Avid) .15EC	8 oz.	12 hr.	6	Apply as needed and repeat application at 7-day intervals or as necessary. Do not apply more than 16 fl. oz. or less than 8 fl. oz. per acre. Use in sufficient water to obtain uniform plant coverage. Phytotoxicity has been observed on certain species of ferns.
		acetamiprid (TriStar 30SG)	6.7-8 .0 oz.	12 hr.	4A	Rotate with other insecticides. Apply as a full coverage foliar spray the use of a non-ionic spreader-sticker adjuvant may improve control.
		azadirachtin (Azatin 3.0% E) (Neemazad) (Ornazin 3%)	10-16 oz. 2.25-4.5 fl. oz. 10 oz.	4 hr. 12 hr. 12 hr.	18B	Must get full coverage for control but avoid excess runoff. Use fine spray; can also be applied as drench. Spray early. Make 2 applications in rotation with adulticides such as pyrethroids.
		chlorpyrifos (Dursban) 50WP (DuraGuard) 20% ME	2 lbs. 0.25-0.5 oz./gal.	12 hr.	1B	
		cyromazine (Citation) 75WP	2.66 oz/acre	12 hr.	17	Labeled only for chrysanthemums. Apply to wet in minimum of 100 gal. of water when stippling first appears. Harvesters must wear long sleeved shirt, long pants and rubber gloves when harvesting.
		dinotefuran (Safari 20SG)	¼-½ lb for foliar ¾-1 ½ lbs. for drench	12 hr.	4A	For drench apply 4 fl. oz. finished solution per 6" pot. See label for ebb and flood rates.
		lambda-cyhalothrin (Scimitar GC)	1.5-5 oz.	24 hr.	3A	Use for adults only.
		novaluron (Pedestal) 10% SC IGR	6-8 fl. ozs.	12 hr.	15	
		permethrin (Pounce) 3.2EC	20 fl. oz.	24 hr.	3A	Registered for use on chrysanthemums.
		thiamethoxam (Flagship) 24WG	4-8 oz.	12 hr.	4A	
	spinosad (Conserve SC)	22 fl. oz.	4 hr.	5		
	Leafroller	acephate (Orthene TT&O) 75SP TT&O 97	% lb. 8-12 oz.	24 hr.	1B	
		cyfluthrin (Decathlon) 2EC 20WP	1-2 oz. 1.9 oz.	12 hr.	3A	(See aphids)
		pyrethrum (X.clude) (Pyrenone, Natural Plus)	Aerosol 2-12 oz/acre	12 hr.	3A	Follow label directions.
	Mealybug	acephate (Orthene TT&O) 75SP TT&O 97	% lb. 8-12 oz.	24 hr.	1B	See aphid
		acetamiprid (TriStar 70WSP) (TriStar 3 OSG)	2-4 soluble bags 2.7 oz.	24 hrs. 12 hr.	4A	Tank mix with surfactant or pyrethroid may improve control of adults. Apply as a full coverage foliage spray the use of a non-ionic sp reader-sticker adjuvant may improve control.
		azadirachtin (Azatin) (Neemazad) (Ornazin 3%)	10-16 oz. 2.25-4.5 oz. 8 oz.	4 hr. 12 hr. 12 hr.	18B	Must get full coverage for control but avoid excess runoff. Use fine spray; can also be applied as drench. Addition of 0.5-1.0% non-phytotoxic oil will enhance efficiency.

COMMERCIAL GREENHOUSE INSECT CONTROL (continued)

PLANT	INSECT OR MITE	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALS. WATER	REI	MODE OF ACTION	COMMENTS
(Many flower and foliage plants) (cont.)	Mealybug (cont.)	<i>Beauveria bassiana</i> (Naturalis-O)	30-10 0 fl. oz.	4 hr.		Wait 48 hours before applying a fungicide.
		bifenthrin (Talstar T&O or Attain) 10WP 7.9% .67F (Attain)	8-40 oz. 25-50 fl. oz. 8-40 oz. aerosol	12 hr.	3A	Apply as a full coverage foliar spray.
		chlorpyrifos (Dursban) 50WP 4E	1 lb. 0.5-1 pt.	12 hr.	1B	
		cyfluthrin (Decathlon) 2EC	1-2 oz.	12 hr.	3A	(See aphids).
		dinotefuran (Safari 20SG)	¼-½ lb for foliar ¾-1 ½ lbs. for drench	12 hr.	4A	For drench apply 4 fl. oz. finished solution per 6" pot. See label for ebb and flood rates.
		fenpropathrin (Tame) 2.4EC	10 % oz.	24 hr.	3A	
		flonicamid 50 WDG (Aria 0.7 oz. package)	3-6 packets (2.1-4.3 oz.)	12 hr.	9C	Repeat application every 7-28 days as necessary.
		fluvalinate (Mavrik) 2EC	2-5 ozs.	12 hr.	3A	
		horticultural oils (Sunspray ultrafine) (Saf-T-Side)	1-2% (1-2 gal.)	4 hr.		Care must be taken because some plants are sensitive to oils. Thorough coverage is necessary but do not over apply and get excessive runoff. Use fine spray.
		imidacloprid (Marathon 1G)	9-15 oz./1000 sq. ft.	12 hr.	4A	
		Marathon II	1.7 fl. oz.			
		Insecticidal Soap (M-Pede) (Olympic)	1-2% (1-2 gal.)	12 hr.		Repeat spray after 2 or 3 days. Thoroughly wet both surfaces of infested leaves. Use soft water whenever possible.
		kinoprene (Enstar II) 5EC	6-20 oz.	4 hr.	7A	See aphid. Registered for root mealybug.
		methiocarb (Mesurol 75 WP)	0.5-1 lb.	24 hr.	1A	
		spirotetramat (Kontos) 2F	1.7 fl.ozs.	24 hrs.	23	See label for drench instructions.
	thiamethoxam (Flagship 25WG) (Flagship 0.22G)	4-8.5 oz. Follow label	12 hrs.	4A	Medium treatment may take 1-2 weeks for activity, do not leach for 7 days.	
	Slugs and Snails	metaldehyde (Deadline) B 15D	Follow label	24 hr.		
		methiocarb (Mesurol 75 WP)	½-1 lb.	24 hrs.	1A	Spray plants and foliage until wet. Do not use in conjunction with foliar fertilizer.
	Spider Mite	abamectin (Avid) .15EC	4 oz.	12 hr.	6	Apply as needed and repeat as necessary.
		acequinocyl (Shuttle 15 SC)	6.4-1 2.8 fl. oz.	12 hrs.	20B	Do not apply through any type irrigation. Wetting agent can be used.
		bifenthrin (Talstar T&O or Attain) 10WP 7.9% (Attain)	6-32 oz. 25-50 fl. oz. aerosol	12 hr.	3A	Apply as a full coverage foliar spray.

COMMERCIAL GREENHOUSE INSECT CONTROL (continued)

PLANT	INSECT OR MITE	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALS. WATER	REI	MODE OF ACTION	COMMENTS
(Many flower and foliage plants) (cont.)	Spider Mite (cont.)	bifenazate (Floramite)	2-4 oz.	12 hr.	un	Do not apply in successive applications. Use at least 2 alternative products between Floramite treatments.
		chlorfenapyr (Pylon)	2.6-5 .2 fl. oz.	12 hr.	13	
		chlorpyrifos (Dursban) 50WP	½ lb.	12 hr.	1B	When large numbers of eggs are present, apply a second spray 3 to 5 days after initial treatment.
		clofentezine (Ovation)	2 oz.	12 hr.	10A	Limited number of plants (see label).
		dicofol (Kelthane) 35WP	1-1 α lbs.	12 hr.	un	Repeat as necessary.
		etoxazole (TetraSan 5WDG)	8-16 oz.	12 hr.	10B	Limited to 2 applications per crop cycle.
		fenbutatin-oxide (Vendex) 50WP	8-16 oz.	48 hr.	12B	Do not add oil to spray solution.
		fenpropathrin (Tame) 2.4EC	8-16 oz	24 hr.	3A	
		fenpyrozimate (Akari 5 SC)	16-24 fl. oz.	12 hr.	21A	
		fluvalinate (Mavrik) 2E	2-5 oz.	12 hr.	3A	
		hexythiazox (Hexygon DF)	1-2 oz.	12 hr.	10A	
		horticultural oil (Sunspray ultrafine, Saf-T-Side, Triact)	1-2 gal.	4 hr.		
		Insecticidal Soap (M-Pede) (Olympic)	1-2% (1-2 gal.)	12 hr.		Repeat spray weekly for 2 or 3 weeks. Thoroughly wet both surfaces of infested leaves. Use soft water whenever possible.
		lambda-cyhalothrin (Scimitar GC)	1.5-5 oz.	24 hr.	3A	
		methiocarb (Mesurool 75W)	½ -1 lb.	24 hr.	1A	
		pyridaben (Sanmite 75WP)	2-4 oz.	12 hr.	21A	
		spinosad (Conserve SC)	22 fl. oz.	4 hr.	5	
		spiromesifen (Judo 4 F)	1-4 oz.	12 hr.	23	Effective on nymphal and egg stages.
		spirotetramat (Kontos) 2F	1.7 fl.ozs.	24 hrs.	23	See label for drench instructions.
		Thrips	abamectin (Avid) .15 EC	8 oz.	12 hr.	6
	acetamiprid (TriStar 30SG)		4-8 oz.	12 hr.	4A	Apply as a full coverage foliage spray the use of a non-ionic sp reader-sticker adjuvant may improve control.
	acephate (Orthene TT&O) 75SP TT&O 97		% lbs. 8 oz.	24 hr.	1B	Aerosol may also be used as for aphid control.
	azadirachtin (Azatin 3.0% E) (neemazad 4.5%) (Ornazin 3%)		12-16 oz. 2.25-4.5 oz. 8 oz.	4 hr. 12 hr. 12 hr.	18B	Must get full coverage for control but avoid excess runoff. Use fine spray; can also be applied as drench. Addition of 0.5-1.0% non-phytotoxic oil will enhance efficiency.

COMMERCIAL GREENHOUSE INSECT CONTROL (continued)

PLANT	INSECT OR MITE	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALS. WATER	REI	MODE OF ACTION	COMMENTS
(Many flower and foliage plants) (cont.)	Thrips	<i>Beauveria bassiana</i> (Naturalis-O) (BotaniGard ES)	30-100 fl. oz. 32-64 fl. oz.	4 hr. 12 hr.		
		chlorfenapyr (Pylon)	10-20 fl. oz.	12 hr.	13	
		chlorpyrifos (Dursban) 50WP 4E (DuraGuard) 20% ME	1 lbs. 0.5-1 pt. 0.25-0.5 oz./gal	12 hr.	1B	
		cyfluthrin (Decathlon) 2EC 20WP	1-2 oz. 1.9 oz.	12 hr.	3A	(See aphids)
		dinotefuran (Safari 20SG)	4-8 oz. for foliar, 12-24 oz. for drench	12 hr.	4A	Suppression only. For drench apply 4 fl. oz. Finished solution per 6" pot. See label for ebb and flood rates.
		flonicamid 50 WDG (Aria 0.7 oz. package)	3-4 packets (2.1-2.9 oz.)	12 hr.	9C	Repeat application every 7-28 days as necessary.
		fluvalinate (Mavrik) 2E	2-5 ozs.	12 hr.	3A	Not western flower thrips.
		imidacloprid (Marathon 1G, 60WP)	9-15 oz./1000 sq. ft.	12 hr.	4A	Use 60WP as drench.
		Insecticidal Soap (M-Pede) (Olympic)	1-2% (1-2 gal.)	12 hr.		Repeat spray weekly for 2 or 3 weeks. Thoroughly wet both surfaces of infested leaves. Use soft water whenever possible.
		lambda-cyhalothrin (Scimitar GC)	1.5-5 oz.	24 hr.	3A	
		novaluron (Pedestal 10%SC)	6-8 fl. oz.	12 hr.	15	Do not apply more than once every 30 days nor more than 2 applications per crop. Do not apply to poinsettias.
		pyrethrum (X.Clude, Natural Plus) (Pyrenone)	aerosol 2-12 oz./acre	12 hr.	3A	Follow label directions.
		pyridalyl (Overture) 35WP	8 oz.	12 hr.	un	2 oz. Soluble packets, do not get wet.
		resmethrin (SBP-1382) 2E (PT 1200)	1 pt. aerosol	12 hr.	3A	Use on begonia, fuchsia, salvia, poinsettia, coleus, chrysanthemum, geranium, petunias, aster, calendula, marigolds, roses, azalea and ivy.
		spinosad (Conserve SC)	6 fl. oz.	4 hr.	5	
		thiamethoxam (Flagship 25WG)	4-8.5 oz.	12 hr.	4A	For leaf feeding thrips.
		Whitefly	abamectin (Avid 0.15EC)	8 fl. oz.	12 hr.	6
	acephate (Orthene TT&O) 75SP (PT 1300) TT&O 97		% lb. aerosol 8 oz.	24 hr.	1B	
	acetamiprid (TriStar 70WSP) (TriStar 3 0SG)		2-4 soluble bags 2.7-5.3 oz.	24 hrs. 12 hr.	4A	Tank mix with surfactant or pyrethroid may improve control of adults. Apply as a full coverage foliage spray the use of a non-ionic spreader-sticker adjuvant may improve control.

COMMERCIAL GREENHOUSE INSECT CONTROL (continued)

PLANT	INSECT OR MITE	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALS. WATER	REI	MODE OF ACTION	COMMENTS
(Many flower and foliage plants) (cont.)	Whitefly (cont.)	azadirachtin (Azatin 3.0% E) (Neemazad) (Ornazin 3%)	10-16 oz. 2.25-4.5 oz. 10 oz.	4 hr. 12 hr. 12 hr.	18B	Must get full coverage for control but avoid excess runoff. Use fine spray; can also be applied as drench. Ensure good coverage to top and bottom of leaves.
		<i>Beauveria bassiana</i> (Naturalis-O) (BotaniGard ES)	30-100 fl. oz. 16-32 fl. oz.	4 hr. 12 hr.		
		bifenthrin (Talstar T&O or Attain) 10WP 7.9% (Attain)	6-32 oz. 25-50 fl. oz. aerosol	12 hr.	3A	Apply as a full coverage foliar spray.
		chlorpyrifos (Dursban) 50WP (DuraGuard 20%)	½ lb. 0.25-0.5 oz./gal.	12 hr.	1B	
		cyfluthrin (Decathlon) 2E	1-2 oz.	12 hr.	3A	(See aphids).
		dinotefuran (Safari 20SG)	¼-½ lb for foliar ¾-1 ½ lbs. for drench	12 hr.	4A	For drench apply 4 fl. oz. finished solution per 6" pot.
		endosulfan 50 WP 3E	1 lb. % qt.	24 hr.	2A	(See aphids).
		fenpropathrin (Tame) 2.4EC	5 α-10 % ozs.	24 hr.	3A	
		fenvalerate (Pydrin) 2.4EC	5-10 ozs.	12 hr.	3A	
		flonicamid 50 WDG (Aria 0.7 oz. package)	4-6 packets (2.9-4.3 oz.)	12 hr.	9C	Repeat application every 7-28 days as necessary.
		fluvalinate (Mavrik) 2E	2-5 oz.	12 hr.	3A	
		horticultural oils (Sunspray ultrafine) (Saf-T-Side)	1-2% (1-2 gal.)	4 hr.		Care must be taken because some plants are sensitive to oils. Thorough coverage is necessary but do not over apply and get excessive runoff. Use fine spray.
		imidacloprid (Marathon 1G, 60WP)  Marathon II	9-15 oz./1000 sq. ft.  1.7 fl. oz.	12 hr.	4A	Use 60WP as drench.
		Insecticidal Soap (M-Pede) (Olympic)	1-2% (1-2 gal.)	12 hr.		Thoroughly wet both surfaces of infested leaves. Use soft water whenever possible.
		kinoprene (Enstar II) 5EC	6-20 oz.	4 hr.	7A	(See aphids).
		lambda-cyhalothrin (Scimitar GC)	1.5-5 oz.	24 hr.	3A	
		novaluron (Pedestal 10%SC)	6-8 fl. oz.	12 hr.	15	Do not apply more than once every 30 days nor more than 2 applications per crop. Do not apply to poinsettias.
		pymetrozine (Endeavor) 50WG	2.5-5 oz.	12 hr.	9B	
		pyridaben (Sanmite 75WP)	2-4 oz.	12 hr.	21A	
		pyriproxyfen (Distance)	6-8 fl. oz.	12 hr.	7C	Target crawlers. Apply no more than 2 times/crop cycle. Do not apply to poinsettias.

**COMMERCIAL GREENHOUSE INSECT CONTROL (continued)**

<b>PLANT</b>	<b>INSECT OR MITE</b>	<b>INSECTICIDE AND FORMULATION</b>	<b>AMOUNT PER 100 GALS. WATER</b>	<b>REI</b>	<b>MODE OF ACTION</b>	<b>COMMENTS</b>
(Many flower and foliage plants) (cont.)	Whitefly (cont.)	pyrethrum (X.Clude, Pyrenone, Natural Plus)	aerosol 2-12 oz./acre	12 hr.	3A	Follow label direction.
		resmethrin (SBP-1382) 2E (PT 1200)	1 pt. aerosol	12 hr.	3A	Use on begonia, fuchsia, salvia, poinsettia, coleus, chrysanthemum, geranium, petunias, aster, calendula, marigolds, roses, azalea and ivy.
		spiromesifen (Judo 4 F)	1-4 oz.	12 hr.	23	Effective on nymphal and egg stages.
		spirotetramat (Kontos) 2F	1.7 fl.ozs.	24 hrs.	23	See label for drench instructions.
		thiamethoxam (Flagship 25WG)  (Flagship 0.22G)	4-8.5 oz.  Follow label	12 hrs.	4A	Medium treatment may take 1-2 weeks for activity, do not leach for 7 days.
	Broad and Clycamen Mite	Abamectin (Avid .15EC)	4 oz.	12 hr.	6	Apply as needed and repeat as necessary.
		chlorfenapyr (Pylon)	2.6-5 .2 fl. oz.	12 hr.	13	
		dicofol (Kelthane) 35WP	1-1 ½ lbs.	12 hr.	un	
		endosulfan 3E 50WP	% qt. 1 lb.	24 hr.	2A	
		pyridaben (Sanmite 75WP)	2-4 oz.	12 hr.	21A	
		Sulfur (elemental sulfur)	follow label	12 hr.		Do not tank mix with oils.

# COMMERCIAL GREENHOUSE GROWTH REGULATORS

Paul A. Thomas, Extension Horticulturist

Plant	Desired Response	Growth Regulator	Method of Application	Concentration	Mixing Rate	Comments
Azalea	Height control	B-Nine SP	Foliar spray	2500-3500 ppm	0.4-0.5 oz./gal.*	Apply 4 to 6 weeks after pinch. Increases short day response.
		Cycocel	Foliar spray	1500 ppm	2.5 ozs./gal.	Apply 4 to 6 weeks after 1st pinch and again 1 week later. May cause temporary chlorosis.
		A-Rest	Foliar spray	26 ppm	12.6 ozs./gal.	Apply after pruning at rate of 1 gal./200 ft. <sup>2</sup> .
		Bonzi	Foliar spray	100-200 ppm	3.2-6.4 fl. ozs./gal	
		Sumagic	Foliar spray	10-15 ppm	2.56-3.8 4 fl. ozs./gal.	
	Chemical pinching	Off-Shoot-0	Foliar spray	2500-6300 ppm	8-20 ozs./gal.	Apply as a fine mist when plant is actively growing. Provide good air movement.
		Atrinal	Foliar spray	280-790 ppm	1.5-4.25 ozs./gal.	Apply at 8 week intervals 2 to 3 times per year when shoots are 1 to 2" long. Use lower rates (280 to 460 ppm) for plants up to 1 year old and higher rates (460-790 ppm) for older plants.
Bedding plants	Height control	B-Nine SP	Foliar spray	2500-5000 ppm	0.4-0.8 oz./gal.*	Apply 3 to 4 weeks after transplanting. Repeat applications may be necessary. Ineffective on snapdragon, celosia, coleus.
		A-Rest	Foliar spray	6-66 ppm (see table)	1.5-17 ozs./gal.	Apply as a foliar spray 2 to 10 weeks after planting. Apply at rate of 1 gal./200 ft. <sup>2</sup> .
		Bonzi (0.4%)	Foliar spray	5-90 ppm (see table)	0.2-2.0 ozs./gal.	Mix to obtain the desired concentration and spray uniformly at the rate of 1 gal./200 sq. ft. of bench space. Species and cultivars vary in their response to Bonzi. Pansy and periwinkle (annual vinca) are very sensitive. Use of sequential applications at lower rates may provide more uniform growth regulation. (Growers also may wish to drench using Bonzi for more effective control. Please refer to the label recommendations provided by UniRoyal Chemical Company before using Bonzi as a drench on bedding plants.)
		Cycocel	Foliar spray	400-3000 ppm	0.43-3.2 5 fl. ozs./gal.	
		Cycocel + B9	Foliar spray	800-5000 ppm B9 and 1000-1500 ppm Cycocel applied as a tank mix	0.13-0.79 fl. ozs./gal. and 1.08-1.63 fl. ozs./gal.	
		Sumagic (See Table Below)	Foliar spray drench	1-50 ppm.* (see table) .1 to 2.0 ppm	0.26-12.79 ozs./gal. 0.026-0.6 ozs./gal.	Apply Sumagic as a foliar spray as plant elongation begins (plant height approximately 2 to 4 inches). Timing may vary with species and the use should determine the appropriate growth stage for specific cultivars and environmental conditions. Use rates listed below and apply uniformly at a spray volume of 2 qts. per 100 sq. ft. of bench area. Multiple applications of lower rate may be applied as necessary. Cultivars within the same species may respond differently to a given rate of Sumagic. First time users of Sumagic should make single or sequential applications at the lowest recommended rate to determine optimum dose for specific cultivars under local conditions.  Do not apply Sumagic to vinca ( <i>Catharanthus roseus</i> ). Dark spots can occur.

**COMMERCIAL GREENHOUSE GROWTH REGULATORS (continued)**

<b>Plant</b>	<b>Desired Response</b>	<b>Growth Regulator</b>	<b>Method of Application</b>	<b>Concentration</b>	<b>Mixing Rate</b>	<b>Comments</b>
Vegetables	There are no growth regulators labeled for vegetables at this time.					
Bromeliad	Flower induction	Florel	(see comment)	25 mg./plant	8 ozs./gal.	Pour 2 tsp. of solution in to "vase" of 1 1/2-2 year old plant. Should flower in 2 months.
Chrysanthemum	Height control	B-Nine	Foliar spray	2500-5000 ppm	0.4-0.8 oz./gal.*	Apply 10 to 14 days after pinch or when shoots 1 to 1 1/2" long. A second application 3 weeks later may be necessary.
		A-Rest	Foliar spray	25-50 ppm	12-24.2 ozs./gal.	Apply approximately 2 weeks after pinch at rate of a gal./200 ft. <sup>2</sup> .
		Bonzi (0.4%)	Soil drench	2-4 ppm	1.0-1.9 ozs./gal.	Apply 4 ozs. of solution per 6" pot approximately 2 weeks after pinch. Less effective on plants grown in bark media.
			Foliar Spray	50-200 ppm	1.6-6.4 ozs./gal.	Apply when laterals are 1 1/2" to 2" long. Sequential applications of lower rates generally provide more uniformly shaped plants than single spray applications.
		Sumagic	Soil drench	1-4 ppm	0.03-0.14 oz./gal.	Apply 4 ozs. of final solution per 6" pot when shoot laterals are 1 1/2 to 2" long. Media containing pine bark will reduce the effectiveness.
Foliar spray	5-10 ppm		1.28 to 2.56 ozs./gal.	Apply Sumagic as a foliar spray when the length of the breaks if 1.5 to 2.0" (about 7 to 14 days after pinching). Use from 1.28 to 2.56 ozs./ gal. (38 to 78 ml/gal., 5 to 10 ppm.) in a uniform spray volume of 2 qts. per 100 sq. ft. of bench area. Multiple applications should be applied as necessary. NOTE: Chrysanthemum cultivars vary widely in their response to Sumagic. Treat a small number of plants to confirm appropriate rates for local conditions and specific cultivars.		
Dahlia	Height control	A-Rest	Soil drench	2-4 ppm	1-2 ozs./gal.	Apply 4 ozs. of solution per 6" pot 2 weeks after planting.
Easter Lily	Height control	A-Rest	Soil drench	2-4 ppm	1.0-1.9 ozs./gal.	Apply 4 ozs. of solution per pot when plants are 2 to 6" tall. Less effective on plants grown in bark media.
			Foliar spray	50-132 ppm	24-64 ozs./gal.	Apply at rate of 1 gal./200 ft. <sup>2</sup> when plants 2 to 6" tall.
		Sumagic	Soil drench	.01-1.0 ppm	0.02-0.26 ozs./gal	Apply Sumagic when shoots average 3 inches tall. Apply 4 fl. oz. of diluted solution to each pot. Avoid late season application.
Foliar spray	10-30 ppm		2.56-7.68 ozs./gal	All states except Florida: Apply when shoots average 3 inches tall. Use a uniform spray volume 2 qt. per 100 sq. ft. of bench area. If a second application is made, it should be applied when shoots average 6" tall.		
(NOTE: Treatment with Sumagic may reduce the water requirement for Easter Lilies).						

COMMERCIAL GREENHOUSE GROWTH REGULATORS (continued)

Plant	Desired Response	Growth Regulator	Method of Application	Concentration	Mixing Rate	Comments
Geranium (Cuttings)	Height control	Cycocel	Foliar spray	2000 ppm	2 ozs./gal.	Apply 2 to 3 weeks after potting. May cause marginal leaf chlorosis.
		Bonzi (0.4%)	Foliar spray	6-16 ppm	0.2-0.5 ozs./gal.	Early applications should be applied at the lowest rate to avoid stunting.
Geranium (Seedlings)	Height control	Cycocel	Foliar spray	500-1500 ppm	0.87-1.63 ozs./gal.	Apply at 4 to 5 true leaf stage. May cause earlier flowering and marginal leaf chlorosis.
		A-Rest	Foliar spray	26-35 ppm	12.6-17.0 ozs./gal.	Apply at 5 to 7 true leaf stage at rate of 1 gal./200 ft. <sup>2</sup> .
		Florel	Foliar spray	500 ppm	1.6 ozs./gal.	Apply at 6 to 7 true leaf stage. Reapply 2 to 3 weeks later if required. May delay flowering.
	Bonzi (0.4%)	Foliar spray	6-16 ppm	0.2-0.5 oz./gal.	Early applications should be applied at the lowest rates to avoid stunting.	
	Early flowering	Gibberellic Acid (GA)	Foliar spray Pro Gibb (4%)	5-15 ppm	1.66-5 ozs./100 gal.	Apply when buds are first visible. Speeds flowering 10 to 21 days depending on variety.
Hydrangea	Height control (during summer growth)	B-Nine SP	Foliar spray	2500-7500 ppm	0.4-1.2 ozs./gal.*	Apply 4 weeks after pinch but not after Aug. 1. Repeat applications may be necessary.
	Height control (during forcing)	B-Nine SP	Foliar spray	2500 ppm	0.4 ozs./gal.*	Apply first spray at 4 to 5 leaf stage followed by second spray 1 week later.
Poinsettia	Height control	Cycocel	Soil drench or Foliar spray	800-1500 ppm	0.87-1.63 ozs./gal.	Apply drench as 6 ozs. of solution per 6" pot. Apply 3000 ppm when auxiliary shoots are 1 1/2 to 2" long. May apply split foliar application 1 to 2 days apart to reduce leaf blotching. If necessary, apply a second application of 3000 ppm September to early October. Late application may reduce bract size and delay flowering. Response varies with cultivar.
		B-Nine SP	Foliar spray	5000-7000 ppm	0.8-1.2 ozs./gal.	Make the first application when breaks are 1 1/2 to 2" long. Make a second application 2 weeks later if necessary.
		B-Nine SP + Cycocel	Foliar spray	2500 ppm. B-Nine SP + 1500 ppm. Cycocel	0.4 ozs./gal. B-Nine SP + 1.5 ozs./gal. Cycocel	Apply when breaks are 1 1/2 to 2" long. A repeat application may be necessary if excessive elongation occurs. A slight reduction in bract size may occur with some cultivars.
		A-Rest	Soil drench	0.5-2 ppm	0.25-1.0 ozs./gal.	Apply 4 ozs. of solution per pot at pinch to 4 weeks after pinch. Response varies with cultivar. Less effective on plants grown in bark media.

COMMERCIAL GREENHOUSE GROWTH REGULATORS (continued)

Plant	Desired Response	Growth Regulator	Method of Application	Concentration	Mixing Rate	Comments
Poinsettia (cont.)	Reduced Height	Bonzi (0.4%)	Foliar spray or soil drench	16-50 ppm. 1-3 ppm	0.8-1.6 ozs./gal. 0.032-0.096 ozs./gal.	Apply when axillary breaks are 1 1/2 to 2" long for foliar sprays or 3 to 4" for drenches or sprays in situations where plants will naturally be shorter. Response varies with cultivar. A second application at half the initial rate may be required. Late application may reduce bract size. With foliar sprays, apply the recommended rate in a final spray volume of 2 qts/100 ft. <sup>2</sup> of bench space. With soil drenches, apply the recommended rate in 4 fl. oz. final dilution per pot. Media containing pine bark will reduce the effectiveness. Overly stunted plants can result from rates that are too high. Use of sequential applications at lower rates may reduce the possibility of overly stunted plants. Grower trials are recommended.
		Sumagic	Foliar spray	2.5-10 ppm	0.64-2.56 ozs./gal.	Apply Sumagic as a foliar spray when the breaks are 1.5 to 2.0" (about 10 to 14 days after pinching). Use rates listed below and apply uniformly at a spray volume of 2 qts./100 sq. ft. of bench area. Multiple applications of the lower rate may be applied as necessary. First time users of Sumagic should make single or sequential applications at the lowest recommended rate to determine optimum dose for specific cultivars under local conditions. Late season application (after short-day initiation) may have negative effects on bract size, plant quality, and marketability.
	Height control	Sumagic	Foliar spray	2.5-10 ppm	.64-2.56 fl. ozs./gal.	
(NOTE: Do not apply Sumagic to Poinsettias after the initiation of short days).						
Tulip	Height control	A-Rest	Soil drench	1-4 ppm	0.5-2.0 ozs./gal.	Apply 4 ozs. of solution per 6" pot within period of 1 week prior and 2 days after forcing begins. Response varies with cultivar. Less effective on plants grown in bark media.

**NOTE:** Follow label directions. Add no additional wetting agent unless directed. Apply growth regulators only when plants are turgid and soil is moist. Avoid application under extreme temperatures. Avoid wetting foliage for several hours after foliar spray applications. Avoid spray drift to other desirable plants. Uniform results depend on uniform application with both foliar sprays and soil drenches.

<sup>1</sup> Ounces to be placed in a gallon container and water added to the 1 gal. mark.

\*Six (6) level tablespoons equal approximately one (1) oz. dry weight.

## BONZI RECOMMENDATIONS FOR BULBS

BULB TYPE	SPRAY RATE (PPM)	DRENCH RATE (PPM)	PREPLANT BULB SOAK RATE (PPM) /SOAK TIME
Amaryllis	ND	200	ND
Caladium	100 - 200	10 - 20	ND
Calla Lily	ND	10 - 30	20/15 min.
Daffodil	ND	20 - 40	ND
Freesia	ND	ND	100 - 300/1 hr.
Hybrid Lily	250 - 500	10 - 20	20 - 30/15 min.
Montbretia	ND	ND	20 - 30/15 min.
Tulip	ND	5 - 40	2 - 5/1 hr.

Changes in plant growth regulator labelling is occurring in our industry at a very rapid pace. It is a good practice to always read the product label before use. Be sure to keep current product information on hand. If a crop is not labelled for use (specifically not listed or the crop is a single species of a very large group term (such as "bedding plants" or "ornamentals"), contact the manufacturer, your county agent or your distributor to determine if the product can legally be used on the intended crop. Always spray new or unfamiliar PGRs on a few test plants before application to an entire crop.

## BONZI TABLES

PPM Bonzi desired	fl. oz. per gallon	ml per gallon
1.2345e+22	0.032	1.0
	0.064	1.9
	0.096	2.8
	0.13	3.8
	0.16	4.7
	0.32	9.5
	0.64	19.0
	0.8	24.0
	1.0	28.0
	1.3	38.0
	1.6	47.0
	3.2	95.0
	6.4	190.0

Pot Diameter (inches)	Drench Volume (fl. oz./pot)	mg.ai. BONZI/Pot			
		1 PPM	2 PPM	3 PPM	4 PPM
4"	2	0.063	0.125	0.188	0.25
5"	3	0.094	0.188	0.282	0.375
6"	4	0.125	0.25	0.375	0.50
8"	10	0.313	0.625	0.938	1.25
10"	25	0.783	1.56	2.35	3.125
12"	40	1.25	2.5	3.75	5.0

**NOTE:** The recommended drench volumes were based on the soil capacity of a common 6-inch 'azalea' type pot. Extrapolating the recommendation for this 6-inch 'azalea' type pot to smaller or larger containers may not be correct for the total drench volume but should only be used as a guideline. The user must determine the appropriate rate and drench volume needed to achieve the desired result, based on both pot size and potting media used.

## AREST TABLES

<b>Table 1</b>					
<b>A-REST DILUTION TABLE</b>					
PPM A-rest desired concentration	fl. oz. per gallon solution	ml. per gallon solution	PPM A-rest desired concentration	fl. oz. per gallon solution	ml. per gallon solution
0.5	.25	7	16	7.8	234
1	0.5	14	17	8.2	246
2	1.0	29	18	8.7	261
3	1.5	43	19	9.2	276
4	1.9	57	20	9.7	287
5	2.4	72	25	12.1	359
6	2.9	87	26	12.5	378
7	3.4	102	30	14.5	430
8	3.9	117	33	16.0	480
9	4.4	132	35	17.0	510
10	4.8	143	40	19.4	573
11	5.3	159	50	24.2	717
12	5.8	174	65	31.5	932
13	6.3	189	66	32.0	960
14	6.8	204	100	48.5	1,433
15	7.3	215	132	64.0	1,692

<b>Table 2</b>		
<b>DRENCH VOLUME GUIDELINES</b>		
Pot Diameter (inches)	Drench Volume (fl. oz./pot)	Drench Volume (mis./pot)
4	2	60
5	3	90
6	4	120
7	10	300
10	25	750
12	40	1200

<b>Table 3</b>			
<b>SPRAY RATE RANGE (PPM) GUIDELINES FOR SOME BEDDING PLANTS</b>			
Plant	Plug	Plant Stage of Growth	
		After Transplant	Finished
Ageratum	7-12	10-15	15-26
Begonia	3-5	6-12	10-15
Celosia	7-12	10-15	15-26
China Aster	7-12	10-15	15-26
Cleome	7-12	10-15	15-26
Cornflower	7-12	10-15	15-26
Dahlia	7-12	10-15	15-26
Dianthus	7-12	10-15	15-26
Geranium	26-35	33-66	NR
Marigold	13-20	18-26	26-33
Impatiens	10-20	20-26	26-44
Pansy	3-7	8-10	11-15
Petunia	10-15	15-20	15-26
Portulace	7-12	10-15	15-26
Salvia	10-15	15-20	15-26
Snapdragon	10-15	15-20	15-26
Vinca	5-10	8-13	13-18
Zinna	7-12	10-15	15-26

COMMERCIAL GREENHOUSE GROWTH REGULATORS (continued)

AREST TABLES (continued)

Plant	Spray Rate Range (PPM)	Drench Rate Range (PPM)
Alternanthera	25-132	2-4
Bleeding Heart	65-132	2-4
Clematis	25-132	2-4
Columbine	65-132	2-4
Delphinium	35-132	2-4
Dracaena	25-132	2-4
Fatsy	65-132	2-4
Gerbera Daisy	25-132	2-4
Liatis	25-132	2-4
Monstera	25-132	2-4
Nephtytis, Green Gold	25-132	2-4
Nephtytis, Green	25-132	2-4
Philodendron	25-132	2-4
Pilea	25-132	2-4
Pothos	25-132	2-4
Purple Passion	25-132	2-4
Schefflera	25-132	2-4

**SUMAGIC TABLES**

**RATE TABLE**

Bedding Plants	Recommended Spray Concentration Range		
	fl. oz./gal.	ml./gal.	ppm
Ageratum	5.1 to 7.7	151 to 227	20 to 30
Alyssum	1.3 to 6.4	38 to 189	5 to 25
Bee Balm (Mondarda)	3.8 to 7.7	114 to 227	15 to 30
Celosia	2.6 to 5.1	76 to 151	10 to 20
Coleus	2.6 to 5.1	76 to 151	10 to 20
Coneflower	7.7 to 10.2	227 to 303	30 to 40
Dahlia	2.6 to 5.1	76 to 151	10 to 20
Dusty Miller	7.7	227	30
Hollyhock	1.3 to 10.2	38 to 303	5 to 40
Impatiens*	1.3 to 2.6	38 to 76	5 to 10
Marigold**	2.6 to 5.1	76 to 151	10 to 20
Pansy	0.26 to 1.5	8 to 46	1 to 6
Periwinkle (Vinca)	0.26 to 0.8	8 to 23	1 to 3
Petunia**	6.4 to 12.8	189 to 379	25 to 50
Portulaca	3.8 to 7.7	114 to 227	15 to 30
Purple Coneflower	7.7 to 10.2	227 to 303	30 to 40
Salvia	1.3 to 2.6	38 to 76	5 to 10
Shasta Daisy	3.8 to 7.7	114 to 227	15 to 30
Snapdragon**	6.4 to 12.8	189 to 379	25 to 50
Speedwell (Veronica)	5.1 to 10.2	151 to 303	20 to 40
Verbena	3.8 to 7.7	114 to 227	15 to 30
Viola	0.26 to 1.3	8 to 38	1 to 5

\*Seed Propagated  
\*\*Multiple applications may be necessary

**DRENCH APPLICATION:** Optimum rates for drench applications to bedding plants have not been determined. Users can conduct trials based on recommendations in the section titled ‘Determining Optimum Rates’.

COMMERCIAL GREENHOUSE GROWTH REGULATORS (continued)

SUMAGIC TABLES TABLES (continued)

RATE CONVERSION TABLE

ppm	ml/l	ml/gal.	fl. oz./gal.
1	2	8	0.26
2.5	5	19	0.6
3	6	23	0.8
5	10	38	1.3
10	20	76	2.6
15	30	114	3.8
20	40	151	5.1
25	50	189	6.4
30	60	227	7.7
35	70	265	9.0
40	80	303	10.2
45	90	341	11.5
50	100	379	12.7
70	150	568	19.2

TOPFLOR TABLES

Topflor effectively reduces internode elongation through the inhibition of gibberellic acid (GA) biosynthesis, resulting in a more desirable plant. The active ingredient in Topflor, flurprimidol, is a nitrogen-containing heterocycle compound of the pyrimidine chemical class. Flurprimidol acts as an inhibitor of enzymes catalyzing the steps in the GA biosynthetic pathway that involve oxidation of ent-kaurene to ent-kaurenoic acid, a GA precursor.

Table 1: Dilution Table

PPM Topflor desired concentration	mL per gallon solution	fl. oz. per gallon solution	fl. oz. per 10 gallon solution	fl. oz. per 100 gallon solution
0.25	0.247	0.008	0.08	0.83
0.5	0.493	0.017	0.17	1.67
1	0.987	0.033	0.33	3.34
2	1.974	0.067	0.67	6.67
5	4.934	0.167	1.67	16.69
10	9.87	0.33	3.34	33.37
20	19.74	0.67	6.67	66.75
40	39.47	1.33	13.35	133.49
100	98.68	3.34	33.37	333.73
200	197.37	6.67	66.75	667.46

Table 2: Drench Volume Application Guidelines

Pot Diameter (Inches)	Drench Volume		mg a.i. Topflor/pot from solutions mixed at the following ppm*				
	fl oz/pot	ml/pot	0.5 ppm	1 ppm	2 ppm	3 ppm	4 ppm
4	2	59	0.029	0.059	0.118	0.177	0.236
5	3	89	0.044	0.089	0.177	0.266	0.356
6	4	118	0.059	0.118	0.236	0.355	0.473
8	10	296	0.148	0.295	0.590	0.888	1.183
10	25	740	0.370	0.740	1.480	2.220	2.960
12	40	1184	0.592	1.178	2.360	3.543	4.727

NOTE: The recommended drench volumes were based on the soil capacity of a common 6-inch "azalea-type" pot. Extrapolating the recommendation for this type pot to smaller or larger containers may not be correct for the total drench volume, but should only be used as a guideline. The user must determine the appropriate rate and drench volume needed to achieve the desired result, based on both pot size and root medium used.

COMMERCIAL GREENHOUSE GROWTH REGULATORS (continued)

TOPFLOR TABLES TABLES (continued)

Table 3: Spray Rate Range Trial Guidelines for Some Bedding Plants\*

Plant	Rate Range (PPM)*	Plant	Rate Range (PPM)*
Ageratum	20-60	Osteospermum	20-60
Amaranthus tricolor	60	Pansy	2.5-7.5
Calceolaria	20	Petunia	20-60
Celosia, flame	10-40	Portulaca	40-80
Coleus, seed	20-40	Salvia	20-80
Dianthus	40-60	Snapdragon	15-40
Dusty Miller	20-30	Spilanthes	20-40
Geranium, zona <sup>1</sup>	15-25	Stobilanthes	5-20
Impatiens	20-60	Vinca2	2.5-10
Marigold	20-60	Verbena	20-40
Nemesia <sup>1</sup>	10-15	Zinnia	20-40

Table 4: Rate Range Guideline for Some Bulb Crops

Plant	Spray Rate Range(PPM)*	Drench Rate Range*
		mg a.i./pot
Calla Lily	ND	1-2.5
Canna Lily	50-80	ND
Dahlia	NR	0.5-2
Oriental Hybrid Lily "Stargazer"	ND	0.25-0.5
Tulip <sup>1</sup>	80-100	0.5-1
Hyacinth	ND	0.5-1
Caladium	NR	0.5-2

Table 5: Rate Range Trial Guidelines for Some Flowering/Foliage Plants

Plant	Spray Rate Range(PPM)*	Drench Rate Range*
		mg a.i./pot
Campanula	10-30	ND
Cape Primrose (Streptocarpus hybridus)	5-20	ND
Chrysanthemums <sup>1</sup>	7.5-25	ND
Exacum	25-50	0.01-0.03
Garden Mum	50-100	ND
Geraniums	10-25	ND
Hibiscus	40-80	1-2 (ppm)
Poinsettia	2.5-80 (see Table 5)	0.03-0.5
Pot Mum	15-25	ND
Sunflower	30-50	1-2

COMMERCIAL GREENHOUSE GROWTH REGULATORS (continued)

TOPFLOR TABLES TABLES (continued)

**Table 6: Poinsettia Growth Vigor Groups and Spray Rate Range Trial Guidelines**

Vigor Groups	Example Cultivars	Weeks of growth after pinch (6.5-inch pot) NORTH	Weeks of growth after pinch (6.5-inch pot) SOUTH	Topflor Spray Rate (PPM)*
Very Low	'Hollypoint', 'Carousel'	7-8	4-5	NR
Low	'Maren', 'Sonora Red', 'Coco White'	5-6	3-5	2.5-20
Moderate	'Freedom Red', 'Orion', 'Prestige Red', 'Christmas Season', 'Christmas Wish'	3-4	2-3	15-40
Substantial	'Red Velvet', 'Spotlight Dark Red', 'Victory Red'	2-3	2-3	30-60
Extreme	'Monet Twilight', 'Snowcap'	2-3	1-2	60-80

**Table 7: Rate Range Trial Guidelines for Some Vegetative Annuals**

Plant	Spray Rate Range (PPM)*
Angelonia	45-60
Argyranthemum	20-40
Calibrachoa	5-30
Geranium, vegetative	15-25
Lantana	15-30
Nemesia	10-15
New Guinea Impatiens	5-10
Nicotiana	20-80
Petunia, vegetative	30
Scaevola	45-60

## CROP USE AND RATE RECOMMENDATIONS

B-NINE and BONZI are effective in regulating the plant growth of most ornamental crops. The following section is based on years of research conducted around the United States under many types of growing environments. The rates recommended both here and on the product label are rate ranges and should be used as guidelines in determining optimum rates for your specific plant type, growing conditions and desired results. Be sure to read and fully understand both the product label and the section on DETERMINING OPTIMUM RATES & APPLICATION METHODS before applying to large numbers of plants.

Crop	Common Name	RECOMMENDED RATES (IN PPM) X NO. APPLICATIONS				
		B-Nine	Bonzi (spray)	Bonzi (drench)	B-Nine & Bonzi	B-Nine & Cycocel
<b>Achillea millefolium</b> 'Coronation Gold' 'Summer Pastels'	<b>Yarrow</b>	5000 x 4	120 x 1 or >30 x 4			
<b>Agapanthus</b>	<b>Lily of the Nile</b>			>30 x 1		
<b>Alcea rosea</b> 'Powder Puff Mix' 'Charter's Double Mix'	<b>Hollyhock</b>	5000 x 4	30-50 x 1	1.5 x 1		
<b>Amsonia</b>	<b>Bluestar</b>			30 x 1		
<b>Artemisia</b>	<b>Silver Mound</b>			>30 x 1		
<b>Asclepias tuberosa</b> 'Royal Red'	<b>Butterfly weed</b>	5000 x 3-4	30 x 4			>5000 & 1500 x 1
<b>Aster</b> x Frikarti 'Monch' 'Alpine Mix'	<b>Hardy Aster</b>	5000 X 4	>240 x 1 or >30 x 4	12-16 x 1		
<b>Astilbe</b> x arendsii 'Bressingham Beauty'	<b>Astilbe</b>	NR @ 5000 x 4	>30 x 4	30 x 1		
<b>Baleria cristata</b>	<b>Phillipine Violet</b>	5000 x 3	>45			1000 & 1000 x 2
<b>Baptisis</b>	<b>False Indigo</b>			30 x 1		
<b>Boltonia</b>	<b>Boltonia</b>			>30 x 1		
<b>Buddleia davidii</b> 'Royal Red'	<b>Butterfly Bush</b>	5000 x 2-3	>40 x 1	5 x 1		
<b>Campanula carpatica</b> 'Blue Chips'	<b>Carpathin harebell</b>	5000 x 2-4	<30 x 4			
<b>Campanula persicifolia</b> 'Blue'	<b>Bellflower</b>	5999 x 4	>30 x 4			
<b>Centaurea montana</b> 'Violet'	<b>Mountain bluet</b>	5000 x 4	>30 x 4			
<b>Chelone glabra</b>	<b>Turtlehead</b>	NR @ 5000 x 4	>30 x 4	30 x 1		
<b>Chrysanthemum</b> C. coccineum 'J. Kelway' C. patenium	<b>Painted daisy</b> <b>Feverfew</b>	5000 x 4	>30 x 4 <40 x 1	>30 x 1		
<b>Coleus</b> 'Solar Storm'	<b>Coleus</b>	>5000 x 1	>60 x 1	>30 x 1		2500 & 1500 x 1
<b>Coreosis grandiflora</b> 'Baby Sun' 'Sun ray' 'Moonbeam' C. verticillata 'Rosea'	<b>Tickseed</b>	5000 x 3	80-100 x 1  80-100 x 1	5-10 x 1  >4 x 1	2500 & 20-40 x 1	>2500 & 1500 x 1
<b>Crocsmia</b>	<b>Crocsmia</b>			>30 x 1		
<b>Delphinium elatum</b> 'Mix'	<b>Delphinium</b>	NR @ 5000 x 4	30 x 4			
<b>Digitalis purpurea</b> 'Foxy'	<b>Foxglove</b>		80-160 x 1	2-4 x 1		
<b>Duranta repens</b>	<b>Golden Dewdrop</b>		>100 x 1			
<b>Echinacea</b> E. purpurea 'Brava do'	<b>Purple Coneflower</b>	>5000 x 4	>30 x 4	>30 x 1		

**CROP USE AND RATE RECOMMENDATIONS (continued)**

Crop	Common Name	RECOMMENDED R ATES (IN PPM) X NO. APPLICATIONS				
		B-Nine	Bonzi (spray)	Bonzi (drench)	B-Nine & Bonzi	B-Nine & Cycocel
<b>Eupatorium coelestinum</b>	<b>Hardy Ageratum</b>	>5000 x 2	>240 x 1	8 - 10 x 1		
<b>Gaillardia grandiflora</b> 'Goblin' 'Burgundy'	<b>Blanket Flower</b>	5000 x 2	>160 x 1 >30 x 4			5000 & 150 0 x 1
<b>Gaura lindheimeri</b> 'Whirling Butterflies' 'Siskiyou Pink'	<b>Garu</b>	NR @ 5000 x 4 2500 x 1	>30 x 4 >15 x 1	30 x 1	2500 & 8 x 1	
<b>Gypsophla paniculata</b> 'Double Snowflake'	<b>Baby's Breath</b>	NR @ 5000 x 4	>30 x 4			
<b>Helenium autumnale</b>	<b>Sneezeweed</b>	5000 x 4	>30 x 4			
<b>Heliopsis</b>	<b>False Sunflower</b>			30 x 1		
<b>Heliotropium arborescens</b> 'Fragrant Blue'	<b>Heliotrope</b>	<5000 x 1				<5000 & 150 0 x 1
<b>Hemerocallis</b> 'Halls Pink'	<b>Daylily</b>	NR @ 5000 x 4	>30 x 4	>30 x 1		
<b>Heuchera sanguinea</b> 'Bressingham'	<b>Corabells</b>	NR @ 5000 x 4	>30 x 4			
<b>Iris</b> Iris germanica	<b>Iris German Iris</b>		>160 x 1	<30 x 1 >4 x 1		
<b>Jacobina (pink)</b> <b>Jacobina (red)</b>	<b>Flamingo Flower</b>		5-10 x 1 >200 x 1	<1 x 1 >10 x 1		
<b>Lavendula augustifolia</b> 'Munstead Dwarf'	<b>Lavender</b>	5000 x 4	>30 x 4			
<b>Leucanthemum x superbum</b> 'Becky' <b>L. maximum</b> 'Snow Lady' <b>x superbum</b> 'Alaska'	<b>Shasta Daisy</b>	>5000 x 2	>160 x 1 >40 x 1 40-60 x 1		>2500 & 40 x 1	>5000 & 300 0 x 1
<b>Linium perenne</b> 'Sapphire'	<b>Flax</b>	NR @ 5000 x 4	>30 x 4			
<b>Lobelia x hybrida</b> 'Queen Victoria' <b>Lobelia x speciosa</b> 'Compliment Scarlet'	<b>Cardinal flower</b> <b>Sweet lobelia</b>	5000 x 4 5000 x 4	>30 x 4 >30 x 4			
<b>Malva alcea</b>	<b>Hollyhock Mallow</b>	>5000 x 2	<40 x 1			
<b>Monarda didyma</b> 'Blue Stocking' <b>Monarda citriodora</b>	<b>Beebalm</b> <b>Beebalm</b>	>5000 x 1	160 x 1 60-100 x 1	>4 x 1		
<b>Pachystachys lutea</b>	<b>Golden Shrimp</b>		200 x 1	>1, <10 x 1		
<b>Penta lanceolata</b> 'Orchid Illusion' 'Lavender' 'Red'	<b>Egyptian Star Flower</b>	5000 x 3 5000 x 3 >5000 x 3	>45 x 1 >45 x 1 >45 x 1	>16 x 1		<1500 & 150 0 x 1 1500 & 150 0 x 1 2500 & 150 0 x 1
<b>Perovskia atriplicifolia</b>	<b>Russian sage</b>	5000 x 2 - 4	>30 x 4	>30 x 1		5000 & 150 0 x 1
<b>Phlox paniculata</b> 'Bright Eyes' 'Juliet' 'Eva Cullum'	<b>Summer Phlox</b>	5000 x 1 - 2 NR @ 5000 x 4	>160 x 1 >30 x 4			
<b>Physostegia virginiana</b> 'Summer Show'	<b>Obedient plant</b>	NR @ 5000 x 4	>30 x 4	>30 x 1		
<b>Platycodon grandiflorus</b> 'Fuji White'	<b>Balloonflower</b>		>50 x 1	>1.5 x 1		

**CROP USE AND RATE RECOMMENDATIONS (continued)**

Crop	Common Name	RECOMMENDED RATES (IN PPM) X NO. APPLICATIONS				
		B-Nine	Bonzi (spray)	Bonzi (drench)	B-Nine & Bonzi	B-Nine & Cycocel
<b>Polemonium caeruleum</b>	<b>Jacob's Ladder</b>	>2500 x 1	>15 x 1		>2500 & 15 x 1	2500 & 150 0 x 1
<b>Polygonium</b>	<b>Silver Fleece</b>			>30 x 1		
<b>Pseuderanthemum lactifola</b>		>5000 x 2	>45 x 1			>2500 & 150 0 x 1
<b>Ratibiditia</b>				>30 x 1		
<b>Rudbeckia fulgida</b> 'Goldsturm'	<b>Coneflower</b>	NR @ 5000 x 4	>160 x 1, >30 x 4	>30 x 1		
<b>Salvia x superba</b> 'Blue Queen'		5000 x 4	>30 x 4	>30 x 1		
<b>Salvia greggi</b>	<b>Cherry Sage</b>	5000 x 3		>6 x 1		5000 & 150 0 x 1
<b>Salvia leucantha</b>	<b>Mexican Sage</b>	5000 x 2	40-60 x 1			5000 & 150 0 x 1
<b>Saponaria ocymoides</b>	<b>Rock soapwort</b>		>160 x 1			
<b>Scabiosa caucasica</b> 'House hybrids'	<b>Pincushion Flower</b>	>5000 x 1	>160 x 1			5000 & 150 0 x 1
<b>Sedum</b> <b>S. spurium</b> 'Dragons Blood'	<b>Sedum</b>	NR @ 5000 x 4	>30 x 4	30 x 1		
<b>S. telephium</b> 'Autumn Joy'		>2500 x 1	>40		>2500 & 40 x 1	2500 & 150 0 x 1
<b>Solidago canadensis</b>	<b>Goldenrod</b>	5000 x 2	80-100 x 1	>30 x 1		
<b>Solidaster luteus</b> 'Tara'	<b>Yellow Aster</b>	>2500 x 1	>40 x 1		>2500 & 40 x 1	>2500 & 150 0 x 1
<b>Stokesia laevis</b> 'Purple Parasols'	<b>Stokes Aster</b>	<5000 x 2	40-80 x 1			
<b>Verbena bonariensis</b> <b>V. canadensis</b> 'Homestead Purple'	<b>Verbena</b>		120-160 x 1	>3 x 1		
<b>Veronica x</b> 'Red Fox' 'Georgia Blue' 'Blue' 'Sunny Blue Border'	<b>Speedwell</b>	5000 x 4 >2500 x 1 5000 x 4 <5000 x 1	40 x 1 >15 x 1 >30 x 4 <40 x 1		2500 & 7.5 x 2	5000 & 150 0 x 2

\*RECOMMENDED APPLICATION INTERVALS OF 10 to 14 DAYS. NR = No Response, > = Greater than, < = Less than

# COMMERCIAL GREENHOUSE AND FIELD PRODUCTION WEED CONTROL

Mark A. Czarnota, Extension Horticulturist-Weed Science

USE STAGE/ HERBICIDE	AMOUNT OF FORMULATION PER ACRE	POUNDS ACTIVE INGREDIENT PER ACRE	REMARKS AND PRECAUTIONS
<b>PREEMERGENCE<sup>1,2,3,4</sup></b>			
<b>HERBACEOUS FLOWERING PLANTS:</b>			
benefin + oryzalin (XL 2G)	2.0% granular	4.6 - 6.9 lbs.	Can be applied over-the-top of several established bedding plants (see label). Provides broad spectrum control of many broad leaf and annual grass weeds.
Napropamide (Devrinol 2G) (Devrinol 50DF)	100 - 150 lb 8 - 12 lb	2.0-3.0	Good at controlling several annual grasses and broadleaf weeds. Can be used over-the-top on many ornamentals and annual bedding plants (see label)
oryzalin (Surflan 4AS) (Surflan 85 DF)	2.0 - 4.0 qt 2.4 - 7.1 lb 2.4 - 4.7 lb	2.0 - 4.0	Controls a wide variety of annual and broadleaf plants from seed. As with many preemergent herbicides, over-the-top oryzalin sprays can cause stunting to select actively growing herbaceous plants. Do not apply these treatments to seeded beds or to non-rooted plants or in greenhouses.
pendimethalin (Pendulum 3.3 EC) (Pendulum AquaCap 3.8 ACS) (Pendulum 2 GR) (Corral 2.68 GR)	3.6 - 7.2 pt 2.1-4.2 qt 75 to 100 lb 76 - 114 lb	1.4 - 3.0 2.0 - 4.0 1.5 - 2.0 2.0 - 3.0	Apply to established plantings to control annual grass and certain broadleaf weeds. On most bedding plants, do not apply within 4 weeks of transplanting. See label for details. DO NOT use in greenhouses.
trifluralin (Treflan 5G)	80 lb	4	Do not apply to seeded beds or to non-rooted plants or use in greenhouses. Refer to label for soil texture restrictions. Use the Treflan products registered for ornamental use (several companies market the 5G formulation and all have different labels).
<b>POSTEMERGENCE: Control of annual and perennial grasses</b>			
fluazifop-P (Ornamec) 0.5 lb./gal. (Fusilade II) 2.0 lb./gal.	2.3-3.0 qt  1.0-1.5 pt	0.25-0.38  0.25-0.38	Apply postemergence over-the-top to actively growing grasses that are not drought stressed. Refer to label to determine best rate for the species /size of grass you are trying to control. Refer to label to determine if a surfactant should be added to the spray mix. If so, consider the use of a non-ionic surfactant, as oil type adjuvants tend to cause more damage to desirable plant foliage. <b>DO NOT</b> apply these herbicides to ornamental grasses. Foliage of some ornamental flower species can be damaged by fluazifop.
clethodim (Envoy Plus) 0.97 lb./gal	17-34 fl. oz.	0.12-0.25	
fenoxaprop (Acclaim Extra) 0.57 lb./gal.	1.2-2.4 pt	0.09-0.17	
sethoxydim (Segment) 1.0 lb./gal.	2 .25 - 3.75 pt	0.28-0.47	Apply postemergence over-the-top to actively growing grasses that are not drought-stressed. Refer to label to determine best rate for the species /size of grass you are trying to control. DO NOT add a surfactant or crop oil concentrate to Segemnt. DO NOT apply to ornamental grasses.
<b>POSTEMERGENCE: Areas adjacent to Ornamentals</b>			
glufosinate (Finale) 1.0 lb./gal.	3.0-6.0 qt	0.75-1.5	Controls a wide range of broadleaf weeds and grasses. DO NOT permit spray to contact foliage or green stems of desirable ornamentals.
glyphosate  Various trade names and formulations available	see label.	see label	Controls a wide range of broadleaf weeds and grasses. DO NOT permit spray to contact foliage or green stems of desirable ornamentals or turfgrasses. DO NOT use Roundup Pro in greenhouses with desirable vegetation or when air circulation / ventilation systems are running. Use caution when spraying glyphosate around greenhouse air intakes. Small air borne spray droplets can enter greenhouses through air intakes causing damage to plant materials in greenhouse.

COMMERCIAL GREENHOUSE AND FIELD PRODUCTION WEED CONTROL (continued)

USE STAGE/ HERBICIDE	AMOUNT OF FORMULATION PER ACRE	POUNDS ACTIVE INGREDIENT PER ACRE	REMARKS AND PRECAUTIONS
<b>POSTEMERGENCE: For use in greenhouses, lathhouses, and shade structures.</b>			
diquat (Reward) 2.0 lbs./gal.	1.0-2.0 qt/100 gals. of water	1.0-2.0	Do not allow spray drift to contact desirable plants. Postemergent applications provide contact kill of most herbaceous plant material. Add surfactant to mixture.
fluazifop-P (Ornamec) 0.5 lb./gal. (Fusilade II) 2.0 lb./gal.	2.3-3.0 qt  1.0-1.5 pt	0.25-0.38  0.25-0.38	Only controls annual and perennial grasses. Apply postemergence over-the-top to actively growing grasses, which are not drought-stressed, according to plant size limitations shown on the label. A surfactant is required for both products (add surfactant so that the final spray solution is 0.25% V/V surfactant (0.5 oz surfact/gallon). DO NOT apply these herbicides to ornamental grasses. Foliage of some ornamental flower species can be damaged by fluazifop (see label). <b>For spot spraying use 0.75 oz of Fusilade II (plus 0.5 oz of a non-ionic surfactant) per gallon of water).</b>
glufosinate (Finale) 1.0 lb./gal.	3.0-6.0 qt	0.75-1.5	May be used to control emerged weeds in greenhouses and shade-houses. Air circulation fans must be turned off during application. Avoid spray droplet drift and direct contact with foliage and green stems of ornamentals.
glyphosate (Various trade names and formulations are available)	See label	See label	Controls a wide range of broadleaf weeds and grasses. Can be used in greenhouses that do not contain desirable vegetation. DO NOT use glyphosate in greenhouses when air circulation / ventilation systems are running. Not all formulations of glyphosate are labeled for this application. Check label for compliance. <b>USE ONLY A BRAND RECOMMENDED FOR THIS USE!</b>
Potassium salts of fatty acids Various trade names are available	See label	See label	Provides postemergence, contact control of mosses, algae, liverworts and lichens inside greenhouses, on growing containers and benches. Do not allow spray to contact foliage of desirable ornamentals.
Sodium chlorate + Sodium metaborate (Barespot)	870 - 1740  (2 to 4 lb/100ft <sup>2</sup> )	683 - 1396	Can be used under greenhouse benches to control unwanted vegetation. Also provides a short period of preemergent weed control. Apply granular herbicide anytime when actively growing plants can be seen. Product can be used in a greenhouse when desirable plants are present.

<sup>1</sup>All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5 to 1.0 inch of water). If no rain event occurs and no supplemental watering is provided after a preemergent herbicide application, weed control can be extremely poor.

<sup>2</sup>Most preemergent herbicides will only control germinating weed seed. Generally, they will not control weeds after they have become established (1st or 2nd true leaf), and most preemergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).

<sup>3</sup>As long as the treated area remains undisturbed, most pre-emergent herbicides will provide weed control for 2 to 4 months in most growing mediums.

<sup>4</sup>Do not apply preemergence herbicides to seeded beds or to non-rooted plants.

# COMMERCIAL INTERIOR PLANTSCAPES INSECT CONTROL

Ronald D. Oetting and Will Hudson, Extension Entomologists

**Note:** People without proper application protective clothing must not enter treated area until plants are dry or as stipulated on the label. If possible, remove infested plants from living and eating areas prior to spray application. Place plants outdoors or in an area not likely to come in contact with people, pets, or food while spraying and while plants are wet. In most situations plants can be returned to original location when they are dry. If plants can not be removed follow label precautions.

PLANTS	INSECT OR MITE	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALS. WATER	AMOUNT PER GALLON	COMMENTS
Many (flower and foliage check label)	Aphid	insecticidal soap (M-Pede)	1-2%	1-2%	Thorough coverage is necessary, spray must contact pest to be effective. Repeat spray 3 times at 5-7 day interval. Soap could make floor slippery.
		kinoprene (Enstar 5E)	6-10 oz.	½ tsp.	Follow label directions.
		<i>Beauveria bassiana</i> (Botani Gard ES)	0.5-1 lb.	.08-1 .6 oz.	
		horticultural oil (Sunspray ultrafine, Saf-T-Side, Triact 90EC)	1-2%	1-2%	Thorough coverage is necessary, spray must contact pest to be effective.
		imidacloprid (Merit 75WP) (Merit 75WPS) (Marathon II)			Per label directions.
		cyfluthrin (Decathlon)	1.3-1 .9 oz.	¼ tsp.	Follow label directions.
		flonicamid 50 WDG (Aria 0.7 oz. package)	1-6 packets (0.7-4.3 oz.)	12 hr.	Repeat application every 7-28 days as necessary.
		pymetrozine (Endeavor)	2-5 oz.	¼ - ½ tsp.	Follow label directions.
		pyriproxyfen (Distance)	6-8 fl. ozs.	0.02 ozs. (0.6 ml)	Follow label directions.
		fluvalinate (Mavrik)	4-10 oz.	½ - 1 tsp.	Follow label directions.
		sumithrin	1-2 pt.	1-2 tsp.	Follow label directions.
		spirotetramat (Kontos) 2F	1.7 fl.ozs.	24 hrs.	Follow label directions.
	Naturalis-O	30-100 fl. oz.	0.30-1.0 fl. oz.		
	Scale	horticultural oils (Sunspray ultrafine, Saf-T-Side, Triact 90EC)	1-2%	1-2%	Care must be taken because some plants are sensitive to oils. Thorough coverage is necessary but do not over apply. Use fine spray.
		insecticidal soap (M- Pede)	1-2%	1-2%	Thorough coverage necessary, spray must contact pest to be effective. Soap could make floor slippery.
		pyrethrum (PT 1600 A or Pyrenone)	aerosol		Follow label directions.
		pyriproxyfen (Distance)	8-12 fl. ozs.	0.02 ozs. (0.6 ml)	Follow label directions.
		cyfluthrin (Decathlon)	1.3-1 .9 oz.	1/4 tsp.	Follow label directions.
		spirotetramat (Kontos) 2F	1.7 fl.ozs.	24 hrs.	Follow label directions.

COMMERCIAL INTERIOR PLANTSCAPES INSECT CONTROL (continued)

PLANTS	INSECT OR MITE	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALS. WATER	AMOUNT PER GALLON	COMMENTS
Many (flower and foliage check label) (cont.)	Fungus gnats	<i>Bacillus thuringiensis</i> (Gnatrol)	16-32 oz. 64-128 oz.	1-2 tsp. 4-8 tsp.	For light infestation. For heavy infestation. Follow label directions.
		diflubenzuron (Adept 25WSB)	16-24 ozs.	0.04-0.08 (1-2 grams)	Follow label directions.
		kinoprene (Enstar 5E)	6-10 oz.	½ tsp.	Follow label directions.
		cryomazine (Citation 75% WP)	2.66 oz.	½ tsp.	Follow label directions.
		pyriproxyfen (Distance)	3-6 fl. ozs.	0.02 (0.6 ml)	Follow label directions.
		<i>Steinernema feltiae</i> (Entonem, NemaShield, Nemasys, ScanMask)			Follow label directions.
	Mealybug	horticultural oils (Sunspray ultrafine, Saf-T-Side, Triact 90EC)	1-2%	1-2%	Care must be taken because some plants are sensitive to oils. Thorough coverage is necessary but do not over apply. Use fine spray.
		insecticidal soap (M- Pede)	1-2%	1-2%	Thorough coverage necessary, spray must contact pests to be effective. Repeat spray 3 times at 10-14 day intervals. Soap could make floor slippery.
		kinoprene (Enstar 5E)	6-10 oz.	½ tsp.	Follow label directions.
		pyrethrum (PT 1600 A or Pyrenone)	aerosol		Follow label directions.
		clothianidin (Celero 16 WSG)	2-4 oz.	12 hr.	Apply as a full coverage foliar spray or a drench.
		spirotetramat (Kontos) 2F	1.7 fl.ozs.	24 hrs.	Follow label directions.
	Fungus gnats	<i>Bacillus thuringiensis</i> (Gnatrol)	16-32 oz. 64-128 oz.	1-2 tsp. 4-8 tsp.	For light infestation. For heavy infestation. Follow label directions.
		diflubenzuron (Adept 25WSB)	16-24 ozs.	0.04-0.08 (1-2 grams)	Follow label directions.
		kinoprene (Enstar 5E)	6-10 oz.	½ tsp.	Follow label directions.
		cryomazine (Citation 75% WP)	2.66 oz.	½ tsp.	Follow label directions.
		pyriproxyfen (Distance)	3-6 fl. ozs.	0.02 (0.6 ml)	Follow label directions.
		<i>Steinernema feltiae</i> (Entonem, NemaShield, Nemasys, ScanMask)			Follow label directions.
	Mealybug	horticultural oils (Sunspray ultrafine, Saf-T-Side, Triact 90EC)	1-2%	1-2%	Care must be taken because some plants are sensitive to oils. Thorough coverage is necessary but do not over apply. Use fine spray.
		insecticidal soap (M- Pede)	1-2%	1-2%	Thorough coverage necessary, spray must contact pests to be effective. Repeat spray 3 times at 10-14 day intervals. Soap could make floor slippery.

COMMERCIAL INTERIOR PLANTSCAPES INSECT CONTROL (continued)

PLANTS	INSECT OR MITE	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALS. WATER	AMOUNT PER GALLON	COMMENTS	
Many (flower and foliage check label) (cont.)	Mealybug (cont.)	kinoprene (Enstar 5E)	6-10 oz.	½ tsp.	Follow label directions.	
		pyrethrum (PT 1600 A or Pyrenone)	aerosol		Follow label directions.	
		clothianidin (Celero 16 WSG)	2-4 oz.	12 hr.	Apply as a full coverage foliar spray or a drench.	
		spirotetramat (Kontos) 2F	1.7 fl.ozs.	24 hrs.	Follow label directions.	
		cyfluthrin (Decathlon)	1.3-1.9 oz.	¼ tsp.	Follow label directions.	
		flonicamid 50 WDG (Aria 0.7 oz. package)	1-6 packets (0.7-4.3 oz.)	12 hr.	Repeat application every 7-28 days as necessary.	
		sumithrin	1-2 pt.	1-2 tsp.	Follow label directions.	
		imidacloprid (Merit 75WP) (Merit 75 WSP) (Marathon II)			Follow label directions.	
		pyriproxyfen (Distance)	8-12 fl. ozs.	0.02 (0.6 ml)	Follow label directions.	
		<i>Beauveria bassiana</i> (Botani Gard ES)	0.5-1 lb.	.08-1.6 oz.		
	Mites	dienochlor (Pentac)	½ pt.	% tsp.	Thorough coverage necessary. Avoid use of alkaline water in spray. Mix well before spraying. If necessary repeat spray in 5-7 days.	
		insecticidal soap (M- Pede)	1-2%	1-2%	Thorough coverage necessary, spray must contact pest to be effective. Repeat spray 3 times at 5-7 day intervals. Soap could make floor slippery.	
		fenproximate (Akari 5SC)	16-24 ozs.	0.16-0.24 ozs. (4.527 ml)	Follow label directions.	
		fluvalinate (Mavrik)	4-10 oz.	½ - 1 tsp.	Follow label directions.	
		bifenazate (Floramite)	2-4 oz.	¼ - ½ tsp.	Follow label directions.	
		pyrethrum (PT 1600 A or Pyrenone)	aerosol		Follow label directions.	
		sumithrin	1-2 pt.	1-2 tsp.	Follow label directions.	
		Naturalis-O	30-100 fl. oz.	0.30-1.0 fl. oz.		
		Thrips	insecticidal soap (M- Pede)	1-2%	1-2%	Thorough coverage necessary, spray must contact pest to be effective. Repeat spray 3 times at 5-7 day intervals. Soap could make floor slippery.
			fluvalinate (Mavrik)	4-10 oz.	½ - 1 tsp.	
	cyfluthrin (Decathlon)		1.3-1.9 oz.	¼ tsp.	Follow label directions.	
	azadirachtin (Azatin)				Follow label directions.	
	<i>Beauveria bassiana</i> (Botani Gard ES)		1-2 lbs.	1.6-3.2 oz.		
	flonicamid 50 WDG (Aria 0.7 oz. package)		1-6 packets (0.7-4.3 oz.)	12 hr.	Repeat application every 7-28 days as necessary.	
	Naturalis-O		30-100 fl. oz.	0.30-1.0 fl. oz.		

**COMMERCIAL INTERIOR PLANTSCAPES INSECT CONTROL (continued)**

<b>PLANTS</b>	<b>INSECT OR MITE</b>	<b>INSECTICIDE AND FORMULATION</b>	<b>AMOUNT PER 100 GALS. WATER</b>	<b>AMOUNT PER GALLON</b>	<b>COMMENTS</b>
Many (flower and foliage check label) (cont.)	Whitefly	horticultural oils (Sunspray ultrafine, Saf-T-Side, Triact 90EC)	1-2%	1-2%	Care must be taken because some plants are sensitive to oils. Thorough coverage is necessary but do not over apply. Use fine spray.
		cyfluthrin (Decathlon)	1.3-1.9 oz.	¼ tsp.	Follow label directions.
		diflubenzuron (Adept 25WSB)	16-24 ozs.	0.04-0.08 ozs. (1-2 grams)	Follow label directions.
		pymetrozine (Endeavor)	2-5 oz.	¼ - ½ tsp.	Follow label directions.
		sumithrin	1-2 pt.	1-2 tsp.	Follow label directions.
		azadirachtin (Azatin)			Follow label directions.
		flonicamid 50 WDG (Aria 0.7 oz. package)	1-6 packets (0.7-4.3 oz.)	12 hr.	Repeat application every 7-28 days as necessary.
		insecticidal soap (M- Pede)	1-2%	1-2%	Thorough coverage necessary, spray must contact pest to be effective. Repeat spray 3 times at 5-7 day intervals. Soap could make floor slippery.
		kinoprene (Enstar 5E)	6-10 oz.	½ tsp.	Follow label directions.
		pyrethrum (PT 1600 A or Pyrenone)	aerosol		Follow label directions.
		cyfluthrin (Decathlon)	1.3 - 1.9 oz.	¼ tsp.	Follow label directions.
		imidacloprid (Merit 75WP) (Merit (75WPS) (Marathon II)			Follow label directions.
		pyriproxyfen (Distance)	6-8 fl. ozs.	0.02 ozs. (0.6 ml)	Follow label directions.
		<i>Beauveria bassiana</i> (Botani Gard ES)	0.5-1 lb.	.08-1.6 oz.	
		spirotetramat (Kontos) 2F	1.7 fl.ozs.	24 hrs.	Follow label directions.
Naturalis-O	30-100 fl. oz.	0.30-1.0 fl. oz.			