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Are Your Geraniums Happy?

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Zonal geraniums are a popular spring crop for North Carolina greenhouses with over \$7 million dollars of plants being grown in 1997. We are at the start of the spring season and unfortunately two major problems associated with geraniums are already appearing at the NCSU Plant Diagnostic Clinic: (1) micronutrient toxicities caused by too low of a root substrate pH and (2) Bacterial Blight [*Xanthomonas campestris* pv. *pelargonii*].

The easiest one to monitor and correct is the micronutrient toxicities caused by too low of a root substrate pH. Symptoms of micronutrient toxicities (Fe and Mn) are lower leaf yellowing, followed in more advanced cases to necrotic spots or margins on the lower to mid-level leaves. The condition is common from the Piedmont westward. The problem is that most of western North Carolina is blessed with too good of a water source. There is little alkalinity in the irrigation water to buffer the change in pH caused by the use of an acidic fertilizers (like 20-10-20). In addition, geraniums don't seem to know what is good for them. They naturally acidify the root substrate, much to their detriment.

What to do? Monitor the pH of your geraniums. Do this by in-house testing or sending samples out to a commercial lab. The optimal pH for zonal geraniums

is between 6.0 to 6.5. If it strays out of this range, take one of the corrective actions listed in Table 1.

The more serious problem is Bacterial Blight (*Xanthomonas*). It is a devastating disease that result in loss of whole blocks of infected plants. The disease is spread by propagation from infected stock and splashing water. Leaf symptoms may appear as small, tan to brown, round spots on the leaves with well defined yellow margins. The spots may continue to enlarge into yellow patches or brown wedges and can eventually turn the entire leaf brown. Leaf wilt is also a common symptom seen in the greenhouse, especially late in the spring when greenhouse temperatures become hot. Bacterial Blight can infect zonal geraniums and ivy geraniums. It is a good idea to avoid placing geranium hanging baskets above benches containing geranium plants. If leaf wilt is noticed, the first thing to do is to check the roots. If the roots are discolored, then *Pythium* root rot may be the cause. If the roots look white and healthy, the wilt may be Bacterial Blight. Symptomatic plants should be immediately removed and isolated from other geraniums. After handling infected plants, thoroughly wash hands and tools before working with other geraniums. The only way to confirm Bacterial Blight

(see *Geraniums*, continued on page 15)

Pesticides Labeled For Greenhouse Ornamental Insect and Related Pest Control

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This table lists pesticides currently labeled for use in commercial floriculture greenhouses for use on ornamental plants. Unless noted in the precautions and remarks column, the pesticide listed is labeled for any greenhouse flower or foliage plant. Read individual labels for any restrictions on use prior to application; labels do change. The abbreviation " NA" stands for not applicable; used when a column is not applicable for a product. Do not confuse volume rates (given in fluid ounces [fl oz]; 8 fl oz = 1 cup) with weight rates (given in avoirdupois ounces [oz]; 16 oz = 1 pound [lb]). Do not equate 1 fl oz with 1 oz; many dry products such as wettable powders should be weighed out for precise concentrations. Other volume and weight abbreviations used include: Tablespoon (Tbsp), teaspoon (tsp), pint (pt), gallon (gal), and pound (lb). Aerosol product and vaporized product application rates are based on either greenhouse area (ft²) or greenhouse volume (ft³).

¹ Pesticide classifications: BO - botanical; CA - carbamate; CH - chlorinated hydrocarbon; DI - Diphenyl; IGR - insect growth regulator; MI - microbial; OP - organophosphate; PY - pyrethroid

Pesticide formulations: A - aerosol (includes compressed total release products and smoke generator products); AS - aqueous suspension; D - dust; DF - dry flowable; EC - emulsifiable concentrate; F - flowable; G - granular; L - water-soluble liquid; ME - microencapsulated; P - pelleted; SP - soluble powder; WG - water-dispersible granules; WP - wettable powder; WSP - water-soluble packets.

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Aphids	acephate -- OP 75 SP (Orthene Turf, Tree and Ornamental, Pro 75) 3 A (PT 1300 TR Orthene & PT 1300 DS Orthene)	1 to 2 tsp NA -- Aerosols	0.33 to 0.66 lb NA -- Aerosols	24 hours See product label	Orthene 75 SP is also available for use on tobacco. When spraying ornamental plants, be sure to use Orthene Tree, Turf & Ornamentals or Pro 75 products. Apply total release aerosols using a rate of 1 lb per 1,500 to 3,000 ft ² . Treat as late in the day as possible. Apply directed spray aerosol using a release rate of 5 to 10 seconds per 100 ft ² .
	azadirachtin -- BO 0.3 F (Margosan-O) 3 EC (Azatin XL) 4.5 EC (Neemazad)	2.5 to 5 tsp 0.5 tsp 0.125 to 0.25 tsp	40 to 80 fl oz 8 fl oz 2.25 to 4.5 fl oz	4 hours 4 hours 4 hours	
	<i>Beauveria bassiana</i> -- MI 7.16 EC (Naturalis-O) 22 WP (BotaniGard)	2 tsp to 2 Tbsp 2 tsp	30 to 100 fl oz 1 lb	4 hours 4 hours	Three to 5 sprays needed for adequate control. BotaniGard can be used at 3 lb per 100 gal for heavy infestations.
	bendiocarb -- CA 76 WP (Dycarb, Ficam, Turcam)	1 Tbsp	12 to 20 oz	See product label	Avoid excessive runoff. Labeled for chrysanthemum only.
	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	Apply aerosol using a rate of 1 lb per 1,500 to 3,000 ft ² . Treat as late in the day as possible. Buildings should be vented before reentry.
	chlorpyrifos -- OP 20 ME (PT 1325 DuraGuard)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	
	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	
	diazinon -- OP 23 EC (Knox-Out)	1 to 2 Tbsp	3 to 6 pt	See product label	Diazinon should not be applied directly to open blooms; it is not labeled for use on poinsettias.

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Aphids, <i>continued</i>	dichlorvos -- OP 5 A (Vapona)	NA -- Smoke generator	NA -- Smoke generator	See product label	Vapona may damage chrysanthemum varieties 'Shasta', 'Pink Champagne', and 'Nightingale'.
	endosulfan -- CH 24.2 EC (Thiodan) 50 WP (Thiodan) 5 A (Thiodan)	2 tsp 1 Tbsp NA -- Smoke generator	2 pt 1 lb NA -- Smoke generator	24 hours 24 hours See product label	Apply as needed. Repeat applications may be necessary. Thiodan is phytotoxic to some varieties of geraniums and chrysanthemums.
	fenoxycarb -- IGR 0.6 A (PT 2100 Preclude)	NA-- Aerosol	NA-- Aerosol	See product label	Apply aerosol using a rate of 1 lb per 1,500 to 3,000 ft ² . Treat as late in the day as possible. Buildings should be vented before reentry.
	fenpropathrin -- PY 30 EC (Tame)	0.66 tsp	10.66 fl oz	See product label	Can be used with 0.33 lb per 100 gal acephate (Orthene Turf, Tree and Ornamental 75 SP).
	fluvalinate -- PY 22.3 F (Mavrik)	0.125 to 0.625 tsp	2 to 10 fl oz	See product label	Also labeled as a plant dip.
	horticultural oil -- Other 98.8 EC (Ultra Fine, Sun Spray)	2.5 to 5 Tbsp	1 to 2 gal	4 hours	Oils is a contact killer of pests; thorough coverage is required. May cause foliar injury if sprayed during extremely humid conditions.
	imidacloprid -- Other 1 G (Marathon)	NA -- Granular	NA -- Granular	12 hours	Can be incorporated into substrate at 3 lb per yd ³ ; broadcast over flats at 9 to 15 oz per 1,000 ft ² ; or surface applied to pots (rate varies with pot size -- use 0.33 tsp (1.3 grams) per 6" pot).
	kinoprene -- IGR 65.1 EC (Enstar II)	0.5 to 0.66 tsp	5 to 10 fl oz	4 hours	
	lambda-cyhalothrin -- PY 10 WSP (Topcide)	NA -- Packets	1 to 4 Packets	24 hours	
	lindane -- CH 25 WP (Lindane)	1 Tbsp	1 lb	See product label	
	malathion -- OP 25 WP (Malathion) 57 EC (Malathion)	2 tsp 2 tsp	40 oz 2 pt	See product label See product label	Malathion may injure African violet, begonia, crassula, ferns, gloxinia, orchids, pansy, petunia, some red carnations, and some rose varieties.
	methiocarb -- CA 75 WP (Mesuroil)	2 to 4 tsp	1 to 2 lb	24 hours	Up to 4 applications per season. Not for use in the landscape.
	naled -- OP 58 EC (Dibrom)	NA -- Vaporized	NA -- Vaporized	24 hours	Apply on steam pipes at rate of 1 fl oz per 10,000 ft ³ of greenhouse volume. Then heat pipes to 160 °F. Naled will corrode pipes with continued use. Naled vapor treatment may injure 'White Butterfly' and 'Golden Rapture' roses, 'Pink Champagne' chrysanthemums, wandering jew, poinsettias, and Dutchman's pipe.
	nicotine sulfate -- Other 40 EC (Nicotine Sulfate)	1.5 tsp	1.5 pt	See product label	Nicotine sulfate will damage young chrysanthemums and lilies.
	permethrin -- PY 36.8 EC (Astro)	0.25 to 0.5 tsp	4 to 8 fl oz	24 hours	
	pyrethrins -- BO 6 EC (Pyrenone) 0.5 A (PT 1100 Pyrethrum)	0.125 to 1.5 tsp NA -- Aerosol	2 to 12 fl oz NA -- Aerosol	See product label See product label	Pyrethrins are not recommended for use directly on open blooms or on bracts showing color. Apply PT 1100 using a rate of 1 lb per 3,000 ft ² . Treat as late in the day as possible. Ventilate prior to reentry.

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Aphids, <i>continued</i>	pyriproxyfen -- IGR 11.2 EC (Distance)	0.5 to 0.75 tsp	6 to 12 fl oz	12 hours	For aphid suppression only.
	resmethrin -- PY 24.3 EC (Resmethrin) 1 A (Pt 1200 TR Resmethrin & PT 1200 DS Resmethrin)	1 tsp NA -- Aerosols	1 pt NA -- Aerosols	See product label See product label	Apply PT 1200 TR using a rate of 1 lb per 1,500 to 3,000 ft ² . Treat as late in the day as possible. Ventilate prior to reentry. Apply PT 1200 DS using a release rate of 5 to 10 seconds per 100 ft ² .
	soap -- Other 25 EC (Olympic Insecticidal) 49 EC (M-Pede) 49.5 EC (Olympic Insecticidal)	2.5 to 5 fl oz 1.25 to 2.5 fl oz 2.5 fl oz	-- 1 to 2 gal 2 gal	See product label 12 hours 12 hours	Do not apply more than 2 times consecutively; too frequent of applications can cause foliar discoloration.
	sulfotepp -- OP 15 A (Dithio, Plantfume 103)	NA -- Smoke generator	NA -- Smoke generator	See product label	Consult product label for recommended rates.
Brown Soft Scale	bendiocarb -- CA 76 WP (Dycarb, Ficam, Turcam)	0.75 Tbsp	5.5 oz	See product label	Avoid excessive runoff.
	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	See aphids section for comments.
	lambda-cyhalothrin -- PY 10 WSP (Topcide)	NA -- Packets	2 to 4 Packets	24 hours	
	sulfotepp -- OP 15 A (Dithio, Plantfume 103)	NA -- Smoke generator	NA -- Smoke generator	See product label	Consult product label for recommended rates.
Caterpillars (including Armyworm [AW], Beet Armyworm [BAW], Cabbage Looper [CL], and Cutworms [CW])	acephate -- OP 75 SP (Orthene Turf, Tree and Ornamental, Pro 75) 3 A (PT 1300 TR Orthene & PT 1300 DS Orthene)	1 to 2 tsp NA -- Aerosols	0.33 to 0.66 lb NA -- Aerosols	24 hours See product label	See aphids section for comments. Registered for AW, CL, and CW.
	azadirachtin -- BO 0.3 F (Margosan-O) 3 EC (Azatin XL) 4.5 EC (Neemazad)	2.5 to 5 tsp 0.66 to 1 tsp 0.125 to 0.25 tsp	40 to 80 fl oz 10 to 16 fl oz 2.25 to 4.5 fl oz	4 hours 4 hours 4 hours	Registered for AW, BAW, CL, and CW.
	<i>Bacillus thuringiensis</i> -- MI 3.2 AS (Dipel) 15 AS (Victory)	1 to 2 tsp 2.5 to 5 tsp	1 to 2 pt 40 to 80 fl oz	4 hours 4 hours	Registered for AW, CL, and CW.
	<i>Beauveria bassiana</i> -- MI 7.16 EC (Naturalis-O)	2 tsp to 2 Tbsp	30 to 100 fl oz	4 hours	See aphids section for comments.
	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	See aphids section for comments. Registered for AW and CW.
	chlorpyrifos -- OP 20 ME (PT 1325 DuraGuard)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	Registered for BAW and CL.
	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	Registered for AW, CL, and CW.
	diazinon -- OP 23 EC (Knox-Out)	1 to 2 Tbsp	3 to 6 pt	See product label	See aphids section for comments. Registered for CL.
	dichlorvos -- OP 5 A (Vapona)	NA -- Smoke generator	NA -- Smoke generator	See product label	See aphids section for comments. Registered for CL.
	diflubenzuron -- IGR 25 WSP (Adept)	NA -- Packets	4 to 8 Packets	12 hours	Apply at a volume of 1 gal of final solution per 200 ft ² . Registered for AW.

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Caterpillars (including Armyworm [AW], Beet Armyworm [BAW], Cabbage Looper [CL], and Cutworms [CW]), <i>continued</i>	fenpropathrin -- PY 30 EC (Tame)	0.66 tsp	10.66 fl oz	See product label	See aphids section for comments. Registered for BAW.
	fluvalinate -- PY 22.3 F (Mavrik)	0.125 to 0.625 tsp	2 to 10 fl oz	See product label	See aphids section for comments. Registered for AW, CL, and CW.
	lambda-cyhalothrin -- PY 10 WSP (Topcide)	NA -- Packets	1 to 4 Packets	24 hours	Registered for AW, CL, and CW.
	naled -- OP 58 EC (Dibrom)	NA -- Vaporized	NA -- Vaporized	24 hours	See aphids section for comments. Registered for CL.
	permethrin -- PY 36.8 EC (Astro)	0.25 to 0.5 tsp	4 to 8 fl oz	24 hours	Registered for BAW and CL.
	pyrethrins -- BO 6 EC (Pyrenone) 0.5 A (PT 1100 Pyrethrum)	0.125 to 1.5 tsp NA -- Aerosol	2 to 12 fl oz NA -- Aerosol	See product label See product label	See aphids section for comments. Registered for AW, CL, and CW.
	resmethrin -- PY 24.3 EC (Resmethrin) 1 A (Pt 1200 TR Resmethrin & PT 1200 DS Resmethrin)	1 tsp NA -- Aerosols	1 pt NA -- Aerosols	See product label See product label	See aphids section for comments. Registered for AW and CL.
	soap -- Other 25 EC (Olympic Insecticidal)	2.5 to 5 fl oz	--	See product label	See aphids section for comments.
Chrysanthemum Gall Midge	lindane -- CH 25 WP (Lindane)	1 Tbsp	1 lb	See product label	For use on chrysanthems only. Weekly applications may be needed.
Crickets	chlorpyrifos -- OP 20 ME (PT 1325 DuraGuard)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	
	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	
	lambda-cyhalothrin -- PY 10 WSP (Topcide)	NA -- Packets	1 to 4 Packets	24 hours	
	pyrethrins -- BO 6 EC (Pyrenone) 0.5 A (PT 1100 Pyrethrum)	0.125 to 1.5 tsp NA -- Aerosol	2 to 12 fl oz NA -- Aerosol	See product label See product label	See aphids section for comments.
	soap -- Other 25 EC (Olympic Insecticidal) 49 EC (M-Pede) 49.5 EC (Olympic Insecticidal)	2.5 to 5 fl oz 1.25 to 2.5 fl oz 2.5 fl oz	-- 1 to 2 gal 2 gal	See product label 12 hours 12 hours	See aphids section for comments.
Cucumber Beetle	azadirachtin -- BO 3 EC (Azatin XL)	0.66 to 1 tsp	10 to 16 fl oz	4 hours	
	<i>Beauveria bassiana</i> -- MI 7.16 EC (Naturalis-O)	2 tsp to 2 Tbsp	30 to 100 fl oz	4 hours	See aphids section for comments.
	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	See aphids section for comments.
	chlorpyrifos -- OP 20 ME (PT 1325 DuraGuard)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	
	fluvalinate -- PY 22.3 F (Mavrik)	0.125 to 0.625 tsp	2 to 10 fl oz	See product label	See aphids section for comments.
	pyrethrins -- BO 6 EC (Pyrenone) 0.5 A (PT 1100 Pyrethrum)	0.125 to 1.5 tsp NA -- Aerosol	2 to 12 fl oz NA -- Aerosol	See product label See product label	See aphids section for comments.
	resmethrin -- PY 24.3 EC (Resmethrin) 1 A (Pt 1200 TR Resmethrin & PT 1200 DS Resmethrin)	1 tsp NA -- Aerosols	1 pt NA -- Aerosols	See product label See product label	See aphids section for comments.

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Cucumber Beetle, <i>continued</i>	soap -- Other 25 EC (Olympic Insecticidal)	2.5 to 5 fl oz	--	See product label	See aphids section for comments.
Cyclamen Mite	endosulfan -- CH 24.2 EC (Thiodan) 50 WP (Thiodan) 5 A (Thiodan)	2 tsp 1 Tbsp NA -- Smoke generator	2 pt 1 lb NA -- Smoke generator	24 hours 24 hours See product label	See aphids section for comments.
Earwigs	soap -- Other 49 EC (M-Pede) 49.5 EC (Olympic Insecticidal)	1.25 to 2.5 fl oz 2.5 fl oz	1 to 2 gal 2 gal	12 hours 12 hours	See aphids section for comments.
Fungus Gnats	azadirachtin -- BO 0.3 F (Margosan-O) 3 EC (Azatin XL)	2.5 to 5 tsp 0.5 tsp	40 to 80 fl oz 8 fl oz	4 hours 4 hours	
	<i>Bacillus thuringiensis</i> -- MI 3.2 AS (Dipel) 15 AS (Victory)	1 to 2 tsp 2.5 to 5 tsp	1 to 2 pt 40 to 80 fl oz	4 hours 4 hours	See aphids section for comments.
	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	See aphids section for comments.
	chlorpyrifos -- OP 20 ME (PT 1325 DuraGuard)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	
	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	
	diazinon -- OP 23 EC (Knox-Out)	1 to 2 Tbsp	3 to 6 pt	See product label	See aphids section for comments.
	diflubenzuron -- IGR 25 WSP (Adept)	--	2 Packets	12 hours	Apply at a volume of 1 to 3 gal of final solution per 100 ft ² .
	fenoxycarb -- IGR 25 WP (Precision)	0.5 tsp	4 oz	See product label	
	kinoprene -- IGR 65.1 EC (Enstar II)	0.5 to 0.66 tsp	5 to 10 fl oz	4 hours	Enstar II is for larvae control only.
	nematodes (<i>Steinernema carpocapsae</i>) -- Other 17 AS (Exhibit)	--	--	See product label	Apply 1 gal per 10,000 ft ² for larvae control only. Make 3 applications, each 7 days apart for best results.
	oxamyl -- CA 24 L (Vydate L) 10 G (Oxamyl)	2 to 4 tsp NA -- Granules	2 to 4 pt NA -- Granules	See product label See product label	Ornamental uses of Vydate are being phased out. Apply 22 to 30 oz of Oxamyl granules per 1,000 ft ² (equates into 0.125 tsp per 6" to 10" azalea pot).
	permethrin -- PY 36.8 EC (Astro)	0.25 to 0.5 tsp	4 to 8 fl oz	24 hours	
	pyrethrins -- BO 6 EC (Pyreneone) 0.5 A (PT 1100 Pyrethrum)	0.125 to 1.5 tsp NA -- Aerosol	2 to 12 fl oz NA -- Aerosol	See product label See product label	See aphids section for comments.
	pyriproxyfen -- IGR 11.2 EC (Distance)	0.5 to 0.75 tsp	6 to 12 fl oz	12 hours	Apply as a spray or drench.
	resmethrin -- PY 24.3 EC (Resmethrin) 1 A (Pt 1200 TR Resmethrin & PT 1200 DS Resmethrin)	1 tsp NA -- Aerosols	1 pt NA -- Aerosols	See product label See product label	See aphids section for comments.
soap -- Other 25 EC (Olympic Insecticidal)	2.5 to 5 fl oz	--	See product label	See aphids section for comments.	

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Hemispherical Scale	bendiocarb -- CA 76 WP (Dycarb, Ficam, Turcam)	0.75 Tbsp	5.5 oz	See product label	Avoid excessive runoff.
Leaf-hoppers	azadirachtin -- BO 3 EC (Azatin XL)	0.66 to 1 tsp	10 to 16 fl oz	4 hours	
	<i>Beauveria bassiana</i> -- MI 7.16 EC (Naturalis-O)	2 tsp to 2 Tbsp	30 to 100 fl oz	4 hours	See aphids section for comments.
	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	See aphids section for comments.
	chlorpyrifos -- OP 20 ME (PT 1325 DuraGuard)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	
	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	
	fenpropathrin -- PY 30 EC (Tame)	0.33 to 0.66 tsp	5.3 to 10.66 fl oz	See product label	See aphids section for comments.
	lambda-cyhalothrin -- PY 10 WSP (Topcide)	NA -- Packets	1 to 4 Packets	24 hours	
	malathion -- OP 25 WP (Malathion) 57 EC (Malathion)	2 tsp 2 tsp	40 oz 2 pt	See product label See product label	See aphids section for comments.
	permethrin -- PY 36.8 EC (Astro)	0.25 to 0.5 tsp	4 to 8 fl oz	24 hours	
	pyrethrins -- BO 6 EC (Pyrenone) 0.5 A (PT 1100 Pyrethrum)	0.125 to 1.5 tsp NA -- Aerosol	2 to 12 fl oz NA -- Aerosol	See product label See product label	See aphids section for comments.
	resmethrin -- PY 24.3 EC (Resmethrin) 1 A (Pt 1200 TR Resmethrin & PT 1200 DS Resmethrin)	1 tsp NA -- Aerosols	1 pt NA -- Aerosols	See product label See product label	See aphids section for comments.
	soap -- Other 25 EC (Olympic Insecticidal) 49.5 EC (Olympic Insecticidal)	2.5 to 5 fl oz 2.5 fl oz	-- 2 gal	See product label 12 hours	See aphids section for comments.
Leafminers	abamectin B1 -- Other 2 EC (Avid)	0.5 tsp	8 fl oz	See product label	Do not use on ferns or conifers.
	acephate -- OP 75 SP (Orthene Turf, Tree and Ornamental, Pro 75) 3 A (PT 1300 TR Orthene & PT 1300 DS Orthene)	1 to 2 tsp NA -- Aerosols	0.33 to 0.66 lb NA -- Aerosols	24 hours See product label	See aphids section for comments.
	azadirachtin -- BO 0.3 F (Margosan-O) 3 EC (Azatin XL) 4.5 EC (Neemazad)	2.5 to 5 tsp 0.5 tsp 0.125 to 0.25 tsp	40 to 80 fl oz 8 fl oz 2.25 to 4.5 fl oz	4 hours 4 hours 4 hours	
	bendiocarb -- CA 76 WP (Dycarb, Ficam, Turcam)	0.75 Tbsp	5.5 oz	See product label	Avoid excessive runoff.
	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	See aphids section for comments.
	chlorpyrifos -- OP 20 ME (PT 1325 DuraGuard)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Leafminers, <i>continued</i>	cyromazine -- IGR 75 WP (Citation)	--	2.66 oz	See product label	Must wear protective clothing when harvesting. Labeled for chrysanthemum only.
	diazinon -- OP 23 EC (Knox-Out)	1 to 2 Tbsp	3 to 6 pt	See product label	See aphids section for comments.
	dichlorvos -- OP 5 A (Vapona)	NA -- Smoke generator	NA -- Smoke generator	See product label	See aphids section for comments.
	malathion -- OP 25 WP (Malathion) 57 EC (Malathion)	2 tsp 2 tsp	40 oz 2 pt	See product label See product label	See aphids section for comments.
	permethrin -- PY 36.8 EC (Astro)	0.25 to 0.5 tsp	4 to 8 fl oz	24 hours	
Leaf Rollers	acephate -- OP 75 SP (Orthene Turf, Tree and Ornamental, Pro 75) 3 A (PT 1300 TR Orthene & PT 1300 DS Orthene)	1 to 2 tsp NA -- Aerosols	0.33 to 0.66 lb NA -- Aerosols	24 hours See product label	See aphids section for comments.
	azadirachtin -- BO 0.3 F (Margosan-O) 3 EC (Azatin XL)	2.5 to 5 tsp 0.5 tsp	40 to 80 fl oz 8 fl oz	4 hours 4 hours	
	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	See aphids section for comments.
	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	
	diazinon -- OP 23 EC (Knox-Out)	1 to 2 Tbsp	3 to 6 pt	See product label	See aphids section for comments.
	lambda-cyhalothrin -- PY 10 WSP (Topcide)	NA -- Packets	1 to 4 Packets	24 hours	
	naled -- OP 58 EC (Dibrom)	NA -- Vaporized	NA -- Vaporized	24 hours	See aphids section for comments.
	pyrethrins -- BO 6 EC (Pyrenone)	0.125 to 1.5 tsp	2 to 12 fl oz	See product label	See aphids section for comments.
	resmethrin -- PY 24.3 EC (Resmethrin) 1 A (Pt 1200 TR Resmethrin & PT 1200 DS Resmethrin)	1 tsp NA -- Aerosols	1 pt NA -- Aerosols	See product label See product label	See aphids section for comments.
Mealybugs	acephate -- OP 75 SP (Orthene Turf, Tree and Ornamental, Pro 75) 3 A (PT 1300 TR Orthene & PT 1300 DS Orthene)	1 to 2 tsp NA -- Aerosols	0.33 to 0.66 lb NA -- Aerosols	24 hours See product label	See aphids section for comments.
	azadirachtin -- BO 0.3 F (Margosan-O) 3 EC (Azatin XL) 4.5 EC (Neemazad)	2.5 to 5 tsp 0.66 to 1 tsp 0.125 to 0.25 tsp	40 to 80 fl oz 10 to 16 fl oz 2.25 to 4.5 fl oz	4 hours 4 hours 4 hours	
	<i>Beauveria bassiana</i> -- MI 22 WP (BotaniGard)	4 tsp	2 lb	4 hours	May be applied at 3 lb per 100 gal for heavy infestations.
	bendiocarb -- CA 76 WP (Dycarb, Ficam, Turcam)	0.75 Tbsp	5.5 oz	See product label	Avoid excessive runoff.

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Mealybugs, <i>continued</i>	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	See aphids section for comments.
	chlorpyrifos -- OP 20 ME (PT 1325 DuraGuard)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	
	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	
	diazinon -- OP 23 EC (Knox-Out)	1 to 2 Tbsp	3 to 6 pt	See product label	See aphids section for comments.
	dichlorvos -- OP 81 EC (Vapona) 5 A (Vapona)	-- NA -- Smoke generator	-- NA -- Smoke generator	See product label See product label	The 81 EC product is for use on African violets and begonias only. Vaporize 1 fl oz per 10,000 ft ³ . Ventilate thoroughly after 2 hours post application. See aphids section for comments on the 5 A product.
	fenpropathrin -- PY 30 EC (Tame)	0.66 tsp	10.66 fl oz	See product label	See aphids section for comments.
	fluvalinate -- PY 22.3 F (Mavrik)	0.125 to 0.625 tsp	2 to 10 fl oz	See product label	See aphids section for comments.
	horticultural oil -- Other 98.8 EC (Ultra Fine, Sun Spray)	2.5 to 5 Tbsp	1 to 2 gal	4 hours	See aphids section for comments.
	imidacloprid -- Other 1 G (Marathon) 60 WP (Marathon)	NA -- Granular NA -- Drench	NA -- Granular NA -- Drench	12 hours 12 hours	See aphids section for comments. Follow label directions.
	kinoprene -- IGR 65.1 EC (Enstar II)	0.5 to 0.66 tsp	5 to 10 fl oz	4 hours	
	lambda-cyhalothrin -- PY 10 WSP (Topcide)	NA -- Packets	2 to 4 Packets	24 hours	
	malathion -- OP 25 WP (Malathion) 57 EC (Malathion)	2 tsp 2 tsp	40 oz 2 pt	See product label See product label	See aphids section for comments.
	naled -- OP 58 EC (Dibrom)	NA -- Vaporized	NA -- Vaporized	24 hours	See aphids section for comments.
	permethrin -- PY 36.8 EC (Astro)	0.25 to 0.5 tsp	4 to 8 fl oz	24 hours	
	pyrethrins -- BO 6 EC (Pyrenone) 0.5 A (PT 1100 Pyrethrum)	0.125 to 1.5 tsp NA -- Aerosol	2 to 12 fl oz NA -- Aerosol	See product label See product label	See aphids section for comments.
	resmethrin -- PY 24.3 EC (Resmethrin) 1 A (Pt 1200 TR Resmethrin & PT 1200 DS Resmethrin)	1 tsp NA -- Aerosols	1 pt NA -- Aerosols	See product label See product label	See aphids section for comments.
	soap -- Other 25 EC (Olympic Insecticidal) 49 EC (M-Pede) 49.5 EC (Olympic Insecticidal)	2.5 to 5 fl oz 1.25 to 2.5 fl oz 2.5 fl oz	-- 1 to 2 gal 2 gal	See product label 12 hours 12 hours	See aphids section for comments.
	sulfotepp -- OP 15 A (Dithio, Plantfume 103)	NA -- Smoke generator	NA -- Smoke generator	See product label	See aphids section for comments.
Millipedes	malathion -- OP 25 WP (Malathion) 57 EC (Malathion)	2 tsp 2 tsp	40 oz 2 pt	See product label See product label	See aphids section for comments.

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Moths	chlorpyrifos -- OP 22.5 EC (Dursban Pro)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	
Plant Bugs	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	See aphids section for comments.
	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	
	fluvalinate -- PY 22.3 F (Mavrik)	0.125 to 0.625 tsp	2 to 10 fl oz	See product label	See aphids section for comments.
	lambda-cyhalothrin -- PY 10 WSP (Topcide)	NA -- Packets	1 to 4 Packets	24 hours	
	resmethrin -- PY 24.3 EC (Resmethrin) 1 A (Pt 1200 TR Resmethrin & PT 1200 DS Resmethrin)	1 tsp NA -- Aerosols	1 pt NA -- Aerosols	See product label See product label	See aphids section for comments.
	soap -- Other 25 EC (Olympic Insecticidal) 49.5 EC (Olympic Insecticidal)	2.5 to 5 fl oz 2.5 fl oz	-- 2 gal	See product label 12 hours	See aphids section for comments.
Scale Insects	acephate -- OP 75 SP (Orthene Turf, Tree and Ornamental, Pro 75) 3 A (PT 1300 TR Orthene & PT 1300 DS Orthene)	1 to 2 tsp NA -- Aerosols	0.33 to 0.66 lb NA -- Aerosols	24 hours See product label	See aphids section for comments.
	azadirachtin -- BO 3 EC (Azatin XL)	0.5 tsp	8 fl oz	4 hours	
	bifenthrin -- PY 0.5 A (PT 1800 Attain)	NA-- Aerosol	NA-- Aerosol	See product label	See aphids section for comments.
	chlorpyrifos -- OP 20 ME (PT 1325 DuraGuard)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	
	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	
	diazinon -- OP 23 EC (Knox-Out)	1 to 2 Tbsp	3 to 6 pt	See product label	Diazinon should not be applied directly to open blooms (phytotoxicity): it is not labeled for use on poinsettias.
	fenoxycarb -- IGR 25 WP (Precision) 0.6 A (PT 2100 Preclude)	0.5 tsp NA -- Aerosol	4 oz NA -- Aerosol	See product label See product label	See aphids section for comments.
	horticultural oil -- Other 98.8 EC (Ultra Fine, Sun Spray)	2.5 to 5 Tbsp	1 to 2 gal	4 hours	See aphids section for comments.
	imidacloprid -- Other 60 WP (Marathon)	NA -- Drench	NA -- Drench	12 hours	Follow label directions.
	kinoprene -- IGR 65.1 EC (Enstar II)	0.5 to 0.66 tsp	5 to 10 fl oz	4 hours	
	lambda-cyhalothrin -- PY 10 WSP (Topcide)	NA -- Packets	1 to 4 Packets	24 hours	
	pyrethrins -- BO 6 EC (Pyrenone) 0.5 A (PT 1100 Pyrethrum)	0.125 to 1.5 tsp NA -- Aerosol	2 to 12 fl oz NA -- Aerosol	See product label See product label	See aphids section for comments.
	soap -- Other 25 EC (Olympic Insecticidal) 49 EC (M-Pede) 49.5 EC (Olympic Insecticidal)	2.5 to 5 fl oz 1.25 to 2.5 fl oz 2.5 fl oz	-- 1 to 2 gal 2 gal	See product label 12 hours 12 hours	See aphids section for comments.

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Shore Flies	azadirachtin -- BO 3 EC (Azatin XL)	0.66 to 1 tsp	10 to 16 fl oz	4 hours	
	diflubenzuron -- IGR 25 WSP (Adept)	--	2 Packets	12 hours	Apply at a volume of 1 to 3 gal of final solution per 100 ft ² .
	fenoxycarb -- IGR 25 WP (Precision)	0.5 tsp	4 oz	See product label	See aphids section for comments.
Slugs and Snails	metaldehyde -- Other 4P (Deadline Bullets and Granules 5P (Snarol)	NA -- Pelleted bait NA -- Pelleted bait	NA -- Pelleted bait NA -- Pelleted bait	See product label See product label	More than one application usually necessary. Follow label directions for application rates.
	methiocarb -- CA 75 WP (Mesuro)	8 tsp	4 lb	24 hours	See aphids section for comments.
Sowbugs	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	
	lindane -- CH 25 WP (Lindane)	1 Tbsp	1 lb	See product label	Apply 1 gal of spray per 150 ft ² . Repeat applications every 7 to 10 days may be required for effective control.
	malathion -- OP 25 WP (Malathion) 57 EC (Malathion)	2 tsp 2 tsp	40 oz 2 pt	See product label See product label	See aphids section for comments.
	resmethrin -- PY 1 A (Pt 1200 TR Resmethrin & PT 1200 DS Resmethrin)	NA -- Aerosols	NA -- Aerosols	See product label	See aphids section for comments.
Spider Mites (including Broad Mites [BM], Mites [M], and Two-spotted Spider Mite [TSM])	abamectin B1 -- Other 2 EC (Avid)	0.25 tsp	4 fl oz	See product label	Do not use on ferns or conifers.
	<i>Beauveria bassiana</i> -- MI 7.16 EC (Naturalis-O)	2 tsp to 2 Tbsp	30 to 100 fl oz	4 hours	See aphids section for comments. Registered for M.
	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	See aphids section for comments. Also registered for BM.
	chlorpyrifos -- OP 20 ME (PT 1325 DuraGuard)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	
	diazinon -- OP 23 EC (Knox-Out)	1 to 2 Tbsp	3 to 6 pt	See product label	See aphids section for comments. Registered for M.
	dichlorvos -- OP 5 A (Vapona)	NA -- Smoke generator	NA -- Smoke generator	See product label	See aphids section for comments.
	dicofol -- CH 35 WP (Kelthane 35) 50 WP (Kelthane T/O)	1.5 Tbsp 1 Tbsp	1 to 1.33 lb 0.5 to 1 lb	12 hours 12 hours	Also registered for M.
	dienochlor -- CH 50 WP (Pentac) 38 F (Pentac)	1 tsp 0.5 tsp	8 oz 8 fl oz	See product label See product label	Repeat Pentac applications in 5 to 14 days for effective control. Also registered for BM.
	fenpropathrin -- PY 30 EC (Tame)	0.5 to 1 tsp	10.66 fl oz	See product label	See aphids section for comments. Registered for M and TSM only.
	fluvalinate -- PY 22.3 F (Mavrik)	0.125 to 0.625 tsp	2 to 10 fl oz	See product label	See aphids section for comments. Also registered for M and TSM.
	horticultural oil -- Other 98.8 EC (Ultra Fine, Sun Spray)	2.5 to 5 Tbsp	1 to 2 gal	4 hours	See aphids section for comments.
	lambda-cyhalothrin -- PY 10 WSP (Topcide)	NA -- Packets	2 to 4 Packets	24 hours	Also registered for BM.

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Spider Mites (including Broad Mites [BM], Mites [M], and Two-spotted Spider Mite [TSM]), <i>continued</i>	methiocarb -- CA 75 WP (Mesurol)	2 to 4 tsp	1 to 2 lb	24 hours	See aphids section for comments. Registered for M.
	naled -- OP 58 EC (Dibrom)	NA -- Vaporized	NA -- Vaporized	24 hours	See aphids section for comments.
	pyridaben -- DI 75 WP (Sanmite)	--	2 to 4 oz	12 hours	Do not exceed 10.5 oz of product per acre per application. Registered for BM and TSM only.
	pyriproxyfen -- IGR 11.2 EC (Distance)	0.5 to 0.75 tsp	6 to 12 fl oz	12 hours	Use higher rates and shorter intervals for higher populations.
	soap -- Other 25 EC (Olympic Insecticidal) 49 EC (M-Pede) 49.5 EC (Olympic Insecticidal)	2.5 to 5 fl oz 1.25 to 2.5 fl oz 2.5 fl oz	-- 1 to 2 gal 2 gal	See product label 12 hours 12 hours	See aphids section for comments. The Olympic Insecticidals are also registered for M.
Spittlebugs	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	
	resmethrin -- PY 24.3 EC (Resmethrin)	1 tsp	1 pt	See product label	See aphids section for comments.
	soap -- Other 49 EC (M-Pede)	2.5 fl oz	7.5 quarts	12 hours	See aphids section for comments.
Thrips (including Western Flower Thrips [WFT])	acephate -- OP 75 SP (Orthene Turf, Tree and Ornamental, Pro 75) 3 A (PT 1300 TR Orthene & PT 1300 DS Orthene)	1 to 2 tsp NA -- Aerosols	0.33 to 0.66 lb NA -- Aerosols	24 hours See product label	See aphids section for comments. The 75 SP formulation is also registered for WFT.
	azadirachtin -- BO 0.3 F (Margosan-O) 3 EC (Azatin XL) 4.5 EC (Neemazad)	2.5 to 5 tsp 0.66 to 1 tsp 0.125 to 0.25 tsp	40 to 80 fl oz 10 to 16 fl oz 2.25 to 4.5 fl oz	4 hours 4 hours 4 hours	Azatin is also registered for WFT.
	<i>Beauveria bassiana</i> -- MI 7.16 EC (Naturalis-O) 22 WP (BotaniGard)	2 tsp to 2 Tbsp 2 to 4 tsp	30 to 100 fl oz 1 to 2 lb	4 hours 4 hours	See aphids section for comments. BotaniGard may be applied at 3 lb per 100 gal for heavy infestations.
	bendiocarb -- CA 76 WP (Dycarb, Ficam, Turcam)	1.5 tsp	12 to 20 oz	See product label	Avoid excessive runoff.
	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	See aphids section for comments.
	chlorpyrifos -- OP 20 ME (PT 1325 DuraGuard)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	
	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	
	diazinon -- OP 23 EC (Knox-Out)	1 to 2 Tbsp	3 to 6 pt	See product label	Diazinon should not be applied directly to open blooms (phytotoxicity); it is not labeled for use on poinsettias.
	fluvalinate -- PY 22.3 F (Mavrik)	0.125 to 0.625 tsp	2 to 10 fl oz	See product label	See aphids section for comments.
	fomentate hydrochloride -- CA 92 SP (Carzol)	1 tsp	8 oz	24 hours	Local use registration in Indiana and North Carolian only. Registered for WFT only.
	horticultural oil -- Other 98.8 EC (Ultra Fine, Sun Spray)	2.5 to 5 Tbsp	1 to 2 gal	4 hours	See aphids section for comments.
	lambda-cyhalothrin -- PY 10 WSP (Topcide)	NA -- Packets	1 to 4 Packets	24 hours	

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Thrips (including Western Flower Thrips [WFT]), <i>continued</i>	lindane -- CH 25 WP (Lindane)	1 Tbsp	1 lb	See product label	Apply 1 gal of spray per 150 ft ² . Repeat applications every 7 to 10 days may be required for effective control.
	malathion -- OP 25 WP (Malathion) 57 EC (Malathion)	2 tsp 2 tsp	40 oz 2 pt	See product label See product label	See aphids section for comments.
	methiocarb -- CA 75 WP (Gowan Mesurol)	--	0.5 to 1 lb	24 hours	Registered for WFT only.
	pyrethrins -- BO 6 EC (Pyrenone)	0.125 to 1.5 tsp	2 to 12 fl oz	See product label	See aphids section for comments.
	resmethrin -- PY 24.3 EC (Resmethrin) 1 A (Pt 1200 TR Resmethrin & PT 1200 DS Resmethrin)	1 tsp NA -- Aerosols	1 pt NA -- Aerosols	See product label See product label	See aphids section for comments.
	sulfotepp -- OP 15 A (Dithio, Plantfume 103)	NA -- Smoke generator	NA -- Smoke generator	See product label	See aphids section for comments.
Whiteflies (including Silverleaf [sweet-potato] whitefly [SLWF])	acephate -- OP 75 SP (Orthene Turf, Tree and Ornamental, Pro 75) 3 A (PT 1300 TR Orthene & PT 1300 DS Orthene)	1 to 2 tsp NA -- Aerosols	0.33 to 0.66 lb NA -- Aerosols	24 hours See product label	See aphids section for comments.
	azadirachtin -- BO 0.3 F (Margosan-O) 3 EC (Azatin XL) 4.5 EC (Neemazad)	2.5 to 5 tsp 0.66 to 1 tsp 0.125 to 0.25 tsp	40 to 80 fl oz 10 to 16 fl oz 2.25 to 4.5 fl oz	4 hours 4 hours 4 hours	Azatin XL and Margosan-O are also registered for SLWF.
	<i>Beauveria bassiana</i> -- MI 7.16 EC (Naturalis-O) 22 WP (BotaniGard)	2 tsp to 2 Tbsp 2 tsp	30 to 100 fl oz 1 lb	4 hours 4 hours	See aphids section for comments. BotaniGard may be applied at 3 lb per 100 gal for heavy infestations.
	bendiocarb -- CA 76 WP (Dycarb, Ficam, Turcam)	0.75 tsp	5.5 oz	See product label	Avoid excessive runoff.
	bifenthrin -- PY 10 WP (Talstar) 7.9 F (Talstar) 0.5 A (PT 1800 Attain)	1 to 5 tsp 0.5 to 2.5 tsp NA-- Aerosol	6.4 to 32 oz 2 to 10 fl oz NA-- Aerosol	See product label 12 hours See product label	See aphids section for comments.
	chlorpyrifos -- OP 20 ME (PT 1325 DuraGuard)	0.5 to 1 Tbsp	1.5 to 3 pt	12 hours	
	cyfluthrin -- PY 20 WP (Decathlon)	0.25 tsp	1.9 oz	See product label	
	diazinon -- OP 23 EC (Knox-Out)	1 to 2 Tbsp	3 to 6 pt	See product label	See aphids section for comments.
	dichlorvos -- OP 5 A (Vapona)	NA -- Smoke generator	NA -- Smoke generator	See product label	See aphids section for comments.
	diflubenzuron -- IGR 25 WSP (Adept)	--	2 Packets	12 hours	Apply at a volume of 1 gal of final solution per 200 ft ² .
	endosulfan -- CH 24.2 EC (Thiodan) 50 WP (Thiodan) 5 A (Thiodan)	2 tsp 1 Tbsp NA -- Smoke generator	2 pt 1 lb NA -- Smoke generator	24 hours 24 hours See product label	See aphids section for comments.
	fenoxycarb -- IGR 0.6 A (PT 2100 Preclude)	NA -- Aerosol	NA -- Aerosol	See product label	See aphids section for comments.

Insect or Related Pest	Pesticide, Classification, and Formulation ¹	Amount of Formulation per Gallon of Spray	Amount per 100 Gallons of Water	Minimum Interval Between Application	Precautions and Remarks
Whiteflies (including Silverleaf [sweet-potato] whitefly [SLWF]), <i>continued</i>	fenpropathrin -- PY 30 EC (Tame)	0.66 tsp	10.66 fl oz	See product label	See aphids section for comments. Also registered for SLWF.
	fluvalinate -- PY 22.3 F (Mavrik)	0.125 to 0.625 tsp	2 to 10 fl oz	See product label	See aphids section for comments.
	horticultural oil -- Other 98.8 EC (Ultra Fine, Sun Spray)	2.5 to 5 Tbsp	1 to 2 gal	4 hours	See aphids section for comments.
	imidacloprid -- Other 1 G (Marathon) 60 WP (Marathon)	NA -- Granular NA -- Drench	NA -- Granular NA -- Drench	12 hours 12 hours	See aphids section for comments. Follow label directions.
	kinoprene -- IGR 65.1 EC (Enstar II)	0.5 to 0.66 tsp	5 to 10 fl oz	4 hours	
	lambda-cyhalothrin -- PY 10 WSP (Topcide)	NA -- Packets	2 to 4 Packets	24 hours	
	naled -- OP 58 EC (Dibrom)	NA -- Vaporized	NA -- Vaporized	24 hours	See aphids section for comments.
	permethrin -- PY 36.8 EC (Astro)	0.25 to 0.5 tsp	4 to 8 fl oz	24 hours	
	pyrethrins -- BO 6 EC (Pyrenone) 0.5 A (PT 1100 Pyrethrum)	0.125 to 1.5 tsp NA -- Aerosol	2 to 12 fl oz NA -- Aerosol	See product label See product label	See aphids section for comments.
	pyridaben -- DI 75 WP (Sanmite)	--	4 to 6 oz	12 hours	Do not exceed 10.5 oz of product per acre per application.
	pyriproxyfen -- IGR 11.2 EC (Distance)	0.5 to 0.75 tsp	6 to 12 fl oz	12 hours	
	resmethrin -- PY 24.3 EC (Resmethrin) 1 A (Pt 1200 TR Resmethrin & PT 1200 DS Resmethrin)	1 tsp NA -- Aerosols	1 pt NA -- Aerosols	See product label See product label	See aphids section for comments.
	soap -- Other 25 EC (Olympic Insecticidal) 49 EC (M-Pede) 49.5 EC (Olympic Insecticidal)	2.5 to 5 fl oz 1.25 to 2.5 fl oz 2.5 fl oz	-- 1 to 2 gal 2 gal	See product label 12 hours 12 hours	See aphids section for comments.
	sulfotepp -- OP 15 A (Dithio, Plantfume 103)	NA -- Smoke generator	NA -- Smoke generator	See product label	See aphids section for comments.

<h1>Calendar of Events</h1>			
Event	Date	Time	Location and Contacts
Southeast Greenhouse Conference and Trade Show	June 16 to June 19, 1999	All day	Greenville, SC (Contact SGCTS office at 800.453.3070)
Bedding Plant Field Day	July 28, 1999	8 am to 4 pm	Horticultural Field Lab, Raleigh (Contact Bonnie at 919.779.4618)

(Geraniums, continued from page 1)

is by testing. Send a few suspect plants to a university-based (North Carolina growers should submit samples through their local Cooperative Extension Service office) or private testing lab. There are no chemical control measures for Bacterial Blight. If the disease is confirmed, roguing of infected plants is the only option. Increasing the temperature to between 70 and 85 °F will help speed the appearance of the wilt symptoms so roguing can be done.

Table 1. Recommended corrective measures for geranium pH problems.

Continual Control:

Monitor the root substrate pH on a weekly or bi-weekly basis. Adjust with an acidic fertilizer (20-10-20 or 20-9-20) to lower the pH or basic fertilizer (calcium nitrate [Ca(NO₃)₂] plus potassium nitrate [KNO₃] or Excel[®] 15-5-15 Cal-Mag) to increase the pH.

Corrective Measures:

1. Lower pH: If modifications are required, the pH can be lowered with an acid-based fertilizer (20-10-20, 20-20-20, or 21-7-7 [The fertilizers are listed in an increasing degree of acidity. Keep in mind that acid-based fertilizers contain a high percentage of ammonical or urea type nitrogen, which can result in 1) plant stretch or 2) ammonium toxicity during the cooler growing conditions]) or acid injection.
2. Increase pH: The pH can be increased with a basic fertilizer, dolomitic limestone, or hydrated lime.

Rapid Corrective Measures:

These are rapid corrective measures to use to adjust the root substrate pH in pots or benches already containing plants. Iron sulfate, aluminum sulfate, and hydrated lime will burn most plant tissue. Apply only to the root substrate. Rinse plants if solution comes in contact. Some plants may be sensitive, so test a small area or a few plants before treating a large area. Adjustment is pH is rapid, but effects are not long lasting. Recheck the pH in a week and reapply if necessary.

1. To lower pH: Dissolve 1 to 2.5 pounds of iron sulfate [FeSO₄·7H₂O] or aluminum sulfate [Al₂(SO₄)₃·18H₂O] in 100 gallons of water. Apply to the root substrate and rinse the foliage after application. Both iron sulfate and aluminum sulfate will increase the root substrate EC level and may release toxic levels of minor elements from the root substrate's exchange sites.

2. To increase pH:

In a plastic bucket, mix 1 pound of hydrated lime with 3 to 5 gallons of warm water. Allow the mixture to settle and pour off the clear solution into another plastic bucket. Apply the clear solution with a fertilizer injector set at 1:100 or 1:128. Hydrated lime is corrosive, avoid contact with skin and metal. Hydrated lime may displace ammonium from the root exchange sites of the root substrate into the soil solution causing root injury. Avoid using hydrated lime if high levels of ammonium fertilizer are present in the root substrate.

Opening Remarks:

We at the North Carolina Farm Bureau would like to thank you, "the North Carolina Commercial Flower Growers," for the opportunity to submit articles for inclusion in the *North Carolina Commercial Flower Growers Bulletin*. We hope you find the information timely and useful.

GREG BARNES
NORTH CAROLINA FARM BUREAU

Sam Franklin, Jr. - Appointed

Sam Franklin, Jr. - Franklin Brothers Nursery & Greenhouse - Vance County, North Carolina has been recently appointed to serve a one-year term on the American Farm Bureau Agricultural Nursery and Greenhouse Advisory Committee. Sam was nominated to serve on this committee by North Carolina Farm Bureau President W. B. Jenkins. The Committee recently made recommendations to the American Farm Bureau President and the American Farm Bureau Board of Directors for consideration in policy execution. This year, the committee met in Reno, Nevada in mid-February. Agricultural Nursery and Greenhouse growers from 15 other major nursery and greenhouse producing states identified, discussed, and prioritized areas of concern to those of you who are growers.



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ADDRESS CORRECTION REQUESTED

TO:

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