

Diseases

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The conditions under which many floral and foliage crops are produced, i.e., high humidity, low light intensity, and frequent watering, are favorable for the development of fungal and bacterial diseases. If insects are uncontrolled in the greenhouse, viruses can become a major problem. Nematodes may be introduced on infected plant material or unsterilized soil.

Sanitation in propagation and growing will reduce the incidence of disease. Soil-less culture, healthy plant material, clean containers and benches, and pathogen-free water are important considerations. Plant culture on wire benches will avoid soil-borne pathogens. Most fungicides are protectants and require frequent reapplication. Early correct identification of causal agents is important in preventing heavy disease losses and avoiding improper use of pesticides.

Table 5.1 - Common Diseases and Chemical Control Options

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
African Violet	Decree 0.70-1.5 lb; fenhexamid	Spray 7- to 14-day intervals.
Botrytis blight (Gray mold)	Touche (50% EG) 0.5-1.0 lb vinclozolin	Foliar preventative 0.5 to 0.75 lb on a 10- to 14-day interval. Foliar curative 0.75 to 1.0 lb on a 14-day interval.
Phytophthora root rot	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Apply every 7 days.
	Subdue Maxx 0.5-1.0 fl oz mefenoxam	Apply in 100 gal of water over 400 to 800 sq ft (1.0 pt/sq ft). For soil depth greater than 4 inches apply 1.5 to 2.0 pts solution/sq ft. Repeat at 1- to 2-month intervals. Irrigate to thoroughly wet soil after application. For Subdue 5G do not apply rate of 9 oz more often than once every 6 weeks.
	FenStop 7.0-14.0 fl oz fenamidone	Drench 1.0 to 2.0 pt/sq ft and repeat at a 28-day interval if necessary.
	Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	Treat soil at 3-week to 3-month intervals.
Powdery mildew	Strike (25% WDG) 2.0-4.0 oz; triadimefon	Apply at 7- to 14-day intervals.
	Sythane (40% WSP) 4 oz; myclobutanil	Apply at 10- to 14-day intervals.
	Triact 70 0.5-1.0 gal, neem oil	Apply every 14 days.
Ageratum	Decree 0.70-1.5 lb; fenhexamid	Spray 7- to 14-day intervals.
Botrytis blight (Gray mold)	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb; iprodione	Apply at 7- to 14-day intervals.
	Exotherm (Termil) 3.5 oz/1000 sq ft chlorothalonil	Fumigate every 7 to 14 days.
Powdery mildew	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Strike (25% WDG) 2.0-4.0 oz; triadimefon	Apply at 7- to 14-day intervals.
	Triact 70 0.5-1.0 gal; neem oil	Apply every 14 days.
Root Rot (<i>Pythium</i>)	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Apply every 7 days.
	Subdue Maxx 0.5-1.0 fl oz mefenoxam	Drench at seeding (soil 2 to 3 inches deep). Mix Subdue with 100 gal of water and apply 1 pt of solution/sq ft. Transplanting mix 0.5 to 2.0 fl oz with 100 gal of water and apply 1 pt solution/sq ft or 1.5 to 2.0 pt for soil depth greater than 4 inches. Do not apply rates of 1.5 to 2.0 fl oz more often than once every six weeks.

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Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Ageratum Root rot (<i>Pythium</i>) (cont.)	Terrazole (35% WP) 3.0-10.0 oz etridiazole	Apply on 400 sq ft or saturate the soil medium, such as 1/2 pt/6-inch container.
	Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	Treat soil at 3-week to 3-month intervals.
Root rot (<i>Rhizoctonia</i>)	Medallion (50% WP) 1 packet fludioxonil	Drench at 3- to 4-week intervals.
	Chipco 26019 (50% WP) 0.4 lb Sextant (23.3%) 1.0-2.5 lb; iprodione	Apply 1.0 to 2.0 pt/sq ft every 14 days.
Annual Vinca (Madagascar periwinkle) Phytophthora blight	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Apply every 7 days.
	Subdue Maxx 0.5-1.0 fl oz mfenoxam	Drench at seeding (soil 2 to 3 inches deep). Mix Subdue with 100 gal of water and apply 1 pt of solution/sq ft. Transplanting mix 0.5 to 2.0 fl oz with 100 gal of water and apply 1 pt solution/sq ft or 1.5 to 2.0 pt for soil depth greater than 4 inches. Do not apply rates of 1.5 to 2.0 fl oz more often than once every six weeks.
	FenStop 7.0-14.0 fl oz; fenamidone	Spray plants at a 28-day interval.
Azalea (Rhododendron) Botrytis blight (Gray mold)	Chipco 26019 (50% WP) 1.0-2.0 lb iprodione	Spray every 10 to 14 days.
	Daconil Weather Stik 2.0 pt Concorde (54% SST) 1.3 pt chlorothalonil	Spray every 7 to 10 days during wet weather. Apply at early bloom.
	Exotherm (Termil) 3.5 oz/1000 sq ft chlorothalonil	Fumigate every 7 to 14 days.
	Touche (50% EG) 0.5-1.0 lb; vinclozolin	Repeat every 10 to 14 days.
Cylindrocladium root rot	OHP 26 GT 1.0 qt; iprodione	Dip cuttings for 5 minutes prior to planting.
	Cleary 3336-WP 0.8 lb thiophanate methyl	Drench Cleary 3336 on the surface of growing medium to prevent disease development. Repeat at 2- to 4-week intervals during disease pressure.
	Fore Rainshield NT Fore WSP Rainshield Dithane T/O Rainshield NT Dithane WF Junction (15% DF) 1.5 lb; mancozeb	Apply in a full coverage spray every 7 to 10 days while flowers are opening spray ground under bushes and into open flowers.
	Terragard, 50 W triflumizole	Soil drench 6.0 to 8.0 oz or 1-1 1/3 tps/gal on propagation beds. On established plants apply a drench at 6.0 to 12.0 oz or 1.0 to 2.0 tsp/gal.
Ovulinia flower blight	Daconil Weather Stik 2.0 pt Concorde (54% SST) 1.1 pt chlorothalonil	Spray every 7 to 10 days. Apply at new leaf emergence.
	Strike (25% WDG) 8.0-16.0 oz triadimefon	Begin applications at the expanded bud stage.
	Cleary 3336-WP 0.5 lb thiophanate methyl	Apply as flowers open. Repeat every 4 to 6 days as needed during disease periods.

Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Azalea Ovulinia flower blight (cont.)	Fore Rainshield NT	Apply in a full coverage spray every 7 to 10 days while flowers are opening also spray ground under bushes.
	Fore WSP Rainshield Dithane T/O Rainshield NT Dithane WF Junction (15% DF) 1.5 lb; mancozeb	
Powdery mildew	Banner Maxx 2.0-4.0 fl oz propiconazole	Apply at 2- to 3-week intervals.
	Cygnus (50%) 1.6-3.2 oz Kresoxim-methyl	Apply every 10 to 14 days.
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Apply to run-off when mildew first appears.
	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Triact 70 0.5-1.0 gal; neem oil	Apply every 14 days.
Phytophthora shoot blight	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Apply every 7 days.
	FenStop 7.0-14.0 fl oz; fenamidone	Spray plants at a 28-day interval.
	Aliette (80% WDG) 2.5-5.0 lbs fosetyl-AI	Apply as a spray to wet, repeat at monthly intervals.
Phytophthora root and crown rot	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Apply every 7 days.
	Terrazole (35% WP) 8.0 oz etridiazole	Container & Bed grown Plants: Mix 8 oz with 100 gal of water/400 sq ft or apply in sufficient amount to saturate the soil mixture such as 0.5 pt/6-inch pot. Irrigate immediately with additional water equal to at least half the volume of the fungicidal drench for improved soil penetration of the fungicide. Repeat at 4-week intervals if necessary.
	Subdue Maxx 0.6-1.3 fl oz mefenoxam	Apply 1.0 pt solution/sq ft. For soil depth greater than 4 inches apply 1.5 to 2.0 pts solution/sq ft.
	Aliette (80% WDG) 0.4-0.8 lb fosetyl-AI	Apply as a drench with 100 gal of water/400 sq ft (2 pt solutions/sq ft) or 0.5-0.8 lb (8.0 to 12.8 oz)/cubic yard of potting soil at transplanting.
	Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	See African Violet.
	FenStop 7.0-14.0 fl oz; fenamidone	Drench 1.0 to 2.0 pt/sq ft and repeat at a 28-day interval if necessary.
	Septoria leaf spot	Cleary 3336-F 12.0-16.0 fl oz or 1 tsp/gal; thiophanate methyl
Bedding various flowering plants	Soil Gard (12% G) 1.0-1.5 lb/cubic yd microbial / (biocontrol)	Mix with soilless media before seeding/plants.
Damping-off, <i>Rhizoctonia</i> , <i>Pythium</i>	Captan (50% WP) 2.0-4.0 lb captan	Apply at 7- to 10-day intervals.
	Terrazole (35% WP) 3.5-10.0 oz etridiazole	Apply at 4- to 12-week intervals.

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Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Begonia Botrytis flower spot (Gray mold)	Fore Rainshield NT Fore WSP Rainshield Dithane T/O Rainshield NT Dithane WF Junction (15% DF) 1.5 lb; mancozeb	Apply in a full coverage spray every 7 to 10 days while flowers are opening spray ground under bushes and into open flowers.
	Touche (50% EG) 0.5-1.0 lb vinclozolin	Foliar preventive: 0.5 to 0.75 lb on a 14-day interval. Foliar curative: 0.75 to 1.0 lb on a 14-day interval.
	Exotherm (Termil) 3.5 oz/1000 cu ft chlorothalonil	Fumigate every 7 to 14 days.
	Cleary 3336-F 12.0-16.0 fl oz thiophanate methyl	Spray every 10 to 14 days.
Powdery mildew	Rubigan 3.0-5.0 fl oz; fenarimol	Apply at 10- to 14-day intervals.
	Sythane (40% WSP) 4.0 oz; myclobutanil	Apply at 10- to 14-day intervals.
	Strike (25% WDG) 2.0-4.0 oz	Spray every 7 to 14 days. Follow label instructions. Spray triadimefon to run-off when mildew first appears.
	Triact 70 0.5-1.0 gal; neem oil	Apply every 14 days.
Pythium root rot	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Apply every 7 days.
	Terrazole (35% WP) 3.0-10.0 oz etridiazole	Apply on 400 sq ft or saturate the soil medium, such as 0.5 pt/6-inch container.
	Subdue Maxx 0.6-1.3 fl oz; mefenoxam	See African Violet.
	Aliette (80% WDG) 1.25-4.0 lb fosetyl-AI	Apply as a foliar spray. Do not exceed one application every 30 days.
	Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	See African Violet.
	FenStop 7.0-14.0 fl oz; fenamidone	Drench 1.0 to 2.0 pt/sq ft and repeat at a 28-day interval if necessary.
Black-eyed Susan (rudbeckia) Septuria leaf spot	Daconil WeatherStik 2.0 pt Concord (54% SST) 2.0 pt chlorothalonil	Apply at 7- to 10-day intervals.
	Downy mildew	
Downy mildew	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Apply every 7 to 10 days.
	FenStop 7.0-14.0 fl oz; fenamidone	Spray plants at a 28-day interval if necessary.
	Cactus Root rot (<i>Rhizoctonia</i>)	Cleary 3336-F 12.0-16.0 fl oz thiophanate methyl
Chipco 26019 (50% WP) 0.4 lb; iprodione		Apply 1.0 to 2.0 pt/sq ft every 14 days.
Caladium Various tuber rots	Cleary 3336-F 12.0-16.0 fl oz 2 tsp/gal Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Dip tubers in solution prior to planting.
	Chipco 26019 (50% WP) 0.4 lb Sextant (23.3%) 1.0 lb; iprodione	Dip tubers in solution prior to planting.
	Pythium root rot	
Pythium root rot	Subdue Maxx 0.5-1.0 fl oz; mefenoxam	See African Violet.
	Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	Treat soil every 3 weeks to 3 months.
	FenStop 7.0-14.0 fl oz; fenamidone	Drench 1.0 to 2.0 pt/sq ft and repeat at a 28-day interval if necessary.

Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Calendula powdery mildew rust	Rubigan 3.0-5.0 fl oz; fernalimol	Apply at 10- to 14-day intervals.
	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Apply as a spray at 14- to 21-day intervals.
	Banner Maxx 2.0-4.0 fl oz propiconazole	Apply every 14 to 21 days.
	Triact 70 0.5-1.0 gal neem oil	Apply every 14 days.
Carnation (<i>Dianthus</i>) Alternaria blight	Daconil Weather Stik 1.4 pt Concorde (54% SST) 1.4 pt chlorothalonil	Apply every 7 to 14 days.
	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb iprodione	Apply as a spray every 10 to 14 days.
	Maneb 80 (80% WP) or Maneb Plus Zinc F4 Fungicide (37% F) 1.0-1.5 lb maneb	Begin when new growth starts. Repeat weekly.
Botrytis flower spot (Gray mold)	Chipco 26019 (50% WP) Sextant (23.3%) 1.0-2.5 lb iprodione	Spray every 10 to 14 days.
	Exotherm (Termil) 3.5 oz/1000 cu ft chlorothalonil	Fumigate every 7 to 14 days.
	Cleary 3336-WP 0.8 lb thiophanate methyl	Spray every 7 to 14 days.
	Touche (50% EG) 0.5-1.0 lb vinclozolin	Foliar preventive: 0.5 to 0.75 lb on a 10- to 14-day interval. Foliar curative: 0.75 to 1.0 lb on a 14-day interval.
Fusarium stem rot	Cleary 3336-WP 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Heavy spray or drench during cool, moist conditions.
Rhizoctonia stem rot	Chipco 26019 0.4 lb; iprodione	Apply 1.0 to 2.0 pt/sq ft every 14 days.
	Terraclor (75% WP) 0.5 lb; quintozene	Apply 1.0 pt of solution/sq ft or 100 gal to 800 to 1000 sq ft.
Chrysanthemum Botrytis blight (Gray mold)	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb; iprodione	Apply every 10 to 14 days.
	Cleary 3336-WP 0.8 lb thiophanate methyl	Spray every 10 to 14 days under normal weather.
	Cleary 3336-F (4.5 F) 10.0 fl oz or 0.75 tsp/gal; thiophanate methyl	Apply as foliar spray every 7 to 14 days.
	Daconil Weather Stik 2.0 pt Concorde (54% SST) 2.0 pt; chlorothalonil	
	Touche (50% EG) 0.5-1.0 lb or 2.0 tsp-1.0 tbsp/gal; vinclozolin	Foliar preventive: 0.5 to 0.75 lb on a 10- to 14-day interval. Foliar curative: 0.75 to 1.0 lb on a 14-day interval.
	Cygnus (50%) 1.6-3.2 oz Kresoxim-methyl	Apply every 10 to 14 days.

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Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Chrysanthemum (cont.) Powdery mildew	Rubigan 3.0-5.0 fl oz; fenarimol	Apply at 10- to 14-day intervals.
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Spray to run-off when mildew first appears.
	Triact 70 0.5-1.0 ga; neem oil	Apply every 14 days.
Puccinia horiana white rust	Strike (25% WDG) 2.0-4.0 oz triadimefon	Control of this rust consists of avoiding wetting of the foliage when watering and spraying with Bayleton when disease is first observed. If not controlled, cut back plants to the ground, gather all plant material and debris and incinerate. Spray Bayleton to run-off when rust first appears.
	Sythane (40%WSP) 4.0 oz; myclobutanil	Apply at 10- to 14-day intervals.
Mycosphaerella ray blight	Banner Maxx 2.0-4.0 fl oz propiconazole	Apply at 14-day intervals.
	Daconil Weather Stik 1.4 pt Concorde (54% SST) 1.4 pt; chlorothalonil	Apply at transplant of cuttings.
	Chipco 26019 (50% WP) 1.0-2.0 lb or 1.0-2.0 tbs/gal Sextant (23.3%) 1.0-2.5 lb; iprodione	Apply as a spray every 10 to 14 days.
Pythium root rot	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Apply at 7-day intervals.
	Subdue Maxx 0.5-1.0 fl oz; mefenoxam	See African Violet.
	Terrazole (35% WP) 4.0 oz etridiazole	Retreat bedding plants with etridiazole at 4- to 8-week intervals. Retreat container plants at 4- to 12-week intervals.
	FenStop 7.0-14.0 fl oz fenamidone	Drench 1.0 to 2.0 pt/sq ft and repeat at a 28-day interval if necessary.
	Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	Treat soil every 3 weeks to 3 months.
Rhizoctonia root rot	Soil Gard (12% G) 1.0-1.5 lb/cubic yd microbial / (biocontrol)	Mix with soilless media before seeding/plants.
	Captan (50% WP) 2.0-4.0 lb captan	Apply at 7- to 10-day intervals.
	Terrazole (35% WP) 3.5-10.0 oz etridiazole	Apply at 4- to 12-week intervals.
Rhizoctonia	Medallion (50% WP) 1 packet fludioxonil	Drench at 3- to 4-week intervals.
	Chipco 26019 (50% WP) 0.4 lb Sextant (23.3%) 1.0-2.5 lb; iprodione	Apply 1.0 to 2.0 pt/sq ft every 14 days.
	Cleary 3336-WP 0.8 lb thiophanate methyl	Apply 1.0 to 2.0 pt/sq ft every 14 days.
Septoria leaf spot	Cleary 3336-WP 0.8 lb thiophanate methyl	Apply at weekly intervals when a new shoot growth begins. Cover lower leaf surfaces completely. Apply thiophanate methyl at 10- to 14-day intervals.
	Daconil Weather Stik 1.4 pt chlorothalonil	Spray chlorothalonil every 7 to 14 days. Apply at transplanting of cuttings.

Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Cineraria Powdery mildew (<i>Erysiphe cichoracearum</i>)	Strike (25% WDG) 2.0-4.0 oz or 0.5-1.0 tsp/gal; triadimefon	Spray to run-off when mildew first appears.
	Triact 70 0.5-1.0 gal neem oil	Spray every 14 days.
Cyclamen Botrytis leaf blight (Gray mold)	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb	Spray every 10 to 14 days.
	Touche (50% EG) 0.5-1.0 lb vinclozolin	Foliar preventive: 0.5 to 0.75 lb on a 10- to 14-day interval. Foliar curative: 0.75 to 1.0 lb on a 14-day interval.
	Cleary 3336-WP 0.8 lb thiophanate methyl	Apply every 10-14 days and reduce humidity.
Daylily Leaf streak	Cleary 3336 WP 1.5 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Repeat at 7- to 14-day intervals.
	Sythane (40% WSP) 4.0 oz; myclobutanil	
Rust	Synthane (40% WSP) 4.0 oz myclobutanil	Repeat every 7 to 14 days.
	Daconil Weather Stik 2.0 pt Concorde (54% SST) 1.4 pt chlorothalonil	
	Banner Maxx 2.0-4.0 fl oz; propiconazole	Apply at 2- to 3-week intervals.
	Heritage 1.0-4.0 oz; azoxystrobin	Apply every 1 to 4 weeks.
Foliage Plants Pythium root rot	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Spray every 7 days.
	Terrazole (35% WP) 12.0 oz etridiazole	Use well-drained growing medium. Sanitation, above ground benches. Avoid overhead watering. Drench at 4-week intervals.
	Subdue Maxx 0.5-1.0 fl oz; mefenoxam	
	Aliette (80% WDG) 0.4-0.8 lb fosetyl-Al	Apply as a drench with 100 gal of water/400 sq ft (2.0 pt solutions/sq ft) or 0.5 to 0.8 lb (8.0 to 12.8 oz)/cu yd of potting soil at transplanting.
	Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	Treat soil every 3 weeks to 3 months.
	FenStop 7.0-14.0 fl oz fenamidone	Drench 1.0 to 2.0 pt/sq ft and repeat at a 28-day interval if necessary.
Geranium Botrytis leaf blight (Gray mold)	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb; iprodione	Spray every 10 to 14 days.
	Decree 0.7-1.5 lb; fenhexamid	Spray at 7- to 14-day intervals.
	Compass 2.0-4.0 oz	Spray every 7 to 14 days.
Bacterial blight		Purchase clean stock plants. Practice good sanitation procedures.
	Cleary 3336-WP 0.8 lb thiophanate methyl	Apply thiophanate methyl every 10 to 14 days under normal weather. Complete sanitation, keep humidity low, and avoid splashing water and drips. Remove old plants and burn affected parts. Spray Daconil during cool moist conditions.

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Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Geranium (cont.) Bacterial blight	Daconil Weather Stik 2.0 pt Concorde (54% SST) 1.4 pt chlorothalonil	Apply thiophanate methyl every 10 to 14 days under normal weather. Complete sanitation, keep humidity low, and avoid splashing water and drips. Remove old plants and burn affected parts. Spray Daconil during cool moist conditions.
Pythium blackleg or black rot	Touche (50% EG) 0.5-1.0 lb vinclozolin	Foliar preventive: 0.5 to 0.75 lb on a 10- to 14-day interval. Foliar curative: 0.75 to 1.0 lb on a 14-day interval.
	Terrazole (35% WP) 3.0-10.0 oz etridiazole	Apply 0.5 pt/6-inch container. Sterilize rooting media, pots, and benches with steam-flow sanitation program.
Rhizoctonia root and stem rot	Chipco 26019 (50% WP) 0.4 lb Sextant (23.3%) 1.0-2.5 lb iprodione	Apply 1.0 to 2.0 pt/sq ft every 14 days.
	Cleary 3336-WP; 0.8 lb thiophanate methyl	Apply as a drench or heavy spray (1.0 to 2.0/sq ft) after transplanting into containers or propagation beds.
Rust	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Daconil Weather Stik 1.4 pt Concorde (54% SST) 1.4 pt chlorothalonil	Apply during cool, moist conditions.
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Spray at first sign of disease.
	Triact 70 0.5-1.0 gal neem oil	Apply every 14 days.
Powdery mildew	Triact 70 0.5-1.0 gal neem oil	Apply every 14 days.
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Spray to run-off when mildew first appears.
	Sythane (40% WP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Cygnus (50%) 1.6-3.2 oz Kresoxim-methyl	
Gerbera Botrytis blight (Gray mold)	Decree 0.7-1.5 lb; fenhexamid	Apply at 7- to 14-day intervals.
	Cleary 3336-WP (50% WP) 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Spray every 10 to 14 days to run-off.
	Touche (50% EG) 0.5-1.0 lb or 2.0 tsp-1.0 tbsp/gal; vinclozolin	Foliar preventive: 0.5 to 0.75 lb on a 10- to 14-day interval. Foliar curative: 0.75 to 1.0 lb on a 14-day interval.
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Strike (25% WDG) 2.0-4.0 oz or 0.5-1.0 tsp/gal; triadimefon	Spray to run-off when mildew first appears.
	Triact 70 0.5-1.0 gal neem oil	Apply every 14 days.
Root/stem rot (non-water molds)	Medallion (50% WP) 1 packet fludioxonil	Drench at 3- to 4-week intervals.

Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Gerbera (cont.) Root/stem rot (<i>Pythium</i> and <i>Phytophthora</i>)	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Apply every 7 days.
	Terrazole (35% WP) 3.0-10.0 oz etrizadiazole	Apply as a drench at 0.5 pt/6-inch pot at 4- to 12-week intervals.
	FenStop 7.0-14.0 fl oz; fenamidone	Drench 1.0 to 2.0 pt/sq ft and repeat at a 28-day interval if necessary.
Gladiolus Botrytis blight	Fore Rainshield NT Fore WSP Rainshield Dithane T/O Rainshield Dithane WF Junction (15% DF) 1.5 lb; mancozeb	Apply at a 7- to 14-day interval.
	Cleary 3336-WP 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply as a spray plus sticker-spreader just as first flowers show color. Repeat at 10- to 14-day intervals.
	Daconil Weather Stick 2.0 pts Concorde (54% SST) 1.4 pt; chlorothalonil	Apply as a spray with a sticker-spreader on a 10-day interval.
	Touche (50% EG) 0.5-1.0 lb vinclozolin	Foliar preventive: 0.5 to 0.75 lb on a 10- to 14-day interval. Foliar curative: 0.75 to 1.0 lb on a 14-day interval.
Fusarium basal rot (<i>Fusarium oxysporium</i> <i>F. gladioli</i>)	OHP 26 GT 2.0 qt; iprodione	Dip corms for 5 minutes prior to storage.
	Mertect 340-F (42.28%) 30 oz thiabendazole	Use as a corm dip within 48 hours after digging. Suspension temperature should be 55° to 75°F.
	Cleary 3336-F 12.0-16.0 fl oz Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Soak cleaned corms for 15 to 30 minutes in a warm dip (80° to 85°F.) within 48 hours of digging. Dry corms after treatment.
Leaf and flower spot (<i>Curvularia lunata</i>)	Cleary 3336-WP 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply as a spray with a sticker-spreader on a 10-day interval.
	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb; iprodione	Spray every 10 to 14 days.
	Maneb 80 (80% WP) 1.5 lb maneb	Begin when flower spikes develop. Repeat 2 to 3 times at weekly intervals.
Impatiens Rhizoctonia stem rot	Chipco 26019 (50% WP) 1.0-2.0 lb iprodione	Do not use iprodione as a drench treatment on Impatiens. Apply as a foliar spray on a 7- to 14-day interval.
	Cleary 3336-F 12.0-16.0 fl oz or 1.0 tsp/2 gal water Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply as a drench or heavy spray at the rate of 1.0 to 2.0 pts/sq ft.
Impatiens necrotic spot virus	Transmitted by thrips feeding	See insect control section on thrips control.
Iris Botrytis blight	Junction (15% DF) 1.5 lb mancozeb	Apply at a 7- to 14-day interval.
	Soft rot	Disinfect tools when cutting rhizomes. Avoid overwatering. Rotate with resistant plants if damage is severe.
Kalanchoe Botrytis blight	Touche (50% EG) 0.5-1.0 lb or 2.0 tsp-1.0 tbsp/gal; vinclozolin	Apply every 10 to 14 days.
	Powdery mildew	See African violet.

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Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Lily Botrytis blight	Fore Rainshield NT Fore WSP Rainshield Dithane T/O Rainshield Dithane WF Junction (15% DF) 1.5 lb; mancozeb	Spray at a 7- to 14-day interval.
	Chipco 26019 (50% WP) 1.0-2.0 lb iprodione	Spray every 10 to 14 days.
	Decree 0.7-1.5 lb; fenhexamid	Apply at 7- to 14-day intervals.
	Touche (50% EG) 0.5-1.0 lb; vinclozolin	Foliar preventive: 0.5 to 0.75 lb on a 10- to 14-day interval. Foliar curative: 0.75 to 1.0 lb on a 14-day interval.
	Daconil Weather Stik 2 pt Concorde (54% SST); chlorothalonil	Spray every 7 to 14 days. Apply at prebloom.
	Exotherm (Termil) 3.5 oz/1000 cu ft chlorothalonil	Fumigate every 7 to 14 days.
	Cleary 3336-WP 0.8 lb thiophanate methyl	Spray every 10 to 14 days.
Penicillium and Fusarium bulb rot	Cleary 3336-F 12.0-16.0 fl oz Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Soak cleaned bulbs for 15 to 30 minutes in warm dip (80° to 85°F), preferably within 48 hours after digging.
	Touche (50% EG) 1.5-2.0 lb vinclozolin	Dry bulbs after treatment. A fungicide for Pythium should be added.
	Mertect 340-F (42.28%) 30.0 fl oz thiabendazole (TBZ)	Use a bulb dip. Suspension temperature should be 55° to 75°F.
Root rot complex (<i>Pythium</i> spp. and <i>Rhizoctonia solani</i>)	See Chrysanthemum.	
Narcissus Bulb rot	See Gladiolus <i>Fusarium</i> basal rot.	
Pansy Botrytis blight	Decree 0.7-1.5 lb; fenhexamid	Spray at 7- to 14-day intervals.
	Fore Rainshield NT Fore WSP Rainshield Dithane T/O Rainshield NT Dithane WF Junction (15% DF) 1.5 lb; mancozeb	
	Daconil Weather Stik 2.0 pt chlorothalonil	Spray every 7 to 10 days.
	Cleary 3336-F (4.5 F) 10.0 fl oz Cleary 3336-WP (50% WP) 0.8 lb thiophanate methyl	Apply every 10 to 14 days.
Root rot (<i>Rhizoctonia</i>)	Touche (50% EG) 0.5-1.0 lb; vinclozolin	Apply every 10 to 14 days.
	Medallion (50% WP) 1 packet fludioxonil	Drench at 3- to 4-week intervals.
<i>Sclerotinia</i> , <i>Fusarium</i> , and <i>Thielaviopsis</i>	Systhane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Cleary 3336-F 12.0-16.0 fl oz Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply as a drench at 1.0 to 2.0 pts/sq ft.
	Hurricane, 1 packet/gallon water fludioxonil and mefenoxam	Drench this solution into one cubic yard of potting mix before seeding or transplanting.

Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Pansy (cont.) Phytophthora root/crown rot	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Apply every 7 days.
	FenStop 7.0-14.0 fl oz; fenamidone	Drench 1.0 to 2.0 pt/sq ft and repeat at a 28-day interval if necessary.
	Subdue Maxx 0.5-1.0 fl oz mefenoxam	Apply in 100 gal of water over 400 to 800 sq ft (1.0 pt/sq ft). For soil depth greater than 4 inches apply 1.5 to 2.0 pts solution/sq ft. Repeat at 1- to 2-month intervals. Irrigate to thoroughly wet soil after application. For Subdue 5G do not apply rate of 9 oz more often than once every 6 weeks.
	Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	Treat soil at 3-week to 3-month intervals.
Petunia Phytophthora root/crown rot	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Apply every 7 days.
	Subdue Maxx 0.5-1.0 fl oz mefenoxam	Apply in 100 gal of water over 400-800 sq ft (1.0 pt/sq ft). For soil depth greater than 4 inches apply 1.5 to 2.0 pts solution/sq ft. Repeat at 1- to 2-month intervals. Irrigate to thoroughly wet soil after application. For Subdue 5G do not apply rate of 9 oz more often than once every 6 weeks.
	FenStop 7.0-14.0 fl oz; fenamidone	Drench 1.0 to 2.0 pt/sq ft and repeat at a 28-day interval if necessary.
	Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	Treat soil at 3-week to 3-month intervals.
Fungus root rot (<i>Rhizoctonia</i> and <i>Fusarium</i>)	Terrazole (35% WP) 3.5-10.0 oz etrizadiazole	Apply every 4 to 12 weeks.
Botrytis blight	Decree 0.7-1.5 lb; fenhexamid	Spray at 7- to 14-day intervals.
	Fore Rainshield NT Fore WSP Rainshield Dithane T/O Rainshield NT Dithane WF Junction (15% DF) 1.5 lb; mancozeb	
	Daconil Weather Stik 2.0 pt chlorothalonil	Spray every 7 to 10 days.
	Cleary 3336-F (4.5 F) 10.0 fl oz Cleary 3336-WP (50% WP) 0.8 lb thiophanate methyl	Apply every 10 to 14 days.
	Touche (50% EG) 0.5-1.0 lb; vinclozolin	Apply every 10 to 14 days.
Poinsettia Botrytis blight	Daconil Weather Stik 2.0 pts Concorde (54% SST) 1.4 pt chlorothalonil	
	Chipco 26019 (50% WP) 1.0-2.0 lb iprodione	Spray every 10 to 14 days.
	Touche (50% EG) 0.5-1.0 lb or 2.0 tsp-1.0 tbs/gal vinclozolin	Foliar preventive: 0.5 to 0.75 lb on a 10- to 14-day interval. Foliar curative: 0.75 to 1.0 lb on a 14-day interval.
	Cleary 3336-WP 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Spray every 10 to 14 days.

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Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Poinsettia Botrytis blight (cont.)	Exotherm (Termil) 3.5 oz/1000 cu ft chlorothalonil	Fumigate every 7 to 14 days. Do not apply when foliage is wet or when temperature is above 75°F.
Root rot complex (<i>Rhizoctonia solani</i> , <i>Pythium</i> spp., and <i>Thielaviopsis basicola</i>)	Cleary 3336-WP (50% WP) 1.0 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl + Terrazole (35% WP) 3.0-10.0 oz or 0.5 pt/6-inch pot etridiazole	Cleary 3336 will not control <i>Pythium</i> . However, a mixture of Cleary 3336 and Terrazole applied every 4 weeks will prevent root rot caused by most soil-borne fungi.
Rhizoctonia leaf blight	Medallion (50% WP) 1-2 packet fludioxonil	Spray only before bract formation and at 7- to 10-day intervals in greenhouses and closed structures.
	Terraguard 50W 4.0-8.0 oz; triflumizole	Controls <i>Rhizoctonia</i> as a drench at 3- to 4-week intervals.
	Fungo 50 AGC 12.0-16.0 oz Cleary 3336-WP 0.8 lb thiophanate methyl	Spray every 10 to 14 days.
Rose Botrytis blight black spot	Decree 0.7-1.5 lb; fenhexamid	Apply every 7 to 14 days.
	Cleary 3336-WP (50% WP) 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply as a spray at 10- to 14-day intervals.
	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb; iprodione	Apply as a spray at 10- to 14-day intervals.
	Daconil Weather Stik 2.0 pt Concorde (54% SST) 1.3 pt chlorothalonil	Repeat at 7- to 14-day intervals.
	Touche (50% EG) 0.5-1.0 lb vinclozolin	Foliar preventive: 0.5 to 0.75 lb on a 10- to 14-day interval. Foliar curative: 0.75 to 1.0 lb on a 14-day interval.
	Cygnus (50%) 1.6-3.2 oz Kresoxim-methyl	
Powdery mildew	Systhane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Spray to run-off when mildew first appear.
	Terraguard 50W 4.0-16.0 oz triflumizole	Apply at 7- to 14-day intervals as needed. Use higher rate on existing initial infection.
	Cygnus (50%) 1.6-3.2 oz; Kresoxim-methyl	
Snapdragon Botrytis blight	Decree 0.7-1.5 lb; fenhexamid	Apply every 7 to 14 days.
	Daconil Weather Stik 2.0 pts Concorde (54% SST) 1.4 pt chlorothalonil	Repeat on a 7- to 14-day interval.
	Fungo 50 AGC 12.0-16.0 oz Cleary 3336-WP 0.8 lb; thiophanate methyl	Spray every 10 to 14 days.
	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb; iprodione	

Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Snapdragon Botrytis blight (cont.)	Exotherm (Termil) 3.5 oz/1000 cu ft chlorothalonil	Fumigate every 7 to 14 days.
	Touche (50% EG) 0.5-1.0 lb vinclozolin	Foliar preventive: 0.5 to 0.75 lb on a 10- to 14-day interval. Foliar curative: 0.75 to 1.0 lb on a 14-day interval.
Downey mildew	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Apply every 7 days.
Rust	Banner Maxx, 2-4 fl oz; propiconazole	Apply every 14 to 21 days.
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Spray to run-off when rust first appears.
	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Triact 70 0.5-1.0 gal; neem oil	Apply every 14 days.
	Cygnus (50%) 3.2-6.4 oz Kresoxim-methyl	
Powdery mildew	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Triact 70 0.5-1.0 gal; neem oil	Apply every 14 days.
	Cygnus (50%) 1.6-3.2 oz Kresoxim-methyl	
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Spray to run-off when mildew first appears.
Rhizoctonia root rot	Medallion (50% WP) 1 packet fludioxonil	Drench at 3- to 4-week intervals.
	Chipco 26019 (50% WP) 0.4 lb Sextant (23.3%) 1.0-2.5 lb; iprodione	Apply 1.0 to 2.0 pt/sq ft every 14 days.
	Cleary 3336-F (4.5 F) 20.0 fl oz thiophanate methyl	
Tulip Botrytis blight (Gray mold)	Fore Rainshield NT Fore WSP Rainshield Dithane T/O Rainshield NT Dithane WF Junction (15% DF) 1.5 lb; mancozeb	Spray at a 7- to 14-day interval.
	Touche (50% EG) 0.5-1.0 lb vinclozolin	Foliar preventive: 0.5 to 0.75 lb on a 10- to 14-day interval. Foliar curative: 0.75 to 1.0 lb on a 14-day interval.
	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb iprodione	Spray every 10 to 14 days.
Fusarium and Penicillium bulb rot	Cleary 3336-F 12.0-16.0 fl oz Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Soak cleaned bulbs for 15- to 30-minutes in warm dip (80° to 85°F). Dry bulbs after treatment.
	Mertect 340-F 30.0 oz thiabendazole (TBZ)	Dip bulbs 15- to 30-minutes at 55° to 75°F.

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Table 5.1 - Common Diseases and Chemical Control Options (cont.)

Plant Disease	Fungicide & Formulation; Rate/100 gal	Remarks
Zinnia Alternaria blight	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb; iprodione	Spray every 10 to 14 days.
	Fore Rainshield NT Fore WSP Rainshield Dithane T/O Rainshield NT Dithane WF Junction (15% DF) 1.5 lb; mancozeb	Spray every 10 to 14 days.
	Maneb 80 (80% WP) or Maneb Plus Zinc F4 Fungicide (37%) 1.0-1.5 lb maneb	Spray every 10 to 14 days.
Bacterial blight		Purchase clean stock plants. Practice good sanitation procedures.
Powdery mildew	Rubigan 3.0-5.0 fl oz fenarimol	Spray every 10 to 14 days.
	Systhane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Cygnus (50%) 1.6-3.2 oz Kresoxim-methyl	Apply at 10- to 14-day intervals.
	Daconil Weather Stik 1.4 pt chlorothalonil	Treat at 7- to 10-day intervals at first sign of disease.
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Spray every 7 to 10 days.
	Terraguard 50W 4.0-8.0 oz triflumizole.	Foliar spray at weekly intervals.
	Triact 70 0.5-1.0 gal neem oil	Apply every 14 days.

Insects

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Relatively few kinds of insects and related pests occur on greenhouse and floral crops, but they attack a wide range of plants, can be highly destructive, and are difficult to control.

Many insecticide and miticide formulations are available to growers, but specific uses may be quite limited for any one crop, and plant varieties vary greatly in susceptibility to chemical injury. Your local Extension agent may be able to help you obtain the technical information you need.

Proper Use of Pesticides

Insecticides are poisonous, and their use in the greenhouse can present a serious danger to both the applicator and plant material if handled carelessly or improperly. Some extremely toxic chemicals are labeled and recommended for greenhouse use.

If all precautions are followed meticulously, they are safe, but they should not be used by novices or by unsupervised inexperienced personnel, in home or garden greenhouses, or in greenhouses used for demonstrations, exhibits, teaching, or horticultural therapy. Restricted pesticides must be applied only by certified pesticide applicators, and are marked (+) in the publication.

Pesticides no longer being sold are listed to insure proper usage of existing material in the user's possession. Products withdrawn for marketing reasons can reappear under new brand names.

In order to use a pesticide safely and effectively, the product label should be read thoroughly each time a control treatment is applied. By law, pesticides must be used in accordance with label directions. The following checklist is a guide to utilizing label information and directions. Prior to the actual application of any chemical treatment, determine which pesticide to use from the recommendations in this Pest Management Guide and become familiar with the general directions and precautions found on the label.

Effective application of pesticides depends on: proper timing, favorable treatment conditions of temperature, humidity, moisture, and time of day; plant condition; and thorough coverage, especially the undersides of leaves and in dense or low-growing foliage. Thorough wetting is especially important on waxy foliage and waxy insects such as mealybugs and scales. Most insecticides do not act efficiently at temperatures below 50-55 degrees Fahrenheit, and may cause plant injury if used when the temperature is above 90 degrees Fahrenheit, especially when coupled with high humidity. Overhead irrigation or watering should be avoided for at least 12 hours after applying pesticide treatments. Plants should be well watered, with foliage allowed to dry, before applying chemicals.

Non-chemical control methods should not be overlooked, particularly preventative measures such as making sure not to introduce infested plants into production areas. Weeds and excess plants left around can harbor pests and may be sources of reinfestation. Under controlled conditions, parasites (for example, *Encarsia formosa* for whiteflies) and predators (for example, *Cryptolaemus montrouzieri* for mealybugs) can be introduced for biological control.

Plant Injury

Phytotoxicity is a term referring to plant injury caused by chemicals, particularly pesticides. Greenhouse plants seem to be especially prone to this problem, in part because of the wide variety of plants often grown or held in one common area. Signs of phytotoxicity include: 1) tip or marginal burn of leaves; 2) chlorosis in spots, at tips, or on margins of the leaves; 3) leaf distortion, including curling, twisting, or cupping; 4) stunting or growth reduction in the size of entire plants or certain parts; and 5) abnormal or excessive growth of certain plant parts. Flower parts and bracts are especially sensitive in many cases and are most critical to plant sales. New growth is most commonly affected when systemic chemicals are improperly used. Soil drenches and granular treatments may cause root injury resulting in decline, stunting, and damage to older leaves.

The following suggestions will reduce phytotoxic potential:

- Do not apply pesticides to plants under stress.
- Avoid spraying under extremely hot, sunny, or humid conditions.
- Apply sprays in the mornings between 6:00 a.m. and 10:00 a.m.
- Avoid treating when temperature extremes or severe fluctuations are likely.

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- Apply pesticides when foliage is dry and conditions are conducive to drying.
- Use wettable powders rather than emulsifiable concentrates.
- Do not mix pesticides without prior experience; check compatibility.
- Keep nozzles of aerosols or mist blowers at least 18-24" from plants being treated.
- Never spray insecticides in equipment that has been used for applying herbicides (tanks, pumps, hoses, guns).
- Clean sprayer, tank, pump, hose, and gun after each use.
- Do not let spray mixes stand in the sprayer; do not expose spray concentrates to extreme heat or freezing.
- Read **ALL** of the label directions every time you use each pesticide.

Formulations and Application Methods

Pesticides are available in various formulations: as concentrates for spraying or producing vapors, granular soil treatments, aerosols, smokes, and fogs. In some cases, only one or a few application methods may be registered for use of a specific pesticide.

Dilute sprays are applied with pressurized tank sprayers or high-pressure powered spraying machines. Formulations to be used may be wettable powders (WP), emulsifiable concentrates (E or EC), soluble powders (SP), liquids or liquid concentrates (L, LC), or flowables (F). Wettable powders are less likely to cause phytotoxicity problems.

Concentrate sprays are applied with motor-driven or electric mist sprayers and deliver droplets 5 to 20 times as concentrated as dilute sprayers. Extreme care and skill is necessary for the proper use of mist sprayers to achieve effective, safe, non-phytotoxic treatments.

Aerosols, smokes, and foggers create pesticide concentrations in air that are lethal to pests. Rates of application from aerosol bombs, generators, and foggers are based on air volume in closed greenhouses in terms of amount of pesticide/cubic feet. It is important to close the greenhouse tightly for the recommended length of time followed by adequate prescribed ventilation time periods.

Compatibility and Coverage

Care should be taken in mixing different chemicals. Mixing different formulations such as wettable powders and emulsifiable concentrates is not recommended. Never mix herbicides or fungicides, and never use a sprayer that has been used to apply herbicides for insecticide or fungicide application.

For especially waxy foliage, the addition of a wetting agent or spreader-sticker may be desirable when applying sprays. However, it is unnecessary if two or more pesticides are added together, since a greater amount of wetting agent or emulsifier will be present in the tank. The use of two (2) or more emulsifiable concentrates mixed together in the same quantity of water results in twice as much or more solvent applied to the plants and may cause plant injury. **Read the pesticide label carefully for compatibility** statements and mixing **precautions**. Highly alkaline water (pH 8.0 or higher) may cause rapid breakdown of many pesticide chemicals.

Safety and Toxicity

Pesticides are readily absorbed through the skin, as well as being poisonous by ingestion, by inhalation, or by contact in the eyes. Penetration of the skin occurs immediately on contact and is most hazardous when handling undiluted concentrates. It is essential to wear protective clothing, proper gloves, boots, and adequate face shields and respirators or gas masks as directed on the label. Frequent changes to clean clothing and protective devices are essential. With some chemicals, potential eye damage warrants a danger or warning category on the label even though oral and dermal toxicities are in the caution range.

The signal word on the pesticide label ("caution," "warning," or "danger - poison") and the LD₅₀ values are helpful as guides to relative toxicities of pesticides. The LD₅₀ is the lethal dose, orally (ingestion) or dermally (skin absorption) necessary to kill one-half of a test population and is expressed in milligrams of chemical / kilogram of body weight (mg/kg). The LD₅₀'s given below are for technical grade material.

Table 5.2 - Label Categories

Signal Word	Toxicity Category	LD ₅₀ mg/kg	
		Oral	Dermal
DANGER, POISON (skull and crossbones)	Highly toxic	0-50	0-200
WARNING	Moderately toxic	51-500	201-2000
CAUTION	Slightly toxic	501-5000	2001-20,000
CAUTION	Relatively non-toxic	over 5000	over 20,000

Table 5.3 - Selected Relative Toxicities

Pesticide	Toxicity LD ₅₀ (mg/kg)	
	oral	dermal
Abamectin	650	>2,000
Acephate	866-945	>10,250
Azadirachtin	>5,000	>2,000
<i>Bacillus thuringiensis</i>	none	none
Chlorpyrifos	96-270	2,000
Cyfluthrin	900	>5,000
Dicofol	820-960	2,100
Endosulfan	100	359
Fenoxycarb	16,800	>2,000
Fluvalinate	261-282	>20,000
Metaldehyde	250-1,000	—
Methiocarb	10-35	>5,000
Permethrin	>430-4,000	>2,000
Resmethrin	>2,500	>3,000

How to Use These Recommendations

Once the pest problem has been identified, consult Table I. Find the pest or pest group (arranged alphabetically) to determine which control measures are available, the formulations that are registered, and remarks. Then consult Table II for specific use and precautionary information on the control measure chosen. Be sure to check the potential phytotoxicity statements. If in doubt about a crop, treat a small sample area. Observe sprayed plants for several days for indications of plant injury.

After using the recommendations here, read and follow the directions on the pesticide label prior to mixing and application.

Table 5.4 - Guide to Pesticide and Formulations Recommended by Pest or Pest Group

Pesticide	Signal Word	Foliar Spray	Aerosol	Smoke Fog Vapor	Soil	Remarks ¹
Aphids						
Abamectin	warning	0.15 EC	—	—	—	See label
Acephate	caution	75SP, 97	3A	—	—	Carnation, chrysanthemum, rose aerosol is labeled for most crops.
Acetamiprid	caution	70WSP, 30 SG	—	—	—	See label
Azadirachtin	caution	EC	—	—	—	All crops
<i>Beauveria bassiana</i>	caution	22WF, ES	—	—	—	All crops
Bifenthrin	warning	.667F	A	—	—	Greenhouse-grown ornamentals
Chlorpyrifos	caution	20ME	8A	—	—	See label
Cyfluthrin	warning	20WP	—	—	—	See label
Dinotefuran	caution	20SG	—	—	20SG	Soil application as drench
Endosulfan	danger	50W	—	—	—	All crops
Fenoxycarb	caution	25WP	0.6A	—	—	All crops
Fenpropathrin	warning	2.4EC	1A	—	—	See label
Flonicamid	caution	SG	—	—	—	See label for rate range
Fluvalinate	caution	2AF	—	—	—	All crops; see label for phytotoxicity
Imidacloprid	caution	II	—	—	1%G, 60WP	See label
Insecticidal soap	warning	—	—	—	—	See label
Kinoprene	warning	II	—	—	—	All crops
Lambda-cyhalothrin	caution	GC	—	—	—	All crops
Methiocarb	warning	75WP	—	—	—	See label
Naled	warning	—	—	F-8EC	—	All crops
Permethrin	caution	3.2EC	—	—	—	All crops
Pymetrozine	caution	50WG	—	—	—	All crop
Pyrethrin	caution	—	A	—	—	See label
Pyriproxyfen	caution	.86L	—	—	—	See label
Resmethrin	caution	2EC	A	—	—	All crops
Spirotetramat	caution	240SC	—	—	240SC	Soil application as drench
Thiomethoxam	caution	25WG	—	—	25WG	See label
Ultra-fine oil	caution	—	—	—	—	See label
Caterpillars, Cutworms, Loopers, Armyworms						
Acetamiprid	caution	70WSP 30SG	—	—	—	See label for pest species
Azadirachtin	caution	EC	—	—	—	All crops
<i>Bacillus thuringiensis (Bt)</i>	caution	WP	—	—	—	Consult label of this and other brands of <i>Bt</i> available for specific pest uses.
Bifenthrin	warning	.667F	A	—	—	Greenhouse-grown ornamentals
Carbaryl	caution	50W, 80S	—	—	—	All crops
Chlorfenapyr	caution	2S	—	—	—	All crops
Chlorpyrifos	caution	20ME	8A	—	—	See label

¹Be sure to check precautions for phytotoxicity for each pesticide in table.

Table 5.4 - Guide to Pesticide and Formulations Recommended by Pest or Pest Group (cont.)

Pesticide	Signal Word	Foliar Spray	Aerosol	Smoke Fog Vapor	Soil	Remarks ¹
Caterpillars, Cutworms, Loopers, Armyworms (cont.)						
Cyfluthrin	warning	20WP	—	—	—	See label
Diflubenzuron	caution	25WSB	—	—	—	Armyworm listed on label
Fenpropathrin	warning	2.4EC	1A	—	—	For beet armyworm; see label
Fluvalinate	caution	2AF	—	—	—	All crops
Novaluron	caution	10SC	—	—	—	Armyworm listed on label
Permethrin	caution	3.2EC	—	—	—	All crops
Pyridalyl	caution	35WP	—	—	—	See label for insect species
Spinosad	caution	11.6SC	—	—	—	All crops
Tebufenozide	caution	2S	—	—	—	All crops
Centipedes (see Millipedes)						
Cyclamen Mite						
Chlorfenapyr	caution	2S	—	—	—	All crops
Dicofol	caution	18.5EC	—	—	—	African violet, cyclamen, snapdragon, gerbera
Endosulfan	warning	50W, 2E	—	—	—	African violet, cyclamen, snapdragon, begonia, gerbera
Spiromesifen	caution	4F	—	—	—	Also labeled for broad mite
Fungus Gnats (Adults)						
Bifenthrin	caution	—	A	—	—	All crops
Fenpropathrin	warning	—	1A	—	—	All crops
Insecticidal soap	warning	25EC	—	—	—	See label, formulations vary
Permethrin	caution	3.2EC	—	—	—	See label for sensitive plants
Resmethrin	caution	2EC	1A	—	—	All crops
Ultra-fine oil	caution	—	—	—	—	See label
Vapona	danger	—	10A	V-41	—	All crops
Fungus Gnats (Larvae)						
Acetamiprid	caution	70WSP 30SG	—	—	—	See label
<i>Bacillus thuringiensis</i>	non-toxic	—	—	—	AS	All crops
Cyromazine	caution	75WP	—	—	—	All crops
Diflubenzuron	caution	—	—	—	25WSB	See label
Fenpropathrin	warning	—	1A	—	—	All crops
Fenoxycarb	caution	25WP	—	—	—	All crops
Kinoprene	warning	II	—	—	—	All crops
Pyriproxyfen	caution	.86 EC	—	—	—	See label
Leafminers						
Abamectin	warning	0.15EC	—	—	—	Flower crops, foliage plants
Acetamiprid	caution	70WSP 30SG	—	—	—	See label
Azadirachtin	caution	EC	—	—	—	All crops

¹Be sure to check precautions for phytotoxicity for each pesticide in table.

Table 5.4 - Guide to Pesticide and Formulations Recommended by Pest or Pest Group (cont.)

Pesticide	Signal Word	Foliar Spray	Aerosol	Smoke Fog Vapor	Soil	Remarks ¹
Leafminers (cont.)						
Bifenthrin	warning	.667 F	A	—	—	See label
Cyfluthrin	warning	20WP	—	—	—	See label
Cyromazine	caution	75WP	—	—	—	All crops
Diflubenzuron	caution	25WSB	—	—	—	See label
Dinotefuran	caution	20SG	—	—	20SG	Soil application as drench
Fenpropathrin	warning	—	1A	—	—	All crops
Fenoxycarb	caution	25WP	—	—	—	Lepidopterous leaf miners only All crops
Naled	warning	—	—	V, 8EC	—	All crops
Novaluron	caution	10SC	—	—	—	Serpentine, citrus leafminers only
Permethrin	caution	3.2EC	—	—	—	Chrysanthemum only
Spinosad	caution	11.6SC	—	—	—	All crops
Vapona	danger	—	10A	—	—	All crops
Leafrollers						
Acephate	caution	75SP, 97	3A	—	—	Rose
Bifenthrin	warning	.667 F	A	—	—	Greenhouse-grown ornamentals, trees, shrubs
Chlorpyrifos	caution	20ME	—	—	—	See label
Cyfluthrin	warning	20WP	—	—	—	See label
Fenpropathrin	warning	—	1A	—	—	All crops
Naled	warning	—	—	V	—	
Mealybugs (Foliar)						
Acephate	caution	75SP, 97	3A	—	—	Foliage plants, orchids, anthurium, cacti, poinsettia
Acetamiprid	caution	70WSP 30SG	—	—	—	See label
Azadirachtin	caution	EC	—	—	—	All crops
<i>Beauveria bassiana</i>	caution	22WP, ES	—	—	—	All crops
Bifenthrin	warning	.667 F	A	—	—	Greenhouse-grown ornamentals, trees, shrubs
Buprofezin	caution	70WSP	—	—	—	All crops
Chlorpyrifos	caution	20ME	8A	—	—	See label
Cyfluthrin	warning	20WP	—	—	—	See label
Dinotefuran	caution	20SG	—	—	20SG	Soil application as drench
Fenpropathrin	warning	2.4EC	1A	—	—	See label
Flonicamid	caution	SG	—	—	—	See label for rate range
Fluvalinate	caution	22.3F	—	—	—	See label
Imidacloprid	caution	II	—	—	1%G	See label
Insecticidal soap	warning	25EC	—	—	—	Concentration varies with formulation; see label
Kinoprene	warning	II	—	—	—	See label

¹Be sure to check precautions for phytotoxicity for each pesticide in table.

Table 5.4 - Guide to Pesticide and Formulations Recommended by Pest or Pest Group (cont.)

Pesticide	Signal Word	Foliar Spray	Aerosol	Smoke Fog Vapor	Soil	Remarks ¹
Mealybugs (Foliar) (cont.)						
Methiocarb	warning	75WP	—	—	—	See label
Naled	warning	—	—	F, V	—	All crops
Permethrin	caution	3.2EC	—	—	—	See label for sensitive plants
Pyrethrin	caution	—	A	—	—	See label
Thiomethoxam	caution	25WG	—	—	25WG	See label
Vapona	danger	—	10A	—	—	All crops
Mealybugs (Root)						
Kinoprene	warning	II	—	—	—	All crops
Millipedes						
Chlorpyrifos	warning	50W	—	—	—	Outside building
Scale Insects						
Acephate	caution	75SP, 97	3A	—	—	See crops listed on label
Acetamiprid	caution	70WSP 30SG	—	—	—	See label
Buprofezin	caution	70WSP	—	—	—	All crops
Chlorpyrifos	caution	20ME	8A	—	—	See label
Cyfluthrin	warning	20WP	—	—	—	See label directions
Dinotefuran	caution	20SC	—	—	20SC	Soil applicaion as drench
Fenoxycarb	caution	25WP	0.6A	—	—	All crops, soft scales only
Fenpropathrin	warning	—	1A	—	—	See label
Insecticidal soap	warning	25EC	—	—	—	Formulations vary; see label
Kinoprene	warning	II	—	—	—	All crops
Pyriproxyfen	caution	.86EC	—	—	—	See label
Thiomethoxam	caution	25WG	—	—	25WG	Labeled for soft scales
Shore Flies						
Cyromazine	caution	75WP	—	—	—	All crops
Diflubenzuron	caution	—	—	—	25WSB	See label
Fenoxycarb	caution	25WP	0.6A	—	—	All crops
Pyriproxyfen	caution	.86EC	—	—	—	See label
Slugs, Snails						
Metaldehyde	caution	—	—	—	bait	All crops
Methiocarb	warning	75WP	1A	—	—	See label
Sowbugs						
Cyfluthrin	warning	20WP	—	—	—	See label
Spider Mites						
Abamectin	warning	0.15EC	—	—	—	See label
Acequinocyl	caution	15SC	—	—	—	See label. Two-spotted spider mite.
Azadirachtin	caution	70	—	—	—	All crops

¹Be sure to check precautions for phytotoxicity for each pesticide in table.

Table 5.4 - Guide to Pesticide and Formulations Recommended by Pest or Pest Group (cont.)

Pesticide	Signal Word	Foliar Spray	Aerosol	Smoke Fog Vapor	Soil	Remarks ¹
Spider Mites (cont.)						
Bifenazate	caution	50SP	—	—	—	All crops
Bifenthrin	warning	.667 F	A	—	—	Greenhouse-grown ornamentals, trees, shrubs
Chlorfenapyr	caution	2S	—	—	—	All crops
Chlorpyrifos	caution	20ME	8A	—	—	See label
Cinnamaldehyde	caution	30EC	—	—	—	All crops
Clofentezine	caution	5SC	—	—	—	All crops
Dicofol	caution	35WP	—	—	—	All crops
Etoxazole	caution	5WDG	—	—	—	See label for resistance management
Fenbutatin oxide	danger	50WP	—	—	—	All crops
Fenpropathrin	warning	2.4EC	1A	—	—	See label
Fenpyroximate	warning	5SC	—	—	—	Labeled for other mite species
Fluvalinate	caution	22.3F	—	—	—	See label
Hexythiazox	caution	50DF	—	—	—	See label
Insecticidal soap	warning	25EC	—	—	—	Formulations vary; see label
Methiocarb	warning	75WP	—	—	—	See label
Naled	warning	—	—	F, V	—	All crops
Pyrethrin	caution	—	A	—	—	See label
Pyridaben	danger	75WP	—	—	—	See label
Spiromesifen	caution	4F	—	—	—	See label for species
Ultra-fine oil	caution	—	—	—	—	See label
Vapona	danger	—	10A	—	—	All crops
Springtails						
Chlorpyrifos	warning	50W	—	—	—	See label
Thrips						
Abamectin	caution	0.15EC	—	—	—	All crops
Acephate	caution	75WP, 97	3A	—	—	All crops
Acetamiprid	caution	70WSP, 30SG	—	—	—	See label
Azadirachtin	caution	EC	—	—	—	All crops
<i>Beauveria bassiana</i>	caution	22WP, EC	—	—	—	All crops
Bifenthrin	warning	.667 F	—	—	—	See label
Chlorfenapyr	caution	2S	—	—	—	All crops
Chlorpyrifos	caution	ME	8A	—	—	See label
Cyfluthrin	warning	20WP	—	—	—	See label
Dinotefuran	caution	20SG	—	—	20SG	Soil application as drench
Fenoxycarb	caution	25WP	A	—	—	All crops
Fenpropathrin	warning	—	1A	—	—	
Fonicamid	caution	SG	—	—	—	See label for rate range

¹Be sure to check precautions for phytotoxicity for each pesticide in table.

Table 5.4 - Guide to Pesticide and Formulations Recommended by Pest or Pest Group (cont.)

Pesticide	Signal Word	Foliar Spray	Aerosol	Smoke Fog Vapor	Soil	Remarks ¹
Thrips (cont.)						
Fluvalinate	caution	2AF	—	—	—	All crops
Imidacloprid	caution	II	—	—	1%G, 60WP	See label
Lambda-cyhalothrin	caution	10WSP	—	—	—	All crops
Methiocarb	warning	75WP	—	—	—	All crops
Naled	warning	—	—	V	—	All crops
Novaluron	caution	10SC	—	—	—	See label for listed species
Pyridalyl	caution	35WP	—	—	—	See label for special instructions
Resmethrin	caution	—	2A	—	—	All crops
Spinosad	caution	11.6SC	—	—	—	All crops
Vapona	danger	—	10A	F	—	All crops
Whiteflies						
Abamectin	caution	0.15E	—	—	—	See label
Acephate	caution	75SP	3A	—	—	All crops
Acetamiprid	caution	70WSP, 30SG	—	—	—	See label
Azadirachtin	caution	EC	—	—	—	All crops
<i>Beauveria bassiana</i>	caution	22WP, ES	—	—	—	See label
Bifenthrin	warning	.667 F	A	—	—	Greenhouse-grown ornamentals, trees, shrubs
Buprofezin	caution	70WSP	—	—	—	All crops
Chlorpyrifos	caution	20ME	8A	—	—	See label
Cyfluthrin	warning	20WP	—	—	—	See label
Diflubenzuron	caution	25WSB	—	—	—	See label
Dinotefuran	caution	20SG	—	—	20SG	Soil application as drench
Endosulfan	warning	50WP	—	S	—	All crops
Fenoxycarb	caution	25WP	0.6A	—	—	All crops
Fenpropathrin	warning	2.4EC	1A	—	—	See label
Fonicamid	caution	SG	—	—	—	See label for rate range
Fluvalinate	caution	2F	—	—	—	All crops
Imidacloprid	caution	II	—	—	1%G, 60WP	See label
Insecticidal soap	caution	L	—	—	—	See label
Kinoprene	caution	II	—	—	—	See label
Naled	warning	—	—	S, V	—	All crops
Novaluron	caution	10SC	—	—	—	See label for listed species
Permethrin	caution	3.2EC	—	—	—	See label for sensitive plants
Pymetrozine	caution	50WG	—	—	—	All crops
Pyrethrin	caution	—	A	—	—	See label
Pyridaben	danger	75WP	—	—	—	See label

¹Be sure to check precautions for phytotoxicity for each pesticide in table.

Table 5.4 - Guide to Pesticide and Formulations Recommended by Pest or Pest Group (cont.)

Pesticide	Signal Word	Foliar Spray	Aerosol	Smoke Fog Vapor	Soil	Remarks ¹
Whiteflies (cont.)						
Pyriproxyfen	caution	.86EC	—	—	—	See label
Resmethrin	caution	2A 2EC	— —	— F	—	All crops See label
Spiromesifen	caution	4F	—	—	—	See label for species
Spirotetramat	caution	240SC	—	—	240SC	Soil application as drench
Thiomethoxam	caution	25WG	—	—	25WG	See label
Vapona	danger	—	10A	S, F	—	All crops

¹Be sure to check precautions for phytotoxicity for each pesticide in table.

Table 5.5 - Guide to Pesticide Usage Cross Reference to Other Common Trade Names

Other trade or common names that are often found on labels, in advertising, or in trade journals are provided here for reference.

Abamectin - Avid	Cythion - Malathion	Naled - Dibrom
Acephate - Orthene, PT1300	Diflubenzuron - Adept	Novaluron - Pedestal
Acequinocyl - Shuttle	Dinotefuran - Safari	Permethrin - Astro, Pramex, SBP-1315
Acetamiprid - Tristar	Endosulfan - Thionex	Pymetrozine - Endeavor
Azadirachtin - Azatin, Neemazid, Ornazin, Triact, Azatrol	Fenbutatin oxide - Promite	Pyrethum - Pt 1600, X-Clude
<i>Bacillus thuringiensis</i> - Dipel, Gnatrol	Fenoxycarb - Preclude, Precision	Pyridaben - Sanmite
<i>Beauveria bassiana</i> - BotaniGard, Mycotrol, Naturalis-O	Fenpropathrin - Tame	Pyridalyl - Overture
Bifenazate - Floramite	Fenpyroximate - Akari	Pyriproxyfen - Pyrigro, Distance
Bifenthrin - Talstar, Attain	Flonicamid - Aria	Resmethrin - Pt 1200, SBP-1382
Carbaryl - Sevin	Fluvalinate - Mavrik	Spiromesifen - Judo
Chlorfenapyr - Pylon	Hexythiazox - Hexygon	Spirotetramat - Kontos
Chlorpyrifos - Duraguard, Duraplex	Insecticidal soap - M-Pede	Tebufenozide - Confirm
Cinnamaldehyde - Cinnamite	Kinoprene - Enstar	Thuricide - Dipel
Cyfluthrin - See Decathlon	Lambda-cyhalothrin - Scimitar, Topcide	Ultra-fine spray oil - Sunspray
	Methiocarb - Mesurol, Grandslam	Vapona - DDVP, Dichlorvos

Rates of Application (T= Tablespoon; t= teaspoon)

Pesticide	Formulation	50 Gal	10 Gal	3 Gal	Precautions And Remarks
Abamectin (Avid) aphids, leafminers, spider mites, thrips, whiteflies	0.15EC	2.0-4.0 fl oz	0.75-1.5 T	0.75-1.5 t	A generic product exists. See label. 12-hr REI SIGNAL WORD - WARNING

Abbreviations: AF - aquaflo; W, WP - wettable powder; E, EC - emulsifiable concentrate; L - liquid; ME - microencapsulated; SP - sprayable or soluble powder; SC - spray concentrate; D - Dust; G - granular; A - aerosol; F - fog; SG - smoke generator; V - vapor; lb - pound; pt - pint; oz - ounce; fl oz - fluid ounce; cu ft - cubic feet; c - cup; T - tablespoon; t - teaspoon; gal - gallon(s)

Useful Equivalents 1 lb WP/100 gal = 1 T/1 gal; 2.0 T = 1 fl oz; 1 pt EC/100 gal = 1 t/1 gal; 16 fl oz = 1 pt; 3 t = 1 T; 2 pt = 1 qt

Table 5.5 - Guide to Pesticide Usage Cross Reference to Other Common Trade Names (cont.)

Rates of Application (T= Tablespoon; t= teaspoon)

Pesticide	Formulation	50 Gal	10 Gal	3 Gal	Precautions And Remarks
Acephate (Orthene) aphids, leafroller, mealybugs, scale crawler, thrips, whitefly	75 SP 97	See label for rates	See label for rates	See label for rates	Repeated applications may cause phytoxicity. See label label for rate and species list. SIGNAL WORD - CAUTION
mealybugs	3% aerosol	spray 5 sec- onds/ 100 sq ft	spray 5 sec- onds/ 100 sq ft	spray 5 sec- onds/ 100 sq ft	Apply 5-10 seconds/100 sq ft. Do not use under high temperature and humidity conditions or where gas heat- ing systems are unvented. See label for sensitive plant list. 24-hr REI SIGNAL WORD - CAUTION
Azequinocyl (Shuttle) spider mites	15SC	3.2-6.4 fl oz	1.25-2.5 T	1.25-2.5 t	Do not use on miniature roses or impa- tiens. Use low rate on standard roses. See label for resistance management. 12-hr REI SIGNAL WORD - CAUTION
Acetamiprid (Tristar) aphids, mealy- bug, leafhopper, whiteflies, thrips, scales, fungus gnat larvae, leafminers, caterpillars	70WSP, 30SG	See label for rates.	See label for rates.	See label for rates.	See label for restrictions. 70WSP in water soluble packets. 12-hr REI SIGNAL WORD - CAUTION
Azadirachtin aphids, caterpillars, leafminers, mealy- bugs, thrips, whiteflies	various	See label for rates.	See label for rates.	See label for rates.	Product is available at several concen- trations and sold under multiple trade names. 4-hr REI SIGNAL WORD - CAUTION
Bacillus thuringi- ensis (Gnatrol) fungus gnats	AS	1.0-4.0 pts	3.0-13.0 oz	2.0-8.0 T	Consult label for proper rate. Use 3 weekly applications for heavy infes- tations. 4-hr REI SIGNAL WORD - CAUTION
caterpillars, loopers, budworm, omniv- orous leafroller, armyworm	various	See label for rates.	See label for rates.	See label for rates.	Many formulations exist. Check rate and use labeled rate only. Use full coverage foliar spray when larvae are small. Use lower rate for light infestations. 4-hr REI SIGNAL WORD - CAUTION
Beauvaria bassiana (BotaniGard) aphids, mealybugs, thrips, whiteflies	22WP, ES	See label for rates.	See label for rates.	See label for rates.	A mycoinsecticide. See label for rate for each pest.
Bifenazate (Floramite) spider mites	50SP	1.0-2.0 oz	—	—	See label for species controlled. Do not use in successive applications. Sold in water soluble bags. 12-hr REI SIGNAL WORD - CAUTION

Abbreviations: AF - aquaflo; W, WP - wettable powder; E, EC - emulsifiable concentrate; L - liquid; ME - microencapsulated; SP - sprayable or soluble powder; SC - spray concentrate; D - Dust; G - granular; A - aerosol; F - fog; SG - smoke generator; V - vapor; lb - pound; pt - pint; oz - ounce; fl oz - fluid ounce; cu ft - cubic feet; c - cup; T - tablespoon; t - teaspoon; gal - gallon(s)

Useful Equivalents 1 lb WP/100 gal = 1 T/1 gal; 2.0 T = 1 fl oz; 1 pt EC/100 gal = 1 t/1 gal; 16 fl oz = 1 pt; 3 t = 1 T; 2 pt = 1 qt

Table 5.5 - Guide to Pesticide Usage Cross Reference to Other Common Trade Names (cont.)

Rates of Application (T= Tablespoon; t= teaspoon)					
Pesticide	Formulation	50 Gal	10 Gal	3 Gal	Precautions And Remarks
Bifenthrin (Attain) aphids, armyworms, caterpillars, mealy- bugs, leafrollers, plant bugs, scale, mites, whiteflies	0.5%/A	1 lb can/3000 sq ft			A generic product exists. See label for total release directions. 12-hr REI SIGNAL WORD - CAUTION
(Talstar) aphids, whiteflies, mealybugs, spider mites, leafroller, armyworms	0.667F	4.0-20.0 oz	0.8-4.0 oz	2.0-6.0 t	Apply as full-coverage foliar spray. Repeat as necessary. Do not handle plants till dry. Rate depends on pest. 12-hr REI SIGNAL WORD - CAUTION
Buprofezin (Talus) leafhoppers, mealy- bugs, planthoppers, scales, whiteflies	70WSP	3.0-7.0 oz	0.6-1.8 oz	—	Consult label for proper rate. Sold in water-soluble bags. 12-hr REI SIGNAL WORD - CAUTION
Carbaryl (Sevin) blister bee- tle, flea beetle, leaf- hoppers, leafrollers	10D				Apply a light covering of dust barely visible when completed. Treat when plants are dry and humidity is low. Use caution for greenhouse treatments if conditions are not suitable. 12-hr REI SIGNAL WORD - WARNING
mealybugs, plant bugs, thrips (exposed)	50W 80SL	1.0 lb 10.0 oz	6.6 T 4.0 T	6.0 T 3.75 T	
Chlorfenapyr (Pylon) spider mites, cycla- men mites, thrips, caterpillars, foliar nematodes	2S	1.3-2.6 fl oz	1.5-3.0 t	0.5-1.0 t	Labeled for greenhouse vegetable transplants. See label for thrips rate. 12-hr REI SIGNAL WORD - CAUTION
Chlorpyrifos (Duraguard) aphids, leafhopper, leafminer, leafroller, mealybug, mites, scale, springtails, thrips, whiteflies	ME	25.0-50.0 oz	2.5-5.0 oz	1.5-3.0 T	Rates vary depending on pest. See label. 12-hr REI SIGNAL WORD - CAUTION
Chlorpyrifos + cyfluthrin (Duraplex) aphids, caterpillars, mealybugs, mites, scales, thrips, whiteflies	8A	2.0 oz	fogger treats	3000 sq ft	See label for special note re gas-heat- ing systems. 12-hr REI SIGNAL WORD - CAUTION
Cinnamaldehyde (Cinnamite)	30EC	42.5 oz	8.5 oz	2.6 oz	Can cause plant injury. Do not use on begonias, orchids, or poinsettias once bracts are set. 12-hr REI

Abbreviations: AF - aquaflo; W, WP - wettable powder; E, EC - emulsifiable concentrate; L - liquid; ME - microencapsulated; SP - sprayable or soluble powder; SC - spray concentrate; D - Dust; G - granular; A - aerosol; F - fog; SG - smoke generator; V - vapor; lb - pound; pt - pint; oz - ounce; fl oz - fluid ounce; cu ft - cubic feet; c - cup; T - tablespoon; t - teaspoon; gal - gallon(s)

Useful Equivalents 1 lb WP/100 gal = 1 T/1 gal; 2.0 T = 1 fl oz; 1 pt EC/100 gal = 1 t/1 gal; 16 fl oz = 1 pt; 3 t = 1 T; 2 pt = 1 qt

Table 5.5 - Guide to Pesticide Usage Cross Reference to Other Common Trade Names (cont.)

Rates of Application (T= Tablespoon; t= teaspoon)

Pesticide	Formulation	50 Gal	10 Gal	3 Gal	Precautions And Remarks
Clofentezine (Ovation)	5SC	1.0 oz	—	—	One application per crop cycle. Apply at first sign of mite activity. 12-hr REI SIGNAL WORD - CAUTION
Cyfluthrin (Decathlon) armyworms, lace bug, aphids, leafrollers, mealybugs, thrips, whiteflies, sowbugs	20WP	3.0-4.5 T	2.0-3.0 t	0.75-1.0 t	Addition of a spreader-sticker may improve control. See label. 12-hr REI SIGNAL WORD - WARNING
Cyromazine (Citation) Leafminers, fungus gnats, shore flies	75WP	1.33 oz	—	—	Apply as foliar spray or drench; will not control adults. Sold in water-soluble pouches. SIGNAL WORD - CAUTION
Dicofol (Kelthane) spider mites, cyclamen mite	50WP	0.33 lb	10.0 T	3.0 T	Apply 2 to 3 times at 4-7 day intervals. Works best at cool cool temperatures. Use EC for cyclamen mite. 48-hr REI SIGNAL WORD - DANGER
Diflubenzuron (Adept) armyworms, fungus gnats, leafminers, shore flies, whiteflies	25WP	1.0 oz	—	—	Read label before using as a drench. Under cover uses are registered. Sold in water soluble bags. Rates differ for foliar feeders. Do not use on poinsettia. 12-hr REI SIGNAL WORD - CAUTION
Dinotefuran (Safari) aphids, scale, Japanese beetles, leafminers, mealybugs, thrips, whiteflies	20SG	See label for rates	See label for rates	See label for rates	For foliar insects. Apply as foliar spray or soil applications as drenches. See label for scale species. See label for vegetable transplant use. 12-hr REI SIGNAL WORD - CAUTION
Endosulfan (Thionex) aphids, cyclamen mite, whitefly, thrips	3EC 50WP	0.3 qt 0.5 lb	4.0 T 10.0 T	4.0 t 3.0 T	Use proper mask or respirator. EC may injure some chrysanthemums. Foliage and blooms should be dry. Close vents for at smoke least 2 hrs overnight. 24 HR REI SIGNAL WORD - WARNING
Etoxazole (TetraSan)	5WDG	2-4 packets	—	—	Sold in water soluble packets. 12-hr REI SIGNAL WORD - CAUTION
Fenbutatin oxide (Promite)	50WP	1.0 lb soluble bag in 100.0-200.0 gal			Do not add oil. Apply for foliage only on mums and pre-bract on poiseettias. 24-hr REI SIGNAL WORD - DANGER

Abbreviations: AF - aquaflo; W, WP - wettable powder; E, EC - emulsifiable concentrate; L - liquid; ME - microencapsulated; SP - sprayable or soluble powder; SC - spray concentrate; D - Dust; G - granular; A - aerosol; F - fog; SG - smoke generator; V - vapor; lb - pound; pt - pint; oz - ounce; fl oz - fluid ounce; cu ft - cubic feet; c - cup; T - tablespoon; t - teaspoon; gal - gallon(s)

Useful Equivalents 1 lb WP/100 gal = 1 T/1 gal; 2.0 T = 1 fl oz; 1 pt EC/100 gal = 1 t/1 gal; 16 fl oz = 1 pt; 3 t = 1 T; 2 pt = 1 qt

Table 5.5 - Guide to Pesticide Usage Cross Reference to Other Common Trade Names (cont.)

Rates of Application (T= Tablespoon; t= teaspoon)					
Pesticide	Formulation	50 Gal	10 Gal	3 Gal	Precautions And Remarks
Fenoxycarb (Preclude)	0.6A	5-10 Seconds/ 100sq ft	5-10 seconds/ 100sq ft	5-10 seconds/ 100sq ft	See label for dosage for specific pest; WP sold in 1.0 oz pouches. Insect growth regulator. 12-hr REI SIGNAL WORD - CAUTION
(Precision) whiteflies, soft scales, fungus gnats, shore flies, lepidopterous leaf miners, and thrips	25WP	1.0-4.0 fl oz	—	—	
Fenpyroximate (Akari) spider mites	5SC	8.0-12.0 oz	3.0-4.5 T	1.0-1.5 T	See label for resistance management. 12-hr REI SIGNAL WORD - WARNING
Fenpropathrin (Tame) aphids, beet army- worm, leafhoppers, mealybugs, mites, whiteflies, Japanese beetle	2.4EC, 1A	2.67-8.0 oz	1.0-3.0 T	1.0-3.0 t	See label for dosage for specific pest, and for mixing instructions. Aerosol for- mulation contains acephate. 24-hr REI SIGNAL WORD - WARNING
Flonicamid (Aria) aphids, mealybugs, thrips, whiteflies	SG	See label for rates			Each packet contains 20g of product. Registered for greenhouse and interi- or-scapes. 12-hr REI SIGNAL WORD - CAUTION
Fluvalinate (Mavrik) aphids, thrips, mites, white- flies, leaf-feeding caterpillars	2AF	2.0-5.0 fl oz	1.0 T-2.5 T	1.0 t-2.5 t	May repeat at 5- to 10-day intervals if needed. See label for precautions. 12-hr REI SIGNAL WORD - CAUTION
Hexythiazox (Hexygon) spider mites	50DF	See label for rates	See label for rates	See label for rates	Rates differ for high- and low-volume applications. 12-hr REI SIGNAL WORD - CAUTION
Imidacloprid (Marathon)	1%G, 60 WP, II	See label for rates	See label for rates	See label for rates	Generic products exist. Do not over irrigate following application. 12-hr REI SIGNAL WORD - CAUTION
Insecticidal soap aphids, mealybugs, mites	50.5EC 25EC	4.0-10.0 pt 2.0 gal	0.8-2.0 pts 50.0 oz	8.0-20.0 T 15.0 oz	See label. Repeated applications of high rates may cause plant damage. Numerous formulations are available. 12-hr REI
Kinoprene (Enstar) aphids, fungus gnats, mealybugs, scales, whitefly	II Fog	2.5-5.0 oz	2.5-5.0 t	0.75-1.5 t	See label for usage directions. For car- nations, mums, roses. Foliage should be dry. Fogging rate - 1 oz/3,000 cu ft 4-hr REI SIGNAL WORD - WARNING
Abbreviations: AF - aquaflo; W, WP - wettable powder; E, EC - emulsifiable concentrate; L - liquid; ME - microencapsulated; SP - sprayable or soluble powder; SC - spray concentrate; D - Dust; G - granular; A - aerosol; F - fog; SG - smoke generator; V - vapor; lb - pound; pt - pint; oz - ounce; fl oz - fluid ounce; cu ft - cubic feet; c - cup; T - tablespoon; t - teaspoon; gal - gallon(s)					
Useful Equivalents 1 lb WP/100 gal = 1 T/1 gal; 2.0 T = 1 fl oz; 1 pt EC/100 gal = 1 t/1 gal; 16 fl oz = 1 pt; 3 t = 1 T; 2 pt = 1 qt					

Table 5.5 - Guide to Pesticide Usage Cross Reference to Other Common Trade Names (cont.)

Rates of Application (T= Tablespoon; t= teaspoon)					
Pesticide	Formulation	50 Gal	10 Gal	3 Gal	Precautions And Remarks
Lambda-cyhalothrin (Scimitar) adult leaf miners, aphids, armyworms, brown soft scale, leaf-feeding caterpillars, mealybugs, spider mites, thrips, whiteflies	6C	0.75-2.5 oz	—	—	Generic products exist. See label for rates. 24-hr REI SIGNAL WORD - CAUTION
Metaldehyde (Deadline, Metarex) aphids, mites, slugs, snails, western flower thrips	3.25% pellets	1.0 lb/1,000 sq ft			Apply bait only to soil surface around plants, not foliage or other plant parts. 12-hr REI SIGNAL WORD - CAUTION
Methiocarb (Grandslam) (Mesurol) aphids, mites, snails, slugs, western flower thrips	2% G 75WP	1.0 lb/ 1,000 sq ft 0.5-2.0 lbs	 1.6-6.4 oz	 0.5-2.0 T	Only Mesurol labeled for thrips. Apply bait to soil around plants or flats but not on plant foliage. Do not apply to food crops. 24-hr REI SIGNAL WORD - DANGER
Naled (Dibrom) aphids, leafrollers, mealybugs, spider mites, whiteflies (adults)	8E Fog	Vaporize 1.0 fl/ 10,000 cu ft Use 1.0 fl oz/3,000 cu ft in fog generator.	Vaporize 1.0 fl/ 10,000 cu ft Use 1.0 fl oz/3,000 cu ft in fog generator.	Vaporize 1.0 fl/ 10,000 cu ft Use 1.0 fl oz/3,000 cu ft in fog generator.	See label for detailed directions on use and safety precautions. 24-hr REI
Novaluron (Pedestal) thrips, caterpillars, whiteflies, leafminers	10SC	3.0-4.0 fl oz	4.0-5.0 tsp	1.0-1.5 tsp	See label for precautions. 12-hr REI SIGNAL WORD - CAUTION
Permethrin (Perm-up) leafminers, caterpillars, aphids, fungus gnats, mealybugs	3.2EC	10.0 oz	2.0 oz	1.0 T	Apply as full-coverage foliar spray. Rate is for leafminers; lower rate is for other pests. 12-hr REI SIGNAL WORD - CAUTION
Pymetrozine (Endeavor) aphids, whiteflies	50SP	1.25-2.5 oz	—	—	Only sold in water soluble packets. 12-hr REI SIGNAL WORD - CAUTION
Pyrethrin (X-clude) aphids, scale, mealybugs, spider mites, whiteflies	Aerosol	Use 5-10 second application for each 100 sq ft	Use 5-10 second application for each 100 sq ft	Use 5-10 second application for each 100 sq ft	See label. NO - REI SIGNAL WORD - CAUTION
Abbreviations: AF - aquaflo; W, WP - wettable powder; E, EC - emulsifiable concentrate; L - liquid; ME - microencapsulated; SP - sprayable or soluble powder; SC - spray concentrate; D - Dust; G - granular; A - aerosol; F - fog; SG - smoke generator; V - vapor; lb - pound; pt - pint; oz - ounce; fl oz - fluid ounce; cu ft - cubic feet; c - cup; T - tablespoon; t - teaspoon; gal - gallon(s)					
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Table 5.5 - Guide to Pesticide Usage Cross Reference to Other Common Trade Names (cont.)

Rates of Application (T= Tablespoon; t= teaspoon)					
Pesticide	Formulation	50 Gal	10 Gal	3 Gal	Precautions And Remarks
Pyridaben (Sanmite) mites, whiteflies	75WP	1-3 oz	—	—	Sold in 1 oz pouches. See label for dosage for specific pest. 12-hr REI SIGNAL WORD - DANGER
Pyridalyl (Overture) thrips, caterpillars	35WP	4.0 oz	—	—	Only sold in water-soluble packets. 12-hr REI. SIGNAL WORD - CAUTION
Pyriproxyfen (Distance, Pyrigro) whiteflies, fungus gnats, shoreflies, scale	0.86 EC	3.0-6.0 fl oz	0.5-1.0 fl oz	1.0-2.0 t	See label for restrictions on application per cropping cycle. Rate differs for scale. 12-hr REI SIGNAL WORD - CAUTION
Resmethrin whiteflies	24% liquid	0.5 pt	3.3 T	1.0 T	Spray weekly to point of runoff for 4 weeks. Best results at 70° F. Foliage should be dry. Keep greenhouse closed 2-4 hours following aerosol treatments. SIGNAL WORD - CAUTION
	Fog	1.5 fl oz/10,000 cu ft	1.5 fl oz/10,000 cu ft	1.5 fl oz/10,000 cu ft	
whiteflies, fungus gnats, thrips, cucumber beetles, aphids	1% aerosol (PT 1200)	Apply 5-10 sec/100 sq ft of bench	Apply 5-10 sec/100 sq ft of bench	Apply 5-10 sec/100 sq ft of bench	
Spinosad (Conserve) thrips, spider mites, dipterous leafminers, dipterous gall midges, lepidopterous and sawfly larvae, leaf beetles	SC	3.0-11.0 fl oz	1.0-11.0 T	1.0-11.0 t	Compatible with IPM programs. See label for resistance management and rates for specific pests. 4-hr REI SIGNAL WORD - CAUTION
Spiromesifen (Judo) mites, whiteflies	4F	1.0-2.0 fl oz	1.2-2.4 t	0.38-0.75 t	See label for species and number of applications per season. 12-hr REI SIGNAL WORD - CAUTION
Spirotetramat (Kontos) aphids, whiteflies	240SC	0.8 fl oz (25.0 ml)	0.2 fl oz (5.0 ml)	0.07 fl oz (2.0 ml)	See label for resistance management. Registered for vegetable transplants. 24-hr REI for sprays, no REI for drench. SIGNAL WORD - CAUTION
Tebufenozide (Confirm) lepidopterous larvae	2E	2.0-8.0 oz	1.0-4.0 T	1.0-4.0 t	See label regarding spray adjuvants. 4-hr REI SIGNAL WORD - CAUTION
Thiomethoxam (Flagship) aphids, whiteflies, mealybugs, soft scales	25WG	See label	—	—	See label for rate directly to soil or media. 12-hr REI SIGNAL WORD - CAUTION
	.22G	See label			See label for granular product rate. 12-hr REI SIGNAL WORD - CAUTION
Abbreviations: AF - aquaflo; W, WP - wettable powder; E, EC - emulsifiable concentrate; L - liquid; ME - microencapsulated; SP - sprayable or soluble powder; SC - spray concentrate; D - Dust; G - granular; A - aerosol; F - fog; SG - smoke generator; V - vapor; lb - pound; pt - pint; oz - ounce; fl oz - fluid ounce; cu ft - cubic feet; c - cup; T - tablespoon; t - teaspoon; gal - gallon(s)					
Useful Equivalents 1 lb WP/100 gal = 1 T/1 gal; 2.0 T = 1 fl oz; 1 pt EC/100 gal = 1 t/1 gal; 16 fl oz = 1 pt; 3 t = 1 T; 2 pt = 1 qt					

Table 5.5 - Guide to Pesticide Usage Cross Reference to Other Common Trade Names (cont.)

Rates of Application (T= Tablespoon; t= teaspoon)

Pesticide	Formulation	50 Gal	10 Gal	3 Gal	Precautions And Remarks
Ultra-fine spray oil aphids, leafminers, whiteflies, mites, scales, mealybugs	6E	0.5-1.0 gal	13.0-26.0 oz	4.0-7.5 oz	Applicator should conduct phytotoxicity tests. 4-hr REI SIGNAL WORD - CAUTION
Vapona aphids, leafminers, leafrollers, mealybugs, thrips, whiteflies	10% aerosol	Use 2-4 second application for each 1,000 cu ft	Use 2-4 second application for each 1,000 cu ft	Use 2-4 second application for each 1,000 cu ft	Treat when foliage is dry. Best and safest at house temperature of 60-65° F. Keep vents closed at least 2 hrs, or overnight. See label for precautions.
	4E	vaporize 1.0 oz/10,000 cu ft	vaporize 1.0 oz/10,000 cu ft	vaporize 1.0 oz/10,000 cu ft	SIGNAL WORD - DANGER
aphids, mealybugs, spider mites, thrips, whitefly	Fog	1.0 oz EC/3,000 cu ft	1.0 oz EC/3,000 cu ft	1.0 oz EC/3,000 cu ft	
	smoke	6.0 oz can/10,000 cu ft	6.0 oz can/10,000 cu ft	6.0 oz can/10,000 cu ft	

Abbreviations: AF - aquaflo; W, WP - wettable powder; E, EC - emulsifiable concentrate; L - liquid; ME - microencapsulated; SP - sprayable or soluble powder; SC - spray concentrate; D - Dust; G - granular; A - aerosol; F - fog; SG - smoke generator; V - vapor; lb - pound; pt - pint; oz - ounce; fl oz - fluid ounce; cu ft - cubic feet; c - cup; T - tablespoon; t - teaspoon; gal - gallon(s)

Useful Equivalents 1 lb WP/100 gal = 1 T/1 gal; 2.0 T = 1 fl oz; 1 pt EC/100 gal = 1 t/1 gal; 16 fl oz = 1 pt; 3 t = 1 T; 2 pt = 1 qt

Organic Controls for Insect Pests of Floral Crops

Peter B. Schultz, Extension Entomologist, Hampton Roads AREC

Eric R. Day, Extension Entomologist, Virginia Tech

Table 5.6 - Organic Chemicals, Predators, and Pathogens

Product	Insects Controlled	Remarks
Chemical		
Insecticidal soap	Works well on soft bodied insects in particular aphids, mites, lacebugs, mealybugs	This product is sold under many trade names and is a fatty acid soap.
Spinosad	Many insect pests, including thrips, lepidopterous larvae, and leaf beetles	Entrust is for organic production.
Rotenone	Many insect pests including aphids, leafhoppers, weevils, Japanese beetles, flea beetles	Usually sold as a dust, but some formulations can be mixed in water.
Pyrethrin	Broad spectrum, works on a wide variety of insects	Usually sold mixed with other botanical insecticides.
Predators		
Lady beetles	Feed on aphids and other soft bodied insects	Lady beetles may leave to find other prey. <i>Cryptolaemus</i> for mealybug, <i>Delphastus</i> for whitefly.
Lacewings	Aphids, scales, mealy bugs, other soft bodied insects	Immature lacewings are called aphid lions.
Predatory mites	Mostly for control of spider mites	Release approximately 2/square foot. <i>Phytoseiulus persimilis</i> will work in most situations, <i>Mesoseiulus</i> and <i>Amblyseius</i> for greenhouse and interiorscape.
Parasitic wasps	Many insect pests on the foliage including caterpillars, whiteflies.	<i>Trichogramma</i> wasps work well on many caterpillar eggs. <i>Encarsia formosa</i> for whiteflies, <i>Diglyphus</i> for leaf miner, <i>Aphytis</i> for armored scale.
Pathogens		
<i>Bacillus thuringiensis</i>	Leaf-feeding caterpillars	Known as <i>Bt</i> is sold under many trade names. A strain of this bacterium controls fungus gnats.
<i>Beauveria bassiana</i>	Aphids, leafhoppers, thrips, mites, beetles, caterpillars	A fungus, multiple applications may be needed. Trade names include Naturalis-O, Mycotrol, BotaniGard.
Entomopathogenic nematodes	Root-feeders, borers	For grubs or weevil larvae, apply to ground at base of plants. Rates are on product label; soil temperature should exceed 60°F Apply late in the day, irrigate immediately. For borers, inject directly into galleries using syringe or turkey baster. Aqueous sprays to trunk are effective. Rates are on label. Not effective against foliar feeding pests as desiccation and exposure to ultraviolet light on the leaf surface will kill the nematodes within hours.

Weed Control in Greenhouses

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Nonchemical Control

Hand-weeding and good sanitation are the safest ways to control weeds in greenhouses. Remove weeds from plugs or liners prior to planting. Use media that are free of weed seed or have been temporarily sterilized using steam or other methods. For steam sterilization of media, mix should be maintained at 180°F for at least 30 minutes. Some weed seed will not be controlled. Prevent weeds from flowering in and around the greenhouse. Allow the greenhouse to completely dry out between crops. Use concrete for the greenhouse floor. Clean up growing media that spills onto the floor.

Chemical Control

Most herbicides cannot be used in greenhouses due to the potential for chemical volatilization under high temperatures. Since greenhouses are enclosed structures, herbicide vapors are trapped around the crop and could cause severe injury. There are several herbicides that are registered for weed control under greenhouse benches. There are no preemergence herbicides registered for weed control in containers or flats located in a greenhouse. See the chapters on Home and Commercial Ornamentals for herbicides registered for annual and perennial flowers maintained outdoors.

Table 5.7 - Nonselective Herbicides Registered for Weed Control Under Greenhouse Benches

Chemical	Rate	Comments
Finale (glufosinate)	1.5-4.0 fl oz/gal	Turn off air circulation fans during application. Contact herbicide with some systemic activity. No soil residual action.
Roundup Pro (glyphosate) or other labeled formulation	1.3-2.0 fl oz/gal	Remove desired vegetation from the greenhouse and turn off air circulation fans prior to application. Systemic postemergence herbicide for control of all weeds. No soil residual action.
Reward (diquat)	0.75 fl oz + labeled rate of a nonionic surfactant/gal	Avoid spray drift to crops. Contact postemergence herbicide for control of all weeds. No residual action.

