

Nursery Crops: Diseases

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The most cost-effective way to managing nursery crop diseases is a systems approach. This approach includes three major components. The first and most important component is to prevent pathogens from entering a production facility or production system by using new containers, fresh potting mixes and healthy plant materials including liners and plugs, and irrigating with decontaminated water. It is advisable to use locally propagated plant materials whenever possible. When bringing in plant materials from another nursery is absolutely necessary, buy them from an accredited nursery and place incoming materials in an isolated areas for several weeks to observe whether they are free of high-impact diseases such as boxwood blight and sudden oak death. The second component is to create an environment that is against pathogens while promoting plant growth. This includes fertilizing and irrigating crops as needed and reducing free water on foliage. The third component is to treat the disease with right product in a timely manner when a disease emerges.

Fungicides and bactericides play an important part in the prevention of container and field-grown ornamental and flower diseases. They do not take the place of cultural control methods, but should be used to complement them. In some disease situations there are no effective chemicals available. Only chemicals registered by the Environmental Protection Agency (EPA) are recommended.

Most fungicides on the market protect woody shrubs, ground cover plants, and flowers against diseases. This protection is accomplished by preventing plant pathogens from becoming established. Systemic fungicides are therapeutic and may eradicate pathogens that are already established. Because chemicals are subject to weathering and degradation, they must be reapplied to the soil or container or susceptible parts at regular intervals as long as the danger of plant disease exists. In general, protectants must **not** be reapplied more frequently than recommended treatment intervals, or applied in excess of recommended rates.

In every instance, the manufacturer's label should be read carefully and attention should be directed particularly to the safety measures listed on the label regarding mixing, handling, compatibility with other chemicals, and application methods and rate. It is always essential that the user familiarize himself with the antidote given on the label. In many instances, the addition of a surfactant will improve retention of the chemical.

Table 5.1 - Common Diseases and Chemical Control Options

Plant Disease	Fungicide Rate/100 Gal	Remarks
Ajuga Sclerotium rot	Terraclor (75% WP) 2.0 lb/1,000 sq ft or 2.5 lb/300.0 gal water; quintozene	Dust or drench on soil surface before planting and thoroughly work into the top 2 inches of soil.
	Heritage (50%); 1.0-4.0 oz (spray) 0.2-0.9 oz (drench) azoxystrobin	Apply every 1 to 4 weeks.
	Palladium (62.5% WDG) 2.0 to 4.0 oz cyprodinil and fludioxonil	Apply at 7- to 14-da intervals
	Pageant (38%) 12.0 to 18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days
Andromeda (Japanese) (<i>Pieris</i> spp.)	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Spray every 7 days.
	<i>Phytophthora</i> dieback	Alliete (80% WDG) 1.3-4.0 lb fosetyl-AI
	FenStop 7.0-14.0 fl oz fenamidone	Spray plants at a 28-day interval.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7 to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals

5-2 Nursery Crops: *Diseases*

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Andromeda <i>Phytophthora</i> dieback (cont.)	Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.
	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
	Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.
<i>Phytophthora</i> root rot	Alliette (80% WDG) 1.0-2.0 lb/1,000 sq ft; fosetyl-Al	Drench Alliette monthly (2.0 pt/sq ft) over the surface of the potting medium.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7 to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals
	Subdue MAXX 1.0-2.0 fl oz mefenoxam	Repeat at 3-month intervals. Provide good drainage. After application, irrigate to thoroughly wet soil.
	Terrazole (35% WP) 3.5-10.0 oz etridiazole	Treat soil at 4- to 12-week intervals.
	FenStop 7.0-14.0 fl oz fenamidone	Drench 1.0-2.0 pints per square foot at a 28-day interval.
	Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.
	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.	
Arborvitae Phomopsis needle twig blight	Cleary 3336-WP (50% WP) 1.5 lb thiophanate methyl	Begin application at bud break and repeat at 7- to 10-day intervals throughout the growing season.
	Heritage (50%) 1.0-4.0 oz azoxystrobin	Apply at 1- to 4-week intervals.
Cercospora blight	Cleary 3336-WP (50% WP) 1.5 lb thiophanate methyl	Cleary 3336 should be applied when disease first appears and repeat on 10- to 14-day intervals. Shorten interval during humid, rainy weather.
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply every 14 to 28 days as needed

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Arborvitae Cercospora blight (cont.)	Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil	Apply at 14- to 21-day intervals
	Fore (80% WP) or Dithane T/O Rainshield or Dithane WF or Fore Flowable Rainshield NT or Fore WSP Rainshield 1.5 lb or 1.2 qt mancozeb	Mancozeb should be applied at 7- to 10-day intervals.
Aucuba Phytophthora root rot	Alude 1.0-2.0 qt Vital 2.0-4.0 pt phosphite	Spray every 7 days.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7 to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals
	Subdue MAXX 1.0-2.0 fl oz mefenoxam	See Andromeda.
	Terrazole (35% WP) 3.5-10.0 oz etridiazole	Treat soil at 4- to 12-week intervals.
	FenStop 7.0-14.0 fl oz fenamidone	Drench 1.0-2.0 pints per square foot at a 28-day interval.
	Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.
	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.	
Azalea Cylindrocladium root rot	Fore Rainshield NT Dithane T/O Rainshield Dithane WF or Fore WSP Rainshield 1.5 lb or 1.2 qt mancozeb	See Arborvitae.
	Cleary 3336-WP (50% 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 inter- vals during disease pressure period.
	Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil	Apply every 14 to 21 days
	Pageant (38%) 12.0 to 18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days
	Spectro TM (90% WDG) 1.0 to 2.0 lb chlorothalonil and thiophanate-methyl	Apply every 14 days
	Terraguard 50W triflumizole	Soil drenched for propagation beds, 6.0-8.0 oz or established root systems 6.0-12.0 oz.
	Torque (38.7%) 4.0 to 10.0 fl oz tebuconazole	Apply every 14 to 21 days

5-4 Nursery Crops: *Diseases*

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Azalea Cylindrocladium root rot (cont.)	OHP 26 GT-O 1.0 qt; iprodione	Dip cuttings for 5 minutes prior to planting.
Exobasidium leaf and flower gall	Fore Rainshield NT Fore WSP Rainshield Dithane T/O Rainshield NT or Dithane WF 1.5 lb or 1.2 qt mancozeb	Hand pick infected leaves and remove from plant. Apply mancozeb just before leaves unroll in spring and 10 days later.
Rust	Strike (25% WDG) 2.0-4.0 oz triadimefon	Spray to run-off when rust first appears.
Botrytis blight (Gray mold)	Broadform 4.0 to 8.0 fl oz fluopyram and trifloxystrobin	Spray at 7 to 14 day intervals.
	Compass 2.0-4.0 oz; trifloxystrobin	Spray at 7- to 14-day intervals.
	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb; iprodione	Apply to petals to protect from disease. Continue at 10- to 14-day intervals as long as disease conditions are favorable.
	Cleary 3336-WP (50% WP) 0.8 lb thiophanate methyl	Repeat every 7 to 10 days as needed during disease periods.
	Decree (50 WDG) 0.7-1.5 lb fenhexamide	Repeat at 7- to 10-day intervals.
Ovulinia petal blight	Pageant (38%) 12.0-18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days as needed
	Strike (25% WDG) 8.0-16.0 oz triadimefon	Apply Strike to all flower buds to point of run-off. Application should be made during the expanded bud stage (color showing). A second application may be needed.
	Cleary 3336-WP (50% WP) 0.5 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply Cleary 3336 as flowers open. Repeat every 4 to 6 days as needed during disease periods.
	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Daconil Weather Stik 1.4 pt chlorothalonil	Spray Daconil every 7 days during wet weather.
	Fore (80% WP) or Dithane T/O (75% DF) or Dithane WF (4F) or Fore Flowable (4F) 1.5 lb or 1.2 qt mancozeb	Spray mancozeb or ziram at 7- to 10-day intervals when flowers start to show color.
	Ziram (F-4) 3.0-4.0 pt ziram	Spray mancozeb or ziram at 7- to 10-day intervals when flowers start to show color.
Phomopsis dieback	Cleary 3336-F 12.0-16.0 fl oz Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Spray at 7- to 10-day intervals. Prune out all diseased branches. Avoid stress.
Phytophthora root and crown rot	Alude 1.0-2.0 qt Vital 2.0-4.0; phosphite	Spray every 7 days.
	Subdue MAXX 0.6-1.2 fl oz mefenoxam	Thoroughly wet soil after application of Subdue and repeat at 3-month intervals.
	Terrazole (35% WP) 3.5-10.0 oz etridiazole	Treat soil at 4- to 12-week intervals.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7 to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Azalea (cont.) Phytophthora root and crown rot (cont.)	Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	Treat soil at 3-week to 3-month intervals.
	FenStop 7.0-14.0 fl oz; fenamidone	Drench 1.0-2.0 pints per square foot at a 28-day interval.
	Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.
	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
	Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.
Phytophthora shoot blight	Alliette (80% WDG) 2.5-5.0 lb; fosetyl-Al	One application every 30 days.
	Alude 1.0-2.0 qt Vital 2.0-4.0; phosphite	Spray every 7 days.
	FenStop 7.0-14.0 fl oz; fenamidone	Spray plants at a 28-day interval.
	Micora (23.3%) 8.0 fl o mandipropamid	Apply every 7 to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals
	Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.
	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
	Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.
Powdery mildew	Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil	Apply at 14 to 21 day intervals
	Strike (25% WDG) 2.0-4.0 oz; triadimefon	Spray to run-off when mildew first appears.
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply every 14 to 28 days
	Triact 70 0.5-1.0 gal, neem oil	Apply every 14 days.
	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7 to 14 day intervals
	Sythane (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.
	Banner Maxx 2.0-4.0 fl oz propiconazole	Apply at 2- to 3-week intervals.

5-6 Nursery Crops: *Diseases*

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Azalea Rhizoctonia web blight	Cleary 3336-F 12.0-16.0 fl oz	Avoid crowding the plants. Use a drench spray treatment. Repeat at 2- to 4-week intervals.
	Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	
	Empress (23.3%) 2.0 to 6.0 fl oz Pyraclostrobin	Repeat application at 7- to 28-day intervals as needed.
	Hurricane (48%) 1.5 oz fludioxonil and mefenoxam	Apply at 21- to 28-day intervals
	Medallion (50% WP) 1-2 packets fludioxonil	Only in greenhouses and closed structures at 7- to 14-day intervals.
	Pageant (38%) 12.0 to 18.0 oz pyraclostrobin and boscalid	Apply at 7- to 14-day intervals
	Palladium (63.5% WDG) 2.0 to 4.0 oz Cyprodinil and fludioxonil	Apply at 7- to 14-day intervals
	OHP 26 GT-O 1.0-2.5 qt; iprodione	Spray plants every 7 to 14 days.
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply at 14- to 28-day intervals
Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7- to 14-day intervals	
Septoria leaf spot	Cleary 3336-F 12.0-16.0 fl oz thiophanate methyl	Repeat at 10- to 14-day intervals throughout the growing season.
Boxwood (English, American, Korean, Japanese) Phytophthora root rot	Alude 1.0-2.0 qt	Spray every 7 days.
	Vital 2.0-4.0 phosphite	
	Alliette (80% WDG) 6.4-12.8 oz (drench) sq ft fosetyl-Al	See Azalea.
	Subdue MAXX 1.0-2.0 fl oz mefenoxam	See Azalea.
	FenStop 7.0-14.0 fl oz fenamidone	Drench 1.0- 2.0 pints per square foot at a 28-day interval.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7 to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals
	Terrazole (35% WP) 3.5-10.0 oz etridiazole	See Azalea.
	Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.
	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
	Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.
Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	Treat soil at 3-week to 3-month intervals.	

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
boxwood blight	Daconil weather Stik 2.0 pt chlorothalonil Medallion WDG 2.0-4.0 oz fludioxonil 2.0-4.0 oz Cleary 3336-WP 1.5 lb thiophanate methyl Dithane 75 DF Rainshield 1.5 lb mancozeb Pageant 12.0-18.0 oz boscalid + pyraclostrobin Torque 10 fl oz tebuconazole Spectro 90WDG 1.5 lb chlorothalonil + thiophanate methyl	Apply and repeat at 7- to 14-day intervals during prolonged wet periods in spring and fall. Every 14 days, 3 applications maximum Every 14 days
Camellia Leaf gall	See Azalea.	Hand pick infected leaves.
Sclerotinia flower blight	Pageant (38%) 12.0 to 18.0 oz pyraclostrobin and boscalid Palladium (62.5% WDG) 2.0 to 4.0 oz cyprodinil and fludioxonil Terraclor (75% WP) 1 cup in enough water to give thorough coverage of 100 sq ft quintozene	Apply every 7 to 14 days Apply at 7- to 14-day intervals Drench soil surface in late December or early January.
Phytophthora root rot	See Azalea.	
Cedar Phomopsis needle and twig blight	Heritage (50%) 1.0-4.0 oz azoxystrobin Cleary 3336-WP (50% WP) 1.5 lb thiophanate methyl	Apply every 1 to 4 weeks. Begin application at bud break and repeat at 7- to 10-day intervals throughout the growing season.
Cercospora blight	Cleary 3336-F 12.0-16.0 fl oz thiophanate methyl Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil Fore (80% WP) or Dithane T/O (75% DF) or Dithane WF (4F) or Fore Flowable (4F) 1.5 lb or 1.2 qt mancozeb Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Spray at 7- to 10-day intervals, starting when plants are well leafed out or at first sign of disease. Apply at 14- to 21-day intervals Spray at 7- to 10-day intervals, starting when plants are well leafed out or at first sign of disease. Apply every 14 to 28 days as needed

5-8 Nursery Crops: *Diseases*

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Chrysanthemum Rhizoctonia root rot	Cleary 3336-F 12.0-16.0 fl oz or Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply Cleary 3336-F as a heavy drench or spray.
	Chipco 26019 (50% WP) 0.4 lb iprodione	Apply after transplant (1.0-2.0 pt/sq ft). Repeat every 14 days.
	Empress (23.3%) 2.0 to 6.0 fl oz Pyraclostrobin	Repeat application at 7- to 28-day intervals as needed.
	Hurricane (48%) 1.5 oz fludioxonil and mefenoxam	drench to completely wet root zone at 21- to 28-day intervals
	Medallion (50% WP) 1 packet fludioxonil	Apply after transplant (1.0-2.0 pt/sq ft). Repeat every 14 days.
	Pageant (38%) 12.0 to 18.0 oz pyraclostrobin and boscalid	Drench to completely wet root zones at 7- to 14-day intervals
	Palladium (63.5% WDG) 2.0 to 4.0 oz Cyprodinil and fludioxonil	Apply at 7- to 14-day intervals
	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7- to 14-day intervals
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply at 14- to 28-day intervals
Chrysanthemum Mycosphaerella ray blight	Banner Maxx 2.0-4.0 fl oz propiconazole	Apply on a 14-day schedule.
	Chipco 26019 (50% WP) 1.0-2.0 lb iprodione	Apply at 7- to 10-day intervals.
	Daconil Weather Stik 1.4 pt chlorothalonil	Apply first spray of Daconil just before flower color shows and at 7-day intervals.
	Fore (80% WP) or Dithane T/O (75% DF) or Dithane WF (4F) or Fore Flowable (4F) 1.5 lb or 1.2 qt mancozeb	Apply mancozeb at 7- to 10-day intervals. Apply at transplant of cuttings.
	Maneb 80 (80% WP) or Maneb Plus Zinc F4 Fungicide (37% F) 1.0-1.5 lb of 80 or 1.2 qt of F4; maneb Fore WSP Rainshield or Fore Rainshield NT 1.5 lb mancozeb	Apply maneb at 7- to 10-day intervals. Apply at transplant of cuttings.
	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb iprodione	Apply at first sign of disease and repeat at 10- to 14- day intervals.
	Cleary 3336-WP (50% WP) 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply Cleary 3336 at 7- to 10-day intervals as needed.

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Botrytis gray mold and <i>Septoria</i> leafspot	Broadform 4.0 to 8.0 fl oz fluopyram and trifloxystrobin	Spray at 7 to 14 day intervals.
	Cleary 3336-F 12.0-16.0 fl oz Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply at prebloom and repeat at 7- to 14-day intervals.
	Daconil Weather Stik 2.0 pt Concorde (54% SST) 1.4 pt chlorothalonil	Apply at prebloom and repeat at 7- to 14-day intervals.
	Fore WSP Rainshield or Fore Rainshield NT 1.5 lb Junction (15% DF) 1.5 lb mancozeb	Apply at 7- to 10-day intervals.
	Pageant (38%) 12.0-18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days as needed
Leaf rust	Strike (25% WDG) 2.0-4.0 oz triadimefon	Apply at first sign of disease and repeat at 7- to 14-day intervals.
	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Cygnus (50%) 3.2-6.4 oz Kresoxim-methyl	Apply at 10- to 14-day intervals.
	Fore (80% WP) or Dithane T/O (75% DF) or Dithane WF (4F) or Fore Flowable (4F) 1.5 lb or 1.2 qt mancozeb	Spray at 7- to 10-day intervals.
Chrysanthemum Pythium root rot	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Spray every 7 days.
	Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	Treat soil at 3-week to 3-month intervals.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	FenStop 7.0-14.0 fl oz fenamidone	Drench 1.0-2.0 pints per square foot at a 28-day interval.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7 to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
	Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.
	Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.
Subdue MAXX 0.05-1.0 fl oz mefenoxam	See Azaleas	
Terrazole (35% WP) 4.0-6.0 oz etridiazole	Repeat bedding plants at 4- to 8-week intervals. Repeat container plants at 4- to 12-week intervals.	

5-10 Nursery Crops: *Diseases*

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Powdery mildew	Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil	Apply at 14 to 21 day intervals
	Rubigan 3.0-5.0 fl oz; fenarimol	Spray every 10 to 14 days.
	Strike (25% WDG) 2.0-4.0 oz triadimefon	See manufacturer's directions. Spray to run-off when mildew first appears.
	Triact 70 0.5-1.0 gal, neem oil	Apply every 14 days.
	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7 to 14 day intervals
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply every 14 to 28 days
Southern blight (<i>Sclerotium</i>)	Pageant (38%) 12.0 to 18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days
	Palladium (62.5% WDG) 2.0 to 4.0 oz cyprodinil and fludioxonil	Apply at 7- to 14-da intervals
	Terraclor (25% WP) 8.0 oz quintozone	See manufacturer's directions.
Crabapple Cedar-apple rust	Banner Maxx 2.0-4.0 fl oz propiconazole	Three applications every 14 days starting at green tip.
	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Daconil Weather Stik 1.4 pt chlorothalonil	Start as flower buds open and spray 3 times at 10-day intervals.
	Fore (80% WP) or Dithane T/O (75% DF) or Dithane WF (4F) or Fore Flowable (4F) or 1.5 lb or 1.2 qt; mancozeb	Begin application at 1/4 inch to 1/2 inch green tip and continue on a 7- to 10-day schedule.
	Maneb 80 (80% WP) 1.5 lb maneb	Begin application at 1/4 inch to 1/2 inch green tip and continue on a 7- to 10-day schedule.
	Cleary 3336-WP (50% WP) 1.0 lb thiophanate methyl	Apply at 10- to 14-day intervals.
	Triact 70 0.5-1.0 gal, neem oil	Apply every 14 days.
Fire blight	Alliette (80% WP) 2.5 lb fosetyl-AI	Apply every 7 days.
	Agri-Strep 0.5 lb streptomycin sulfate	Apply at early, mid, and late flowering.
Crabapple Powdery mildew	Banner Maxx, 2.0-4.0 fl oz propiconazole	Apply Banner every 14 to 21 days.
	Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil	Apply at 14 to 21 day intervals
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Spray to run-off when mildew first appears.
	Terraguard 50W 4.0-8.0 oz triflumizole	Apply as foliar spray as needed.
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply every 14 to 28 days
	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7 to 14 day intervals
	Triact 70 0.5-1.0 gal, neem oil	Apply every 14 days.

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Scab	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Banner Maxx, 2.0-4.0 fl oz propiconazole	Banner applied on a 14-day schedule. Begin at green tip.
	Daconil Weather Stik 2.0 pt Concorde (54% SST) 1.4 pt chlorothalonil	Apply at bud break and at 7-day intervals during wet weather.
	Cleary 3336-WP (50% WP) 0.75 lb thiophanate methyl	Apply at 7- to 10-day intervals from bud break until two weeks after petal fall.
	Fore (80% WP) or Dithane T/O (75% DF) or Dithane WF (4F) or Fore Flowable (4F) or 1.5 lb or 1.2 qt Junction (15% DF) 1.5 lb mancozeb	Apply at 7- to 10-day intervals from bud break until two weeks after petal fall.
	Manzate 80 (80 % WP) 1.5 lb; maneb	Apply at 7- to 10-day intervals from bud break until two weeks after petal fall.
Crape Myrtle Powdery mildew	Banner Maxx 2.0-4.0 fl oz propiconazole	Apply Banner every 21 days.
	Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil	Apply at 14 to 21 day intervals
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Spray Strike to run-off when mildew first appears.
	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Terraguard 50W 4.0-8.0 oz triflumizole	Use higher rates under severe conditions.
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply every 14 to 28 days
	Triact 70 0.5-1.0 gal, neem oil	Apply every 14 days.
Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7 to 14 day intervals	
Daffodil Botrytis blight	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb iprodione	Apply every 10-14 days.
	Decree (50 WDG) 0.7-1.5 lb fenhexamid	Repeat at 7- to 10-day intervals.
	Pageant (38%) 12.0-18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days as needed
Fusarium and Penicillium bulb rots	Cleary 3336-WP (50% WP) 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Soak bulbs for 15 to 30 minutes in a warm dip (80° to 85°F.)
Dahlia Powdery mildew	Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil	Apply at 14 to 21 day intervals
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Spray to run-off when mildew first appears.
	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply every 14 to 28 days

5-12 Nursery Crops: *Diseases*

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Dahlia Powdery mildew (cont.)	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7 to 14 day intervals
Botrytis blight (Gray mold)	Fore Rainshield NT or Fore WSP Rainshield 1.5 lb mancozeb	
	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb iprodione	Apply to protect against disease. Repeat at 10- to 14- day intervals.
	Cleary 3336-WP (50% WP) 0.75 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply to protect against disease. Repeat at 10- to 14- day intervals.
	Decree (50 WDG) 0.7-1.5 lb fenhexamid	Repeat at 7- to 10-day intervals.
Dogwood Rhizoctonia root rot	Chipco 26019 (50% WP) 6.5 lb iprodione	Use as a drench and apply 1.0-2.0 pts of solution/sq ft.
	Empress (23.3%) 2.0 to 6.0 fl oz Pyraclostrobin	Repeat application at 7- to 28-day intervals as needed.
	Hurricane (48%) 1.5 oz fludioxonil and mefenoxam	drench to completely wet root zone at 21- to 28-day intervals
	Pageant (38%) 12.0 to 18.0 oz pyraclostrobin and boscalid	Drench to completely wet root zones at 7- to 14-day intervals
	Palladium (63.5% WDG) 2.0 to 4.0 oz Cyprodinil and fludioxonil	Apply at 7- to 14-day intervals
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply at 14- to 28-day intervals
	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7- to 14-day intervals
Botrytis petal blight	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb iprodione	Apply Chipco 26019 at 7- to 14-day intervals.
	Cleary 3336-WP (50% WP) 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply Cleary 3336 at 10- to 14-day intervals.
	Decree (50 WDG) 0.7-1.5 lb fenhexamid	Repeat at 7- to 10-day intervals.
	Pageant (38%) 12.0-18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days as needed
Botrytisphaeria canker	Pageant (38%) 12.0 to 18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days as needed
Phytophthora root rot	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Alude 1.0-2.0 qt Vital 2.0-4.0 pt phosphite	Spray every 7 days.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	FenStop 7.0-14.0 fl oz fenamidone	Drench 1.0-2.0 pints per square foot at a 28-day interval.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7 to 14 days

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Dogwood Phytophthora root rot (cont.)	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
	Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.
	Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.
	Subdue MAXX 1.0-2.0 fl oz mefenoxam	See Azalea.
Septoria leaf spot	Fore Rainshield NT Dithane T/O Rainshield NT Dithane WF or Fore WSP Rainshield 1.5 lb or 1.2 qt Junction (15% DF) 1.5 lb; mancozeb	Begin at first sign of disease and spray at intervals of 7 to 10 days.
	Daconil Weather Stik 1.4 pt Concorde (54% SST) 1.4 pt chlorothalonil	Apply at early bloom. Apply at 7- to 14-day intervals.
	Cleary 3336-F 12.0-16.0 fl oz thiophanate methyl	Spray when disease first appears and repeat at 10- to 14-day intervals.
Spot anthracnose, Leaf and flower blight Anthracnose (<i>Discula</i> sp.)	Fore Rainshield NT or Fore WSP Rainshield or Dithane T/O Rainshield NT or Dithane WF 1.5 lb or 1.2 qt mancozeb	Apply when buds begin to open, when bracts have fallen, 4 weeks later, and again in late summer after flower buds for next season have formed.
	Banner Maxx, 2.0-4.0 fl oz propiconazole	Apply Banner at 14-day intervals.
	Daconil Weather Stik 2.0 pts. chlorothalonil	For spot anthracnose and leaf and flower blight apply when buds begin to open. Repeat when bracts have fallen, 4 weeks later and in the late summer after flower buds have formed. For anthracnose (<i>Discula</i> sp.) apply 3 to 4 sprays during leaf expansion in the spring, at 10- to 14-day intervals.
	Maneb 80 (80% WP) or Maneb Plus Zinc F4 Fungicide (37% F) 1.0-1.5 lb or 0.8-1.2 qt maneb Junction (15% DF) 1.5 lb mancozeb	For spot anthracnose, leaf and flower blight apply when buds begin to open. Repeat when bracts have fallen, 4 weeks later and in the late summer after flower buds have formed. For anthracnose (<i>Discula</i> sp.) apply 3 to 4 sprays during leaf expansion in the spring, at 10- to 14-day intervals.
Powdery mildew	Concert II (41.4%) 22.0 to 35.0 fl oz ozpropiconazole and chlorothalonil	Apply at 14 to 21 day intervals
	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.
	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply every 14 to 28 days
	Triact 70 0.5-1.0 gal, neem oil	Apply every 14 days.

5-14 Nursery Crops: *Diseases*

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Dogwood Powdery mildew(cont.)	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7 to 14 day intervals
Euonymus Powdery mildew	Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil	Apply at 14 to 21 day intervals
	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.
	Systhane (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.
	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7 to 14 day intervals
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply every 14 to 28 days
Crown gall	Galltrol-A	See manufacturer's directions. Purchase healthy plants. Do not replant in beds where infected plants have been removed.
Anthracnose (<i>Colletotrichum</i>)	Fore Rainshield NT Dithane T/O Rainshield NT Dithane WF, or Fore WSP Rainshield 1.5 lb or 1.2 qt Junction (15% DF) 1.5 lb mancozeb	Spray at bud break, then repeat at 14-day intervals.
	Daconil Weather Stik 1.375 pt Concorde (54% SST) 1.37 pt chlorothalonil	Spray at bud break, then repeat at 14-day intervals.
Botrytis blight (Gray mold)	Decree (50 WDG) 0.7-1.5 lb fenhexamid	Repeat at 7- to 10-day intervals.
	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb iprodione	Repeat at 10- to 14-day intervals.
	Pageant (38%) 12.0-18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days as needed
Forsythia Rhizoctonia	Chipco 26019 (50% WP) 0.4 lb iprodione	Apply after transplanting (1.0-2.0 pt/sq ft). Repeat after 14 days.
	Cleary 3336-F 12.0-16.0 fl oz thiophanate methyl	Apply as a drench or heavy spray.
	Empress (23.3%) 2.0 to 6.0 fl oz Pyraclostrobin	Repeat application at 7- to 28-day intervals as needed
	Hurricane (48%) 1.5 oz fludioxonil and mefenoxam	Drench to completely wet root zone at 21- to 28-day intervals
	Pageant (38%) 12.0 to 18.0 oz pyraclostrobin and boscalid	Drench to completely wet root zones at 7- to 14-day intervals
	Palladium (63.5% WDG) 2.0 to 4.0 oz Cyprodinil and fludioxonil	Apply at 7- to 14-day intervals
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply at 14- to 28-day intervals
Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7- to 14-day intervals	

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Forsythia Phytophthora shoot blight	See Azalea shoot blight	
Gladiolus Botrytis leaf blight	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb iprodione	Chipco 26019 at 10- to 14-day intervals.
	Daconil Weather Stik 1.4 pt chlorothalonil	Apply Daconil every 7 to 10 days during normal weather, every 2 to 3 days during wet periods.
	Decree (50 WDG) 0.7-1.5 lb fenhexamid	Apply at 7- to 10-day intervals.
	Pageant (38%) 12.0-18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days as needed
Penicillium and Fusarium corm rots (pre-planting)	Cleary 3336-WP (50% WP) 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Submerge clean corms for 15-30 minutes in warm water (80° to 85°F). Stir solution constantly to be sure chemical remains in suspension.
Curvularia and Leaf spots <i>Stemphylium</i>	Maneb 80 (80% WP) or Maneb Plus Zinc F4 Fungicide (37% F) 1.5 lb or 1.2 qt; maneb	Begin when flower spikes are developing. Repeat 2 to 3 times at weekly intervals.
Hawthorn Rust and <i>Fabraea</i> leaf spot	Systhane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Daconil Weather Stik 1.4 pt chlorothalonil	Spray at prebloom with cover sprays at 7- to 10-day intervals as needed.
	Fore Rainshield NT Dithane T/O Rainshield NT Dithane WF or Fore WSP Rainshield 1.5 lb; mancozeb	
Holly (Japanese) Root rot (<i>Thielaviopsis basicola</i> , <i>Rhizoctonia</i>)	Affirm or Veranda-O (11.3%) 0.3 to 0.5 lb polyoxin D zinc salt	Drench to completely wet root zone at 14- to 28-day intervals as needed
	Cleary 3336-F 12.0-16.0 fl oz Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Sanitation in propagation. Apply as heavy drench or spray to 800 sq ft of bench area (1.0-2.0 pts/sq ft). Repeat at 2- to 4-week intervals.
	OHP 26 GT-0 13.0 fl oz	Drench 1.0 to 2.0 pints of solution per square foot every 14 days.
Rhizoctonia web blight (<i>Rhizoctonia solani</i>)	Cleary 3336-F 12.0-16.0 fl oz Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply as a heavy drench or spray to 800 sq ft of bench or bed area, (1.0-2.0 pts/sq ft). Repeat at 2- to 4-week intervals.
	Empress (23.3%) 2.0 to 6.0 fl oz Pyraclostrobin	Repeat application at 7- to 28-day intervals as needed.
	Hurricane (48%) 1.5 oz fludioxonil and mefenoxam	Apply at 21- to 28-day intervals
	Pageant (38%) 12.0 to 18.0 oz pyraclostrobin and boscalid	Apply at 7- to 14-day intervals
	Palladium (63.5% WDG) 2.0 to 4.0 oz Cyprodinil and fludioxonil	Apply at 7- to 14-day intervals
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply at 14- to 28-day intervals

5-16 Nursery Crops: *Diseases*

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Holly (<i>Japanese Rhizoctonia web blight</i>) (<i>Rhizoctonia solani</i>) (cont.)	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7- to 14-day intervals
Phytophthora and Pythium root rot	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Alliette (80% WDG) 1.0-2.0 lbs/1000 sq ft fosetyl-AI	
	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Spray every 7 days.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	FenStop 7.0-14.0 fl oz fenamidone	Drench 1.0-2.0 pints per square foot at a 28-day interval.
	Subdue MAXX 1.0-2.0 fl oz mefenoxam	See Azalea.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7- to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10- to 14 day intervals
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
	Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.
Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.	
Hydrangea Botrytis leaf 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.
	Cleary 3336-F 12.0-16.0 fl oz Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply when disease first appears, repeat at 10- to 14-day intervals.
	Decree (50 WDG) 0.7-1.5 lb fenhexamid	Repeat at 7- to 10-day intervals.
	Fore Rainshield NT Fore WSP Rainshield Dithane T/O Rainshield NT or Dithane WF 1.5 lb; mancozeb	Apply at 7- to 14-day intervals.
	Pageant (38%) 12.0-18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days as needed

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Juniper Phomopsis needle and twig blight	Cleary 3336-WP (50% WP) 1.5 lb thiophanate methyl	Begin application at bud break and repeat at 7-day intervals through the growing season.
	Fore Rainshield NT Fore WSP Rainshield Dithane T/O Rainshield NT or Dithane WF 1.5 lb mancozeb	Begin application at bud break and repeat at 7-day intervals through the growing season.
Rhizoctonia web blight (<i>Rhizoctonia solani</i>)	Cleary 3336-F 12.0-16.0 fl oz Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply as a heavy drench or spray to 800 sq ft of bench or bed area, (1.0-2.0 pts/sq ft). Repeat at 2- to 4-week intervals. Avoid crowding plants.
	Empress (23.3%) 2.0 to 6.0 fl oz Pyraclostrobin	Repeat application at 7- to 28-day intervals as needed.
	Hurricane (48%) 1.5 oz fludioxonil and mefenoxam	Apply at 21- to 28-day intervals
	OHP 26 GT 1.0-2.5 qt; iprodione	Spray plants every 7 to 14 days.
	Pageant (38%) 12.0 to 18.0 oz pyraclostrobin and boscalid	Apply at 7- to 14-day intervals
	Palladium (63.5% WDG) 2.0 to 4.0 oz Cyprodinil and fludioxonil	Apply at 7- to 14-day intervals
	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7- to 14-day intervals
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply at 14- to 28-day intervals
Phytophthora and Pythium root rot	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Alliette (80% WP) 1.0-2.0 lbs/1000 sq ft; fosetyl-AI	See Azalea.
	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Spray every 7 days.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	FenStop 7.0-14.0 fl oz fenamidone	Drench 1.0-2.0 pints per square foot at a 28-day interval.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7 to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
	Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.
	Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.
Subdue Maxx 1.0-2.0 fl oz; mefenoxam	See Azalea.	

5-18 Nursery Crops: *Diseases*

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Lilac Powdery mildew	Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil	Apply at 14 to 21 day intervals
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Spray 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.
	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7 to 14 day intervals
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply every 14 to 28 days
Liriope Fusarium root and crown rot	Empress (23.3%) 2.0 to 6.0 fl oz pyraclostrobin	Apply at 7- to 28-day intervals as needed
Mountain Laurel (<i>Kalmia latifolia</i>) Cercospora leaf spot	Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil	Apply at 14- to 21-day intervals
	Daconil Weather Stik 2.0 pt chlorothalonil	Spray at 7-day intervals during wet weather. Spray when buds break in the spring and twice more at 2-week intervals.
	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply every 14 to 28 days as needed
Pachysandra Volutella leaf and stem blight	Fore Rainshield NT Dithane T/O Rainshield NT Dithane WF or Fore WSP Rainshield 1.5 lb mancozeb	Apply first spray in the spring. Make 5 applications at 10- to 14-day intervals.
	Fixed Copper (WP) 1.0 lb; copper	Apply Fixed Copper at 7- to 10-day intervals.
Peony Botrytis blight (Gray mold)	Cleary 3336-F 12.0-16.0 fl oz thiophanate methyl	Begin when disease first appears and repeat at 10- to 14-day intervals.
	Decree (50 WDG) 0.7-1.5 lb fenhexamid	Repeat at 7- to 10-day intervals.
	Pageant (38%) 12.0-18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days as needed
Alternaria leaf spot and Phytophthora blight	Maneb 80 (80% WP) or Maneb Plus Zinc F4 Fungicide (37% F) 1.5 lb or 1.2 qt; maneb	Begin when disease first appears and repeat at 10- to 14-day intervals.
Rhizoctonia root and stem rot	Cleary 3336-F 12.0-16.0 fl oz Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply as a heavy drench or spray to 800 sq ft of bench or bed area, (1.0-2.0 pts/sq ft). Repeat at 2- to 4-week intervals. Avoid crowding plants.
	Empress (23.3%) 2.0 to 6.0 fl oz Pyraclostrobin	Repeat application at 7- to 28-day intervals as needed.
	Hurricane (48%) 1.5 oz fludioxonil and mefenoxam	Apply at 21- to 28-day intervals
	OHP 26 GT 1.0-2.5 qt; iprodione	Spray plants every 7 to 14 days.
	Pageant (38%) 12.0 to 18.0 oz pyraclostrobin and boscalid	Apply at 7- to 14-day intervals
	Palladium (63.5% WDG) 2.0 to 4.0 oz Cyprodinil and fludioxonil	Apply at 7- to 14-day intervals

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Peony (cont.) Rhizoctonia root and stem rot (cont.)	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7- to 14-day intervals
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply at 14- to 28-day intervals
Periwinkle (<i>Vinca minor</i>) Phomopsis stem rot	Cleary 3336-F 12.0-16.0 fl oz thiophanate methyl	Begin when disease first appears and repeat at 10- to 14-day intervals.
Photinia Powdery mildew	Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil	Apply at 14 to 21 day intervals
	Strike (25% WDG) 2.0-4.0 oz triadimefon	
	Systhane (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.
	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7 to 14 day intervals
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply every 14 to 28 days
Entomosporium leaf spot (<i>Entomosporium maculatum</i>)	Banner MAXX 2.0-4.0 fl oz propiconazole	Apply in early spring as growth starts and reapply on 14-day schedule until new growth is fully expanded.
	Strike (25% WDG) 16.0 oz; triadimefon	
	Daconil Weather Stik 1.4 pt Concorde (54% SST) 1.4 pt chlorothalonil	Spray at 2- to 4-week intervals. Avoid overhead irrigation. Avoid crowding containers.
	Fore Rainshield NT Dithane T/O Rainshield NT Dithane WF or Fore WSP Rainshield 1.5 lb mancozeb	Spray at 7- to 14-day intervals.
	Cleary 3336-F 12.0-16.0 fl oz thiophanate methyl	Spray at 7- to 14-day intervals.
Pine (White, Japanese, Black) Phytophthora root rot	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Alliette (80% WP) 1.0-2.0 lbs/100 sq ft fosetyl-Al	See Azalea.
	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Spray every 7 days.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	FenStop 7.0-14.0 fl oz fenamidone	Drench 1.0-2.0 pints per square foot at a 28-day interval.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7 to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
	Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.
	Stature (43.55% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14 day intervals. Constant agitation required.
Subdue Maxx 1.0-2.0 fl oz mefenoxam	See Azalea.	

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Pyracantha (Firethorn) Fire blight	Alliette (80% WP) 2.5 lb fosetyl-AI	Begin spray at pre-bloom. Repeat as necessary but do not exceed one application every 7 days until blooming period ends.
	Streptomycin agric. compd. 100 ppm streptomycin sulfate	Spray when 20% of the blossoms are open and repeat 5 to 7 days during bloom period. COMMERCIAL ORNAMENTAL USE ONLY.
	Fixed copper 1.0 lb copper	Apply the first spray at bud break, 10 to 14 days later and at petal fall.
Pyracantha Scab	Systhane (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	Spray at bud break and repeat twice at 10-day intervals.
	Fore Rainshield NT Dithane T/O Rainshield NT Dithane WF or Fore Flowable WSP Rainshield 1.5 lb or 1.2 qt Junction (15% DF) 1.5 lb mancozeb	Spray at 7- to 14-day intervals.
	Fixed Copper 1.0 lb; copper	Spray at 7- to 14-day intervals.
	Cleary 3336-WP (50% WP) 0.8 lb thiophanate methyl	Begin when disease appears and repeat at 10- to 14-day intervals.
Rhododendron Ovulinia petal blight	Same as for Azalea.	Same as for Azalea.
Phytophthora root rot and wilt	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Alliette (80% WDG) 2.5-5.0 lb fosetyl-AI	Spray to run-off at monthly intervals.
	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Spray every 7 days.
	Banol (66.5%) 20.0-30.0 fl oz propamocarb hydrochloride	Repeat every 3 weeks to 3 months.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluxastrobin	Apply at 14- to 28-day intervals.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7 to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
	Terrazole (35% WP) 4.0-10.0 oz etridiazole	See Azalea.
	Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.
	Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.
	Subdue Maxx 1.0-2.0 fl oz mefenoxam	See Azalea.
Rust	Same as for Azalea.	Same as for Azalea.

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Rhododendron (cont.)	Chipco 26019 (50% WP) 1.0-2.0 lb Sextant (23.3%) 1.0-2.5 lb; iprodione	See Azalea.
Botrytis gray mold	Cleary 3336-WP (50% WP) 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	See Azalea.
	Decree (50 WDG) 0.7-1.5 lb fenhexamid	Apply at 7- to 10-day intervals.
	Pageant (38%) 12.0-18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days as needed
Rose Crown gall	Galltrol-A	See manufacturer's directions. Purchase healthy rose bushes. Do not injure the roots or crowns of roses.
Black spot	Banner EC Maxx, 2.0-4.0 fl oz propiconazole	Tank mix with a registered contact fungicide labeled for black spot control.
	Cleary 3336-WP (50% WP) 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Start applications in the spring as leaves expand. During dry weather, treat at 7- to 10-day intervals for Daconil.
	Daconil Weather Stik 1.375 pt chlorothalonil	Start applications in the spring as leaves expand. During dry weather, treat at 7- to 10-day intervals for Daconil.
	Fore Rainshield NT Dithane T/O Rainshield NT Dithane WF or Fore WSP Rainshield 1.5 lb Junction (15% DF) 1.5 lb mancozeb	Apply at 7- to 14-day intervals.
	Maneb 80 (80% WP) or Maneb Plus Zinc F4 Fungicide (37% F) 1.5 lb or 1.2 qt; maneb	Apply at 7- to 14-day intervals.
	Triact 70 0.5-1.0 gal, neem oil	Apply every 14 days.
	Torque (38.7) 4.0 to 10.0 fl oz tebuzonazole	Apply every 14 to 21 days as needed
	Sythane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
Botrytis blight (Gray mold)	Decree 0.7-1.5 lb; fenhexamid	Spray every 7 to 14 days.
	Cleary 3336-WP (50% WP) 0.8 lb Fungo 50 AGC 12.0-16.0 oz thiophanate methyl	Apply to buds to protect against disease. Repeat 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 to buds to protect against disease. Repeat at 10- to 14-day intervals.
	Pageant (38%) 12.0-18.0 oz pyraclostrobin and boscalid	Apply every 7 to 14 days as needed

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Rose (cont.) Downy mildew	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Alliette (80% WDG) 2.5 lb fosetyl-AI	Apply every 7 to 14 days.
	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Spray every 7 days.
	Cygnus (50%) 3.2-6.4 oz kresoxim-methyl	
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	FenStop 7.0-14.0 fl oz fenamidone	Spray plants at a 28-day interval.
	Heritage (50%) 2.0-4.0 oz azoxystrobin	Apply every 1 to 3 weeks.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7 to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
	Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.
Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.	
Powdery mildew	Banner Maxx, 2.0-4.0 fl oz propiconazole	Thorough coverage is needed for best results.
	Concert II (41.4%) 22.0 to 35.0 fl oz propiconazole and chlorothalonil	Apply at 14 to 21 day intervals
	Cygnus (50%) 1.6-3.2 oz kresoxim-methyl	Start applications in the spring as leaves expand. Treat at 10- to 14-day intervals to protect. Spray at 7-day intervals if mildew is present.
	Strike (25% WDG) 2.0-4.0 oz triadimefon	Start applications in the spring as leaves expand. Treat at 10- to 14-day intervals to protect. Spray at 7-day intervals if mildew is present.
	Systhane (40% WSP) 4.0 oz myclobutanil	Apply at 10- to 14-day intervals.
	Terraguard 50W 4.0-16.0oz triflumizole	Apply on a 7- to 14-day interval as needed. Use the high rate on an existing infection.
	Trinity (19.2%) 8.0 to 12.0 fl oz triticonazole	Apply at 7 to 14 day intervals
	Tourney (50% WDG) 1.0 to 4.0 oz metconazole	Apply every 14 to 28 days
Willow <i>Crown gall</i>	Galltrol-A	See manufacturer's directions.

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

Plant Disease	Fungicide Rate/100 Gal	Remarks
Yew (<i>Taxus</i>) Phytophthora root rot and crown rot	Adorn (39.5%) 1.0-4.0 fl oz fluopicolide	Apply at 14- to 28-day intervals but not more than twice per crop cycle.
	Alliette (80% WDG) 1.0-2.0 lbs/1000 sq ft; fosetyl-Al	See Azalea.
	Alude 1.0-2.0 qt Vital 2.0-4.0 pt; phosphite	Spray every 7 days.
	Disarm (40.3% SC) 1.0-6.0 fl oz fluoxastrobin	Apply at 14- to 28-day intervals.
	FenStop 7.0-14.0 fl oz fenamidone	Drench 1.0-2.0 pints per square foot at a 28-day interval.
	Micora (23.3%) 8.0 fl oz mandipropamid	Apply every 7 to 14 days
	Orvego (46.2%) 14.0 fl oz ametoctradin and dimethomorph	Apply at 10 to 14 day intervals
	Pageant (38.0% WDG) 4.0-18.0 oz pyraclostrobin	Apply at 7- to 14-day intervals.
	Terrazole (35% WP) 4.0-10.0 oz etridiazole	Repeat every 4 to 12 weeks.
	Segway (34.5% SC) 2.0-6.0 fl oz cyazoflamid	Apply at 14- to 28-day intervals.
	Stature (43.5% SC) 6.0-13.0 fl oz dimethomorph	Apply at 10- to 14-day intervals. Constant agitation required.

Nursery Crops: Organic Controls for Insect Pests

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Table 5.2 - Organic Controls for Predators and Pathogens

Products or pathogens	Insects Controlled	Remarks
Azadirachtin	Thrips, aphids, lepidopterous larvae, mealybugs, leafhoppers, leafminers,	Sold under many trade names including; Azatin, Triact, Omazin, Neemazide, Trilogy, and Azatrol.
<i>Bacillus thuringiensis</i>	Leaf-feeding caterpillars, elm and willow leaf beetle	Known as "Bt," sold under many trade names. A strain of Bt is sold as M-One for beetle control
<i>Beauveria bassiana</i>	Beetles, Aphids, Others	Various trade names
<i>Capsicum oleoresin</i> extract, garlic and soy-bean oils	Thrips and mites	Sold as Captiva
Chromobacterium subtsugae strain PRRA4-1	Caterpillars, cottonwood leaf beetle	Sold as Grandevo WDG; See label for rates for specific pests.
d-limonene	Imported fire ants	Provides quick kill of workers.
Entomopathogenic nematodes	Root-feeders, borers, black vine weevil	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 kills the nematodes within hours.
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. Least impact on natural enemies.
<i>Isaria fumosorosea</i> <i>Apopka</i> Strain 97	Aphids, thrips, whiteflies, weevils, psyllids, leafminers, spider mites, mealybugs	See label. Foliar and soil applications. Sold as Preferal.
Kaolin clay	Beetles, Aphids, Caterpillars, Others	Various trade names
Pyrethrins	Broad spectrum, works on a wide variety of insects	Sold under numerous trade names. Pycana is mixed with canola oil and is labeled for use on flowers, shrubs, fruits, and vegetables in shadehouse, nursery, hoophouse, container-grown nursery crops, and greenhouses.
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.
Spinosad	Many insect pests, including thrips, lepidopterous larvae, and leaf beetles	Entrust is for certified organic production.
Predators	Insects Controlled	Remarks
Lady beetles	Feed on aphids and other soft bodied insects	Lady beetles may leave to find other prey after release. <i>Cryptolaemus</i> is used for mealybug, <i>Delphastus</i> is used for whitefly. <i>Chilocorus</i> is used for scales.
Lacewings	Aphids, scales, mealybugs, other soft bodied insects	Immature <i>Chrysoperla carnea</i> are called aphid lions.
Predatory mites	Mostly for control of spider mites	Release approximately 2/square foot. <i>Phytoseiulus persimilis</i> will work in some situations.
Parasitic wasps	Many insect pests on the foliage including caterpillars, whiteflies	<i>Trichogramma</i> wasps work well on many Lepidoptera eggs; <i>Encarsia formosa</i> for whiteflies; <i>Diglyphus</i> for leaf miners; <i>Aphytis</i> for armored scale.

Nursery Crops: Insects

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These recommendations are for use by nursery producers, commercial and municipal arborists, and other certified applicators, Category 3, who are responsible for the production, care, and protection of shade trees, shrubs, and other woody ornamental plants. Pest control is a highly complex and technical implementation of cultural and pest management practices.

There is no simple magic formula for pest control on trees and shrubs. More than 250 species of insects and mites are commonly found which damage or are potentially injurious to over 100 genera of woody ornamentals. Great diversity by insects in host preferences, seasonal development, periods of activity, habits, and susceptibility to insecticides requires careful planning and critical timing of control measures. It is a simple fact that insects and mites will occur, multiply, and cause serious losses if ignored or inadequately controlled. The most frequent cause of insect problems is the failure of nurserymen and arborists to carry out necessary control procedures properly at the right time due to pressures from other phases of production and maintenance.

The best way to control insects and mites is a preventive program. First, do not introduce pest problems. In nursery production, propagate or buy **ONLY** clean, uninfested stock plants. In municipal tree plantings or private landscaping, set out **ONLY** insect-free plant materials. The presence of a few hardly noticeable insects or mites at planting time is a sure source of extra work and costly effort later on. Second, draw up a seasonal pest monitoring schedule to prevent the establishment and buildup of insects and mites. Third, maintain regular surveillance of established plant materials and be prepared to schedule control measures for difficult or complex pest problems which arise. Take advantage of assistance from your local Extension faculty and the Extension specialists at Virginia Tech.

How to Use These Recommendations

Prepare a seasonal monitoring and management schedule for your specific plant types and pest problems. Each nursery, municipality, or local area tends to have its own unique pest situation depending on routine cultural and control practices. If the pest situation is not known, conduct a thorough survey to determine which problems exist and what the control needs are. Select those treatments which most conveniently fit the work plan in your own operation. For example, the use of dormant sprays on many plants will minimize or eliminate the need for spraying operations during the busier periods of the season. Another example is controlling spruce and southern red mite in the fall rather than the spring, or controlling pine needle scale in late July rather than in May. With careful study and planning these recommendations can be adapted to an effective, seasonal, preventive control program. There are numerous built-in options and alternatives. It is essential to carry out the program precisely. Thoroughness and proper timing are critical in obtaining effective results. Degree day (DD) accumulations to the susceptible life stage are included (50°F base temperature) in the timing section. Beware that using this information without scouting can lead to unnecessary applications.

Precautions

Be absolutely sure to read and follow **ALL** of the directions and precautions on the labels and accompanying brochures of the pesticides used. Every statement included is important and can prevent serious injuries or losses. Be sure that those involved in the application of pesticides are fully informed of all precautions for use and are certified applicators. Formulations and amounts to mix in preparing sprays are given; however, consult the labels for precise directions. It is illegal to use pesticides inconsistent with uses specified on the label. Be sure the host plants and pests to be controlled are stated on the label of the product you use.

Toxicity and Hazard to Humans and Animals

As a guide to general hazards of chemicals, know the relative toxicities of common insecticides. Also study the precautionary statements on pesticide labels. Certain chemicals may be more readily absorbed through the skin than if ingested, or vice versa. Some may be relatively non-toxic to bees and birds, but highly toxic to fish. Other chemicals may be acutely or chronically toxic to bees. Read the label for special precautions. In using pesticides, avoid application where undesirable side effects may result. When spraying, it is essential to stay out of drift and direct spray. Wear protective equipment as directed by the label.

Special Precautions for Pollinators

Some insecticides may be acutely or chronically toxic to bees. Read the label for special precautions. Certain labels contain special precaution section titled "Protection of Pollinators". A bee hazard icon may warn applicators of special application restrictions to protect pollinators.

Plant Injury

Insecticides vary greatly in their phytotoxicity. Be sure to avoid treating sensitive or stressed plants. Cautions on the label usually indicate plants which should not be sprayed. **Read the entire label carefully.** Petroleum oils for dormant or summer spraying are much safer, but may injure birch, beech, sugar and Japanese maple, hickory, walnut, butternut, douglas fir, spruces, or juniper.

It is important not to mix pesticides which are not compatible with each other, and avoid formulations not intended for use on plants. Formulations used for structural pest control should never be applied to plants.

Table 5.3 - Control Measures for Major Pests and Pest Groups

Pest	Control	Timing of Treatment	Remarks
Adelgids spruce gall adelgid	bifenthrin carbaryl diazinon endosulfan imidacloprid malathion	Treat just before buds break in the spring, and/or in September and early October after galls have opened.	Spring treatments should be applied before cottony egg masses are evident on buds in the spring. Cooley spruce gall adelgid on Douglas fir does not produce galls; it feeds openly on the needles. Sprays can be applied in September and October.
pine bark adelgid	bifenthrin deltamethrin diazinon horticultural oil imidacloprid insecticidal soap malathion	Treat in late April or early May and repeat 2-3 weeks later.	Use a forceful spray to penetrate cottony secretions and wash aphids from twigs and bark. Use less-toxic materials in public areas and around homes. Deltamethrin labeled for adelgids. For additional information on this pest, refer to: http://bit.ly/1jDVntZ
hemlock woolly adelgid	bifenthrin diazinon dinotefuran horticultural oil insecticidal soap imidacloprid thiamethoxam	Treat in late June and/or in September or October.	When spraying, thoroughly wet entire plant including the bark of branches and the trunk. Use a forceful spray; be sure the new growth is thoroughly wet. Use care when treating soil to avoid runoff from site. For additional information on this pest, refer to: http://bit.ly/1jDVEwX
hickory leafstem gall aphid	malathion	Treat just as new buds are beginning to open. Timing is critical.	Because aphids begin feeding immediately as leaf buds begin to open, control is very difficult and often ineffective.
Ambrosia Beetles	bifenthrin permethrin	Treat trunk and larger branches in April when the daytime temperature exceeds 70°F for the first time.	Sawdust projecting from the trunk like a toothpick is diagnostic for this insect. Treat the bark but leave infested trees in place as trap trees for 1 month before removing and destroying. Trees can often survive a small infestation.
Ants see "imported fire ant"			

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks	
Aphids (general)	abamectin	Some aphids (spirea, willow twig, white pine) occur in the spring. Others (crape myrtle, giant bark, willow leaf, linden, maple and oak) build up in mid-summer. Many (white pine aphid) may migrate to hosts throughout the season and in the fall. Look for honeydew or sooty mold.	Apply control measures before populations become large. Aphids may infest buds, leaves, stems, branches, or trunks of the host plants. Be sure to follow all label directions and precautions. Use less toxic and less hazardous materials in public areas, around homes, and where plants are to be moved or transplanted. Be aware of lady beetles, aphid lions, syrphid larvae, and other beneficial populations. Do not apply when plants are flowering and honeybees are active. Root aphids are best controlled with <i>Beauveria bassiana</i> or acephate. Do not apply dinotefuran to linden, basswood or other tilia.	
	acephate			
	acetaprimid			
	azadirachtin			
	<i>Beauveria bassiana</i>			
	diazinon			
	dimethoate			
	dinotefuran			
	endosulfan			
	flonicamid			
	flupyradifurone			
	fluvalinate			
	imidacloprid			
	insecticidal soap			
	malathion			
	methiocarb			For additional information on this pest, refer to: http://bit.ly/1jDVQwm
pymetrozine				
rotenone				
spirotetramat				
thiamethoxam				
Bagworm	acephate	Apply treatments when bags are less than 1/2 inch. Late May in coastal Virginia, early to mid-June elsewhere. DD-600 controls less effective in mid-late summer.	Lightly misting the foliage is sufficient. Mist blower treatments are effective. Do not use the more toxic or hazardous materials in public areas or around homes. Carbaryl and permethrin may lead to mite increases. Light infestations can be handpicked and destroyed. Indoxacarb and chlorantraniliprole are for landscape use only.	
	azadirachtin			
	bifenthrin			
	carbaryl			
	chlorantraniliprole			
	cyfluthrin			
	diazinon			
	emamectin benzoate			
	fluvalinate			
	indoxacarb			
	gamma-cyhalothrin			For additional information on this pest, refer to: http://bit.ly/1LrpfTh
	lambda-cyhalothrin			
	methoxyfenozide			
permethrin				
spinosad				
tebufenozide				
	<i>Bacillus thuringiensis</i> (Bt)	Treat when larvae are young in mid to late June.	Lightly misting the foliage is sufficient. Mist blower treatments are effective.	
	remove and burn bags	August to May for light infestation of a few infested trees.	Overwintering eggs remain inside the bags until hatching in late May. Destroy the bags; eggs will hatch from bags thrown on the ground.	
Bark Beetles Deciduous trees	bifenthrin	Treatments should be applied to prevent infestation of and breeding in the bark. Treat weakened or injured trees in late April and repeat 2 or 3 times at monthly intervals.	Thoroughly soak the bark of the trunk and branches. Sprays are more concentrated than usual foliar treatments. Cypermethrin, landscapes only.	
	cypermethrin			
	permethrin			For additional information on this pest, refer to: http://bit.ly/1NXNI6i

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
Bark Beetles (cont.) elm bark beetle	sanitation	Immediately destroy all branches larger than 1-1/2" in diameter as soon as they begin to die or are cut to prevent infestation and breeding by beetles.	Wood should NEVER be piled or stored unless all of the bark is removed. Where possible, susceptible wood should be burned or buried with at least 18 inch fill.
	bifenthrin methoxychlor permethrin	As late in the spring as possible before LEAF BUDS open. This treatment can be supplemented with a second spray in early June.	Complete coverage of all bark is absolutely essential, especially the one year-old twigs in the tops and outer reaches of the trees. The trunk and larger branches should be soaked thoroughly. Spraying is supplementary to sanitation.
Conifers	bifenthrin permethrin	Treat unhealthy, weakened, or damaged trees in early April, early June, and August if near infested trees. Also effective in preventing spread if sprayed on infested trees or wood before beetles emerge, or in preventing infestations in uninfested wood that is cut but cannot be disposed of immediately.	Thoroughly wet the bark. Healthy vigorous trees are not likely to be attacked and do not require spraying. Beetles will not reinfest or attack wood or trees dead more than one year.
	sanitation	Throughout the year, particularly during the growing season, when trees begin dying or wood is cut. Prune out large, dying, or recently dead branches.	Dispose of susceptible wood, slash, and bark from stumps by burning, burying where feasible. Beetles will not reinfest or attack wood or trees dead longer than one year.
shot-hole borer, fruit tree bark beetles, ash bark beetle (<i>Scolytus</i>)	bifenthrin permethrin	Spray the bark of healthy trees in late April and early June.	
Borers banded ash borer	bifenthrin permethrin	Treat trunk and main stems in late July and again in early September	Control measures are aimed at newly hatched larvae prior to tunneling into the tree. For additional information on this pest, refer to: http://bit.ly/1KtyfDI
lilac borer ash borer	bifenthrin endosulfan permethrin	Treat trunk and branches in early May and again 6 weeks later. DD-148	Treatments kill emerging as well as entering borers. Thorough wetting and soaking of the bark is necessary. Foliage need not be treated. For additional information on this pest, refer to: http://bit.ly/1Ma5eh9
dogwood borer	bifenthrin endosulfan permethrin	Treat trunk and larger branches in mid-May and repeat after 6 weeks. DD-250	Brown frass around bark cracks and wounds indicate an infestation. For additional information on this pest, refer to: http://bit.ly/1i0pnP0
peach tree borer	acelepryn bifenthrin chlorantraniliprole chlorantraniliprole permethrin	Treat trunks and soil around the base in July and repeat in 6 weeks.	Cracked bark, frass, and gummosis at the root crown are signs of infestation. Chlorantraniliprole is for landscape use only
rhododendron borer	bifenthrin permethrin	Treat the trunks and larger branches in late June. DD-192	Wilting foliage and dieback are symptoms.

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
Borers (cont.) bronze birch borer	bifenthrin permethrin	Treat all bark surfaces, especially in the uppermost part of the tree in mid-May, early, mid-, and late June. DD-440	Bifenthrin and permethrin are labeled for landscapes.
emerald ash borer	bifenthrin carbaryl cyfluthrin dinotefuran emamectin benzoate imidacloprid spinosad permethrin	Branch and trunk applications in early May and early June.	Additional insecticides are labeled as soil drenches and tree injections. See PMG 456-018 <i>Insects of trees and shrubs</i> . Do not move firewood. For additional information on this pest, refer to: http://bit.ly/1LKH9yn
round-headed and flat-headed tree borer	bifenthrin permethrin	Treat bark of trunk and branches in early May, early June, and early July.	Bifenthrin is labeled for flatheaded appletree borer in landscapes. For additional information on this pest, refer to: http://bit.ly/1GYZ6qF
oak borer	bifenthrin permethrin	Treat trunk to ground level early June.	Populations are larger in even-numbered years.
locust borer	permethrin	Treat the trunk and larger branches in late August to mid-September or in spring.	Sprays applied in early spring are directed at small larvae. For additional information on this pest, refer to: http://bit.ly/1OWaFWI
Cicada (periodical cicada)	bifenthrin carbaryl	Treat bark of twigs on susceptible hosts soon after adult male singing becomes evident, usually around early May.	Cicada damage is caused by adult females inserting eggs in deep slits in twigs. Control is necessary only for young trees. For additional information on this pest, refer to: http://bit.ly/1R0S1vB
Defoliators general	acephate azadirachtin <i>Bacillus thuringiensis</i> (Bt) bifenthrin carbaryl chlorantraniliprole clothianidin cryolite diazinon malathion methoxychlor novaluron permethrin phosmet	When insects are first observed feeding. Timing varies with the species. It is critical to observe plants regularly to detect feeding as soon as it begins.	Insecticide combinations marketed by formulators and distributors are available. Consult the labels for specific uses and precautions. Mist blowers are effective. (Use Bt only for caterpillars). Novaluron is labeled for armyworms: clothianidin, chlorantraniliprole for landscapes; cryolite for caterpillars.
Defoliators (cont.) cankerworms	acephate azadirachtin <i>Bacillus thuringiensis</i> (Bt) carbaryl cyfluthrin diazinon emamectin benzoate fluvalinate lambda-cyhalothrin methoxychlor permethrin phosmet spinosad tebufenozide	In May when leaves are half to two-thirds full size, treatments must be applied when larvae are small. DD-148	Do not use methoxychlor on Chinese elm, Japanese or red maple, or redbud. See Intro., Plant Injury. Mist blowers are very effective.

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
elm leaf beetle	bifenthrin carbaryl chlorpyrifos cyfluthrin cypermethrin endosulfan fluvalinate imidacloprid lambda-cyhalothrin methoxychlor spinosad	Treat in mid-to-late May, when eggs have hatched but larvae are small. Second generation may need treatment in mid-to-late July.	Do not use methoxychlor on Chinese elm. Carbaryl may injure tender foliage if plants are wet or humidity is high.
flea beetles	bifenthrin carbaryl cryolite cyfluthrin diazinon fluvalinate lambda-cyhalothrin spinosad	When insects are found feeding on host plants as adults or as larvae.	Flea beetles can appear suddenly and cause serious injury to foliage. Monitoring of susceptible plants is critical. See also red-headed flea beetles. For additional information on this pest, refer to: http://bit.ly/1NrsMBC
grasshoppers	bifenthrin carbaryl lambda-cyhalothrin	When grasshoppers are found feeding.	Grasshoppers are infrequent pests but can be destructive when abundant. For additional information on this pest, refer to: http://bit.ly/1OMI2NY
Defoliators (cont.) gypsy moth	acephate <i>Bacillus thuringiensis (Bt)</i> bifenthrin carbaryl cryolite cypermethrin diflubenzuron emamectin benzoate fluvalinate indoxacarb gamma-cyhalothrin lambda-cyhalothrin methoxychlor methoxyfenozide permethrin phosmet spinosad tebufenozide	When leaves have expanded but caterpillars are small, usually in mid-May. (DD-90)	Mist blowers and aerial applications are effective. Indoxacarb and cypermethrin are for landscape use only.
Japanese beetle	azadirachtin bifenthrin carbaryl chlorantraniliprole clothianidin cyfluthrin diazinon dinotefuran gamma-cyhalothrin imidacloprid lambda-cyhalothrin malathion methoxychlor permethrin	In late June or early July after adults have begun to congregate on selected hosts. Repeat as necessary into August. (DD-1029)	Since adults actively fly and move continuously, they seem to be present constantly even where treatments have been applied. Clothianidin for landscapes only. Chlorantraniliprole as a soil drench for adults in landscapes only. Do not apply dinotefuran to linden, basswood and other tilia. For additional information on this pest, refer to: http://bit.ly/1RsgVE8

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
rose chafer	azadirachtin malathion methoxychlor	During June and mid-summer when insects are found.	Adults are active flyers and move continually onto susceptible hosts. For additional information on this pest, refer to: http://bit.ly/1LKJmd3
rose slugs	chlorantraniliprole malathion methoxychlor	Throughout the growing season when young larvae are seen on plants, especially in May, June.	Time treatments to when larvae are young and damage is not yet severe. Chlorantraniliprole as a soil drench for roseslug sawfly only.
Defoliators (cont.) tussock moth	azadirachtin bifenthrin cyfluthrin fluvalinate gamma-cyhalothrin indoxacarb lambda-cyhalothrin methoxychlor methoxyfenozide tebufenozide spinosad	In mid-May or late August.	Treat when larvae are small. Indoxacarb is for landscape use only.
willow leaf beetle	carbaryl methoxychlor spinosad	In May, June, and later if infestations persist. There may be several generations in a season.	Be sure to treat the undersides of the leaves. For additional information on this pest, refer to: http://bit.ly/1R0TlCq
Gall Insects	carbaryl fenoxycarb spinosad thiamethoxam	Treatments are effective when insects are active, before galls appear in spring.	Spinosad is labeled for dipterous gall midges (e.g. honeylocust pod gall midge). Fenoxycarb is labeled for honeylocust pod gall midge. Thiamethoxam is labeled for honeylocust pod-gall, nipple gall, and blister gall. For additional information on this pest, refer to: http://bit.ly/1GZ0Ss1 , http://bit.ly/1R0UqpV , http://bit.ly/1R0TlCq
Imported Fire Ant	abamectin (bait) acephate bifenthrin dinotefuran fenoxycarb (bait) hydramethylnon (bait) indoxacarb (bait) lambda-cyhalothrin methoprene (bait) pyriproxyfen (bait) spinosad	When ants or mounds are observed.	Nurseries and landscapers shipping out of the quarantine area must contact VDACS. The Two-Step method of a bait followed in several days by mound treatments to sensitive or highly trafficked areas is effective within the quarantine area. Combinations of chemicals are also available. Many products are sold under multiple trade names.

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
Lacebugs	acephate	On evergreens, overwintering eggs hatch in mid-late May. Treat in late May or early June.	Consult the label for host plants and specific pests listed under directions for use. Nonsystemic treatments must cover the undersides of the leaves thoroughly. Control of the first generations is most important to slow populations buildup. Examine foliage for lacebugs. Chlorantraniliprole for landscapes only. Repeat at 3-week intervals if using a low residual product. Do not apply dinotefuran to linden, basswood and other tilia.
	bifenthrin		
	carbaryl	On deciduous hosts, adults emerge in May. Treat in late May.	
	chlorantraniliprole		
	cyfluthrin		
	diazinon		
	dinotefuran		
	fenpropathrin		
	flupyradifurone		
	imidacloprid		
	lambda-cyhalothrin		
	malathion		
	methoxychlor		
	permethrin		
spirotetramat			
Leafhoppers	acetaprimid	When leafhoppers are first seen and before stippling on leaves becomes extensive.	Thorough coverage of the undersides of the leaves improves control when using nonsystemics. Clothianidin for landscapes only. Do not apply dinotefuran to linden, basswood and other tilia. For additional information on this pest, refer to: http://bit.ly/1GvpRIw
	azadirachtin		
	bifenthrin		
	buprofezin		
	carbaryl		
	clothianidin		
	cyfluthrin		
	dinotefuran		
	flonicamid		
	flupyradifurone		
	fluvalinate		
	gamma-cyhalothrin		
	imidacloprid		
	lambda-cyhalothrin		
permethrin			
spirotetramat			
thiamethoxam			
Leafminers azalea leafminer	abamectin	Treat in mid-late May or when mines are first seen on the plants.	Be cautious with dimethoate on azaleas; some varieties may be susceptible to plant injury. Fenoxycarb will not control adult stages. Clothianidin for landscapes only. For additional information on this pest, refer to: http://bit.ly/1NruV09
	acephate		
	azadirachtin		
	bifenthrin		
	clothianidin		
	diazinon		
	fenoxycarb		
	lambda-cyhalothrin		
permethrin			
boxwood leafminer adults	cyromazine	Treat in late April or early May when adults are active. DD-448	Numerous adults can be eliminated before eggs are laid.
	diazinon		
	lambda-cyhalothrin		
	malathion		
	permethrin		
spinosad			
boxwood leafminer larvae	cyromazine	Treat in May-June after eggs have hatched.	Systemic treatment are most effective in eliminating miners. They are also effective later in the fall season, and persist into the following year.
	dinotefuran		
	imidacloprid		

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
holly leafminer adults	cyromazine diazinon lambda-cyhalothrin permethrin spinosad	Treat in mid-May when new leaves are unfolding and adults are active on the foliage. (DD-192)	Helps reduce feeding punctures on undersides of leaves but may not prevent all mines in the foliage.
holly leafminer larvae	acephate cyromazine dinotefuran imidacloprid	Treat in mid-late June after eggs have hatched.	Systemics are effective in eliminating miners.
oak leafminer	acephate permethrin lambda-cyhalothrin fenoxycarb	Treat when mines are first seen - less than 1/4 inch. Several generations occur each summer.	Rake and destroy leaves in fall.
Leaf-rollers, Leaf Tiers	azadirachtin <i>Bacillus thuringiensis (Bt)</i> bifenthrin carbaryl cryolite cyfluthrin diazinon emamectin benzoate gamma-cyhalothrin lambda-cyhalothrin methoxyfenozide permethrin phosmet	Treat when insects are first seen. On some hosts, injury occurs in early spring when new buds are opening.	Consult the label for specific host plants listed. Phosmet is currently labeled for fruit trees and can be used on flowering fruit trees only.
Mealybugs	horticultural oil	Treat in late spring, before new growth begins.	Spray on warm days when the temperature remains above 40°F (5°C) for 12-24 hours. Do not spray sensitive plants listed on the label.
	acephate acetaprimid azadirachtin <i>Beauveria bassiana</i> bifenthrin buprofezin carbaryl cyfluthrin dinotefuran fenpyroximate flonicamid flupyradifurone imidacloprid lambda-cyhalothrin malathion permethrin pyridaben spirotetramat thiamethoxam	Treat whenever mealybugs are first noticed. Repeat 2-3 applications if necessary until infestation is eliminated.	Forceful spray streams help penetrate cracks and crevices in the bark and waxy secretions that protect the mealybugs. Destroying infested plants is another option. Fenpyroximate for suppression only. Do not apply dinotefuran to linden, basswood and other tilia.

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
Mites hemlock rust mite eriophyid mites	horticultural oil	Treat in early spring before new growth develops.	Do not use on sensitive plants indicated on the label.
	abamectin azadirachtin fenazaquin fenpyroximate spiromesifen	Treat when mites are found in very early spring, in late fall, or during the growing season.	Thoroughly wet the undersides of leaves with a full coverage spray.
spruce mite, southern red mite, boxwood mite	abamectin acequinocyl azadirachtin bifenazate clofentazine etoxazole fenazaquin fenbutatin-oxide fenpropathrin fenpyroximate fluvalinate	Treat in late April or early May and/or in September and October.	Thoroughly wet all of the foliage and stems with a full coverage spray. Fenpropathrin and etoxazole are labeled for shade and lath house use only. Acequinocyl is labeled for spruce spider mite and two-spotted spider mite. See spiromesifen label for list of mite species. For additional information on the spruce mite, refer to: http://bit.ly/1i0tD0W For additional information on the boxwood mite, refer to: http://bit.ly/1LRJyea
Mites (cont.) spruce mite, southern red mite, boxwood mite (cont.)	hexythiazox methiocarb milbectin pyridaben spinosad spiromesifen		
honeylocust mite	abamectin fenazaquin spiromesifen	Treat when mites occur, repeat after 10 days.	Thoroughly wet the undersides of leaves with a full coverage spray.
two spotted spider mite	abamectin acequinocyl bifenthrin cyflumetofen etoxazole fenazaquin fenbutatin-oxide fenpyroximate fluvalinate hexythiazox methiocarb milbectin pyridaben spiromesifen	Treat whenever mites first appear. Infestations may occur from spring to fall. Mite infestations are directly proportionate to increasingly warmer temperatures.	Thoroughly wet the foliage and stems with a full coverage spray. Do not use acequinocyl on miniature roses. Etoxazole for shade and lath house use only. See bifenthrin label for special instructions. For additional information on this pest, refer to: http://bit.ly/1LRJyea
Oriental Beetle	bifenthrin imidacloprid	Treat when small larvae are present.	Most effective against early instars. Beneficial nematodes may be effective. Apply bifenthrin as granules, other materials as soil drenches.
Plant Bugs, Planthoppers	bifenthrin buprofezin carbaryl cyfluthrin flonicamid flupyradifurone fluvalinate lambda-cyhalothrin malathion permethrin thiamethoxam	Treat when insects or signs of damage first appear. Treat honeylocust as soon as new growth begins.	Control is difficult because plant bugs are active flyers and move around continuously. Fluvalinate is labeled for plant bugs. Permethrin is labeled for Lygus bugs.

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
Psyllids (Boxwood psyllid, hackberry psyllid)	azadirachtin <i>Beauveria bassiana</i> bifenthrin carbaryl dinotefuran flupyradifurone lambda-cyhalothrin spirotetramat	Treat in late April or early May as new growth begins to develop.	Addition of a wetting agent or spreader-sticker is advised.
Redheaded flea beetle	bifenthrin carbaryl cyantraniliprole diazinon dinotefuran imidacloprid spinosad thiamethoxam	Treat when adults first appear. Repeated applications may be necessary.	<i>Hydrangea paniculata</i> and <i>itea</i> are especially susceptible
Sawflies	acetaprimid azadirachtin bifenthrin carbaryl chlorantraniliprole cyfluthrin dinotefuran gamma-cyhalothrin imidacloprid lambda-cyhalothrin malathion methoxychlor spinosad thiamethoxam	Treat when insects are first seen. Treat in April for Virginia pine sawfly. Larvae are gregari- ous and broods often cluster on one branch.	See label for which species are registered for each chemical. Do not apply dinotefuran to lin- den, basswood and other tilia. Chlorantraniliprole as a soil drench for ros- eslug sawflies in landscapes only.
Scale Insects (All scales)	dinotefuran flonicamid horticultural oil imidacloprid lambda-cyhalothrin pyriproxyfen spirotetramat thiamethoxam	Treat with horticultural oil in late March or early April before new growth develops, and when temperatures are not likely to go below 40°F (5°C) for 12 to 24 hours. Oils can also be used as summer sprays when indicated on the label.	Do not spray oil-sensitive plants listed under precautions on the label. Be sure to follow the dosage rates given on the label for the vari- ous scale species. Thiamethoxam is labeled for soft scales. Pyriproxyfen, Deltamethrin and spirotetramat are labeled for scale crawlers. Review label for target species. For additional information on this pest, refer to: http://bit.ly/1i0uoXH
Azalea bark scale	carbaryl diazinon insecticidal soap lambda-cyhalothrin malathion	Crawlers: June 5-25. Treat June 10-30.	Scale is often mistaken for mealybugs.
brown soft scale	bifenthrin buprofezin carbaryl diazinon fenoxycarb insecticidal soap lambda-cyhalothrin pyriproxyfen	Treat when scale insects appear. Treat 2-3 times at 10-day intervals.	This scale insect does not winter outside in colder plant zones of Virginia.

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
calico scale	carbaryl insecticidal soap lambda-cyhalothrin pyriproxyfen	Crawlers: June 1-20. Treat June 15-30.	Often seen on Zelcova and honeylocust trees.
camellia scale	insecticidal soap lambda-cyhalothrin	Crawlers first appear in May. Treat at 2-week intervals as needed.	
Scale Insects (cont.)	carbaryl insecticidal soap	Crawlers: June 1-10. Treat June 15-30.	
cottony camellia scale	lambda-cyhalothrin malathion		
cottony maple leaf scale	acephate carbaryl diazinon insecticidal soap lambda-cyhalothrin	Crawlers: June 1-10. Treat June 15-30.	Ovisacs are found on foliage.
Cottony maple scale	carbaryl insecticidal soap lambda-cyhalothrin pyriproxyfen	Crawlers: June 5-25. Treat June 10-30.	Be sure to thoroughly cover stems and branches near the ground. Dinotefuran is also effective as a bark spray.
Crape myrtle bark scale	buprofezin clothianidin dinotefuran imidacloprid pyriproxyfen thiamethoxam	Best control May-July	Allow several weeks after drenching to be effective. See label regarding bark sprays. See label for dinotefuran commercial landscapes. Do not spray or drench when lady beetle larvae or adults are present.
Euonymus scale	carbaryl fenoxycarb insecticidal soap malathion lambda-cyhalothrin	Crawlers: first generation May 1-10; second July 5-15. Treat May 10-20, and July 15-25.	Do not spray when beneficial lady beetles are present.
Euonymus alatus scale	carbaryl diazinon lambda-cyhalothrin	Crawlers: in June and July. Treat: June to late July.	
European elm scale	carbaryl diazinon insecticidal soap lambda-cyhalothrin	Crawlers: June 5-25. Treat June 10-30.	
fern scale	buprofezin carbaryl insecticidal soap lambda-cyhalothrin	Crawlers: first appear in mid-May. Treat at 2-week intervals as needed.	Often on liriopse, near the base of the plant.
fletcher scale	carbaryl insecticidal soap lambda-cyhalothrin malathion	Crawlers: in early to mid-June. Treat June 15-20.	On Taxus and Arborvitae.
Florida red scale	acephate buprofezin carbaryl diazinon insecticidal soap lambda-cyhalothrin	Crawlers: May 5-15. Treat May 15-30.	Found on burford holly.

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
forbes scale	carbaryl insecticidal soap lambda-cyhalothrin malathion	Crawlers: June 1-15. Treat June 5-20.	
gloomy scale	carbaryl diazinon insecticidal soap lambda-cyhalothrin	Crawlers: peak June 10-20. Treat June 20-30.	Serious pest of maples that is difficult to control.
golden oak scale	insecticidal soap lambda-cyhalothrin	Crawlers: June 1-30. Treat June 10 - July 10.	
Scale Insects (cont.) hemlock scale	insecticidal soap lambda-cyhalothrin	Crawlers: peak May 15-June 20, some produced throughout the season. Treat May 20-25 and June 5-20.	Also called fiorinia hemlock scale.
Japanese maple scale	carbaryl diazinon lambda-cyhalothrin malathion	Crawlers: June 1-September 1. Treat at 2-week intervals June-September.	Serious pest that is difficult to control. Thorough coverage is needed.
juniper scale	carbaryl insecticidal soap lambda-cyhalothrin malathion	Crawlers: April 5-20 and June 5-20. Treat April 10-25 and/or June 10-25.	Crawler dates vary based on temperature.
latania scale	diazinon insecticidal soap lambda-cyhalothrin	Crawlers: continuous from June through season. Treat 2-3 times at 10 day intervals.	
lecanium scale	diazinon lambda-cyhalothrin	Crawlers: May 25-June 25. Treat June 15-30.	Treat crawlers for oak lecanium June 1-10 in coastal areas. Avoid harming beneficials by using soaps or oils in March-April.
oak kermes	carbaryl lambda-cyhalothrin malathion	Crawlers: June 1-20. Treat June 10-30.	
obscure scale	carbaryl diazinon lambda-cyhalothrin malathion	Crawlers: on red oak during July. Treat white oaks in mid-August.	Also treat with oil as a dormant spray. Can be a serious pest.
oystershell scale	buprofezin carbaryl insecticidal soap lambda-cyhalothrin	Crawlers: May 1-20 and July 15-25. Treat May 10-25 and/or July 20-30.	Hatches at around 370 DD. Oils and soaps are also effective.
peony scale	carbaryl diazinon insecticidal soap lambda-cyhalothrin malathion	Crawlers: mid-May. Treat in late May.	Often found on azaleas.
pine needle scale	bifenthrin carbaryl diazinon gamma-cyhalothrin insecticidal soap lambda-cyhalothrin malathion	Crawlers: April 20-May 30 and July 10-20. Treat May 5-30 and/or July 15-20.	Sporadic outbreaks can occur.

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
pine tortoise scale	carbaryl insecticidal soap gamma-cyhalothrin lambda-cyhalothrin	Crawlers: June 10-July 5. Treat June 20-July 15.	
rose scale	carbaryl insecticidal soap lambda-cyhalothrin	Crawlers: late May-June 30, possible second generation in August. Treat June 5-10 and 20-30 and in mid-August.	
Scale Insects (cont.) San Jose scale	bifenthrin buprofezin carbaryl diazinon insecticidal soap lambda-cyhalothrin pyriproxyfen	Crawlers: at least 3 generations June, July, and September. Treat June, July, and September.	
tea scale	insecticidal soap lambda-cyhalothrin	Crawlers: throughout season in overlapping generations. Treat 2-3 times at 10-day intervals when infested.	
wax scale	buprofezin carbaryl fenoxycarb lambda-cyhalothrin	Crawlers: June 1-25. Treat June 5-30.	Thoroughly wet foliage and bark with a full-coverage spray.
white peach scale, white prunicola scale	buprofezin diazinon fenoxycarb insecticidal soap lambda-cyhalothrin malathion	Crawlers: April 25-May 15, July 1-15, August 20-September 15. Treat May 1-15, July 5-15, September 1-15.	
Spittle Bug	bifenthrin carbaryl cyfluthrin gamma-cyhalothrin lambda-cyhalothrin spirotetramat	Treat in early June if yellowing or damage occurs.	Often noticed on pines, but rarely causes any injury.
Spotted lanternfly	acetaprimid, bifenthrin, dinotefuran, imidaclo- prid, thiamethoxam	Treat in early spring and summer	A new pest in Virginia. Dinotefuran is labeled as a basal trunk spray on tree-of-heaven only in Virginia. See label for rate.
Slugs and Snails	Iron phosphate metaldehyde methiocarb orthoboric acid	Apply when pests are observed.	Iron phosphate is available in homeowner packaging.
Stink Bug	flonicamid	Apply when pests are observed.	Some pansy cultivars may be sensitive. For additional information on this pest, refer to: http://bit.ly/1KtDO4S

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
Tent Caterpillars	azadirachtin <i>Bacillus thuringiensis</i> (Bt) bifenthrin carbaryl chlorantraniliprole cyfluthrin diazinon emamectin benzoate gamma-cyhalothrin indoxacarb lambda-cyhalothrin methoxychlor methoxyfenozide permethrin spinosad tebufenozide	Treat in early spring as new growth is developing and when caterpillars are small.	Caterpillars leave the nests to feed on the foliage during the day. Apply full coverage spray to the entire tree. Forest tent caterpillar does not make a tent. Spinosad and lambda-cyhalothrin are labeled for eastern tent caterpillar only. Indoxacarb and chlorantraniliprole are for landscape use only. For additional information on this pest, refer to: http://bit.ly/1Gm5z4k
Thrips	abamectin acephate acetaprimid azadirachtin <i>Beauveria bassiana</i> bifenthrin cyfluthrin dinotefuran flonicamid fluvalinate imidacloprid lambda-cyhalothrin methiocarb novaluron permethrin spinosad spirotetramat	Treat in May-June when thrips are active on new foliage.	Methiocarb is labeled for western flower thrips. Spirotetramat provides suppression at low levels. Dinotefuran and flonicamid are for suppression. Pyrethroid applications may result in higher levels of western flower thrips. For additional information on this pest, refer to: http://bit.ly/1W8UwwZ
Tip Moths	acephate azadirachtin bifenthrin cyfluthrin diflubenzuron gamma-cyhalothrin lambda-cyhalothrin methoxyfenozide permethrin tebufenozide	Treat with liquid formulation in mid March, April, June and July when moths are flying.	Spray entire tree to runoff. Two and three-needle pines are susceptible to tip moth. Younger trees are preferred.
Treehoppers	bifenthrin carbaryl	Treat when nymphs are seen on twigs (usually in clusters) before adults are present to begin egg-laying, usually in late summer and fall.	Apply sprays to cover the small twigs thoroughly.
Webworms cotoneaster webworm	cyfluthrin diazinon gamma-cyhalothrin lambda-cyhalothrin permethrin	Treat when larvae are first found.	Apply a full-coverage spray, wetting foliage to the point of runoff.

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
juniper webworm	bifenthrin cyfluthrin diazinon gamma-cyhalothrin lambda-cyhalothrin permethrin	Treat in late July or in August when larvae are small. Spring treatments may be applied when plants are found to be infested.	Apply a forceful spray to penetrate severely webbed foliage. Thoroughly wet the foliage to runoff.
Webworms (cont.) fall webworm	<i>Bacillus thuringiensis</i> (<i>Bt</i>) bifenthrin cyantraniliprole chlorantraniliprole cyfluthrin diazinon emamectin benzoate indoxacarb gamma-cyhalothrin lambda-cyhalothrin methoxychlor permethrin methoxyfenozide spinosad tebufenozide	Treat in late June or early July when larvae are small and webs just starting to form. Treat for second generation in August or early September.	Caterpillars are gregarious and infest individual branches. Apply full-coverage foliar spray to infested area, or entire tree in years of high populations. Indoxacarb and chlorantraniliprole are for landscape use only. For additional information on this pest, refer to: http://bit.ly/1jDYdPK
mimosa webworm	carbaryl cyfluthrin diazinon emamectin benzoate gamma-cyhalothrin lambda-cyhalothrin permethrin	Apply foliage sprays at 4-5 day intervals until the infestation is controlled.	
pine webworm	bifenthrin cyfluthrin diazinon gamma-cyhalothrin lambda-cyhalothrin permethrin	Treat in early June.	
Weevils Two banded Japanese weevil, black vine weevil	acephate <i>Beauveria bassiana</i> bifenthrin dinotefuran flupyradifurone lambda-cyhalothrin	Apply in June or July as a full-coverage spray when foliar feeding is first observed.	Lambda-cyhalothrin is for black vine weevil adults. Flupyradifurone is for black vine weevil larvae. Do not apply dinotefuran to linden, basswood and other tilia. For additional information on the Japanese weevil, refer to: http://bit.ly/1GZ2Rg1 For additional information on the black vine weevil, refer to: http://bit.ly/1LRMmaV
white pine weevil	bifenthrin gamma-cyhalothrin diflubenzuron Cut out and burn infested leaders.	Apply sprays in the late spring before adults lay eggs, normally prior to April 1-10 Prune out infested leaders during June.	Treat only the main terminal leaders of the tree down to the first whorl of branches. Thoroughly wet the bark. Adults begin emerging from infested leaders in July. For additional information on the white pine weevil, refer to: http://bit.ly/1OMnJyO

Table 5.3 - Control Measures for Major Pests and Pest Groups (cont.)

Pest	Control	Timing of Treatment	Remarks
Whiteflies	abamectin	When whiteflies are found. Treat every three weeks until infestation is controlled.	See labels for whitefly species. Clothianidin for landscapes. Do not apply dinotefuran to linden, basswood and other tilia. For additional information on this pest, refer to: http://bit.ly/1NXSS2r
	acetaprimid		
	azadirachtin		
	<i>Beauveria bassiana</i>		
	bifenthrin		
	clothianidin		
	cyfluthrin		
	dinotefuran		
	fenoxycarb		
	flonicamid		
	flupyradifurone		
	fluvalinate		
	imidacloprid		
	lambda-cyhalothrin		
	novaluron		
	permethrin		
	pymetrozine		
pyridaben			
spiromesifen			
spirotetramat			
thiamethoxam			
Zimmerman Pine Moth	bifenthrin	Treat in early- to mid-April and in early September. (DD-121)	Apply as full coverage spray to the point of runoff.
	endosulfan		
	methoxyfenozide		

Table 5.4 - Directions for Pesticide Usage

Chemical	Formulation	Pests Controlled	Amount to Use		Phytotoxicity and Remarks
			per 100 gal	per 3 gal	
abamectin (Avid) (Sirocco)	0.15EC 0.011B	aphids, eriophyid mites, leafminers, thrips, whiteflies, imported fire ants	4.0-8.0 fl oz	0.75-1.5 tsp	See label for rate and volume directions. Sirocco also contains bifenazate. Do not use on ferns or Shasta Daisy. Generic products exist. 12-hr REI. Bait for imported fire ants. SIGNAL WORD - WARNING
acephate (Orthene)	75S 97	All labeled uses.	See label for rates	—	Rates differ as to pests. See label for phytotoxicity list. 24-hr REI. Bait for imported fire ants. Some formulations are labeled for use as a basal soil injection for trees. SIGNAL WORD - CAUTION
acequinocyl (Shuttle)	15SC	two-spotted spider mite, spruce spider mite	6.4-12.8 fl oz	1.0-2.0 tsp	Do not use on miniature roses or impatiens. Use low rate on standard roses. See label for resistance management. 12-hr REI. SIGNAL WORD - CAUTION

Table 5.4 - Directions for Pesticide Usage (cont.)

Chemical	Formulation	Pests Controlled	Amount to Use		Phytotoxicity and Remarks
			per 100 gal	per 3 gal	
acetaprimid (Tristar)	70WSP 30SG	aphids, European pine sawfly, tentiform leaf miner, mealy- bug, leafhop- per, white- flies, thrips	See label for rates	—	See label for resistance management, restrictions, and precautions. 70WSP in water soluble packets. 12-hr REI. SIGNAL WORD - CAUTION
azadirachtin (Azatin, Triact, Ornazin, neemazid, tril- ogy, azatrol)	various	All labeled uses.	See label for rates	See label for rates	Product is sold by several companies, and in many formulations. 4-hr REI. SIGNAL WORD - CAUTION
<i>Bacillus</i> <i>thuringiensis</i> (Bt)	various	defoliating caterpillars (see label)	See label for rates	See label for rates	Product is sold by many companies, and in many formulations. 4-hr REI. SIGNAL WORD - CAUTION
<i>Beauveria</i> <i>bassiana</i> (BotaniGard)	22WP ES	aphids, mealy- bugs, thrips, whiteflies	0.5-2.0 lb 0.5-2.0 qt	1.5-6.0 tbsp 1.0-4.0 tbsp	12-hr REI. SIGNAL WORD - CAUTION
bifenazate (Floramite) (Sirocco)	50WP	mites	See label for rates	—	See label for species controlled. Sirocco also contains abamectin. 12-hr REI. SIGNAL WORD - CAUTION
bifenthrin (Talstar, Onyx Pro, Allectus, Aloft)	F	All labeled uses	See label for rates	—	Onyx Pro is labeled for nurseries. Generic products exist. 12-hr REI. SIGNAL WORD - WARNING.
	0.2G	All labeled uses.	See label for rates	—	SIGNAL WORD - CAUTION
	various	All labeled uses	See label for rates	—	Allectus is a bifenthrin/imidacloprid combo for landscape ornamentals. Aloft is a bifenthrin/clothianidin combo for landscape ornamentals.
buprofezin (Talus)	70WSP 40SC 70DF	leafhoppers, mealybugs, planthop- pers, scales, whiteflies	See label for rates	—	Sold in water soluble bags. Consult label for rate. 12-hr REI. Do not mix with oils. SIGNAL WORD - CAUTION
carbaryl (Sevin)	50W SL 23.4% EC	All labeled uses.	2.0 lbs 1.0 qt 2.0 qt	6.0 tbsp 3.0 tbsp 4.0 tbsp	Do not apply to wet foliage or in high humidity; injury may result. 12-hr REI. SIGNAL WORD - WARNING

Table 5.4 - Directions for Pesticide Usage (cont.)

Chemical	Formulation	Pests Controlled	Amount to Use		Phytotoxicity and Remarks
			per 100 gal	per 3 gal	
chlorantraniliprole (Acelepryn)	1.67SC	Leaf-feeding caterpillars, lacebugs, bagworms, birch leaf miner, clear-wing borers, Japanese beetles	See label for rates	See label for rates	No signal word required. 4-hr REI. For landscape use.
clofentezine (Ovation)	5SC	mites	2.0 fl oz	1.0 tbsp	Not for landscape use. 12-hr REI. SIGNAL WORD - CAUTION
clothianidin (Arena, Aloft)	50WDG .25G	See label	See label	See label	Landscape use only. Aloft also contains bifenthrin. Do not apply this product while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen. 12-hr REI. SIGNAL WORD - CAUTION
cryolite (Kryocide)	D	See label	See remarks	See remarks	Rate is 8.0-24.0 lbs/A. 12-hr REI. SIGNAL WORD - CAUTION
cyantraniliprole (Mainspring)	18.66SC	See label	1-16 fl. oz	—	Soil and Foliar uses. See label for uses and rates. 4-hr REI.
cyflumetofen (Sultan)	18.7SC	mites	13.7 fl. oz	See label	12-hr REI. SIGNAL WORD - CAUTION
cyfluthrin (Discus, Decathlon)	20WP F	See label.	1.3-1.9 oz	0.75-1.0 tsp	Discus also contains imidacloprid. 12-hr REI. SIGNAL WORD - WARNING
cypermethrin (Cynoff)	EC, WP	box elder bug, elm leaf beetle	See label for rates	See label for rates	Only in landscapes. 12-hr.- REI. SIGNAL WORD - WARNING (WP) CAUTION (EC).
cyromazine (Citation)	75WP	leaf miners, shoreflies, fungus gnats	2.66 oz	—	Sold in water-soluble pouches. Not to exceed 6 applications/crop. Shoreflies on greenhouse crops only. 12-hr REI. SIGNAL WORD - CAUTION
diazinon	AG500, 4F 50W	See label for pests.	1.0-3.0 pt 1.0-3.0 lb	1.0-3.0 tbsp 3.0-9.0 tbsp	Not all formulations have the same pests on the label. Read the label carefully. 12-hr REI. SIGNAL WORD - WARNING
	Knox-out	See label.	3.0-6.0 pt	1.0-2.0 tbsp	See label. 12-hr REI. SIGNAL WORD - CAUTION
diflubenzuron (Dimilin, Adept)	25W	Pine tip moth, gypsy moth	see label	see label	12-hr REI. SIGNAL WORD - CAUTION

Table 5.4 - Directions for Pesticide Usage (cont.)

Chemical	Formulation	Pests Controlled	Amount to Use		Phytotoxicity and Remarks
			per 100 gal	per 3 gal	
dinotefuran (Safari, Transtect, Zylam)	20SG	All labeled uses.	See label for rates.	—	See label for proper rate for target pest. See label for scale species. Apply as foliar spray or drench. 12-hr REI. SIGNAL WORD - CAUTION Make applications post-bloom when bees are present. Do not apply this product while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen. Zylam and Transtect labeled for landscape ornamentals as a soil drench, trunk banding or soil injection.
emamectin benzoate (Tree-age, Enfold)	F 5SG	All labeled uses	See label for rates	See label for rates	Applied by injection to base of tree. Effective against fall webworm SIGNAL WORD - WARNING 12-hr REI. SIGNAL WORD - CAUTION
endosulfan (Thionex)	50WP	All labeled uses.	1.0-1.5 lb	—	Sold in water-soluble bags. Do not exceed 6 lbs/A/year. 24-hr REI. SIGNAL WORD - WARNING
	3EC	All labeled uses.	0.66-1.33 qt	1.33-2.66 tbsp	Rate varies depending on pest. See label. Do not exceed 4 qts/acre/year.
etoxazole (TetraSan)	5WDG 5WSP	spider mites	See label for rates	See label for rates	Shade and lath house use only. 12-hr REI. SIGNAL WORD - CAUTION
fenazaquin (Magus)	200SC	mites, whiteflies	12.0-24.0 fl oz	2.0 tsp-1.5 tbsp	Do not exceed 24 oz per acre per year. Do not use on roses. 12-hr REI. SIGNAL WORD - WARNING
fenbutatin oxide (Promite)	50WP	mites	8.0-16.0 oz	—	Sold in soluble pouches. 48-hr REI. SIGNAL WORD - DANGER
fenoxycarb (Precision)	25WP	All labeled uses.	2.0-8.0 oz	—	See label for proper rate for target pest. Sold in 1-oz pouches. 12-hr REI. SIGNAL WORD - CAUTION
fenpropathrin (Tame)	2.4EC	All labeled uses.	5.33-16.0 oz	1.0-3.0 tsp	24-hr REI. SIGNAL WORD - DANGER
fenpyroximate (Akari)	5SC	mites, mealybugs	16.0-24.0 fl oz	1.0-1.5 tbsp	Good coverage is essential. 12-hr REI. SIGNAL WORD - WARNING
flonicamid (Aria)	WSP	All labeled uses	0.7-2.1 oz	—	See label for proper rate for target pest. Sold in 20.0 g packets 12-hr REI. SIGNAL WORD - CAUTION.
flupyradifurone (Altus)	1.67SC	All labeled uses	—	—	See label for foliar and soil drench rates. 4-hr REI. SIGNAL WORD - CAUTION
fluralinate (Mavrik)	2F	All labeled uses.	4.0-10.0 fl oz	0.75-2.0 tsp	See label for precautions and rates for root weevils. For outdoor plantings and containerized nursery stock. 12-hr REI. SIGNAL WORD - CAUTION
gamma-cyhalothrin (Proaxis)	(0.5F)	All labeled uses	2.56-5.12 fl oz	—	SIGNAL WORD - CAUTION
hexythiazox (Hexygon)	50WP	mites	1.0-2.0 oz or 4.0-6.0 oz/A	0.5-1.0 tsp	Use only once/crop cycle. 12-hr REI. SIGNAL WORD - CAUTION.

Table 5.4 - Directions for Pesticide Usage (cont.)

Chemical	Formulation	Pests Controlled	Amount to Use		Phytotoxicity and Remarks
			per 100 gal	per 3 gal	
horticultural oils	various	All labeled uses.	See label for rates.	—	Numerous companies sell this product. See label for phytotoxicity. 4- to 12-hr REI. SIGNAL WORD - CAUTION
hydramethylnon (Amdro, Max Force)	various	imported fire ant	See label for rates	—	Apply when ants are foraging. 12-hr REI. SIGNAL WORD - CAUTION
imidacloprid (Marathon, Discus, Allectus, Merit, Zenith)	Various	All labeled uses	See label for rates	—	See label for application directions. Labeled for soil and foliar application. Discus also contains cyfluthrin. Allectus also contains bifenthrin. Generic products exist. Merit and Zenith are labeled for landscape ornamentals. Do not apply this product while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen. 12-hr REI. SIGNAL WORD - CAUTION
indoxacarb (Provaunt, Advion)	30WDG 0.45G	caterpillars, sawfly, leaf-hoppers, imported fire ant	1.25-5.0 oz	—	Provaunt is labeled for landscape use only. Granular form for imported fire ants. SIGNAL WORD - CAUTION.
insecticidal soap	various	All labeled uses.	See label for rates.	—	Several companies sell this product. 12-hr REI. SIGNAL WORD - WARNING
iron phosphate	1% bait	snails, slugs	Per 100 gl 2.56 to 10 fl. oz	—	Rate is 1.0 lb per 1000 sq ft. SIGNAL WORD - CAUTION.
lamba-cyhalothrin (Warrior II)	22.8CS	All labeled uses	Per 100 gl 2.56 to 10 fl. oz	—	Labeled for commercial and residential turf and landscape ornamental plants. Generic products are sold by many companies. 24-hr REI. SIGNAL WORD - WARNING
(Scimitar)	9.7GC 9.7CS	All labeled uses.	1.5-5.0 fl oz	—	Scimitar CS is only labeled for commercial landscapes only; 24-hr REI. SIGNAL WORD - CAUTION
lime sulfur	26-30% L	armored scales	10.0-12.0 gal	39.0-45.0 fl oz	Apply when plants are fully dormant. Will cause yellow staining of paint, masonry. SIGNAL WORD - DANGER
malathion	Various	All labeled uses.	See label	—	See label for rates and directions for target pests. Product is sold by several firms. 12-hr REI. SIGNAL WORD - CAUTION
metaldehyde (Deadline, Metarex)	Bait	slugs, snails	Ready-to-use.	—	12-hr REI. SIGNAL WORD - CAUTION
methiocarb (Grandslam, Mesuro)	75W	aphids, mites, slugs, snails, thrips	1.0-4.0 lb	3.0-12.0 tbsp	Do not apply with foliar fertilizer. Apply up to 4 applications/season. 24-hr REI. SIGNAL WORD - WARNING
methoprene s-methoprene (Extinguish)	various	imported fire ant	See label for rates	—	Also sold in combination with hydramethylnon. 4-hr REI. SIGNAL WORD - CAUTION

Table 5.4 - Directions for Pesticide Usage (cont.)

Chemical	Formulation	Pests Controlled	Amount to Use		Phytotoxicity and Remarks
			per 100 gal	per 3 gal	
methoxychlor (Marlate)	50WP	All labeled uses.	2.0-3.0 lb	6.0 tbsp	Do not use on Chinese elm, Japanese and red maple, redbud, privet and viburnum, repeated uses on evergreens. 12-hr REI. SIGNAL WORD - CAUTION
methoxyfenozide (Intrepid 2F)	2F	All labeled uses	4.0 to 16.0 fl. oz/acre	3/4 to 3.0 tsp	4-hr REI. SIGNAL WORD - CAUTION
milbemectin (Ultriflora)	1% EC	spider mites	8.0-16.0 fl oz	1.5-3.0 tsp	See label for application directions. See label for sensitive species. 12-hr REI. SIGNAL WORD - CAUTION.
novaluron (Pedestal)	10SC	white-flies, thrips, leafminers, armyworms	6.0-8.0 oz	1.0-1.5 tsp	Registered for container-grown ornamentals. 12-hr REI. SIGNAL WORD - CAUTION
orthoboric acid (Niban)	5G	snails and slugs	See remarks for rates	—	4-hr REI. Apply evenly at 6.0 oz per 100 sq ft.
permethrin (Astro, Perm-up)	2E	All labeled uses.	6.4-12.8 oz	1.0-2.0 tsp	Permethrin is sold under several trade names. Do not apply to salvia or snapdragon. 12-hr REI. SIGNAL WORD - CAUTION
	3.2EC	All labeled uses.	4.0-8.0 oz	0.75-1.5 tsp	
phosmet (Imidan)	70W	Elm spanworm, gypsy moth, birch leafminer, spring cankerworm	0.75-1.0 lb	2.25-3.0 tbsp	Sold in WSP. See label for rates and pests on evergreens. 24-hr REI. SIGNAL WORD - WARNING
pymetrozine (Endeavor)	50WG	aphids, whiteflies	2.5-5.0 oz	—	Sold in WSP. 12-hr REI. SIGNAL WORD - CAUTION
pyriproxyfen (Distance, Fulcrum)	0.86EC 0.5G	scale crawlers, imported fire ant	See label for rates	See label for rates	See label for sensitive species. Granular formulation for imported fire ants. 12-hr REI. SIGNAL WORD - CAUTION
pyridaben (Sanmite)	75SP	All labeled uses.	2.0-6.0 oz	—	Sold in 1.0 oz soluble bags only. 12-hr REI. SIGNAL WORD - WARNING
spinosad (Conserve, Entrust)	SC	All labeled uses.	6.0-22.0 fl oz	1.0-4.0 tbsp	See label for resistance management strategies and rates for specific pests. Compatible with IPM programs. 4-hr REI. SIGNAL WORD - CAUTION
spiromesifen (Forbid, Judo, Savate)	4F	spider and eriophyid mites, whiteflies	2.0-4.0 fl oz	0.38-0.75 tsp	Forbid registered for outdoor landscapes only; Judo registered for nursery and greenhouse sites. 12-hr REI. SIGNAL WORD - CAUTION
spirotetramat (Kontos)	240SC	See label.	1.7-3.4 fl oz	0.07-0.1 fl oz	See label for additional pests. 24-hr REI. as foliar spray; no REI. for drench. SIGNAL WORD - CAUTION
tebufenozide (Confirm)	2E	See label.	4.0-16.0 fl oz	0.75-3.0 tsp	See label for rates for specific pests. 4-hr REI. SIGNAL WORD - CAUTION

Table 5.4 - Directions for Pesticide Usage (cont.)

Chemical	Formulation	Pests Controlled	Amount to Use		Phytotoxicity and Remarks
			per 100 gal	per 3 gal	
thiamethoxam (Flagship, Meridian)	25WG .22G .33G	All labeled uses.	See label	See label	See label for application direction and specific rate. Granular is labeled for aphids, mealybugs, whiteflies, and beetle larvae (grubs). Meridian is for landscape ornamentals. Refer to label for special application restrictions for protection of pollinators. Do not apply this product while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen. 12-hr REI. SIGNAL WORD - CAUTION

Abbreviations

W, WP = wettable, wettable powder; WSP = water-soluble packets; S, SP = sprayable powder; L, LS = liquid, liquid spray; E, EC = emulsifiable, emulsifiable concentrate; SC = spray concentrate; CS = capsule suspension; GS = granule suspension

Precautions:

Do not apply liquid concentrate when the temperature is above 85°F (29-30°C.) or any spray when the temperature is above 90°F (32°C).

Do not apply oil sprays if the temperature is below 40°F (4-5°C) or is likely to approach or go below freezing within 24 hours. Never use a sprayer or a tank that has been used previously to apply herbicides.

Use only the recommended dosage rates. The label directions are the final authority. Wettable powders and other suspensions (flowable) require continuous agitation in the tank to avoid settling. Do not allow spray suspensions to remain in the tank without agitation, or any spray mixture to remain in a non-operating sprayer for more than 1 hour.

Clean all spraying equipment thoroughly after each use.

Use spreader-stickers only for hard-to-wet foliage and special uses. Unnecessary wetting agents and spreaders cause excess run-off.

Equivalents:

1 pt liquid in 100 gal = 1 tsp in 1 gal

1 lb powder in 100 gal = 1 tbsp in 1 gal

1 gal = 4 qt = 8 pts = 128 fl oz

1 cup = 1/2 pt = 8 fl oz = 16 tbsp

1 fl oz = 1/8 cup = 2 tbsp = 29.57 milliliter

1 lb = 16 oz = 454 grams

1 tbsp = 1/2 fl oz = 3 tsp = 14.78 milliliter

1 oz = 28.3 grams

Nursery Crops: Weeds

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Nonchemical Weed Control

Use a 2- to 4-inch depth of mulch. Avoid overmulching. Suitable mulch materials include pine bark, hardwood bark, pine straw, leaves, or similar organic materials. Rock mulches can also be used in certain landscape situations for weed management and tend to provide greater weed control than an organic mulch. Consider placing a landscape fabric under a rock mulch to act as a soil separator. Do not spread mulch that has an off-odor (rotten egg/sulfur smell or an ammonia odor) or plant injury can occur. Mulches will suppress annual weeds but generally will not control perennial weeds.

Landscape fabrics overcome the porosity problem inherent to solid black plastic. Use a shallow mulch layer (1 inch) above the fabric. A rock mulch/fabric combination would be expected to provide greater weed control than an organic mulch/fabric combination. Fabric/mulch combinations improve weed control over mulch alone. Use a landscape fabric with limited open space. Use landscape fabrics only in woody landscape beds. Fabrics will inhibit emergence of herbaceous perennials and will inhibit rooting in of groundcovers. Certain weeds, such as yellow nutsedge, can penetrate through landscape fabrics. Biobarrier with slow release trifluralin provides greater weed control than do landscape fabrics that do not contain an herbicide.

Chemical Weed Control

There is now a selection of herbicides for use in nursery stock. Selection of a given herbicide must be based on the particular weed and crop situation. None of the preemergent herbicides are effective against all weed species. Tank-mixing of herbicides often broadens the spectrum of weed control. If a chemical application kills all but one species, that species will multiply. This results in a shift in weed population and eventually weed control with that product becomes ineffective. Chemical rotation can reduce the buildup of a tolerant species. Use of directed sprays of a nonselective herbicide (diquat, glufosinate, paraquat, or glyphosate) or cultivation is usually necessary to give control of all species.

One application of a preemergent herbicide will not give adequate weed control for an entire year. Late fall or winter applications of isoxaben, simazine, dichlobenil, or pronamide will provide weed control well into the growing season. When control begins to decrease, the area can be cultivated or a postemergence herbicide could be applied and application of one of the other preemergent herbicides can be made.

Applications should be made to limited areas until experience is gained with a given herbicide. Any application of a new herbicide should include an untreated area to allow observation of weed control and possible injury. Small and shallow-rooted plants are more easily injured than large established plants. Sandy soil and excessive watering also increases chances of injury. Irrigate after a granular herbicide application to wash the granules off the leaf surfaces. Certain granular herbicides can cause spotting of foliage if granules are not washed off leaves.

Tables 4.6, 4.7, 4.8, and 4.9 list which herbicides are registered for use on individual nursery species. Check herbicide labels to determine specific cultivars that can be treated. These registrations are only for liners or rooted cuttings planted into the field or planted in containers which are maintained outdoors. Consult herbicide labels to determine which compounds can be used in propagation, be it seedbeds or vegetative propagation. See the section on weed control in the greenhouse for plants maintained indoors.

It is wise to keep a separate sprayer for herbicides since certain ones are difficult to clean from the spray tank.

Table 5.5 - Herbicides

Time of Application	Weed Problem	Chemical Rate/Acre	Remarks	
Preplant soil fumigation	Most annual and perennial weeds	dazomet (Basamid 218-525 lb/A or 5-12 lb/1000 sq ft)	Incorporate after application. Irrigate or cover with plastic after application. Do not use below soil temperature of 43° F. Waiting period for transplants ranges from 10 to over 25 days.	
Postplant but preemergence to weeds	Annual grasses and certain broad-leaf weeds	dithiopyr 0.38-0.5 lb (Dimension 2EW 1.5-2.0 pt/A)	Apply to established ornamentals. Combine with a broadleaf herbicide such as isoxaben for improved broadleaf weed control. Do not apply more than 2 pt/A/application or 6 pt/A/year. For small areas apply 0.7 fl oz/1000 sq ft.	
		napropamide 4.0-6.0 lb (Devrinol 50DF 8.0-12.0 lb)	Use on container or field grown nursery stock. Apply to weed-free soil or include an appropriate postemergence herbicide. Safe on a wide variety of plant material. May be used on newly transplanted stock after soil has settled from first watering. Needs incorporation (mechanical or irrigation). For small areas, apply 2.9-4.4 oz Devrinol 50DF/1000 sq ft.	
		oryzalin 2.0-4.0 lb (Surflan 4AS 2.0-4.0 qt, Oryzalin 4AS 2.0-4.0 qt)	Can be applied overtop or as a directed spray on field and container grown ornamentals. Will not control established weeds. Irrigation will improve weed control. For small areas, apply 1.5-2.9 fl oz Surflan 4AS/1000 sq ft. For those desiring a granular formulation of Surflan, XL contains 1% oryzalin and 1% benefin (Balan). The list of registered species and weeds controlled is very similar to that of Surflan.	
		prodiamine 0.65-1.5 lb (Barricade 65WG 1.0-2.3 lb, Barricade 4FL 21.0-48.0 oz)	Apply prior to weed germination. Do not apply more than 2.3 lb Barricade 65WG or 48 fl oz Barricade 4FL/year. For small areas apply 0.4-0.8 oz Barricade 65WG or 0.5-1.1 fl oz Barricade 4FL/1000 sq ft.	
		pendimethalin 2.0-4.0 lb (Corral 2.7G 76.0-113.0 lb, Pendulum 2G 100.0-200.0 lb, Pendulum AquaCap 2.1-4.2 qt, Pendulum 3.3EC 2.4-4.8 qt)	Can be applied to container and field grown ornamentals. Do not apply to moist foliage. Will not control established weeds. For small areas apply 1.7-2.6 lbs Corral 2.7G, 2.3-4.6 lbs Pendulum 2G, or 1.6-3.2 fl oz Pendulum AquaCap, Pendulum 3.3EC 1.8-3.6 fl oz/1000 sq ft. DO NOT APPLY PENDULUM 3.3EC OVERTOP ACTIVELY GROWING NURSERY PLANTS.	
		trifluralin 0.5-4.0 lb (Treflan 5G 10.0-80.0 lb, Preen Garden Weed Preventer 270 lb)	Will not control established weeds. Use lower rate if incorporated or higher rate and irrigate after application. Apply as a directed spray. Consult label for use on specific soil types. For small areas, apply 0.3-1.8 lb Treflan 5G/1000 sq ft or 6.2 lb Preen Garden Weed Preventer.	
		Annual grasses, dodder, and certain other broadleaf weeds	DCPA 10.5-12.0 lb (Dacthal W-75 14.0-16.0 lb/A)	Apply after transplanting or to established ornamentals. For small areas, apply 0.3 lb/1000 sq ft.
		Annual grasses and broadleaf weeds	flumioxazin 0.375 lb (BroadStar 150.0 lb/A)	Apply granules to dry foliage prior to weed germination and follow with irrigation or use a leaf blower to remove granules from the nursery foliage. For use in woody ornamental production and in landscape maintenance. For small areas, apply 3.4 lb/1000 sq ft. DO NOT APPLY TO NEWLY PLANTED LINERS.

Table 5.5 - Herbicides (cont.)

Time of Application	Weed Problem	Chemical Rate/Acre	Remarks
Postplant but preemergence to weeds (cont.)	Annual grasses and broadleaf weeds (cont.)	flumioxazin 0.25-0.375 lb (SureGuard 8.0-12.0 oz/A)	Preemergence and early postemergence action. Apply as a directed spray to dormant nursery trees or to established woody landscape ornamentals prior to weed germination or to small emerged weed seedlings. Combine with a labeled postemergence herbicide for control of larger annual weeds or perennials. Can be applied ovetop dormant conifers. For small areas, apply 0.18-0.275 oz/1000 sq ft.
		indaziflam 0.029-0.058 lb (Specticle FLO 6-12 fl oz, Specticle G 100-200 lb) Indaziflam 0.036-0.075 lb (Marengo 7.5-15.5 fl oz, Marengo G 100-200 lb)	Use Marengo in nursery production and Specticle in landscape beds. Apply to established trees and shrubs as a direct spray, ideally when the plants are dormant. Do not exceed 18.5 fl oz/acre/year or 400 lb/acre/year. Long residual herbicide for pre-emergence control of many annual weeds. Include a postemergence herbicide for control of emerged weeds as indaziflam has limited postemergence activity. Do not apply to herbaceous ornamentals. For small areas, apply Specticle G or Marengo G at 2.3-4.6 lb/1,000 sq ft
		isoxaben 0.5-1.0 lb (Gallery 75DF 0.6-1.3 lb, Gallery SC 16-31 fl oz)	Do not apply to new plantings until soil has settled and no cracks are present. Apply prior to weed germination. Combine with oryzalin for improved control of annual grasses. For small areas, apply 0.25-0.5 oz Gallery 75DF or 0.3-0.7 fl oz Gallery SC/1000 sq ft.
		isoxaben 0.5-0.1.0 lb + prodiamine 0.75-1.5 lb (Gemini 3.7SC 43.5-87 fl oz/A)	Apply to established plants or after the soil has settled with root development for new plantings. Do not apply more than 87 fl oz/A/year. For small areas, apply 1.0-2.0 fl oz/1,000 sq ft.
		isoxaben 0.75 lb + dithiopyr 0.375 lb (Fortress 150 lb)	Maximum 2 applications per year. Do not apply to containers less than 4 inches wide. Do not apply to unrooted cuttings. For small areas apply 3.4 lb/1000 sq ft.
		isoxaben 0.25-0.5 lb + prodiamine 0.4-0.8 lb (Gemini Granular 100-200 lb)	Apply to established plants or after the soil has settled with root development for new plantings. Do not apply more than 375 lb/A/year. For small areas apply 37-75 oz/1000 sq ft.
		isoxaben 0.5-1.0 lb + trifluralin 2.0-4.0 lb (Snapshot 2.5TG 100-200 lb)	A prepackaged mix of the active ingredients in Gallery and Treflan. For small areas apply 2.3- 4.6 lb Snapshot 2.5TG/1000 sq ft. Apply prior to weed germination.
		oxadiazon 2.0-4.0 lb (Ronstar 2G 100.0-200.0 lb, Ronstar 50WP 4.0-8.0 lb)	Use on container or field grown nursery stock. The granular formulation is safe on a wide variety of plant material. Apply prior to weed germination. Disturbing soil after application may result in reduced weed control. Do not apply when foliage is wet. For continued weed control, an additional application to certain ornamentals can be made 60-120 days later. Toxic to fish. Do not contaminate water by washing equipment or disposal of waste. For small areas, apply 2.3-4.5 lb Ronstar 2G/1000 sq ft. Ronstar WP can cause foliar injury to certain species that are not injured by Ronstar G. Check WP label to determine which species can be treated.

Table 5.5 - Herbicides (cont.)

Time of Application	Weed Problem	Chemical Rate/Acre	Remarks
Postplant but preemergence to weeds (cont.)	Annual grasses and broadleaf weeds	oxyfluorfen 1.0-2.0 lb - conifers (Goal 2XL 4.0-8.0 pt, GoalTender 2.0-4.0 pt)	Apply to seedbeds, containers, or transplants of many conifer species and to certain field-grown trees. Apply before bud-break or after new growth has hardened-off. Goal has preemergence and postemergence activity if applied to weeds less than 3-4 inches in height.
		oxyfluorfen 0.5-1.5 lb Shadetrees (Goal 2XL 2.0-6.0 pt, GoalTender 1.0-3.0 pt)	
		oxyfluorfen 2.0 lb + prodiamine 0.75 lb (Biathlon100.0 lb)	Apply to weed-free soil immediately after transplanting or to established ornamentals grown in containers or in the field. Do not apply to ornamentals when foliage is moist or foliar injury can result. Apply overhead irrigation or use leaf blowers to remove granules from leaf surfaces. For small areas, apply 2.3 lb Biathlon/1000 sq ft.
		oxyfluorfen 2.0 lb + pendimethalin 1.0 lb (Ornamental Herbicide 2,100.0 lb)	Apply to weed-free soil immediately after transplanting or to established ornamentals grown in containers or in the field. Do not apply to ornamentals when foliage is moist or foliar injury can result. Apply overhead irrigation to wash granules off leaf surfaces. For small areas, apply 2.3 lb OH2/1000 sq ft.
		oxyfluorfen 2.0 lb + oryzalin 1.0 lb (Rout Ornamental Herbicide 100 lb)	Apply to a weed-free soil surface when foliage is dry and plants are not making a flush of growth. Use on container and field grown stock. Apply overhead irrigation to wash granules off leaf surface. Do not apply to ornamentals when foliage is moist or foliar injury can result. For small areas, apply 2.3 lb Rout/1000 sq ft.
		simazine 1.0-3.0 lb (Princep Liquid 1.0-3.0 qt, or other labeled formulation)	Apply to weed-free soil in the fall or spring before new weed growth appears. Apply no more than once per year. Apply at least one year after transplanting. For small areas, apply 0.8-2.2 fl oz Princep Liquid/1000 sq ft.
	Annual broadleaf weeds and yellow nutsedge	sulfentrazone 0.08-0.25 lb (Dismiss Turf 4-12 fl oz)	Provides preemergence control of certain annual broadleaf weeds plus postemergence yellow nutsedge control. Apply as a directed spray. Add a herbicide such as oryzalin for improved annual grass control and add a postemergence herbicide if weeds are present.
	Annual and certain perennial weeds	dichlobenil 4.0-6.0 lb (Barrier, Casoron 100.0-150.0 lb)	Apply in the late fall, winter, or early spring. If dichlobenil remains on the soil surface during warm weather, activity will be lost. Do not apply until 4 weeks after transplanting. NOTE: Use higher rate for control of certain perennials in ornamentals established at least one year. Do not remove old weed growth before making a surface application in the fall for control of perennial weeds. For small areas, apply 2.3-3.4 lb Barrier or Casoron/1000 sq ft.
	Primarily annual grasses and yellow nutsedge	metolachlor 1.2-2.4 lb (Pennant Magnum 1.3-2.6 pt)	Apply to weed-free soil. Direct toward base of ornamentals established for at least 2 weeks. For additional broadleaf weed control, tank-mix with Princep where labeled. For small areas, apply 0.5-0.9 fl oz Pennant Magnum/1,000 sq ft.

Table 5.5 - Herbicides (cont.)

Time of Application	Weed Problem	Chemical Rate/Acre	Remarks
Postplant but preemergence to weeds (cont.)	Annual grasses, yellow nutsedge, and certain annual broadleaf weeds	pendimethalin + dimethenamid 1.75-3.5 lb ai (FreeHand 1.75G 100-200 lbs)	Apply to established plantings prior to weed emergence. Delay application for 2-4 weeks after transplanting bare-root liners. Irrigate after transplanting to settle the soil prior to application. For small areas, apply 2.3-4.6 lb/1000 sq ft.
	Annual grasses, yellow nutsedge, and certain annual broadleaf weeds	dimethenamid 0.98-1.5 lb (Tower 6EC 21.0-32.0 fl oz)	Apply to established plantings prior to weed emergence or include a postemergence herbicide to control emerged weeds. Apply as directed spray either prior to bud break or after new growth has hardened. Combine with a preemergence broadleaf herbicide for broader-spectrum control. Use a shielded spray if ornamentals have been in the ground less than one year. For small areas, apply 0.48-0.73 fl oz/1000 sq ft.
	Annual weeds and certain perennial grasses	pronamide 1.0-2.0 lb (Kerb 50W 2.0-4.0 lb, Kerb SC 2.5-5.0 pt)	Fall application when temperatures are below 60° F. High rate has given quackgrass control as well as control of other cool season grasses. Do not use on fine-textured soils of high organic content. Kerb should not be applied to transplants less than 1 year old. For small areas, apply 0.7-1.4 oz Kerb 50W or or 0.9-1.8 fl oz Kerb SC/1,000 sq ft. RESTRICTED USE.
Postemergence to weeds	All weeds contact kill	diquat 0.5 lb (Reward 2.0 pt + nonionic surfactant)	Avoid contact with desired foliage. For spot treatment, mix 3/4 fl oz Reward plus a nonionic surfactant per gallon. Thorough coverage of weed foliage is needed for best results.
		pelargonic acid (Scythe 3-7% V/V)	Rapid acting contact herbicide. Can be used to control weeds prior to crop emergence and can be applied under greenhouse benches. Treat weeds when they are less than 4 inches tall. Avoid contact with desired foliage.
		glufosinate 0.75-1.5 lb (Finale 3-6 qts)	Apply as a directed spray. Do not contact bark or foliage of desired plants. Contact herbicide with some systemic action. For spot application use 2.0-4.0 fl oz/gal on a spray to wet basis, prior to runoff. Ensure complete coverage of weed foliage.
	All weeds controlled	glyphosate 0.75-3.75 lb ae (Roundup Pro 1.0-5.0 qt, Roundup Pro Max 1.0-3.3 qt, or other labeled formulation. For wiper application, use 1 part herbicide to 2 parts water; for cut stump treatments, use a 50% to 100% solution)	Apply as a directed spray in established plantings. Adjust rate of application to weed species according to label instructions. Do not contact bark or foliage of desired plants or serious systemic injury may occur. For small area application with a hand sprayer, use 2.0 fl oz/gal water and lightly wet the foliage. Also cleared for site preparation prior to planting nursery stock. Other glyphosate formulations are available. See label for application rates. Compare products based on the lb/gal glyphosate acid and the presence of a surfactant.
Annual and perennial grasses including bermudagrass, quackgrass, and johnsongrass	clethodim 0.09-0.25 lb (Envoy Plus 9.0-32.0 fl oz + 0.25% nonionic surfactant)	Apply to actively growing grasses. For spot treatment use a 0.44-0.88 fl oz/gal solution plus 0.25% nonionic surfactant (0.33 fl oz/gal). A repeat application may be required for perennial grass control.	
	fenoxaprop-ethyl 0.06-0.17 lb (Acclaim Extra 13.0-39.0 fl oz)	Primarily useful in landscape maintenance. Controls annual grasses and suppresses bermudagrass and johnsongrass. Apply when grasses are small and actively growing. Do not apply under drought stress. For spot treatment, mix 0.3-0.46 fl oz Acclaim Extra/gal.	

Table 5.5 - Herbicides (cont.)

Time of Application	Weed Problem	Chemical Rate/Acre	Remarks
Postemergence to selected weeds	Annual and perennial grasses including bermudagrass, quackgrass, and johnsongrass	fluazifop-P-butyl 0.25-0.375 lb (Ornamec 64.0-96.0 fl oz, Fusilade II 16.0-24.0 fl oz, or other labeled formulation + 0.5 pt nonionic surfactant/25.0 gal)	May be applied overtop to ornamentals and as a directed spray to others. Treat bermudagrass when runners are 4-8" long, quackgrass when 6-10" tall and johnsongrass when 8-10" tall. Treat annual grasses prior to tillering. Apply only to actively growing grasses not under moisture stress. For spot treatment, use 2.5 fl oz Ornamec or 0.75 fl oz Fusilade II plus 0.5 fl oz nonionic surfactant/gal and lightly wet grass.
	Annual and perennial grasses including bermudagrass, quackgrass, and johnsongrass	sethoxydim 0.28-0.46 lb (Segment II 1.5-2.5 pt/A) + 2 pt/A crop oil concentrate or 1.5 pt/A methylated seed oil	Apply overtop of ornamentals to actively growing grasses. Use lower rate on annual grasses less than 6 inches tall and higher rate on grasses up to 12 inches in height. Treat perennial grasses with higher rate as follows: bermudagrass, 6 inch runners; johnsongrass, 15-20 inches tall; quackgrass, 6 inches tall; wirestem muhly, 6 inches tall. Repeat applications may be necessary on perennial grasses. Less than optimum results are likely if treatments are applied during moisture stress. For spot treatment, use 1.3 fl oz Segment II + 0.6 fl oz COC or 0.5 fl oz MSO per gal.
	Yellow nutsedge and certain broadleaf weeds	bentazon 0.75-1.0 (Basagran T/O 1.5-2.0 pt + 1 qt crop oil concentrate)	Apply as a directed spray to small, actively growing weeds. A second application 7-10 days later may be needed for acceptable yellow nutsedge control. Minimize contact with foliage of desired trees and shrubs. For small areas, mix 3/4 to 1 1/2 fluid ounces Basagran T/O plus 3/4 fl oz crop oil concentrate/gal.
	Yellow and purple nutsedge	halosulfuron 0.0321-0.062 lb (SedgeHammer 0.66-1.33 oz plus 0.25-0.5% V/V nonionic surfactant)	Apply as a directed spray around woody ornamentals that have been established at least 3 months after transplanting in landscapes. Do not contact leaves of desired woody plants. Do not apply to herbaceous perennials or bedding plants. For small areas, mix 0.9 g SedgeHammer plus 2 tsp (0.33 fl oz) nonionic surfactant/gal and wet entire foliage of sedges.
	Certain broadleaf weeds	clopyralid 0.09-0.5 lb (Lontrel 0.25-1.33 pt)	Provides postemergence control of primarily legume and composite weeds such as clover, vetch, thistles, ragweed, and horseweed. Do not apply to container-grown ornamentals. Avoid drift to sensitive ornamentals such as daisy, redbud, locust, or linden. Apply as a directed spray.
	Poison ivy	glyphosate (Roundup Pro 2.67 fl oz/gal, Roundup Pro Max 2.0 fl oz/gal or other labeled formulation)	Apply as a foliar spray when poison ivy is actively growing. Do not allow herbicide to contact leaves or green bark of desired plants. Use shielded sprays or other techniques. For wiper applications, use a 33% to 70% solution. For cut stump treatments, apply a 50% to 100% solution immediately after cutting stems.
	Phragmites (common reed)	glyphosate (various)	Apply to foliage during active growth. Repeat applications will be needed for control. Use a formulation registered for aquatic sites if treating near water, such as AquaMaster or Glyphomate 41.

Table 5.6 - Guide for Herbicide Selection - Annual and Perennial Flowers, Vines, and Groundcovers¹

	Acclaim	Barricade	Dacthal	Devrinol	Envoy	Fortress	FreeHand	Gallery	Ornamec	Pendulum G	Pennant	Segment	Ronstar G	Snapshot	Surflan	trifluralin	Tower
Annual And Perennial Flowers																	
Alyssum	-	-	F	-	C,F	-	C,F	-	-	C,F	F	C,F	-	-	-	F	-
Aster	-	C,F	F	C	-	C,F	C,F	-	-	C,F	F	-	-	C,F	-	F	-
Begonia	F	-	-	-	-	-	-	-	-	C,F	-	C,F	-	-	-	-	-
Chrysanthemum	F	-	F	C	C,F	-	-	-	-	C,F	F	C,F	-	C,F	F	F	C,F
Coleus	F	-	F	-	C,F	-	C,F	-	-	-	-	C,F	-	-	-	-	C,F
Daffodil	-	C,F	-	C	-	-	C,F	-	-	C,F	F	-	-	-	F	F	C,F
Dahlia	-	-	F	C	C,F	C,F	-	-	-	C,F	-	-	-	-	-	F	-
Daylily	F	C,F	-	-	C,F	C,F	C,F	C,F	C,F	C,F	F	F	-	C,F	-	-	C,F
Delphinium	-	-	F	-	-	-	-	-	-	-	F	-	-	-	-	-	-
Ferns	-	-	-	-	-	-	-	-	-	C,F	-	-	-	-	-	-	-
Forget-me-not	F	-	F	-	-	-	-	-	-	-	-	-	-	-	-	F	-
Four-o'clock	-	-	F	-	-	-	-	-	-	-	-	-	-	-	-	F	-
Geranium	F	-	F	C	C,F	-	-	-	-	C,F	F	C,F	-	-	F	-	-
Gladiolus	-	F	F	C	-	-	C,F	-	-	C,F	F	C,F	-	-	F	F	-
Hosta	F	C,F	-	C	C,F	C,F	C,F	C,F	C,F	C,F	C,F	C,F	-	C,F	-	-	C,F
Impatiens	-	-	-	-	-	-	-	-	-	C,F	-	C,F	-	-	F	F	-
Iris	F	C,F	F	-	C,F	C,F	C,F	-	-	C,F	F	C,F	-	C,F	F	F	C,F
Lily	-	C,F	F	-	-	-	-	-	-	C,F	F	-	-	-	-	-	C,F
Marigold	-	-	-	-	C,F	-	C,F	-	C,F	C,F	F	C,F	-	-	F	F	C,F
Nasturtium	-	-	F	-	-	-	-	-	-	-	-	-	-	-	-	F	-
Pansy	-	-	-	-	-	-	-	-	-	C,F	-	C,F	-	-	F	-	-
Peony	F	-	F	-	-	-	C,F	-	-	C,F	-	-	-	-	-	-	-
Periwinkle	F	-	-	-	-	-	C,F	-	-	C,F	-	C,F	-	-	-	-	-
Petunia	F	-	F	C	C,F	-	C,F	-	-	C,F	F	C,F	-	-	-	F	C,F
Phlox	F	-	-	-	C,F	-	C,F	-	-	C,F	F	-	-	-	-	F	-
Salvia	-	-	-	-	C,F	C,F	C,F	-	-	C,F	-	C,F	-	-	-	F	C,F
Shasta daisy	F	-	-	C	-	C,F	C,F	-	C,F	C,F	-	C,F	-	-	-	F	-
Snapdragon	F	-	-	-	C,F	-	-	-	-	C,F	F	C,F	-	-	-	F	-
Sunflower	-	-	F	-	-	-	C,F	-	-	C,F	-	-	-	-	-	F	-
Sweetpea	-	-	F	-	-	-	-	-	-	-	-	-	-	-	-	F	-
Sweet William	F	-	-	-	-	-	C,F	-	C,F	C,F	F	C,F	-	-	-	F	-
Tulip	-	C,F	-	-	-	-	C,F	-	-	C,F	F	-	-	-	F	F	-
Zinnia	F	-	F	C	C,F	-	C,F	-	C,F	C,F	F	C,F	-	-	F	F	C,F

¹This table should be used only as a guide. A 'C' indicates the herbicide is registered for use on that species when container-grown. An 'F' indicates the herbicide is registered for use on that species when field-grown or planted in landscapes. Check the herbicide label for special considerations such as variety, plant growth stage, rate adjustment, or application precautions prior to application.

Table 5.6 - Guide for Herbicide Selection - Annual and Perennial Flowers, Vines, and Groundcovers¹ (cont.)

	Acclaim	Barricade	Dacthal	Devrinol	Envoy	Fortress	FreeHand	Gallery	Ornamec	Pendulum G	Pennant	Segment	Ronstar G	Snapshot	Surflan	trifluralin	Tower
Vines And Groundcovers																	
Ajuga	F	-	-	F	C,F	-	-	-	-	C,F	C,F	-	F	-	-	-	-
Bamboo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Clematis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C,F
English ivy	F	C,F	-	F	C,F	C,F	-	C,F	C,F	C,F	C,F	C,F	F	C,F	F	F	-
Euonymus	-	C,F	F	-	-	-	-	-	C,F	C,F	C,F	-	F	C,F	C,F	-	-
Honeysuckle	-	C,F	F	-	C,F	C,F	-	-	-	-	F	-	F	F	-	-	-
Jasmine	-	C,F	-	-	C,F	C,F	C,F	-	-	C,F	-	-	-	-	-	-	-
Liriope	F	C,F	-	F	C,F	C,F	C,F	C,F	C,F	C,F	C,F	C,F	-	C,F	C,F	F	C,F
Pachysandra	-	-	F	F	C,F	-	C,F	C,F	C,F	C,F	C,F	C,F	F	C,F	-	F	-
Pampasgrass	-	C,F	-	-	-	-	-	C,F	-	C,F	F	-	-	C,F	-	-	-
Santolina	-	C,F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sedum	-	C,F	-	F	C,F	-	C,F	-	-	C,F	F	-	F	C,F	-	F	-
Vinca (Periwinkle)	F	C,F	-	F	C,F	C,F	-	-	C,F	C,F	F	C,F	F	F	F	F	-
Yucca	-	C,F	-	-	-	-	-	-	C,F	C,F	C,F	-	-	-	C,F	-	-

¹This table should be used only as a guide. A 'C' indicates the herbicide is registered for use on that species when container-grown. An 'F' indicates the herbicide is registered for use on that species when field-grown or planted in landscapes. Check the herbicide label for special considerations such as variety, plant growth stage, rate adjustment, or application precautions prior to application.

Table 5.7 - Guide for Herbicide Selection - Narrowleaf and Broadleaf Evergreens

Tolerant Species	Acclaim	Barricade	BroadStar	Casoron	Dacthal	Devrinol	Fortress	Pennant	Ornamec	Gallery	Goal	Kerb	Lontrel
Narrowleaf Evergreens													
Arborvitae	-	C,F	C,F	F	F	C	C,F	C,F	C,F	C,F	C,F	F	F
Cedar (<i>Cedrus</i>)	-	-	C,F	-	-	C,F	-	-	-	F	-	F	-
Chamaecyparis	-	F	C,F	-	-	-	-	-	-	C,F	-	-	-
Cryptomeria	-	-	-	-	-	-	C,F	-	-	C,F	-	-	-
Fir	-	F	C,F	-	F	C,F	C,F	F	C,F	C,F	C,F	F	F
Hemlock	-	C,F	C,F	-	-	F	-	F	C,F	-	C,F	F	-
Juniper	F	C,F	C,F	F	F	C,F	C,F	C,F	C,F	C,F	C,F	F	F
Leyland cypress	-	-	-	-	-	C,F	-	-	C,F	-	-	-	-
Pine	F	C,F	C,F	F	F	C,F	C,F	C,F	C,F	F	C,F	F	F
Spruce	-	F	C,F	-	F	F	C,F	F	C,F	C,F	C,F	F	F
Yew	F	C,F	C,F	F	F	F	-	C,F	C,F	C,F	C,F	F	F

¹This table should be used only as a guide. A 'C' indicates the herbicide is registered for use on that species when container-grown. An 'F' indicates the herbicide is registered for use on that species when field-grown or planted in landscapes. Check the herbicide label for special considerations such as variety, plant growth stage, rate adjustment, or application precautions prior to application.

Table 5.7 - Guide for Herbicide Selection - Narrowleaf and Broadleaf Evergreens (cont.)

Tolerant Species	Acclaim	Barricade	BroadStar	Casoron	Dacthal	Devrinol	Fortress	Pennant	Ornamec	Gallery	Goal	Kerb	Lontrel
Broadleaf Evergreens													
Aucuba	-	C,F	-	-	-	F	-	C,F	C,F	-	-	-	-
Azalea	F	C,F	C,F	F	F	C,F	C,F	C,F	C,F	F	-	F	F
Barberry	F	C,F	C,F	F	F	-	C,F	F	C,F	C,F	-	F	-
Bayberry	-	-	C,F	-	-	-	-	F	-	-	-	-	-
Boxwood	F	C,F	C,F	F	F	C,F	C,F	C,F	C,F	F	-	F	F
Camellia	-	-	C,F	F	-	C,F	C,F	F	C,F	-	-	-	-
Euonymus	F	C,F	C,F	F	F	C,F	-	F	C,F	-	-	F	-
Holly	F	C,F	C,F	-	F	C,F	C,F	C,F	C,F	C,F	-	F	-
Leucothoe	-	-	-	F	-	C,F	-	C,F	-	-	-	-	-
Magnolia (Southern)	F	F	C,F	F	F	-	C,F	F	C,F	-	-	F	-
Mahonia	-	-	C,F	-	-	-	C,F	-	C,F	-	-	-	-
Mountain laurel	-	-	-	-	F	-	-	C,F	-	C,F	-	F	-
Osmanthus	-	C,F	-	F	-	F	C,F	F	-	-	-	-	-
Pittosporum	-	C,F	C,F	F	F	C,F	C,F	C,F	-	C,F	-	-	-
Pyracantha	F	C,F	C,F	F	-	C,F	C,F	F	C,F	C,F	-	F	-
Rhododendron	F	C,F	C,F	F	F	C,F	C,F	C,F	C,F	-	-	F	F
	OH 2	Segment	Pendulum G	Princep	Ronstar G	Rout		Snapshot	SureGuard	Surflan	trifluralin	Tower	FreeHand
Narrowleaf Evergreens													
Arbovitae	-	C,F	C,F	F	-	C,F		-	C,F	F	F	C,F	C,F
Cedar (<i>Cedrus</i>)	-	-	-	-	C,F	-		-	-	-	-	-	-
Cryptomeria	-	-	C,F	-	-	-		-	-	C,F	-	-	-
Chamaecyparis	C,F	-	C,F	-	C,F	C,F		F	-	-	-	-	-
Fir	-	C,F	C,F	-	-	-		F	C,F	F	F	C,F	C,F
Hemlock	-	C,F	C,F	F	F	-		-	C,F	-	F	C,F	C,F
Juniper	C,F	C,F	C,F	F	C,F	C,F		C,F	C,F	C,F	F	C,F	C,F
Leyland cypress	-	C,F	C,F	-	-	-		-	-	-	-	-	C,F
Pine	C,F	C,F	C,F	F	C,F	C,F		F	C,F	F	F	C,F	-
Spruce	C,F	C,F	C,F	F	F	C,F		F	C,F	F	F	C,F	C,F
Yew	C,F	C,F	C,F	F	F	-		F	C,F	F	F	C,F	C,F

¹This table should be used only as a guide. A 'C' indicates the herbicide is registered for use on that species when container-grown. An 'F' indicates the herbicide is registered for use on that species when field-grown or planted in landscapes. Check the herbicide label for special considerations such as variety, plant growth stage, rate adjustment, or application precautions prior to application.

Table 5.7 - Guide for Herbicide Selection - Narrowleaf and Broadleaf Evergreens (cont.)

	OH 2	Segment	Pendulum G	Princep	Ronstar G	Rout		Snapshot	SureGuard	Surflan	Trifluralin	Tower	FreeHand
Broadleaf Evergreens													
Aucuba	-	-	C,F	-	-	-		-	-	-	-	-	-
Azalea	C,F	C,F	C,F	-	C,F	C,F		C,F	-	F	F	C,F	C,F
Barberry	C,F	C,F	C,F	F	C,F	C,F		C,F	-	C,F	F	C,F	C,F
Bayberry	-	-	-	-	-	-		-	-	-	-	-	-
Boxwood	C,F	C,F	C,F	-	C	C,F		C,F	-	C,F	F	C,F	C,F
Camellia	C,F	C,F	C,F	-	C,F	-		C,F	-	-	F	C,F	C,F
Euonymus	C,F	C,F	C,F	-	C,F	C,F		C,F	-	C,F	F	C,F	-
Holly	C,F	C,F	C,F	F	C,F	C,F		C,F	-	C,F	F	C,F	C,F
Leucothoe	-	-	C,F	F	C	-		-	-	F	-	C,F	-
Magnolia (Southern)	-	C,F	C,F	-	C	-		C,F	-	F	-	C,F	-
Mahonia	C,F	-	-	F	C,F	C,F		C,F	-	F	-	-	C,F
Mountain laurel	-	-	C,F	-	-	-		-	-	F	F	-	-
Osmanthus	-	C,F	C,F	F	C	C,F		-	-	F	-	C,F	-
Pittosporum	C,F	C,F	-	-	C,F	C,F		C,F	-	-	F	-	-
Pyracantha	C,F	C,F	C,F	-	C,F	C,F		C,F	-	C,F	F	-	-
Rhododendron	C,F	C,F	C,F	-	C,F	C,F		C,F	-	C,F	F	C,F	-

¹This table should be used only as a guide. A 'C' indicates the herbicide is registered for use on that species when container-grown. An 'F' indicates the herbicide is registered for use on that species when field-grown or planted in landscapes. Check the herbicide label for special considerations such as variety, plant growth stage, rate adjustment, or application precautions prior to application.

Table 5.8 - Guide for Herbicide Selection - Deciduous Trees and Shrubs¹

Tolerant Species	Acclaim	Barricade	BroadStar	Casoron	Dacthal	Devrinol	Fortress	Pennant	Ornamec	Gallery	Goal	Kerb	Lontrel
Deciduous Trees													
Amelanchier	-	-	-	-	-	-	-	-	-	-	-	-	-
Ash	-	-	C,F	F	F	F	C,F	F	C,F	F	F	F	-
Beech	-	-	-	-	-	-	-	F	-	-	-	F	-
Birch	-	-	C,F	F	F	F	C,F	C,F	C,F	F	F	F	-
Cherry	-	-	-	-	-	F	-	F	-	F	F	F	-
Crabapple	-	C,F	C,F	F	F	F	C,F	F	-	F	F	F	-
Dawn redwood	-	-	-	-	-	-	-	-	-	-	-	-	-

¹This table should be used only as a guide. A 'C' indicates the herbicide is registered for use on that species when container-grown. An 'F' indicates the herbicide is registered for use on that species when field-grown or planted in landscapes. Check the herbicide label for special considerations such as variety, plant growth stage, rate adjustment, or application precautions prior to application.

Table 5.8 - Guide for Herbicide Selection - Deciduous Trees and Shrubs¹ (cont.)

Tolerant Species	Acclaim	Barricade	BroadStar	Casoron	Dacthal	Devrinol	Fortress	Pennant	Ornamec	Gallery	Goal	Kerb	Lontrel
Dogwood	-	C,F	C,F	F	F	C,F	C,F	C,F	C,F	-	F	F	F
Elm	-	-	C,F	F	F	-	-	-	-	F	-	F	-
Ginkgo	-	-	C,F	-	-	-	-	F	-	-	-	F	-
Deciduous Trees (cont.)													
Goldenchain tree	-	-	-	F	-	F	-	-	-	-	-	-	-
Goldenrain tree	-	-	-	-	-	-	-	-	-	-	-	-	-
Hawthorn	F	C,F	-	F	F	F	-	-	-	-	-	F	-
Honeylocust	-	-	-	F	-	F	-	F	C,F	-	-	F	-
Linden	-	-	-	F	-	-	-	-	-	F	-	F	-
Magnolia	F	F	C,F	F	F	-	C,F	F	C,F	-	-	F	-
Maple	F	C,F	C,F	F	F	F	C,F	C,F	C,F	F	F	F	F
Oak	-	C,F	C,F	F	F	F	C,F	C,F	C,F	F	F	F	F
Pear	-	C,F	-	F	-	F	-	F	-	F	F	-	-
Poplar	-	-	C,F	F	F	-	-	F	-	-	F	F	-
Redbud	-	-	C,F	-	F	-	-	-	C,F	-	F	-	-
Russian Olive	-	-	-	F	-	-	-	F	C,F	-	F	-	-
Sourgum (<i>Nyssa</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-
Sourwood (<i>Oxydendron</i>)	-	C,F	-	-	-	-	C,F	-	-	-	-	-	-
Sweetgum	-	-	C,F	-	-	-	C,F	F	C,F	F	F	F	-
Sycamore	-	-	C,F	-	F	-	-	-	-	F	F	F	F
Tulip tree	-	-	-	-	F	-	-	F	-	-	F	-	-
Walnut	F	-	C,F	-	F	F	-	-	-	-	F	F	-
Willow	F	-	-	F	F	-	C,F	F	C,F	F	-	F	-
Zelkova	-	-	-	-	-	-	-	-	-	-	-	-	-
Deciduous Shrubs													
Abelia	-	C,F	C,F	-	F	C,F	C,F	C,F	C,F	-	-	-	-
Cotoneaster	-	C,F	C,F	F	F	C,F	-	C,F	C,F	C,F	-	F	-
Crape myrtle	-	C,F	C,F	-	-	C,F	-	F	C,F	-	F	-	-
Deutzia	-	-	-	F	-	-	-	-	-	-	-	-	-
Euonymus	-	C,F	C,F	F	F	C,F	C,F	C,F	C,F	-	-	F	-
Flowering quince	-	-	-	F	-	-	-	-	C,F	-	-	F	-
Forsythia	-	C,F	C,F	F	F	C,F	-	C,F	-	-	-	F	-
Hibiscus	-	C,F	-	-	-	C,F	-	F	-	C,F	-	-	-
Honeysuckle	-	C,F	C,F	F	F	F	-	F	-	-	-	-	-
Hydrangea	F	C,F	-	-	F	-	-	F	-	-	-	-	-

¹This table should be used only as a guide. A 'C' indicates the herbicide is registered for use on that species when container-grown. An 'F' indicates the herbicide is registered for use on that species when field-grown or planted in landscapes. Check the herbicide label for special considerations such as variety, plant growth stage, rate adjustment, or application precautions prior to application.

Table 5.8 - Guide for Herbicide Selection - Deciduous Trees and Shrubs¹ (cont.)

Tolerant Species	Acclaim	Barricade	BroadStar	Casoron	Dacthal	Devrinol	Fortress	Pennant	Ornamec	Gallery	Goal	Kerb	Lontrel
Hypericum	-	-	-	-	-	F	-	F	-	-	-	-	-
Lilac	-	-	C,F	F	-	-	-	F	C,F	F	F	F	-
Nandina	F	C,F	-	F	-	C,F	C,F	F	-	C,F	-	-	-
Photinia	F	C,F	C,F	F	-	C,F	C,F	F	C,F	C,F	-	-	-
Deciduous Shrubs (cont.)													
Privet	F	C,F	-	F	F	C,F	-	C,F	C,F	-	-	F	-
Rose	F	C,F	C,F	F	F	C,F	-	F	C,F	F	-	F	-
Spirea	-	C,F	-	F	F	-	C,F	F	C,F	-	-	-	F
Viburnum	F	C,F	C,F	-	F	F	C,F	C,F	F	-	-	-	-
Vitex	-	-	-	-	-	-	-	-	-	-	-	-	-
Weigela	F	C,F	C,F	F	F	-	-	F	C,F	-	-	-	-
Witchhazel (<i>Hamamelis</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-
Tolerant Species	OH 2	Segment	Pendulum G	Princep	Ronstar G	Rout		Snapshot	SureGuard	Surflan	Treflan	Tower	FreeHand
Deciduous Trees													
Amelanchier (serviceberry)	-	-	-	-	-	-		-	-	-	-	-	-
Ash	-	C,F	C,F	-	F	-		-	F	-	F	F	C,F
Beech	-	-	-	-	-	-		-	-	-	-	-	-
Birch	C,F	C,F	C,F	-	F	-		C,F	F	-	F	-	C,F
Cherry	-	C,F	C,F	-	-	-		F	F	F	F	-	C,F
Crabapple	-	C,F	C,F	F	F	-		-	F	-	F	-	C,F
Dawn redwood	-	C,F	-	-	-	-		-	-	-	-	-	-
Dogwood	C,F	C,F	C,F	F	C,F	C,F		C,F	F	-	F	F	C,F
Elm	-	C,F	C,F	F	-	-		F	-	-	-	F	C,F
Ginkgo	-	C,F	C,F	-	C	-		F	F	C,F	-	-	-
Goldenchain tree	-	-	-	-	-	-		-	-	-	-	-	-
Goldenrain tree	-	-	-	-	-	-		-	-	F	-	-	-
Hawthorn	C,F	C,F	C,F	-	-	-		-	-	-	-	F	C,F
Honeylocust	-	C,F	C,F	F	-	-		F	-	-	F	-	C,F
Linden	-	C,F	C,F	-	-	-		-	-	-	-	-	-
Magnolia	C,F	C,F	C,F	-	C,F	C,F		-	-	F	-	F	C,F
Maple	C,F	C,F	C,F	-	F	C,F		F	F	F	F	F	C,F

¹This table should be used only as a guide. A 'C' indicates the herbicide is registered for use on that species when container-grown. An 'F' indicates the herbicide is registered for use on that species when field-grown or planted in landscapes. Check the herbicide label for special considerations such as variety, plant growth stage, rate adjustment, or application precautions prior to application.

Table 5.8 - Guide for Herbicide Selection - Deciduous Trees and Shrubs¹ (cont.)

Tolerant Species	Acclaim	Barricade	BroadStar	Casoron	Dacthal	Devrinol		Pennant	Ornamec	Gallery	Goal	Kerb	Lontrel
Oak	C,F	C,F	C,F	F	C,F	C,F		F	F	C,F	F	-	C,F
Pear	-	C,F	C,F	-	-	-		F	F	F	-	F	-
Poplar	-	C,F	C,F	-	-	-		-	F	-	-	-	-
Redbud	C,F	-	-	-	-	-		C,F	F	-	F	-	C,F
Russian olive	-	-	C,F	F	F	C,F		F	-	-	-	-	-
Sourgum (<i>Nyssa</i>)	-	-	C,F	-	-	-		-	-	-	-	-	-
Sourwood (<i>Oxydendron</i>)	-	C,F	-	-	-	-		C,F	-	-	-	-	C,F
Sweetgum	-	C,F	C,F	-	-	-		F	F	C,F	F	-	-
Sycamore	-	C,F	C,F	-	-	-		F	F	-	F	-	-
Tulip tree	-	C,F	C,F	-	-	-		-	-	-	F	-	-
Walnut	-	C,F	C,F	-	-	-		F	F	-	F	F	C,F
Willow	-	C,F	C,F	-	-	-		F	-	-	F	-	-
Zelkova	-	-	-	-	-	-		-	-	-	-	-	C,F
Deciduous Shrubs													
Abelia	C,F	C,F	C,F	-	-	C,F		C,F	-	F	-	-	C,F
Cotoneaster	C,F	C,F	C,F	F	C,F	C,F		C,F	-	C,F	F	-	C,F
Crape myrtle	-	C,F	C,F	-	-	-		F	-	C,F	-	F	C,F
Deutzia	-	C,F	C,F	-	-	-		F	-	-	F	-	C,F
Euonymus	C,F	C,F	C,F	-	C,F	C,F		C,F	-	C,F	F	-	C,F
Flowering quince	-	C,F	-	-	-	-		-	-	-	-	-	C,F
Forsythia	C,F	C,F	C,F	-	C,F	C,F		C,F	-	F	F	-	C,F
Hibiscus	-	C,F	C,F	-	-	C,F		C,F	-	F	-	-	C,F
Honeysuckle	C,F	-	C,F	-	C,F	C,F		C,F	-	-	F	-	-
Hydrangea	C,F	C,F	C,F	-	-	-		-	-	-	-	F	C,F
Hypericum	C,F	-	-	-	-	C,F		-	-	-	-	-	-
Lilac	-	C,F	C,F	-	F	-		-	F	C,F	F	-	-
Nandina	-	C,F	C,F	-	-	C,F		C,F	-	C,F	-	F	C,F
Photinia	C,F	C,F	C,F	-	C	C,F		C,F	-	C,F	-	-	C,F
Privet	C,F	C,F	C,F	-	C,F	C,F		C,F	-	C,F	F	-	C,F
Rose	-	C,F	-	-	C,F	-		F	-	F	F	F	C,F
Spirea	C,F	C,F	C,F	-	-	C,F		C,F	-	-	F	F	C,F
Viburnum	-	C,F	C,F	-	C	C,F		C,F	-	C,F	F	C,F	C,F
Vitex	-	C,F	C,F	-	-	-		-	-	-	-	-	-
Weigela	-	C,F	C,F	F	-	C,F		F	-	F	F	-	C,F
Witchhazel (<i>Hamamelis</i>)	-	-	-	-	-	-		-	-	-	-	-	-

¹This table should be used only as a guide. A 'C' indicates the herbicide is registered for use on that species when container-grown. An 'F' indicates the herbicide is registered for use on that species when field-grown or planted in landscapes. Check the herbicide label for special considerations such as variety, plant growth stage, rate adjustment, or application precautions prior to application.

Table 5.9 - Guide to Weeds Which May Be Controlled by Preemergence Herbicides Approved for Use in Ornamentals

Weed	Barricade	BroadStar, SureGuard	Casoron	Dacthal	Devrinol	Fortress	FreeHand	Pendulum	Pennant	Gallery	Goal	Kerb	Specticle	Dismiss
Monocot weeds														
Annual bluegrass	G	P-F	G	F	G	G	G	G	F	P	F	G	E	-
Barnyardgrass	G	-	G	G	G	-	-	G	G	-	F	F	-	P
Bermudagrass	N	N	P	N	N	N	N	N	N	N	N	N	N	N
Cheat	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crabgrass	G	F-G	G	G	G	G	G	G	G	P	F	F	E	P
Doveweed	P	G	-	-	-	-	G	P	G	N	-	-	P	-
Fall panicum	-	-	G	G	G	-	G	G	G	-	-	F	-	P
Foxtails	G	F-G	G	G	G	-	G	G	G	-	F	F	-	P
Goosegrass	G	-	G	G	G	-	G	G	G	-	F	-	G	P
Johnsongrass (seedling)	-	F	G	-	G	-	-	G	G	-	-	F	-	-
Microstegium	G	-	-	-	-	-	-	G	-	-	-	-	G	-
Orchardgrass, fescue	N	N	G	N	N	N	N	N	N	N	N	G	P	N
Quackgrass	-	-	G	N	N	-	N	-	N	-	-	G	-	-
Small grains (volunteer)	-	-	-	-	G	-	-	-	-	-	-	G	-	-
Stinkgrass	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Nutsedge	N	N	G	N	P	N	F-G	N	F-G	N	-	N	N	F
Broadleaf Weeds														
Artemisia (wild chrysanthemum)	-	-	G	N	N	-	-	-	-	-	-	-	-	-
Bittercress	P-F	G	-	P	F	G	F-G	P-F	P	G	G	-	G	-
Canada thistle	-	-	-	N	N	-	-	-	-	-	-	-	-	-
Carpetweed	G	-	G	G	G	-	G	G	F	-	-	-	E	G
Chamberbitter	P	G	-	-	-	-	F	F	P	P-F	-	-	G	-
Chickweed	G	F-G	G	G	G	-	G	G	F	G	F	G	G	-
Cutleaf evening primrose	P	-	G	-	G	-	-	P	P	F	F	-	-	-
Dandelion	-	-	G	N	-	-	-	-	-	-	-	-	-	-
Dock	-	-	G	N	-	-	-	-	-	-	-	-	-	-
Dodder	-	-	G	F	-	-	-	-	-	-	-	-	-	-
Dogfennel	-	-	G	N	-	-	G	-	-	G	-	-	-	-
Eclipta	P	G	-	-	P	-	F-G	P	P	G	F	-	F	-
Filaree	-	-	-	-	F	-	-	-	-	-	-	-	-	-
Galinsoga (quickweed)	-	-	-	P	F	-	F	N	G	G	G	P	-	F

G = good control, F = fair, P = poor, N = no control, and - = no information.

Table 5.9 - Guide to Weeds Which May Be Controlled by Preemergence Herbicides Approved for Use in Ornamentals (cont.)

Weed	Barricade	BroadStar, SureGuard	Casoron	Dacthal	Devrinol	Fortress	FreeHand	Pendulum	Pennant	Gallery	Goal	Kerb	Specticle	Dismiss
Broadleaf Weeds (cont.)														
Groundsel, common	-	G	G	-	F	-	F	P	P	F	G	-	G	-
Henbit (deadnettle)	-	-	G	-	G	-	-	-	G	G	G	-	G	-
Horseweed (marestail)	-	-	G	-	N	-	-	-	P	F	G	-	G	-
Knotweed	-	-	-	F	G	-	-	-	-	-	G	-	P	-
Lambsquarters	-	E	G	G	F	-	-	F	P	G	G	F	F-G	G
Long-Stalk Phyllanthus	F	G	-	-	-	-	F	F	P	P-F	-	-	G	-
Morningglory	-	G	G	P	N	-	-	P	N	P	G	-	P	-
Mulberry weed	F-G	G	-	-	-	-	G	F-G	F-G	G	-	-	-	-
Mustard	-	-	-	P	N	-	-	-	-	-	G	-	-	-
Nightshade	-	-	-	P	N	-	-	P	G	-	G	-	-	-
Pigweed	-	G	G	F	F	-	G	F	G	G	G	F	-	G
Poison Ivy	N	-	-	N	N	-	-	N	N	N	N	-	-	-
Prickly lettuce	-	-	-	-	G	-	-	-	-	-	G	-	-	-
Prickly sida	-	E	G	-	P	-	-	-	P	-	-	-	-	-
Purslane	-	-	G	G	G	-	-	F	F	G	G	G	-	G
Pusley, Florida	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ragweed	P	E	G	N	P	-	-	N	N	G	F	P	F-G	P
Red sorrel	-	-	G	N	-	-	-	-	-	-	-	-	-	-
Shepherds' purse	-	-	-	P	P	-	-	N	-	G	G	-	-	-
Smartweed	-	-	G	N	P	-	-	-	P	G	G	F	-	G
Sowthistle	-	G	-	-	G	-	F	F	-	-	G	-	G	-
Spurge, prostrate (spotted)	G	G	-	F	P	-	G	G	P	F	F	-	F-G	-
Tassel flower	N	G	-	-	-	-	F-G	N	N	F	-	-	-	-
Velvetleaf	-	G	-	N	N	-	-	G	P	F	G	P	-	-
Veronica (speedwell)	-	-	-	G	-	-	-	-	-	-	G	-	-	-
Virginia copperleaf	-	P-F	-	-	-	-	-	-	-	-	-	-	-	-
Wild aster	-	-	-	N	-	-	-	-	-	-	-	-	-	-
Wild carrot	-	-	G	-	-	-	-	-	-	-	-	-	-	-
Yellow woodsorrel (<i>Oxalis</i>) from seed	G	G	G	G	N	-	G	G	P	F	G	-	G	-

G = good control, F = fair, P = poor, N = no control, and - = no information.

Table 5.9 - Guide to Weeds Which May Be Controlled by Preemergence Herbicides Approved for Use in Ornamentals (cont.)

	OH2	Princep	Ronstar	Rout	Snapshot	Surflan	Tower	Treflan
Monocots								
Annual bluegrass	G	G	F	G	G	G	-	-
Barnyardgrass	G	G	G	G	G	G	G	G
Bermudagrass	N	P	N	N	N	N	N	N
Cheat	-	-	-	-	-	-	-	-
Crabgrass	G	F	G	G	G	G	G	G
Doveweed	P-F	-	P-F	P-F	N	N	G	N
Fall panicum	G	F	-	G	G	G	G	G
Foxtails	G	F	G	G	G	G	G	G
Goosegrass	G	G	G	G	G	G	G	G
Johnsongrass (seedling)	G	P	-	G	G	G	P	G
Microstegium	-	-	G	-	-	G	-	-
Orchardgrass, fescue	N	F	N	N	N	N	N	N
Quackgrass	N	F	-	N	N	N	N	N
Small grains (volunteer)	G	-	-	G	-	-	-	-
Stinkgrass	-	-	-	-	-	-	-	-
Yellow Nutsedge	N	N	N	N	N	N	F-G	N
Broadleaf Weeds								
Artemisia (wild chrysanthemum)	-	-	-	-	-	-	-	-
Bittercress	G	-	G	G	G	G	-	F
Canada thistle	N	N	N	N	-	N	-	N
Carpetweed	-	-	-	-	-	-	-	-
Chamberbitter	G	-	G	G	F	G	-	N
Chickweed	F	G	N	F	G	F	-	G
Cutleaf evening primrose	G	F	G	G	G	F	-	-
Dandelion	G	-	-	G	-	-	-	-
Dock	-	-	-	-	-	-	-	-
Dodder	-	-	-	-	-	-	-	-
Dogfennel	-	F	P	G	G	G	-	-
Eclipta	F	-	P	G	F-G	F-G	-	-
Filaree	-	-	-	-	-	-	-	-
Galinsoga (quickweed)	G	G	G	G	G	N	-	N
Groundsel, common	G	G	F	G	F-G	P	-	-
Henbit (deadnettle)	G	G	G	G	G	G	-	-
Horseweed (marestail)	G	-	G	G	G	-	-	-
Knotweed	G	-	-	G	-	-	-	-

G = good control, F = fair, P = poor, N = no control, and - = no information.

Table 5.9 - Guide to Weeds Which May Be Controlled by Preemergence Herbicides Approved for Use in Ornamentals (cont.)

	OH2	Princep	Ronstar	Rout	Snapshot	Surflan	Tower	Treflan
Lambsquarters	G	G	G	G	G	G	P	F
Long-Stalk Phyllanthus	G	-	G	G	F	F	-	P
Broadleaf Weeds (cont.)								
Morningglory	G	F	P	G	-	N	N	N
Mulberry weed	G	-	F-G	G	F-G	G	-	P
Mustard	G	G	-	G	-	-	-	-
Nightshade	G	G	-	G	G	P	-	P
Pigweed	G	G	G	G	-	F	-	F
Poison Ivy	N	N	N	N	N	N	N	N
Prickly lettuce	G	G	-	G	-	-	-	-
Prickly sida	-	G	-	-	-	P	P	P
Purslane	G	G	G	G	G	F	-	F
Pusley, Florida	-	-	-	-	-	-	-	-
Ragweed	-	G	P	G	G	N	P	N
Red sorrel	-	-	-	-	-	-	-	-
Shepherds'purse	G	G	G	G	-	N	-	N
Smartweed	G	G	-	G	-	P	P	P
Sowthistle	G	F	-	G	-	-	-	-
Spurge, prostrate (spotted)	G	G	F	G	G	G	-	-
Tassel flower	G	-	N	G	P-F	P-F	-	N
Velvetleaf	-	P	F	G	G	P	N	P
Veronica (speedwell)	G	-	-	G	-	-	-	-
Virginia copperleaf	P	-	-	P	F	-	-	-
Wild aster	-	-	-	-	-	-	-	-
Wild carrot	-	-	-	-	-	-	-	-
Yellow woodsorrel (<i>Oxalis</i>) from seed	G	-	G	G	G	F	-	-
Wild aster	N	-	N	-	N	-	G	N
Wild carrot	N	-	N	-	N	-	G	N
Yellow woodsorrel (<i>Oxalis</i>) from seed	N	N	N	G	N	-	G	N

G = good control, F = fair, P = poor, N = no control, and - = no information.

Table 5.10 - Guide to Weeds Which May Be Controlled by Postemergence Herbicides Approved by Use in Ornamentals

Weed	Acclaim	Basagran	Envoy	Finale	Lontrel	Ornamec	Reward	Roundup	Segment
Monocots									
Annual bluegrass	N	N	G	G	N	P	G	G	N
Bamboo	-	-	-	P	N	-	-	F	-
Barnyardgrass	-	N	G	G	N	G	G	G	G
Bermudagrass	F	N	G	F	N	G	P	G	G
Cheat	-	N	-	-	N	-	-	G	-
Crabgrass	G	N	G	G	N	G	G	G	G
Doveweed	N	-	N	G	N	N	-	F	N
Fall panicum	-	N	G	G	N	G	G	G	G
Foxtails	G	N	G	G	N	G	G	G	G
Goosegrass	G	N	G	G	N	G	G	G	G
Johnsongrass (seedling)	-	N	G	-	N	G	-	G	G
Microstegium	G	-	G	G	N	G	-	G	G
Orchardgrass, fescue	N	N	F	P	N	F	F	G	F
Quackgrass	P	N	G	P	N	G	-	G	G
Small grains (volunteer)	-	N	-	-	N	G	-	G	G
Stinkgrass	-	N	-	-	N	-	-	G	-
Yellow Nutsedge	N	F	N	F	N	N	F	G	N
Broadleaf Weeds									
Artemisia (wild chrysanthemum)	N	-	N	-	F	N	-	F	N
Bittercress	N	G	N	-	N	N	G	G	N
Canada thistle	N	-	N	-	G	N	F	G	
Carpetweed	N	-	N	-	-	N	G	G	N
Chickweed	N	-	N	G	-	N	G	G	N
Cutleaf evening primrose	N	N	N	G	-	N	-	F	N
Dandelion	N	-	N	G	F	N	-	G	N
Dock	N	-	N	-	-	N	-	G	N
Dodder	N	-	N	-	-	N	-	G	N
Dogfennel	N	N	N	-	-	N	F	G	N
Eclipta	N	G	N	G	E	N	-	G	N
Filaree	N	-	N	-	-	N	-	G	N
Galinsoga (quickweed)	N	-	N	-	-	N	G	G	N
Groundsel, common	N	F	N	G	G	N	G	G	N
Henbit (deadnettle)	N	-	N	G	-	N	G	G	N
Horseweed (marestail)	N	N	N	G	F	N	F	G	N
Knotweed	N	-	N	-	-	N	-	G	N
Lambsquarters	N	F	N	G	P	N	F	G	N
Morningglory	N	P	N	-	N	N	G	F	N

Table 5.10 - Guide to Weeds Which May Be Controlled by Postemergence Herbicides Approved by Use in Ornamentals (cont.)

Weed	Acclaim	Basagran	Envoy	Finale	Lontrel	Ornamec	Reward	Roundup	Segment
Broadleaf Weeds (cont.)									
Mustard	N	-	N	G	-	N	G	G	N
Nightshade	N	N	N	-	F	N	G	G	N
Pigweed	N	P	N	G	P	N	G	G	N
Poison Ivy	N	-	N	-	-	N	P	G	N
Prickly lettuce	N	-	N	G	-	N	G	G	N
Prickly sida	N	G	N	-	-	N	F	G	N
Purslane	N	-	N	G	-	N	G	G	N
Pusley, Florida	N	-	N	-	-	N	-	G	N
Ragweed	N	G	N	G	E	N	G	G	N
Red sorrel	N	-	N	G	-	N	F	G	N
Shepherds' purse	N	-	N	G	-	N	G	G	N
Smartweed	N	G	N	G	F	N	F	G	N
Sowthistle	N	-	N	-	F	N	-	G	N
Spurge, prostrate (spotted)	N	N	N	G	-	N	G	G	N
Velvetleaf	N	G	N	G	-	N	-	G	N
Veronica (speedwell)	N	-	N	-	-	N	-	G	N

G = good control, F = fair, P = poor, N = no control, and - = no information.

