X—DISEASE CONTROL

Foliar Fungicides for Wheat Leaf Disease Control

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Anyone using any agricultural chemical should refer to the current chemical label, which contains information about the safe and effective use of the chemical, before using the chemical.

Table 10-1A. Foliar Fungicides for Wheat Leaf Disease Control

Disease	Fungicide Type and (FRAC Code)	Fungicide[1]	Amount of Formulation Per Acre	Remarks[2]
Powdery Mildew, Leaf Rust	Triazoles (3)	metconazole (Caramba)	10 to 14 oz	For Powdery Mildew, apply fungicide only when mildew covers 5% to 10% of area of upper leaves. For leaf rust, apply fungicide only when disease covers 1% to 3% of total leaf area. Do not apply after head emergence (Feekes Growth Stage 10.5). Make no more than one application of tebuconazole per year. Apply Caramba immediately after flag leaf emergence for optimum control of diseases other than Fusarium head blight.
		propiconazole (Propimax, Tilt 3.6 EC)	4 fl oz	
		prothioconazole (Proline)	4.3 to 5.0 oz	
	Combinations	fluapyroxad 2.8% pyraclostrobin 18.7% propiconazole 11.7% (Nexicor)	7 to 13 fl oz	For Powdery Mildew, apply fungicide only when mildew covers 5% to 10% of area of upper leaves. For leaf rust, apply fungicide only when disease covers 1% to 3% of total leaf area. Do not apply after head emergence (Feekes Growth Stage 10.5). Do not apply if head scab is anticipated to become a problem.
		propiconazole 11.7% + azoxystrobin 7.0% (Quilt)	10.5 to 14 fl oz	
		prothioconazole 10.8% + trifloxystrobin 32.3% (StrategoYLD)	4.0 to 4.65 oz	
		propiconazole 11.7% + azoxystrobin 13.5% (QuiltXcel)	10.5 to14 fl oz	
		flutriafol 18.63% azoxystrobin 25.30% (Topguard EQ)	4.0 to 7.0 fl oz	
		cyproconazole 7.2% + picoxystrobin 32.3% (Aproach Prima)	3.4 to 6.8 fl oz	
	Strobilurins (11)	azoxystrobin (Quadris 2.08 F)	6.2 to 10.8 fl oz	
		pyraclostrobin (Headline 2.09 EC)	6 to 9 fl oz	
		picoxystrobin 22.5% (Aproach)	6.0 to 12.0 fl oz	
***Stagonospora* Leaf and Glume Blotch, Tan Spot, *Helminthosporium* Leaf Spot**	Multi-site action (M3)	mancozeb (various brands) 4 F 80 WP 75 DF	 1.6 qt 2 lb 2 lb	If 25% of the indicator leaves have one or more lesions, then a fungicide application is indicated. Indicator leaves are: Feekes Growth Stage 6 to 8: Flag - 4 and Flag - 5 Feekes Growth Stage 8 to10: Flag - 3 Feekes Growth Stage 10 to 10.51: Flag - 2 Feekes Growth Stage 10.52 to 11: Flag - 1 Do not apply mancozeb after late heading (Feekes Growth Stage 10.5) or Tilt after flag leaf emergence (Feekes Growth Stage 8).
	Strobilurins (11)	pyraclostrobin (Headline 2.09 EC)	6 to 9 fl oz	For *Stagonospora*, if 25% of the indicator leaves have one or more lesions, then a fungicide application is indicated. Indicator leaves are: Feekes Growth Stage 6 to 8: Flag - 4 and Flag - 5 Feekes Growth Stage 8 to 10: Flag - 3 Feekes Growth Stage 10 to 10.51: Flag - 2 Feekes Growth Stage 10.52 to 11: Flag - 1
		azoxystrobin (Quadris 2.08 F)	6.2 to 10.8 fl oz	
		picoxystrobin 22.5% (Aproach)	6.0 to 12.0 fl oz	
	Combinations	trifloxystrobin 32.3% + prothioconazole 10.8% (Stratego Yld)	4.0 to 4.65 oz	
		metconazole 7.4% + pyraclostrobin 12.0% (Twinline)	7 to 9 fl oz	
		flutriafol 18.63% azoxystrobin 25.30% (Topguard EQ)	4.0 to 7.0 fl oz	
		cyproconazole 7.2 % + picoxystrobin 32.3% (Approach Prima)	3.4 to 6.8 fl oz	Do not apply if head scab is anticipated to become a problem.
Head Scab	Triazoles (3)[2]	tebuconazole (generic brands)	4 fl oz	Specifically, forward and backward mounted nozzles, or nozzles that have two-directional spray, should be used. Spraying at 45 degrees down from horizontal has been shown to be most effective. Operate nozzles within the spray pressure directions suggested by the manufacturer. Do not make more than one application of tebuconazole per year. Do not apply after Feekes 10.5.4. Do not apply Caramba within 30 days of harvest. Do not apply Proline or Prosaro or Prosaro Pro within 30 days of harvest or after full flower (Feekes 10.5.2). Do not apply Sphaerex within 30 days of harvest.
		tebuconazole 19.0% + prothioconazole 19.0% (Prosaro 421 SC)	6.5 to 8.2 fl oz	
		tebuconazole 8.7% + fluopyram 8.7% + prothioconazole 17.4% (Prosaro Pro)	10.3 to 13.6 fl oz	
		metconazole 10.9% + prothioconazole 18.2% (Sphaerex)	7.3 fl oz	
		pydiflumetofen 13.7% propiconazole 11.4% (Miravis Ace SE)	13.7	
		metconazole (Caramba)	13.5 to 17 oz	
		prothioconazole (Proline)	5.0 to 5.7 fl oz	

[1] Fungicides are more likely to be profitable when the yield potential is 50 bushels/acre or more.

[2] Triazole fungicides are generally more effective in control of powdery mildew, while the strobilurins are generally more effective against leaf rust and *Stagonospora*. Some triazoles can suppress but not eliminate head scab, whereas strobilurins should not be used if there is concern about head scab.

Fungicide Efficacy for Control of Wheat Diseases

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The North Central Regional Committee on Management of Small Grain Diseases (NCERA-184) has developed the following information on fungicide efficacy for control of certain foliar diseases of wheat for use by the grain production industry in the United States. Efficacy ratings for each fungicide listed in the table were determined by field testing the materials over multiple years and locations by the members of the committee. Efficacy is based on proper application timing to achieve optimum effectiveness of the fungicide as determined by labeled instructions and overall level of disease in the field at the time of application. Differences in efficacy among fungicide products were determined by direct comparisons among products in field tests and are based on a single application of the labeled rate as listed in the table. Table includes most widely marketed products and is not intended to be a list of all labeled products.

Table 10-1B. Efficacy of Fungicides for Wheat Disease Control Based on Appropriate Application Timing

Fungicide(s)				Disease								
Class	Active ingredient	Product	Rate/A (fl oz)	Powdery mildew	*Stagonospora* leaf/glume blotch	*Septoria* leaf blotch	Tan spot	Stripe rust	Leaf rust	Stem rust	Head scab	Harvest Restriction
Strobilurin	Picoxystrobin 22.5%	Aproach SC	6.0 to 12	G[1]	VG	VG[2]	VG	E	VG	VG	NL	Feekes 10.5
	Pyraclostrobin 23.6%	Headline SC	6.0 to 9.0	G	VG	VG[2]	E	E[3]	E	G	NL	Feekes 10.5
Triazole	Metconazole 8.6%	Caramba 0.75 SL	10.0 to 17.0	VG	VG	--	VG	E	E	E	G	30 days
	Tebuconazole 38.7%	Folicur 3.6 F[5]	4.0	NL	NL	NL	NL	E	E	E	F	30 days
	Prothioconazole 41%	Proline 480 SC	5.0 to 5.7	--	VG	VG	VG	VG	VG	VG	G	30 days
	Prothioconazole 19% Tebuconazole 38.7%	Prosaro 421 SC	6.5 to 8.2	G	VG	VG	VG	E	E	E	G	30 days
	Propiconazole	Tilt 3.6 EC[4,5]	4.0	VG	VG	VG	VG	VG	VG	VG	P	Feekes 10.5.4
Mixed modes of action[6]	Tebuconazole 22.6% Trifloxystrobin 22.6%	Absolute Maxx SC	5.0	G	VG	VG	VG	VG	E	VG	NL	35 days
	Cyproconazole 7.17% Picoxystrobin 17.94%	Aproach Prima SC	3.4 to 6.8	VG	VG	VG	VG	E	VG	--	NR	45 days
	Prothioconazole 16.0% Trifloxystrobin 13.7%	Delaro 325 SC	8.0	G	VG	VG	VG	VG	VG	VG	NL	Feekes 10.5 35 days
	Pydiflumetofen 13.7% Propiconazole 11.4%	Miravis Ace SE	13.7	VG	VG	VG	VG	VG	VG	VG	G[7]	Feekes 10.5.4
	Fluapyroxad 2.8% Pyraclostrobin 18.7% Propiconazole 11.7%	Nexicor EC	7.0 to 13.0	VG	VG	E	E	E	E	VG	NL	Feekes 10.5
	Fluoxastrobin 14.8% Flutriafol 19.3%	Preemptor SC	4.0 - 6.0	--	--	VG	VG	E	VG	--	NL	Feekes 10.5 and 40 days
	Fluxapyroxad 14.3% Pyraclostrobin 28.6%	Priaxor	4.0 to 8.0	G	VG	VG	E	VG	VG	G	NL	Feekes 10.5
	Propiconazole 11.7% Azoxystrobin 13.5%	Quilt Xcel 2.2 SE[5]	10.5 to 14.0	VG	VG	VG	VG	E	E	VG	NL	Feekes 10.5.4
	Metconazole 10.9% Protioconazole 18.2%	Sphaerex	4.0 to 7.3	VG	VG	VG	VG	E	E	E	G	30 days
	Prothioconazole 10.8% Trifloxystrobin 32.3%	Stratego YLD	4.0	G	VG	VG	VG	VG	VG	VG	NL	Feekes 10.5 and 35 days
	Benzovindiflupyr 2.9% Azoxystrobin 10.5%	Trivapro SE	9.4 to 13.7	VG	VG	VG	VG	E	E	VG	NL	Feekes 10.5.4
	Flutriafol 18.63% Azoxystrobin 25.30%	Topguard EQ	4.0-7.0	VG	NL	VG	VG	E	E	VG	NL	Feekes 10.5.4 30 days

[1] Efficacy categories: NL=Not Labeled; NR=Not Recommended; P=Poor; F=Fair; G=Good; VG=Very Good; E=Excellent; -- = Insufficient data to make statement about efficacy of this product.
[2] Product efficacy may be reduced in areas with fungal populations that are resistant to strobilurin fungicides.
[3] Efficacy may be significantly reduced if solo strobilurin products are applied after stripe rust infection has occurred.
[4] Application of products containing strobilurin fungicides may result in elevated levels of the mycotoxin Deoxynivalenol (DON) in grain damaged by head scab.
[5] Multiple generic products containing the same active ingredients also may be labeled in some states.
[6] Products with mixed modes of action generally combine triazole and strobilurin active ingredients. Nexicor, Priaxor and Trivapro include carboxamide active ingredients.
[7] Based on application timing at the beginning of anthesis (Feekes 10.5.1)

Seed Treatment for Wheat Foliar Disease Control

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Anyone using any agricultural chemical should refer to the current chemical label, which contains information about the safe and effective use of the chemical, before using the chemical.

Table 10-2. Seed Treatment for Wheat Foliar Disease Control

Disease	Fungicide	Amount of Formulation per cwt	Remarks
Seed-Borne *Stagonospora nodorum* Blotch, Damping Off	difenoconazole (3) + mefenoxam (4) (Dividend XL)	5 to 10 fl oz	Seed treatments are moderately effective for control of seed-borne SNB.
	clothianidin + metalaxyl (4) + metconazole (3) (NipsItSuite)	5 to 7.5 fl oz	
	prothioconazole + tebuconazole + metalaxyl (Raxil, Pro MD)	0.6 to 0.2 fl oz	
Barley Yellow Dwarf Virus	imidacloprid (Gaucho 600 F) (Gaucho XT)	0.8 to 2.4 fl oz 3.4 fl oz	
	thiamethoxam (Cruiser 5FS)	0.75 to 1.33 fl oz	
	clothianidin (NipsIt)	0.75 to 1.79 fl oz/100 lb seed	

Nematode Control in Corn

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Table 10-3. Nematode Control in Corn[1]

Material and Formulation	Amount of Formulation Per Acre (36-inch rows)	Precautions and **Remarks**
terbufos (Counter 20G)	5.0 lb	Apply in furrow. Do not exceed 6.5 lb per acre of Counter 20G.
fluopyram 17.4% + prothioconazole 17.4% (Propulse)	8.0 fl oz	In-furrow spray during planting on or below seed. Tank mixes with Propulse and some fertilizers has been problematic. A "jar test" before tank mixing to test compatibility is recommended. See label for additional instructions.
fluopyram (Velum)	3.0 to 5.0 fl oz	Apply in furrow, via drip or trickle chemigation, or through overhead chemigation with sufficient water to move product into root zone. Minimum 14-day interval between applications; do not exceed 13.7 fl oz/ac/year of Velum.
abamectin (Avicta)	0.15 mg per seed	Seed treatment[1]
clothianidin 40.30% + *Bacillus firmus* I-1582 8.10% (Poncho/Votivo)	2.7 fl oz per 80,000 seeds	Seed treatment
Bacillus amyloliquefaciens Strain PTA-4838 16.5% (Aveo EZ)	0.1 fl oz per 80,000 seed	Seed treatment
Heat-killed *Burkholderia* spp. strain A396 94.46% (BioST)	8 oz per 100 lb seed	Seed treatment

[1] Efficacy of chemical treatments is dependent upon genera or type of nematode present and population density. Seed treatments are most effective under low to moderate nematode populations. For best control, sample fields in fall (by the end of November).

Fungicides for Control of Corn Foliar Diseases

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Table 10-4A. Fungicides for Control of Corn Foliar Diseases (Northern and Southern Blight, Gray Leaf Spot, and Rusts)[1]

Fungicide Type and FRAC Code	Fungicide	Rate Per Acre Formulated (fluid ounces per acre)	Remarks
Strobilurins (11)	azoxystrobin (Quadris)	6.0 to 9.0	See label for restrictions. Application should be with 20 gallons of water/acre for adequate coverage with ground application or with 5 gallons of water/acre with aerial applications.
	pyraclostrobin (Headline)	6.0 to 12.0	
	picoxystrobin (Aproach)	6.0 to 12.0	
Triazoles (3)	propiconazole (Tilt)[1]	2.0 to 4.0	See label for restrictions. Application should be with 20 gallons of water/acre for adequate coverage with ground application or with 5 gallons of water/acre with aerial applications.
	tetraconazole (Domark)	4.0 to 6.0	See label for restrictions. Application should be with 5 gallons of water/acre for adequate coverage with ground application or with 2 gallons of water/acre with aerial applications.
	tebuconazole (Tebuconazole 3.6F or other names)	4.0 to 6.0	See label for restrictions. Must have two to four hours of drying time on com foliage for the active ingredient to move systemically into plant tissue before rain or irrigation occurs.
	prothioconazole (Proline)	5.7	Apply at R1 to R3 as a preventative or curative spray and 14 to 21 days later if disease pressure is high. Do not apply after R5 or within 21 days of harvest.
	flutriafol (Xyway LFR) (Xyway 3D)	5.8 to 15.2 5.8 to 11.8	Apply in a band over the closed seed furrow or in a 2x2 band at planting. Do not apply more than one application per year.
Combinations	azoxystrobin + propiconazole (Quilt)[1]	7.0 to 14.0	See label for restrictions. Application should be with 20 gallons of water/acre for adequate coverage with ground application or with 5 gallons of water/acre with aerial applications. Alternate with another non-Group 11 fungicide if making more than one application per season.
	trifloxystrobin + propiconazole (Stratego)[1]	10.0	
	prothioconazole + trifloxystrobin (Stratego YLD)	4.0 to 5.0	Do not apply more than 10 ounces per year. Do not apply within 14 days of harvest.
	benzovindiflupyr + azoxystrobin + propiconazole (Trivapro)	13.7	See label for restrictions. Do not apply within 30 days of harvest.
	flutriafol + bixafen (Lucento)	3.0 to 5.5	See label for restrictions.
	mefentrifluconazole + pyraclostrobin (Veltyma)	7.0 to 10.0	Do not apply more than 20 ounces per year. See label for pre-harvest interval.
	flutriafol + azoxystrobin (TopGuard EQ)	5.0 to 7.0	See label for restrictions.
	azoxystrobin + propiconazole (QuiltXcel)[1]	10.5 to14	Do not apply more than 84 ounces per year. Do not apply within 30 days of harvest.
	pyraclostrobin + metconazole (Headline AMP)	10.0 to 14.4	Do not apply more than 57.6 ounces/acre per season. See label for pre-harvest interval.
	mefentrifluconazole + pyraclostrobin (Veltyma)	7.0 to 10.0	See label for restrictions.
	mefentrifluconazole + pyraclostrobin + fluxapyroxad (Revytek)	8.0 to 15.0	See label for restrictions.
	fluoxastrobin + flutriafol (Fortix)	4.0 to 6.0	Field corn only, not labeled for sweet corn.
	cyproconazoe + picoxystrobin (Aproach Prima)	3.4 to 6.8	Apply at R1 to R3 as a preventative or curative spray and 14 to 21 days later if disease pressure is high. Do not apply after R5 or within 21 days of harvest.
	tetraconazole + azoxystrobin (Affiance)	10.0 to 17.0	Apply at R1 to R3 as a preventative or curative spray and 14 to 21 days later if disease pressure is high. Do not apply after R5 or within 21 days of harvest.
	fluxapyroxad + pyraclostrobin (Priaxor)	4.0 to 8.0	Apply at R1 to R3 as a preventative or curative spray and 14 to 21 days later if disease pressure is high. Do not apply after R5 or within 21 days of harvest.
	prothioconazole + fluopyram + trifloxystrobin (Delaro Complete 3.83 SC)	4.0 to 12.0	See label restrictions for target disease.
	mefentrifluconazole + fluxapyroxad (Revylok)	5.5 fl oz/acre	21-day pre-harvest interval. Apply at 14-day interval. No more than 13 fl oz/acre/year.

[1] Fungicides often significantly increase yields only in intensive production systems with high plant populations and adequate moisture.

Fungicide Efficacy for Control of Corn Diseases

The Corn Disease Working Group (CDWG) developed ratings for how well fungicides control major corn diseases in the United States. The CDWG determined efficacy ratings for each fungicide listed in the table by field testing the materials over multiple years and locations. Ratings are based on the product's level of disease control and do not necessarily reflect yield increases obtained from product application. A product's efficacy depends upon proper application timing, rate, and application method as determined by the product label and overall disease level in the field at the time of application. Differences in efficacy among each fungicide product were determined by directly comparing products in field tests using a *single application* of the labeled rate. For application timing and use considerations, please contact your local Cooperative Extension center. The table includes marketed products available that have been tested over multiple years and locations. The table is not intended to be a list of all labeled products. Additional fungicides are labeled for disease on corn, including contact fungicides such as chlorothalonil. Other fungicides may be available for diseases not listed in the table, including *Diplodia*, *Gibberella*, and *Fusarium* ear rots. Many products have specific use restrictions about the amount of active ingredient that can be applied within a period of time or the number of sequential applications that can occur. Read and follow all use restrictions prior to applying any fungicide.

Efficacy categories: NR=Not Recommended; P=Poor; F=Fair; G=Good; VG=Very Good; E=Excellent; NL = Not Labeled for use against this disease; U = Unknown efficacy or insufficient data to rank product

Table 10-4B. Fungicide Efficacy for Control of Corn Diseases

Fungicide(s)				Disease							
Class	Active ingredient (%)	Product/ Trade name	Rate/A (fl oz)	Anthracnose leaf blight	Common rust	Eyespot	Gray leaf spot	Northern leaf blight	Southern rust	Tar Spot[1]	Harvest Restriction[2]
QoI Strobilurins Group 11	Azoxystrobin 22.9%	Quadris 2.08 SC Multiple Generics	6.0 to 15.5	VG	E	VG	E	G	VG	NL	7 days
	Pyraclostrobin 23.6%	Headline 2.09 EC/SC	6.0 to 12.0	VG	E	E	E	VG	VG	NL	7 days
	Picoxystrobin 22.5%	Aproach 2.08 SC	3.0 to 12.0	VG	VG-E	VG	F-VG	VG	G	G	7 days
DMI Triazoles Group 3	Propiconazole 41.8%	Tilt 3.6 EC Multiple Generics	2.0 to 4.0	NL	VG	E	G	G	F	NL	30 days
	Prothioconazole 41.0%	Proline 480 SC	5.7	U	VG	E	U	VG	G	NL	14 days
	Tebuconazole 38.7%	Folicur 3.6 F Multiple Generics	4.0 to 6.0	NL	U	NL	U	VG	F	NL	36 days
	Tetraconazole 20.5%	Domark 230 ME Multiple Generics	4.0 to 6.0	U	U	U	E	VG	G	G	R3 (milk)
	Flutriafol 20.9% Flutriafol 26.4%	Xyway LFR 1.92 SC Xyway 3D	5.8 to 15.2 5.8 to 11.8	NL	U	NL	G	VG	NL	NL	N/A
Mixed mode of action	Azoxystrobin 13.5% Propiconazole 11.7%	Quilt Xcel 2.2 SE Multiple Generics	10.5 to 14.0	VG	VG-E	VG-E	E	VG	VG	NL	30 days
	Benzovindiflupyr 2.9% Azoxystrobin 10.5% Propiconazole 11.9%	Trivapro	13.7	U	U	U	E	VG	E	G-VG	30 days
	Cyproconazole 7.17% Picoxystrobin 17.94%	Aproach Prima 2.34 SC	3.4 to 6.8	U	U	U	E	VG	G	G-VG	30 days
	Flutriafol 19.3% Fluoxastrobin 14.84%	Fortix 3.22 SC Preemptor 3.22 SC	4.0 to 6.0	U	U	U	E	VG-E	VG	G-VG	30 days
	Flutriafol 26.47% Bixafen 15.55%	Lucento	3.0 to 5.5	U	U	U	VG-E	VG	VG	G	30 days
	Flutriafol 18.63% Azoxystrobin 25.30%	TopGuard EQ	5.0 to 7.0	U	F	U	VG	G-VG	G-VGU	G-VG	45 days
	Prothioconazole 16.0% Trifloxystrobin 13.7%	Delaro 325 SC	8.0 to 12.0	VG	E	VG	E	VG	G-VG	G-VG	14 days
	Prothioconazole 14.9% Fluopyram 10.9% Trifloxystrobin 13.1%	Delaro Complete 3.83 SC	4.0 to 12.0	U	U	U	E	VG	G-VG	VG	14 days
	Pydiflumetofen 7.0% Azoxystrobin 9.3% Propiconazole 11.6%	Miravis Neo 2.5 SE	13.7	U	U	U	E	VG-E	VG	G-VG	30 days
	Pyraclostrobin 28.58% Fluxapyroxad 14.33%	Priaxor 4.17 SC	4.0 to 8.0	U	VG	U	VG	VG-E	VG	NL	21 days
	Pyraclostrobin 13.6% Metconazole 5.1%	Headline AMP 1.68 SC	10.0 to 14.4	U	E	E	E	VG	G	G-VG	20 days
	Trifloxystrobin 32.3% Prothioconazole 10.8%	Stratego YLD 4.18 SC	2.0 to 5.0	VG	E	VG	E	VG	G	NL	14 days
	Tetraconazole 7.48% Azoxystrobin 9.35%	Affiance 1.5 SC	10.0 to 14.0	U	G-VG	U	G-VG	G-VG	G	G	7 days
	Mefentrifluconazole 17.56% Pyraclostrobin 17.56%	Veltyma	7.0 to 10.0	U	U	U	VG-E	VG-E	VG	VG	21 days

Table 10-4B. Fungicide Efficacy for Control of Corn Diseases

Fungicide(s)				Disease							Harvest Restriction[2]
Class	Active ingredient (%)	Product/ Trade name	Rate/A (fl oz)	Anthracnose leaf blight	Common rust	Eyespot	Gray leaf spot	Northern leaf blight	Southern rust	Tar Spot[1]	
	Mefentrifluconazole 11.61% Pyraclostrobin 15.49% Fluxapyroxad 7.74%	Revytek	8.0 to 15.0	U	U	U	VG-E	VG-E	VG	VG	21 days

[1] Fungicide application timing is extremely important and needs to be made near the onset of the tar spot symptoms. Efficacy ratings based on limited site locations from 2018 to 2022. A 2ee label is available for several fungicides for control of tar spot, however, efficacy data are limited. Check 2ee labels carefully, as not all products have 2ee labels in all states.

[2] Harvest restrictions are listed for field corn harvested for grain. Restrictions may vary for other types of corn (sweet, seed, or popcorn), and corn for other uses such as forage or fodder.

This information is provided only as a guide. It is the applicator's legal responsibility to read and follow all current label directions. Reference in this publication to any specific commercial product is for general information only and does not constitute an endorsement or recommendation by the CDWG. Individuals using such products assume responsibility for their use in accordance with current directions of the manufacturer. Members or participants in the CDWG assume no liability resulting from the use of these products.

Cotton Disease Control

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Anyone using any agricultural chemical should refer to the current chemical label, which contains information about the safe and effective use of the chemical, before using the chemical.

Table 10-5A. Nematode Control on Cotton

Nematodes	Nematicide	Amount of Formulation Per Acre	Precautions and Remarks
Root-Knot, Columbia Lance, Sting, Reniform	1,3-dichloropropene (Telone II)	9 to 12 gallons (broadcast)	Inject 1 to 2 weeks before planting 12 to 15 inches deep.
	sodium methyldithiocarbamate (Vapam HL, Metam CLR 42%)	30 gallons	Inject 2 to 3 weeks before planting at 6 to 12 inches deep.
	aldicarb (AgLogic 15GG)	3.5 to 7 lb	Apply in the seed furrow and cover with 1 inch or more of soil
	oxamyl (Vydate C-LV)	17 fl oz	Apply as broadcast foliar or drip treatment at first to seventh true leaf stage.
	fluopyram (Velum)	6.84 fl oz	Apply as an In-furrow spray during planting directed on or below seed.
	abamectin (11.2%) + thiamethoxam (28%) (Avicta DuoCOT202)	0.15 mg a.i. abamectin per seed	Seed treatment.[1]
	thiodicarb (24%) + imidacloprid (24%) (Aeris)	25.6 fl oz per 100 lb seed	Seed treatment.
	clothianidin 40.30% + Bacillus firmus I-1582 8.10% (Poncho/Votivo)	2.4 fl oz per 100,000 seed	Seed treatment
	fluopyram (Copeo)	1.13 to 1.69 fl oz per 100,000 seed	Seed treatment.

[1] Seed treatments are most effective under low to moderate nematode populations. Accurate assessment of nematode populations by soil sampling in fall will indicate if seed treatments will be effective for managing nematodes economically in a specific field.

Table 10-5B. Disease Control on Cotton

Disease	Fungicide Type and FRAC Code	Fungicide	Rate of Formulation	Remarks
Damping Off	Seed Treatments[1]	trifloxystrobin + triadimenol + metalaxyl (Trilex Advanced)	1.6 fl oz/100 lb seed	Efficacy on *Fusarium, Rhizoctonia,* and *Pythium* spp.
		azoxystrobin + fludioxonil + mefenoxam + difenconazole (Seed Shield)	4.0 fl oz/100 lb seed	Efficacy on *Fusarium, Rhizoctonia, Phoma, Pythium,* and *Thielaviopsis* spp.
		ipconazole (Vortex or Acceleron DX-509)	0.051 to 0.085/100 lb seed or 0.085 to 0.34 fl oz/100 lb seed	Efficacy on *Fusarium*, *Rhizoctonia*, *Phoma*, and *Thielaviopsis* spp.
		mefenoxam (Apron XL)	0.32 to 0.64 fl oz/100 lb seed	Efficacy on *Pythium* and *Phytophthora* spp.
		pyraclostrobin + boscalid (Coronet)	3.1 to 6.2 fl oz/100 lb seed	Efficacy on *Fusarium*, *Rhizoctonia*, *Phoma*, *Pythium*, and *Thielaviopsis* spp.
		acibenzolar-S-methyl (Bion 500 FS)	0.0003 to 0.0009 mg ai/seed	Efficacy on *Thielaviopsis basicola* and *Fusarium* spp.
		sedaxane (Vibrance)	0.08 to 0.60 fl oz/100 lb of seed	Efficacy on *Rhizoctonia solani*
		Thiram (Thiram 42-S, Thiram 480 DP)	3 fl oz/100 lb of seed	Efficacy on *Fusarium*, *Rhizoctonia*, *Phoma*, and *Thielaviopsis* spp.
	In-furrow Fungicides	mefenoxam (Ridomil Gold SL)	0.075 to 0.15 oz/1000 row ft	Efficacy on *Pythium* and *Phytophthora* spp.
		pyraclostrobin (Headline SC)	0.1 to 0.8 fl oz/1000 row ft	Efficacy on *Rhizoctonia solani*
		azoxystrobin (Quadris)	0.4 to 0.8 fl oz/1000 row ft	Efficacy on *Pythium* spp. and *Rhizoctonia solani*
		prothioconazole (Proline)	0.4 to 0.5 fl oz/1000 row ft	Efficacy on *Rhizoctonia solani* and *Fusarium* spp.
		fluxapyroxad + pyraclostrobin (Priaxor)	0.1 to 0.6 fl oz/1000 row ft	Efficacy on *Rhizoctonia solani* and *Fusarium* spp.
Foliar Diseases	Strobilurins (11)	azoxystrobin (Quadris and other names)	6 to 9 fl oz/acre	45-day pre-harvest interval. Three applications allowed. Max 27 fl oz/acre/season. See label for rates other names.
		pyraclostrobin (Headline SC)	6 to 12 fl oz/acre	30-day pre-harvest interval. Two applications allowed.
	Triazoles (3)	flutriafol (TopGuard)	7 to 14 fl oz/acre	30-day pre-harvest interval. Two applications allowed.
		prothioconazole (Proline)	5 to 5.7 fl oz/acre	30-day pre-harvest interval. Two applications allowed.
		tebuconazole (Tebuconazole 3.6F or other names)	6 to 8 fl oz/acre	30-day pre-harvest interval. Do not apply more than 24 fl oz/acre/season. See label for rates of other names.
	Combinations (7, 11)	fluxapyroxad + pyraclostrobin (Priaxor)	4 to 8 fl oz/acre	30-day pre-harvest interval. Three applications allowed.
	Combinations (3, 11)	azoxystrobin + difenoconazole (Amistar Top)	8 to 11.6 fl oz/acre	First application needs to be targeted approximately at pinhead square to first bloom or when conditions are conducive for disease development. Ensure coverage of upper and lower leaves. Subsequent applications may be made on a 14-21 day interval.
	Combination (3,7)	mefentrifluconazole fluxapyroxad (Revylok)	5.5 fl oz/acre	30-day pre-harvest interval. 7-day application interval. No more than 13 fl oz/acre/year.

[1] This is not an exhaustive list but represents several products for seed treatments available in cotton seed production that have differential efficacy on damping off pathogens.

Peanut Disease Control

L. R. Lux, A. M. Gorny, and B. B. Shew, Entomology and Plant Pathology

Most peanut disease control chemicals leave residues on peanut vines that make them unsuitable for hay. Check each label before using the material if you intend to feed hay to livestock.

Note: certain products labeled on peanut in the United States contain active ingredients (propiconazole, phosphites, or phosphorous acid) that were not acceptable to export markets in 2022. Products containing these ingredients are not listed in the tables below. Check with local North Carolina Cooperative Extension personnel and your buyer for the latest information on the current status of these ingredients and products.

Table 10-6A. Peanut Disease Control

Disease or Diseases Controlled	Pesticide Formulation (FRAC Group Number)	Amount of Formulation Per Acre	Recommended Application Schedule	Minimum Days to Harvest	Precautions and Remarks
***Aspergillus* Crown Rot (*Aspergillus*); see also seedling diseases**	azoxystrobin (Abound, various brands)[1] 2.08 F (11)	0.4 to 0.8 fl oz/1,000 ft of row	At planting	NA	Apply as in-furrow spray with 3 to 5 gallons of water.
Black Root Rot (CBR) (*Cylindrocladium*); see also seedling diseases	metam sodium 42% (various brands) 4.25 F	7.5 gal (36-inch rows) or 6.6 fl oz/100 ft of row	At least 2 weeks before planting or longer if cool or wet	NA	Inject 8 to 10 inches below seed placement. Apply only when soil temperature at 3-inch depth is between 60ºF and 90ºF. If wet or cold weather occurs following fumigation, the waiting period should be extended. Soil aeration helps reduce residual chemical. When in doubt use a bioassay such as the lettuce seed germination test to determine if safe to plant. Buffer zones, fumigant management plans, and other restrictions on metam sodium must be followed. See your local Extension center for details.
	prothioconazole (Proline) 480 SC (3)	5.7 oz per acre (36-inch rows) or 0.4 fl oz/1,000 ft of row	At planting or at full emergence	NA	Apply as in-furrow spray or in a 4- to 6-inch band at full emergence for suppression of CBR. Not a substitute for fumigation in fields with a history of more than10% CBR and rotations of less than 4 years. Use with a CBR-resistant cultivar.
Black Root Rot (CBR) (*Cylindrocladium*); see also seedling diseases (continued)	prothioconazole + fluopyram (Propulse) 3.3 SC (3 + 7)	13.7 fl oz	At planting	NA	Apply as in-furrow spray for suppression of CBR. Not a substitute for fumigation in fields with a history of more than10% CBR and rotations of less than 4 years. Use with a CBR-resistant cultivar. See below for nematode suppression.
Early Leaf Spot	cupric hydroxide (Kocide, various brands and formulations)[2] (M1)	Various; see label	Begin applications at 45 to 55 days after planting. Repeat applications every 7 to 14 days.	0	Use nozzles that give a cone-shaped spray pattern. Use 12 to 24 gallons of water for spray materials applied by ground sprayers. Use at least 5 gallons of water for materials applied by air. **Calendar program**: 5 or 6 applications suggested. Begin applications at 45 to 55 days after planting. Repeat applications at 7 to 14-day intervals. **Not suitable for use with the leaf spot advisory.**
	basic copper sulfate (various brands and formulations)[2] (M1)	Various; see label	See above	0	See above.
	mancozeb and copper hydroxide (Mankocide)[2] 61.1 DF (M3)	2 to 2.6 lb	See above	14	See above.
	mancozeb (Manzate, Koverall, various brands and formulations)[2] (M3) M45 F45 75 WDG or DF 80 WP	 1 to 2 lb .8 to 1.6 qt 1 to 2 lb 1 to 2 lb	See above	14	See above.
	Sulfur (Microthiol Disperss, various brands and formulations)[2] (M2)	Various; see label	See above	0	See above. May be mixed with other fungicides to enhance their leaf spot control.
Early Leaf Spot; Late Leaf Spot; Web Blotch	chlorothalonil (Bravo, Echo, various brands) (M5) 720, 6 F 82.5 WDG 90 DF	 1 to1.5 pt .9 to 1.36 lb .875 to 1.25 lb	Begin applications no later than very early pod (R3) or July 10, whichever comes first. Repeat applications every 14 days or according to daily weather-based advisories. Begin 14-day program if web blotch is found.	14	Use nozzles that give a cone-shaped spray pattern. Use 12 to 24 gallons of water for spray materials applied by ground sprayers. Use at least 5 gallons of water for materials applied by air. **14-day program:** 5 or 6 applications suggested. Begin applications no later than very early pod (R3) or July 10, whichever comes first. Repeat applications at 14-day intervals. **Advisory:** Begin applications no later than very early pod (R3) or July 10, whichever comes first. Repeat applications when weather conditions become favorable as determined by peanut leaf spot advisories. This schedule requires strict adherence to the program guidelines and usually results in fewer fungicide applications than the 14-day schedule. Contact your local Extension center for details. Leaf spot advisories are most effective if used with long rotations, resistant varieties, and high rates of effective fungicides. Repeated applications of chlorothalonil can make spider mites and Sclerotinia blight more difficult to control.
	boscalid (Endura)[2,3] 70 WDG (7)	10 oz	Make up to 2 or 3 applications in mid-season as part of a full-season, 14-day, or advisory program	14	See above. Primarily controls web blotch. Alternate with another fungicide or mix with 0.75 to 1 pint chlorothalonil to improve leaf spot control. Also controls Sclerotinia blight; see below.

Table 10-6A. Peanut Disease Control

Disease or Diseases Controlled	Pesticide Formulation (FRAC Group Number)	Amount of Formulation Per Acre	Recommended Application Schedule	Minimum Days to Harvest	Precautions and Remarks
Early Leaf Spot; Late Leaf Spot; Web Blotch (continued)	thiophanate-methyl (Topsin; various brands and formulations) (1) 4.5 F Other formulations	 10 fl oz See label	14-day or advisory	14	See above. **Do not** apply alone. Always mix with another fungicide that is effective against leaf spot. Use no more than 2 times per season.
	dodine (Elast) 400 F (U12)	1.5 pt	Make no more than 3 applications as part of a full-season, 14-day, or advisory program	14	See above. Mixing with chlorothalonil is recommended.
	cyproconazole (Alto) 100 SL (3)	5.5 fl oz	Apply up to 2 times in a calendar or advisory program beginning no later than R3	30	See above. Mixing with chlorothalonil is recommended. The minimum retreatment interval is 28 days.
	cyproconazole + picoxystrobin (Aproach Prima) SC (3 +11)	5 to 6.8 fl oz	Apply up to 2 times in a calendar or advisory program beginning no later than R3	30	See above. Mixing with chlorothalonil is recommended. The minimum retreatment interval is 28 days; use another product when spraying at 14-day intervals.
	tetraconazole (Eminent VP, Domark) (3) 125 SL 230ME	 6 to 13 fl oz 5.25 to 6.9 fl oz	Apply up to 2 times in a 14-day or advisory program beginning no later than R3	14	See above. Mix or alternate with another fungicide to reduce the risk of fungicide resistance
	pydiflumetofen (Miravis)[3] 1.67 SC (7)	3.4 fl oz	Apply up to 2 times in a calendar or advisory program beginning no later than R3	14	See above. Can be effective against leaf spots for up to 21 or 28 days; if using an extended interval, apply a fungicide that is effective against stem rot after 14 days or tank mix with a long-lasting stem rot fungicide. Tank mixing with Elatus may suppress Sclerotinia blight. **Resistance management:** Do not make more than 2 applications of **any** unmixed group 7 fungicide per season. Do not make consecutive applications of any unmixed group 7 fungicide.
Stem Rot (white mold, Southern blight, *Sclerotium rolfsii*); Limb Rot (*Rhizoctonia*); Pod Rot (*Sclerotium rolfsii*, *Rhizoctonia*)	tebuconazole (various brands) (3) 3.6F 20AQ	 7.2 fl oz 15.4 fl oz	Following leaf spot advisories, make 1 to 3 applications in mid-season. May suppress some foliar diseases.	14	Effective against stem rot. Not effective against many populations of leaf spot fungi. **Always** mix with chlorothalonil or another fungicide (other than group 3) that is effective against leaf spots.
	flutolanil (Convoy)[3] 3.8 SC (7)	10 to 16 fl oz or 20 to 32 fl oz (see remarks)	Following leaf spot advisories, make 1 to 3 applications in mid-season. **Does not control foliar diseases.**	40	Apply up to 16 fluid ounces per acre at 2-week intervals or up to 32 fluid ounces per acre at 3- to 4-week intervals. Do not apply more than a combined total of 64 fluid ounces in a single growing season. See label for detailed information on rates. Wheat may be planted 30 days after last application; do not plant other small grains within 5 months of last application. See label for other plant-back restrictions.
Stem Rot (white mold, Southern blight, *Sclerotium rolfsii*); Limb Rot (*Rhizoctonia*); Pod Rot (*Sclerotium rolfsii*, *Rhizoctonia*)	inpyrfluxam (Excalia) 2.84 SC	2 to 4 fl oz	Following leaf spot advisories, make 1 to 3 applications in mid-season.	40	Use the higher rate and a 2-week interval when disease pressure is high. Do not apply more than a combined total of 8 fluid ounces in a single growing season. Suppresses leaf spots but should be mixed with a leaf spot fungicide for efficacy.
Early Leaf Spot; Late Leaf Spot; Web Blotch; Limb Rot (*Rhizoctonia*); Stem Rot (*Sclerotium rolfsii*); Pod Rot (*Sclerotium rolfsii*, *Rhizoctonia*)	prothioconazole + tebuconazole[4] Provost Silver 420 SC (3+3)	 11 to 13 fl oz	Make up to 2 to 4 applications in mid-season as part of a full-season, 14-day, or advisory program.	14	See Early Leaf Spot, Late Leaf Spot, and Web Blotch above. For best control of limb and pod rot, do not use a surfactant. Do not apply more than 3 times in a 5-spray program. Most effective at 13 fl oz/A. **Resistance management:** Mix or rotate site-specific fungicides (groups 3, 7, and 11) with a fungicide from a different group to minimize the risk of fungus resistance development.
	metconazole (Quash) 50 WDG (3)	2.5 to 4 oz	Make up to 3 applications in mid-season as part of a full-season, 14-day, or advisory program.	14	See above. Mix with chlorothalonil for leaf spot control.
	mefentrifluconazole (Provysol) 400 SC (3)	2.5 to 7 fl oz	Make up to 2 or 3 applications in mid-season as part of a full-season, 14-day, or advisory program.	14	See above. Use the higher rate for control of stem rot or Rhizoctonia
	mefentrifluconazole + pyraclostrobin + fluxapyroxad (Revytek) SC (3+11+7)	8 to 15 fl oz	Make up to 2 or 3 applications in mid-season as part of a full-season, 14-day, or advisory program.	14	See above. Most effective at 12 to 15 fl oz/A. **Resistance management:** To minimize the risk of fungus resistance development, rotation with chlorothalonil is recommended

Table 10-6A. Peanut Disease Control

Disease or Diseases Controlled	Pesticide Formulation (FRAC Group Number)	Amount of Formulation Per Acre	Recommended Application Schedule	Minimum Days to Harvest	Precautions and Remarks
Early Leaf Spot; Late Leaf Spot; Web Blotch; Limb Rot (*Rhizoctonia*); Stem Rot (*Sclerotium rolfsii*); Pod Rot (*Sclerotium rolfsii*, *Rhizoctonia*) (continued)	prothioconazole + fluopyram (Propulse) 3.3 SC (3 + 7)	13.7 fl oz	Make up to 2 applications per season as part of a full-season, 14-day or advisory program.	14	See Early Leaf Spot, Late Leaf Spot, and Web Blotch above. **Resistance management:** Mix or rotate site-specific fungicides (groups 3, 7, and 11) with a fungicide from a different group to minimize the risk of fungus resistance development.
	flutriafol + bixafen (Lucento) SC (3 + 7)	5.5 fl oz	Make up to 2 or 3 applications in mid-season as part of a full-season, 14-day, or advisory program.	14	See above. **Resistance management:** Mix or rotate site-specific fungicides (groups 3, 7, and 11) with a fungicide from a different group to minimize the risk of fungus resistance development.
	penthiopyrad (Fontelis)[3] 1.67 SC (7)	16 to 24 fl oz	Make up to 2 applications per season as part of a full-season, 14-day, or advisory program	14	See Early Leaf Spot, Late Leaf Spot, and Web Blotch above. Use the higher rates for web blotch control. Also suppresses Sclerotinia blight; see below. **Resistance management:** Do not make more than 2 applications of **any** unmixed group 7 fungicide per season. Do not make consecutive applications of any unmixed group 7 fungicide.
	azoxystrobin (Abound; various brands)[1,4] 2.08 F (11)	12.0 to 24.6 fl oz	Make up to 2 applications per season as part of a full-season, 14-day, or advisory program. Use higher rates for limb rot and stem rot control.	14	See above. Use the higher rates in mid-season for best control of soil-borne pathogens. Use no more than 2 applications in a 5-spray program. **CAUTION:** Resistance to group 11 fungicides is present in some North Carolina populations of leaf spot pathogens. Mix with a fungicide that is effective against leaf spot (group M, 3, or 7). **Resistance management**: Site-specific fungicides (groups 3, 7, and 11) should be mixed or rotated with a fungicide from a different group to minimize the risk of developing fungal resistance.
	pyraclostrobin (Headline; various brands)[1] 2.09 EC, 2.08 SC (11)	6 to 15 fl oz	Make up to 2 applications per season as part of a full-season, 14-day, or advisory program. Use higher rates for limb rot and stem rot control.	14	See above. Use the higher rates for stem rot control. Make no more than 2 applications in a 5-spray program. **CAUTION:** Resistance to group 11 fungicides is present in some North Carolina populations of leaf spot pathogens. Mix with a fungicide that is effective against leaf spot (group M, 3, or 7). **Resistance management**: Site-specific fungicides (groups 3, 7, and 11) should be mixed or rotated with a fungicide from a different group to minimize the risk of developing fungal resistance.
	fluoxastrobin (Evito, Aftershock)[1] 480 SC (11)	5.7 fl oz	Make up to 2 applications per season as part of a full-season, 14-day, or advisory program.	14	See above. **CAUTION:** Resistance to group 11 fungicides is present in some North Carolina populations of leaf spot pathogens. Mix with a fungicide that is effective against leaf spot (group M, 3, or 7). **Resistance management**: Site-specific fungicides (groups 3, 7, and 11) should be mixed or rotated with a fungicide from a different group to minimize the risk of developing fungal resistance.
	azoxystrobin + tebuconazole (various generic) (11 + 3)	15.5 fl oz	Make up to 2 to 4 applications in mid-season as part of a full-season, 14-day, or advisory program.	14	See above. **CAUTION:** Check labels. Most products contain 1.0 lb/A azoxystrobin per gallon, which is about one-half the amount found in 2.08 F formulations of azoxystrobin. **CAUTION:** Resistance to tebuconazole and to group 11 fungicides is present in some North Carolina populations of leaf spot pathogens. Mix with a fungicide that is effective against leaf spot.
	fluoxastrobin + tebuconazole (Evito T) (11+3)	11.2 fl oz	Make up to 2 to 4 applications in mid-season as part of a full-season, 14-day, or advisory program.	14	See above. **CAUTION:** Resistance to tebuconazole and to group 11 fungicides is present in some North Carolina populations of leaf spot pathogens. Mix with a fungicide that is effective against leaf spot (group M or 7).
	azoxystrobin + benzovindiflupyr (Elatus) 45 DF (11 + 7)	7.3 to 9.5 fl oz	Make up to 2 or 3 applications per season as part of a full-season, 14-day, or advisory program. Use higher rates for limb rot and stem rot control.	30	See above. May be effective against stem rot for up to 21 days at the highest rate. Tank mixing with Miravis may suppress Sclerotinia blight. **CAUTION:** Resistance to group 11 fungicides is present in some North Carolina populations of leaf spot pathogens. Alternate or mix with a fungicide that is effective against leaf spot (group M or 3). **Resistance management**: Site-specific fungicides (groups 3, 7, and 11) should be mixed or rotated with a fungicide from a different group to minimize the risk of developing fungal resistance.
	fluxapyroxad + pyraclostrobin (Priaxor) 4.17 SC (7+11)	4 to 8 fl oz	Use 1 to 3 times per season as part of a full-season, 14-day, or advisory program. Use higher rates for limb rot and stem rot control.	14	See above. Use the higher rate for stem rot or Rhizoctonia. **CAUTION:** Resistance to group 11 fungicides is present in some North Carolina populations of leaf spot pathogens. Alternate or mix with a fungicide that is effective against leaf spot (group M or 3).
	flutriafol + azoxystrobin (Topguard EQ)[2] 4.3 SC (3+11)	5 to 8 fl oz	Use up to 2 times per season as part of a full-season, 14-day, or advisory program. Use higher rates for limb rot and stem rot control.	14	See above. Mix or alternate with another fungicide to reduce the risk of fungicide resistance. Mix or alternate with another leaf spot fungicide to improve leaf spot control (group M or 7). **CAUTION:** Resistance to group 11 fungicides is present in some North Carolina populations of leaf spot pathogens. Mix with a fungicide that is effective against leaf spot.

Table 10-6A. Peanut Disease Control

Disease or Diseases Controlled	Pesticide Formulation (FRAC Group Number)	Amount of Formulation Per Acre	Recommended Application Schedule	Minimum Days to Harvest	Precautions and Remarks
Pythium Pod Rot	mefenoxam (Ridomil Gold 2.5 GR; various brands) (4) (Ridomil Gold SL; various brands) (4)	Per 1,000 ft of row (GR): 13 oz SL per Acre: .5 to 1 pt	Early pegging	NA	Apply in an 8- to 12-inch band at early pegging. Do not apply to wet foliage as foliar toxicity may result. Use with other fungicides for late-season control of stem rot (*Sclerotium rolfsii*) and Rhizoctonia stem and pod rot (*Rhizoctonia* spp.).
Seedling Diseases—Seed Treatments	azoxystrobin + fludioxonil + mefenoxam (Dynasty PD)[4] (11 + 12 + 4)	4 oz/100 lb seed	Seedling diseases: Apply to conditioned, untreated seed. Commercial application strongly recommended.	NA	Peanuts can be replanted immediately. Do not plant other crops within 45 days of planting treated seed.
	carboxin + ipconazole + metalaxyl (Rancona V PD) (3 + 4 + 7)	4 oz/100 lb seed	See above	NA	Dust formulation.
Sclerotinia Blight	fluazinam (Omega) 500 F (29) Orbus 4 F	1 to 1.5 pt	1 to 3 applications according to weather-based advisory field history, and scouting.	30	According to advisory or whenever disease is detected. If favorable conditions persist, reapply at 21- to 30-day intervals. Minimum retreatment interval is 21 days.Do not apply more than a combined total of 4 pints in a single growing season. Application at less than label rates will not provide effective control. Contact your local Extension center for details on weather-based Sclerotinia advisories.
	boscalid (Endura)[2,3] 70 WG (7)	8 to 10 oz	See above	14	According to advisory or whenever disease is detected. If favorable conditions persist, reapply at 14- to 21-day intervals. Make no more than 2 consecutive applications per season. Contact your local Extension center for details on weather-based Sclerotinia advisories. Also controls or suppresses leaf spots and web blotch. **Resistance management:** Do not make more than 2 applications of **any** unmixed group 7 fungicide per season. Do not make consecutive applications of any unmixed group 7 fungicide.
	penthiopyrad (Fontelis)[3] 1.67 SC (7)	24 fl oz	See above	14	Performance varies. Apply at 2-week intervals or according to advisory. Do not apply more than 72 fl oz per season. Use on cultivars that have some Sclerotinia blight resistance, for example, Bailey II. Also controls or suppresses leaf spots, web blotch, southern stem rot, and Rhizoctonia limb and pod rot; see above. **Resistance management:** Do not make more than 2 applications of **any** unmixed group 7 fungicide per season. Do not make consecutive applications of any unmixed group 7 fungicide.
	fluopyram + prothioconazole (Propulse) (7 + 3)	13.7 fl oz	See above	14	Suppression only. Apply at 2-week intervals or according to advisory. Use on cultivars that have some Sclerotinia blight resistance, for example, Bailey II. Also controls southern stem rot and Rhizoctonia limb rot; see above.

[1] QOI (group 11) fungicide. Do not apply group 11 fungicides more than 2 times in sequence or more than 3 times per season. Some populations of leaf spot fungi are not controlled by group 11 fungicides. See www.FRAC.org for information on fungicide resistance management.
[2] Less effective against leaf spots than many other fungicides. If using advisories, alternate or mix with more effective fungicides.
[3] Do not apply unmixed group 7 fungicides more than 2 times in sequence. FRAC guidelines: no more than 2 applications of a group 7 fungicide per 5-spray program; no more than 3 applications per ≥6-spray program. May be alternated with group 11 or group 3 fungicides. See www.FRAC.org for information on fungicide resistance management.
[4] Also suppresses CBR. See label for details.

Further Information: *2024 Peanut Information* and peanut disease control information are available at your local Cooperative Extension center.

Table 10-6B. Nematode Control in Peanut

Disease or Diseases Controlled	Pesticide Formulation (FRAC Group Number)	Amount of Formulation Per Acre	Recommended Application Schedule	Minimum Days to Harvest	Precautions and Remarks
Nematodes—Fumigants	1-3 dichloropropene (Telone II)	Depends on application method; see label for details	At least 2 weeks before planting	NA	Inject 8 to 10 inches below the soil surface. Very effective against all nematodes. Does not control soil-borne fungi. Regulations require handler training and impose buffer zones and other restrictions on fumigant use. See the label and your local Extension center for details.
	1-3 dichloropropene + chloropicrin (Telone C-17; Telone C-35; Pic-Chlor 60; InLine)	Depends on application method; see label for details	At least 2 weeks before planting	NA	Inject 8 to 10 inches below the soil surface. Very effective against all nematodes. Regulations require handler training and impose buffer zones and other restrictions on fumigant use. See the label and your local Extension center for details.
	sodium methyldithiocarbamate (metam sodium; Metam CLR 42%; Vapam HL)[1]	7.5 gal (36" row spacing)	At least 2 weeks before planting	NA	Inject 8 to 10 inches below the soil surface. If wet or cold weather occurs following fumigation, the waiting period should be extended. Soil aeration helps reduce residual chemical. When in doubt use a bioassay such as the lettuce seed germination test to determine if safe to plant. Moderately effective against Northern root knot nematode (M. hapla). Not very effective on peanut root knot nematode (M. arenaria). Buffer zones and other restrictions on metam sodium use are required. See your local Extension center for details.
Nematodes—Nonfumigant	fluopyram (Velum) (7)	6.5 to 6.84 fl oz	At planting	14	Previously labeled as Velum Total; new formulation Velum does not contain imidacloprid, so an additional insecticide application may be necessary. Apply in-furrow at planting, directed on or below the seed. Minimum 14 day interval between applications; do not apply more than 13.7 fl oz of Velum per season. May provide early season control of leaf spots and stem rot. See label for plant-back restrictions.
	prothioconazole + fluopyram (Propulse SC) 3.3 SC (3 + 7)	13.6 fl oz	Apply approx. 45 days after planting	NA	Make a banded application in a minimum of 15 gal of water per acre and follow with 0.1 to 0.25 inches of irrigation. Use after application of a nematicide at planting. Application requires possession of a FIFRA Section 2(ee) label. May also be applied in furrow. In-furrow or banded applications may provide early season suppression of leaf spots and stem rot.

[1] Probably not as effective as the other fumigants against nematodes.

Peanut Disease Management Calendar

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Table 10-6C. Peanut Disease Management Calendar

Time of Year	Disease	Threshold	Management Tactics
Spring (April–June)	Tomato spotted wilt virus (TSWV)	See TSWV risk index	Plant a resistant cultivar (Bailey, Sullivan, or Bailey II); use a high seeding rate or twin rows; plant after May 5 and before May 16; apply an insecticide in furrow. Consider an additional postemergence insecticide application.
	CBR (*Cylindrocladium* black rot)	1% to 10% disease in this field last time peanuts were grown	Rotate 2-4 years; avoid soybeans in rotations. Plant a resistant cultivar (Bailey or Bailey II). Consider an in-furrow fungicide application.
		More than 10% disease in this field last time peanuts were grown	Rotate 3-4 years; avoid soybeans in rotations. Plant a resistant cultivar (Bailey or Bailey II) and fumigate before planting.
June–Harvest	Leaf spots, Web blotch, Pepper spot	R3 (beginning pods) or July 10, whichever comes first. Start at 45 days after planting in high risk fields.	Rotate at least 2 years to any crop other than peanuts. Longer rotations are preferred. Plant a partially resistant cultivar (Bailey, Sullivan, or Bailey II). Begin calendar sprays or advisory program no later than R3 or July 10, whichever comes first, in well-rotated peanuts. Start sprays at 45 days after planting in high risk fields. peanut.ces.ncsu.edu/peanut-risk-tool-and-field-log. Use nozzles that give a cone-shaped spray pattern. Use 12 to 24 gallons of water for spray materials applied by ground sprayers. Use at least 5 gallons of water for materials applied by air. **14-day program**: 4 to 6 applications suggested. Begin applications at very early pod (R3) or July 10. Repeat applications at 14-day intervals. **Advisory:** Begin applications no later than very early pod (R3) or July 10. Repeat applications when weather conditions become favorable as determined by peanut leaf spot advisories. This schedule requires strict adherence to the program guidelines and usually results in fewer fungicide applications than the 14-day schedule. Contact your local Extension center for details. Not recommended for rotations of less than 3 years. Scout fields: if 20% or more of leaflets have spots in the worst part of the field, begin a 14-day spray program.
		20% leaflets with spots in any area of the field	Switch to a 14-day spray schedule. Switch to a more effective fungicide if late leaf spot, web blotch, or pepper spot becomes predominant.
		30% defoliation	Fungicide treatment is not likely to be effective. Consider digging early. Pod losses due to disease may not be offset by gains from maturity.
	Southern stem rot	Mid-July or on demand	Plant a partially resistant cultivar (Bailey or Bailey II). Avoid highly susceptible cultivars. Rotate 3 to 4 years to non-host crops. Use a soil fungicide or a foliar fungicide with efficacy against soil-borne pathogens at least once from mid-July to mid-August on resistant cultivars, or up to 3 times on susceptible cultivars in fields with a history of disease, or if signs and symptoms of disease are present. See leaf spots above for application information. Using a surfactant, higher volumes of water (15 to 25 gallons per acre) or spraying at night may improve control.

Table 10-6C. Peanut Disease Management Calendar

Time of Year	Disease	Threshold	Management Tactics
June–Harvest (continued)	*Sclerotinia* blight	In fields with a history of disease, but less than 10% disease: early July or according to advisory	Plant a partially resistant cultivar (Bailey or Bailey II). Avoid highly susceptible cultivars. Rotate 4+ years with non-host crops. Scout every 2 weeks or according to advisory; begin fungicide applications if disease is seen or as indicated by advisory.
		In fields with a history of greater than 10% disease: just before vines close or according to weather-based *Sclerotinia* advisory	Plant a partially resistant cultivar (Bailey or Bailey II). Avoid highly susceptible cultivars. Begin fungicide applications just before vines close or according to weather-based *Sclerotinia* advisory. Using higher volumes of water (15-25 gallons per acre) may improve control. Rotate 4-plus years with non-host crops.
September–October	CBR, *Sclerotinia* blight, Southern stem rot	At digging	Make disease maps to decide future rotations, use of resistant varieties, and to pinpoint areas for fumigation and fungicide application.
October–November	Nematodes, All diseases	Sample areas to be planted to peanut the following spring for nematodes and soil fertility. See the NCDA &CS website for nematode and fertility sampling instructions.	Plan rotation and nematicide use based on recommendations. Adjust soil fertility and pH as recommended. Avoid planting in areas with high levels of Zn or a history of manure or litter applications.

Soybean Disease Control

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Please refer to the current chemical label for all directions regarding safe use and the most up-to-date recommendations for application rates, timing, and harvest intervals.

Table 10-7A. Soybean Nematode Control

Nematodes	Nematicide and Formulation	Amount of Formulation[1]	Precautions and Remarks
Soybean Cyst, Root-Knot, Columbia Lance, Lesion, Stubby Root, Sting	1,3-dichloropropene (Telone II)	3 to 6 gal/acre	Apply 10 to 14 days prior to planting. Inject at least 12 inches deep. Do not use in dry, wet, or cold soils.
	aldicarb (AgLogic 15GG)	7.0 lbs/acre	Apply granules in furrow and immediately cover with soil, or apply a 4-6 inch band in-furrow and immediately cover with soil.
	fluopyram (Velum)	3.0 to 6.0 fl oz/acre	Apply in furrow, via drip or trickle chemigation with sufficient water to move product into root zone. Minimum 7 day interval between applications; do not exceed 13.7 fl oz/ac/year of Velum.
	Pasteuria nishizawae (Clariva)	1 to 3 oz/100 lb of seed	Seed treatment[1].
	abamectin (Avicta Beans 500)	6.2 fl oz per 100 lb seed	Seed treatment.
	clothianidin 40.30% + Bacillus firmus I-1582 8.10% (Poncho/Votivo)	1.02 fl oz per 140,000 seed	Seed treatment.
	Bacillus amyloliquefaciens (Aveo EZ)	0.1 fl oz per 140,000 seeds	Seed treatment.
	fluopyram (Ilevo)	0.6 to 1.97 fl oz per 140,000 seeds	Seed treatment.
	pydiflumetofen (Saltro)	0.714 fl oz per 140,000 soybean seeds	Seed treatment

[1] Seed treatments may not be effective in high pressure environments. Soil samples should be taken in the fall when nematode populations are highest to determine if seed treatments may be effective in managing nematode populations.

Table 10-7B. Soybean Foliar Disease Control

Disease	Fungicide Type and FRAC Code	Fungicide	Rate Per Acre Formulated	Remarks
Frogeye Leaf Spot and Asian Soybean Rust[2]	Strobilurins (11)[1]	azoxystrobin (Quadris Flowable)	6.0 to 15.5 fl oz	Apply fungicide at R1 to R3 and make a second application 14 to 21 days later with a different mode of action if disease pressure is high. Do not apply after R5 (small bean) or within 21 days of harvest. Higher rates provide longer residual activity and may reduce the need for a second application.
		picoxystrobin (Aproach)	6.0 to 12.0 fl oz	
		pyraclostrobin (Headline)	6.0 to 12.0 fl oz	
		fluoxastroben (Aftershock, Evito 480 SC)	2.0 to 5.7 fl oz	
	Nitriles (M5)	chlorothalonil (multiple brands)	1.5 to 2.25 pints	Apply fungicide at R1 to R3 and make a second application 14 days later if disease pressure is high. Do not apply within 48 days of harvest.
	Thiophanates (1)	thiophanate-methyl (multiple brands	10 to 20fl oz	Apply fungicide at R1 to R3 and make a second application 14 to 21 days later if disease pressure is high. Do not apply after R5 (small bean). Higher rates provide longer residual activity and may reduce the need for a second application. Thiophanate-methyl is not labeled for Asiatic soybean rust.
	Triazoles (3)	cyproconazole (Alto 100 SL)	2.75 to 5.5 fl oz	Apply at R1 to R3 and a second application 14 to 28 days later if rust is expected. Use higher rates if rust is present in field. Do not apply after R6 or within 21 days of harvest. Make no more than 2 applications of cyproconazole to soybean per season. Corn or wheat may be planted within 180 days of last application; do not plant other crops within 360 days of last application.
		flutriafol (Topguard) (Xyway LFR)	7 to 14 fl oz 7.6 to 15.2 fl oz	Apply Topguard at R1 to R3 as a preventative spray and 21 to 35 days (7 fl oz) later if rust is expected. Do not apply within 21 days of harvest. Make no more than 2 applications of flutriafol to soybean per season. Plant-back restrictions for all crops except soybean is 120 days after last application. Apply Xyway at planting off the row within 3 inches of the seed, direct contact with the seed can cause injury to the crop. No more than one application in a season. Do not make foliar applications. Xyway is not labeled for Asiatic soybean rust.
		propiconazole (Tilt, Propimax, Bumper)	4.0 to 6.0 fl oz	Apply at R1 to R3 as a preventative spray and 14 to 21 days later if rust is expected. Use higher rates if rust is present in field. Do not apply after R5 or within 21 days of harvest. Make no more than 2 applications of propiconazole-containing materials to soybean per season.
		tetraconazole (Domark, Andiamo 230)	4.0 to 5.0 fl oz	Apply at R1 to R5 as a preventative spray if rust is expected. A second application of another fungicide may be required if disease pressure is high. Use higher rates if rust is present in field. Do not apply after R5 or within 22 days of harvest. Make no more than 2 applications of tetraconazole per season. Peanut, soybean, and sugar beets may be planted immediately after the last application; small grains (barley, buckwheat, millet, oats, rice, rye, triticale, and wheat) and sugarcane can be planted 45 days after the last application; all other crops can be planted 120 days after the last application.
		prothioconazole (Proline)	2.5 to 3 fl oz	Apply at R1 to R3 as a preventative spray and 14 to 21 days later if rust is expected. Do not apply after R6 or within 30 days of harvest. Make no more than 3 applications of materials containing triazoles per year. Any crop not listed on the label may be planted within 30 days of last application.
	Combinations of Strobilurins and Triazoles (3,11)[1]	prothioconazole (10.8%) + trifloxystrobin (32.3%) (Stratego YLD, Protegam YLD)	4 to 4.65 fl oz	Apply at R1 to R3 and 14 to 21 days later if disease pressure is high. Do not apply after R5 or within 21 days of harvest.
		fluoxastrobin (14.84%) + flutriafol (19.3%) (Fortix, Preemptor SC)	4 to 6 fl oz	Apply at R1 to R3 and 14 to 21 days later if disease pressure is high. Do not apply after R5 or within 21 days of harvest.
		trifloxystrobin (13.7%) + prothioconazole (16%) (Delaro)	8.0 to11.0 fl oz	Apply at R1 and repeat applications on a 10 to 21 day interval depending on disease pressure.
		azoxystrobin (18.2%) + difenoconazole (11.4%) (Quadris Top, Acadia ESQ,)	8 to 14 fl oz	Apply at R1 to R3 and 14 to 21 days later if rust is expected. Do not apply after R6 or within 14 days of harvest. Make no more than 2 applications of materials containing azoxystrobin or difenoconazole per year soybean per season. Corn or wheat may be planted within 180 days of last application; do not plant other crops within 360 days of last application.
		azoxystrobin (19.8%) + difenoconazole (19.8%) (Radius ESQ)	7.0 to 7.5 fl oz	Apply at R1 and 7-10 days if disease pressure is high. Do not make more than two applications and Do not apply within 14 days of harvest.
		tetraconazole (7.48%) + azoxystrobin (9.35 %) (Affiance, Trevo TRZ)	10.0 to 14.0 fl oz	Apply at R1 to R3 or when conditions are favorable for disease development and make a second application 15 to 21 days after application if disease pressure is high. Do not apply after R5 or within 14 days of harvest.
		tetraconazole (6.6%) + azoxystrobin (13.7 %) (Brixen)	13 to 16 fl oz	Apply at R3 and repeat application at R5 if needed. Do not apply after R5 or make more than two applications.
		cyproconazole (7.17%) + picoxystrobin (17.94%) (Aproach Prima)	5.0 to 6.8 fl oz	Apply fungicide at R1 to R3 and a second application 14 to 21 days later if disease pressure is high. Do not apply after R5 or within 30 days of harvest.
		flutriafol (18.6%) + azoxystrobin (25.3%) (Topguard EQ,Preemptor EQ)	5.0 to 8.0 fl oz	Apply at R1 or when conditions are favorable for disease. Treatment interval is 14 to 21 days.
		tetraconazole (17.7%) + fluoxastrobin (17.7%) (Zolera FX)	4.4 to 6.8 fl oz	Apply at R1 with followup sprays applied 14-days apart. If more than one application is is planned the rates should not exceed 5.7 fl oz/acre. Do not apply within 30 days of harvest.
	Combinations of Triazoles and Dicarboxamides (3,7)	bixafen (15.5%) + flutriafol (26.5%) (Lucento)	3.0 to 5.5 fl oz	Spray preventively when conditions are favorable for disease. Application interval is 10 to 14 days.
		pydiflumetofen (6.9%) + difenoconazole (11.5%) (Miravis Top)	13.7	Begin applications prior to disease development. Continue applications through season on a 7- to 14-day interval based on disease pressure and following the resistance management guidelines. Not labeled for Asian soybean rust.
		mefentrifluconazole (26.04%) + fluxapyroxad (8.68%) (Revylok)	4.5 to 6.5 fl oz	Apply R1 to R3 prior to infection and a second application 14 days later if disease pressure is high. Do not make more than two applications. Do not apply within 21 days of harvest.

Table 10-7B. Soybean Foliar Disease Control

Disease	Fungicide Type and FRAC Code	Fungicide	Rate Per Acre Formulated	Remarks
Frogeye Leaf Spot and Asian Soybean Rust[2] (continued)	Combinations of dicarboximides and Strobilurins (7, 11)	fluxapyroxad (14.33 %) + pyraclostrobin (28.58 %) (Priaxor)[1]	4.0 to 8.0 fl oz	Apply at R1 to R3 prior to infection and a second application 7 to 14 days later if disease pressure is high. Do not apply after R5 or within 21 days of harvest.
	Combinations of Triazoles, Dicarboximides, and Strobilurins (3, 7, 11)	mefentrifluconazole (11.61 %) + fluxapyroxad (7.74 %) + pyraclostrobin (15.49 %) (Revytek)	8.0 to 15 fl oz	Apply at R1 to R3 prior to infection and a second application 7 to 14 days later if disease pressure is high. Do not apply after R5 or within 21 days of harvest. Do not apply more than 30 fl oz per year.
		benzovindiflupyr (2.9%) + azoxystrobin (10.5%) + propiconazole (11.9%) (Trivapro)	13.7 to 20.7 fl oz	Apply at R3 with subsequent sprays occurring at 14-day intervals following resistance management guidelines.
		fluxapyroxad (14.3%) tetraconazole (20.5%) pyraclostrobin (28.5%) (Priaxor D)	4.0 fl oz each component	Apply at R3 when conditions are favorable for disease and continue every 15 to 21 days depending on disease pressure.
		fluopyram (10.9%) trifloxystrobin (13.1%) prothioconazole (14.9%) (Delaro Complete)	8.0 to 11.0 fl oz	Apply Delaro Complete as a broadcast foliar spray at early flowering or prior to disease development, whichever is earlier. Repeat at 7 to 21 day intervals depending on disease pressure.

[1] QOI group fungicides. Avoid using group 11 fungicides (Strobilurins) more than one time in sequence to reduce fungicide resistance development. If fungicide-resistant frogeye leaf spot is identified in your region, avoid using group 11 fungicides.

[2] Fungicides are not recommended for Asiatic Soybean Rust unless it has been confirmed within 100 miles of a field.

Relative Fungicide Efficacy for Control of Soybean Seedling Diseases

The members of the Identification and Biology of Seedling Pathogens of Soybean project funded by the North Central Soybean Research Program and the United Soybean Board, and the North Central Regional Committee on Soybean Diseases (NCERA-137) have developed the following ratings for how well fungicide seed treatments control seedling diseases of soybeans in the United States. Efficacy ratings for each fungicide active ingredient listed in the table were determined by field testing the materials over multiple years and locations by the members of this group, and include ratings summarized from national fungicide trials published in Plant Disease Management Reports (and formerly Fungicide and Nematicide Tests) by the American Phytopathological Society at www.apsnet.org. Each rating is based on the fungicide's level of disease control and does not necessarily reflect efficacy of fungicide active ingredient combinations or yield increases obtained from applying the active ingredient.

The list includes the most widely marketed products available. It is not intended to be a list of all labeled active ingredients and products. Additional active ingredients may be available but have not been evaluated in a manner allowing a rating. Products listed are the most common products available as of the release date of the table; all available products may not be listed. Additional active ingredients may be included in some products for insect and nematode control, however, only active ingredients for pathogen control are listed and rated.

Many active ingredients and their products have specific use restrictions. Read and follow all use restrictions before applying any fungicide to seed, or before handling any fungicide-treated seed. This information is provided only as a guide. It is the applicator's and user's legal responsibility to read and follow all current label directions. Reference in this publication to any specific commercial product, process, or service, or the use of any trade, firm, or corporation name is for general informational purposes only and does not constitute an endorsement, recommendation, or certification of any kind by members of the group, or by the North Central Soybean Research Program. Individuals using such products assume responsibility for their use in accordance with current directions of the manufacturer. Efficacy categories: E = Excellent; VG = Very Good; G = Good; F = Fair; P = Poor; NR = Not Recommended; NS = Not Specified on product label; U = Unknown efficacy or insufficient data to rank product.
Ratings of NR may mean that the fungal group listed is not a target of the specific fungicide active ingredient.

Please note: Efficacy ratings may be dependent on the rate of the fungicide product on seed. Several different species of Pythium and Fusarium impact seed and seedling health in soybean. Therefore, wide ranges in efficacy may be observed in fungicide active ingredients listed in the table. This is why several fungicide active ingredients are combined in seed treatments to provide protection to a broader spectrum of pathogens. Contact your local Extension plant pathologist for recommended fungicide product rate information for your area.

Table 10-7C. Relative Fungicide Efficacy for Control of Soybean Seedling Diseases

Fungicide active ingredient	*Pythium* sp.[1]	*Phytophthora* root rot	*Rhizoctonia* sp.	*Fusarium* sp.[1,3]	Sudden Death Syndrome (SDS) (*Fusarium virguliforme*)	*Phomopsis* sp.
Azoxystrobin	P-G	NS	VG	F-G	NR	P
Carboxin	U	U	G	U	NR	U
Ethaboxam	E	E	NR	NR	NR	NR
Fludioxonil	NR	NR	G	F-VG	NR	G
Fluopyram	NR	NR	NR	NR	VG	NR
Fluxapyroxad	U	U	E	G	NR	G
Ipconazole	P	NR	F-G	F-E	NR	G
Mefenoxam	E[2]	E	NR	NR	NR	NR
Metalaxyl	E[2]	E	NR	NR	NR	NR
Oxathiapiprolin	P-G	E	NR	NR	NR	NR
PCNB	NR	NR	G	U	NR	G
Penflufen	NR	NR	G	G	NR	G
Prothioconazole	NR	NR	G	G	NR	G
Pydiflumetofen	NS	NS	NS	NS	VG	NS
Pyraclostrobin	P-G	NR	F-G	F	NR	G
Sedaxane	NR	NR	E	NS	NR	G
Thiabendazole	NR	NR	NS	NS	P	G
Trifloxystrobin	P	P	F-E	F-G	NR	P-F

[1] Products may vary in efficacy against different *Fusarium* and *Pythium* species.
[2] Areas with mefenoxam or metalaxyl insensitive populations may see less efficacy with these products.
[3] Listed seed treatments do not have efficacy against *Fusarium virguliforme*, causal agent of sudden death syndrome.

Tobacco Disease Control

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Table 10-8A. Tobacco Disease Control — Nematode Control

Nematicide	Amount of Formulation Per Acre	Waiting Period Before Planting[1] (Days)	Precautions and Remarks
Fumigants dichloropropene (Telone II)	6.0 gal	21	Rates are for in-row injection. Broadcast rates are usually 50% to 100% more than in-row rates (see label for details). Apply fumigants and multi-purpose fumigants at a final depth of 12 to 14 inches. Apply only when the soil temperature is between 55ºF and 80ºF and soil is moist but not wet. Should soil become wet for an extended time following application, a longer waiting period before transplanting may be necessary to avoid fumigant injury.
dichloropropene + chloropicrin (Telone C-35) (In Line)	12.0 gal	21	
Contact Nematicides[2] fluensulfone (Nimitz)	3.5 to 7 pt	7-10	Adequate watering in or rain after application is needed for maximum product efficacy (see label). Do not make more than one application per crop.
fluopyram (Velum Prime)	6.5 to 6.85 fl oz	0	Transplant water application in combination with mechanical planting. To reduce the development of pathogen resistance to FRAC group 7, the first foliar fungicide application should be a product from a different FRAC group. Maximum of two applications per field per year.

[1] Read and follow product label directions concerning fumigant application and worker reentry periods.
[2] Contact nematicides may not be effective in situations with high nematode populations. Assess nematode populations in the fall prior to use of nematicides for effective selection of chemistries to control populations.

Table 10-8B. Tobacco Disease Control — Field Blue Mold, Target Spot, and Frog-eye Leafspot Control

Disease	Material (FRAC Group)[1]	Rate Per Acre (Formulated)	Method of Application
Field Blue Mold, Target Spot, and Frog-eye Leafspot Control	azoxystrobin (Quadris) (11)	6.0 to 12.0 fl oz	Apply on a 7- to 14-day interval with sufficient water volume for adequate coverage and canopy penetration. May be applied up to day of harvest. Do not tank mix with thiodan. **Application directions for blue mold:** Applications should begin prior to disease development or at first indication of blue mold in the area. If blue mold is present in the field, apply dimethomorph prior to Quadris applications. Maximum of 2 applications at high rate.
	Bacillus amyloliquefaciens strain MBI 600 (Serifel)	4 to 16 oz	Begin foliar application prior to infection and continue 7- to 10-day intervals if conditions are conductive for disease development. Use higher rate and shorter interval when disease pressure is high. May have activity on other foliar diseases.
	Bacillus amyloliquefaciens strain D747 (Double Nickel LC)	0.5 to 6 qts	For suppression only. Begin applications when conditions are conducive to development of disease. Repeat application every 3 to 10 days, or as needed, for as long as conditions favor disease development. Lower rates (0.5 to 3 quarts per acre) may be applied under light disease pressure. Under moderate to severe disease pressure, or when environmental conditions and plant stage are conducive to rapid disease development, use higher label rates (3 to 6 quarts/acre), apply more frequently (every 3 to 7 days), and mix or rotate Double Nickel™ LC with other fungicides for improved performance.
Blue Mold Only (FRAC Group)[1]	acibenzolar-S-methyl (Actigard) (P01)	0.5 oz	Begin preventative applications after plants reach a height of 12 inches (Flue-Cured)/18 inches (Burley). Make up to 3 applications on a 10-day schedule. Apply in a minimum of 20 gallons of water per acre.
	aluminum tris (O-ethyl phosphate) (Aliette WDG) (33)	2.5 to 4.0 lb	Apply immediately after transplanting and continue on a 7- to 10-day schedule. Begin with a minimum spray volume of 20 gallons per acre and increase by 20 gallons per acre weekly to a maximum of 100 gallons per acre. The pH of spray solution should not be less than 6.0. Do not exceed maximum rate. No more than 20 pounds per season.
	mandipropamid (Revus) (40)	8.0 fl oz	Apply prior to disease development and continue on a 7- to 10- day schedule. Revus can be tank mixed with another fungicide of different FRAC Group. No more than 2 consecutive applications before switching to another mode of action fungicide. No more than 32 fluid ounces per season. Do not apply within 7 days of harvest.
	dimethomorph (Forum) (40)	2.0 to 8.0 oz	Increase rate and spray volume as crop size increases. MUST be used in a tank mix with another fungicide (non-Group 40) active against blue mold. Refer to the partner labeling for rates, application method, and restrictions for safe products. Can be used up to day of harvest.
	mancozeb (M3) Dithane, Penncozeb or other names. Check active ingredients.	Various rates may apply, See label for details.	Use only if there is a threat of metalaxyl-insensitive blue mold. Mix 1.5 to 2 pounds per 100 gallons per acre. Spray weekly for complete coverage. Discontinue when threat of blue mold no longer exists. In flue-cured tobacco, do not spray after first button or within 21 days of harvest. In burley, do not spray within 30 days of harvest.
	Mefenoxam[2] (Ridomil Gold) EC, SL (Ultra Flourish) 2 E (4)	0.5 to 1 pt 1 to 2 pt	For mefenoxam-sensitive strains of the blue mold fungus, apply preplant in a minimum of 15 gallons of water per acre. Incorporate in the top 2 to 4 inches of soil and form beds. Use highest rate for burley tobacco. For prolonged control, especially in burley, apply a supplemental soil application of either 0.5 pints per acre Ridomil Gold EC or 1 pint Ultra Flourish 2 E at layby or the last cultivation. Do not make the supplemental application if more than the highest rate was applied preplant.
	Presidio (43)	4.0 fl oz	MUST be used in a tank mix with another fungicide with different mode of action active against blue mold. No more than 2 foliar applications per season. Seven day preharvest interval.
	Oxathiapiprolin and mandipropamid (Orondis Ultra) (Premix)	5.5 to 8.0 fl oz	Use the higher rates when disease is present, for longer application intervals, or for susceptible varieties. For conventional ground application, apply at least 15 gallons per acre, increasing the spray volume as the plants mature to ensure thorough coverage of the foliage. For aerial application, apply at least 5 gallons per acre. For ground or aerial applications, the addition of a spreading/penetrating type of adjuvant such as a non-ionic surfactant, organosilicone, or blend at labeled agricultural use rates may enhance disease control.
	Bacillus mycoides isolate J (LifeGard WG)	4.5 oz /100 gal	Make preventive applications on a 7- to 14-day schedule whenever conditions favor disease development.
	Copper Octanoate (Copper Soap) (Cueva)	50.8 gal	Use on tobacco in transplant beds (or on field grown plants). Do not reapply within 10 days

[1] To prevent resistance in pathogens, alternate fungicides from a group with fungicides in another group. Fungicides in the "M" group are generally considered "low risk" with no signs of resistance developing to the majority of fungicides.

[2] Mefenoxam resistant blue mold has been reported in tobacco producing regions; use multiple modes of action in a growing season or avoid mefenoxam.

Table 10-8C. Tobacco Disease Control — Black Shank, Granville Wilt, and Black Root Rot Control

Disease	Material	Amount of Formulation Per Acre	Waiting Period Before Planting (Days)	Precautions and Remarks
Black Shank, Granville Wilt, and Black Root Rot	chloropicrin 98% (Chlor-O-Pic 100, Chloropicrin 100) chloropicrin 85% (Pic Plus Fumigant)	3.0 gal 4.0 gal	21	Rates are for in-row injection. Where labeled, broadcast rates are usually 25% to 100% more than in-row rates. Apply multipurpose fumigants to a depth of 6 to 8 inches and form a high, wide bed immediately. Apply only when the soil temperature is above 55ºF and soil is moist but not wet. Should soil become wet for extended time following applications, a longer waiting period before transplanting may be necessary to avoid fumigant injury. Use with Ridomil for black shank control.
	dichloropropene + chloropicrin (Telone C-35)	12.0 gal	21	
Black Shank Only (FRAC Group)[1]	Mefenoxam (Ridomil Gold) EC, SL (Ultra Flourish) 2 E (4)	1 to 3 pt 2 to 6 pt	0 0	Use in combination with crop rotation and resistant varieties where applicable. For prolonged control apply either 1 pint Ridomil Gold EC or SL or 2 pints Ultra Flourish 2 E just before transplanting followed by either 0.5 to 1 pint Gold EC or 1 to 2 pints Ultra Flourish 2 E at first cultivation and at lay-by. Also, control nematodes for best results.
	Oxathiapiprolin (Orondis)		0	If this product is in the co-pack form, it must be mixed with the other chemistry in the co-pack.
	Presidio (43)	4 fl oz	NA	No more than 2 soil applications per season. Applications cannot be consecutive. Alternate with another fungicide of different mode of action. Apply at first cultivation or layby.
	Gliocladium virens strain GL-21 (SoilGard)	½ to 2 lb per 100 gallons	0	Apply 4 to 8 fl. oz. of finished drench in each transplant hole using a water wheel/shank injector, watering can, or low pressure sprayer with flood/drench nozzles.

[1] To prevent resistance in pathogens, alternate fungicides within a group with fungicides in another group. Fungicides in the "M" group are generally considered "low risk" with no signs of resistance developing to the majority of fungicides.

Table 10-8D. Tobacco Disease Control — Tobacco Seedling Disease Control

Disease	Material (FRAC Code)[1]	Rate	Precautions and Remarks
Blue Mold	aluminum tris (O-ethyl phosphonate) (Aliette WDG) (33)	0.5 lb/50 gal water	Apply 3 gallons of spray solution per 1,000 square feet for small plants. Increase the volume as the plants grow to a maximum of 12 gallons per 1,000 square feet. Apply preventatively or at the first sign of blue mold. Apply every 5 to 7 days, and do not exceed 2 applications. After application, wait 24 hours before applying any material over top. Apply insecticides that require a wash down to the soil prior to Alliette.
Blue Mold; Anthracnose; Damping-Off (Rhizoctonia); Stem Rot (Rhizoctonia); Target Spot	Mancozeb (Dithane, Penncozeb or equivalent, see label for details) (M 3)	1 lb/100 gal water (outdoor plant bed) 0.5 lb/100 gal water (greenhouse and float-bed systems) See labels for details for your product.	Begin sprays when seedlings are quarter size: For outdoor beds, mix 1 tablespoon per gallon water, apply 3 to 5 gallons per 900 square feet every 5 to 7 days. For greenhouse and float systems, mix 1 teaspoon per gal water, apply 3 to 12 gallons per 1,000 square feet every 5 to 7 days. Use low gallonage on small plants and higher gallonage on larger plants. Do not contaminate float water with mancozeb.
Stem Rot, damping off (Rhizoctonia); Target Spot	azoxystrobin (Quadris) (11)	0.14 oz (4ml)/1000 sq ft (equal to 6 fl oz/acre)	Use enough water for thorough coverage (recommend 5 gallons per 1,000 square feet or more). Make ONLY ONE application prior to transplanting.
Mosaic	milk (whole or skim) OR dry skim milk	5 gal/100 sq yd of bed 5 lb in 5 gal water/100 sq yd	Spray plants within 24 hours of pulling.
	soap OR milk (skim or whole)		Wash hands with soap or dip hands every 20 minutes while pulling and transplanting to field.
	dry skim milk	1 lb in 1 gal water	
Pythium Root Rot	etridiazole (Terramaster) 4 EC (14)	1.4 oz/100 gal float water	Apply at least 2 to 3 weeks after seeding. Mix thoroughly in the float water. May be used preventively or curatively. A second application may be made, but no later than 8 weeks after seeding.
Wildfire; Angular Leafspot (Burley Tobacco); Blue Mold	streptomycin sulfate (Agri-Mycin 17) (25)	Spray 200 ppm using 5 gal/100 sq yd, Drench 100 ppm using 10 gal/100 sq yd	Spray or drench when plants are in two-leaf stage and repeat once a week for five sprays. Prepare the solution by mixing 2 (200 ppm) or 1 (100 ppm) teaspoon of streptomycin (17% to 21%) per gallon of water. See label for other possible application rates.

[1] To prevent resistance in pathogens, alternate fungicides within a group with fungicides in another group. Fungicides in the "M" group are generally considered "low risk" with no signs of resistance developing to the majority of fungicides.

Table 10-8E. Tobacco Disease Control of Tomato Spotted Wilt (TSWV) — Virus suppression

Material (FRAC Code)[1]	Rate	Precautions and Remarks
acibenzolar (Actigard 50W) (21)	0.5 oz/25,000 to 50,000 plants (sprayed over the top) OR 10 to 25 ppm (added to the float water)	**Waiver of liability must be signed to obtain label.** Apply to trays or flats 5 to 7 days before transplanting. If sprayed over the top, rinse it off into potting soil. Apply only with calibrated boom sprayer to ensure no overlap. If applied to float water, ensure water is circulated uniformly to all tobacco plants. For better results, dilute Actigard in a small volume of water first, and then add this volume to the float water. Use lower rate in areas with moderate TSWV risk and highest in areas with severe TSWV risk.
	0.5 oz/acre	Up to 3 field applications in 10-day increments may be made starting 10 days after the greenhouse application. Begin applications after plants reach a height of 18 inches.
imidacloprid (Admire Pro) (4A)	1.8 oz/1,000 plants	Apply to trays IN THE GREENHOUSE 3 to 5 days prior to transplanting. Mix with water prior to application; do not add wetting agents or defoamers, and do not use in combination with other pesticides. Immediately after application, wash the material off the plants to transfer it to the potting soil. Observe worker protection standards for greenhouse application.
acibenzolar (Actigard 50W) + imidacloprid (21 + 4A)	See above	See comments above for both products. Apply Actigard first, then imidacloprid. Tank mixing has not been determined to be safe.

[1] To prevent resistance in pathogens, alternate fungicides within a group with fungicides in another group. Fungicides in the "M" group are generally considered "low risk" with no signs of resistance developing to the majority of these fungicides.

Turfgrass Disease Control

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When more than one brand name exists for an agricultural chemical, the brand name that first came onto the market is listed first. Otherwise, brand names are listed in alphabetical order. The order in which brand names are given is not an indication of a recommendation or criticism. Products marked with an asterisk (*) are not labeled for home lawn use.

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Algae (Cyanobacteria)	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14
	boscalid + chlorothalonil (Encartis) 6.25 SC*	3 to 4	14
	chlorothalonil*		
	(Daconil) 82.5 WDG	1.8 to 3.25	7 to 14
	(Daconil Weather Stik) 6 F	2 to 3.6	7 to 14
		4 to 5.5	14
	(Daconil Zn) 4.16 F	3 to 5	7 to 14
		6 to 8	14
	chlorothalonil + acibenzolar-S-methyl (Daconil Action) 6.1 F*	2 to 3.6	7 to 14
		4 to 5.4	14
	chlorothalonil + azoxystrobin (Renown) 5.16 SC*	2.5 to 4.5	10 to 14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.4	7 to 14
	chlorothalonil + thiophanate-methyl (Spectro) 90 WDG*	2 to 5.76	7 to 14
	chlorothalonil + triticonazole (Reserve) 4.79 SC*	3.2 to 5.4	14 to 28
	fluazinam (Secure) 4.17 SC*	0.5	14
	fluazinam + acibenzolar-S-methyl (Secure Action) 4.18 SC*	0.5	14
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	14
	fluxapyroxad (Xzemplar) 2.47 SC	0.21 to 0.26	14 to 28
	mancozeb (Fore) 80 WP*	6	7 to 14
Anthracnose (*Colletotrichum cereale*)	azoxystrobin		
	(Heritage) 50 WG	0.2 to 0.4	14 to 28
	(Heritage) 0.8 TL	1 to 2	14 to 28
	(Heritage) 0.31 G	2 to 4 lb	14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5	7 to 10
		4.5	14 to 21
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14
	azoxystrobin + propiconazole (Headway)		
	1.4 ME	1.5 to 3	14 to 28
	1.06 G	2 to 4 lb	14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14
	boscalid + chlorothalonil (Encartis) 6.25 SC*	3 to 4	14
	chlorothalonil*		
	(Daconil Ultrex) 82.5 WDG	2.75 to 5	7 to 14
	(Daconil Weather Stik) 6 F	3 to 3.6	7 to 14
		3.6 to 5.5	14
	(Daconil Zn) 4.16 F	4.4 to 5	7 to 14
		5.3 to 8	14
	chlorothalonil + acibenzolar-S-methyl (Daconil Action) 6.1 F*	3 to 3.6	7 to 14
		3.6 to 5.4	14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	14 to 28
	chlorothalonil + iprodione + thiophanate-methyl + tebuconazole (Enclave) 5.3 F*	3 to 4	14 to 21
		7 to 8	28
	chlorothalonil + propiconazole (Concert) 4.3 SC*	4.5 to 8.5	7 to 28
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.59 SC*	2.75 to 6	14 to 28
	chlorothalonil + thiophanate-methyl (Consyst) 67 WDG*	2 to 8	7 to 14
	cyazofamid + azoxystrobin (Union) 0.79 SC	2.9 to 5.75	14 to 28
	fluazinam (Secure) 4.17 SC*	0.5	14
	fluazinam + acibenzolar-S-methyl (Secure Action) 4.18 SC*	0.5	14
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	14
	fludioxonil (Medallion) 50 WP	0.25 to 0.5	14
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	7 to 14
	fluopyram + trifloxystrobin (Exteris Stressgard) 0.27 SC	2.135 to 6	14 to 28
	fluoxastrobin (Fame)		
	4 SC	0.18 to 0.36	14 to 28
	0.25 G	2.3 to 4.6 lb	14 to 28
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14 to 30
	flutriafol (Rayora) 1.04 L*	0.7 to 1.4	14 to 21
	iprodione + thiophanate-methyl (26/36) 3.8 F*	2 to 4	14 to 21
	iprodione + trifloxystrobin (Interface) 2.27 SC*	4 to 7	refer to label
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mefentrifluconazole (Maxtima) 3.34 SC*	0.4 to 0.6	14
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	metconazole (Tourney) 50 WDG	0.28 to 0.37	14 to 21
	mineral oil (Civitas) + proprietary pigment (Civitas Harmonizer)*	(8 to 32) + (1 to 4)	7 to 21
	myclobutanil (Eagle) 20 EW	1.2	14 to 21
	penthiopyrad (Velista) 50 WG	0.3 to 0.5	14
	polyoxin D		
	(Affirm) 11.3 WDG	0.88	7 to 14
	(Endorse) 2.5 WP	4	7 to 14
	propiconazole (Banner MAXX) 1 ME	1 to 2	14 to 28
	prothioconazole (Densicor) 4 SC*	0.196	14 to 21
	Pseudomonas chlororaphis strain AFS009 (Zio) SC	1.8 to 6.0	7 to 21
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Anthracnose (*Colletotrichum cereale*) (continued)	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28 WG*	0.55 to 1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	tebuconazole* (Torque) 3.6 F (Mirage, Stressgard) 2 SC	 0.6 to 1.1 1 to 2	 21 14 to 28
	thiophanate-methyl (3336) 50 WP or 4 F (3336 Plus) 2 F (3336) 2 G	 2 to 6 2 to 8 3 to 9 lb	 14 14 to 28 14
	triadimefon (Bayleton) 50 WSP	1	30 to 45
	trifloxystrobin (Compass) 50 WDG	0.15 to 0.25	14 to 21
	trifloxystrobin + triadimefon (Armada) 50 WP (Tartan) 2 SC*	 0.6 to 1.2 1 to 2	 14 to 28 14 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70 WDG (Triton Flo) 3 F	 0.5 to 1 0.15 to 0.225 0.41 to 1.1	 14 to 28 14 to 28 14 to 28
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 5.4	14 to 28
Brown Patch (*Rhizoctonia solani*)	azoxystrobin (Heritage) 50 WG28 (Heritage) 0.8 TL (Heritage) 0.31 G	 0.2 to 0.4 1 to 2 2 to 4 lb	 14 to 28 14 to 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5 4.5	14 14 to 21
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 0.75 to 3 2 to 4 lb	 14 to 28 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14 to 21
	boscalid + chlorothalonil (Encartis) 6.25 SC*	3 to 4	14
	chlorothalonil* (Daconil Ultrex) 82.5 WDG (Daconil Weather Stik) 6 F (Daconil Zn) 4.16 F	 1.8 to 3.23 3.7 to 5 2 to 3.6 4 to 5.5 3 to 5 6 to 8	 7 to 14 14 7 to 14 14 7 to 14 14
	chlorothalonil + acibenzolar-S-methyl (Daconil Action) 6.1 F*	2 to 3.5 4 to 5.4	7 to 14 14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	1.5 to 5.9	14 to 28
	chlorothalonil + iprodione + thiophanate-methyl + tebuconazole (Enclave) 5.3 F*	3 to 4 7 to 8	14 to 21 28
	chlorothalonil + propiconazole (Concert) 4.3 SC*	3 to 5.5 5.5 to 8.5	7 to 14 14 to 28
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC*	2.75 to 6	14 to 21
	chlorothalonil + thiophanate-methyl (Spectro) 90 WDG*	3 to 5.76	14 to 21
	cyazofamid + azoxystrobin (Union) 0.79 SC	2.9 to 5.75	14 to 28
	fluazinam (Secure) 4.17 SC*	0.5	14
	fluazinam + acibenzolar-S-methyl (Secure Action) 4.18 SC*	0.5	14
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	14
	fludioxonil (Medallion) 50 WP	0.2 to 0.25 0.5	7 14
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	14 to 28
	fluopyram + trifloxystrobin (Exteris Stressgard) 0.27 SC	2.135 to 6	14 to 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.09 to 0.36 1.2 to 4.6 lb	 14 to 28 14 to 28
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21 to 28
	flutriafol (Rayora) 1.04 L*	0.7 to 1.4	14 to 21
	fluxapyroxad (Xzemplar) 2.47 SC	0.21 to 0.26	14 to 21
	flutolanil (Prostar) 70 WP, 70 DG (Pedigree) 3.8 SC	 1.5 to 3 2.2 to 4.4	 14 to 21 14 to 21
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14 to 21
	iprodione (26GT) 2 F*	3 to 4	14 to 28
	iprodione + thiophanate-methyl (26/36) 3.8 F*	2 to 4	14 to 21
	iprodione + trifloxystrobin (Interface) 2.27 SC*	3 to 5	refer to label
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mancozeb (Fore) 80 WP*	4	7
	mandestrobin (Pinpoint) 4SC	0.31	14

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Brown Patch (*Rhizoctonia solani*) (continued)	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	metconazole (Tourney) 50 WDG	0.28 to 0.37	14 to 21
	mineral oil (Civitas) + proprietary pigment (Civitas Harmonizer)*	(8 to 32) + (1 to 4)	7 to 21
	myclobutanil (Eagle) 20 EW	1.2	14
	penthiopyrad (Velista) 50 WG	0.3 to 0.5	14 to 21
	polyoxin D (Affirm) 11.3 WDG (Endorse) 2.5 WP	 0.88 4	 7 to 14 7 to 14
	propiconazole (Banner MAXX) 1 ME	1 to 2	14 to 21
	prothioconazole (Densicor) 4 SC*	0.196	14 to 21
	Pseudomonas chlororaphis strain AFS009 (Zio) SC	1.8 to 6.0	7 to 21
	pydiflumetofen + azoxystrobin + propiconazole (Posterity Forte) 2.5 SE*	0.63 to 0.84	14 to 21
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	0.75 to 1.5	14
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28 WG*	0.55 to 1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	tebuconazole* (Torque) 3.6 F (Mirage Stressgard) 2 SC	 0.6 to 1.1 1 to 2	 21 14 to 28
	triadimefon (Bayleton) 50 WSP, 4.15 F	0.5 to 1	15 to 30
	trifloxystrobin (Compass) 50 WDG	0.1 to 0.2 0.15 to 0.25	14 21
	trifloxystrobin + triadimefon (Armada) 50 WP (Tartan) 2 SC*	 0.6 to 1.2 1 to 2	 14 to 28 14 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70 WDG (Triton Flo) 3 F	 0.75 to 2 0.15 to 0.3 0.41 to 1.1	 14 to 28 14 to 28 14 to 28
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 5.4	14 to 28
Brown Ring Patch (*Waitea circinata*)	azoxystrobin (Heritage) 50 WG 0.8 TL 0.31 G	 0.2 to 0.4 1 to 2 2 to 4 lb	 14 to 28 14 to 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	azoxystrobin + propiconazole (Headway) 1.4 ME	1.5 to 3	14 to 28
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14 to 21
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	21
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21 to 28
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	penthiopyrad (Velista) 50 WG	0.5	14
	polyoxin D (Affirm) 11.3 WDG (Endorse) 2.5 WP	 0.88 4	 7 to 14 7 to 14
	prothioconazole (Densicor) 4 SC*	0.196	14 to 21
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia) 2 SC	0.7	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	tebuconazole* (Torque) 3.6 F (Mirage, Stressgard) 2 SC	 0.6 to 1.1 1 to 2	 21 14 to 28
	triticonazole (Trinity) 1.7 SC (Triton FLO) 3 F	 1 to 2 0.5 to 1.1	 14 to 28 14 to 28
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 5.4	14 to 28
Copper Spot (*Gloeocercospora sorghi*)	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14
	boscalid + chlorothalonil (Encartis) 6.25 SC*	4	14
	chlorothalonil* (Daconil Ultrex) 82.5 WDG (Daconil Weather Stik) 6 F (Daconil Zn) 4.16 F	 3.7 to 5 4 to 5.5 6 to 8	 14 14 14
	chlorothalonil + acibenzolar-S-methyl (Daconil Action) 6.1 F*	4 to 5.4	14
	chlorothalonil + azoxystrobin (Renown) 5.16 SC*	2.5	14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	5.9	14
	chlorothalonil + iprodione + thiophanate-methyl + tebuconazole (Enclave) 5.3 F*	3 to 4 7 to 8	14 to 21 28
	chlorothalonil + propiconazole (Concert) 4.3 SC*	5.5 to 8.5	14

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Copper Spot (***Gloeocercospora sorghi***) **(continued)**	chlorothalonil + thiophanate-methyl (Consyst) 67 WDG*	3 to 8	7 to 10
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	14
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	7 to 14
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14 to 21
	flutriafol (Rayora) 1.04 L*	0.7 to 1.4	14 to 21
	iprodione + thiophanate-methyl (26/36) 3.8 F*	2 to 4	14 to 21
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mancozeb (Fore) 80 WP*	4 to 8	7 to 14
	myclobutanil (Eagle) 20 EW	1.2	14
	tebuconazole (Torque) 3.6 F*	0.6 to 1.1	refer to label
	thiophanate-methyl (3336) 50 WP or 4 F (3336 Plus) 2 F (3336) 2 G	 2 to 4 2 to 4 1.5 to 6 lb	 14 14 to 28 14
	triadimefon (Bayleton) 50 WSP, 4.15 F	0.5 to 1	15 to 30
Dead Spot (***Ophiosphaerella agrostis***)	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 1.5 to 3 2 to 4 lb	 14 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14
	boscalid* (Emerald) 70 WG	0.18	14
	boscalid + chlorothalonil (Encartis) 6.25 SC*	4	14
	chlorothalonil + thiophanate-methyl (Spectro) 90 WDG*	3.72 to 5.76	14
	fludioxonil (Medallion) 50 WP	0.3 to 0.5	14
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28 WG*	0.55 to 1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	thiophanate-methyl (3336) 50WP or 4 F (3336 Plus) 2 F (3336) 2 G	 4 to 6 4 to 6 6 to 9 lb	 14 14 14
Dollar Spot (***Clarireedia* spp.**)	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 21
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 0.75 to 3 2 to 4 lb	 7 to 28 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14 to 21
	boscalid* (Emerald) 70 WG	0.13 to 0.18	14 to 28
	boscalid + chlorothalonil (Encartis) 6.25 SC*	3 to 4	14 to 28
	chlorothalonil* (Daconil Ultrex) 82.5W DG (Daconil Weather Stik) 6 F (Daconil Zn) 4.16 F	 1 to 3.25 3.7 to 5 1 to 3.6 4 to 5.5 1.5 to 5 6 to 8	 7 to 21 14 to 21 7 to 21 14 to 21 7 to 21 14
	chlorothalonil + acibenzolar-S-methyl (Daconil Action) 6.1 F*	1 to 3.5 4 to 5.4	7 to 21 14
	chlorothalonil + azoxystrobin (Renown) 5.16 SC*	2.5 to 4.5	7 to 14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	14 to 21
	chlorothalonil + iprodione + thiophanate-methyl + tebuconazole (Enclave) 5.3 F*	3 to 4 7 to 8	14 to 21 28
	chlorothalonil + propiconazole (Concert) 4.3 SC*	1.5 to 3 3 to 5.5 5.5 to 8.5	7 to 10 14 to 21 14 to 28
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC*	2.75 to 6	21 to 28
	chlorothalonil + thiophanate-methyl (Consyst) 67 WDG*	2 to 8	7 to 21
	fluazinam (Secure) 4.17 SC*	0.5	14
	fluazinam + acibenzolar-S-methyl (Secure Action) 4.18 SC*	0.5	14 to 21
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	14
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	7 to 14
	fluopyram + trifloxystrobin (Exteris Stressgard) 0.27 SC	1.5 to 4.135	7 to 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.18 to 0.36 2.3 to 4.6 lb	 14 to 21 14 to 21
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21 to 28
	flutriafol (Rayora) 1.04 L*	0.7 to 1.4	14 to 21
	fluxapyroxad (Xzemplar) 2.47 SC	0.16 to 0.26	14 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14 to 30

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Dollar Spot (*Clarireedia spp.*) (continued)	iprodione (26GT) 2 F*	2 to 4	14 to 28
	iprodione + thiophanate-methyl (26/36) 3.8 F*	2 to 4	14 to 21
	iprodione + trifloxystrobin (Interface) 2.27 SC*	2 to 5	refer to label
	isofetamid (Kabuto 3.33 SC)	0.4 to 0.5	14
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mancozeb (Fore) 80 WP*	6 to 8	7 to 14
	mandestrobin (Pinpoint) 4SC	0.17 to 0.31	14 to 21
	mefentrifluconazole (Maxtima) 3.34 SC*	0.2 to 0.4	14 to 28
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	metconazole (Tourney) 50 WDG	0.18 to 0.37	14 to 21
	mineral oil (Civitas) + proprietary pigment (Civitas Harmonizer)*	(8 to 32) + (1 to 4)	7 to 21
	myclobutanil (Eagle) 20 EW	0.5 to 2.4	7 to 28
	penthiopyrad (Velista) 50 WG	0.3 to 0.5	14 to 21
	propiconazole (Banner MAXX) 1 ME	0.5 to 2	7 to 28
	prothioconazole (Densicor) 4 SC*	0.196	14 to 21
	Pseudomonas chlororaphis strain AFS009 (Zio) SC	1.8 to 6.0	7 to 21
	pydiflumetofen (Posterity) 1.67 SC*	0.08 to 0.32	14 to 28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity Forte) 2.5 SE*	0.42 to 0.84	21 to 28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.9 0.7	 14 14
	pyraclostrobin + boscalid (Honor) 28 WG*	0.83 to 1.1	14 to 21
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	tebuconazole* (Torque) 3.6 F (Mirage Stressgard) 2 SC	 0.6 to 1.1 1 to 2	 refer to label 14 to 28
	thiophanate-methyl (3336) 50WP or 4 F (3336 Plus) 2 F (3336) 2 G	 2 to 4 2 to 4 1.5 to 6 lb	 14 14 to 28 14
	triadimefon (Bayleton) 50 WSP, 4.15 F	0.25 to 1	14 to 30
	trifloxystrobin + triadimefon (Armada) 50 WP (Tartan) 2 SC*	 0.6 to 1.2 1 to 2	 14 to 28 14 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70 WDG (Triton FLO) 3 F	 1 to 2 0.15 to 0.3 0.28 to 1.1	 14 to 28 14 to 28 14 to 28
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 4.5	14 to 28
Fairy Ring (Basidiomycetes)	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0.4 2 2 to 4 lb	 28 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	azoxystrobin + propiconazole (Headway) 1.4ME 1.06 G	 1.5 to 3 2 to 4 lb	 14 to 28 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	28
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14 to 28
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	4.5 to 5.9	21 to 28
	cyazofamid + azoxystrobin (Union) 0.79 SC	5.75	28
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	14 to 28
	fluopyram + prothioconazole + propamocarb (Resilia) 3.25 SC*	4	14 to 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.28 to 0.36 2.3 to 4.6 lb	 21 to 28 28
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21 to 28
	flutolanil (Prostar) 70 WP, 70 WDG (Pedigree) 3.8 SC	 2.2 to 4.5 3.25 to 6.6	 21 to 30 21 to 30

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Fairy Ring (Basidiomycetes) (continued)	flutolanil + thiophanate-methyl (SysStar) 80 WDG	3 to 6.12	21 to 28
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mandestrobin (Pinpoint) 4SC	0.31	14
	mefentrifluconazole (Maxtima) 3.34 SC*	0.8	28
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.85	28
	metconazole (Tourney) 50 WDG	0.37	21
	penthiopyrad (Velista) 50 WG	0.5 to 0.7	14 to 28
	polyoxin D (Affirm) 11.3 WDG (Endorse) 2.5 WP	 1 4	 7 7
	prothioconazole (Densicor) 4 SC*	0.196	14 to 21
	pydiflumetofen (Posterity) 1.67 SC*	0.08 to 0.32	21 to 28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.9 0.7	 28 28
	pyraclostrobin + boscalid (Honor) 28 WG*	1.1	28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.47	28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	tebuconazole* (Torque) 3.6 F (Mirage Stressgard) 2 SC	 0.6 to 1.1 1 to 2	 21 28
	triadimefon (Bayleton) 50DF, 4.15 F	1 to 2	14 to 21
Gray Leaf Spot (*Pyricularia grisea*)	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0.2 to 0.4 1 to 2 2 to 4 lb	 14 to 28 14 to 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5 to 4.5	10 to 14
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 21
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 1.5 to 3 2 to 4 lb	 14 to 28 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75	1.5
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14
	boscalid + chlorothalonil (Encartis) 6.25 SC*	3 to 4	14
	chlorothalonil* (Daconil Ultrex) 82.5 WDG (Daconil Weather Stik) 6 F (Daconil Zn) 4.16 F	 1.8 to 3.25 3.7 to 5 2 to 3.6 4 to 5.5 3 to 5 6 to 8	 7 to 21 14 7 to 10 14 7 to 14 14
	chlorothalonil + acibenzolar-S-methyl (Daconil Action) 6.1 F*	2 to 3.5 4 to 5.4	7 to 10 14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	14 to 28
	chlorothalonil + iprodione + thiophanate-methyl + tebuconazole (Enclave) 5.3 F*	3 to 4 7 to 8	14 to 21 28
	chlorothalonil + propiconazole (Concert) 4.3 SC*	3 to 5.5 5.5 to 8.5	7 to 14 14 to 21
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC*	2.75 to 6	10 to 14
	chlorothalonil + thiophanate-methyl (Consyst) 67 WDG*	2 to 8	7 to 14
	cyazofamid + azoxystrobin (Union) 0.79 SC	2.9 to 5.75	14 to 28
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	21
	fludioxonil (Medallion) 50 WP	0.25 to 0.5	14
	fluopyram + trifloxystrobin (Exteris Stressgard) 0.27 SC	2.135 to 6	14 to 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.18 to 0.36 2.3 to 4.6 lb	 14 to 28 14 to 28
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14
	flutriafol (Rayora) 1.04 L*	0.7 to 1.4	14 to 21
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mancozeb (Fore) 80 WP*	8	14

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Gray Leaf Spot (*Pyricularia grisea*) (continued)	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	metconazole (Tourney) 50 WDG	0.37	14
	mineral oil (Civitas) + proprietary pigment (Civitas Harmonizer)*	(8 to 32) + (1 to 4)	7 to 21
	myclobutanil (Eagle) 20 EW	1.2 to 2.4	14
	polyoxin D (Affirm) 11.3 WDG	0.88	7 to 14
	propiconazole (Banner MAXX) 1 ME	1 to 2	14
	prothioconazole (Densicor) 4 SC*	0.196	14 to 21
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28 WG*	0.55 to 1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	tebuconazole* (Torque) 3.6 F (Mirage Stressgard) 2 SC	 0.6 to 1.1 1 to 2	 21 14 to 28
	thiophanate-methyl (3336) 50 WP or 4 F (3336 Plus) 2 F (3336) 2 G	 4 to 6 4 to 8 6 to 9 lb	 14 14 to 28 14
	triadimefon (Bayleton) 50 WSP, 4.15 F	0.5 to 1	14
	trifloxystrobin (Compass) 50 WDG	0.15 to 0.2 0.25	14 21
	trifloxystrobin + triadimefon (Armada) 50 WP (Tartan) 2 SC*	 0.6 to 1.2 1 to 2	 14 to 28 14 to 28
Helminthosporium Leaf Spot/Melting Out (*Bipolaris spp.; Drechslera spp.*)	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0.2 to 0.4 1 to 2 2 to 4 lb	 14 to 21 14 to 21 14 to 21
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 21
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5 to 4.5	14 to 21
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 21
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 1.5 to 3 2 to 4 lb	 14 to 21 14 to 21
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14
	boscalid + chlorothalonil (Encartis) 6.25 SC*	3 to 4	14 to 21
	chlorothalonil* (Daconil Ultrex) 82.5 WDG (Daconil Weather Stik) 6 F (Daconil Zn) 4.16 F	 1.8 to 3.25 3.7 to 5 2 to 3.6 4 to 5.5 3 to 5 6 to 8	 7 to 21 14 to 21 7 to 21 14 7 to 21 14
	chlorothalonil + acibenzolar-S-methyl (Daconil Action) 6.1 F*	2 to 3.5 4 to 5.4	7 to 21 14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	14 to 21
	chlorothalonil + propiconazole (Concert) 4.3 SC*	3 to 5.5 5.5 to 8.5	7 to 14 14 to 21
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC*	2.75 to 6	10 to 21
	chlorothalonil + thiophanate-methyl (Consyst) 67 WDG*	2 to 8	7 to 21
	cyazofamid + azoxystrobin (Union) 0.79 SC	2.9 to 5.75	14 to 21
	fluazinam (Secure) 4.17 SC*	0.5	14
	fluazinam + acibenzolar-S-methyl (Secure Action) 4.18 SC*	0.5	14
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	14
	fludioxonil (Medallion) 50 WP	0.25 to 0.5	14 to 21
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	14 to 21
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.18 to 0.36 2.3 to 4.6 lb	 14 to 21 14 to 21
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Helminthosporium Leaf Spot/Melting Out (*Bipolaris spp.; Drechslera spp.*) (continued)	iprodione (26GT) 2 F*	3 to 4	14 to 28
	iprodione + thiophanate-methyl (26/36) 3.8 F*	2 to 4	14 to 21
	iprodione + trifloxystrobin (Interface) 2.27 SC*	3 to 5	refer to label
	mancozeb (Fore) 80 WP*	4	7 to 14
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	mineral oil (Civitas) + proprietary pigment (Civitas Harmonizer)*	(8 to 32) + (1 to 4)	7 to 21
	myclobutanil (Eagle) 20 EW	1.2	14
	penthiopyrad (Velista) 50 WG	0.3 to 0.5	14
	polyoxin D (Affirm) 11.3 WDG (Endorse) 2.5 WP	 0.88 4	 7 to 14 7 to 14
	propiconazole (Banner MAXX) 1 ME	1 to 2	14
	pydiflumetofen + azoxystrobin + propiconazole (Posterity Forte) 2.5 SE*	0.63 to 0.84	14 to 21
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 21
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28WG*	0.55 to 1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	thiophanate-methyl (3336) 50 WP or 4 F (3336 Plus) 2 F (3336) 2 G	 4 to 6 4 to 8 6 to 9 lb	 14 14 to 28 14
	trifloxystrobin (Compass) 50 WDG	0.1 to 0.15 0.15 to 0.25	14 21 to 28
	trifloxystrobin + triadimefon (Armada) 50 WP (Tartan) 2 SC*	 0.6 to 1.2 1 to 2	 14 to 28 14 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70 WDG	 0.5 to 2 0.15 to 0.3	 14 to 28 14 to 28
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 4.5	14 to 28
Large Patch **(*Rhizoctonia solani*)**	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0..2 to 0.4 2 2 to 4 lb	 14 to 28 14 to 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5 4.5	14 14 to 21
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 1.5 to 3 2 to 4 lb	 14 to 28 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14 to 21
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	14 to 28
	chlorothalonil + iprodione + thiophanate-methyl + tebuconazole (Enclave) 5.3 F*	3 to 4 7 to 8	14 to 21 28
	chlorothalonil + thiophanate-methyl (Consyst) 67 WDG*	2 to 8	7 to 14
	cyazofamid + azoxystrobin (Union) 0.79 SC	5.75	14 to 28
	fluazinam (Secure) 4.17 SC*	0.5	14
	fluazinam + acibenzolar-S-methyl (Secure Action) 4.18 SC*	0.5	14
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	14
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	21 to 28
	fluoxastrobin (Fame) 4 SC 0.25	 0.28 to 0.36 2.3 to 4.6 lb	 14 to 28 14 to 28
	fluxapyroxad (Xzemplar) 2.47 SC	0.21 to 0.26	14 to 28
	flutolanil (Prostar) 70 WP, 70 WDG (Pedigree) 3.8 SC	 2.2 3.25	 30 30
	flutriafol (Rayora) 1.04 L*	0.7 to 1.4	28
	iprodione (26GT) 2 F*	4	14 to 21
	iprodione + thiophanate-methyl (26/36) 3.8 F*	2 to 4	14 to 21

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Large Patch (*Rhizoctonia solani*) (continued)	iprodione + trifloxystrobin (Interface) 2.27 SC*	4	14 to 21
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	metconazole (Tourney) 50 WDG	0.37	14
	myclobutanil (Eagle) 20 EW	2.4	28 (fall)
	penthiopyrad (Velista) 50 WG	0.7	14 to 28
	polyoxin D (Affirm) 11.3 WDG (Endorse) 2.5 WP	 0.88 4	 7 to 14 7 to 14
	propiconazole (Banner MAXX) 1 ME	3 to 4	early fall
	prothioconazole (Densicor) 4 SC*	0.196	14 to 28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity Forte) 2.5 SE*	0.84	14 to 21
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28 WG*	1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	tebuconazole* (Torque) 3.6 F (Mirage Stressgard) 2 SC	 0.6 to 1.1 1 to 2	 21 28
	thiophanate-methyl (3336) 50WP or 4 F (3336 Plus) 2 F (3336) 2 G	 2 to 4 2 to 4 1.5 to 6 lb	 14 14 to 28 14
	thiophanate-methyl + flutolanil (SysStar) 80 WDG	2 to 3	14 to 21
	triadimefon (Bayleton) 50 WSP, 4.15 F	1 to 2	fall and spring
	triticonazole (Trinity) 1.7 SC (Triton) 70 WDG	 1 to 2 0.15 to 0.3	 14 to 28 14 to 28
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 5.4	14 to 28
Leaf and Sheath Spot (*Waitea zeae, W. oryzae*)	azoxystrobin (Heritage) 0.8 TL 0.31 G	 2 2 to 4 lb	 14 to 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5 4.5	14 14 to 21
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 1.5 to 3 2 to 4 lb	 14 to 28 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14 to 21
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.59 SC*	2.75 to 6	14 to 21
	chlorothalonil + thiophanate-methyl (Spectro) 90 WDG*	3 to 5.76	14 to 21
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	14 to 21
	flutolanil (Prostar) 70 WDG (Pedigree) 3.8 SC	 2.2 to 4.5 3.25 to 6.6	 14 to 21 14 to 21
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	penthiopyrad (Velista) 50 WG	0.3 to 0.5	14
	polyoxin D (Affirm) 11.3 WDG	0.88	7 to 14
	prothioconazole (Densicor) 4 SC*	0.196	14 to 21
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28 WG*	1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 28 28

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Pink Patch (***Limonomyces roseipelis***)	azoxystrobin		
	(Heritage) 50 WG	0.2 to 0.4	14 to 28
	(Heritage) 0.8 TL	1 to 2	14 to 28
	(Heritage) 0.31 G	2 to 4 lb	14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5 to 4.5	14 to 21
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	azoxystrobin + propiconazole (Headway)		
	1.4 ME	1.5 to 3	14 to 28
	1.06 G	2 to 4 lb	14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	14 to 28
	chlorothalonil + propiconazole (Concert) 4.3 SC*	3 to 5.5	7 to 14
		5.5 to 8.5	14 to 21
	cyazofamid + azoxystrobin (Union) 0.79 SC	2.9 to 5.75	14 to 28
	fluazinam (Secure) 4.17 SC*	0.5	14
	fluazinam + acibenzolar-S-methyl (Secure Action) 4.18 SC*	0.5	14
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	14
	fluopyram + trifloxystrobin (Exteris Stressgard) 0.27 SC	1.5 to 4.135	14 to 28
	fluoxastrobin (Fame)		
	4 SC	0.18 to 0.36	14 to 28
	0.25 G	2.3 to 4.6 lb	14 to 28
	flutolanil		
	(Prostar) 70 WP, 70 DG	1.5	21 to 28
	(Pedigree) 3.8 SC	2.2	21 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2	21 to 28
	iprodione + trifloxystrobin (Interface) 2.27 SC*	3 to 4	14
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	propiconazole (Banner MAXX) 1 ME	2	14 to 21
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia)		
	20 WG	0.5 to 0.9	14 to 28
	2 SC	0.4 to 0.7	14 to 28
	pyraclostrobin + boscalid (Honor) 28 WG*	0.55 to 1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole		
	(Pillar) 0.81 G	3 lb	14 to 28
	(Pillar) 3.14 SC	1	14 to 28
	tebuconazole*		
	(Torque) 3.6 F	0.6 to 1.1	refer to label
	(Mirage Stressgard) 2 SC	1 to 2	14 to 28
	trifloxystrobin (Compass) 50 WDG	0.1 to 0.15	14
		0.2 to 0.25	21
	trifloxystrobin + triadimefon		
	(Armada) 50 WP	0.6 to 1.2	14 to 28
	(Tartan) 2 SC*	1 to 2	14 to 28
	triticonazole (Trinity) 1.7 EC	1 to 2	14 to 28
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 4.5	refer to label
Pink Snow Mold/*Microdochium* Patch (*Microdochium nivale*)	azoxystrobin		
	(Heritage) 50 WG	0.2 to 0.4	10 to 28
		0.7	1 application
	(Heritage) 0.8 TL	2	10-28
		3.5	1 application
	(Heritage) 0.31 G	4 lbs	10 to 28
		7 lbs	1 application
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.4	refer to label
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5 to 4.5	14 to 21
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	azoxystrobin + propiconazole (Headway)		
	1.4 ME	1.5 to 3	10 to 28
		5.25	1 application
	1.06 G	2 to 4 lbs	14 to 28
		5	1 application
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14 to 21
		2.4	1 application
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14
	chlorothalonil + acibenzolar-S-methyl (Daconil Action) 6.1 F*	5.4	21 to 28
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	28
	chlorothalonil + iprodione + thiophanate-methyl + tebuconazole (Enclave) 5.3 F*	7 to 8	28
	chlorothalonil + propiconazole (Concert) 4.3 SC*	8.5	14 to 28
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC*	5 to 11	late fall

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Pink Snow Mold/*Microdochium* Patch (*Microdochium nivale*) (continued)	chlorothalonil + thiophanate-methyl* (Consyst) 67 WDG (Spectro) 90 WDG	 6 to 8 3.72 to 5.76	 1 application 14
	fluazinam (Secure) 4.17 SC*	0.5	late fall
	fluazinam + acibenzolar-S-methyl (Secure Action) 4.18 SC*	0.5	late fall
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	late fall
	fludioxonil (Medallion) 50 WP	0.25 to 0.5	14
	fluopyram + trifloxystrobin (Exteris Stressgard) 0.27 SC	4.135 to 12.6	10 to 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.18 to 0.36 2.3 to 4.6 lbs	 14 to 28 14 to 28
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	30
	fluxapyroxad (Xzemplar) 2.47 SC	0.26	14 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	4 to 6.12 2 to 3	1 application 14 to 21
	iprodione (26GT) 2 F*	4 to 8	1 to 2 applications
	iprodione + thiophanate-methyl (26/36) 3.8 F*	2 to 4	14 to 21
	iprodione + trifloxystrobin (Interface) 2.27 SC*	4 to 7	1 application
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mancozeb (Fore) 80 WP*	6 to 8	14 to 42
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	metconazole (Tourney) 50 WDG	0.37 to 0.44	late fall
	mineral oil (Civitas) + proprietary pigment (Civitas Harmonizer)*	(8 to 32) + (1 to 4)	7 to 21
	myclobutanil (Eagle) 20 EW	1.2 to 2.4	prior to snow cover
	polyoxin D (Affirm) 11.3 WDG (Endorse) 2.5 WP	 0.88 4	 7 to 14 7 to 14
	propiconazole (Banner MAXX) 1 ME	2 to 4	fall to early spring
	prothioconazole (Densicor) 4 SC*	0.196	14 to 21
	pydiflumetofen (Posterity) 1.67 SC*	0.08 to 0.16	14 to 28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28 WG*	0.55 to 1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 28 28
	tebuconazole* (Torque) 3.6 F (Mirage Stressgard) 2 SC	 0.6 to 1.1 1 to 2	 prior to snowfall 10 to 28
	thiophanate-methyl (3336) 50WP or 4 F (3336 Plus) 2 F (3336) 2 G	 2 to 4 2 to 4 1.5 to 6 lb	 14 14 to 28 14
	triadimefon (Bayleton) 50 WSP, 4.15 F	1 to 2	60 to 90
	trifloxystrobin (Compass) 50 WDG	0.2 to 0.25	fall to early spring
	trifloxystrobin + triadimefon (Armada) 50 WP (Tartan) 2 SC*	 1.2 2	 fall to early spring fall to early spring
	triticonazole (Trinity) 1.7 SC (Triton) 70 WDG (Triton Flo) 3 G	 0.5 to 2 0.15 to 0.3 0.28 to 1.1	 14 to 28 late fall 10 to 14
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 4.5	14 to 28
Powdery Mildew (*Blumeria graminis*)	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0.2 to 0.4 1 to 2 2 to 4 lb	 14 to 28 14 to 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5 to 4.5	14 to 21
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Powdery Mildew (*Blumeria graminis*) (continued)	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 1.5 to 3 2 to 4 lb	 14 to 28 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14 to 21
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	14 to 28
	chlorothalonil + propiconazole (Concert) 4.3 SC*	4.5 to 8.5	14 to 28
	chlorothalonil + thiophanate-methyl (Consyst) 67 WDG*	2 to 8	7 to 14
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	14
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	14 to 21
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.18 to 0.36 2.3 to 4.6 lb	 14 to 28 14 to 28
	flutriafol (Rayora) 1.04 L*	0.7 to 1.4	14 to 21
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	mineral oil (Civitas) + proprietary pigment (Civitas Harmonizer)*	(8 to 32) + (1 to 4)	7 to 21
	myclobutanil (Eagle) 20 EW	1.2	14 to 28
	penthiopyrad (Velista) 50 WG	0.3 to 0.5	14
	propiconazole (Banner MAXX) 1 ME	1 to 2	14 to 28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28 WG*	0.55 to 1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	tebuconazole (Torque) 3.6 F*	0.6 to 1.1	refer to label
	triadimefon (Bayleton) 50 WSP, 4.15 F	0.5 to 1	15 to 30
Pythium Blight (*Pythium aphanidermatum*)	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0.4 2 2 to 4 lb	 10 to 14 10 to 14 10 to 14
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	10 to 14
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 3 2 to 4 lb	 10 to 14 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	10 to 21
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	7 to 14
	cyazofamid (Segway) 3.33 SC	0.45 to 0.9	14 to 21
	cyazofamid + azoxystrobin (Union) 0.79 SC	2.9 to 5.75	14 to 28
	ethazole* (Koban) 30 WP (Terrazole) 35 WP	 2 to 4.5 2 to 4	 10 10 to 14
	fluopicolide + propamocarb (Stellar) 5.7 SC	1.2	14
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.18 to 0.36 2.3 to 4.6 lb	 7 to 14 14
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21
	fosetyl Al (Signature Xtra Stressgard) 60 WDG*	2 to 4 4 to 6	7 to 14 14 to 21
	mancozeb (Fore) 80 WP*	8	5 to 14
	mefenoxam (Subdue) 43 WSP (Subdue MAXX) 2 ME (Subdue) 1 GR	 0.28 to 0.56 0.5 to 1 12.5 to 25	 10 to 21 10 to 21 10 to 14

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Pythium Blight (*Pythium aphanidermatum*) (continued)	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.85	10 to 14
	picarbutrazox (Serata) 20 WDG	0.6 to 0.8	14 to 21
	potassium phosphite (Appear II) 4.1 SC	3 to 4 4 to 6	7 to 14 14
	propamocarb (Banol) 6 S*	1.3 to 4	7 to 21
	Pseudomonas chlororaphis strain AFS009 (Zio) SC	1.8 to 6.0	7 to 21
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	3	14
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.9 0.7	 14 to 28 10 to 14
	pyraclostrobin + boscalid (Honor) 28 WG*	1.1	10 to 14
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.47	14
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 14
Pythium Root Dysfunction (*Pythium spp.*)	azoxystrobin (Heritage) 50 WG 0.8 TL	 0.4 2	 21 to 28 21 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.4	21 to 28
	cyazofamid (Segway) 3.33 SC	0.9	14 to 28
	cyazofamid + azoxystrobin (Union) 0.79 SC	5.75	21 to 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.27 to 0.36 3.6 to 4.6 lb	 14 to 28 14 to 28
	fluoxastrobin + chlorothalonil (Fame C) 4.25 SC *	4.5 to 5.9	14 to 28
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.85	14 to 28
	picarbutrazox (Serata) 20 WDG	0.6 to 0.8	21 to 28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	3	21 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.9 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28WG*	1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 14
Pythium Root Rot (*Pythium spp.*)	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0.4 2 2 to 4	 10 to 14 10 to 14 10 to 14
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 3 2 to 4 lb	 10 to 14 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	10 to 21
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC *	3 to 5.9	7 to 10
	cyazofamid (Segway) 3.33 SC	0.9	21
	cyazofamid + azoxystrobin (Union) 0.79 SC	2.9 to 5.75	14 to 21
	ethazole* (Koban) 30 WP (Terrazole) 35 WP	 4.5 2 to 4	 10 10 to 14
	fluopyram + prothioconazole + propamocarb (Resilia) 3.25 SC*	4	14 to 21
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.18 to 0.36 2.3 to 4.6 lb	 7 to 10 14
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21
	fosetyl Al (Signature Xtra Stressgard) 60 WDG*	2 to 4 4 to 6	7 to 14 14 to 21
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.85	14 to 28
	picarbutrazox (Serata) 20WDG	0.6 to 0.8	14
	potassium phosphite (Appear II) 4.1 SC	6 to 8	7 to 14
	propamocarb (Banol) 6 S*	1.3 to 4	7 to 21
	Pseudomonas chlororaphis strain AFS009 (Zio) SC	1.8 to 6.0	7 to 21
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	3	14

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Rapid Blight (***Labyrinthula* spp.**)	iprodione + trifloxystrobin (Interface) 2.27 SC*	3 to 5	refer to label
	mancozeb (Fore) 80 WP*	8	14
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	penthiopyrad (Velista) 50 WG	0.5	14
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 14 to 28
	pyraclostrobin + boscalid (Honor) 28WG*	0. 55 to 1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	trifloxystrobin (Compass) 50 WDG	0.15 to 0.2 0.25	14 21
	trifloxystrobin + triadimefon (Armada) 50 WP	0.6 to 1.2	14 to 28
Red Thread (***Laetisaria fuciformis*)**	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0.2 to 0.4 1 to 2 2 to 4 lb	 14 to 28 14 to 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5 to 4.5	14 to 21
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 1.5 to 3 2 to 4 lb	 14 to 28 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14
	boscalid + chlorothalonil (Encartis) 6.25 SC*	3 to 4	14
	chlorothalonil* (Daconil Ultrex) 82.5 WDG (Daconil Weather Stik) 6 F (Daconil Zn) 4.16 F	 1.8 to 3.25 3.25 to 5 2 to 5.5 5.5 3 to 5 5.3 to 8	 7 to 10 14 7 to 14 14 7 to 10 14
	chlorothalonil + acibenzolar-S-methyl (Daconil Action) 6.1 F*	2 to 3.5 3.6 to 5.4	7 to 10 14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	14 to 28
	chlorothalonil + iprodione + thiophanate-methyl + tebuconazole (Enclave) 5.3 F*	3 to 4 7 to 8	14 to 21 28
	chlorothalonil + propiconazole (Concert) 4.3 SC*	3 to 5.5 5.5 to 8.5	7 to 14 14 to 21
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC*	2.75 to 6	14 to 21
	chlorothalonil + thiophanate-methyl (Consyst) 67 WDG*	3 to 8	7 to 10
	cyazofamid + azoxystrobin (Union) 0.79 SC	2.9 to 5.75	14 to 28
	fluazinam (Secure) 4.17 SC*	0.5	14
	fluazinam + acibenzolar-S-methyl (Secure Action) 4.18 SC*	0.5	14
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	14
	fluopyram + trifloxystrobin (Exteris Stressgard) 0.27 SC	1.5 to 4.135	14 to 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.18 to 0.36 2.3 to 4.6 lb	 14 to 28 14 to 28
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21 to 28
	flutolanil (Prostar) 70 WP, 70 WDG (Pedigree) 3.8 SC	 1.5 2.2	 21 to 28 21 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14 to 21
	iprodione (26GT) 2 F*	4	14
	iprodione + thiophanate-methyl (26/36) 3.8 F*	2 to 4	14 to 21
	iprodione + trifloxystrobin (Interface) 2.27 SC*	3 to 4	14
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mancozeb (Fore) 80 WP*	4 to 8	7 to 14
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	metconazole (Tourney) 50 WDG	0.37	14
	mineral oil (Civitas) + proprietary pigment (Civitas Harmonizer)*	(8 to 32) + (1 to 4)	7 to 21
	myclobutanil (Eagle) 20 EW	1.2	14 to 21
	penthiopyrad (Velista) 50 WG	0.3 to 0.5	14
	polyoxin D (Affirm) 11.3 WDG (Endorse) 2.5 WP	 0.88 4	 7 to 14 7 to 14

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Red Thread (*Laetisaria fuciformis*) (continued)	propiconazole (Banner MAXX) 1 ME	2	14 to 21
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28 WG*	0.55 to 1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	tebuconazole* (Torque) 3.6 F (Mirage Stressgard) 2 SC	 0.6 to 1.1 1 to 2	 refer to label 14 to 28
	thiophanate-methyl (3336) 50WP or 4 F (3336 Plus) 2 F (3336) 2 G	 2 to 4 2 to 4 1.5 to 6 lb	 14 14 to 28 14
	triadimefon (Bayleton) 50 WSP, 4.15 F	0.5 to 1	15 to 30
	trifloxystrobin (Compass) 50 WDG	0.1 to 0.15 0.2 to 0.25	14 21
	trifloxystrobin + triadimefon (Armada) 50 WP (Tartan) 2 SC*	 0.6 to 1.2 1 to 2	 14 to 28 14 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70 WDG	 0.5 to 1 0.15 to 0.3	 14 to 28 14 to 28
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 4.5	refer to label
Rust (*Puccinia* ssp.)	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0.2 to 0.4 1 to 2 2 to 4 lb	 14 to 28 14 to 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5 to 4.5	14 to 21
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 1.5 to 3 2 to 4 lb	 14 to 28 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14 to 21
	boscalid + chlorothalonil (Encartis) 6.25 SC*	4	14
	chlorothalonil* (Daconil Ultrex) 82.5 WDG (Daconil Weather Stik) 6 F (Daconil Zn) 4.16 F	 3.7 to 5 4.0 to 5.5 6 to 8 3 to 5 7.9 2.12 to 3.5 5.5	 14 14 14 7 to 14 14 7 to10 14
	chlorothalonil + acibenzolar-S-methyl (Daconil Action) 6.1 F*	4 to 5.4	14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	14 to 28
	chlorothalonil + propiconazole (Concert) 4.3 SC*	3 to 5.5 4.5 to 8.5	7 to 14 14 to 28
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC*	2.75 to 6	14 to 28
	chlorothalonil + thiophanate-methyl (Consyst) 67 WDG*	3 to 8	7 to 14
	cyazofamid + azoxystrobin (Union) 0.79 SC	2.9 to 5.75	14 to 28
	fluazinam (Secure) 4.17 SC*	0.5	14
	fluazinam + acibenzolar-S-methyl (Secure Action) 4.18 SC*	0.5	14
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	14
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	14 to 21
	fluopyram + trifloxystrobin (Exteris Stressgard) 0.27 SC	1.5 to 4.135	14 to 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.18 to 0.36 2.3 to 4.6 lb	 14 to 28 14 to 28
	flutriafol (Rayora) 1.04 L*	0.7 to 1.4	14 to 21
	iprodione + trifloxystrobin (Interface) 2.27 SC*	3 to 5	refer to label

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Rust (***Puccinia* ssp.**) **(continued)**	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mancozeb (Fore) 80 WP*	4 4 5 to 7 4 4	7 to 14 10 7 to 10 7 to 10 7 to 10
	mandestrobin (Pinpoint) 4SC	0.31	14
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	metconazole (Tourney) 50 WDG	0.37	14
	myclobutanil (Eagle) 20 EW	1.2	14 to 28
	propiconazole (Banner MAXX) 1 ME	1 to 2	14 to 28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28WG*	0.55 to 1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	tebuconazole* (Torque) 3.6 F (Mirage Stressgard) 2 SC	 0.6 to 1.1 1 to 2	 refer to label 14 to 28
	thiophanate-methyl (3336) 50WP or 4 F (3336 Plus) 2 F	 4 to 6 4 to 8	 14 14 to 28
	triadimefon (Bayleton) 50 WSP, 4.15 F	0.5 to 1	15 to 30
	trifloxystrobin (Compass) 50 WDG	0.1 to 0.15 0.2 to 0.25	14 21
	trifloxystrobin + triadimefon (Armada) 50 WP (Tartan) 2 SC*	 0.6 to 1.2 1 to 2	 14 to 28 14 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70 WDG	 0.5 to 1 0.15 to 0.225	 14 to 28 14 to 28
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 4.5	14 to 28
Slime Mold (***Myxomycetes spp.*)**	mancozeb (Fore) 80 WP*	4 to 8	7 to 14
Southern Blight (***Athelia rolfsii*)**	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0.2 to 0.4 1 to 2 2 to 4 lb	 14 to 28 14 to 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5 to 4.5	14 to 21
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 1.5 to 3 2 to 4 lb	 14 to 28 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	0.75 to 1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	14 to 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.18 to 0.36 2.3 to 4.6 lb	 14 to 28 14 to 28
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21 to 28
	flutolanil (Prostar) 70 WP, 70 WDG (Pedigree) 3.8 SC	 1.5 2.2	 21 to 28 21 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2	21 to 28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	triadimefon (Bayleton) 50 WSP, 4.15 F	0.5 to 2	14 to 28
	trifloxystrobin + triadimefon (Armada) 50 WP (Tartan) 2 SC*	 0.6 to 1.2 1 to 2	 14 14

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Spring Dead Spot (***Ophiosphaerella korrae; O. herpotricha; O. narmari***)	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL	 0.4 2	 14 to 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 3 2 to 4 lb	 14 to 28 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14 to 28
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	5.9	14 to 28
	chlorothalonil + iprodione + thiophanate-methyl + tebuconazole (Enclave) 5.3 F*	3 to 4 7 to 8	14 to 21 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.36 2.3 to 4.6 lb	 14 to 28 14 to 28
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	21 to 28
	fluopyram + prothioconazole + propamocarb (Resilia) 3.25 SC*	4	14 to 28
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21 to 28
	flutriafol (Rayora) 1.04 L*	0.7 to 1.4	21 to 28
	isofetamid (Kabuto) 3.33 SC	0.5 to 1.6	14 to 28
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mefentrifluconazole (Maxtima) 3.34 SC*	0.6 to 0.8	28
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.85	28
	myclobutanil (Eagle) 20 EW	2.4	28 (fall)
	penthiopyrad (Velista) 50 WG	0.7	28
	propiconazole (Banner MAXX) 1 ME	4	30
	prothioconazole (Densicor) 4 SC*	0.196	14 to 28
	pydiflumetofen (Posterity) 1.67 SC*	0.16 to 0.32	28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity Forte) 2.5 SE*	0.63 to 0.84	14 to 28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	3	28
	tebuconazole* (Torque) 3.6 F (Mirage Stressgard) 2 SC	 0.6 to 1.1 2	 21 28
	thiophanate-methyl (3336) 50WP or 4 F (3336) 2 G	 4 to 6 6 to 9 lb	 14 14
Stripe Smut (***Ustilago striiformis***)	chlorothalonil + iprodione + thiophanate-methyl + tebuconazole (Enclave) 5.3 F*	3 to 4 7 to 8	14 to 21 28
	chlorothalonil + propiconazole (Concert) 4.3 SC*	4.5 to 8.5	fall or spring
	fluazinam + tebuconazole (Traction) 3.24 SC*	1.3	one application
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	myclobutanil (Eagle) 20 EW	1.2	14
	propiconazole (Banner MAXX) 1 ME	1 to 2	fall or spring
	tebuconazole* (Torque) 3.6 F	 0.6 to 1.1	 spring
	thiophanate-methyl (3336) 50WP or 4 F (3336 Plus) 2 F (3336) 2 G	 4 to 6 4 to 8 6 to 9 lb	 14 14 to 28 14
	triadimefon (Bayleton) 50 WSP	1	refer to label
	trifloxystrobin + triadimefon (Armada) 50 WP (Tartan) 2 SC*	 0.6 1	 refer to label refer to label
Summer Patch (***Magnaporthiopsis poae***)	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0.2 to 0.4 1 to 2 2 to 4 lb	 14 to 28 14 to 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 1.5 to 3 2 to 4 lb	 14 to 28 14 to 28
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	14 to 28
	chlorothalonil + iprodione + thiophanate-methyl + tebuconazole (Enclave) 5.3 F*	3 to 4 7 to 8	14 to 21 28
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC*	6 to 11	14 to 28

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Summer Patch (*Magnaporthiopsis poae*) (continued)	cyazofamid + azoxystrobin (Union) 0.79 SC	2.9 to 5.75	14 to 28
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	14 to 28
	fluopyram + prothioconazole + propamocarb (Resilia) 3.25 SC*	4	14 to 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.18 to 0.36 2.3 to 4.6 lb	 14 to 28 14 to 28
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21 to 28
	fludioxonil (Medallion) 50 WP	0.5	14
	flutriafol (Rayora) 1.04 L*	0.7 to 1.4	21 to 28
	fluxapyroxad (Xzemplar) 2.47 SC	0.26	14 to 28
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mefentrifluconazole (Maxtima) 3.34 SC*	0.8	21 to 28
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	metconazole (Tourney) 50 WDG	0.37	14
	myclobutanil (Eagle) 20 EW	1.2 to 2.4	14 to 28
	penthiopyrad (Velista) 50 WG	0.3 to 0.5	14 to 28
	propiconazole (Banner MAXX) 1 ME	2 4	14 28
	prothioconazole (Densicor) 4 SC*	0.196	14 to 28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28 WG*	1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
	tebuconazole* (Torque) 3.6 F (Mirage Stressgard) 2 SC	 0.6 to 1.1 1 to 2	 21 14 to 28
	thiophanate-methyl (3336) 50WP or 4 F (3336 Plus) 2 F (3336) 2 G	 4 to 6 4 to 8 6 to 9 lb	 14 to 21 14 to 28 14 to 21
	triadimefon (Bayleton) 50 WSP, 4.15 F	1 to 2	30
	trifloxystrobin (Compass) 50 WDG	0.2 to 0.25	21 to 28
	trifloxystrobin + triadimefon (Tartan) 2 SC * (Armada) 50 WP	 2 1.2	 21 to 28 21 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70 WDG	 1 to 2 0.3 to 0.6	 14 to 28 14 to 28
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 5.4	14 to 28
Take-All Patch (*Gaeumannomyces avenae*)	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0.4 2 2 to 4 lb	 28 28 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	28
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	28
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 3 2 to 4 lb	 14 to 28 14 to 28
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	5.9	28
	cyazofamid + azoxystrobin (Union) 0.79 SC	5.75	28
	fluopyram + prothioconazole + propamocarb (Resilia) 3.25 SC*	4	14 to 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.36 2.3 to 4.6 lb	 28 28
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	28
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	mandestrobin (Pinpoint) 4SC	0.31	14
	mefentrifluconazole (Maxtima) 3.34 SC*	0.8	28

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Take-All Patch (*Gaeumannomyces avenae*) (continued)	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	myclobutanil (Eagle) 20 EW	2.4	28 (spring/fall)
	propiconazole (Banner MAXX) 1 ME	2 to 4	spring and fall
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	3	21
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.9 0.7	 28 28
	pyraclostrobin + boscalid (Honor) 28 WG*	1.1	28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.47	28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 28 28
	tebuconazole* (Torque) 3.6 F (Mirage Stressgard) 2 SC	 0.6 to 1.1 1 to 2	 fall and spring 14 to 28
	thiophanate-methyl (3336) 50 WP or 4 F (3336 Plus) 2 F (3336) 2 G	 4 to 6 4 to 8 6 to 9 lb	 14 14 to 28 14
	triadimefon (Bayleton) 50 WSP, 4.15 F	1 to 2	21 to 28
	trifloxystrobin + triadimefon (Armada) 50 WP	1.2	28
	triticonazole (Trinity) 1.7 SC (Triton) 70 WDG	 1 to 2 0.15 to 0.3	 14 to 28 14 to 28
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 5.4	14 to 28
Take-all Root Rot/Bermudagrass Decline (*Gaeumannomyces graminis*)	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.4	28
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	fluindapyr + flutriafol (Kalida) 4 SC	0.25 to 0.4	14 to 21
	fluopyram + prothioconazole + propamocarb (Resilia) 3.25 SC*	4	14 to 28
	fluxapyroxad + pyraclostrobin (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	refer to label
	mefentrifluconazole (Maxtima) 3.34 SC*	0.8	28
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	prothioconazole (Densicor) 4 SC*	0.196	14 to 28
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	1.5 to 3	14 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.9 0.7	 refer to label refer to label
	pyraclostrobin + boscalid (Honor) 28 WG*	1.1	refer to label
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 28 28
	tebuconazole* (Torque) 3.6 F (Mirage Stressgard) 2SC	 0.6 to 1.1 2	 14 to 28 28
	thiophanate-methyl (3336) 50 WP or 4 F (3336 Plus) 2 F (3336) 2 G	 4 to 6 4 to 8 6 to 9 lb	 14 14 to 28 14
	triadimefon (Bayleton) 50 WSP, 4.15 F	1 to 2	21 to 28
Yellow Patch (*Rhizoctonia cerealis*)	azoxystrobin (Heritage) 50 WG (Heritage) 0.8 TL (Heritage) 0.31 G	 0.4 2 2 to 4 lb	 28 28 14 to 28
	azoxystrobin + acibenzolar-S-methyl (Heritage Action) 51 WG*	0.2 to 0.4	14 to 28
	azoxystrobin + chlorothalonil (Renown) 5.16 SC*	2.5 to 4.5	14 to 28
	azoxystrobin + difenoconazole (Briskway) 2.7 SC*	0.5 to 1.2	14 to 28
	azoxystrobin + propiconazole (Headway) 1.4 ME 1.06 G	 3 2 to 4 lb	 28 14 to 28
	azoxystrobin + tebuconazole (Strobe T) 2.67 SC*	1.5	14 to 21
	benzovindiflupyr + difenoconazole (Ascernity) 0.86 SL*	1	14 to 21
	chlorothalonil + fluoxastrobin (Fame C) 4.25 SC*	3 to 5.9	14 to 28
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC*	8 to 11	late fall
	chlorothalonil + thiophanate-methyl (Spectro) 90 WDG*	3 to 5.76	14 to 21
	cyazofamid + azoxystrobin (Union) 0.79 SC	5,75	28
	fludioxonil (Medallion) 50 WP	0.5	1 application

Table 10-9. Turfgrass Disease Control

Disease	Fungicide and Formulation[1]	Amount of Formulation (oz/1,000 sq ft)[2]	Application Interval (days)[3]
Yellow Patch (*Rhizoctonia cerealis*) (continued)	fluopyram + trifloxystrobin (Exteris Stressgard) 0.27 SC	2.135 to 6	21 to 28
	fluoxastrobin (Fame) 4 SC 0.25 G	 0.36 2.3 to 4.6 lb	 28 14 to 28
	fluoxastrobin + tebuconazole (Fame T) 4 SC*	0.45 to 0.9	21 to 28
	flutolanil (Prostar) 70 WP, 70 WDG (Pedigree) 3.8 SC	 1.5 2.2	 21 to 28 21 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2	21 to 28
	isofetamid + tebuconazole (Tekken) 1.8 SC*	3	14 to 28
	metconazole (Tourney) 50 WDG	0.37 to 0.44	late fall
	polyoxin D (Affirm) 11.3 WDG (Endorse) 2.5 WP	 0.88 4	 7 to 14 7 to 14
	propiconazole (Banner MAXX) 1 ME	3 to 4	late fall
	pydiflumetofen + azoxystrobin + propiconazole (Posterity XT) 1.48 SE*	3	28
	tebuconazole (Mirage Stressgard) 2 SC*	1 to 2	21 to 28
	thiophanate-methyl (3336) 50WP or 4 F (3336 Plus) 2 F (3336) 2 G	 4 to 6 4 to 8 6 to 9 lb	 14 14 to 28 14
	triticonazole (Triton FLO) 3 F (Trinity) 1.75 SC	 0.55 to 1.1 1 to 2	 21 to 28 21 to 28
	triticonazole + chlorothalonil (Reserve) 4.79 SC*	3.2 to 5.4	21 to 28
Yellow Tuft (*Sclerophthora macrospora*)	fosetyl Al (Signature Xtra Stressgard) 60 WDG*	2 to 4 4 to 6	7 to 14 14 to 21
	mefenoxam (Subdue WSP) 43 WSP (Subdue MAXX) 2 ME (Subdue GR) 1 G	 0.28 to 0.56 0.5 to 1 12.5 to 25	 10 to 21 10 to 21 10 to 14
	mefentrifluconazole + pyraclostrobin (Navicon) 3.34 SC*	0.7 to 0.85	14 to 28
	pyraclostrobin (Insignia) 20 WG 2 SC	 0.5 to 0.9 0.4 to 0.7	 14 to 28 14 to 28
	pyraclostrobin + boscalid (Honor) 28 WG*	0.55 to 1.1	14 to 28
	pyraclostrobin + fluxapyroxad (Lexicon Intrinsic) 4.17 SC	0.34 to 0.47	14 to 28
	pyraclostrobin + triticonazole (Pillar) 0.81 G (Pillar) 3.14 SC	 3 lb 1	 14 to 28 14 to 28
Zoysia Patch	See Large Patch		

[1] Other trade names with the same active ingredients are labeled for use on turfgrasses and can be used according to label directions.
[2] Apply fungicides in 2 to 5 gallons of water per 1,000 square feet according to label directions. Use lower rates for preventive and higher rates for curative applications.
[3] Use shorter intervals when conditions are very favorable for disease.
* Products marked with an asterisk are not labeled for home lawn use.

Nematicides for Turf

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Table 10-10. Nematicides for Turf

Nematicide and Formulation	Amount of Formulation Per 1,000 sq ft	Precautions and Remarks
abamectin (Divanem) 0.7 SC	3.125 to 12.2	For control of turf-parasitic nematodes on golf course greens, tees, fairways and professional and collegiate sports fields. It is not labeled for use on golf course roughs, residential turf, or commercial turf. Divanem should be applied as a seasonal program. Apply Divanem as an early curative treatment after appropriate nematode extraction, identification, and counts. Multiple applications may be required before improvements in turf quality are observed. Maximum annual rate must not exceed 0.27 lb abamectin/calendar year or 50 fl oz Divanem/A/calendar year. Do not apply to turf under heat or moisture stress. Apply in the early morning while grass is wet with dew or irrigate the area prior to application with 0.1 inches of water. Spray onto wet turf. Irrigate with 0.1 to 0.5 inches of water beginning within 1 hour of application to move Divanem through the thatch. For best results, irrigate before the spray droplets have dried on the turf. Apply in 2 gallons of water per 1,000 square feet of turf. Application rate is 3.125 to 6.25 fl oz/A every 14 to 21 days or 6.25 to 12.2 fl oz/A every 21 to 28 days.
fluensulfone (Nimitz Pro G)	1.38 to 2.75 lbs	Intended for use by a commercial applicator. For nematode control in bermudagrass, St. Augustinegrass, zoysiagrass, centipedegrass, seashore paspalum, tall fescue, and creeping bentgrass on golf courses, sports fields, commercial turfgrass areas, sod farms, and residential turfgrass lawns. Nimitz must be immediately watered in after application with a minimum of ¼ inch water. Do not make applications when soil temperature is below 55ºF. Do not exceed 240 pounds of product per acre per calendar year. Do not allow bystanders to enter the treated area until the granules have been watered-in.
fluopyram (Indemnify)	0.195 to 0.39	Intended for use by commercial applicators. For use on golf courses, sod farms, sports fields, residential, institutional, municipal, commercial, and other turfgrass areas. Do not apply more than the maximum annual rate for each specific use from any combination of products containing fluopyram. Do not apply via aerial application. For ground application equipment, apply 2 to 5 gallons of solution per 1000 sq. ft. When using against nematodes, for optimum control irrigate within 24 hours of application to depth of the root zone to be protected. Do not apply more than 17.1 fl oz of Indemnify per acre per year. For residential turf, do not apply more than 15.5 fl oz of Indemnify per acre per year.
fluopyram + prothioconazole + propamocarb (Resilia) 3.25 SC*	4	For suppression and golf course turf only. Apply Resilia preventatively when conditions are favorable for target pest activity. Reapply as needed, using shorter intervals when target pest pressure is high but do not exceed maximum specified rate. Adequately water in applications to the depth of the root zone or target pest. Do not exceed 16 fl oz product per 1,000 sq. ft. per year. Do not exceed 4 applications per year using the maximum single application rate.
furfural (Multiguard Protect)	0.126 to 0.184	For terrestrial (outdoor) non-food use on established turf on golf course tees and greens, practice greens, spot treatment of fairways, roughs, and turf/sod farms. Areas to be treated must be at least 70% of field capacity before application. Apply up to 6 applications using only ground boom sprayers set to release spray at no more than 2 feet above the ground. Use the high rate at the start of the season and under high infestation and/or until acceptable control is achieved every 14 to 28 days. Then use the lower rate as a maintenance application at 14- to 28-day intervals.

Floral, Nursery, and Landscape Diseases

Fungicides and Bactericides for Disease Control of Greenhouse Floriculture Crops

Inga Meadows, Entomology and Plant Pathology

Anyone using any agricultural chemical should refer to the current chemical label, which contains information about the safe and effective use of the chemical, before using the chemical. Consult the product label to ensure that the variety of ornamental plant that you wish to treat is listed on the label. Check for phytotoxicity by making trial applications on a smaller number of plants before you treat an entire crop.

Table 10-11A. Disease Control of Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses

Disease	Pesticide and Formulation	FRAC	Rate of Formulation	Schedule and Remarks
Bacterial leaf spot (*Pseudomonas, Xanthomonas*)	copper (various)	M01	(See label)	Begin at first sign of disease and repeat at 7 to 14-day intervals. Do not tank mix copper formulations with Aliette. Avoid contact with metal surfaces. Discoloration of blooms may occur on certain plant varieties - check label. Phytotoxicity may occur; test a small number of plants first before treating an entire crop. Check label rates for crops in dormancy.
	fosetyl-Al (Aliette WDG)	P07	1.25 to 4 lb/100 gal	Do not exceed one application every 14 days on bedding plants. See label for rates and intervals on treating other ornamental plants.
	difenoconazole + pydiflumetofen (Postiva)	3 + 7	10 to 28 fl oz/100 gal	Suppression only. Begin applications prior to disease development and continue on a 7 to 14-day interval. Do not make more than 2 applications before switching to a fungicide that is not in Group 3 or 7.
Black root rot (*Berkeleyomyces basicola* [formerly *Thielaviopsis basicola*])	etridiazole + thiophanate-methyl (Banrot 40WP) (Banrot 8G)	14 + 1	4 to 8 oz or 6 to 12 oz/100 gal 8 or 16 oz/cu yd soil mix	Banrot 40WP: Use 4 to 8 oz for bedding plants or 6 to 12 oz for foliage and bedgrown plants. Apply Banrot 40WP in sufficient volume to saturate the soil mixture. Irrigate immediately. Banrot 8G: Use 8 oz per cu yd soil mix for bedding plants and 16 oz per cu yd soil mix for container and foliage plants.
	fludioxonil (Medallion WDG, Emblem SC, Spirato GHN)	12	(See label)	Rates vary depending on site – see label. May cause stunting or chlorosis on impatiens and New Guinea impatiens and Geranium.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	8 to 10 fl oz/100 gal	Apply preventatively on a 7 to 28-day interval. Suppression only.
	iprodione + thiophanate-methyl (26/36, Dovetail)	2 + 1	33 to 84 fl oz/100 gal 17 to 34 fl oz/100 gal	Spray plants to ensure thorough coverage. Do not make more than 4 applications per crop per year. 26/36: Repeat at 7 to 14-day intervals. Dovetail: Repeat at 10 to 14-day intervals. Do not drench Impatiens or pothos. Do not use on *Spathiphyllum.* Do not make repeat applications at the high rate on chrysanthemum.
	mefentrifluconazole (Avelyo)	3	2 to 3 fl oz/100 gal	Apply as a drench on a 14 to 28-day interval. Do not make more than 2 applications before switching to a non-Group 3 fungicide.
	polyoxin D zinc salt (Affirm WDG)	19	0.5 lb/100 gal/A	Apply as a soil drench every 14 to 28 days. Use in alternation with fungicides with a different mode of action.
	thiophanate-methyl (various)	1	(See label)	See label for rates and application intervals. Do not apply to plug trays or seedling flats at time of seeding.
	triflumizole (Terraguard SC, Trionic 4SC)	3	2 to 8 fl oz/100 gal	Apply as soil drench at 2 to 4-week intervals. Irrigate well 1 day before application. Do not irrigate until 24 hours after application. Use higher rate under heavy disease pressure. Do not use on impatiens plugs.
Botrytis blight (*Botrytis cinerea*)	azoxystrobin (Heritage WG) (Heritage SC)	11	4 to 8 oz/100 gal 7.7 to 15.3 fl oz/100 gal	Apply every 7 to 21 days prior to infection. Do not exceed 24 fl oz or 24 oz/A. Labeled for suppression of Botrytis blight on flowers only.
	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	4 to 7 oz/100 gal	Apply every 7 to 14 days. Labeled for flower blight only.
	chlorothalonil (various)	M05	(See label)	Repeat at 7 to 14-day intervals. Apply to foliage or flowers when plants are dry or nearly dry. Discontinue applications prior to bract formation on poinsettia. Rotate with fenhexamid, iprodione, or fludioxonil. Avoid applications during bloom on plants where flower injury is unacceptable.
	chlorothalonil + thiophanate-methyl (various)	M05 + 1	(See label)	Minimum re-treat interval is 7 days. Do not apply to green or variegated pittosporum or schefflera more than once. Apply only when foliage and flowers are dry or nearly dry.
	copper (various)	M01	(See label)	Begin at first sign of disease and repeat at 7 to 14-day intervals. Do not tank mix copper formulations with Aliette. Avoid contact with metal surfaces. Discoloration of blooms may occur on certain plant varieties – check label. Phytotoxicity may occur; test a small number of plants first before treating an entire crop. Check label rates for crops in dormancy.
	cyprodinil + fludioxonil (Palladium WDG)	9 + 12	4 to 6 oz/100 gal	Spray on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different mode of action for 2 applications. Cautionary statement on label for applications to Geranium, impatiens and New Guinea impatiens. Apply when foliage and flowers are dry or nearly so.
	difenoconazole + pydiflumetofen (Postiva)	3 + 7	10 to 28 fl oz/100 gal	Begin applications prior to disease development and continue on a 7 to 14-day interval. Do not make more than 2 applications before switching to a fungicide that is not in Group 3 or 7.
	fenhexamid (Decree 50WDG)	17	0.75 to 1.5 lb/100 gal	RESISTANCE TO THIS CHEMICAL HAS BEEN REPORTED IN BOTRYTIS. Avoid making more than 2 consecutive applications of this product. Treat at 7 to 14-day intervals. Rotate with chlorothalonil, copper, mancozeb, or iprodione. Make trial application before treating poinsettia.
	fludioxonil (Medallion WDG, Emblem SC, Spirato GHN)	12	(See label)	Rates vary depending on site – see label. May cause stunting or chlorosis on impatiens and New Guinea impatiens and Geranium.
	fluopyram + trifloxystrobin (Broadform SC)	7 + 11	4 to 8 fl oz/100 gal	Apply as a foliar spray to the point of drip every 7 to 14 days until threat of disease is over. Apply before disease is detected or when conditions are conducive. Under heavy disease pressure, the higher rate should be used. Under light disease pressure, the application interval should be extended. Rotate with a fungicide outside of FRAC 11 after each Broadform application. Season limits apply.
	fluoxastrobin + myclobutanil (Disarm M)	11 + 3	11 fl oz/100 gal	Apply every 7 to 21 days. Season limits apply. Do not apply to leatherleaf ferns or other ferns grown under shade.

Table 10-11A. Disease Control of Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses

Disease	Pesticide and Formulation	FRAC	Rate of Formulation	Schedule and Remarks
Botrytis blight (*Botrytis cinerea*) (continued)	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	8 fl oz/100 gal	Use prior to disease development on a 7 to 14-day interval.
	iprodione (various)	2	(See label)	Spray to ensure thorough coverage. Repeat at 7 to 14-day intervals. Do not make more than 4 applications per year. Do not apply to *Spathiphyllum*. Do not apply as a soil drench on impatiens or pothos.
	iprodione + thiophanate-methyl (26/36) (Dovetail)	2 + 1	33 to 84 fl oz/100 gal 17 to 34 fl oz/100 gal	Spray plants to ensure thorough coverage. Do not make more than 4 applications per crop per year. 26/36: Repeat at 7 to 14-day intervals. Dovetail: Repeat at 10 to 14-day intervals. Do not drench Impatiens or pothos. Do not use on *Spathiphyllum*. Do not make repeat applications at the high rate on chrysanthemum.
	isofetamid (Astun)	7	10 to 17 fl oz/100 gal	Apply on a 7 to 14-day interval. Do not make more than 2 applications before switching to a fungicide that is not in Group 7.
	mancozeb (various)	M03	(See label)	Begin at first sign of disease. Repeat at 7 to 10-day intervals. Most effective when applied prior to infection. Not for use on marigold.
	polyoxin D zinc salt (Affirm WDG)	19	0.25 to 0.5 lb/100 gal	Apply as a foliar spray every 7 to 10 days. Apply prior to disease development and when conditions are conducive for disease. Use in alternation with fungicides with different modes of action. Season limits apply.
	propiconazole + chlorothalonil (Concert II)	3 + M05	69 fl oz (4.3 pt)/100 gal	Apply as needed beginning when conditions are favorable for disease. Apply to full coverage to the point of drip. Do not make more than 3 applications. DO NOT use in the greenhouse.
	pyraclostrobin + boscalid (Pageant Intrinsic)	11 + 7	12 to 18 oz/100 gal	Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
	thiophanate-methyl (various)	1	(See label)	Apply every 7 to 14 days beginning at first signs of disease. Do not apply to plug trays or seedling flats at time of seeding.
	thiophanate-methyl + mancozeb (Zyban WSB)	1 + M03	24 oz/100 gal (4 bags)	Do not use on French marigold or gloxinia. Apply weekly.
	trifloxystrobin (Compass 50WDG)	11	2 to 4 oz/100 gal	Repeat at 7 to 14-day intervals until the threat of disease is over. Rotate to another non-strobilurin fungicide after each application of Compass. Make no more than 4 foliar applications per crop cycle or season.
	triflumizole (Terraguard SC, Trionic 4SC)	3	4 to 8 fl oz/100 gal	Make initial application prior to or at first sign of disease. Do not re-apply at less than 14 days.
Bulb and corm rots (*Fusarium, Penicillium*)	didecyl dimethyl ammonium chloride (KleenGrow)	N/A	0.06 to 0.5 fl oz/1 gal (drench)	Apply as a preventative drench every 14 days making sure the root zone is completely wet with solution. For the pre-plant dip, immerse crate and bulbs in solution for 30 sec. Remove from solution and allow to drain before storage or planting. KleenGrow may be phytotoxic to some plants and may be phytotoxic after repeated applications; be sure to test a small number before treating an entire crop. See label for crops.
	difenoconazole + pydiflumetofen (Postiva)	3 + 7	10 to 28 fl oz/100 gal	Apply via chemigation or as a container drench. Begin applications prior to disease development and continue on a 7 to 14-day interval. Do not make more than 2 applications before switching to a fungicide that is not in Group 3 or 7.
	etridiazole + thiophanate-methyl (Banrot 40WP) (Banrot 8G)	14 + 1	4 to 8 oz or 6 to 12 oz/100 gal 8 or 16 oz/cu yd soil mix	Banrot 40WP: Use 4 to 8 oz for bedding plants or 6 to 12 oz for foliage and bedgrown plants. Apply Banrot 40WP in sufficient volume to saturate the soil mixture. Irrigate immediately. Banrot 8G: Use 8 oz per cu yd soil mix for bedding plants and 16 oz per cu yd soil mix for container and foliage plants.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	8 to 10 fl oz/100 gal	Apply preventatively on a 7 to 14-day interval. The crown, the base of the plant, and the soil media around the crown must be thoroughly covered.
	iprodione (various)	2	(See label)	Dip 5 minutes prior to storage. Labeled for Gladiolus and Fusarium only.
	iprodione + thiophanate-methyl (26/36) (Dovetail)	2 + 1	13.5 oz/100 gal (dip) 17 to 34 fl oz/100 gal (drench)	Dip 5 minutes and allow to dry prior to storage. 26/36 is only labeled for corm rot on Gladiolus. Dovetail is only labeled for drench application (not dip) and is not labeled for *Penicillium* spp. Do not use on *Spathiphyllum* or New Guinea impatiens.
	thiabendazole (Mertect 340-F)	1	30 fl oz/100 gal	Clean and treat bulbs and corms within 24 to 48 hours of digging. Warm solution prior to dipping. Mix fresh solution per label guidelines. Dip bulbs 15 to 30 minutes and corms 15 minutes for *Fusarium* control, or dip bulbs 10 to 15 minutes for *Penicillium* (blue mold) control.
	thiophanate-methyl (various)	1	(See label)	Soak clean bulbs for 15 to 30 minutes in warm (80ºF to 85ºF) solution. Treat bulbs within 48 hours of digging. Dry well before storing.
Cylindrocladium stem canker or root rot	azoxystrobin (Heritage WG) (Heritage SC)	11	4 to 8 oz/100 gal 7.7 to 15.3 fl oz/100 gal	Apply every 7 to 14 days prior to infection.
	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	5 to 7 oz/100 gal	Apply every 7 to 14 days.
	chlorothalonil + thiophanate-methyl (Spectro 90WDG)	M05 + 1	1.0 to 2.0 lb/100 gal	For best results use spray mixture the same day it is prepared. Spray uniformly over the area to be treated with a properly calibrated power sprayer, apply as a full coverage spray to run-off when conditions are favorable for disease development.
	cyprodinil + fludioxonil (Palladium WDG)	9 + 12	2 to 6 oz/100 gal	For stem diseases, ensure full spray coverage of all stems and inner areas of plants to the soil/media level. Do not apply Palladium WDG to leather leaf fern or other ferns for cutting/harvest.
	fludioxonil (Medallion WDG, Emblem SC, Spirato GHN)	12	(See label)	Rates vary depending on site – see label. May cause stunting or chlorosis on impatiens and New Guinea impatiens and Geranium.
	mefentrifluconazole (Avelyo)	3	2 to 3 fl oz/100 gal	Apply as a drench on a 14 to 28 day interval. Do not make more than 2 applications before switching to a non-Group 3 fungicide.
	pyraclostrobin + boscalid (Pageant Intrinsic)	11 + 7	12 to 18 oz/100 gal	Apply prior to disease development. Completely drench the growing medium. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray, as injury may occur.
	thiophanate-methyl (various)	1	(See label)	See label for rates and application intervals. Does NOT control *Cylindrocladium Spathiphyllum.* Do not apply to plug trays or seedling flats at time of seeding.

Table 10-11A. Disease Control of Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses

Disease	Pesticide and Formulation	FRAC	Rate of Formulation	Schedule and Remarks
Cylindrocladium Stem Canker or Root Rot (continued)	trifloxystrobin (Compass WDG)	11	1 to 2 oz/100 gal	Apply as a drench to the upper ½ of the growing media. Begin at transplant and then apply at 14 to 28-day intervals.
	triflumizole (Terraguard SC, Trionic 4SC)	3	4 to 8 fl oz or 12 to 16 fl oz/100 gal	Rate depends on species of *Cylindrocladium* present – see label. Can be used as a cutting soak or soil drench. Apply soil drenches at 2 to 4-week intervals as needed. Use higher rate under high disease pressure, which can occur under warmer conditions. Irrigate well 1 day before application. Do not irrigate until 24 hours after application.
Downy mildew (*Bremia lactuae*, *Peronospora* spp., *Plasmopora viburni*)	azoxystrobin (Heritage WG) (Heritage SC)	11	2 to 4 oz/100 gal 3.8 to 7.7 fl oz/100 gal	Apply every 7 to 21 days during periods of active plant growth and prior to dormancy or severe infection. Use lower use rates for herbaceous seedlings. Do not make more than 3 sequential applications before alternating with a fungicide of a different mode of action.
	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	4 to 7 oz/100 gal	Apply every 7 to 14 days.
	chlorothalonil + thiophanate-methyl (various)	M05 + 1	(See label)	Minimum re-treat interval is 7 days. Do not apply to green or variegated pittosporum or schefflera more than once. Apply only when foliage and flowers are dry or nearly dry.
	copper (various)	M01	(See label)	Begin at first sign of disease and repeat at 7 to 14-day intervals. Do not tank mix copper formulations with Aliette. Avoid contact with metal surfaces. Discoloration of blooms may occur on certain plant varieties – check label. Phytotoxicity may occur; test a small number of plants first before treating an entire crop. Check label rates for crops in dormancy.
	cyazofamid (Segway O)	21	2.1 to 3.5 fl oz/100 gal	14 to 21-day intervals using another registered fungicide with a different mode of action. Apply sufficient volume to wet all foliage until runoff (normally 50 to 100 gallons per acre). Check label for when to use an adjuvant or surfactant.
	dimethomorph (Stature SC)	40	6.12 to 12.25 oz/100 gal	Apply at first sign of disease. Apply to obtain complete coverage of flowers, foliage, and stems. Repeat at 10 to 14-day intervals throughout the production cycle.
	dimethomorph + ametoctradin (Orvego)	40 + 45	11 to 14 fl oz/100 gal	Apply on 10 to 14-day intervals using another registered fungicide with a different mode of action. Apply sufficient volume to wet all foliage until runoff (normally 50 to 100 gallons per acre).
	fenamidone (Fenstop)	11	7 to 14 fl oz/100 gal	Apply as a foliar spray until wet. Repeat as necessary on a 28-day schedule. Do not apply more than 2 applications per crop per season.
	fluoxastrobin (Disarm G) (Disarm 480SC)	11	18 oz/cu yd (soil mix) 1 to 4 fl oz/100 gal	Apply as a surface application or incorporate into soil mixture. It may take 1 to 3 weeks for the product to translocate through the plant and provide sufficient protection. Apply every 7 to 21 days.
	fluoxastrobin + myclobutanil (Disarm M)	11 + 40	6 to 11 fl oz/100 gal	Apply on a 7 to 21-day schedule. Season limits apply.
	fluopicolide (Adorn F)	43	1 to 4 fl oz/100 gal	No more than 2 applications per cropping cycle. Do not apply sequentially; rotate with a fungicide with a different mode of action. Reapply on a 14 to 28-day schedule.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	8 to 10 fl oz/100 gal	Apply preventatively on a 7 to 14-day interval. Check label for specific species of downy mildew as rates may differ.
	fosetyl-Al (Aliette 80WDG)	P07	1.25 to 4 lb/100 gal	Aliette: Do not exceed 400 gallons of spray solution per acre. Do not exceed 1 application every 14 days. Check label for compatibility with copper and other compounds. Aliette is not compatible with the flowable form of Daconil 2787. Do not mix Aliette with any sticker, extender, or wetting agent.
	mancozeb (various)	M03	(See label)	Begin at first sign of disease. Repeat at 7 to 10-day intervals. Most effective when applied prior to infection. Not for use on marigold.
	mandipropamid (Micora)	40	4 to 8 fl oz/100 gal	This product can also be used on vegetables sold to the retail market in GH with permanent flooring. Apply prior to disease development. Repeat sprays at 7 to 14-day intervals. Make no more than 2 sequential applications, then rotate to another fungicide with a different MOA.
	mefenoxam (Subdue Maxx) (Subdue GR)	4	0.5 to 1 fl oz/100 gal See label	Make only 1 application of Subdue MAXX before switching to a fungicide with a different mode of action. Apply Subdue Maxx as a foliar spray or soil drench treatment. Apply Subdue GR as a soil surface or soil/planting media incorporation treatment – see label for rates.
	phosphorous acid, mono- and di-potassium salts of (various)	33	(See label)	Apply prior to disease development. Do not apply to plants that are heat or moisture stressed or dormant. Spray to thoroughly wet all foliage. Avoid application when conditions favor prolonged periods of leaf wetness (>4 hours). Follow labels for repeat application limits and other application method rates.
	oxathiapiprolin (Segovis)	49	0.6 to 3.2 fl oz/100 gal	Begin foliage applications prior to disease development and continue on 7 to 14-day interval when conditions are conducive for disease development. Do not apply more than 2 consecutive applications before switching to another non-Group U-15 fungicide.
	polyoxin D zinc salt (Affirm WDG)	19	0.25 to 0.5 lb/100 gal	Apply as a foliar spray every 7 to 10 days. Apply prior to disease development and when conditions are conducive for disease.
	potassium bicarbonate (MilStop)	N/A	1.25 to 5 lb/100 gal	Uniform and complete coverage of foliage is essential for best results. See label for special instructions regarding poinsettia, pansy, and impatiens.
	potassium phosphite (Confine Extra, Rampart)	N/A	1 to 2 qt/100 gal	Repeat at 2 to 4-week intervals. Do not apply as a foliar spray to plants treated with copper at less than 20-day intervals.
	pyraclostrobin (Insignia) (Insignia SC Intrinsic)	11	4 to 8 oz/100 gal 3 to 6.1 fl oz/100 gal	Apply prior to onset of disease and repeat every 7 to 14 days. Do not expose flowering impatiens or flowering petunias to Insignia.
	pyraclostrobin + boscalid (Pageant Intrinsic)	11 + 7	12 to 18 oz/100 gal	Apply prior to disease development. Repeat at 7 to 10-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
	thiophanate-methyl + mancozeb (Zyban WSB)	1 + M03	24 oz/100 gal	Apply at first sign of disease and repeat at 7-day intervals.
	trifloxystrobin (Compass 50WDG)	11	1 to 2 oz/100 gal	Apply as a foliar spray before disease is detected or when conditions are favorable for disease. Repeat at 7 to 14-day intervals until threat of disease is over.

Table 10-11A. Disease Control of Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses

Disease	Pesticide and Formulation	FRAC	Rate of Formulation	Schedule and Remarks
Fungal leaf spots (consult label for specific fungi controlled)	azoxystrobin (Heritage WG) (Heritage SC)	11	(See label) (See label)	Rates and application intervals differ depending on disease and host – see label. Repeat at 7 to 28-day intervals. Good control of *Alternaria* leaf spot. Do not make more than 3 sequential applications before alternating with a fungicide of a different mode of action.
	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	4 to 7 oz/100 gal	Apply every 7 to 21 days. Rates differ depending on disease present – see label.
	chlorothalonil (various)	M05	(See label)	Repeat at 7 to 14-day intervals. Apply to foliage or flowers when plants are dry or nearly dry. Discontinue applications prior to bract formation on poinsettia. Rotate with fenhexamid, iprodione, or fludioxonil. Avoid applications during bloom on plants where flower injury is unacceptable.
	chlorothalonil + thiophanate-methyl (various)	M05 + 1	(See label)	Minimum re-treat interval is 7 days. Do not apply to green or variegated pittosporum or schefflera more than once. Apply only when foliage and flowers are dry or nearly dry.
	copper (various)	M01	(See label)	Begin at first sign of disease and repeat at 7 to 14-day intervals. Do not tank mix copper formulations with Aliette. Avoid contact with metal surfaces. Discoloration of blooms may occur on certain plant varieties - check label. Phytotoxicity may occur; test a small number of plants first before treating an entire crop. Check label rates for crops in dormancy.
	cyprodinil + fludioxonil (Palladium WDG)	9 + 12	2 to 6 oz/100 gal	Spray on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different mode of action for 2 applications. See cautionary statement on label for applications to Geranium, impatiens and New Guinea impatiens. Apply when foliage and flowers are dry or nearly so.
	didecyl dimethyl ammonium chloride (KleenGrow)	N/A	0.06 to 0.38 fl oz/1 gal	Apply starting at week 3 or earlier if conditions are favorable for disease. Use a watering device to drench the top and bottom of the leaves and stems, avoiding flowers in full bloom, every 14 days to prevent the spread of spores and the build-up of organic material.
	difenoconazole + pydiflumetofen (Postiva)	3 + 7	10 to 28 fl oz/100 gal	Begin applications prior to disease development and continue on a 7 to 14-day interval. Do not make more than 2 applications before switching to a fungicide that is not in Group 3 or 7.
	fludioxonil (Medallion WDG, Emblem SC, Spirato GHN)	12	(See label)	Rates vary depending on site – see label. May cause stunting or chlorosis on impatiens and New Guinea impatiens and Geranium.
	fluopyram + trifloxystrobin (Broadform SC)	7 + 11	4 to 8 fl oz/100 gal	Apply as a foliar spray to the point of drip every 7 to 14 days until threat of disease is over. Apply before disease is detected or when conditions are conducive. Under heavy disease pressure, the higher rate should be used. Under light disease pressure, the application interval should be extended. Rotate with a fungicide outside of FRAC 11 – see label. Season limits apply.
	fluoxastrobin (Disarm G) (Disarm 480SC)	11	18 oz/cu yd (soil mix) 1 to 4 fl oz/100 gal	Apply as a surface application or incorporate into soil mixture. It may take 1 to 3 weeks for the product to translocate through the plant and provide sufficient protection. Apply as foliar spray every 7 to 21 days.
	fluoxastrobin + myclobutanil (Disarm M)	11 + 3	3 to 11 fl oz/ 100 gal	Rates and application interval depend on the disease. Season limits apply.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	4 to 6 or 8 10 fl oz/100 gal	Rate depends on which fungal disease is present; see label.
	iprodione (various)	2	(See label)	Spray plants to ensure thorough coverage. Repeat at 7 to 14-day intervals. Do not make more than 4 applications per crop per year. Do not drench impatiens or pothos. Do not use on *Spathiphyllum*. Good control of *Alternaria* leaf spot. Check label for specific diseases.
	iprodione + thiophanate-methyl (26/36) (Dovetail)	2 + 1	33 to 84 fl oz/100 gal 17 to 34 fl oz/100 gal	Spray plants to ensure thorough coverage. Do not make more than 4 applications per crop per year. 26/36: Repeat at 7 to 14-day intervals. Dovetail: Repeat at 10 to 14-day intervals. Do not drench impatiens or pothos. Do not use on *Spathiphyllum.* Do not make repeat applications at the high rate on chrysanthemum.
	mancozeb (various)	M03	(See label)	Begin at first sign of disease. Repeat at 7 to 10-day intervals. Most effective when applied prior to infection. Not for use on marigold.
	mefentrifluconazole (Avelyo)	3	3 to 5 fl oz/100 gal	Apply on a 7 to 14-day interval. Do not make more than 2 applications before switching to a non-Group 3 fungicide.
	myclobutanil (Eagle 20EW) (Eagle 40WP)	3	 6 to 12 fl oz/100 gal 3 to 6 oz/100 gal	Apply at 10 to 14-day intervals, not to exceed 21 days. For chrysanthemums, see label for specific rates.
	polyoxin D zinc salt (Affirm WDG)	19	0.25 to 0.5 lb/100 gal	Apply as a foliar spray every 7 to 10 days. Apply prior to disease development and when conditions are conducive for disease. Season limits apply.
	potassium bicarbonate (MilStop) (Carb-O-Nator)	N/A	 1.25 to 5 lb/100 gal 2.5-5 lb/100 gal	Uniform and complete coverage of foliage is essential for best results. See label for special instructions regarding poinsettia, pansy, and impatiens.
	propiconazole (Banner Maxx II)	3	See label	Rates vary depending on the disease – see label.
	propiconazole + chlorothalonil (Concert II)	3 + M05	22 to 35 fl oz/100 gal	Apply as needed beginning when conditions are favorable for disease. Apply to full coverage to the point of drip. Do not make more than 3 applications. See label for specific diseases and rates. DO NOT use in the greenhouse.
	pyraclostrobin (Insignia) (Insignia SC Intrinsic)	11	 2 to 8 oz/100 gal 1.5 to 6.1 fl oz/100 gal	Apply prior to onset of disease and repeat every 7 to 14 days. Do not expose flowering impatiens or flowering petunias to Insignia. Rates vary depending on disease – see label.
	pyraclostrobin + boscalid (Pageant Intrinsic)	11 + 7	4 to 12 oz/100 gal	Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
	tebuconazole (Torque)	3	4 to 8 fl oz/100 gal	Begin applications 14 to 21 days prior to when disease is expected, or at very first sign of disease.
	thiophanate-methyl (various)	1	(See label)	Repeat every 7 to 14 days during disease period. Rotations with chlorothalonil can be used. Do not apply to plug trays or seedling flats at time of seeding.
	thiophanate-methyl + mancozeb (Zyban WSB)	1 + M03	24 oz/100 gal	Apply at first sign of disease and repeat at 7-day intervals.
	triadimefon (Strike 25WDG)	3	2 to 4 oz/100 gal	Apply as needed at first sign of disease. Good control of *Alternaria* leaf spot.

Table 10-11A. Disease Control of Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses

Disease	Pesticide and Formulation	FRAC	Rate of Formulation	Schedule and Remarks
Fungal leaf spots (consult label for specific fungi controlled) (continued)	trifloxystrobin (Compass 50WDG)	11	2 to 4 oz/100 gal	Repeat at 7 to 14-day intervals until threat of disease is over. Rotate to another non-strobilurin fungicide after each application. Good control of *Alternaria* leaf spot.
	triflumizole (Terraguard SC, Trionic 4SC)	3	4 to 8 fl oz/100 gal	Apply at very first sign of disease. Some cultivars of impatiens have shown sensitivity. Repeat at 7 to 14-day intervals.
	triticonazole (Trinity 19SC)	3	4 to 12 fl oz/100 gal	See label as rate varies depending on fungal leaf spot pathogen. Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. Use of an adjuvant/spreader sticker can aid in control.
***Fusarium* root and crown rot (*Fusarium* spp.)**	azoxystrobin (Heritage WG) (Heritage SC)	11	1 to 4 oz/100 gal (directed spray); 0.2 to 1 oz/100 gal (drench) 2.0 to 7.7 fl oz/100 gal (directed spray); 0.8 to 3.8 fl oz/100 gal (drench)	Apply as a directed spray every 7 to 21 days. Apply as a soil drench every 7 to 28 days.
	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	5 to 7 oz/100 gal (directed spray); 2 to 3 oz/100 gal (drench)	Apply as a directed spray every 7 to 21 days for foliar applications. Apply 1 to 2 pt per sq ft of solution every 7 to 28 days for drench applications.
	chlorothalonil + thiophanate-methyl (Spectro 90WDG)	M05 + 1	1.0 to 2.0 lb/100 gal	For best results use spray mixture the same day it is prepared. Spray uniformly over the area to be treated with a properly calibrated power sprayer, apply as a full coverage spray to run-off when conditions are favorable for disease development.
	cyprodinil + fludioxonil (Palladium WDG)	9 + 12	2 to 6 oz/100 gal	Spray on a 7 to 14-day interval while conditions are conducive to disease development. Ensure full coverage of stems and inner areas of the plant to the soil/media level.
	didecyl dimethyl ammonium chloride (KleenGrow)	N/A	0.06 to 0.5 fl oz/1 gal (drench)	Apply as a preventative drench every 14 days making sure the root zone is completely wet with solution. For the pre-plant dip, immerse crate and bulbs in solution for 30 sec. Remove from solution and allow to drain before storage or planting. KleenGrow may be phytotoxic to some plants and may be phytotoxic after repeated applications; be sure to test a small number before treating an entire crop. See label for crops.
	difenoconazole + pydiflumetofen (Postiva)	3 + 7	10 to 28 fl oz/100 gal	Apply via chemigation or as a drench application. Begin applications prior to disease development and continue on a 7 to 14-day interval. Do not make more than 2 applications before switching to a fungicide that is not in Group 3 or 7.
	etridiazole + thiophanate-methyl (Banrot 40WP) (Banrot 8G)	14 + 1	4 to 8 oz or 6 to 12 oz/100 gal 8 or 16 oz/cu yd soil mix	Banrot 40WP: Use 4 to 8 oz for bedding plants or 6 to 12 oz for foliage and bedgrown plants. Apply Banrot 40WP in sufficient volume to saturate the soil mixture. Irrigate immediately. Banrot 8G: Use 8 oz per cu yd soil mix for bedding plants and 16 oz per cu yd soil mix for container and foliage plants.
	fludioxonil (Medallion WDG, Emblem SC, Spirato GHN)	12	(See label)	Rates vary depending on site – see label. May cause stunting or chlorosis on impatiens and New Guinea impatiens and Geranium.
	fludioxonil + mefenoxam (Hurricane 48WP)	12 + 4	See label	Apply as a pre-potting or growing media drench per label directions. For control of Fusarium, add Medallion Fungicide at a rate of 1.0 oz/gal. Application to impatiens, New Guinea impatiens, pothos, Geranium, and Easter lily may cause stunting or chlorosis.
	fluoxastrobin (Disarm G) (Disarm 480SC)	11	18 oz/cu yd (soil mix) 0.15 to 0.6 fl oz/100 gal (drench or surface); 2 to 4 fl oz/10-0 gal (crown spray)	Apply as a surface application or incorporate into soil mixture. It may take 1 to 3 weeks for the product to translocate through the plant and provide sufficient protection. Apply as a drench every 14 to 28 days. Apply as a crown spray every 7 to 21 days.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	8 to 10 fl oz/100 gal	The crown and base of the plant and the soil or growing media surrounding the crown must be thoroughly covered.
	iprodione + thiophanate-methyl (26/36) (Dovetail)	2 + 1	13.5 fl oz/100 gal (drench) 17 to 34 fl oz/100 gal	26/36: Repeat at 14-day intervals. Dovetail: Repeat at 10 to 14-day intervals. Do not drench impatiens, petunia, or pothos. Do not make repeat applications at the high rate on chrysanthemum. Do not use on *Spathiphyllum* or New Guinea impatiens.
	potassium phosphite (Confine Extra, Rampart)	N/A	1 to 2 qt/100 gal (foliar) 2 qt/100 gal (root dip)	Apply at 2 to 3-week intervals. Do not apply as a foliar application to plants treated with copper-based compounds at less than 20-day intervals.
	pyraclostrobin (Empress Intrinsic) (Insignia) (Insignia SC Intrinsic)	11	1 to 6 fl oz/100 gal 8 to 16 oz/100 gal 6.1 to 9.1 fl oz/100 gal	Apply Empress Intrinsic as a drench at 1 to 3 fl oz for plants in propagation, rooted cuttings, plugs and seedlings and at 2 to 6 fl oz to all other plants. Do not apply to dry soil media. Apply preventative to disease with sequential at 7 to 28 days after the first application if needed.
	pyraclostrobin + boscalid (Pageant Intrinsic)	11 + 7	12 to 18 oz/100 gal	Apply prior to disease development. Completely drench the growing medium. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray, as injury may occur.
	thiophanate-methyl (various)	1	(See label)	See label for rates and application intervals. Do not apply to plug trays or seedling flats at time of seeding.
	triflumizole (Terraguard SC, Trionic 4SC)	3	4 to 8 fl oz/100 gal	Apply soil drenches weekly as needed. Use higher rate under heavy disease pressure. Some cultivars of impatiens have shown sensitivity. Irrigate well 1 day before application. Do not irrigate until 24 hours after application.
	triticonazole (Trinity 19SC)	3	8 to 12 fl oz/100 gal	Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. The crown and base of the plant and the soil or potting medium surrounding the crown must be thoroughly covered.
***Myrothecium* leaf blight, crown, or petiole rot (*Myrothecium* spp.)**	azoxystrobin (Heritage WG) (Heritage SC)	11	2 to 4 oz/100 gal 3.8 to 7.7 fl oz/100 gal	Apply every 7 to 21 days. Do not make more than 3 sequential applications before alternating with a fungicide of a different mode of action.
	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	4 to 7 oz/100 gal	Apply every 7 to 21 days.

Table 10-11A. Disease Control of Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses

Disease	Pesticide and Formulation	FRAC	Rate of Formulation	Schedule and Remarks
***Myrothecium* leaf blight, crown, or petiole rot (*Myrothecium* spp.) (continued)**	chlorothalonil (various)	M05	(See label)	Repeat at 7 to 14-day intervals. Apply to foliage or flowers when plants are dry or nearly dry. Discontinue applications prior to bract formation on poinsettia. Avoid applications during bloom on plants where flower injury is unacceptable.
	chlorothalonil + thiophanate-methyl (Spectro 90WDG)	M05 + 1	1 to 2 lb/100 gal	Minimum re-treat interval is 7 days. Do not apply to green or variegated pittosporum or schefflera more than once. Applications should be made when both foliage and flowers are dry, or nearly so.
	cyprodinil + fludioxonil (Palladium WDG)	9 + 12	2 to 6 oz/100 gal	Spray on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different mode of action for 2 applications. See cautionary statement on label for applications to Geranium, impatiens and New Guinea impatiens.
	fludioxonil (Medallion WDG, Emblem SC, Spirato GHN)	12	(See label)	Rates vary depending on site – see label. May cause stunting or chlorosis on impatiens and New Guinea impatiens and Geranium.
	fluopyram + trifloxystrobin (Broadform SC)	7 + 11	2 to 4 fl oz/100 gal	Apply as a foliar spray to the point of drip every 7 to 14 days until threat of disease is over. Apply before disease is detected or when conditions are conducive. Season limits apply.
	fluoxastrobin (Disarm G) (Disarm 480SC)	11	18 oz/cu yd (soil mix) 1 to 4 fl oz/100 gal	Apply as a surface application or incorporate into soil mixture. It may take 1 to 3 weeks for the product to translocate through the plant and provide sufficient protection. Apply as a foliar spray every 7 to 21 days.
	fluoxastrobin + myclobutanil (Disarm M)	11 + 3	3 to 11 fl oz/ 100 gal	Apply every 7 to 28 days.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	8 to 10 fl oz/100 gal	Apply preventatively on a 7 to 14-day interval.
	polyoxin D zinc salt (Affirm WDG)	19	0.5 lb/100 gal	Apply as a foliar spray every 7 to 10 days. Apply prior to disease development and when conditions are conducive for disease. Use in alternation with fungicides with different modes of action.
	pyraclostrobin + boscalid (Pageant Intrinsic)	11 + 7	8 to 12 oz/100 gal	Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
	thiophanate-methyl (various)	1	(See label)	See label for rates and application intervals. Do not apply to plug trays or seedling flats at time of seeding.
	trifloxystrobin (Compass 50WDG)	11	1 to 2 oz/100 gal	Repeat at 7 to 14-day intervals until threat of disease is over.
	triflumizole (Terraguard SC, Trionic 4SC)	3	4 to 8 oz/100 gal	Apply prior to or at first sign of disease. Repeat at 7 to 14-day intervals. Use higher rates for initial application under disease pressure. Some cultivars of impatiens have shown sensitivity.
	triticonazole (Trinity 19SC)	3	8 to 12 fl oz/100 gal	Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. Use of an adjuvant/spreader sticker can aid in control.
***Phytophthora* aerial shoot blight (*Phytophthora* spp.)**	azoxystrobin (Heritage WG) (Heritage SC)	11	1 to 4 oz/100 gal 2.0 to 7.7 fl oz/100 gal	Apply every 7 to 28 days.
	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	4 to 7 oz/100 gal	Apply every 7 to 14 days.
	chlorothalonil (various)	M05	(See label)	Repeat at 7 to 14-day intervals. Apply to foliage or flowers when plants are dry or nearly dry. Discontinue applications prior to bract formation on poinsettia. Avoid applications during bloom on plants where flower injury is unacceptable.
	copper (various)	M01	(See label)	Begin at first sign of disease and repeat at 7 to 10-day intervals.
	chlorothalonil + thiophanate-methyl (Spectro 90 WDG)	M05 + 1	1 to 2 lb/100 gal	Apply when plants are dry. Spectro has protective and curative action. Repeat at 7-day intervals. Applications should be made when both foliage and flowers are dry, or nearly so.
	cyazofamid (Segway O)	21	3 to 6 fl oz/100 gal	Make applications on a 14 to 28-day interval. Make no more than 2 applications before switching to a fungicide with a different mode of action. Check label for recommended maximum drench volume based on pot diameter.
	dimethomorph (Stature SC)	40	12.25 fl oz/100 gal	Begin spraying at first sign of disease. Use a full-coverage spray at 10 to 14-day intervals throughout production cycle.
	dimethomorph + ametoctradin (Orvego)	40 + 45	14 fl oz/100 gal	Apply on 10 to 14-day intervals using another registered fungicide with a different mode of action. Apply sufficient volume to wet all foliage until runoff (normally 50 to 100 gallons per acre).
	fenamidone (Fenstop)	11	7 to 14 fl oz/100 gal	Apply as a foliar spray until wet. Repeat as necessary on a 28-day schedule. Do not apply more than 4 applications per crop per season.
	fluopicolide (Adorn F)	43	2 to 4 fl oz/100 gal	No more than 2 applications per cropping cycle. Do not apply sequentially; rotate with a fungicide with a different mode of action. Reapply on a 14 to 28-day schedule.
	fluopyram + trifloxystrobin (Broadform SC)	7 + 11	2 to 4 fl oz/100 gal	Apply as a foliar spray to the point of drip every 7 to 14 days until threat of disease is over. Apply before disease is detected or when conditions are conducive. Season limits apply.
	fluoxastrobin (Disarm G) (Disarm 480SC)	11	18 oz/cu yd (soil mix) 1 to 4 fl oz/100 gal	Apply as a surface application or incorporate into soil mixture. It may take 1 to 3 weeks for the product to translocate through the plant and provide sufficient protection. Apply every 7 to 21 days as a crown spray.
	fluoxastrobin + myclobutanil (Disarm M)	11 + 3	3 to 11 fl oz/100 gal	Apply on a 7 to 28 day interval. Season limits apply.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	10 fl oz/100 gal	Apply preventatively on a 7 to 14-day interval. Suppression only.
	fosetyl-Al (Aliette WDG	P07	1.25 to 4 lb/100 gal	Aliette: Do not exceed 400 gallons of spray solution per acre. Do not exceed 1 application every 14 days. Check label for compatibility with copper and other compounds. Aliette is not compatible with the flowable form of Daconil 2787. Do not mix Aliette with any sticker, extender, or wetting agent.

Table 10-11A. Disease Control of Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses

Disease	Pesticide and Formulation	FRAC	Rate of Formulation	Schedule and Remarks
***Phytophthora* aerial shoot blight (*Phytophthora* spp.) (continued)**	mandipropamid (Micora)	40	4 to 8 fl oz/100 gal	This product can also be used on vegetables sold to the retail market in GH with permanent flooring. Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications before rotating to an alternate MOA.
	oxathiapiprolin (Segovis)	49	0.6 to 3.2 fl oz/100 gal	Begin foliage applications prior to disease development and continue on 7 to 14-day interval when conditions are conducive for disease development. Do not apply more than 2 consecutive applications before switching to another non-Group U-15 fungicide.
	phosphorous acid, mono- and di-potassium salts of (various)	P07	(See label)	Apply prior to disease development. Do not apply to plants that are heat or moisture stressed or dormant. Spray to thoroughly wet all foliage. Avoid application when conditions favor prolonged periods of leaf wetness (>4 hours). Follow labels for repeat application limits and other application method rates.
	potassium phosphite (Confine Extra, Rampart)	N/A	1 to 2 qt/100 gal (foliar) 2 qt/100 gal (root dip)	Apply at 2 to 3-week intervals. Do not apply as a foliar application to plants treated with copper-based compounds at less than 20-day intervals.
	pyraclostrobin (Insignia) (Insignia SC Intrinsic)	11	 8 to 9.1 oz/100 gal 6.1 to 12.2 fl oz/100 gal	Apply prior to onset of disease and repeat every 7 to 14 days. Do not expose flowering impatiens or flowering petunias to Insignia.
	pyraclostrobin + boscalid (Pageant Intrinsic)	11 + 7	18 oz/100 gal	Apply prior to disease development. Repeat at 7 to 10-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
	trifloxystrobin (Compass 50WDG)	11	1 to 2 oz/100 gal	Apply at 7 to 14-day intervals.
***Phytophthora* or *Pythium* root and crown Rot (*Phytophthora* spp., *Pythium* spp.)**	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	3 oz/100 gal (drench)	Apply 1 to 2 pints of drench solution per square foot surface area every 7 to 28 days. Suppression only.
	boscalid + pyraclostrobin (Pageant Intrinsic)	7 + 11	12 to 18 oz/100 gal	Thorough coverage and wetting of root zone, crown and base of the plant, and surrounding growing media is necessary for best control.
	cyazofamid (Segway O)	21	3 to 6 fl oz/100 gal	Rates differ for Pythium and Phytophthora – check label. Make applications on a 14 to 28-day interval using another registered fungicide with a different mode of action. Check label for recommended maximum drench volume based on pot diameter.
	dimethomorph (Stature SC)	40	3.06 to 6.12 oz/50 to 100 gal	Apply when plant roots are well established, or at first sign of disease on 10 to 14-day intervals throughout production cycle. Use enough solution to wet root zone. Avoid watering plants for several hours after application. See label for rates for container-grown perennials and woody ornamentals. **Not labeled for Pythium root rot.**
	dimethomorph + ametoctradin (Orvego)	40 + 21	11 to 14 fl oz/100 gal	NOT LABELED FOR PYTHIUM. Apply on 10 to 14-day intervals. Apply sufficient volume to wet all foliage until runoff (normally 50 to 100 gallons per acre).
	dipotassium phosphonate + dipotassium phosphate (Biophos 1% [v/v])	N/A	See label for rates	Apply as a soil drench or foliar spray as a preventive.
	etridiazole (Truban 30WP) (Terrazole 35WP)	14	 3 to 10 oz/100 gal 3.5 to 10 oz/100 gal	Apply in sufficient volume to saturate soil. Irrigate immediately. Repeat at 4 to 12-week intervals. Drench 4-inch pot with a minimum of 2 oz and a 6-inch pot with 4 oz. Re-treat at 4 to 12-week intervals. Use higher rates for peat or other high-organic potting media.
	etridiazole + thiophanate-methyl (Banrot 40WP) (Banrot 8G)	14 + 1	 4 to 8 oz or 6 to 12 oz/100 gal 8 or 16 oz/cu yd soil mix	Banrot 40WP: Use 4 to 8 oz for bedding plants or 6 to 12 oz for foliage and bedgrown plants. Apply Banrot 40WP in sufficient volume to saturate the soil mixture. Irrigate immediately. Banrot 8G: Use 8 oz per cu yd soil mix for bedding plants and 16 oz per cu yd soil mix for container and foliage plants.
	fenamidone (Fenstop)	11	7 to 14 fl oz/50 to 100 gal/400 sq ft	Apply as a drench using 1 to 2 pints per square foot. Repeat as necessary on a 28-day application schedule. Do not apply more than 4 applications of the maximum rate per crop per season. Higher rate has shown more consistent efficacy in research trials.
	fosetyl-Al (Aliette WDG)	P07	1.25 to 4 lb/100 gal	Aliette: Do not exceed 400 gallons of spray solution per acre. Do not exceed 1 application every 14 days. Check label for compatibility with copper and other compounds. Aliette is not compatible with the flowable form of Daconil 2787. Do not mix Aliette with any sticker, extender, or wetting agent.
	fludioxonil + mefenoxam (Hurricane 48WP)	12 + 4	See label	Apply as a pre-potting or growing media drench per label directions. Application to impatiens, New Guinea impatiens, pothos, Geranium, and Easter lily may cause stunting or chlorosis.
	fluopicolide (Adorn F)	43	to 4 fl oz/100 gal	No more than 2 applications per cropping cycle. Do not apply sequentially; rotate with a fungicide with a different mode of action. Reapply on a 14 to 28-day schedule.
	fluoxastrobin (Disarm G) (Disarm 480SC)	11	18 oz/cu yd (soil mix) 0.15 to 0.6 fl oz/100 gal (drench or surface)	Apply as a surface application or incorporate into soil mixture. It may take 1 to 3 weeks for the product to translocate through the plant and provide sufficient protection. Apply as a drench every 14 to 28 days.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	8 to 10 fl oz/100 gal	Apply preventatively on a 7 to 28-day interval.
	mandipropamid (Micora)	40	4 to 8 fl oz/100 gal (foliar) See label for drench	This product can also be used on vegetables sold to the retail market in GH with permanent flooring. Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications.
	mefenoxam (Subdue Maxx) (Subdue GR)	4	 0.5 to 1 fl oz/100 gal See label	Make only 1 application of Subdue MAXX before switching to a fungicide with a different mode of action. Apply Subdue Maxx as a foliar spray or soil drench treatment. Apply Subdue GR as a soil surface or soil/planting media incorporation treatment – see label for rates.

Table 10-11A. Disease Control of Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses

Disease	Pesticide and Formulation	FRAC	Rate of Formulation	Schedule and Remarks
***Phytophthora* or *Pythium* root and crown rot (*Phytophthora* spp., *Pythium* spp.) (continued)**	oxathiapiprolin (Segovis)	49	0.65 to 3.2 fl oz/100 gal (drench) 0.6 to 3.2 fl oz/100 gal (foliar or stem spray)	NOT LABELED FOR PYTHIUM. Apply at 14 to 28-day interval preventatively or at first sight of disease symptoms. Do not apply more than 2 consecutive applications before switching to another non-Group U-15 fungicide.
	phosphorous acid, mono- and di-potassium salts of (various)	P07	(See label)	Apply prior to disease development. Do not apply to plants that are heat or moisture stressed or dormant. Spray to thoroughly wet all foliage. Avoid application when conditions favor prolonged periods of leaf wetness (>4 hours). Follow labels for repeat application limits and other application method rates.
	potassium phosphite (Confine Extra, Rampart)	N/A	1 to 2 qt/100 gal (foliar) 2 qt/100 gal (root dip)	Apply at 2 to 3-week intervals. Do not apply as a foliar application to plants treated with copper-based compounds at less than 20-day intervals.
	propamocarb hydrochloride (Banol, Proplant)	28	20 to 30 fl oz/100 gal	Apply at seeding or transplanting. See label. Effective for preventing Pythium infections.
	pyraclostrobin (Empress Intrinsic)	11	1 to 6 fl oz/100 gal	Apply as a preventative drench prior to onset of disease. Can be reapplied 7 to 28 days following the initial application. Use 1 to 3 fl oz/100 gal in propagation and 2 to 6 fl oz/100 gal for all other plants in production
	trifloxystrobin (Compass 50WDG)	11	1 to 2 oz/100 gal	Apply as drench to wet the upper half of growing media. Start application at time of planting and at 14 to 28 days depending on disease pressure. NOT LABELED FOR PYTHIUM.
Powdery mildew (*Podosphaera, Oidiopsis, Sphaerotheca, Erysiphe*)	azoxystrobin (Heritage WG) (Heritage SC)	11	1 to 4 oz /100 gal 2.0 to 7.7 fl oz/100 gal	Spray every 7 to 28 days as needed. Do not exceed 2 applications before switching to a fungicide with a different mode of action.
	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	4 to 7 oz/100 gal (foliar); 2 to 3 oz/100 gal (drench)	Apply every 7 to 21 days for foliar applications and 7 to 28 days for drench. Do not make more than 2 sequential applications before rotating to another class of fungicide that is not Group 7 or 11.
	chlorothalonil (various)	M05	(See label)	Repeat at 7 to 14-day intervals. Apply to foliage or flowers when plants are dry or nearly dry. Discontinue applications prior to bract formation on poinsettia. Avoid applications during bloom on plants where flower injury is unacceptable.
	chlorothalonil + thiophanate-methyl (various)	M05 + 1	(See label)	Minimum re-treat interval is 7 days. Do not apply to green or variegated pittosporum or schefflera more than once. Applications should be made when both foliage and flowers are dry, or nearly so.
	cyprodinil + fludioxonil (Palladium WDG)	9 + 12	4 to 6 oz/100 gal	Spray on a 7 to14- day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different mode of action for 2 applications. Apply when foliage and flowers are dry or nearly so.
	didecyl dimethyl ammonium chloride (KleenGrow)	N/A	0.06 to 0.38 fl oz/1 gal	Apply starting at week 3 or earlier if conditions are favorable for disease. Use a watering device to drench the top and bottom of the leaves and stems, avoiding flowers in full bloom, every 14 days to prevent the spread of spores and the build-up of organic material.
	difenoconazole + pydiflumetofen (Postiva)	3 + 7	10 to 28 fl oz/100 gal	Begin applications prior to disease development and continue on a 7 to 14-day interval. Do not make more than 2 applications before switching to a fungicide that is not in Group 3 or 7.
	fluopyram + trifloxystrobin (Broadform SC)	7 + 11	2 to 4 fl oz/100 gal	Apply as a foliar spray to the point of drip every 7 to 14 days until threat of disease is over. Apply before disease is detected or when conditions are conducive. Under heavy disease pressure, the higher rate should be used. Under light disease pressure, the application interval should be extended. Rotate with a fungicide outside of FRAC 11 after each Broadform application. Season limits apply.
	fluoxastrobin (Disarm G) (Disarm 480SC)	11	18 oz/cu yd (soil mix) 1 to 4 fl oz/100 gal	Apply as a surface application or incorporate into soil mixture. It may take 1 to 3 weeks for the product to translocate through the plant and provide sufficient protection. Apply as a foliar spray every 7 to 28 days.
	fluoxastrobin + myclobutanil (Disarm M)	11 + 40	3 to 11 fl oz/ 100 gal	Apply every 7 to 28 days.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	6 to 8 fl oz/100 gal	Use on a 7 to 14-day interval.
	iprodione (various)	2	(See label)	Spray to ensure thorough coverage. Repeat at 7 to 14-day intervals. Do not make more than 4 applications per year. Do not apply to *Spathiphyllum*. Do not apply as a soil drench on Impatiens or pothos.
	iprodione + thiophanate-methyl (26/36) (Dovetail)	2 +1	33 to 84 oz/100 gal 17 to 34 fl oz/100 gal	Spray plants to ensure thorough coverage. Do not make more than 4 applications per crop per year. 26/36: Repeat at 7 to 14-day intervals. Dovetail: Repeat at 10 to 14-day intervals. Do not use on *Spathiphyllum*. Do not make repeat applications at the high rate on chrysanthemum.
	mefentrifluconazole (Avelyo)	3	3 to 5 fl oz/100 gal	Apply on a 7 to 14-day interval. Do not make more than 2 applications before switching to a non-Group 3 fungicide.
	metconazole (Tourney)	3	1 to 4 oz/100 gal	Apply on a 14 to 28-day interval.
	myclobutanil (Eagle 20EW) (Eagle 40WSP)	3	 6 to 12 fl oz/100 gal 3 to 6 oz/100 gal	Apply at 10 to 14-day intervals. Use caution if applying to Gerbera daisy as phytotoxicity may occur.
	neem oil (Triact 70)	N/A	1 gal/100 to 200 gal	Trial first on open blooms. Retreat at 7 to 14-day intervals. Use 1:200 rate as a preventive and 1:100 rate if disease is evident.
	phosphorous acid, mono- and di-potassium salts of (various)	P07	(See label)	Apply prior to disease development. Do not apply to plants that are heat or moisture stressed or dormant. Spray to thoroughly wet all foliage. Avoid application when conditions favor prolonged periods of leaf wetness (>4 hours). Follow labels for repeat application limits and other application method rates.
	piperalin (Pipron LC)	5	4 to 8 fl oz/100 gal	See label for precautions on hydrangea, begonia, and poinsettia. Use high rate if disease is already present.
	polyoxin D zinc salt (Affirm WDG)	19	0.25 to 0.5 lb/100 gal	Apply as a foliar spray every 7 to 10 days. Apply prior to disease development and when conditions are conducive for disease. Can be rotated with other effective products. Season limits apply.

Table 10-11A. Disease Control of Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses

Disease	Pesticide and Formulation	FRAC	Rate of Formulation	Schedule and Remarks
Powdery mildew (*Podosphaera, Oidiopsis, Sphaerotheca, Erysiphe*) (continued)	potassium bicarbonate (Carb-O-Nator) (Kaligreen) (MilStop)	N/A	2.5 to 5 lb/100 gal 1 to 3 lb/100 gal 4 to 8 oz/100 gal	Apply every 10 to 14 days. Increase frequency to every 5 to 7 days under heavy disease pressure. Begin at first sign of disease. Repeat at 7 to 10-day intervals. See label for precautions for poinsettia, impatiens, and pansy. Repeat at 7 to 14-day intervals.
	potassium phosphite (Confine, Fosphite, Rampart)	N/A	1 to 2 qt/100 gal	Apply at 2 to 3-week intervals. Do not apply more than 6 times per crop cycle.
	propiconazole (Banner Maxx II)	3	8 to 12 fl oz/100 gal	Apply every 30 days at the first sign of disease. For impatiens, the maximum label rate is 8 fl oz/100 gal.
	propiconazole + chlorothalonil (Concert II)	3 + M05	22 to 35 fl oz/100 gal	Apply as needed beginning when conditions are favorable for disease. Apply to full coverage to the point of drip. Do not make more than 3 applications. DO NOT use in the greenhouse.
	pyraclostrobin (Insignia) (Insignia SC Intrinsic)	11	4 to 8 oz/100 gal 3 to 6.1 fl oz/100 gal	Apply prior to onset of disease and repeat every 7 to 14 days. Do not expose flowering impatiens or flowering petunias to Insignia.
	pyraclostrobin + boscalid (Pageant Intrinsic)	11 + 7	12 to 18 oz/100 gal	Apply prior to disease development. Repeat at 7 to 10-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
	tebuconazole (Torque)	3	4 to 8 fl oz/100 gal	Begin applications 14 to 21 days prior to when disease is expected, or at very first sign of disease.
	thiophanate-methyl (various)	1	(See label)	Apply every 7 to 14 days beginning at first signs of disease. Do not apply to plug trays or seedling flats at time of seeding.
	thiophanate-methyl + mancozeb (Zyban WSB)	1 + M03	4 bags/100 gal (24 oz/100 gal)	Repeat at weekly intervals.
	triadimefon (Strike) 25WDG	3	2 to 4 oz/100 gal	Apply as needed at first sign of disease. Repeat at 14 to 21-day intervals. Not effective for powdery mildew control on verbena.
	triadimefon + trifloxystrobin (Trigo)	3 + 11	1.2 to 2.4 oz/100 gal	Winter use: 1.2 oz rate; Summer use: 2.4 oz rate.
	trifloxystrobin (Compass 50WDG)	11	1 to 2 oz/100 gal	Repeat at 7 to 14-day intervals. Rotate to another fungicide of non-strobilurin chemistry after each Compass application. Use caution when applying to petunia, violets, and New Guinea impatiens due to possible phytotoxicity.
	triflumizole (Terraguard SC, Trionic 4SC)	3	4 to 8 fl oz/100 gal	Some cultivars of impatiens have shown sensitivity. Repeat at 7 to 14-day intervals.
	triticonazole (Trinity 19SC)	3	6 to 12 fl oz/100 gal	Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. Use of an adjuvant/spreader sticker can aid in control.
***Rhizoctonia* aerial blight (*Rhizoctonia solani*)**	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	4 to 7 oz/100 gal	Apply every 7 to 14 days.
	chlorothalonil (various)	M05	(See label)	Repeat at 7 to 14-day intervals. Apply to foliage or flowers when plants are dry or nearly dry. Discontinue applications prior to bract formation on poinsettia. Avoid applications during bloom on plants where flower injury is unacceptable.
	chlorothalonil + thiophanate-methyl (Spectro 90WDG)	M05 + 1	1 to 2 lb/100 gal	Re-treat at a minimum of 7-day intervals. Applications should be made when both foliage and flowers are dry, or nearly so.
	copper octanoate (Camelot O)	M01	0.5 to 2.0 gal/A	Begin at first sign of disease and repeat at 7 to 10-day intervals. Camelot O may cause copper toxicity on some plant species. OMRI approved.
	cyprodinil + fludioxonil (Palladium WDG)	9 + 12	2 to 4 oz/100 gal	Spray on a 7 to14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different mode of action for 2 applications. Cautionary statement on label for applications to Geranium, impatiens and New Guinea impatiens. Apply when foliage and flowers are dry or nearly so.
	fludioxonil (Medallion WDG, Emblem SC, Spirato GHN)	12	(See label)	Rates vary depending on site – see label. May cause stunting or chlorosis on impatiens and New Guinea impatiens and Geranium.
	flutolanil (Contrast, Prostar 70WSP, Prostar 70WG)	7	3 to 12 oz/100 gal	Apply at 14 to 21-day intervals.
	iprodione (various)	2	(See label)	Spray plants to ensure thorough coverage. Repeat at 7 to 14-day intervals. Do not make more than 4 applications per crop per year. Do not use as a soil drench on impatiens or pothos. Do not use on *Spathiphyllum*.
	iprodione + thiophanate-methyl (26/36) (Dovetail)	2 + 1	33 to 84 fl oz/100 gal (drench) 17 to 34 fl oz/100 gal	26/36: Repeat at 7 to 14-day intervals. Dovetail: Repeat at 10 to 14-day intervals. Do not make repeat applications at the high rate on chrysanthemum. Do not use on *Spathiphyllum* or New Guinea impatiens. Residue may occur on poinsettia if treated prior to sale when in bloom.
	mancozeb (various)	M03	(See label)	Begin at first sign of disease. See label for rates and application intervals. Most effective when applied prior to infection. Not for use on marigold.
	polyoxin D zinc salt (Affirm WDG)	19	0.25 to 0.5 lb/100 gal	Apply as a foliar spray every 7 to 10 days. Apply prior to disease development and when conditions are conducive for disease. Season limits apply.
	potassium phosphite (Confine Extra, Rampart)	N/A	1 to 2 qt/100 gal (foliar) 2 qt/100 gal (root dip)	Apply at 2 to 3-week intervals. Do not apply as a foliar application to plants treated with copper-based compounds at less than 20-day intervals.
	propiconazole (Banner Maxx II)	3	5 to 8 fl oz/100 gal	Apply as needed beginning when conditions are favorable for disease. Apply to full coverage to the point of drip.
	propiconazole + chlorothalonil (Concert II)	3 + M05	22 to 35 fl oz/100 gal	Apply as needed beginning when conditions are favorable for disease. Apply to full coverage to the point of drip. Do not make more than 3 applications.
	pyraclostrobin (Empress Intrinsic) (Insignia) (Insignia SC Intrinsic)	11	1 to 6 fl oz/100 gal 8 to 16 oz/100 gal 6.1 to 9.1 fl oz/100 gal	Apply prior to onset of disease and repeat every 7 to 14 days. Do not expose flowering impatiens or flowering petunias to Insignia. For Empress Intrinsic, use 1 to 3 fl oz/100 gal in propagation and 2 to 6 fl oz/100 gal for all other plants in production
	thiophanate-methyl (various)	1	(See label)	See label for rates and application intervals. Do not apply to plug trays or seedling flats at time of seeding.

Table 10-11A. Disease Control of Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses

Disease	Pesticide and Formulation	FRAC	Rate of Formulation	Schedule and Remarks
***Rhizoctonia* aerial blight (*Rhizoctonia solani*) (continued)**	thiophanate-methyl + flutolanil (SysStar WDG)	1 + 7	4 to 8 oz/100 gal	For best results apply before disease development.
	triflumizole (Terraguard SC, Trionic 4SC)	3	4 to 8 fl oz/100 gal	Make initial application prior to or at first sign of disease. Use the higher rate under heavy disease pressure. Repeat at 7 to 14-day intervals. Some cultivars of impatiens have shown sensitivity.
***Rhizoctonia* stem and root rot (*Rhizoctonia solani*)**	azoxystrobin (Heritage WG) (Heritage SC)	11	1 to 4 oz/100 gal (directed spray); 0.2 to 1 oz/100 gal (drench) 2.0 to 7.7 fl oz/100 gal (directed spray); 0.8 to 3.8 fl oz/100 gal (drench)	Apply as a directed spray or drench treatment. Repeat at 7 to 21 days for directed spray or 7 to 28 days for drench. Do not exceed 2 oz/100 gal on impatiens.
	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	5 to 7 oz/100 gal (directed spray); 2 to 3 oz/100 gal (drench)	Apply as a directed spray every 7 to 21 days. Apply 1 to 2 pints of drench solution per square foot surface area every 7 to 28 days.
	chlorothalonil + thiophanate-methyl (Spectro 90WDG)	M05 + 1	1 to 2 lb/100 gal	Re-treat at a minimum of 7-day intervals. Applications should be made when both foliage and flowers are dry, or nearly so.
	difenoconazole + pydiflumetofen (Postiva)	3 + 7	10 to 28 fl oz/100 gal	Apply via chemigation or as a container drench. Begin applications prior to disease development and continue on a 7 to 14-day interval. Do not make more than 2 applications before switching to a fungicide that is not in Group 3 or 7.
	etridiazole + thiophanate-methyl (Banrot 40WP) (Banrot 8G)	14 + 1	4 to 8 oz or 6 to 12 oz/100 gal 8 or 16 oz/cu yd soil mix	Banrot 40WP: Use 4 to 8 oz for bedding plants or 6 to 12 oz for foliage and bedgrown plants. Apply Banrot 40WP in sufficient volume to saturate the soil mixture. Irrigate immediately. Banrot 8G: Use 8 oz per cu yd soil mix for bedding plants and 16 oz per cu yd soil mix for container and foliage plants.
	fludioxonil (Medallion WDG, Emblem SC, Spirato GHN)	12	(See label)	Rates vary depending on site – see label. May cause stunting or chlorosis on impatiens and New Guinea impatiens and Geranium.
	fludioxonil + mefenoxam (Hurricane 48 WP)	12 + 40	(See label)	Apply as a pre-potting or growing media drench per label directions. Labeled for Rhizoctonia and Phytophthora/Pythium root rots and is best used when both diseases are present or suspected.
	fluopyram + trifloxystrobin (Broadform SC)	7 + 11	2 to 8 fl oz/100 gal	Apply as a foliar spray to the point of drip every 7 to 14 days until threat of disease is over. Apply before disease is detected or when conditions are conducive. Season limits apply.
	fluoxastrobin (Disarm G) (Disarm 480SC)	11	18 oz/cu yd (soil mix) 0.15 to 0.6 fl oz/100 gal (drench or surface); 2 to 4 fl oz/100 gal (crown spray)	Apply as a surface application or incorporate into soil mixture. It may take 1 to 3 weeks for the product to translocate through the plant and provide sufficient protection. Apply as a drench every 14 to 28 days. Apply as a crown spray every 7 to 21 days.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	8 to 10 fl oz/100 gal	Apply preventatively on a 7 to 28-day interval. The crown, base of the plant and media around the crown must be thoroughly covered.
	flutolanil (Contrast, Prostar 70WSP, ProStar 70WG)	7	3 to 6 oz/100 gal	Apply drench at 2 oz per 4-inch pot. Repeat 21 to 28 days after initial application. Make no more than 4 applications per year.
	iprodione (various)	2	(See label)	Apply 1 to 2 pints per sq ft at seeding or transplanting. Repeat every 14 days. Do not make more than 6 applications per year. Do not use on *Spathiphyllum*. Do not apply as a drench on impatiens or pothos.
	iprodione + thiophanate-methyl (Dovetail, Nufarm TM + IP SPC)	2 + 1	17 to 34 fl oz/100 gal	Apply 1 to 2 pints per sq ft at seeding or transplanting. Do not apply as a drench on impatiens or pothos. Do not use on *Spathiphyllum*. Repeat every 10 to 14 days.
	PCNB (Terraclor 400)	14	(See label)	Apply as a bulb soak according to label directions.
	polyoxin D zinc salt (Affirm WDG)	19	0.25 to 0.5 lb/100 gal	Apply as a drench every 14 to 28 days.
	potassium phosphite (Confine Extra, Rampart)	N/A	1 to 2 qt/100 gal (foliar) 2 qt/100 gal (root dip)	Apply at 2 to 3-week intervals. Do not apply as a foliar application to plants treated with copper-based compounds at less than 20-day intervals.
	pyraclostrobin (Empress Intrinsic) (Insignia) (Insignia SC Intrinsic)	11	1 to 6 fl oz/100 gal 8 to 16 oz/100 gal 6.1 to 9.1 fl oz/100 gal	Apply prior to onset of disease and repeat every 7 to 14 days. Do not expose flowering impatiens or flowering petunias to Insignia. For Empress Intrinsic, use 1 to 3 fl oz/100 gal in propagation and 2 to 6 fl oz/100 gal for all other plants in production
	pyraclostrobin + boscalid (Pageant Intrinsic)	11 + 7	12 to 18 oz/100 gal	Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
	thiophanate-methyl (various)	1	(See label)	See label for rates and application intervals. Do not apply to plug trays or seedling flats at time of seeding.
	thiophanate-methyl + flutolanil (SysStar WDG)	1 + 7	2 to 4 oz/100 gal	Apply according to label directions.
	trifloxystrobin (Compass 50WDG)	11	0.5 oz/100 gal	Apply as a drench to wet upper half of the growing media. Apply at seeding, again at transplanting, and at 21 to 28-day intervals thereafter. May injure petunia, violet, and New Guinea impatiens.
	triflumizole (Terraguard SC, Trionic 4SC)	3	4 to 8 fl oz/100 gal	Apply as soil drench at 2 to 4-week intervals. Use higher rate under heavy disease pressure. Some cultivars of impatiens have shown sensitivity. Irrigate well 1 day before application. Do not irrigate until 24 hours after application.
	triticonazole (Trinity 19SC)	3	8 to 12 fl oz/100 gal	Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. The crown and base of the plant and the soil or potting medium surrounding the crown must be thoroughly covered.

Table 10-11A. Disease Control of Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses

Disease	Pesticide and Formulation	FRAC	Rate of Formulation	Schedule and Remarks
Rusts (*Melampsora occidentalis*, *Phragmidium* spp., *Puccinia* spp., *Gymnosporangium* spp.)	azoxystrobin (Heritage WG) (Heritage SC)	11	1 to 4 oz/100 gal 2.0 to 7.7 fl oz/100 gal	Apply at 7 to 28-day intervals. Do not make more than 2 sequential applications of Heritage before alternating with a non-strobilurin fungicide. Not effective for rust control on Hypericum. Rotate with mancozeb or triflumizole.
	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	4 to 7 oz/100 gal (foliar); 2 to 3 oz/100 gal (drench)	Apply every 7 to 14 days for foliar applications or 7 to 28 days for drench. Do not make more than 3 sequential applications before rotating to another class of fungicide that is not Group 7 or 11.
	chlorothalonil + thiophanate-methyl (Spectro 90WDG)	M05 + 1	1 to 2 lb/100 gal	Apply when foliage and flowers are dry, or nearly dry. Re-treat at a minimum of 7-day intervals.
	chlorothalonil (various)	M05	(See label)	Repeat at 7 to 14-day intervals. Apply to foliage or flowers when plants are dry or nearly dry. Discontinue applications prior to bract formation on poinsettia. Avoid applications during bloom on plants where flower injury is unacceptable.
	fluopyram + trifloxystrobin (Broadform SC)	7 + 11	4 to 8 fl oz/100 gal	Apply as a foliar spray to the point of drip every 7 to 14 days until threat of disease is over. Apply before disease is detected or when conditions are conducive. Under heavy disease pressure, the higher rate should be used. Under light disease pressure, the application interval should be extended. Season limits apply.
	flutolanil (ProStar 70WP)	7	3 to 6 oz/100 gal	Use as foliar application and repeat every 14 to 21 days. Do not exceed 4 applications per growing season. Do not make more than 2 consecutive applications before switching to a non-Group 7 fungicide.
	fluoxastrobin (Disarm G) (Disarm 480SC)	11	18 oz/cu yd (soil mix) 1 to 4 fl oz/100 gal	Apply as a surface application or incorporate into soil mixture. It may take 1 to 3 weeks for the product to translocate through the plant and provide sufficient protection. Apply as a foliar spray every 7 to 28 days.
	fluoxastrobin + myclobutanil (Disarm M)	11 + 40	3 to 11 fl oz/ 100 gal	Apply every 7 to 28 days.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	4 to 11 or 6 to 8 fl oz/100 gal	Apply on a 7 to 14-day interval. Rate depends on the species of powdery mildew present – check label.
	mancozeb (various)	M03	(See label)	Begin at first sign of disease. See label for rates and application intervals. Most effective when applied prior to infection. Not for use on marigold.
	mefentrifluconazole (Avelyo)	3	8 to 10 fl oz/100 gal	Suppression only. Apply on a 7 to 14-day interval. Do not make more than 2 applications before switching to a non-Group 3 fungicide.
	metconazole (Tourney)	3	1 to 4 oz/100 gal	Apply on a 14 to 28-day interval.
	myclobutanil (Eagle 20EW) (Eagle 40WP)	3	 6 to 12 fl oz/100 gal 3 to 6 oz/100 gal	Apply on a protectant application schedule at 10 to 14-day intervals. See label for rates to control white rust on chrysanthemum.
	neem oil (Triact 70)	N/A	1 gal/100 to 200 gal	Apply at 7 to 14-day spray intervals. Trial first on open blooms. To control existing disease, apply on a 7-day schedule until disease pressure is eliminated. Not for impatiens, carnation, or hibiscus.
	oxycarboxin (Plantvax 75W)	7	16 to 24 oz/100 gal	Apply at first sign of disease. Repeat at 2-week intervals for a maximum of 2 to 4 applications per season.
	propiconazole (Banner Maxx II)	3	5 to 8 fl oz/100 gal	Apply as needed beginning when conditions are favorable for disease. Apply to full coverage to the point of drip.
	propiconazole + chlorothalonil (Concert II)	3 + M05	22 to 35 fl oz/100 gal	Apply as needed beginning when conditions are favorable for disease. Apply to full coverage to the point of drip. Do not make more than 3 applications. DO NOT use in the greenhouse.
	pyraclostrobin (Insignia) (Insignia SC Intrinsic)	11	 4 to 16 oz/100 gal 3 to 12.2 fl oz/100 gal	Apply prior to onset of disease and repeat every 7 to 14 days. Do not expose flowering impatiens or flowering petunias to Insignia. Rates depend on the genus of rust.
	pyraclostrobin + boscalid (Pageant Intrinsic)	11 + 7	6 to 18 oz/100 gal	Apply prior to disease development. Repeat at 7 to 10-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur. Rates differ among rust species – check label.
	thiophanate-methyl (various)	1	(See label)	See label for rates and application intervals. Do not apply to plug trays or seedling flats at time of seeding.
	triadimefon (Strike 25WDG)	3	2 to 4 oz/100 gal	Spray to the point of drip as needed.
	triadimefon + trifloxystrobin (Armada 50WP, Armada 50WDG, Strike Plus)	3 + 11	 3 to 9 oz/100 gal	See label for application limits.
	trifloxystrobin (Compass 50WDG)	11	2 to 4 oz/100 gal	Apply at 7 to 14-day intervals. Apply to the point of drip. Repeat at 7 to 14-day intervals.
	triflumizole (Terraguard SC, Trionic 4SC)	3	2 to 8 fl oz/100 gal	Apply prior to, or at first sign of disease. Repeat at 7 to 14-day intervals.
Scab, Poinsettia *(Sphaceloma)*	azoxystrobin (Heritage WG) (Heritage SC)	11	1 to 4 oz/100 gal 2.0 to 7.7 fl oz/100 gal	Apply at 10 to 28-day intervals. Test for phytotoxicity prior to treating entire crop. Do not make more than 3 sequential applications of Heritage before alternating with a non-strobilurin fungicide.
	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	4 to 7 oz/100 gal	Apply every 7 to 14 days. Do not make more than 3 sequential applications before rotating to another class of fungicide that is not Group 7 or 11.
	copper sulfate pentahydrate (Phyton 27)	M01	2.0 to 3.5 oz/100 gal	Apply at 7-day intervals.
	fluopyram + trifloxystrobin (Broadform SC)	7 + 11	4 to 8 fl oz/100 gal	Apply as a foliar spray to the point of drip every 7 to 14 days until threat of disease is over. Apply before disease is detected or when conditions are conducive. Under heavy disease pressure, the higher rate should be used. Under light disease pressure, the application interval should be extended. Season limits apply.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	8 to 10 fl oz/100 gal	Apply preventatively on a 7 to 14-day interval.

Table 10-11A. Disease Control of Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses

Disease	Pesticide and Formulation	FRAC	Rate of Formulation	Schedule and Remarks
Scab, Poinsettia *(Sphaceloma)* (continued)	mancozeb (various)	M03	(See label)	Begin at first sign of disease. See label for rates and application intervals. Most effective when applied prior to infection. Not for use on marigold.
	myclobutanil (Eagle 20EW) (Eagle 40WP)	3	 6 to 12 fl oz/100 gal 3 to 6 oz/100 gal	Retreat at 10 to 14-day intervals.
	propiconazole + chlorothalonil (Concert II)	3	22 to 35 fl oz/100 gal	Apply as needed beginning when conditions are favorable for disease. Apply to full coverage to the point of drip. Do not make more than 3 applications. DO NOT use in the greenhouse.
	pyraclostrobin + boscalid (Pageant Intrinsic)	11	6 to 12 oz/100 gal	Apply on a 7 to 10-day interval.
	triticonazole (Trinity 19SC)	3	6 to 12 fl oz/100 gal	Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development.
	trifloxystrobin (Compass 50WDG)	11	2 to 4 oz/100 gal	Apply to the point of drip. Repeat at 7 to 14-day intervals.
Sclerotinia* blight *(Sclerotinia sclerotiorum)	azoxystrobin (Heritage WG) (Heritage SC)	11	1 to 4 oz/100 gal (directed spray); 1 oz/100 gal (drench) 2.0 to 7.7 fl oz/100 gal (directed spray); 0.8 to 3.8 fl oz/100 gal (drench)	Apply as a directed spray every 7 to 21 days. Apply as a drench every 7 to 28 days. Do not make more than 3 sequential applications before alternating with a fungicide of a different mode of action.
	azoxystrobin + benzovindiflupyr (Mural WG)	11 + 7	5 to 7 oz/100 gal (directed spray)	Apply as a directed spray every 7 to 21 days.
	chlorothalonil + thiophanate-methyl (Spectro 90WDG)	M05 + 1	1 to 2 lb/100 gal	Re-treat at a minimum of 7-day intervals. Applications should be made when both foliage and flowers are dry, or nearly so.
	cyprodinil + fludioxonil (Palladium WDG)	9 + 12	2 to 6 oz/100 gal	Spray on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different mode of action for 2 applications.
	difenoconazole + pydiflumetofen (Postiva)	3 + 7	10 to 28 fl oz/100 gal	Apply via chemigation or as a container drench. Begin applications prior to disease development and continue on a 7 to 14-day interval. Do not make more than 2 applications before switching to a fungicide that is not in Group 3 or 7.
	fluoxastrobin + myclobutanil (Disarm M)	11 + 3	6 to 11 fl oz/100 gal	Apply on a 7 to 21-day interval. Season limits apply.
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	7 + 11	8 to 10 fl oz/100 gal	Apply preventatively on a 7 to 28-day interval.
	iprodione + thiophanate-methyl (26/36) (Dovetail)	2 + 1	13.5 fl oz/100 gal (drench) 17 to 34 fl oz/100 gal	26/36: Repeat at 14-day intervals. Dovetail: Repeat at 10 to 14-day intervals. Do not drench impatiens, petunia, or pothos. Do not make repeat applications at the high rate on chrysanthemum. Do not use on *Spathiphyllum* or New Guinea impatiens.
	pyraclostrobin (Empress Intrinsic)	11	1 to 6 fl oz/100 gal (See label)	Apply at 1 to 3 fl oz for plants in propagation, rooted cuttings, plugs and seedlings and at 2 to 6 fl oz to all other plants. Do not apply to dry soil media. Apply preventative to disease with sequential at 7 to 28 days after the first application if needed.
	pyraclostrobin + boscalid (Pageant Intrinsic)	11 + 7	12 to 18 oz/100 gal	Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
	PCNB (Terraclor 400)	14	(See label)	Apply as a bulb soak according to label directions.
	triticonazole (Trinity 19SC)	3	8 to 12 fl oz/100 gal	Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. The stem areas of the plant must be thoroughly covered using spray to runoff.
Southern blight (*Athelia rolfsii* = *Sclerotium rolfsii*)	cyprodinil + fludioxonil (Palladium WDG)	9 + 12	2 to 6 oz/100 gal	Spray on a 7 to 14-day interval while conditions are conducive to disease development. Ensure full coverage of stems, inner plant parts, and down to the soil/media.
	fluoxastrobin (Disarm G) (Disarm 480SC)	11	18 oz/cu yd (soil mix) 0.15 to 0.6 fl oz/100 gal (drench or surface); 2 to 4 fl oz/100 gal (crown spray)	Apply as a surface application or incorporate into soil mixture. It may take 1 to 3 weeks for the product to translocate through the plant and provide sufficient protection. Apply as a drench every 14 to 28 days. Apply as a crown spray every 7 to 21 days.
***Thielaviopsis* Root Rot:** *See* **Black root rot.**				

Table 10-11B. Efficacy of Products for Disease Control in Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses, Nurseries, and Landscapes

Site use: G=Greenhouse, N=Nursery, L=Landscape; Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

Product	Active ingredient	Fungicide group (FRAC)	Site use	Bacterial spots, blights	Black root rot	*Botrytis*	Bulb and corm rots (*Fusarium*, *Penicillium*)	Downy mildew	Fungal leaf spots (various)	*Fusarium*	*Myrothecium*	*Phytophthora* aerial blight	*Phytophthora* root/ crown rot	Powdery mildew	*Pythium* root rot	*Rhizoctonia* (stem and root rot)	Rust	White mold (*Sclerotinia*)
generic (e.g., Cleary 3336DG/EG/F, T-Bird, T-Methyl)	Thiophanate methyl	1	G, N, L	NC	G	F	P-G	F-G	NA	G	P-F	NC	NC	G	NC	G	G	NC
26/36 Fungicide, Dovetail	Thiophanate methyl + Iprodione	1+2	G, N, L	NC	G	F	ND	NC	NA	G	NC	NC	NC	NC	G-E	E	NC	NC
SysStar WDG	Thiophanate methyl + Flutolanil	1+11	G, N, L	NC	ND	ND	ND	NC	NA	ND	ND	ND	NC	ND	NC	NC	NC	NC
Banrot	Thiophanate methyl + Etridiazole	1+14	G, N, L	NC	G	NC	ND	NC	NA	NC	NC	NC	NC	NC	ND	F	NC	NC
Zyban	Thiophanate methyl + Mancozeb	1+M03	G, N, L	NC	NC	NC	ND	NC	ND	NC	NC	NC	NC	G	NC	NC	NC	NC
Consyst, Peregrine, Spectro 90	Thiophanate methyl + Chlorothalonil	1+M05	G, N, L	NC	NC	F	ND	NC	ND	F	NC	G	NC	F	G-E	NC	G	G
generic (e.g., 18 Plus, Chipco 26019, Iprodione Pro, Raven)	Iprodione	2	G, N, L	NC	NC	G	ND	F-G	E	G	F-G	NC	NC	NC	NC	G	NC	G
Avelyo	Mefentrifluconazole	3	G, N	NC	F-G	ND	F-G	NC	G-E	ND	G	NC	NC	E	NC	G-E	ND	ND
Banner Maxx, Strider, Fathom	Propiconazole	3	N, L	NC	NC	NC	ND	NC	ND	G	G	NC	NC	E	NC	NC	G	NC
Bayleton 50, Strike 25WDG	Triadimefon	3	L	NC	NC	NC	ND	NC	ND	NC	NC	NC	NC	G	NC	F	G	NC
Eagle 20EW/40WP	Myclobutanil	3	G, N, L	NC	NC	NC	ND	NC	ND	P-F	F-G	NC	NC	E	NC	G	G-E	NC
Terraguard, Trionic 4SC	Triflumizole	3	G, N, L	NC	G	NC	ND	NC	ND	F-G	G	NC	NC	G	NC	F-G	G	NC
Torque	Tebuconazole	3	N, L	NC	NC	F*	P	NC	E	P	NC	NC	NC	ND	NC	NC	ND	NC
Tourney	Metconazole	3	N, L	NC	ND	P*	G	NC	ND	F-G*	NC	NC	NC	G	NC	G	G	NC
Trinity, Trinity TR	Triticonazole	3	G	NC	ND	F	G	NC	G	F-G	G	NC	NC	G	NC	G	E	NC
Postiva	Difenoconazole + Pydiflumetofen	3 + 7	G, N	F-G	G	G	ND	NC	ND	F	ND	NC	NC	NC	NC	F-G	NC	ND
Trigo, Armada 50WG	Triadimefon + Trifloxystrobin	3+11	G, N	NC	NC	NC	ND	NC	ND	NC	NC	NC	NC	ND	NC	NC	ND	NC
Clevis	Myclobutanil + Mancozeb	3+M03	G, N, L	NC	NC	NC	ND	NC	ND	NC	NC	NC	NC	NC	NC	NC	NC	NC
Concert II	Propiconazole + Chlorothalonil	3+M05	N, L	NC	NC	G	ND	F-G	ND	ND	NC	NC	NC	E	NC	ND	G	NC
Subdue Maxx	Mefenoxam	4	G, N, L	NC	NC	NC	NC	E	ND	NC	NC	G-E	G	NC	G-E	NC	NC	NC
Hurricane WDG	Mefenoxam + Fludioxonil	4+12	G, N	NC	ND	NC	ND	E	ND	E	NC	G-E	F-G	NC	G-E	G	ND	NC
Pipron	Piperalin	5	G	NC	NC	NC	ND	NC	ND	NC	NC	NC	NC	NC	NC	NC	NC	NC
Prostar, Contrast	Flutolanil	7	G, N	NC	NC	NC	ND	NC	ND	NC	NC	NC	NC	NC	NC	ND	G	NC
Astun	Isofetamid	7	G,N	NC	ND	G	ND	NC	ND	ND	G	NC	NC	ND	NC	F-G	ND	ND
Pageant Intrinsic	Boscalid + Pyraclostrobin	7+11	G, N, L	NC	NC	G	ND	G	ND	F	G	ND	F	G-E	F-G	G-E	G-E	G-E
Orkestra Intrinsic	Fluxapyroxad + Pyraclostrobin	7+11	G, N, L	NC	P*	G	ND	F-G	G	F	F-G	F-G	NC	G	NC	G	ND	ND
Mural	Benzovindiflupyr + Azoxystrobin	7+11	G, N, L	NC	ND	E*	ND	G	ND	ND	G	F-G	ND	G-E	NC	G	NC	E
Compass O	Trifloxystrobin	11	G, N, L	NC	NC	G	ND	G	ND	F	F-G	F-G	ND	G-E	NC	G	G-E	G
Cygnus	Kresoxym methyl	11	G, N, L	NC	NC	NC	ND	NC	ND	NC	NC	NC	NC	P	NC	NC	NC	NC

Table 10-11B. Efficacy of Products for Disease Control in Annual, Perennial, Bedding, and Flowering Potted Plants in Greenhouses, Nurseries, and Landscapes

Site use: G=Greenhouse, N=Nursery, L=Landscape; Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

Product	Active ingredient	Fungicide group (FRAC)	Site use	Bacterial spots, blights	Black root rot	*Botrytis*	Bulb and corm rots (*Fusarium*, *Penicillium*)	Downy mildew	Fungal leaf spots (various)	*Fusarium*	*Myrothecium*	*Phytophthora* aerial blight	*Phytophthora* root/ crown rot	Powdery mildew	*Pythium* root rot	*Rhizoctonia* (stem and root rot)	Rust	White mold (*Sclerotinia*)
Disarm O	Fluoxastrobin	11	G, N	NC	NC	F	ND	G	E	P	G	NC	NC	F	G	G	ND	NC
FenStop	Fenamidone	11	G	NC	NC	NC	ND	G	ND	NC	NC	F	F	NC	G	ND	NC	NC
Heritage WG/SC	Azoxystrobin	11	G, N, L	NC	ND	G -E	F-G	G	ND	G-E	E	F-G	F	G-E	G	E	G-E	G-E
Empress Intrinsic, Insignia	Pyraclostrobin	11	G, N	NC	G-E	G	ND	G	ND	E	NC	ND	F	F	G	G	G	NC
Palladium	Cyprodinil + Fludioxonil	9+12	G, N, L	NC	NC	F-G	P-F	NC	ND	F	G	NC	NC	P-F	NC	G	NC	G
generic (e.g., Medallion, Emblem, Spirato GHN)	Fludioxonil	12	G	NC	F-G	G	ND	G-E	ND	G	G-E	NC	NC	NC	NC	G-E	NC	E
Terraclor 400	PCNB	14	G, N, L	NC	ND	ND	ND	ND	ND	NC	NC	NC	NC	NC	NC	G-E	NC	G
Terrazole, Truban	Etridiazole	14	G, N, L	NC	NC	NC	ND	NC	ND	NC	NC	G-E	F -G	NC	G-E	NC	NC	NC
Decree	Fenhexamid	17	G, N	NC	NC	E	ND	F	NC	F	NC	NC	NC	G	NC	P-F	F	P-F
Affirmm	Polyoxin D zinc salt	19	G, N, L	NC	G	F	ND	G	NC	NC	NC	NC	NC	NC	NC	G	NC	NC
Segway O	Cyazofamid	21	G, N, L	NC	ND	NC	NC	E	NC	NC	NC	G-E	G	NC	P	ND	NC	NC
Agri-Mycin 17	Streptomycin	25	G, N, L	G(R)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Banol, Proplant	Propamocarb	28	G, N	NC	NC	NC	NC	F	NC	NC	NC	F-G	ND	NC	F	NC	NC	NC
Aliette WDG, Areca, Viceroy DF	Fosetyl-Al [Aluminum tris (O-etyhl phosphonate)]	P07	G, N, L	F*	NC	P-F	ND	F	NC	NC	NC	F-G	F-G	F-G	F-G	NC	NC	NC
Alude, Fosphite, Fungi-phite, K-Phite, Magellan, Phiticide, Phostrol, Reliant Resyst	Mono and dipotassium salts of phosphorous acid	P07	G, N, L	P-F	ND	P-F	ND	P	NC	NC	NC	F-G	P-F	F-G	F-G	ND	NC	NC
Confine Extra, Rampart, Vital, MilStop, Kaligreen	Potassium phosphite	P07	G, N, L	P-F	F	NC	ND	F-G	NC	NC	NC	F-G	F	NC	F-G	ND	NC	NC
Micora	Mandipropamid	40	G, N	NC	NC	NC	NC	G	NC	NC	NC	G	G	NC	P-F*	ND	NC	NC
Stature SC	Dimethomorph	40	G, N	NC	NC	NC	NC	E	NC	NC	NC	G	G	NC	NC	NC	NC	NC
Orvego	Dimethomorph + Ametoctradin	40+45	G, N	NC	NC	NC	NC	E	NC	NC	NC	G	F	NC	NC	NC	NC	NC
Adorn	Fluopicolide	43	G, N, L	NC	NC	NC	NC	E	NC	NC	NC	F-G	F-G	NC	F	NC	NC	NC
Segovis	Oxathiapiprolin	49	G, N, L	NC	NC	NC	NC	E	NC	NC	NC	E	E	NC	NC	NC	NC	NC
generic (e.g., Camelot O, CuPRO 2005/5000, Kocide 2000, Nu-Cop 50WP/50D-F/3L, Phyton 27/35, Badge SC/X2, Cuprofix Ultra)	Fixed coppers	M01	Varies; see label	G (R)	NC	F	NC	F	F	F	G	P	P	G	F-G	NC	P	NC
generic (e.g., Protect T/O, Fore Dithane, Pentathlon)	Mancozeb	M03	G, N, L	NC	NC	G	NC	F	F	NC	NC	NC	NC	F	NC	P-F	G	NC
generic (e.g., Daconil Ultrex, Echo)	Chlorothalonil	M05	G	NC	NC	G	NC	F	F	F	E	P-F	NC	ND	F-G	G	P	G-E
Junction DF/WSP	Copper hydroxide + Mancozeb	M01 + M03	G, N, L	G	NC	F	NC	F	F	NC	ND	F	NC	F-G	NC	NC	NC	NC
Broadform	Fluopyram + Trifloxystrobin	7+11	G, N, L	NC	P*	NC	ND	ND	ND	ND	G	NC	NC	NC	NC	G	NC	G
Disarm M	Fluoxastrobin + Myclobutanil	11+3	G, N, L	NC	NC	NC	ND	ND	ND	P-F	NC	NC	NC	NC	NC	NC	NC	NC

[R]Resistance observed in the pathogen to this product.

*Phytotoxicity observed in some trials on some plants.

Disease Control for Forest, Christmas, and Ornamental Trees

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Anyone using any agricultural chemical should refer to the current chemical label, which contains information about the safe and effective use of the chemical, before using the chemical.

Table 10-12. Disease Control for Forest, Christmas, and Ornamental Trees

CROP Disease	Material	Rate	Method	Schedule	Remarks
Ash					
Anthracnose	thiophanate-methyl (AllBan Flo) (Cleary 3336 F)	 10.75 to 20 fl oz/100 gal 12 to 16 fl oz/100 gal	foliar spray	Three to four applications at 14-day intervals.	FRAC GROUP 1 First application at bud break or at first sign of disease.
	chlorothalonil (Daconil Ultrex 82.5 WDG) (Daconil Weather Stick)	 1.4 lb/100 gal 1 3/8 pt /100 gal	 foliar spray foliar spray	Repeat in 7 to 14 days when conditions favor disease.	
	metconazole (Tourney)	1 to 4 oz/100 gal	foliar spray	Repeat in 14 to 28 days when conditions favor disease.	FRAC GROUP 3
	fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	foliar spray	Repeat in 7 to 14 days when conditions favor disease.	FRAC GROUP 7 + 11
	mancozeb (Dithane 75DF Rainshield)	1 to 2 lb/100 gal	foliar spray	Repeat at 7 to 10-day intervals.	FRAC GROUP M3 Begin at first sign of disease.
	pyraclostrobin (Insignia)	8 to 16 oz/100gal	foliar spray	Repeat at 7 to 14-day intervals as needed.	FRAC GROUP 11 Use for preventative applications only. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
	pyraclostrobin + boscalid (Pageant Intrinsic)	18 oz./100 gal	foliar spray	Repeat applications every 7 to14 days as needed.	FRAC GROUP 11 + 7
	pyraclostrobin + fluxapyroxad (Orkestra)	8 to 10 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 11 + 7
	mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3. Label indicates not yet tested on Ash-check for phytotoxicity prior to full tree/planting application.
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
	tebuconazole (Torque)	4 to 10 fl oz/100 gal	foliar spray	Begin applications 14 to 21 days prior to when disease is expected, or at very first sign of disease.	FRAC GROUP 3
Powdery mildew	mefentrifluconazole (Avelyo)	8 to 10 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3. Not tested on Ash-check for phytotoxicity prior to full tree/planting application.
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
	fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	foliar spray	Repeat in 7 to 14 days when conditions favor disease.	FRAC GROUP 7 + 11
	propiconazole (Banner Maxx II)	5 to 8 fl oz/100 gal	foliar spray	Repeat applications every 14 to 21 days during times of growth.	FRAC GROUP 3
Crabapple					
Fire blight	copper octanoate (Cueva)	2 to 3 qt/A	foliar spray	Repeat applications every 7 to 10 days until approximately 1 month after petal fall.	FRAC GROUP M1 Can be phytotoxic after bud break. OMRI approved.
	copper hydroxide (Nu-Cop 50WP)	0.5 lb/100 gal	foliar spray	Repeat applications every 7 to 10 days until approximately 1 month after petal fall.	FRAC GROUP M1 Can be phytotoxic after bud break.
	streptomycin (Agri-mycin 17)	50 to 100 ppm	foliar spray	Three to five applications starting at 20% to 30% bloom. Refer to forecasting models.	FRAC GROUP 25 Spray every 10 to 14 days.
Rusts (cedar apple rust, quince rust, hawthorn rust)	mancozeb (Dithane 75DF, Rainshield)	1 to 2 lb/100 gal	foliar spray	Repeat at 7 to 10-day intervals.	FRAC GROUP M3 Begin preventatively at tight cluster and continue through petal fall. Monitor throughout summer.
	myclobutanil (Eagle 20EW)	6 to 12 fl oz/A	foliar spray	Repeat at 7 to 10-day intervals.	FRAC GROUP 3 Begin preventative treatments at tight cluster stage and continue through petal fall. Monitor throughout summer.
	propiconazole (Topaz) (Banner Maxx II)	 See label 2 to 4 fl oz/100 gal	foliar spray	See label. Apply every 14 to 21 days.	FRAC GROUP 3 Begin preventative treatments at tight cluster stage and continue through petal fall. Monitor throughout summer.
	mefentrifluconazole (Avelyo)	8 to 10 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3. Suppression only.
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
	tebuconazole (Torque)	4 to 8 oz/A	foliar spray	Repeat applications every 7 to 10 days as needed.	FRAC GROUP 3 Begin preventative treatments at tight cluster/ pink stage and continue through petal fall. Monitor throughout summer.

Table 10-12. Disease Control for Forest, Christmas, and Ornamental Trees

CROP Disease	Material	Rate	Method	Schedule	Remarks
Crabapple (continued)					
Apple scab, powdery mildew	fluxapyroxad + pyraclostrobin (Orkestra)	4 to 8 fl oz/100 gal (scab) 6 to 8 fl oz/100 gal (mildew)	foliar spray	Apply every 7 to 10 days (scab). Apply every 7 to 14 days (mildew).	FRAC GROUPS 7 + 11 Begin preventative treatments starting at tight cluster and continue through petal fall. Do not make more than 2 consecutive applications before switching to a non-Group 7 or non-Group 11 fungicide.
	myclobutanil (Eagle 20EW)	6 to 12 fl oz/100 gal	foliar spray	Apply every 10 to 14 days.	FRAC GROUP 3 Begin preventative treatments starting at tight cluster and continue through petal fall. Monitor for disease throughout summer.
	fluopyram + trifloxystrobin (Broadform)	2-4 fl oz/100 gal (mildew) 4 to 8 fl oz/100 gal (scab)	foliar spray	Repeat in 7 to 14 days when conditions favor disease.	FRAC GROUP 7 + 11
	propiconazole (Banner MAXX II)	2 to 4 fl oz/ 100 gal (scab) 5 to 8 fl oz/100 gal (mildew)	foliar spray	Every 14 to 21 days as needed.	FRAC GROUP 3 Begin preventative treatments starting at tight cluster and continue through petal fall. Monitor for disease throughout summer.
	chlorothalonil + propiconazole (Concert II)	9 to 35 fl oz/100 gal (see label for specific rate instructions)	foliar spray	Every 14 to 21 days.	FRAC GROUPS M5 + 3 See label for additional details.
	pyraclostrobin + boscalid (Pageant Intrinsic)	6 to 12 oz./100 gal	foliar spray	Repeat applications every 7 to10 days as needed.	FRAC GROUPS 11 + 7
	mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3..
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
	tebuconazole (Torque)	4 to 10 fl oz/100 gal	foliar spray	Begin applications 14 to 21 days prior to when disease is expected, or at very first sign of disease.	FRAC GROUP 3
	trifloxystrobin + triadimefon (Trigo)	3 to 9 oz/100 gal	foliar spray	Apply every 14 to 28 days.	FRAC GROUP 11 + 3
Crapemyrtle					
Cercospora leaf spot	azoxystrobin (Heritage)	4 oz/100 gal	foliar spray	Spray every 7 to 28 days.	FRAC GROUP 11
	azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	foliar spray	Apply every 7 to 21 days.	FRAC GROUPS 11 + 7 Do not make more than 2 sequential applications before rotating to another class of fungicide that is not Group 7 or 11.
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
	fluoxastrobin (Disarm 480SC)	1 to 4 fl oz/100 gal	foliar spray	Every 7 to 28 days.	FRAC GROUP 11
	fluxapyroxad + pyraclostrobin (Orkestra Intrinsic)	8 to 10 fl oz/100 gal	foliar spray	Apply every 7 to 14 days.	FRAC GROUPS 7 + 11
	pyraclostrobin + boscalid (Pageant Intrinsic)	8 to 12 oz./100 gal	foliar spray	Repeat applications every 7 to14 days as needed.	FRAC GROUPS 11 + 7
	mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3
	trifloxystrobin + triadimefon (Trigo)	3 to 9 oz/100 gal	foliar spray	Apply every 14 to 28 days	FRAC GROUP 11 + 3
	triticonazole (Trinity 19SC)	4 to 8 fl oz/100 gal	foliar spray	Every 7 to 14 days.	FRAC GROUP 3 Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. Use of an adjuvant/spreader sticker can aid in control.
Powdery mildew	azoxystrobin (Heritage 50)	1 to 4 oz/100 gal	foliar spray	Preventative sprays at 7 to 28-day intervals.	FRAC GROUP 11
	chlorothalonil + propiconazole (Concert II)	22 to 35 fl oz/100 gal	foliar spray	Every 14 to 21 days.	FRAC GROUPS M5 + 3 See label for details
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
	fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	foliar spray	Repeat in 7 to 14 days when conditions favor disease.	FRAC GROUP 7 + 11
	metconazole (Tourney)	1 to 4 oz/100 gal	foliar spray	Repeat in 14 to 28 days when conditions favor disease.	FRAC GROUP 3
	myclobutanil (Eagle20EW)	6 to 12 fl oz/100 gal	foliar spray	Apply at 10 to 14-day intervals.	FRAC GROUP 3
	potassium bicarbonate (MilStop)	1.25 to 5 lb/100 gal	foliar spray	Apply every 7 to 14 days.	OMRI listed
	propiconazole (Banner Maxx II)	5 to 8 fl oz/100 gal	foliar spray	See label.	FRAC GROUP 3
	pyraclostrobin + boscalid (Pageant Intrinsic)	6 to 12 oz./100 gal	foliar spray	Repeat applications every 7 to 10 days as needed.	FRAC GROUPS 11 + 7
	pyraclostrobin + fluxapyroxad (Orkestra Intrinsic)	6 to 8 fl oz/100 gal	foliar spray	Repeat applications every 7 to 14 days as needed.	FRAC GROUPS 11 + 7
	mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3
	sulfur (Micro Sulf)	3 to 10 lb/100 gal	foliar spray	Repeat every 5 to 10 days.	FRAC GROUP M2 Begin with onset of disease
	trifloxystrobin + triadimefon (Trigo)	3 to 9 oz/100 gal	foliar spray	Apply every 14 to 28 days.	FRAC GROUP 11 + 3
	triadimefon (Bayleton FLO)	See label.	foliar spray	See label.	FRAC GROUP 3

Table 10-12. Disease Control for Forest, Christmas, and Ornamental Trees

CROP Disease	Material	Rate	Method	Schedule	Remarks
Crapemyrtle (continued)					
Powdery mildew (continued)	triticonazole (Trinity 19SC)	6 to 12 fl oz/100 gal	foliar spray	Apply every 7 to 14 days.	FRAC GROUP 3 Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. Use of an adjuvant/spreader sticker can aid in control.
Root rot (*Phytophthora* spp.)	cyazofamid (Segway SC)	3 to 6 fl oz/100 gal	soil drench	14 to 21-day intervals using another registered fungicide with a different mode of action.	FRAC GROUP 21
	fosetyl-AL (Aliette WDG)	0.4 to 0.8 lb/100 gal 2.5 to 5 lb/100 gal	drench foliar	Every 30 days as necessary.	FRAC GROUP 33 Thoroughly wet plant and root mass immediately before transplanting.
	mefenoxam (Subdue MAXX)	Seedlings: 1.25 pt/50 gal 2-0 transplants: 2.5 pt/50 gal	directed soil spray over beds	See label for frequency.	FRAC GROUP 4 Apply 0.5 to 1 inch of water after application, if rain is not expected within 3 days.
	phosphorous acid (Alude, Fosphite, Reliant)	See label for rates	Apply as a soil drench or foliar spray as a preventive		FRAC GROUP 33
	oxathiapiprolin (Segovis)	See label for rates	soil drench	Repeat applications every 14 days as needed.	FRAC GROUP U15 Make no more than 2 sequential applications before rotating to a fungicide with a different mode of action. Test crop for safety prior to widespread application.
	pyraclostrobin + boscalid (Pageant Intrinsic)	12 to 18 oz/100 gal	soil drench	Repeat applications every 7 to 21 days as needed.	FRAC GROUPS 11 + 7
	pyraclostrobin + fluxapyroxad (Orkestra Intrinsic)	8 to 10 fl oz/100 gal	soil drench	Repeat applications every 7 to 28 days as needed.	FRAC GROUPS 11 + 7
Dogwood					
Anthracnose *(Discula)*	chlorothalonil (Daconil Ultrex)	1.4 lb/100 gal	foliar spray	Repeat every 7 to 14 days when conditions favor disease.	FRAC GROUP M5 Prune out all diseased tissue. Several applications in fall before leaf drop may also be advisable.
	chlorothalonil + propiconazole (Concert II)	9 to 17 fl oz/100 gal 35 fl oz/100 gal	foliar spray	Apply every 14 days. Apply every 28 days.	FRAC GROUPS M5 + 3 See label for additional details.
	chlorothalonil + thiophanate-methyl (Spectro 90WDG)	1 to 2 lb/100 gal	foliar spray	Apply every 7 to 14 days.	FRAC GROUPS M5 + 1 See label for additional details.
	mancozeb (Dithane 75DF Rainshield, Fore 80WP, Protect DF)	1 to 2 lb/100 gal (for Dithane - see labels for other formulations)	foliar spray	Spray every 10 to 14 days from bud break until mid-summer.	FRAC GROUP M3 Prune out all diseased tissue. Several applications in fall before leaf drop may also be advisable.
	mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3
	metconazole (Tourney)	1 to 4 oz/100 gal	foliar spray	Repeat in 14 to 28 days when conditions favor disease.	FRAC GROUP 3
	myclobutanil (Eagle 20EW)	6 to 12 fl oz/100 gal	foliar spray	Spray every 10 to 14 days.	FRAC GROUP 3 Prune out all diseased tissue. Several applications in fall before leaf drop may also be advisable.
	propiconazole (Banner MAXX II)	2 to 8 fl oz/100 gal	foliar spray	Apply every 14 to 28 days from bud break to mid-summer.	FRAC GROUP 3 Prune out all diseased tissue. Several applications in fall before leaf drop may also be advisable. Apply 8 fl oz/100 gal rate every 28 days, or 2 to 4 fl oz/100 gal rate every 14 days.
	tebuconazole (Torque)	4 to 10 fl oz/100 gal	foliar spray	Begin applications 14 to 21 days prior to when disease is expected, or at very first sign of disease.	FRAC GROUP 3
	thiophanate-methyl + propiconazole (Protocol)	4 to 8 fl oz/100 gal 16 fl oz/100 gal	foliar spray	Apply every 14 days. Apply every 28 days.	FRAC GROUPS 1 + 3 See label for additional application instructions.
	trifloxystrobin (Compass)	2 to 4 oz/100 gal	foliar spray	Apply every 7 to 14 days.	FRAC GROUP 11 Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
	trifloxystrobin + triadimefon (Trigo)	3 to 9 oz/100 gal	foliar spray	Apply every 14 to 28 days.	FRAC GROUP 11 + 3
Powdery mildew	azoxystrobin (Heritage 50 WG)	1 to 4 oz/100 gal	foliar spray	Spray every 7 to 28 days as needed.	FRAC GROUP 11 Do not make more than 2 sequential applications of Heritage before rotating with nonstrobilurin products to avoid fungicide resistance. See label.
	azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	foliar spray	Apply every 7 to 21 days.	FRAC GROUPS 11 + 7 Do not make more than 2 sequential applications before rotating to a non-Group 7 or non-Group 11 fungicide.
	chlorothalonil + propiconazole (Concert II)	22 to 35 fl oz/100 gal	foliar spray	Every 14 to 21 days.	FRAC GROUPS M5 + 3 See label for additional details.
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
	fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	foliar spray	Repeat in 7 to 14 days when conditions favor disease.	FRAC GROUP 7 + 11
	metconazole (Tourney)	1 to 4 oz/100 gal	foliar spray	Repeat in 14 to 28 days when conditions favor disease.	FRAC GROUP 3
	myclobutanil (Eagle 20 EW)	6 to 12 fl oz/100 gal	foliar spray	Apply every 10 to 14 days.	FRAC GROUP 3
	petroleum distillate: horticultural oil (Sunspray 11 E)	1 gal/100 gal	foliar spray	Spray at 14-day intervals.	

Table 10-12. Disease Control for Forest, Christmas, and Ornamental Trees

CROP Disease	Material	Rate	Method	Schedule	Remarks
Dogwood (continued)					
Powdery mildew (continued)	potassium bicarbonate (MilStop)	1.25 to 5 lb/A	foliar spray	Apply at 7 to 14-day intervals.	Begin applications at first sign of disease. See label for tank mixing considerations. OMRI listed.
	propiconazole (Banner MAXX II)	5 to 8 fl oz/100 gal	foliar spray	Spray every 21 days in spring.	FRAC GROUP 3
	pyraclostrobin + boscalid (Pageant Intrinsic)	6 to 12 oz/100 gal	foliar spray	Repeat applications every 7 to 14 days as needed.	FRAC GROUPS 11 + 7
	pyraclostrobin + fluxapyroxad (Mural)	6 to 8 fl oz/100 gal	foliar spray	Repeat applications every 7 to 14 days as needed.	FRAC GROUPS 11 + 7
	mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3
	sulfur (Micro Sulf)	3 to 10 lb/100 gal	foliar spray	Apply every 5 to 10 days.	FRAC GROUP M2 Begin when disease first appears
	tebuconazole (Torque)	4 to 10 fl oz/100 gal	foliar spray	Begin applications 14 to 21 days prior to when disease is expected, or at very first sign of disease.	FRAC GROUP 3
	triadimefon (Bayleton FLO)	5.5 fl oz/275 to 550 gal	foliar spray	Repeat applications as needed.	FRAC GROUP 3
	trifloxystrobin (Compass O)	1 to 2 oz/100 gal	foliar spray	Repeat at 7 to 14-day intervals.	FRAC GROUP 11 Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
	trifloxystrobin + triadimefon (Trigo)	3 to 9 oz/100 gal	foliar spray	Apply every 14 to 28 days	FRAC GROUP 11 + 3
	thiophanate-methyl + chlorothalonil (Spectro 90 WDG)	1 to 2 lb/100 gal	foliar spray	Minimum repeat interval is 7 days.	FRAC GROUPS 1 + M5 Protective and curative activity.
	thiophanate-methyl + propiconazole (Protocol)	10-16 fl oz/100 gal	foliar spray	Apply every 21 days.	FRAC GROUPS 1 + 3
	triflumizole (Terraguard SC)	16 fl oz/100 gal 4 to 8 fl oz/100 gal	foliar spray	Make initial application prior to or at first sign of disease. Repeat at 7 to 14-day intervals.	FRAC GROUP 3 Use 16 fl oz/100 gal rate only for initial application if disease is present. For subsequent and protective applications use lower rates.
	triticonazole (Trinity 19SC)	6 to 12 fl oz/100 gal	foliar spray	Spray every 7 to 14 days.	FRAC GROUP 3 Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. Use of an adjuvant/spreader sticker can aid in control.
Root rot *(Phytophthora* spp.)	cyazofamid (Segway SC)	3 to 6 fl oz/100 gal	soil drench	14 to 21-day intervals using another registered fungicide with a different mode of action.	FRAC GROUP 21
	fosetyl-AL (Aliette WDG)	2.5 lb/100 gal 2.5 to 5 lb/100 gal	drench foliar	Before transplanting. 30-day minimum interval.	FRAC GROUP 33
	mefenoxam (Subdue MAXX)	1 to 2 fl oz/100 gal 0.5 to 1 fl oz/100 gal	drench foliar	See label for application frequency.	FRAC GROUP 4 FUNGICIDE RESISTANCE IS POSSIBLE. Do not apply rates of 2 fl oz more often than every 10 weeks.
	oxathiapiprolin (Segovis)	See label	soil drench	See label.	FRAC GROUP U15 Do not make more than 2 consecutive applications before switching to a fungicide with a different mode of action.
	phosphorous acid (Fosphite, Reliant)	See label for rates	Apply as a soil drench or foliar spray as a preventive.	See label.	FRAC GROUP 33
	pyraclostrobin + boscalid (Pageant Intrinsic)	12 to 18 oz./100 gal	soil drench	Repeat applications 14 to 21 days as needed.	FRAC GROUP 11 + 7 Apply in tank mix with another effective fungicide.
Spot anthracnose *(Elsinoe)* Septoria leaf spot	azoxystrobin (Heritage)	1 to 4 oz/100 gal	foliar spray	Spray every 7 to 28 days as needed.	FRAC GROUP 11 Do not make more than 3 sequential applications of Heritage before rotating with nonstrobilurin products to avoid fungicide resistance. See label.
	azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	foliar spray	Apply every 7 to 14 days.	FRAC GROUPS 11 + 7 Do not make more than 2 sequential applications before rotating to a non-Group 7 or non-Group 11 fungicide.
	chlorothalonil (Daconil Ultrex)	1.4 lb/100 gal	foliar spray	Apply every 7 to 14 days as needed.	FRAC GROUP M5
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
	fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	foliar spray	Repeat in 7 to 14 days when conditions favor disease.	FRAC GROUP 7 + 11
	mancozeb (Dithane 75DF Rainshield, Fore 80 WP, Protect DF)	See label	foliar spray	First spray as buds break in spring. Second as petals fall. Third in midsummer. Fourth when predormant (after flower buds are well formed).	FRAC GROUP M3 See label as rate varies by product.
	myclobutanil (Eagle 20EW)	6 to 12 fl oz/100 gal	foliar spray	Spray every 10 to 14 days.	FRAC GROUP 3
	potassium bicarbonate (MilStop)	1.25 to 5 lb/100 gal	foliar spray	Apply at 7 to 14-day intervals.	Begin applications at first sign of disease. See label for tank mixing considerations. OMRI listed.

Table 10-12. Disease Control for Forest, Christmas, and Ornamental Trees

CROP Disease	Material	Rate	Method	Schedule	Remarks
Dogwood (continued)					
Spot anthracnose *(Elsinoe)* Septoria leaf spot (continued)	pyraclostrobin + boscalid (Pageant Intrinsic)	8 to 12 oz./100 gal	foliar spray	Repeat applications every 7 to14 days as needed.	FRAC GROUPS 11 + 7
	mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3
	trifloxystrobin + triadimefon (Trigo)	3 to 9 oz/100 gal	foliar spray	Apply every 14 to 28 days	FRAC GROUP 11 + 3
	tebuconazole (Torque)	4 to 10 fl oz/100 gal	foliar spray	Begin applications 14 to 21 days prior to when disease is expected, or at very first sign of disease.	FRAC GROUP 3
Eastern Cedar					
Annosus root rot (*Fomes annosus*)	See PINE				
Phomopsis needle blight	azoxystrobin (Heritage)	1 to 4 oz/100 gal	foliar spray	Spray every 7 to 28 days as needed.	FRAC GROUP 11 Do not make more than 2 sequential applications of Heritage before rotating with nonstrobilurin products to avoid fungicide resistance. See label.
	azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	foliar spray	Apply every 7 to 21 days.	FRAC GROUP 11 + 7
	pyraclostrobin + fluxapyroxad (Orkestra Intrinsic)	8 to 10 fl oz/100 gal	foliar spray	Apply every 7 to 14 days as needed.	FRAC GROUPS 11 + 7 Apply preventatively when conditions are favorable for disease development.
	thiophanate methyl (AllBan Flo) (Cleary 3336 F)	14.5 to 20 fl oz/100 gal 16 to 24 fl oz/100 gal	foliar spray	Beginning when disease appears or during suspected periods of disease incidence, apply every 7 to 14 days.	FRAC GROUP 1
Elm					
Dutch elm disease (*Ophiostoma ulmi*)	All treatments listed must be followed for effective **prevention** of disease on highly valued trees. 1. Sanitation—cut down and destroy diseased trees and dead limbs.				
	2. Elm bark beetle control.				
	3. SMDC (Vapam) - kills root grafts	1 gal SMDC/ 3 gal water 6 oz/hole	Pour in 1-in. diameter holes 15 in. deep, spaced 6 to 9 in. apart in a line between healthy and diseased trees	Apply with first appearance of disease.	Not closer than 20 ft from healthy tree. Soil temperature above 50ºF. Professional applicators only.
	4. Systemic chemical prevention: propiconazole (Alamo) thiabendazole (Arbortect 20S)	See label	root flare injection	See label.	
	5. Therapeutic treatment: propiconazole (Alamo) thiabendazole (Arbortect)	See label		See label.	
Fraser Fir					
Botrytis seedling blight	chlorothalonil (Bravo Ultrex)	1.4 to 2.5 lb/A	foliar	Apply every 7 to 14 days.	FRAC GROUP M5 Make additional applications to nursery beds when seedlings are 4 inches tall at 7 to 14-day intervals as long as favorable conditions persist.
	pyraclostrobin + boscalid (Pageant Intrinsic)	12 to 18 oz/100 gal	foliar spray	Apply every 7 to 14 days.	FRAC GROUPS 11 + 7
	pyraclostrobin + fluxapyroxad (Orkestra Intrinsic)	8 fl oz/100 gal	foliar spray	Apply every 7 to 14 days.	FRAC GROUPS 11 + 7
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
	thiophanate methyl (Cleary 3336 F)	12 to 16 fl oz/100 gal	foliar	Apply at first sign of disease.	FRAC GROUP 1 Tank mix combination with chlorothalonil is recommended.
	Isofetamid (Astun)	10 to 17 fl oz/100 gal	folia	Preventative applications every 7 to 14 days.	FRAC GROUP 7
Damping-off, post-plant	mefenoxam (Subdue MAXX) + thiophanate methyl (Cleary 3336 F)	0.25 fl oz + 12 fl oz/100 gal apply 2 pt/sq ft	drench	Apply at first sign of disease.	FRAC GROUPS 4 + 1
	metconazole (Tourney)	1 to 4 oz/100 gal	foliar spray	Repeat in 14 to 28 days when conditions favor disease.	FRAC GROUP 3
Diplodia tip blight, Lophodermium needlecast, Swiss needlecast	azoxystrobin (Heritage)	3.2 to 8 oz/A	foliar spray	Spray every 7 to 28 days.	FRAC GROUP 11 To avoid fungicide resistance, do not make more than 2 sequential applications before rotating with nonstrobilurin products.
	fluopyram + trifloxystrobin (Broadform)	13.4 fl oz/100 gal	foliar spray	Repeat in 7 to 14 days when conditions favor disease.	FRAC GROUP 7 + 11

Table 10-12. Disease Control for Forest, Christmas, and Ornamental Trees

CROP Disease	Material	Rate	Method	Schedule	Remarks
Fraser Fir (continued)					
Phytophthora root rot	cyazofamid (Segway SC)	3 to 6 fl oz/100 gal	soil drench	14 to 21-day intervals using another registered fungicide with a different mode of action.	FRAC GROUP 21 Irrigate with at least ½ inch of water if rainfall does not occur within 24 hrs. For container plants, check label for recommended maximum drench volume based on pot diameter.
	fosetyl-AL (Aliette WDG)	0.4 to 0.8 lb/100 gal 2.5 to 5 lb/100 gal/acre	drench foliar	30-day minimum interval.	FRAC GROUP 33 Thoroughly wet plant and root mass immediately before transplanting. Field-grown trees in plantations.
	mefenoxam (Subdue MAXX)	1.5 pt/acre/50 gal/ acre 2.5 pt/acre/50 gal/acre 0.63 to 1.25 gal/50 gal/ acre	drench drench directed soil spray	MAXX: Apply in May and September.	FRAC GROUP 4 Do not apply to fir growing on bottomlands or poorly drained soils, or near surface water. Seed beds or plug plantings. 2-0 transplants. Field-grown trees in plantations.
	(Subdue GR)	6 to 30 lb/acre 16 to 20 lb/acre 50 to 250 lb/acre	broadcast broadcast broadcast	GR: once in spring and again in fall.	Seed beds. 2-0 transplants. Field-grown trees in plantations. Apply 0.5 to 1 inch water after application if rain is not expected within 3 days.
	oxathiapiprolin (Segovis)	See label	foliar spray	See label.	FRAC GROUP U15 Do not make more than 2 consecutive applications before switching to non-U15 fungicide
	phosphorous acid (Fosphite, Reliant)	See label for rates	Soil drench or foliar spray.		FRAC GROUP 33 Apply as a soil drench or foliar spray as a preventive
Hemlock					
Twig rust (*Melampsora farlowii*)	triadimefon (Bayleton FLO)	5.5 fl oz/1.5 to 137.5 gal	foliar spray	Begin at bud break and continue every 14 days until growth stops.	FRAC GROUP 3
Leyland Cypress					
Needle blight (*Passalora, Cercosporidium)*	chlorothalonil (Daconil Ultrex)	1.4 lb/100 gal	foliar spray	7 to 10-day intervals.	Begin scouting last year's infection sites for sporulation (tufts of olive-green spores) in mid-May to mid-June. At the first sign of sporulation, make 2 applications of a systemic fungicide at 14-day intervals. Follow with 1 or 2 applications of a protectant fungicide (Daconil, Fore, Kocide, Badge, Rainshield) applied at 7-day intervals. In early August, scout trees for new infections. If sporulation is observed, re-treat with 1 application of a systemic fungicide 14 days later with 2 applications of a protectant applied at 7-day intervals.
	copper hydroxide (Kocide 3000)	0.75 to 1.75 lb/A	foliar spray	7 to 30-day intervals.	
	copper hydroxide + copper oxychloride (Badge SC)	3 to 6 pt/A	foliar spray	7 to 14-day intervals.	
	mancozeb (Fore 80 WP, Dithane Rainshield 75DF)	See label for rates	foliar spray	7 to 10-day intervals.	
	myclobutanil (Eagle 20EW)	6 to 12 fl oz/100 gal	foliar spray	10 to 14-day intervals.	
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
Diplodia tip blight, Lophodermium needlecast, Swiss needlecast	azoxystrobin (Heritage)	3.2 to 8 oz/acre	foliar spray	Spray every 7 to 28 days.	FRAC GROUP 11 To avoid fungicide resistance, do not make more than 2 sequential applications before rotating with nonstrobilurin products.
	azoxystrobin + benzovindiflupyr (Mural)	7 oz/100 gal	foliar spray	Spray every 7 to 21 days	FRAC GROUP 11 + 7
Longleaf Pine					
Brown spot (*Scirrhia acicola*)	Bordeaux mixture (copper sulfate, lime, and water 8-8-100)	60 gal/acre	foliar spray	Spray at 10 to 14-day interval after emergence of seedlings until July 1.	
Maple					
Anthracnose	azoxystrobin (Heritage)	1 to 4 oz/100 gal	foliar spray	Two to three applications at 7 to 28 days.	FRAC GROUP 11 First application at bud break. Do not make more than 3 sequential applications of Heritage before rotating with nonstrobilurin products to avoid fungicide resistance. See label.
	azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	foliar spray	Apply every 7 to 14 days.	FRAC GROUP 11 + 7
	chlorothalonil (Echo 720)	1.375 pt/100 gal	foliar spray	Repeat every 7 to 14 days.	FRAC GROUP M5
	fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	foliar spray	Repeat in 7 to 14 days when conditions favor disease.	FRAC GROUP 7 + 11
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
	pyraclostrobin (Insignia SC Intrinsic)	6.1 to 12.2 fl oz/100 gal	foliar spray	Apply every 7 to 14 days.	FRAC GROUP 11 Do not make more than 2 sequential applications before switching to a non-Group 11 fungicides
	pyraclostrobin + boscalid (Pageant Intrinsic)	8 to 12 oz./100 gal	foliar spray	Repeat applications 7 to14 days as needed.	FRAC GROUPS 11 + 7
	pyraclostrobin + fluxapyroxad (Orkestra Intrinsic)	8 to 10 fl oz/100 gal	foliar spray	Repeat applications 7 to14 days as needed.	FRAC GROUPS 11 + 7
	mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3
	thiophanate methyl (AllBan Flo) (Cleary 3336) F	 10.75 to 20 fl oz/100 gal 12 to 16 fl oz/100 gal	foliar spray	Three to four applications at 10 to 14-day intervals. Apply on 7 to 14-day intervals.	FRAC GROUP 1 Make first application at bud break.
	trifloxystrobin + triadimefon (Trigo)	3 to 9 oz/100 gal	foliar spray	Apply every 14 to 28 days	FRAC GROUP 11 + 3
	triticonazole (Trinity 19SC)	8 to 12 fl oz/100 gal	foliar spray	Spray every 7 to 14 days.	FRAC GROUP 3 Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development.

Table 10-12. Disease Control for Forest, Christmas, and Ornamental Trees

CROP Disease	Material	Rate	Method	Schedule	Remarks
Oak					
Anthracnose	See **Maple**				
Leaf spot	propiconazole (Banner MAXX II) Bumper ES)	16 fl oz/100 gal 6 fl oz/100 gal	foliar spray	Apply every 14 to 28 days.	FRAC GROUP 3 Apply as needed.
	copper hydroxide + copper oxychloride (Badge SC)	1.5 to 2 pt/A	foliar spray	7 to 14-day intervals.	FRAC GROUP M1 See label for use of higher rates.
	fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	foliar spray	Repeat in 7 to 14 days when conditions favor disease.	FRAC GROUP 7 + 11
	metconazole (Tourney)	1 to 4 oz/100 gal	foliar spray	Repeat in 14 to 28 days when conditions favor disease.	FRAC GROUP 3
	pyraclostrobin (Insignia SC Intrinsic)	1.5 to 6.1 fl oz/100 gal	foliar spray	Apply every 7 to 14 days.	FRAC GROUP 11 Do not make more than two sequential applications before switching to a non-Group 11 fungicide.
	pyraclostrobin + boscalid (Pageant Intrinsic)	8 to 12 oz./100 gal	foliar spray	Repeat applications 7 to14 days as needed.	FRAC GROUPS 11 + 7
	pyraclostrobin + fluxapyroxad (Orkestra)	8 to 10 fl oz/100 gal	foliar spray	Repeat applications 7 to14 days as needed.	FRAC GROUPS 11 + 7
	mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3. Not tested for tolerance on oak.
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
	triticonazole (Trinity 19SC)	See label	foliar spray	Spray every 7 to 14 days.	FRAC GROUP 3 Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. Use of an adjuvant/spreader sticker can aid in control.
Wilt *(Ceratocystis)*	propiconazole (Alamo)	See label	root flare injection	See label.	FRAC GROUP 3
Pine					
Annosus root rot (*Fomes annosus*)	Borax, dry granular (sodium tetraborate decahydrate)	1 lb/50 sq ft of stump surface OR liberally cover stump surface	sprinkle liberally on fresh-cut stump	Immediately after felling tree.	To prevent infection from freshly cut stumps.
Fusiform rust (*Cronartium fusiforme*)	triadimefon (Bayleton FLO)	5.5 fl oz/71.25 gal	foliar spray	Begin application before infection. Repeat at 2 to 3-week intervals as needed. Use higher rate in high hazard areas.	FRAC GROUP 3
	myclobutanil (Eagle 20EW)	12 to 18 fl oz/A	foliar spray	Apply at 2 to 3-week intervals.	FRAC GROUP 3 Begin applications before infection in early spring. Add spray adjuvant for enhanced disease control.
	prothioconazole (Proline 480SC)	5 fl oz/A	see label	14 to 21 days.	FRAC GROUP 3
Phytophthora root rot	cyazofamid (Segway SC)	3 to 6 fl oz/100 gal	soil drench	14 to 21-day intervals using another registered fungicide with a different mode of action.	FRAC GROUP 21 Irrigate with at least ½ inch of water if rainfall does not occur within 24 hrs. For container plants, check label for recommended maximum drench volume based on pot diameter.
	fosetyl-AL (Aliette WDG)	0.4 to 0.8 lb/100 gal 2.5 to 5 lb/acre	drench foliar	30-day minimum interval.	FRAC GROUP 33
	mefenoxam (Subdue MAXX)	See label	Can be applied as a drench or soil surface spray. Consult label for specific crops and applications.	Every 2 to 3 months.	FRAC GROUP 4 FUNGICIDE RESISTANCE IS POSSIBLE. Do not apply rates of 2 fl oz more often than every 10 weeks.
	phosphorous acid (Fosphite, Reliant)	See label for rates	Apply as a soil drench or foliar spray as a preventive.		FRAC GROUP 33
Scotch and White Pine					
Needle blight (*Lophodermium pinastri*)	mancozeb (Pentathlon DF)	1 to 2 lb/100 gal	foliar spray	Spray every 7 to 10 days August 15 to October 1.	
Sycamore					
Anthracnose	chlorothalonil (Daconil Ultrex)	1.4 lb/100 gal	foliar spray		FRAC GROUP M5 Spray at budswell and repeat at 7 to 14-day intervals during cool, moist weather.
	copper hydroxide (Kocide 3000)	0.75 to 1.25 lb/100 gal	foliar spray	7 to 10 days.	FRAC GROUP M1 Make first application at bud crack and second application 7 to 10 days later at leaf expansion.
	copper hydroxide + copper oxychloride (Badge SC)	0.75 to 2.5 pt/100 gal	foliar spray	7 to 10 days.	FRAC GROUP M1 Make first application at bud crack and second application 7 to 10 days later at leaf expansion.
	copper sulfate pentahydrate (Phyton 27)	35 fl oz/100 gal	foliar spray	7 to 10 days.	FRAC GROUP M1 Make first application at bud crack and second application 7 to 10 days later at leaf expansion.
	difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3 + 7
	fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	foliar spray	Repeat in 7 to 14 days when conditions favor disease.	FRAC GROUP 7 + 11

Table 10-12. Disease Control for Forest, Christmas, and Ornamental Trees

CROP Disease	Material	Rate	Method	Schedule	Remarks
Sycamore (continued)					
Anthracnose (continued)	mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	foliar spray	Preventative applications every 7 to 14 days.	FRAC GROUP 3. Not tested for tolerance on sycamore. Apply to small area prior to full-scale application to confirm product safety.
	metconazole (Tourney)	1 to 4 oz/100 gal	foliar spray	Repeat in 14 to 28 days when conditions favor disease.	FRAC GROUP 3
	propiconazole (Strider)	5 to 8 fl oz/100 gal	foliar spray		FRAC GROUP 3
	pyraclostrobin + boscalid (Pageant Intrinsic)	18 oz./100 gal	foliar spray	Repeat applications 7 to14 days as needed.	FRAC GROUPS 11 + 7
	thiophanate methyl + mancozeb (Zyban) 70 WSB	4 bags/100 gal	foliar spray		FRAC GROUPS 1 + M3 Spray at budswell and repeat at 7 to 14-day intervals during cool, moist weather.
	thiophanate methyl (Cleary 3336) F	12 to 16 fl oz/100 gal	foliar spray	Apply every 7 to 14 days.	FRAC GROUP 1 Spray at budswell and repeat at 7 to 14-day intervals during cool, moist weather.
	triticonazole (Trinity) 19SC	8 to 12 fl oz/100 gal	foliar spray	Spray every 7 to 14 days.	FRAC GROUP 3 Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development.
Powdery mildew	See **Crabapple**				

Commercial Landscape and Nursery Crops Disease Control

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Anyone using any agricultural chemical should refer to the current chemical label, which contains information about the safe and effective use of the chemical, before using the chemical.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Anthracnose *(Colletotrichum, Gleosporium, Elsinoe, Marssonina, Mycosphaerella,* and others)		
azoxystrobin (Heritage)	1 to 4 oz/100 gal	FRAC GROUP 11. Repeat every 7 to 28 days. Apply at the first sign of disease. Should not be applied to certain plant species; see label. Do not apply to apple or flowering cherry trees. May cause phytotoxicity on certain crabapple cultivars. See label.
azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	FRAC GROUP 11 + 7. Repeat every 7 to 14 days. Do not apply to apple or flowering cherry trees. May cause phytotoxicity on certain crabapple cultivars. Do not make more than 2 consecutive applications before switching to a non-Group 7 or a non-Group 11 fungicide.
Bacillus subtilis (Rhapsody, Cease)	2 to 8 qt/100 gal	Begin applications when conditions favor disease development prior to the onset of disease. Thorough coverage is essential. Repeat at 7-day intervals.
chlorothalonil (Daconil Ultrex, Daconil WeatherStik)	1.4 lb/100 gal 1.375 pt/100 gal	FRAC GROUP M5. Reapply at 7 to 14-day intervals.
chlorothalonil + propiconazole (Concert II)	See label	FRAC GROUP M5 + 3. Apply as a full coverage spray. Reapply at 14 to 21-day intervals. Refer to label for specific rate and application instructions.
chlorothalonil + thiophanate-methyl (Spectro) 90WDG	1 to 2 lb/100 gal	FRAC GROUP M5 + 1. Repeat applications at 7 to 21-day intervals, according to label. See label for maximum seasonal application rules.
copper hydroxide (Nu-Cop) 50DF (CuPRO 2005)	1 lb/100 gal 0.75 to 2.0 lb/100 gal	FRAC GROUP M1. Begin at first sign of disease and repeat at 7 to 21-day intervals. Do not tank mix copper formulations with Aliette. Avoid contact with metal surfaces. Discoloration of blooms may occur on certain plant varieties- check label.
copper oxychloride + copper hydroxide (Badge SC) (Badge X2)	1.5 to 6 pt/A (high) 1.5 to 2 pt/A (low) 1.5 to 5 lb/A (high) 1.5 to 2 lb/A (low)	FRAC GROUP M1. High rates should only be used during dormancy. Use lower rate (1.5 to 2 pt/A or 1.5 to 2 lb/A) when new growth is present. Repeat at 7 to 14-day intervals. Badge X2 is OMRI listed. Do not mix with Aliette.
copper hydroxide + mancozeb (Junction)	1.5 to 3.5 lb/100 gal	FRAC GROUP M1 + M3. Phytotoxicity may occur. Reapply at 7 to 14-day intervals.
copper octanoate (Camelot O)	0.5 to2.0 gal/100 gal	FRAC GROUP M1. Begin at first sign of disease and repeat at 7 to 10-day intervals. Camelot O may cause copper toxicity on some plant species.
copper sulfate pentahydrate (Phyton 27)	See label	FRAC GROUP M1. See label. To avoid phytotoxicity, do not use any copper compound on alyssum.
cyprodinil + fludioxonil (Palladium)	2 to 4 oz/100 gal	FRAC GROUPS 9 + 12. Spray on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different MOA for 2 applications
difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	FRAC GROUPS 3 + 7. Spray on a 7 to 14-day interval.
fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	FRAC GROUPS 7 + 11 Spray on 7 to 14-day interval

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Anthracnose *(Colletotrichum, Gleosporium, Elsinoe, Marssonina, Mycosphaerella,* and others) (continued)		
mancozeb	See label	FRAC GROUP M3
(Dithane 75 DF Rainshield, Fore 80 WP)		Repeat application on 7 to 10-day intervals. Use of a spreader sticker will improve performance.
(Pentathlon LF)		
(Protect DF)		Repeat application on 7 to 10-day intervals.
		Repeat application on 7 to 21-day intervals. Use of a spreader sticker will improve performance.
mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	FRAC GROUP 3
		Repeat application on 7 to 14-day intervals as needed.
metconazole (Tourney)	1 to 4 oz/100 gal	FRAC GROUP 3.
		Repeat in 14 to 28 days when conditions favor disease
polyoxin D zinc salt (Affirm)	0.25 to 0.5 lb/100 gal	FRAC GROUP 19.
		Repeat every 7 to 10 days when conditions favor disease.
propiconazole (Banner MAXX II)	2 to 4 fl oz/100 gal	FRAC GROUP 3.
		Repeat every 14 to 21 days during infection periods
pyraclostrobin (Insignia SC Intrinsic)	6.1 to 12.2 fl oz/100 gal	FRAC GROUP 11.
		Repeat every 7 to 14 days when conditions favor disease. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
pyraclostrobin + boscalid (Pageant Intrinsic)	18 oz/100 gal	FRAC GROUPS 11 + 7.
		Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
pyraclostrobin + fluxapyroxad (Orkestra Intrinsic)	8 to 10 fl oz/100 gal	FRAC GROUPS 11 + 7.
		Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. See label for sensitive plant species.
tebuconazole (Torque)	4 to 10 fl oz/100 gal	FRAC GROUP 3.
		Begin applications 14 to 21 days prior to when disease is expected, or at very first sign of disease.
thiophanate-methyl		FRAC GROUP 1.
(AllBan Flo)	10.75 to 20 fl oz/100 gal	Apply as buds break or at first sign of disease. Repeat application on 7 to 14-day intervals.
(Cleary 3336 F)	12 to 16 fl oz/100 gal	
(SysTec 1998 FL)	20 fl oz/100 gal	
thiophanate-methyl + mancozeb (Zyban WSB)	24 oz (4 bags) /100 gal	FRAC GROUPS 1 + M3.
		Apply at 7-day intervals.
triticonazole (Trinity 19SC)	8 to 12 fl oz/100 gal	FRAC GROUP 3.
		Spray every 7 to 14 days. Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development.
Bacterial Leaf Spot *(Pseudomonas, Xanthomonas)*		
Bacillus subtilis	2 to 8 qt/100 gal	FRAC GROUP BM02.
(Rhapsody, Cease)		Begin applications when conditions favor disease development prior to the onset of disease. Thorough coverage is essential. Repeat at 7-day intervals.
copper hydroxide		FRAC GROUP M1.
(Nu-Cop 50DF) (CuPRO 2005)	1 lb/100 gal 0.75 to 2.0 lb/100 gal	Begin at first sign of disease and repeat at 7 to 14-day intervals. Do not tank mix copper formulations with Aliette. Avoid contact with metal surfaces. Discoloration of blooms may occur on certain plant varieties- check label.
copper hydroxide + mancozeb (Junction)	1.5 to 3.5 lb/100 gal	FRAC GROUPS M1 + M3.
		Begin at first sign of disease and repeat at 7 to 14-day intervals.
copper oxychloride + copper hydroxide (Badge SC)		FRAC GROUP M1.
	1.5 to 6 pt/A (high)	High rates should only be used during dormancy. Use lower rate (1.5 to 2 pt/A or 1.5 to 2 lb/A) when new growth is present. Repeat at 7 to 14-day intervals. Badge X2 is OMRI listed. Do not mix with Aliette.
(Badge X2)	1.5 to 2 pt/A (low) 1.5 to 5 lb/A (high) 1.5 to 2 lb/A (low)	
copper octanoate (Camelot O)	0.5 to 2.0 gal/100 gal	FRAC GROUP M1.
		Begin at first sign of disease and repeat at 7 to 10-day intervals. Camelot O may cause copper toxicity on some plant species.
cuprous oxide	0.66 lb/100 gal	FRAC GROUP M1.
(Nordox 75WG)		Begin at first sign of disease and repeat at 7 to 14-day intervals.
copper sulfate pentahydrate (Phyton 27, Phyton 35)	See label	FRAC GROUP M1.
Black Root Rot *(Thielaviopsis basicola*)		
etridiazole + thiophanate-methyl		FRAC GROUPS 14 + 1.
(Banrot 8G)	Broadcast 8 to 12 lb/1,000 sq ft	After application, rake in or lightly cultivate soil.
(Banrot 40WP)	6 to 12 oz/100 gal	Apply in sufficient volume to saturate the soil mixture. Irrigate immediately. Repeat at 4 to 12-week intervals if necessary. Protects against *Thielaviopsis* and *Pythium* but is not as effective against *Thielaviopsis* as thiophanate-methyl-only products that have a higher concentration of active ingredient.
fludioxonil (Medallion)	1 to 2 oz/100 gal	Apply as a drench at transplanting as a preventive. If needed, re-treat transplants 21 to 28 days after initial application. Do not apply as a seed or soil drench to impatiens or New Guinea impatiens.
mefentrifluconazole (Avelyo)	2 to 3 fl oz/100 gal	FRAC GROUP 3
		Drench application
		Repeat application on 14 to 28 day interval as needed.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Black Root Rot (*Thielaviopsis basicola*) (continued)		
thiophanate-methyl (AllBan Flo) (Cleary 3336 F) (OHP 6672 50WP), (T-Storm 50WSB) (SysTec 1998 FL) (T-Storm Flowable), (OHP 6672 4.5L)	See label	FRAC GROUP 1. Apply as a heavy spray or drench at the rate of 1/2 to 2 pints per sq ft. Repeat at 4 to 8-week intervals. Apply 8 oz as a drench or directed spray after seeding or apply 12 to 16 oz after transplanting. Repeat at 21 to 28-day intervals. Apply 1 to 3 pt/sq ft after transplanting to thoroughly soak growing medium. Repeat at 21 to 28-day intervals. Apply as heavy spray or drench at a rate of 1 to 2 pints per sq ft. Repeat at 2 to 4-week intervals. Apply as heavy spray or drench at a rate of 1 to 2 pints per sq ft. Repeat at 2 to 4-week intervals.
triflumizole (Terraguard SC)	2 to 8 fl oz/100 gal	FRAC GROUP 3. Apply as soil drench at 2 to 4-week intervals. Use higher rate under heavy disease pressure. For use in greenhouses, shadehouses, and nurseries.
Black Rot of Bulb Crops *(Sclerotinia sclerotiorum)*		
PCNB (Terraclor 400) (Revere 10G)	See label	FRAC GROUP 14. Spread evenly on soil and mix into upper 6 to 7 in. of soil.
thiophanate-methyl (AllBan Flo) (Cleary 3336 F) (OHP 6672 50WP), (T-Storm 50WSB) (SysTec 1998 FL), (OHP 6672 4.5L)	 10.75 to 20 oz/100 gal 8 to 16 fl oz/100 gal 12 to 16 oz/100 gal 20 fl oz/100 gal	FRAC GROUP 1. Apply late spring or at first sign of disease. Repeat every 7 to 14 days as needed during disease period. Apply 8 oz as a drench or directed spray after seeding or apply 12 to 16 oz after transplanting. Repeat at 21 to 28-day intervals. Apply late spring or at first sign of disease. Repeat every 7 to 14 days as needed during disease period. Apply as heavy spray or drench at a rate of 1 to 2 pints per sq ft. Repeat at 2 to 4-week intervals.
difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	FRAC GROUPS 3 + 7. Apply via chemigation or as a container drench
Black Spot-Rose *(Diplocarpon rosae)*		
Bacillus subtilis (Rhapsody, Cease)	2 to 8 qt/100 gal	FRAC GROUP BM02. Begin applications when conditions favor disease development, prior to the onset of disease. Thorough coverage is essential. Repeat at 7-day intervals.
azoxystrobin (Heritage)	4 to 8 oz/100 gal	FRAC GROUP 11. Apply on 7-day interval if disease conditions are favorable. If disease is severe, mix with another registered fungicide for black spot control. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
azoxystrobin + benzovindiflupyr (Mural)	7 oz/100 gal	FRAC GROUPS 11+ 7. Apply every 7 to 14 days.
captan (Captec 4L)	1 qt/100 gal	FRAC GROUP M4. Apply at first sign of disease. Repeat at 7 to 10-day intervals.
chlorothalonil (Daconil Ultrex) (Echo 90DF)	 1 lb/100 gal 0.875 lb/100 gal	FRAC GROUP M5. Apply at bud break. Repeat applications at 7 to 14-day intervals. Knock Out and Double Delight roses are sensitive to chlorothalonil.
fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	FRAC GROUPS 7 + 11 Spray on 7 to 14-day interval
difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	FRAC GROUPS 3 + 7. Spray on a 7 to 14-day interval.
mancozeb (Protect DF)	1 to 2 lb/100 gal	FRAC GROUP M3. Apply every 7 to 21 days.
myclobutanil (Eagle 20EW)	6 to 12 fl oz	FRAC GROUP 3. Apply on 7 to 10-day protectant schedule. Some greenhouse varieties are sensitive to myclobutanil.
paraffinic oil (Organic JMS Stylet Oil)	1 to 2 oz/gal	See label regarding application instructions and phytotoxicity warnings (with captan). OMRI listed.
propiconazole (Banner MAXX II)	5 to 8 fl oz/100 gal	FRAC GROUP 3. Apply with contact fungicide labeled for black spot.
propiconazole + chlorothalonil (Concert II)	22 to 35 fl oz/100 gal	FRAC GROUPS 3 + M5. Apply with contact fungicide labeled for black spot.
pyraclostrobin + fluxapyroxad (Orkestra Intrinsic)	8 fl oz/100 gal	FRAC GROUPS 11 + 7. Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. See label for sensitive plant species.
mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	FRAC GROUP 3 Repeat application on 7 to 14 day intervals as needed.
sulfur (Kumulus DF)	3 to 10 lb/A	FRAC GROUP M5. Apply when disease first appears and continue at 5 to 10-day intervals.
tebuconazole (Torque)	4 to 10 fl oz/100 gal	FRAC GROUP 3. Begin applications 14 to 21 days prior to when disease is expected, or at very first sign of disease.
thiophanate-methyl (AllBan Flo) (Cleary 3336 F) (OHP 6672 50WP), (T-Storm 50WSB) (SysTec 1998 FL), (T-Storm Flowable), (OHP 6672 4.5L)	 10.75 to 20 oz/100 gal 12 to 16 fl oz/100 gal 12 to 16 oz/100 gal 20 fl oz/100 gal	FRAC GROUP M5. Apply late spring or at first sign of disease. Repeat every 7 to14 days as needed during disease period. Apply late spring or at first sign of disease. Repeat every 7 to 14 days as needed during disease period. Apply as heavy spray or drench at a rate of 1 to 2 pints per sq ft. Repeat at 2 to 4-week intervals.
Thiophanate-methyl + chlorothalonil (Spectro 90WDG)	1 to 1.5 lb/100 gal	FRAC GROUPS 1 + M5. 7 to 14-day reapplication interval.
Thiophanate-methyl + propiconazole (Protocol)	10 to 16 fl oz/100 gal	FRAC GROUPS 1 + 3. Apply in tank mixture with contact fungicide registered for black spot.
thiophanate-methyl + iprodione (26/36 Fungicide)	33 to 84 fl oz/100 gal	FRAC GROUPS 1 + 12. Do not make more than 4 applications per year.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Black Spot-Rose *(Diplocarpon rosae)* (continued)		
thiophanate-methyl + mancozeb (Zyban) WSB	24 oz (4 bags)/100 gal	FRAC GROUP 1 + M3. Apply at 7-day intervals.
trifloxystrobin (Compass O)	2 to 4 oz/100 gal	FRAC GROUP 11. Apply at 7 to 14-day intervals. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
Botrytis Blight (Gray Mold)		
Bacillus subtilis (Rhapsody, Cease)	2 to 8 qt/100 gal	FRAC GROUP BM02. Begin applications when conditions favor disease development prior to the onset of disease. Thorough coverage is essential. Repeat at 7-day intervals.
azoxystrobin (Heritage)	4 to 8 oz/100 gal	FRAC GROUP 11. Apply for suppression only. Repeat at 7 to 21-day intervals. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide
azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	FRAC GROUP 11 + 7. Apply every 7 to 14 days. Do not apply to apple or flowering cherry trees. May cause phytotoxicity on certain crabapple cultivars. Do not make more than 2 consecutive applications before switching to non-Group 7 or a non-Group 11 fungicide.
copper oxychloride + copper hydroxide (Badge SC) (Badge X2)	1.5 to 6 pt/A (high) 1.5 to 2 pt/A (low) 1.5 to 5 lb/A (high) 1.5 to 2 lb/A (low)	FRAC GROUP M1. High rates should only be used during dormancy. Use lower rate (1.5 to 2 pt/A or 1.5 to 2 lb/A) when new growth is present. Repeat at 7 to 14-day intervals. May cause discoloration in some azalea varieties. Badge X2 is OMRI listed. Do not mix with Aliette.
chlorothalonil (Daconil Ultrex, Daconil)	1.4 lb/100 gal	FRAC GROUP M5. Repeat applications at 7 to 14-day intervals.
cyprodinil + fludioxonil (Palladium)	4 to 6 oz/100 gal	FRAC GROUPS 9 + 12. Spray on a 7 to14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different MOA for 2 applications. See cautionary statement on label for applications to Geraniums, Impatiens and New Guinea Impatiens.
fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	FRAC GROUPS 7 + 11 Spray on 7 to 14-day interval
difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	FRAC GROUPS 3 + 7. Spray on a 7 to 14-day interval.
fluoxastrobin (Disarm 480SC)	4 to 8 fl oz/100 gal	FRAC GROUP 11. Apply prior to infection. Repeat at 7 to 21-day intervals. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
fludioxonil (Medallion)	2 to 4 oz/100 gal	FRAC GROUP 12. Spray to runoff at 7 to 14-day intervals. Do not make more than 2 consecutive applications of Medallion before rotating to another effective product with a different mode of action.
iprodione (Chipco 26GT) (18 Plus, Iprodione Pro 2SE)	 1 to 2.5 qt/100 gal 1 to 2.5 qt/100 gal	FRAC GROUP 2. Apply at 7 to 14-day intervals. Limit total applications to a maximum of 4 per year.
iprodione + thiophanate methyl (26/36 Fungicide)	33 to 84 fl oz/100 gal	FRAC GROUP 2 + 1. Do not make more than 4 applications per year.
isofetamid (Astun)	10 to 17 fl oz/100 gal	FRAC GROUP 3 Apply at 7 to 14-day intervals
mancozeb (Dithane, Fore, Mancozeb)	1.5 lb/100 gal	FRAC GROUP M3 Addition of a nonionic surfactant will improve performance. Re-treat at 7 to 10-day intervals.
pyraclostrobin + boscalid (Pageant Intrinsic)	8 to 12 oz/100 gal	FRAC GROUP 11 + 7. Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
Cylindrocladium Stem Canker or Root Rot		
chlorothalonil (Chlorothalonil DF) (Chlorothalonil 500ZN) (Chlorothalonil 720 SFT) (Chlorostar VI, Daconil Weather Stik, Echo 720, Manicure 6F) (Daconil Ultrex) 82.5WDG (Echo) 90DF, (Echo Ultimate) (Exotherm Termil)	 See label 1.9 pt/100 gal 1.37 pt/100 gal 1 3/8 pt/100 gal 1.4 lb/100 gal 1.25 lb/100 gal 1 can/1,000 sq ft	FRAC GROUP M5. Repeat at 7 to 14-day intervals. Apply to foliage when plants are dry or nearly dry. See label for method of application.
chlorothalonil + thiophanate-methyl (Spectro) 90WDG	1.0 to 2.15 lb per 100 gallons	FRAC GROUPS M5 + 1. For best results use spray mixture the same day it is prepared. Spray uniformly over the area to be treated with a properly calibrated power sprayer, apply as a full coverage spray to run-off when conditions are favorable for disease development.
azoxystrobin + benzovindiflupyr (Mural)	5 to 7 oz/100 gal	FRAC GROUPS 11 + 7. Apply every 7 to 14 days. Do not apply to apple or flowering cherry trees. May cause phytotoxicity on certain crabapple cultivars. Do not make more than 2 consecutive applications before switching to non-Group 7 or a non-Group 11 fungicide.
cyprodinil + fludioxonil (Palladium)	2 to 4 oz/100 gal	FRAC GROUPS 9 + 12. For stem diseases ensure full spray coverage of all stems and inner areas of the plant to the soil/media. Apply on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different MOA for two applications. No drench applications on label.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Cylindrocladium Stem Canker or Root Rot (continued)		
fludioxonil (Medallion) 50WSP	1 to 2 oz/100 gal	FRAC GROUP 12 Completely drench the growing medium. Repeat at 21 to 28-day intervals. Two applications per year when conditions favor disease development are usually adequate for control.
pyraclostrobin + boscalid (Pageant Intrinsic)	8 to 12 oz/100 gal	FRAC GROUPS 11 + 7. Apply prior to disease development. Completely drench the growing medium. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray, as injury may occur.
thiophanate-methyl (AllBan Flo) (Cleary 3336) F (OHP-6672) 50WP, (T-Storm) 50WSB (SysTec 1998) FL (T-Storm Flowable), (OHP 6672) 4.5L	 7.5 to 20 fl oz/100 gal 8 to 16 fl oz/100 gal 12 to 16 oz/100 gal 10 to 20 fl oz/100 gal 20 fl oz/100 gal	FRAC GROUP 1. Apply as drench or heavy spray at 0.5 to 2 pints per sq ft. Repeat at 4 to 8-week intervals. Apply 8 oz after seeding or sticking, or 12 to 16 oz after transplanting as a drench or directed spray at a rate that thoroughly soaks the growing media through the root zone. Repeat every 21 to 28 days. Apply as a drench or heavy spray at a rate of 1 to 3 pints per sq ft. Repeat at 21 to 28-day intervals. Apply as a drench or heavy spray at a rate of 1 to 2 pints per sq ft. Repeat at 2 to 4-week intervals. Apply as a drench or heavy spray at a rate of 1 to 2 pints per sq ft. Repeat at 2 to 4-week intervals.
triflumizole (Terraguard) 50W	See label	FRAC GROUP 3. Can be used as a cutting soak or soil drench.
Daylily Leaf Streak *(Aureobasidium microstictum)*		
chlorothalonil (Daconil Ultrex) 82.5WDG	1.4 lb/100 gal	FRAC GROUP M5. Apply early in the spring as new growth emerges and before disease symptoms appear. Make 3 to 4 applications at 14-day intervals.
mancozeb (Dithane) 75 DF, (Fore) 80 WSP (Protect DF)	 1.5 lb/100 gal 1 to 2 lb/100 gal	FRAC GROUP M3. Apply early in the spring as new growth emerges and before disease symptoms appear. Make 3 to 4 applications at 14-day intervals.
thiophanate-methyl (Cleary 3336) F	12 to 16 fl oz/100 gal	FRAC GROUP 1. Apply early in the spring as new growth emerges and before disease symptoms appear. Make 3 to 4 applications at 14-day intervals.
Daylily Rust *(Puccinia hemerocallidis)*		
Alternately apply a systemic fungicide from Category 1 with a protective fungicide from Category 2 to protect new foliage as it emerges. Re-treat at 7 to 14-day intervals.		
Category 1 Systemics		
azoxystrobin (Heritage)	1 to 4 oz/100 gal	FRAC GROUP 11.
flutolanil (Contrast)	3 oz/100 gal	FRAC GROUP 7.
fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	FRAC GROUPS 7 + 11 Spray on 7 to 14-day interval
mefentrifluconazole (Avelyo)	8 to 10 fl oz/100 gal	FRAC GROUP 3 Repeat application on 7 to 14-day intervals as needed. For suppression only
triadimefon (Bayleton) (Strike) 25 WDG	 1 PVA packet/550 to 1,100 gal 4 oz/100 gal	FRAC GROUP 3. Bayleton cannot be used on plants being grown for sale or other commercial use. Strike is for commercial greenhouse and nursery use only.
mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	FRAC GROUP 3 Repeat application on 7 to 14-day intervals as needed.
trifloxystrobin (Compass)	2 to 4 oz/100 gal	FRAC GROUP 11.
Category 2 Protectants		
chlorothalonil (Daconil Ultrex)	1.4 lb/100 gal	FRAC GROUP M5.
mancozeb (Fore)	1.5 lb/100 gal	FRAC GROUP M3.
Downy Mildew *(Bremia, Pseudoperonospora, Peronospora, Plasmopara* spp.)		
azoxystrobin (Heritage)	1 to 2 oz/100 gal (bedding plants) 2 to 4 oz/100 gal (rose)	FRAC GROUP 11. Apply every 7 to 14 days prior to infection. Do not apply 2 oz rate on less than 14-day intervals. May damage snapdragons; use 1 oz rate and rotate. Apply every 7 to 21 days on rose during periods of active plant growth and prior to dormancy. Do not apply to apple, flowering cherry, or crabapple. See label.
azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	FRAC GROUP 11 + 7. Apply every 7 to 14 days. Do not make more than 2 consecutive applications before switching to a non-Group 7 or non-Group 11 fungicide. Do not apply to apple, flowering cherry, or crabapple. See label.
Bacillus subtilis (Rhapsody, Cease)	2 to 8 qt/100 gal	 FRAC GROUP BM02. Repeat at 3 to 10-day intervals. Thorough coverage is essential. Begin applications when conditions favor disease development, prior to the onset of disease.
copper hydroxide (Champ WG) (Nu-Cop) 50DF (CuPRO 2005)	 0.5 lb/100 gal 1 lb/100 gal 0.75 to 2.0 lb/100 gal	FRAC GROUP M1. Begin at first sign of disease and repeat at 7 to 14-day intervals. Do not tank mix copper formulations with Aliette. Avoid contact with metal surfaces. Discoloration of blooms may occur on certain plant varieties- check label. To avoid phytotoxicity, do not use any copper compound on alyssum.
copper oxychloride + copper hydroxide (Badge SC) (Badge X2)	 1.5 to 2 pt/A 1.5 to 2 lb/A	FRAC GROUP M1. Repeat at 7 to 14-day intervals. May cause discoloration in some azalea varieties. See label for other phytotoxicity warnings. Badge X2 is OMRI listed. Do not mix with Aliette.
copper octanoate (Camelot O)	0.5 to 2.0 gal/100 gal	FRAC GROUP M1 Begin at first sign of disease and repeat at 7 to 10-day intervals. Camelot O may cause copper toxicity on some plant species.
copper sulfate pentahydrate (Phyton 27)	See label	FRAC GROUP M1 See label. To avoid phytotoxicity, do not use any copper compound on alyssum.
cyazofamid (Segway)	2.1 to 3.5 fl oz/100 gal	FRAC GROUP 21 Apply on 14 to 21-day intervals using another registered fungicide with a different mode of action. Apply sufficient volume to wet all foliage until runoff (normally 50 to 100 gallons per acre).

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Downy Mildew *(Bremia, Pseudoperonospora, Peronospora, Plasmopara* spp.) (continued)		
dimethomorph (Stature DM)	6.4 to 12.8 oz/100 gal	FRAC GROUP 40. Apply at first sign of disease. Apply to obtain complete coverage of flowers, foliage, and stems. Repeat at 10 to 14-day intervals throughout the production cycle. For use on greenhouse and nursery-grown ornamentals.
dimethomorph + ametoctradin (Orvego)	11 to 14 fl oz/100 gal	FRAC GROUPS 40 + 45 Apply on 10 to 14-day intervals using another registered fungicide with a different mode of action. Apply sufficient volume to wet all foliage until runoff (normally 50 to 100 gallons per acre).
fosetyl-Al (Aliette) 80WDG	1.25 to 4 lb/100 gal (bedding plants) 2.5 lb/100 gal (roses)	FRAC GROUP 33. Systemic. Apply prior to disease development. Repeat as necessary, but do not make more than 1 application every 14 days.
fluoxastrobin (Disarm 480SC)	1 to 4 fl oz/100 gal	FRAC GROUP 11. Apply every 7 to 21 days. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
pyraclostrobin (Insignia)	4 to 8 oz/100 gal	FRAC GROUP 11. Apply every 7 to 14 days prior to disease development. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
mancozeb (Dithane) 75 DF (Protect DF)	 1.5 lb/100 gal 1 to 2 lb/100 gal	FRAC GROUP M3. Repeat at 7 to 10-day intervals. Reapply in 7 to 21 days.
mandipropamid (Micora)	4 to 8 fl oz/100 gal	FRAC GROUP 40. This product can also be used on vegetables sold to the retail market in GH with permanent flooring. Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications.
mefenoxam (Subdue MAXX) (Subdue Gr)	 0.5 to 1 fl oz/100 gal See label for rates	FRAC GROUP 4. Apply Subdue MAXX as a foliar spray or soil drench treatment. Apply Subdue GR as a soil surface or soil/planting media incorporation treatment.
oxathiapiprolin (Segovis)	0.6 to 2.4 fl oz/100 gal	FRAC GROUP U15. Make no more than 2 consecutive applications before switching to a non-Group 49 fungicide.
pyraclostrobin + boscalid (Pageant)	12 to 18 oz/100 gal	FRAC GROUPS 11 + 7. Use preventatively, prior to disease development on a 7 to 10-day schedule. Do not make more than 2 consecutive applications before switching to a non-Group 7 or non-Group 11 fungicide.
phosphorous acid (Alude, Reliant)	See label	FRAC GROUP 33. Apply prior to disease development. Spray to thoroughly wet all foliage. Repeat at 14 to 21-day intervals.
potassium phosphite (Vital)	4 pt/100 gal	FRAC GROUP 33. Apply as a foliar spray prior to disease onset and repeat at 14-day intervals.
pyraclostrobin + boscalid (Pageant Intrinsic)	8 to 12 oz/100 gal	FRAC GROUP 11 + 7. Apply prior to disease development. Repeat at 7 to 10-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
trifloxystrobin (Compass O) 50WDG	2 to 4 oz/100 gal	FRAC GROUP 11. Apply as a foliar spray before disease is detected or when conditions are favorable for disease. Repeat at 7 to-14-day intervals until threat of disease is over.
thiophanate-methyl + mancozeb (Zyban) WSB	24 oz (4 bags)/100 gal	FRAC GROUPS 1 + M3. Apply at first sign of disease and repeat at 7-day intervals.
Entomosporium Leaf Blight		
azoxystrobin (Heritage) 50WDG	1 to 4 oz/100 gal	FRAC GROUP 11. Spray at budbreak and repeat at 7 to 28-day intervals as needed. To avoid fungicide resistance, make no more than 3 sequential applications of Heritage before rotating with nonstrobilurin products.
copper oxychloride + copper hydroxide (Badge SC) (Badge X2)	 1.5 to 2 pt/A 1.5 to 2 lb/A	FRAC GROUP M1. Repeat at 7 to 14-day intervals. May cause discoloration in some azalea varieties. See label for other phytotoxicity warnings. Badge X2 is OMRI listed. Do not mix with Aliette.
chlorothalonil (Daconil Ultrex) 82.5 WDG	1.4 lb/100 gal	FRAC GROUP M5. Begin applications at budbreak and continue every 7 to 14 days.
chlorothalonil + propiconazole (Concert II)	22 to 35 fl oz/100 gal	FRAC GROUPS M5 + 3. Apply as a full coverage spray. Reapply at 14 to 21-day intervals. Refer to label for specific rate and application instructions.
chlorothalonil + thiophanate-methyl (Spectro 90)	1 to 2 lb/100 gal	FRAC GROUPS M5 + 1. Spray at a minimum of 7-day intervals. Apply when foliage is dry.
iprodione + thiophanate methyl (26/36 Fungicide)	33 to 84 fl oz/100 gal	FRAC GROUPS 4 + 1. Do not make more than 4 applications per year.
myclobutanil (Eagle) 20EW	 6 to 12 fl oz/100 gal	FRAC GROUP 3. Spray every 10 to 14 days.
propiconazole (Banner MAXX II)	5 to 8 fl oz/100 gal	FRAC GROUP 3.
thiophanate-methyl (3336 F)	12 to 16 oz/100 gal	FRAC GROUP 1. Apply when disease first appears and repeat every 7 to 14 days.
triadimefon (Bayleton) 50WSP (Strike) 25WDG	 1 PVA packet/137.5 to 275 gal 8 to 16 oz/100 gal	FRAC GROUP 3. In early spring as growth starts, spray every 14 to 21 days until growth is fully expanded. May be phototoxic with repeated applications. Bayleton is not for plants offered for sale or other commercial use.
triticonazole (Trinity) 19SC	12 fl oz/100 gal	FRAC GROUP 3. Spray every 7 to 14 days. Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Fire blight *(Erwinia amylovora)* **(or see section under fire blight control of crabapple)**		
copper hydroxide (Champ WG) (Nu-Cop) 50DF	0.5 lb/100 gal 1 lb/100 gal 0.75 to 2.0 lb/100 gal	FRAC GROUP M1. Begin at first sign of disease and repeat at 7 to 14-day intervals. Do not tank mix copper formulations with Aliette. Avoid contact with metal surfaces. Discoloration of blooms may occur on certain plant varieties- check label.
copper hydroxide + mancozeb (Junction)	1.5 to 3.5 lb/100 gal	FRAC GROUPS M1 + M3. See label for timing of application.
Fire blight *(Erwinia amylovora)* **(or see section under fire blight control of crabapple) (continued)**		
copper sulfate pentahydrate (Phyton 27)	See label	FRAC GROUP M1 See label. To avoid phytotoxicity, do not use any copper compound on alyssum.
fosetyl-Al (Aliette)	2.5 lb/100 gal	FRAC GROUP 33. See label for timing of application.
streptomycin sulfate (Agri-mycin 17)	0.5 lb/100 gal	FRAC GROUP 25. See label.
Flower Blight. *See* Petal Blight.		
Fungal Leaf Spots ***(Alternaria, Cercospora, Cylindrosporium, Phyllosticta, Septoria)*** **Consult product labels for specific fungi controlled**		
azoxystrobin (Heritage)	1 to 4 oz/100 gal	FRAC GROUP 11. Repeat every 7 to 28 days. Apply at the first sign of disease as new growth buds out. Do not apply to apple, flowering cherry, or crabapple. See label.
azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	FRAC GROUP 11 + 7. Apply every 7 to 21 days. Do not make more than 2 consecutive applications before switching to a non-Group 7 or non-Group 11 fungicide. Do not apply to apple, flowering cherry, or crabapple. See label.
Bacillus subtilis (Rhapsody, Cease)	2 to 8 qt/100 gal	FRAC GROUP BM02. Repeat at 3 to 10-day intervals. Thorough coverage is essential. Begin applications when conditions favor disease development, prior to the onset of disease.
Bacillus amyloliquefaciens strain D747 (DoubleNickel LC)	0.5 to 6 qt/100 gal	FRAC GROUP BM02. Begin preventative applications at plant emergence and repeat every 3 to 28 days depending on disease pressure. OMRI listed.
chlorothalonil (Daconil Ultrex) (Daconil WeatherStik)	1.4 lb/100 gal 1.375 pt/100 gal	FRAC GROUP M5. Reapply at 7 to 14-day intervals.
chlorothalonil + propiconazole (Concert II)	9 to 35 fl oz/100 gal	FRAC GROUPS M5 + 3. Apply as a full coverage spray. Reapply at 14 to 21-day intervals. Refer to label for specific rate and application instructions.
chlorothalonil + thiophanate-methyl (Spectro) 90WDG	1 to 2 lb/100 gal	FRAC GROUPS M5 + 1. Repeat applications at 7 to 21-day intervals depending on plant treated; see label.
copper hydroxide (Champ WG) (Nu-Cop) 50DF (CuPRO 2005)	0.5 lb/100 gal 1 lb/100 gal 0.75 to 2.0 lb/100 gal	FRAC GROUP M1. Begin at first sign of disease and repeat at 7 to 14-day intervals. Do not tank mix copper formulations with Aliette. Avoid contact with metal surfaces. Discoloration of blooms may occur on certain plant varieties- check label.
copper oxychloride + copper hydroxide (Badge SC) (Badge X2)	1.5 to 2 pt/A 1.5 to 2 lb/A	FRAC GROUP M1. Repeat at 7 to 14-day intervals. May cause discoloration in some azalea varieties. See label for other phytotoxicity warnings. Badge X2 is OMRI listed. Do not mix with Aliette.
copper hydroxide + mancozeb (Junction)	1.5 to 3.5 lb/100 gal	FRAC GROUPS M1 + M3. Reapply at 7 to 14-day intervals.
copper octanoate (Camelot O)	0.5 to 2.0 gal/100 gal	FRAC GROUP M1. Begin at first sign of disease and repeat at 7 to 10-day intervals. Camelot O may cause copper toxicity on some plant species.
copper sulfate pentahydrate (Phyton 27)	See label	FRAC GROUP M1.
cyprodinil + fludioxonil (Palladium)	2 to 6 oz/100 gal	FRAC GROUPS 9 + 12. Spray on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different MOA for 2 applications. Cautionary statement on label for applications to Geraniums, Impatiens and New Guinea Impatiens.
fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	FRAC GROUPS 7 + 11 Spray on 7 to 14-day interval
difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	FRAC GROUPS 3 + 7. Spray on a 7 to 14-day interval.
mancozeb (Dithane) 75 DF, (Fore) 80 WSP, Mancozeb DG) (Pentathlon LF) (Protect DF)	1.5 lb/100 gal 1.2 qt/100 gal 1 to 2 lb/100 gal	FRAC GROUP M3. Repeat application at 7 to 10-day intervals. Addition of a spreader sticker will improve performance.
metconazole (Tourney)	1 to 4 oz/100 gal	FRAC GROUP 3. Repeat in 14 to 28 days when conditions favor disease
mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	FRAC GROUP 3 Repeat application on 7 to 14-day intervals as needed.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Fungal Leaf Spots *(Alternaria, Cercospora, Cylindrosporium, Phyllosticta, Septoria)* Consult product labels for specific fungi controlled (continued)		
myclobutanil (Eagle) 40WP	3 to 6 oz/100 gal	FRAC GROUP 3. Apply as a protectant every 10 to 14 days.
potassium bicarbonate (MilStop)	1.25 to 5 lb/100 gal	Uniform and complete coverage of foliage is essential for best results. See label for special instructions regarding poinsettia, pansy, and impatiens.
pyraclostrobin (Insignia)	See label	FRAC GROUP M1 Apply prior to onset of disease and repeat every 7 to 14 days. Do not expose flowering impatiens or flowering petunias to Insignia.
pyraclostrobin + boscalid (Pageant Intrinsic)	8 to 12 oz/100 gal	FRAC GROUP 11 + 7. Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia, or impatiens in flower or wintercreeper, or nine bark to spray or drift as injury may occur.
pyraclostrobin + fluxapyroxad (Orkestra)	See label	FRAC GROUP 11 + 7. Use preventatively on 7 to 14-day intervals
tebuconazole (Torque)	4 to 8 fl oz/100 gal	FRAC GROUP 3. Begin applications 14 to 21 days prior to when disease is expected, or at very first sign of disease.
thiophanate-methyl (AllBan Flo) (Cleary's 3336 F) (SysTec 1998 FL) (Zyban WSB)	 10 to 14.5 fl oz/100 gal 12 to 16 fl oz/100 gal 20 fl oz/100 gal 24 oz (4 bags) /100 gal	FRAC GROUP 1. Apply at first sign of disease. Repeat application at 7 to 14-day intervals.
triadimefon (Bayleton, Strike)	See label	
trifloxystrobin + triadimefon (Trigo)	3 to 9 oz/100 gal	FRAC GROUP 11 + 3. Apply preventatively every 14 to 28 days
triticonazole (Trinity) 19SC	4 to 8 fl oz/100 gal	FRAC GROUP 3. Spray every 7 to 14 days. Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. Use of an adjuvant/spreader sticker can aid in control.
Fusarium Root and Crown Rot		
azoxystrobin (Heritage)	Directed spray: 1 to 4 oz/100 gal Drench: 0.2 to 0.9 oz/100 gal	FRAC GROUP 11. Repeat every 7 to 21 days. Apply 1 to 2 pt of solution per sq ft every 7 to 28 days.
cyprodinil + fludioxonil (Palladium)	2 to 4 oz/100 gal	FRAC GROUPS 9 + 12. For stem diseases ensure full spray coverage of all stems and inner areas of the plant to the soil/media. Apply on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different MOA for two applications.
difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	FRAC GROUPS 3 + 7. Apply via chemigation or as a container drench
fludioxonil (Medallion)	1 to 2 oz/100 gal	FRAC GROUP 12. Wet entire medium. Reapply at 21 to 28-day intervals. May cause phytotoxicity when applied to impatiens, New Guinea impatiens, and geraniums.
thiophanate-methyl (AllBan Flo) (Cleary's 3336 G) (Cleary 3336 F) (SysTec 1998 FL)	 7.5 to 20 fl oz/100 gal 22 to 30 lb/1,000 sq ft Drench: 8 to 16 fl oz/100 gal 10 to 20 fl oz/100 gal	FRAC GROUP 1. Apply as drench or heavy spray after transplanting. Repeat at 2 to 4-week intervals. For preventative control, incorporate into media prior to planting or as a broadcast, or make an over the top application after seeding or transplanting. For curative control, apply when disease first appears. Repeat every 21 to 28 days. Apply after seeding or transplanting at a rate to thoroughly soak growing medium. Repeat every 21 to 28 days. Apply as drench or heavy spray after transplanting. Repeat at 2 to 4-week intervals.
pyraclostrobin (Empress Intrinsic)	1 to 6 fl oz/100 gal (see label)	FRAC GROUPS 11. Apply at 1 to 3 fl oz for plants in propagation, rooted cuttings, plugs, and seedlings and at 2 to 6 fl oz to all other plants. Do not apply to dry soil media.
pyraclostrobin + boscalid (Pageant Intrinsic)	12 to18 oz/100 gal	FRAC GROUPS 11 + 7. Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia, or impatiens in flower or wintercreeper, or nine bark to spray or drift as injury may occur.
Streptomyces griseoviridis (Mycostop)	See label	FRAC GROUP BM02. Apply inoculant as a seed dressing, soil drench spray, or transplant dip. Must be applied prior to onset of disease. See label.
triflumizole (Terraguard) 50W	4 to 8 oz/100 gal	FRAC GROUP 3. Apply soil drenches at weekly intervals. Use higher rate under heavy disease pressure.
triticonazole (Trinity) 19SC	8 to 12 fl oz/100 gal	FRAC GROUP 3. Apply every 7 to 14 days. Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. The stem areas of the plant must be thoroughly covered using spray to runoff.
Gray Mold. *See* Botrytis Blight.		
Iris Leaf Spot *(Didymellina macrospora/Mycosphaerella macrospora)*		
azoxystrobin (Heritage)	2 to 4 oz/100 gal	FRAC GROUP 11. Every 7 to 21 days.
azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	FRAC GROUPS 11 + 7. Apply every 7 to 21 days. Do not make more than 2 consecutive applications before switching to a non-Group 7 or non-Group 11 fungicide.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Iris Leaf Spot *(Didymellina macrospora/Mycosphaerella macrospora)* (continued)		
chlorothalonil		FRAC GROUP M5.
(Daconil Ultrex)	1.4 lb/100 gal	Apply to new growth at 7 to 14-day intervals in spring.
(Daconil WeatherStik)	1.375 pt/100 gal	
difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	FRAC GROUPS 3 + 7. Spray on a 7 to 14-day interval.
mancozeb		FRAC GROUP M3.
(Dithane) 75 DF, (Fore) 80 WSP, Mancozeb DG)	1.5 lb/100 gal	Addition of a spreader sticker will improve performance.
(Pentathlon LF)	0.8 to 1.6 qt/100 gal	Repeat applications on 7 to 10-day intervals.
(Protect DF)	1 to 2 lb/100 gal	Apply at 7 to 21-day intervals.
mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	FRAC GROUP 3 Repeat application on 7 to 14 day intervals as needed. Tolerance to iris not specifically mentioned on label. Test a small area prior to a large-scale application.
myclobutanil		FRAC GROUP 3.
(Eagle) 20EW	12 fl oz/100 gal	
(Eagle) 40WP	6 oz/100 gal	
pyraclostrobin (Insignia)	2 to 8 oz/100 gal	FRAC GROUP 11. Apply preventatively on a 7 to 14-day application interval. Do not make more than 2 consecutive applications before switching to a non-Group 7 or non-Group 11 fungicide.
thiophanate-methyl (Incognito 85WDG)	7.2 to 9.6 oz/100 gal	FRAC GROUP 1. Apply every 7 to 14 days prior to or immediately at the onset of disease.
Kabatina Twig Blight		
thiophanate-methyl	16 to 24 fl oz/100 gal	FRAC GROUP 1.
(Cleary 3336) F		Apply at 7 to 14-day intervals. Disease not easily controlled. Fall applications may reduce disease the following year.
Leaf and Flower Gall *(Exobasidium* ssp.)		
triadimefon		FRAC GROUP 3.
(Bayleton) 50WSP	1 PVA packet (11 oz/550 gal)	Begin applications at bud break and apply at 10-day intervals. Bayleton cannot be used on plants grown for sale or other commercial use. Strike is for use in commercial nurseries, garden centers, and greenhouses only.
(Strike) 25W	4 oz/100 gal	
ferbam (Granuflo)	1 to 1.5 lb/100 gal	FRAC GROUP M3. Apply to plants, flowers, and litter around plants at 3 to 4-day intervals during bloom.
Petal or Flower Blight of Azalea, Rhododendron, or Camellia (*Ovulinia ssp., Ciborinia camelliae, Sclerotinia camelliae*)		
mancozeb		FRAC GROUP M3.
(Dithane) 75 DF, (Fore) 80 WSP, (Mancozeb DG)	1.5 lb/100 gal	Beginning when flowers start to show color, spray 2 or 3 times each week during bloom. Direct spray into flowers and thoroughly spray ground under bushes.
(Protect DF)	1 to 2 lb/100 gal	
myclobutanil		FRAC GROUP 3.
(Eagle) 40WP	3 to 6 oz/100 gal	Beginning when flowers start to show color, spray every 10 to 14 days.
propiconazole (Banner MAXX II)	5 to 8 fl oz/100 gal	FRAC GROUP 3. Spray every 21 days during bloom.
tebuconazole (Torque)	4 to 8 fl oz/100 gal	FRAC GROUP 3. Apply 2 to 3 times per week into the flowers as they open and develop.
thiophanate-methyl (AllBan Flo) (Cleary 3336) F (OHP 6672) 50WP, (T-Storm) 50WSB (SysTec 1998) FL, (T-Storm Flowable), OHP 6672 (4.5L)	 10.75 to 20 oz/100 gal 8 to 16 fl oz/100 gal 8 to 16 oz/100 gal 20 fl oz/100 gal	FRAC GROUP 1. Apply as flowers open. Repeat every 7 to 14 days.
triadimefon		FRAC GROUP 3.
(Bayleton) 50WSP	1 PVA packet (11 oz/137.5 to 275 gal)	Make 1 application as first flower buds show color. Spray later varieties as they show color at 7 to 14-day intervals.
(Strike) 25WDG	8 to 16 oz/100 gal	Bayleton cannot be used on plants being grown for sale or other commercial use. Strike is for use in commercial nurseries, garden centers, and greenhouses only.
Phomopsis Twig Blight		
azoxystrobin (Heritage)	1 to 4 oz/100 gal	FRAC GROUP 11. Apply at the first sign of disease, as new growth buds out. Repeat every 7 to 28 days.
azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	FRAC GROUP 11 + 7. Apply every 7 to 21 days. Do not make more than 2 consecutive applications before switching to a non-Group 7 or non-Group 11 fungicide. Do not apply to apple, flowering cherry, or crabapple. See label.
copper oxychloride + copper hydroxide (Badge SC) (Badge X2)	 1.5 to 2 pt/A 1.5 to 2 lb/A	FRAC GROUP M1. Repeat at 7 to 14-day intervals. May cause discoloration in some azalea varieties. See label for other phytotoxicity warnings. Badge X2 is OMRI listed. Do not mix with Aliette.
cyprodinil + fludioxonil (Palladium)	2 to 4 oz/100 gal 2 to 4 oz/100 gal 2 to 4 oz/100 gal	FRAC GROUP 9 + 12. For stem diseases ensure full spray coverage of all stems and inner areas of the plant to the soil/media. Apply on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different MOA for two applications.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Phomopsis Twig Blight (continued)		
mancozeb		FRAC GROUP M3.
(Dithane) 75 DF, (Fore) 80 WSP, (Mancozeb DG)	1.5 lb/100 gal	Addition of a spreader sticker will improve performance. Repeat application on 7 to 10-day intervals.
(Pentathlon LF)	0.8 to 1.6 qt/100 gal	
(Protect DF)	1 to 2 lb/100 gal	
mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	FRAC GROUP 3 Repeat application on 7 to 14 day intervals as needed.
propiconazole	5 to 8 fl oz/100 gal	FRAC GROUP 3.
(Banner MAXX II)		For junipers, make first application as soon as new growth is observed. Repeat application every 14 to 21 days during period of active plant growth.
pyraclostrobin + boscalid (Pageant Intrinsic)	8 to 12 oz/100 gal	FRAC GROUPS 11 + 7. Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia, or impatiens in flower or wintercreeper, or nine bark to spray or drift as injury may occur.
pyraclostrobin + fluxapyroxad (Orkestra)	8 to 10 fl oz/100 gal	FRAC GROUPS 11 + 7. Apply prior to disease development. Repeat at 7 to 14-day intervals.
thiophanate-methyl		FRAC GROUP 1.
(AllBan Flo)	14.5 to 20 fl oz/100 gal	Repeat at 10 to 14-day intervals.
(Cleary 3336) F	16 to 24 fl oz/100 gal	
(T-Storm) 50WSB	24 oz/100 gal	Apply when symptoms first appear. Re-treat every 7 to 14 days as needed during disease period.
(SysTec 1998) FL, (T-Storm Flowable), OHP 6672 (4.5L)	20 fl oz /100gal	Apply in spring; repeat every 7 to 10 days.
thiophanate-methyl + mancozeb (Zyban)	6 bags (36 oz/75 gal)	FRAC GROUPS 1 + M3. Apply at 7 to 10-day intervals.
Phytophthora and Pythium Root Rot		
cyazofamid (Segway)	3 to 6 fl oz/100 gal	FRAC GROUP 21 Apply at 14 to 21-day intervals using another registered fungicide with a different mode of action. Irrigate with at least ½ inch of water if rainfall does not occur within 24 hrs. For container plants, check label for recommended maximum drench volume based on pot diameter.
azoxystrobin + benzovindiflupyr (Mural)	3 oz/100 gal	FRAC GROUPS 11 + 7. Apply 1 to 2 pints of drench solution per square foot surface area every 7 to 28 days. Do not apply to apple, flowering cherry, or crabapple. See label.
dipotassium phosphonate + dipotassium phosphate (Biophos)	256 fl oz/100 gal	FRAC GROUP 33. Apply as a soil drench or foliar spray as a preventative.
dimethomorph (Stature DM) 50W	6.4 to 12.8 oz/100 gal	FRAC GROUP 40. Apply at 10 to 14-day intervals through production cycle. When applied as a drench, use enough solution to wet root zone of the plant. No more than 2 applications of Stature DM can be applied consecutively in a crop. **Not effective on Pythium root rot.**
dimethomorph + ametoctradin (Orvego)	11 to 14 fl oz	FRAC GROUPS 40 + 45. NOT LABELED FOR PYTHIUM. Apply on 10 to 14-day intervals using another registered fungicide with a different mode of action. Apply sufficient volume to wet all foliage until runoff (normally 50 to 100 gallons per acre).
etridiazole		FRAC GROUP 3.
(Truban) 30WP	3 to 10 oz/100 gal/400 sq ft	Apply in sufficient volume to saturate the soil mixture. Water in immediately after application. Repeat at 4 to 12-week intervals.
(Terrazole) 35WP	3.5 to 10 oz/100 gal	
etridiazole + thiophanate-methyl		FRAC GROUPS 3 + 1.
(Banrot) 40WP	6 to 12 oz/100 gal	Apply in sufficient volume to saturate the soil mixture. Irrigate immediately with additional water equal to at least half the volume of the fungicide drench. Re-treat at 4 to 12-week intervals. For use in nursery crops. See label.
(Banrot) 8G	See label	
fluopicolide (Adorn)	1 to 4 fl oz/100 gal	FRAC GROUP 43. MUST ALWAYS BE TANK MIXED WITH THE LABELED RATE OF ANOTHER FUNGICIDE WITH A DIFFERENT MODE OF ACTION. Apply before disease development. Use higher rate when treating plants with high potential for disease. Reapply after 14 to 28 days.
fosetyl-Al (Aliette) 80WP	See label	FRAC GROUP 33. Can be applied as a preventative foliar or drench application. Can be incorporated into the soil for control of Phytophthora species.
mandipropamid (Micora)	4 to 8 fl oz/100 gal	FRAC GROUP 40. This product can also be used on vegetables sold to the retail market in GH with permanent flooring. Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications.
mefenoxam (Fenox ME, Mefenoxam 2, Subdue MAXX, Subdue GR)	See label	FRAC GROUP 4. Can be applied as a drench or soil surface spray or soil incorporation treatment (granular). Consult label for specific crops and applications. Repeat at 2 to 3-month intervals. Do not apply rates of 1.25 fl oz per 100 gal more often than every 3 months.
oxathiapiprolin (Segovis)	0.65 to 3.2 fl oz/100 gal	FRAC GROUP U15. NOT LABELED FOR PYTHIUM. Apply on 5 to 14-day interval preventatively or at first sight of disease symptoms. Do not apply more than 2 consecutive applications before switching to another non-Group U-15 fungicide.
phosphorous acid (Alude, Fosphite, Reliant)	See label for rates	FRAC GROUP 33. Apply as a soil drench or foliar spray as a preventive.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Phytophthora and Pythium Root Rot (continued)		
potassium phosphite (Vital)	See label	FRAC GROUP 33. Apply as a soil drench or foliar spray as a preventive.
propamocarb (Banol)	See label	FRAC GROUP 28. Do not use for field-grown ornamentals.
trifloxystrobin (Compass O)	1 to 2 oz/100 gal	FRAC GROUP 11.
Powdery Mildew		
azoxystrobin (Heritage) 50WDG	1 to 4 oz/100 gal	FRAC GROUP 11. Apply only as a preventive. Spray every 7 to 28 days as needed. To avoid fungicide resistance, make no more than 2 sequential applications of Heritage before rotating with nonstrobilurin products. Do not apply to apple, flowering cherry, or crabapple. See label.
azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	FRAC GROUPS 11 + 7. Apply every 7 to 21 days. Do not make more than 2 sequential applications before rotating to another class of fungicide that is not Group 7 or 11. Do not apply to apple, flowering cherry, or crabapple. See label.
Bacillus subtilis (Rhapsody, Cease)	2 to 4 qt/100 gal	FRAC GROUP BM02. Repeat at 7-day intervals. Thorough coverage is essential. Begin applications when conditions favor disease development prior to the onset of disease.
Bacillus amyloliquefaciens strain D747 (DoubleNickel LC)	0.5 to 6 qt/100 gal	FRAC GROUP BM02. Begin preventative applications at plant emergence and repeat every 3 to 28 days depending on disease pressure. OMRI listed.
chlorothalonil (Daconil Ultrex) 82.5 WDG	1.4 lb/100 gal	FRAC GROUP M5. Spray at 7 to 14-day intervals. Applications made during bloom may damage flowers.
chlorothalonil + propiconazole (Concert II)	22 to 35 fl oz/100 gal	FRAC GROUP M5 + 3. Apply as a full coverage spray. Reapply at 14 to 21-day intervals. Refer to label for specific rate and application instructions.
copper oxychloride + copper hydroxide (Badge SC) (Badge X2)	 1.5 to 2 pt/A 1.5 to 2 lb/A	FRAC GROUP M1. Repeat at 7 to 14-day intervals. May cause discoloration in some azalea varieties. See label for other phytotoxicity warnings. Badge X2 is OMRI listed. Do not mix with Aliette.
copper octanoate (Camelot O)	0.5-2.0 gal/100 gal	FRAC GROUP M1 Begin at first sign of disease and repeat at 7 to 10-day intervals. Camelot O may cause copper toxicity on some plant species.
copper sulfate pentahydrate (Phyton 27)	See label	FRAC GROUP M1.
cyprodinil + fludioxonil (Palladium)	2 to 6 oz/100 gal	FRAC GROUPS 9 + 12. Spray on a 7 to 14- day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different MOA for 2 applications.
fluopyram + trifloxystrobin (Broadform)	2 to 4 fl oz/100 gal	FRAC GROUPS 7 + 11 Spray on 7 to 14-day interval
difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	FRAC GROUPS 3 + 7. Spray on a 7 to 14-day interval.
fluoxastrobin (Disarm 480SC)	1 to 4 fl oz/100 gal	FRAC GROUP 11. Use for preventative applications only and apply every 7 to 28 days depending on disease pressure. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	FRAC GROUP 3 Repeat application on 7 to 14 day intervals as needed.
metconazole (Tourney)	1 to 4 oz/100 gal	FRAC GROUP 3. Repeat in 14 to 28 days when conditions favor disease
myclobutanil (Eagle) 20EW (Eagle) 40WP	 8 fl oz/100 gal 3 to 6 oz/100 gal	FRAC GROUP 3. Apply at 10 to 14-day intervals.
potassium bicarbonate (Kaligreen)	1 to 3 lb/100 gal	Apply at 7 to 10-day intervals.
propiconazole (Banner MAXX, Banner MAXX II)	5 to 12 fl oz/100 gal	FRAC GROUP 3. See label for appropriate rate and application intervals. For application in field nurseries and landscape plantings.
pyraclostrobin (Insignia)	4 to 8 oz/100 gal	FRAC GROUP 11. Apply at 7 to 14-day intervals. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
pyraclostrobin + boscalid (Pageant Intrinsic)	6 to12 oz/100 gal	FRAC GROUPS 11 + 7. Apply prior to disease development. Repeat at 7 to 10-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
sulfur (Micro Sulf)	3 to 10 lb/100 gal	FRAC GROUP M2. Begin when disease first appears and continue at 5 to 10-day intervals. See label for phytoxicity considerations.
tebuconazole (Torque)	4 to 8 fl oz/100 gal	FRAC GROUP 3. Apply every 14 days for a total of 3 applications at the first sign of disease.
thiophanate-methyl (AllBan Flo) (Cleary 3336) F (OHP 6672) 50WP, (T-Storm) 50WSB (SysTec 1998) FL (T-Storm Flowable), OHP 6672 (4.5L)	 10 to 20 oz/100 gal 12 to 24 fl oz/100 gal 8 to 16 oz/100 gal 10 fl oz/100 gal 20 fl oz/100 gal	FRAC GROUP 1 Apply when disease first appears and repeat every 7 to 14 days. Rotations with other effective products are recommended. Apply when disease first appears and repeat every 7 to 14 days. Rotations with other effective products are recommended. Apply when disease first appears and repeat every 7 to 14 days as needed during disease period. Apply as heavy spray or drench at a rate of 1 to 2 pints per sq ft. Repeat at 2 to 4-week intervals. Apply as heavy spray or drench at a rate of 1 to 2 pints per sq ft. Repeat at 2 to 4-week intervals.
thiophanate-methyl + mancozeb (Zyban) WSB	24 oz (4 bags) /100 gal	FRAC GROUP 1 + M3. Apply at first sign of disease. Repeat at 7-day intervals.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Powdery Mildew (continued)		
triadimefon (Bayleton) 50WSP (Strike) 25WDG	 1 PVA packet (11 oz/550 to 1,100 gal) 2 to 4 oz/100 gal	FRAC GROUP 3. Spray as needed. Bayleton cannot be used on plants for sale or other commercial use. Strike is for greenhouse and nursery use only.
trifloxystrobin (Compass O)	2 to 4 oz/100 gal	FRAC GROUP 11. Apply to point of drip before disease is detected. Apply at 7 to 14-day intervals. Rotate to another nonstrobilurin product after each application.
trifloxystrobin + triadimefon (Trigo)	3 to 9 oz/100 gal	FRAC GROUPS 11 + 3. Apply every 14 to 28 days
triticonazole (Trinity) 19SC	6 to 12 fl oz/100 gal	FRAC GROUP 3. Apply every 7 to 14 days. Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. Use of an adjuvant/spreader sticker can aid in control.
Rhizoctonia Aerial Blight *(Rhizoctonia solani)*		
chlorothalonil (Daconil Ultrex)	1.4 lb/100 gal	FRAC GROUP M5. Spray to runoff. Repeat at 7 to 14-day intervals until conditions no longer favor disease.
cyprodinil + fludioxonil (Palladium)	2 to 6 oz/100 gal	FRAC GROUPS 9 + 12. Spray on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different MOA for 2 applications.
fludioxonil (Medallion)	1 to 2 oz/100 gal	FRAC GROUP 12. Spray to runoff. Repeat at 7 to 14-day intervals until conditions no longer favor disease.
flutolanil (Contrast) 70WSP (Prostar) 70WP	3 to 12 oz/100 gal	F FRAC GROUP 12. Apply at 14 to 21-day intervals.
iprodione (Chipco 26019 N/G) (18 Plus, Iprodione Pro 2SE)	 1.0 to 2.5 qt/100 gal 1.0 to 2.5 qt/100 gal	FRAC GROUP 2. Spray plants to ensure thorough coverage Repeat at 7 to 14-day intervals. Do not make more than 4 applications per crop per year.
mancozeb (Dithane 75DF)	1 to 2 lb/100 gal	FRAC GROUP M3. Apple at 7 to 10-day intervals. See label for specific instructions.
myclobutanil (Eagle 20EW)	6 to 12 fl oz/100 gal	FRAC GROUP 3. Apply at 7 to 10-day intervals. See label for specific instructions.
polyoxin D zinc salt (Endorse 2.5 WP)	1.1 to 2.2 lb/100 gal	FRAC GROUP 19. Apply as a foliar spray every 7 to 10 days. Apply prior to disease development and when conditions are conducive for disease.
pyraclostrobin + boscalid (Pageant Intrinsic)	12 to18 oz/100 gal	FRAC GROUPS 11 + 7. Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
thiophanate-methyl (Cleary 3336) F	12 to 16 fl oz/100 gal	FRAC GROUP 1. Apply when disease symptoms first appear. Repeat at 7 to 14-day intervals during disease period.
thiophanate-methyl + iprodione (26/36 fungicide)	33 to 84 fl oz/100 gal	FRAC GROUPS 1 + 2. No more than 4 applications per year.
triflumizole (Terraguard) 50W	4 to 8 oz/100 gal	FRAC GROUP 3. Make initial application prior to or at first sign of disease. Use the higher rate under heavy disease pressure. Repeat at 7 to 14-day intervals.
Rhizoctonia Stem and Root Rot *(Rhizoctonia solani)*		
azoxystrobin (Heritage) 50WDG	directed spray: 1 to 4 oz/100 gal drench: 0.2 to 0.9 oz/100 gal	FRAC GROUP 11. Apply as a directed spray every 7 to 21 days as needed. To avoid fungicide resistance, make no more than 3 sequential applications of Heritage before rotating with nonstrobilurin products. Apply 1 to 2 pt of solution per sq ft surface area every 7 to 28 days as a preventative drench treatment. Do not exceed 2 oz/100 gal on impatiens or pansy.
azoxystrobin + benzovindiflupyr (Mural)	3 oz/100 gal	FRAC GROUP 11 + 7. Apply 1 to 2 pints of drench solution per square foot surface area every 7 to 28 days. Should not be applied to some tree fruit varieties. See label.
Bacillus amyloliquefaciens strain D747 (DoubleNickel LC)	0.5 to 4.5 pt/100 gal	FRAC GROUP BM02. Apply as a drench or course spray to growing medium at or immediately before seeding. Repeat applications as needed. OMRI listed.
chlorothalonil + thiophanate-methyl (Spectro) 90WDG	1 to 2 lb/100 gal	FRAC GROUP M5 + 1. Retreat at 7-day intervals. Apply as a spray only. Do not apply more than once to green or variegated Pittosporum due to risk of phytotoxicity. Apply when foliage is dry.
cyprodinil + fludioxonil (Palladium)	2 to 4 oz/100 gal	FRAC GROUP 9 + 12. For stem diseases ensure full spray coverage of all stems and inner areas of the plant to the soil/media. Apply on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different MOA for 2 applications.
fluopyram + trifloxystrobin (Broadform)	2 to 8 fl oz/100 gal	FRAC GROUPS 7 + 11 Spray on 7 to 14-day interval
difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	FRAC GROUPS 3 + 7. Apply via chemigation or as a container drench. See label for further instructions.
etridiazole + thiophanate-methyl (Banrot) 40W	16 to 12 oz/400 sq ft	FRAC GROUP 3 + 1. Apply in sufficient volume to saturate the soil mixture. Irrigate immediately. Repeat at 4 to 12-week intervals if necessary.
fludioxonil (Medallion) 50W	1 to 2 oz/100 gal	FRAC GROUP 12. Apply as a drench at seeding or transplanting. Apply sufficient mix to wet the upper one-half of the growing medium. Make only 1 application to seedling crop. If needed, re-treat transplants 21 to 28 days after initial application. Do not apply as a seed or soil drench to impatiens or New Guinea impatiens. May cause stunting or chlorosis on some geranium cultivars. See label for maximum amounts that can be applied per year.
flutolanil (Contrast) 70WSP (Prostar) 70WP	3 to 6 oz/100 gal	FRAC GROUP 7. Apply drench according to label. Repeat 21 to 28 days after initial application. Make no more than 4 applications per year to ornamental plantings.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Rhizoctonia Stem and Root Rot *(Rhizoctonia solani)* (continued)		
iprodione (Chipco 26019 N/G) (18 Plus, Iprodione Pro 2SE)	 6.5 oz/100 gal 13 fl oz/100 gal	FRAC GROUP 2. Apply 1 to 2 pints per sq ft at seeding or transplanting. Do not apply as a drench on impatiens or pothos. Repeat every 14 days. Do not make more than 6 applications per year. Do not use on Spathiphyllum.
metconazole (Tourney)	1 to 4 oz/100 gal	FRAC GROUP 3. Repeat in 14 to 28 days when conditions favor disease
PCNB (Terraclor) 75WP	4 to 8 oz/100 gal	FRAC GROUP 14. See label for amount to apply. One repeat application can be made 4 to 6 weeks later, if necessary.
polyoxin D zinc salt (Endorse 2.5 WP)	1.1 to 2.2 lb/100 gal/acre	FRAC GROUP 19. Apply as a foliar spray every 7 to 10 days. Apply as a drench every 14 to 28 days.
pyraclostrobin + boscalid (Pageant Intrinsic)	12 to18 oz/100 gal	FRAC GROUP 11 + 7. Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
pyraclostrobin + fluxapyroxad (Orkestra)	8 to 10 fl oz/100 gal	FRAC GROUP 11 + 7. Apply as drench. Repeat at 7 to 28-day intervals.
thiophanate-methyl (AllBan Flo) (Cleary 3336) F (OHP-6672) 50WP	 7.5 to 20 oz/100 gal 8 to 16 fl oz/100 gal 12 to 16 oz/100 gal	FRAC GROUP 1. Repeat at 4 to 8-week intervals. Apply as a soil drench or directed spray to thoroughly soak growing media through the root zone after seeding or transplanting at 21 to 28-day interval. Apply 1 to 3 pt/sq ft after transplanting to thoroughly soak growing medium. Repeat every 21 to 28 days.
thiophanate-methyl + iprodione (26/36 fungicide)	See label	FRAC GROUP 1 + 2. See label.
trifloxystrobin (Compass)	0.5 oz/100 gal	FRAC GROUP 11. Apply as a drench to wet upper half of the growing media. Apply at seeding, transplanting, and at 21 to 28-day intervals thereafter. May injure petunia, violet, and New Guinea impatiens.
triflumizole (Terraguard) 50W	4 to 8 oz/100 gal	FRAC GROUP 3. Apply as soil drench at 2 to 4-week intervals. Use higher rate under heavy disease pressure.
Rust (also see Daylily Rust)		
azoxystrobin (Heritage)	1 to 4 oz/100 gal commercial rose production: 1.6 to 8 oz	FRAC GROUP 11. Apply at 7 to 28-day intervals. Do not make more than 3 sequential applications of Heritage before alternating with a nonstrobilurin fungicide. Should not be applied to certain plant species; see label.
azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	FRAC GROUP 11 + 7. Apply every 7 to 14 days. Do not make more than 2 sequential applications before rotating to another class of fungicide that is not Group 7 or 11.
Bacillus amyloliquefaciens strain D747 (DoubleNickel LC)	0.5 to 6 qt/100 gal	FRAC GROUP BM 02. Begin preventative applications at plant emergence and repeat every 3 to 28 days depending on disease pressure. OMRI listed.
chlorothalonil (Daconil Ultrex) (Echo) 90DF	 1.4 lb/100 gal; 1 lb for roses 1.4 lb/100 gal; 0.875 oz for roses	FRAC GROUP M5. Apply when foliage and flowers are dry. Repeat at 7 to 14-day intervals. Apply to hydrangea foliage only. Avoid application during bloom period on plants where flower injury is unacceptable.
chlorothalonil + propiconazole (Concert II)	22 to 35 fl oz/100 gal	FRAC GROUPS M5 + 3. Apply as a full coverage spray. Reapply at 14 to 21-day intervals. Refer to label for specific rate and application instructions. Higher rate listed for *Melampsora occidentalis* --use 69 fl oz/100gal.
chlorothalonil + thiophanate-methyl (Spectro) 90	1 to 2 lb/100 gal	FRAC GROUPS M5 + 1. Apply when foliage and flowers are dry, or nearly dry. Re-treat at 7-day intervals. Do not exceed 50.6 lb per acre during 1 season for field-grown ornamentals.
fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	FRAC GROUPS 7 + 11 Spray on 7 to 14-day interval
difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	FRAC GROUPS 3 + 7. Spray on a 7 to 14-day interval.
flutolanil (Contrast) 70 WSP	3 to 6 oz/100 gal	FRAC GROUP 7. Repeat at 14 to 21-day intervals.
fluoxastrobin (Disarm 480SC)	1 to 4 fl oz/100 gal	FRAC GROUP 11. Use for preventative applications only and apply every 7 to 28 days depending on disease pressure. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
mancozeb (Dithane, Mancozeb) (Protect DF)	 1.5 lb/100 gal 1 to 2 lb/100 gal	FRAC GROUP M3. Begin at first sign of disease. Repeat at 7 to 10-day intervals. Apply at 7 to 21-day intervals. To improve performance, add 2 to 4 oz of a spreader-sticker.
mefentrifluconazole (Avelyo)	8 to 10 fl oz/100 gal	FRAC GROUP 3 Repeat application on 7 to 14-day intervals as needed. Suppression only
metconazole (Tourney)	1 to 4 oz/100 gal	FRAC GROUP 3. Repeat in 14 to 28 days when conditions favor disease
myclobutanil (Eagle 40WP) (Eagle 20WE)	 3 to 6 oz/100 gal 6 to 12 oz/100 gal	FRAC GROUP 3. Apply on a protectant application schedule at 10 to 14-day intervals.
neem oil (Triact 70)	1 gal/100 to 200 gal See label	Apply at 7 to 14-day spray intervals. Trial first on open blooms. To control existing disease, apply on a 7-day schedule until disease pressure is eliminated. Not for impatiens, carnation, or hibiscus.
pyraclostrobin (Insignia)	See label	FRAC GROUP 11. Apply prior to onset of disease and repeat every 7 to 14 days. Do not expose flowering impatiens or flowering petunias to Insignia.
propiconazole (Banner MAXX II)	See label	FRAC GROUP 3 See label. Do not use in greenhouses.
pyraclostrobin + boscalid (Pageant Intrinsic)	12 to18 oz/100 gal	FRAC GROUPS 11 + 7. Apply prior to disease development. Repeat at 7 to 14-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Rust (also see Daylily Rust) (continued)		
tebuconazole (Torque)	4 to 8 fl oz/100 gal	FRAC GROUP 3. Apply every 14 days for a total of 3 applications at the first sign of disease.
thiophanate-methyl (AllBan Flo) (Cleary 3336 F) (OHP 6672 50WP), (T-Storm 50WSB) (OHP 6672 4.5L)	 10.75 to 20 oz/100 gal 12 to 16 fl oz/100 gal 12 to 16 oz/100 gal 20 fl oz/100 gal	FRAC GROUP 1. For use on crabapples. Do not use treated crabapples for food. Apply late spring or at first sign of disease. Repeat every 7 to 14 days as needed during disease period. Apply 8 oz as a drench or directed spray after seeding or apply 12 to 16 oz after transplanting. Repeat at 21 to 28-day intervals. Apply late spring or at first sign of disease. Repeat every 7 to 14 days as needed during disease period. Apply as heavy spray or drench at a rate of 1 to 2 pints per sq ft. Repeat at 2 to 4-week intervals.
thiophanate-methyl + mancozeb (Zyban) WSB	See label	FRAC GROUPS 1 + M3.
triadimefon (Bayleton) (Strike)	See label	FRAC GROUP 3. Spray to the point of drip as needed. See label for spray interval. Bayleton is not for use on plants being grown for sale.
triflumizole (Terraguard) 50W	2 to 8 oz/100 gal	FRAC GROUP 3. Apply prior to, or at first sign of disease. Repeat at 7 to 14-day intervals.
Scab *(Cladosporium, Fusicladium, Spilocea, Venturia)* For apple scab, see disease under "crabapple" above.		
mancozeb (Dithane, Fore, Mancozeb)	1.5 lb/100 gal	FRAC GROUP M3. Begin spraying at first sign of disease and repeat at 7 to 10-day intervals.
azoxystrobin (Heritage)	1 to 4 oz/100 gal	FRAC GROUP 11. Repeat every 10 to 28 days. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide. PHYTOTOXIC to some crabapple and other tree fruit cultivars. See label.
Scab *(Cladosporium, Fusicladium, Spilocea, Venturia)* For apple scab, see disease under "crabapple" above. (continued)		
azoxystrobin + benzovindiflupyr (Mural)	4 to 7 oz/100 gal	FRAC GROUPS 11 + 7. Repeat every 7 to 14 days. Do not make more than two consecutive applications before switching to a non-Group 11 fungicide. PHYTOTOXIC to some crabapple and other tree fruit cultivars. See label.
copper oxychloride + copper hydroxide (Badge SC) (Badge X2)	1.5 to 2 pt/A 1.5 to 2 lb/A	FRAC GROUP M1. Repeat at 7 to 14-day intervals. May cause discoloration in some azalea varieties. See label for other phytoxicity warnings. Badge X2 is OMRI listed. Do not mix with Aliette.
difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	FRAC GROUPS 3 + 7. Spray on a 7 to 14-day interval.
fluopyram + trifloxystrobin (Broadform)	4 to 8 fl oz/100 gal	FRAC GROUPS 7 + 11 Spray on 7 to 14-day interval
fluoxastrobin + myclobutanil (Disarm M)	3 to 11 fl oz/100 gal	FRAC GROUPS 11 + 3. Repeat at 7 to 28-day intervals
mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	FRAC GROUP 3 Repeat application on 7 to 14-day intervals as needed.
metconazole (Tourney)	1 to 4 oz/100 gal	FRAC GROUP 3. Repeat in 14 to 28 days when conditions favor disease
myclobutanil (Eagle 20EW)	6 to 12 fl oz/100 gal	FRAC GROUP 3. Spray every 10 to 14 days.
propiconazole (Banner MAXX II)	See label	FRAC GROUP 3. See label. Do not use in greenhouses.
pyraclostrobin (Insignia)	4 to 8 oz/100 gal	FRAC GROUP 11. Repeat at 7 to 14-day intervals. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
pyraclostrobin + boscalid (Pageant Intrinsic)	8 to12 oz/100 gal	FRAC GROUPS 11 + 7. Apply prior to disease development. Repeat at 7 to 10-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
tebuconazole (Torque)	4 to 10 fl oz/100 gal	FRAC GROUP 3. For preventative applications, apply at least 3 times per year, 14 to 21 days apart.
thiophanate-methyl (AllBan Flo) (Cleary 3336 F) (SysTec 1998 FL)	 10.75 to 20 fl oz/100 gal 12 to 16 fl oz/100 gal 20 fl oz/100 gal	FRAC GROUP 1. Spray at bud break. Repeat 3 to 4 times at 7 to 14-day intervals.
thiophanate-methyl + iprodione (26/36 fungicide)	33 to 84 fl oz/100 gal	FRAC GROUP 1 + 2. No more than 4 applications per year.
thiophanate-methyl + mancozeb (Zyban) WSB	24 oz (4 bags)	FRAC GROUP 1 + M3. Repeat at 7-day intervals.
trifloxystrobin (Compass O)	2 to 4 oz/100 gal	FRAC GROUP 11. Repeat at 7 to 14-day intervals. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide.
triticonazole (Trinity) 19SC	6 to 12 fl oz/100 gal	FRAC GROUP 3. Apply every 7 to 14 days. Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development.
Sclerotinia Stem Rot *(Sclerotinia sclerotiorum)*		
chlorothalonil (Daconil Ultrex 82.5 WDG)	1.4 lb/100 gal	FRAC GROUP M5. Repeat at 7 to 14-day intervals when conditions favor disease.
cyprodinil + fludioxonil (Palladium)	2 to 4 oz/100 gal	FRAC GROUPS 9 + 12. For stem diseases ensure full spray coverage of all stems and inner areas of the plant to the soil/media. Apply on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different MOA for 2 applications.
difenoconazole + pydiflumetofen (Postiva)	10 to 28 fl oz/100 gal	FRAC GROUPS 3 + 7. Apply via chemigation or as a container drench. See label for additional information.
metconazole (Tourney)	1 to 4 oz/100 gal	FRAC GROUP 3. Repeat in 14 to 28 days when conditions favor disease
PCNB (Revere) 10G (Terraclor) 75W	 20 lb/1,000 sq ft 6 to 12 fl oz/100 gal	FRAC GROUP 14. Apply 1 wk prior to planting; spread on soil surface and mix into soil at a 4-in. depth. See label for amount to apply. One repeat application may be made 4 to 6 weeks later.

Table 10-13. Commercial Landscape and Nursery Crops Disease Control

DISEASE Pesticide and Formulation	Rate of Formulation (per 100 gallons)	Schedule and Remarks
Sclerotinia Stem Rot *(Sclerotinia sclerotiorum)* (continued)		
pyraclostrobin + boscalid (Pageant Intrinsic)	12 to18 oz/100 gal	FRAC GROUP 11 + 7. Apply prior to disease development. Repeat at 7 to 10-day intervals. Make no more than 2 sequential applications. Do not expose petunia or impatiens in flower or wintercreeper or nine bark to spray or drift as injury may occur.
triticonazole (Trinity) 19SC	8 to 12 fl oz/100 gal	FRAC GROUP 3. Apply every 7 to 14 days. Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. The stem areas of the plant must be thoroughly covered using spray to runoff.
Shot Hole (*Blumeriella, Coccomyces* fungal and bacterial)		
copper hydroxide + mancozeb (Junction)	1.5 to 3.5 lb/100 gal	FRAC GROUP M1. Begin at first sign of disease. Repeat at 7 to 14-day intervals.
mancozeb (Pentathlon DF) (Protect DF)	1 to 2 lb/100 gal	FRAC GROUP M3. Begin applications at first sign of disease. Apply at 7 to 10-day intervals. Begin applications at first sign of disease. Apply at 7 to 21-day intervals.
mefentrifluconazole (Avelyo)	3 to 5 fl oz/100 gal	FRAC GROUP 3 Repeat application on 7 to 14 day intervals as needed. Tolerance to iris not specifically mentioned on label. Test a small area prior to a large-scale application.
metconazole (Tourney)	1 to 4 oz/100 gal	FRAC GROUP 3. Apply on a 14 to 28-day interval.
thiophanate-methyl (Cleary 3336) F	12 to 16 fl oz/100 gal	FRAC GROUP 1. Begin when disease first appears and repeat every 7 to 14 days.
Southern Stem Blight *(Sclerotium rolfsii)*		
azoxystrobin (Heritage)	directed spray: 1 to 4 oz/100 gal drench: 0.2 to 0.9 oz/100 gal	FRAC GROUP 11. Apply every 7 to 21 days. Can be used in outdoor nurseries, retail nurseries, residential and commercial landscape areas. Apply 1 to 2 pt solution per square foot surface area every 7 to 28 days, prior to infection. Apply to container-grown ornamentals only. Do not apply to crabapple, apple, or some tree fruit. See label.
azoxystrobin + benzovindiflupyr (Mural)	5 to 7 oz/100 gal (direct spray) 2 to 3 oz/100 gal (drench)	FRAC GROUPS 11 + 7. Repeat every 7 to 21 days. Do not make more than 2 consecutive applications before switching to a non-Group 11 fungicide. PHYTOTOXIC to some crabapple and other tree fruit cultivars. See label.
cyprodinil + fludioxonil (Palladium)	2 to 4 oz/100 gal	FRAC GROUPS 9 + 12. For stem diseases ensure full spray coverage of all stems and inner areas of the plant to the soil/media. Apply on a 7 to 14-day interval while conditions are conducive to disease development. After 2 applications, alternate with another fungicide with a different MOA for 2 applications.
fluoxastrobin (Disarm 480SC)	2 to 4 fl oz/100 gal	FRAC GROUP 11 Crown spray every 7 to 21 days.
flutolanil (Contrast) 70WSP (Prostar) 70WP	3 to 6 oz/100 gal	FRAC GROUP 7. Drench at 21 to 28-day intervals. Uses 1 pt per sq ft or 2 pt for depths greater than 4 in. See label for container rates. For use in outdoor container and field-grown stock. Make no more than 4 applications per year to nursery ornamental plantings.
PCNB (Terraclor) 75WP	3.25 to 6.5 lb/1,000 sq ft	FRAC GROUP 14. Apply in sufficient water to ensure uniform ground coverage prior to planting, and thoroughly incorporate to a depth of 6 to 7 in. For use in nursery and landscape plantings.
tebuconazole (Torque)	4 to 8 fl oz/100 gal	FRAC GROUP 3. Apply every 14 days for a total of 3 applications at the first sign of disease.
triticonazole (Trinity) 19SC	8 to 12 fl oz/100 gal	Apply every 7 to 14 days. Use preventively. Begin applications when conditions favor fungal infection and before disease symptom development. The stem areas of the plant must be thoroughly covered using spray to runoff.
Volutella Blight		
chlorothalonil (Daconil Ultrex) 82.5 WDG (Daconil WeatherStik)	 1.4 lb/100 gal 1.375 pt/100 gal	 FRAC GROUP M5. Reapply at 7 to 14-day intervals.
copper hydroxide (Champ WG) (Nu-Cop) 50DF (CuPRO 2005)	 0.5 lb/100 gal 1 lb/100 gal 0.75 to 2.0 lb/100 gal	FRAC GROUP M1. Begin at first sign of disease and repeat at 7 to 14-day intervals. Do not tank mix copper formulations with Aliette. Avoid contact with metal surfaces. Discoloration of blooms may occur on certain plant varieties- check label.
copper hydroxide + mancozeb (Junction)	1.5 to 3.5 lb/100 gal	FRAC GROUPS M1 +M3. Begin at first sign of disease and repeat at 7 to 14-day intervals.
copper oxychloride + copper hydroxide (Badge SC) (Badge X2)	 1.5 to 2 pt/A 1.5 to 2 lb/A	FRAC GROUP M1. Repeat at 7 to 14-day intervals. May cause discoloration in some azalea varieties. See label for other phytoxicity warnings. Badge X2 is OMRI listed. Do not mix with Aliette.
copper sulfate pentahydrate (Phyton 27, Phyton 35)	See label	FRAC GROUP M1. See label. To avoid phytotoxicity, do not use any copper compound on alyssum.
mancozeb (Dithane) 75 DF, (Fore) 80 WSP, Mancozeb DG) (Pentathlon LF) (Pentathlon DF) (Protect DF)	 2.0 lb/50 gal/5,000 sq ft of bed 0.8 to 1.6 pt/100 gal 1 to 2 lb/100 gal 3 to 4 lb/100 gal/10,000 sq ft of bed	FRAC GROUP M3. Start at first sign of disease and apply at 10 to 14-day intervals. Use a drenching spray. Start at first sign of disease and apply at 10 to 14-day intervals. Begin at first sign of disease and repeat at 7 to 10-day intervals. Use a drenching spray. Start at first sign of disease and apply at least 5 applications at 10 to 14-day intervals.
thiophanate-methyl + mancozeb (Zyban) WSB	24 oz (4 bags)/100 gal	FRAC GROUPS M1 + M3. Apply at 7-day intervals while disease is prevalent.

Treatments for Sanitizing Tools, Equipment, Cultivation Surfaces, Pots, and Flats

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Anyone using any agricultural chemical should refer to the current chemical label, which contains information about the safe and effective use of the chemical, before using the chemical.

All items should be free of organic debris before exposure to the treatments listed below. Sanitizing an entire greenhouse involves physically removing leftover debris and soil as a first step prior to disinfection, as soil and organic residues reduce the effectiveness of disinfectants. There are some commercial cleaners specifically designed for greenhouse use, for instance, Strip-It (best applied by spray, brush, or foam), which is a combination of cleaning and wetting agents formulated to remove algae, dirt, and hard water deposits. High pressure power washing with soap and water is also an option prior to disinfection as listed below.

Table 10-14. Treatments for Sanitizing Tools, Equipment, Cultivation Surfaces, and other Related Items

Material or Treatment	Trade name	Formulation	Remarks	Contact time
alcohol, ethyl and isopropyl (grain, rubbing, wood) (70-100%)	Various commercial brands; Lysol Spray (also includes quaternary ammonium)	Depends on formulation. Read label. Typically, full strength for RTU (Ready To Use) formulations.	Evaporates quickly so that adequate contact time may not be achieved; high concentrations of organic matter diminish effectiveness; flammable.	10 min for equipment, pots, flats and surfaces. Tools can be dipped for 10 seconds and allowed to dry. Do not rinse.
alkyl dimethyl benzyl ammonium chloride + alkyl dimethyl ethylbenzyl ammonium chloride	Green-Shield Green-Shield II	See label	Corrosive: Causes irreversible eye damage and skin burns. Pre-clean surfaces/heavily soiled areas prior to use.	10 min for hard, non-porous surfaces, pots, flats, cutting tools (see label for other surfaces)
hydrogen peroxide (hydrogen dioxide) and peroxyacetic acid mixture	ZeroTol 2.0; SaniDate 5.0; Oxidate 2.0	2.5 fl oz per gallon of water 0.5 fl oz per gallon of water 0.5 to 1.25 fl oz per gallon of water	Very corrosive; eye/skin irritant. Low odor. Use according to label. Must be stored in cool location.	1-10 min
quaternary ammonium	Physan 20; KleenGrow	Depends on formulation. Typically, 1 tablespoon per gallon of water For general disinfection use 0.5 to 1.0 fl oz per gallon of water	Effective for non-porous surface sanitation, for instance, floors, walls, benches, pots. Low odor, irritation. Hard, NON-POROUS surfaces use 1.0 fl oz per gal water; Tools, cutters & equipment use 0.5 fl oz per gal water. Apply solution with a cloth, mop, sponge, coarse spray device or by immersion until surfaces are wet. Prepare a fresh solution daily.	10-15 min Must remain wet for 10 min. Wipe dry with a clean cloth or sponge or allow to air dry. Must remain wet for 10 min. Wipe dry with a clean cloth or sponge or allow to air dry.
sodium hypochlorite (8.25%)	Clorox; Commercial bleach;	10%; or a 1:14 ratio of bleach: water	Inactivated by organic matter; fresh solutions should be prepared every 8 hrs or more frequently if exposed to sunlight; corrosive to metal; irritating to eyes and skin; Exposure to sunlight reduces efficacy. Keep solution in opaque container.	10-15 min. for equipment, pots, flats and surfaces. Tools can be dipped for 10 seconds and allowed to dry. Do not rinse.
steam	NA	Cover or otherwise seal	For plastic pots and trays, heat center of steamer between 150ºF to 160ºF; For less heat-sensitive objects, heat to 180ºF.	60 min. 15 min.
solarization	NA	Place clean items on solid surface, cover tightly with CLEAR plastic	Clear plastic works much better.	140ºF, 4 to 8 hr/day for 7 days

Disease Control for Commercial Vegetables

L. M. Quesada-Ocampo, Inga Meadows, and Adrienne Gorny, Entomology and Plant Pathology

This section was prepared as a collaborative effort of vegetable pathology experts in the southeastern United States who yearly update the Southeastern U.S. Vegetable Crop Handbook. Contributors this year included: L. Quesada-Ocampo (North Carolina State University), E. Sikora (Auburn University), A. Keinath (Clemson University), N. Gauthier (University of Kentucky), B. Dutta (University of Georgia), I. Meadows (North Carolina State University), A. Gorny (North Carolina State University), Z. Hansen (University of Tennessee), S. Rideout (Virginia Polytechnic Institute and State University), A. Hajihassani (University of Georgia), J. Desaeger (University of Florida), R. Singh (Louisiana State University), D. Langston (Virginia Polytechnic Institute and State University), Elena Rogers (North Carolina State University), and R. A. Melanson (Mississippi State University).

Caution: At the time these tables were prepared, the entries were believed to be useful and accurate. However, labels change rapidly and errors are possible, so the user must follow all directions on the product labels. Federal tolerances for fungicides may be canceled or changed at any time.

Information in the following tables must be used in the context of an integrated disease management program. Many diseases are successfully managed by combined strategies—using resistant varieties, crop rotation, deep-turn plowing, sanitation, seed treatments, cultural practices, and fungicides. Always use top quality seed and plants obtained from reliable sources. Seeds are ordinarily treated by commercial producers for control of decay and damping-off diseases.

Preplant fumigation of soils, nematode control chemicals, and greenhouse disease control products are provided in separate tables following the crop tables. The efficacy tables will help you select the appropriate disease control materials for some vegetable crops. These tables are located at the end of each crop table.

Rates: Some foliar rates are based on mixing a specified amount of product in 100 gal of water and applying the finished spray for complete coverage of foliage just to the point of run off with high-pressure (over 250 psi) drop nozzle sprayers. Actual amount of product and water applied per acre will vary depending on plant size and row spacing. Typically, 25 to 75 gallons (gal.) per acre of finished spray are used. Concentrate spray (air blast, aircraft) rates are based on the amount of product per acre.

Caution: With concentrate sprays, it is easy to apply too much product. Some fungicides are adversely affected by pH of water; adjust pH of water if specified on label. Some fungicides will cause damage to the plant if applied at temperatures above 90°F. Do not feed treated foliage to livestock unless allowed by the label. Do not reenter fields until sprays have dried; some fungicides may have a reentry requirement of one to several days. Read the label. Do not exceed maximum number of applications on the label. Do not exceed maximum limit of fungicide per acre per application or per year as stated on the label. See label for rotational crops. In all cases, follow directions on the label. The label is the law.

The following online databases provide current product labels and other relevant information:

Database[1]	Web Address
Agrian Label Database	www.telus.com/agcg/agribusiness
Crop Data Management Systems	www.cdms.net/Label-Database
EPA Pesticide Product and Label System	ordspub.epa.gov/ords/pesticides/f?p=PPLS:1
Greenbook Data Solutions	www.greenbook.net/
Kelly Registration Systems[2]	www.kellysolutions.com

[1] Additional databases not included in this list may also be available. Please read the database terms of use when obtaining information from a particular website.

[2] Available for AK, AL, AZ, CA, CO, CT, DE, FL, GA, IA, ID, IN, KS, MA, MD, MN, MO, MS, NC, ND, NE, NJ, NV, NY, OK, OR, SC, SD, VA, VT, WA, and WI. Kelly Registration Systems works with State Departments of Agriculture to provide registration and license information.

Disease Control by Crop

Asparagus

E. Sikora, Plant Pathologist, Auburn University

Table 10-15. Disease Control Products for Asparagus

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
CROWN ROT					
mancozeb (various)	M	See label	See label	See label	Soak crowns 5 min in burlap bag with gentle agitation, drain, and plant.
GRAY MOLD					
fenhexamid (Elevate)	17	1.5 lb/acre	180	0.5	Apply at fern stage only. Make up to four applications. Repeat at 7- to 14-day intervals if conditions favor disease development.
PHYTOPHTHORA CROWN ROT, SPEAR SLIME					
mefenoxam (various)	4	1 pt/acre	1	2	Apply over beds after seeding or covering crowns, 30- to 60-days before first cutting, and just before harvest.
fosetyl-AL (Aliette)	33	5 lb/acre	110	0.5	
RUST					
myclobutanil (various)	3	5 oz/acre	180	1	Begin applications to developing ferns after harvest has taken place. Repeat on a schedule not to exceed 14 days. Do not apply to harvestable spears.
sulfur (various)	M	See label	0	1	
tebuconazole (various)	3	4 to 6 fl oz/acre	180	0.5	Apply to developing ferns at first sign of rust and repeat on a 14-day interval, no more than 3 applications per season.
copper oxychloride/ hydroxide (Badge SC)	M	1 to 2.5 pints/acre	0	48 hr	Recommended for tank mixture with other registered products. For disease suppression only. Addition of spread/sticker is recommended.
RUST, CERCOSPORA LEAF SPOT					
chlorothalonil (various)	M	2 to 4 lb/acre	190	0.5	Repeat applications at 14- to 28-day intervals depending on disease pressure. Do not apply more than 12 pints/ acre during each growing season.
mancozeb (various)	M	See label	180	1	Apply to ferns after harvest; spray at first appearance of disease at 7-to 10-day intervals. Do not exceed 8 lb product per acre per crop.
mancozeb + azoxystrobin (Dexter MAX)	M3+11	2 to 2.2 lb/acre	180	1	Apply only on ferns after spears have been harvested. Applications should begin prior to disease development. Do not apply more than 8.5 lbs. of product per acre per season.
PURPLE SPOT					
azoxystrobin (various)	11	6 to 15.5 fl oz/acre	100	4 hr	Do not apply more than 1 foliar application of Quadris (or other group 11 fungicide) before alternating with a fungicide with a different mode of action.
chlorothalonil (various)	M	2 to 4 lb/acre	190	0.5	Repeat applications at 14- to 28-day intervals depending on disease pressure. Do not apply more than 12 pints/ acre during each growing season.
mancozeb + azoxystrobin (Dexter MAX)	M3+11	2 to 2.2 lb/acre	180	1	Apply only on ferns after spears have been harvested. Applications should begin prior to disease development. Do not apply more than 8.5 lbs. of product per acre per season.
trifloxystrobin (Flint Extra 500 SC)	11	3 to 3.8 oz/acre	180	12 hr	Apply on a 14-day interval as needed. Make applications to the fern stage only. Mow down the asparagus ferns (or allow the ferns to senesce) between the last fungicide application and harvest.

Importance of Alternative Management Practices for Disease Control in Asparagus

E. Sikora, Plant Pathologist, Auburn University and A. Keinath, Plant Pathologist, Clemson University

Table 10-16. Importance of Alternative Management Practices for Disease Control in Asparagus

Scale E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data.

Strategy	Rust	*Cercospora* blight	*Stemphylium* blight	*Fusarium* root rot	*Phytophthora* crown/ spear rot
Avoid overhead irrigation	F	F	F	NC	NC
Crop rotation(5 years or more)	NC	NC	NC	F	P
Clip and bury infected ferns	G	G	G	NC	NC
Destroy infected ferns	E	E	E	NC	NC
Encourage air movement/wider row spacing	P	P	G	NC	NC
Plant in well-drained soil	NC	NC	NC	F	F
Destroy volunteer asparagus	F	NC	NC	NC	NC
Pathogen-free planting material	NC	NC	NC	E	E
Resistant/tolerant cultivars	G	G	NC	G	NC

Basil

L. Quesada-Ocampo, Plant Pathology, North Carolina State University

Table 10-17. Disease Control Products for Basil

Crop/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DAMPING OFF *(PYTHIUM* SPP.*)*					
mefenoxam (Ridomil Gold SL)	4	1.0 to 2.0 pt/acre	21	2	Limit of 2 soil applications per season. Basal direct spray at 28 days after planting or after first cutting.
LEAFSPOTS, FUNGAL *(BOTRYTIS, ALTERNARIA, FUSARIUM, ANTHRACNOSE)*, POWDERY MILDEW					
cyprodinil + fludioxonil (Switch 62.5WG)	9 + 12	11 to 14 oz/acre	7	0.5	Limit of 56 fl oz per acre per season. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action. Apply in a minimum spray volume of 30 gal/A to obtain thorough coverage.
fluopyram (Luna Privilege)	7	4.0 to 6.84 fl oz/ acre	3	0.5	Limit of 13.7 fl oz per acre per season. Apply as needed on a 7- to 10-day interval. When disease pressure is severe, use the higher rates and/or shorter intervals.
fluopyram + trifloxystrobin (Luna Sensation)	7 + 11	5.0 to 7.6 fl oz/ acre	7	0.5	Limit of 15.3 fl oz per acre per season. Apply as needed on a 7- to 10-day interval. When disease pressure is severe, use the higher rates and/or shorter intervals.
potassium phosphite (Rampart)	P07	1 to 3 qt/20 to a minimum 20-gal water/acre	0	4 hr	Apply 2 – 3 weeks intervals. Do not apply at intervals less than 3 days. To avoid undesirable copper phytotoxicity, do not apply product to already treated plants with copper-based products at less than 20-days intervals.
azoxystrobin (Aframe, Quadris)	11	6.0 to 15.5 fl oz/ acre	3	4 hr	Apply as needed on a 7-day schedule following resistant management guidelines. Use a minimum of 30-gal water per acre. Do not apply more than 2 sequential application of this active ingredient or a similar group 11.
Streptomyces lydicus WYEC 108 (Actinovate AG)	BM 02	3 – 12 oz/acre	0	4 hr	Re-apply every 7 – 10 days. For best results use with a spreader-sticker.
Polyoxin D zinc salt (Affirm WDG)	19	6.2 oz/acre	0	4 hr	Apply as a full coverage foliar spray with sufficient water (50 – 300 gal per acre).
Sodium chloride (Amicos KPM)	NC	2.5 – 3.0 lb/acre	0	0	Repeat application at 10 -14 days intervals or as needed. Do not exceed a mix rate of 5 pounds per 100 gallons of water.
Cinnamon oil (Cinnerate)	BM 01	13 – 32 fl oz/100 gal	0	0	10-100 gallons per acre. Repeat as needed (5-day interval).
Bacillus subtillis strain IAB/BD03 (Aviv)	BM 02	10 – 30 fl oz / 100-gal water	0	4 hr	Apply with a minimum of 5 gallons of water per acre. Reapply every 7 – 14 days.
Garlic oil (Brandt Organics Aleo)	BM 01	3 – 12 fl oz / minimum of 20 gallons per acre	0	0	The use of adjuvants is highly recommended for improving performance. Repeat as need (5-day intervals).
Copper Octanoate (Cueva)	M 01	16.8 gal/acre	0	4 hr	Reapply every 10 – 14 days as needed. Do not apply more than 0.53 lb./Cu per acre.
Potassium bicarbonate (Carb-O-Nator)	BM 01	2.5 – 5 lbs./100 gallons of water	0	4 hr	Minimum application of 20 gallons per acre. Repeat application 10 – 14 days interval or as needs. Do not exceed the 5 pounds per 100 gallons of water.
Bacillus amyloliquefaciens strain D747 (Double Nickel LC)	BM 02	0.25 – 3.0 lbs/ acre	0	4 hr	Apply using sufficient water to achieve full coverage. Repeat application every 7 0 10 days or as needed.
Extract of *Swinglea glutinosa* (EcoSwing))	BM 01	1.5 – 2 pts/acre	0	4 hr	Sufficient water recommended for foliar application, 5 – 20 gallons of water per acre.
Hydrogen peroxide + peroxyacetic acid (OxiDate 2.0)	NC	1:500 to 1:1000	0	1 hr	Apply 3-20 gallons of spray per acre. For best results apply at first sign of disease. Use 12.8 fl oz to 25.65 fl oz of product per 100 gallons of water. Spray 3 – 5 days intervals until control is achieved.
Cyprodinil (Vango)	9	5.5 – 7 oz/acre	7	12 hr	Apply at 7 to 10 days interval. After 2 applications, alternate with another fungicide with a different mode of action.
Cerevisane (Romeo)	BM 02	0.23 – 0.68 lbs/ acre	0	4 hr	Spray interval of 7 – 10 days. In high-pressure scenarios program with other fungicides.

Table 10-17. Disease Control Products for Basil

Crop/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DOWNY MILDEW *(PERONOSPORA BELBAHRII)*					
fluopicolide (Presidio)	43	4 fl oz/acre	1	12 hr	Limit of 12 fl oz per acre per year. Make no more than two sequential applications. Alternate with a fungicide with a different mode of action.
cyazofamid (Ranman 400SC)	21	2.75 to 3 fl oz/ acre	0	0.5	Limit of 27 fl oz per acre per season. Alternate with a fungicide with a different mode of action. May be applied through sprinkler irrigation system. Can be applied in a greenhouse.
Mandipropamid (Revus)	40	8 fl oz/acre	1	4 hr	Limit of 32 fl oz per acre per season. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action.
phosphorous acid (Confine Extra, K-Phite)	P07	1 to 3 qt/20-to-100-gal water/ acre	0	4 hr	Do not apply at less than 3-day intervals. Minimum 10 gallons of water/A.
potassium phosphite (Rampart)	P07	1 to 3 qt/20 to a minimum 20-gal water/acre	0	4 hr	Apply 2 – 3 weeks intervals. Do not apply at intervals less than 3 days. To avoid undesirable copper phytotoxicity, do not apply product to already treated plants with copper-based products at less than 20-days intervals.
Bacillus subtillis strain IAB/BD03 (Aviv)	BM 02	10 – 30 fl oz / 100-gal water	0	4 hr	Apply with a minimum of 5 gallons of water per acre. Reapply every 7 – 14 days.
Potassium bicarbonate (Carb-O-Nator)	BM 01	2.5 – 5 lbs./100 gallons of water	0	4 hr	Minimum application of 20 gallons per acre. Repeat application 10 – 14 days interval or as needs. Do not exceed the 5 pounds per 100 gallons of water.
Bacillus amyloliquefaciens strain D747 (Double Nickel LC)	BM 02	0.25 – 3.0 lbs/ acre	0	4 hr	Apply using sufficient water to achieve full coverage. Repeat application every 7 0 10 days or as needed.
Extract of *Swinglea glutinosa* (EcoSwing))	BM 01	1.5 – 2 pts/acre	0	4 hr	Sufficient water recommended for foliar application, 5 – 20 gallons of water per acre.
Oxathiapiprolin + mandipropamid (Orondis Ultra)	49 + 40	5.5 – 8.0 fl oz / acre	1	4 hr	Begin foliar application prior disease and continue a 7-to-10-day interval.
Oxathiapiprolin (Segovis)	U 15	1.1 – 2.4 fl oz/ acre	0	4 hr	Apply in at least 15 gallons per acre. Use higher application rate when disease is present. Minimum application intervals of 5 days. No more than 2 application.
Cerevisane (Romeo)	BM 02	0.23 – 0.68 lbs/ acre	0	4 hr	Spray interval of 7 – 10 days. In high-pressure scenarios program with other fungicides.
Fenamidone (Reason 500 SC)	11	6.0 lbs/acre	2	12 hr	Maximum application per year 24.0 fl oz/acre. Minimum of 7 days intervals.
FUSARIUM WILT, PYTHIUM, VERTICILLIUM AND RHIZOCTONIA ROOT ROTS					
phosphorous acid (Confine Extra, K-Phite)	P07	1 to 3 qt/20 to100 gal water/acre	0	4 hr	Do not apply at less than 3-day intervals.
potassium phosphite (Rampart)	P07	1 to 3 qt/20 to a minimum 20-gal water/acre	0	4 hr	Apply 2 – 3 weeks intervals. Do not apply at intervals less than 3 days.
Streptomyces lydicus WYEC 108 (Actinovate AG)	BM 02	3 – 12 oz/acre	0	4 hr	For best results apply product with damp soil.
Polyoxin D zinc salt (Affirm WDG)	19	8.0 oz/acre	0	4 hr	Apply as a soil drench every 14-28 days.
Garlic oil (Brandt Organics Aleo)	BM 01	3 – 12 fl oz / minimum of 20 gallons per acre	0	0	The use of adjuvants is highly recommended for improving performance. Repeat as need (5-day intervals).
Bacillus amyloliquefaciens strain D747 (Double Nickel LC)	BM 02	0.125 – 1 lbs/acre	0	4hr	For soil application, spray directly onto the soil surface or lower plant parts.
Hydrogen peroxide + peroxyacetic acid (OxiDate 2.0)	NC	1:500 to 1:1000	0	1 hr	Apply previous planting for better control. Post planting treat soil as needed.
Azoxystrobin + Extract of *Reynoturia sachalinensis* (Azterknot)	11 + P5	7.4 - 18.4 fl oz / acre	0	4 hr	Apply on a 7 to 14 days interval throughout the season following the resistance management guidelines. Minimum of 30-gallon pr acre. Ground application only.

Bean

R. Singh, Plant Pathologist, Louisiana State University Agricultural Center; E. Sikora, Plant Pathologist, Auburn University

Table 10-18. Disease Control Products for Bean

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
BEAN, SNAP					
ANTHRACNOSE, BOTRYTIS, SCLEROTINIA					
azoxystrobin (various)	11	6.2 to 15.4 fl oz	0	4 hr	For anthracnose only. Do not apply more than three sequential applications.
boscalid (Endura 70WG)	7	8 to 11 oz	7	0.5	Many other dried and succulent beans on label.
chlorothalonil (various)	M	2.7 lb/acre	7	2	Spray first appearance, 11 lb limit per acre per crop, 7-day intervals. **Not for Sclerotinia control.**
thiophanate-methyl (various)	1	1 to 2 lb/acre	14	1	Spray at 25% bloom; repeat at full bloom. Do not exceed 4 lb product per season.
fluazinam (various)	29	8 to 13.6 fl oz/acre	14	3	PHI varies by crop; see label restrictions.
fluxapyroxad + pyraclostrobin (Priaxor)	7+11	4.0 to 8.0 fl oz	7	12 hr	Begin prior to disease development and continue on a 7- to 14-day spray schedule. See label for specific directions for edible-podded legumes and dried-shelled legumes.
ASCOCHYTA BLIGHT, BOTRYTIS GRAY MOLD, WHITE MOLD (*SCLEROTINIA*)					
boscalid (Endura 70 WG)	7	8 to 11 oz	7	0.5	
penthiopyrad (Fontelis)	7	14 to 30 fl oz/acre	0	12 hr	Begin sprays prior to disease development.
ALTERNARIA, ANTHRACNOSE, ASCOCHYTA, RUST, SOUTHERN BLIGHT, WEB BLIGHT					
azoxystrobin + propiconazole (Quilt Xcel; Aframe Plus)	11+3	10.5 to 14 oz/acre	7	0.5	Apply when conditions are conducive for disease. Up to three applications may be made on 7- to 14-day intervals.
BOTRYTIS GRAY MOLD, WHITE MOLD (*SCLEROTINIA*)					
iprodione (various)	12	1.5 to 2 pt	See label	1	Apply as foliar spray and again 5- to 7-days later or up to peak bloom if conditions are favorable for disease. Do not use on cowpeas
isofetamid (Kenja 400SC)	7	17 fl oz	See label	0.5	Apply at 10 to 30% bloom and 7- to 14-days later, if needed. Do not allow livestock to graze in treated area.
cyprodinil + fludioxonil (various)	9+12	11 to 14 oz	7	0.5	Begin applications prior to onset of disease and repeat on 7-day intervals if condition remain favorable for disease development.
BACTERIAL BLIGHTS					
fixed copper (various)	M	See labels	1	1	Spray first appearance, 10-day intervals.
POWDERY MILDEW					
sulfur (various)	M	See labels	0	1	Spray at first appearance, 10- to 14-day intervals. Avoid days over 90°F.
DOWNY MILDEW, PYTHIUM POD ROT, COTTONY LEAK					
mefenoxam + copper hydroxide (Ridomil Gold Copper)	4+M1	5 lb/2.5 acres	7	2	For succulent shelled beans. Begin foliar applications at onset of disease and continue on a 7-day interval. Do not make more than 2 applications per season. Do not use an adjuvant.
COTTONY LEAK (*PYTHIUM* SPP.)					
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz	3	0.5	Begin applications when conditions become favorable for disease development. Do not make more than one application before alternating to a product with a different mode of action.
COTTONY LEAK, DOWNY MILDEW, PHYTOPHTHORA BLIGHT					
cyazofamid (Ranman)	21	2.75 fl oz	0	0.5	Read label for specific directions for each disease as well as use restrictions.
RHIZOCTONIA ROOT ROT					
azoxystrobin (various)	11	0.4 to 0.8 fl oz/ 1,000 row feet	—	4 hr	Apply in-furrow or banded applications shortly after plant emergence.

Table 10-18. Disease Control Products for Bean

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
myclobutanil (various)	3	4 to 5 oz/acre	0	1	**For Rhizoctonia only.**
RHIZOCTONIA ROOT ROT (continued)					
Dichloropropene (Telone C-17) (Telone C-35)	—	10.8 to 17.1 gal/ acre 13 to 20.5 gal/acre	—	5	Rate is based on soil type; see label for in-row rates.
metam-sodium (Vapam)	—	37.5 to 75 gal/trt acre	—	—	Rate is based on soil properties and depth of soil to be treated; apply 14- to 21-days before planting.
RHIZOCTONIA AND FUSARIUM SEED ROT, DAMPING OFF					
prothioconazole (Redigo 480)	3	0.16 to 0.32 fl oz/ 100 lbs seed	—	—	For seed rot and damping off caused by Rhizoctonia and Fusarium.
penflufen + trifloxystrobin (Evergol Prime)	7+11	0.16 to 0.32 fl oz/ 100 lb seed	—	0.5	For seed rot and damping off caused by Rhizoctonia, Fusarium, Phomopsis, or Botrytis. **Seed treatment only.**
RUST (*UROMYCES*)					
azoxystrobin (various)	11	6.2 to 15.4 fl oz/ acre	0	4 hr	Make no more than three sequential applications.
pyraclostrobin (various)	11	6.0 to 9.0 fl oz		0.5	Make no more than two sequential applications.
myclobutanil (various)	3	4 to 5 oz/acre	0	1	Spray at first appearance.
sulfur (various)	M	See label	0	1	Spray at 7- to 10-day intervals.
tebuconazole (various)	3	4 to 6 fl oz/acre	7	0.5	Apply before disease appears when conditions favor rust development and repeat at 14-day intervals: maximum 24 fl oz per season.
WHITE MOLD (*SCLEROTINIA*)					
dicloran (Botran 5F)	14	1.3 qt/acre	2	0.5	Begin applications when disease is anticipated.
BEAN, LIMA					
ALTERNARIA, ANTHRACNOSE, ASCOCHYTA, BEAN RUST, SOUTHERN BLIGHT, WEB BLIGHT (RHIZOCTONIA)					
azoxystrobin + propiconazole (Quilt Xcel, Aframe Plus)	11+3	10.5 to 14 fl oz	7	0.5	Apply when conditions are conducive for disease. Up to three applications may be made on a 7- to 14-day interval.
ALTERNARIA, ASCOCHYTA, CERCOSPORA, MYCOSPHAERELLA, POWDERY MILDEW, RUST					
pydiflumetofen + difenoconazole (Miravis Top)	3+7	13.7 fl oz/acre	14	0.5	For dried shelled beans only. Begin applications prior to disease development. Continue applications on a 14-day interval. Do not make more than 4 applications per season.
BOTRYTIS, LEAF SPOTS, SCLEROTINIA					
azoxystrobin (various)	11	6.2 to 15.4 fl oz/ acre	0	4 hr	Leaf spots only; do not make more than three sequential applications.
iprodione (various)	2	1.5 to 2 lb/acre	See label	1	Apply as foliar spray and again 5- to 7-days later or up to peak bloom. If conditions are favorable for disease. Do not use on cowpeas.
isofetamid (Kenja 400SC)	7	17 fl oz	See label		Apply at 10 to 30% bloom and 7- to 14-days later, if needed. Do not allow livestock to graze in treated area.
cyprodinil + fludioxonil (various)	9+12	11 to 14 oz	7	0.5	Begin applications prior to onset of disease and repeat on 7-day intervals if condition remain favorable for disease development.
fluazinam (various)	29	8 to 13.6 fl oz/acre	30	3	PHI varies by crop; see label restrictions.
boscalid (Endura 70WG)	7	8 to 11 oz	7	0.5	Apply at beginning of flowering or prior to onset of disease. Apply a second time at full bloom if conditions are favorable for disease.
fluxapyroxad + pyraclostrobin (Priaxor)	7+11	4.0 to 8.0 fl oz	21	12 hr	Begin prior to disease development and continue on a 7- to 14-day spray schedule. See label for specific directions for edible-podded legumes and dried-shelled legumes.
penthiopyrad (Fontelis)	7	14 to 30 fl oz/acre	0	12 hr	Begin sprays prior to disease development.

Table 10-18. Disease Control Products for Bean

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
BOTRYTIS, LEAF SPOTS, SCLEROTINIA (continued)					
pyraclostrobin (various)	11	6.0 to 9.0 fl oz	21	12 hr	Make no more than two sequential applications.
thiophanate-methyl (various)	12	7 oz	7	0.5	Begin before disease develops and continue on 7-day interval until conditions no longer favor disease development. Do not apply more than 28 oz/acre. Do not apply on cowpeas.
COTTONY LEAK (*PYTHIUM* SPP.)					
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz	3	12 hr	A spreader/sticker may be used to improve disease control. Minimum interval of 7-days between applications
COTTONY LEAK, DOWNY MILDEW PHYTOPHTHORA BLIGHT					
cyazofamid (Ranman)	21	2.75 fl oz	0	0.5	Read label for specific directions for each disease as well as use restrictions.
DAMPING-OFF, PYTHIUM, RHIZOCTONIA					
azoxystrobin (various)	11	0.4 to 0.8 fl oz/ 1,000 row feet	—	4 hr	**For Rhizoctonia only**. Make in-furrow or banded applications shortly after plant emergence.
azoxystrobin + mefenoxam (Uniform)	11+4	0.34 fl oz/ 1,000 row ft	—	—	Limit of one application per season. In-furrow spray. See label directions.
mefenoxam (various)	4	0.5 to 2 pt/trt acre	—	2	**For Pythium only.** Soil incorporate. See label for row rates. Use proportionally less for banded rates.
BOTRYTIS, FUSARIUM, PHOMOPSIS, RHIZOCTONIA					
penflufen + trifloxystrobin (Evergol Prime)	7+11	See label	—	—	For seed rot and damping off caused by Rhizoctonia, Fusarium, Phomopsis, or Botrytis. **Seed treatment only.**
DOWNY MILDEW					
mefenoxam + copper hydroxide (Ridomil Gold Copper)	4+M1	5 lb/2.5 acres	3	2	For succulent shelled beans. Begin foliar applications at onset of disease and continue on a 7-day interval. Do not exceed 4 applications per season.

Table 10-19. Importance of Alternative Management Practices for Disease Control in Beans

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

	Anthracnose	Ashy stem blight	*Botrytis* gray mold	*Cercospora*	Common bacterial blight and halo blight	*Fusarium* root rot	Mosaic viruses	Powdery mildew	*Pythium* damping-off	*Rhizoctonia* root rot	Root knot nematode	Rust (more on pole beans)	Southern blight (*Sclerotium rolfsii*)	White mold (*Sclerotinia*)
Avoid field operations when leaves are wet	E	NC	E	F	E	NC	NC	NC	NC	NC	NC	E	NC	NC
Avoid overhead irrigation	E	NC	E	E	E	NC	NC	NC	P	NC	NC	E	NC	G
Change planting date	F	F	NC	P	F	G	F	P	E	E	P	G (early)	NC	NC
Cover cropping with antagonist	NC	ND	NC	NC	NC	NC	NC	NC	NC	NC	G	NC	NC	NC
Crop rotation	G	P	F	F	G	F	P	P	F	F	G	NC	F	E
Deep plowing	E	F	E	P	E	F	NC	NC	F	F	F	NC	E	E
Destroy crop residue	E	F	E	F	E	NC	NC	NC	P	P	F	F	G	E
Encourage air movement	E	NC	E	F	E	NC	NC	E	P	NC	NC	F	NC	G
Increase between-plant spacing	P	NC	P	F	P	P	P	P	F	F	NC	P	F	G
Increase soil organic matter	NC	F	NC	NC	NC	F	NC	NC	NC	NC	F	NC	NC	NC
Insecticidal oils	NC	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	NC	NC	NC
pH management	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	NC	NC	NC	NC
Plant in well-drained soil	F	F	F	NC	F	E	NC	NC	E	E	NC	NC	P	F
Plant on raised beds	F	P	F	NC	F	E	NC	NC	E	E	NC	NC	P	F
Plastic mulch bed covers	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	F
Postharvest temperature control	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	E
Reflective mulch	NC	NC	NC	NC	NC	NC	G	NC	NC	NC	NC	NC	NC	P
Reduce mechanical injury	NC	NC	NC	NC	NC	F	P	NC	NC	NC	NC	NC	P	NC
Rogue diseased plants	NC	NC	P	NC	NC	NC	F	NC	NC	NC	NC	NC	P	F
Row covers	NC	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	NC	NC	NC
Soil solarization	NC	NC	P	NC	NC	F	NC	NC	F	G	F	NC	F	G
Pathogen-free planting material	E	G	NC	F	E	NC	G	NC	NC	NC	NC	NC	NC	NC

Brassicas (Broccoli, Brussel Sprout, Cabbage, Cauliflower)

A. Keinath, Plant Pathologist, Clemson University

Table 10-20. Disease Control Products for Broccoli, Brussel Sprout, Cabbage, and Cauliflower (Head and Stem Brassicas)

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
ALTERNARIA LEAF SPOT (*ALTERNARIA* SPP.)					
azoxystrobin + difenoconazole (Quadris Top 2.72 SC)	11+3	14 fl oz/acre	1	0.5	Apply prior to disease, but when conditions are favorable on 7- to 14-day schedule. Alternate to a non-FRAC 11 fungicide after 1 application. No more than 4 applications per season.
boscalid (Endura 70 EG)	7	6 to 9 oz/acre	0	0.5	Begin applications prior to disease development and continue on a 7- to 14-day interval. Make no more than 2 applications per season.
cyprodinil + difenoconazole (Inspire Super 2.82SC)	9+3	16 to 20 fl oz/acre	7	0.5	Begin applications prior to disease development and continue on a 7- to 10-day interval. Make no more than 2 sequential applications before rotating to another effective fungicide with a different mode of action. Do not exceed 80 fl oz per season.
cyprodinil +fludioxonil (Switch 62.5WG)	9+12	11 to 14 oz/acre	7	0.5	Apply when disease first appears and continue on a 7- to 10-day interval. Do not exceed 56 oz of product per acre per year.
flutriafol (Rhyme 2.08SC)	3	5 to 7 fl oz/acre	7	0.5	Limit of 4 applications per year. Labeled for Alternaria and Cercospora leaf spots.
flutriafol + azoxystrobin (Topguard EQ 4.29 SC)	3+11	4 to 8 fl oz/acre	0	0.5	Limit of 4 applications per year.
fluxapyroxad + pyraclostrobin (Priaxor 500 SC)	7+11	6.0 to 8.2 fl oz/acre	3	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Maximum of 3 applications. **Do not apply to turnip greens or roots.**
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	11.4 fl oz/acre	7	0.5	Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action. Maximum 3 applications per year.
triflumizole (Procure 480SC)	3	6 to 8 fl oz/acre	1	0.5	Apply when disease first appears and continue on a 14-day interval. Do not exceed 18 fl oz per season.
ALTERNARIA LEAF SPOT, GRAY MOLD					
fluopyram + trifloxystrobin (Luna Sensation 500 SC)	7+11	5.0 to 7.6 fl oz/acre	0	0.5	Do not apply more than 15.3 fl oz per acre per season. Make no more than 2 sequential applications before rotating to a fungicide not in Group 7 or 11.
penthiopyrad (Fontelis 1.67 SC)	7	14 to 30 fl oz/acre	0	0.5	Do not exceed 72 fl oz of product per year. Make no more than 2 sequential applications per season before rotating to another effective product with a different mode of action. **See additional products listed below under Downy mildew and Alternaria leaf spot.**
BLACK LEG (*LEPTOSPHAERIA MACULANS*)					
iprodione (Rovral 4F)	2	2 lb/acre 2 pt/acre	0	—	Apply to base of plant at 2- to 4-leaf stage. A second application may be made up to the harvest date. Do not use as a soil drench. **For broccoli only.**
fluxapyroxad + pyraclostrobin (Priaxor 500 SC)	7+11	6.0 to 8.2 fl oz/acre	3	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Maximum of 3 applications. **Do not apply to turnip greens or roots.**
BLACK ROT (*XANTHOMONAS CAMPESTRIS* PV. *CAMPESTRIS*), DOWNY MILDEW (*HYALOPERONOSPORA PARASITICA*)					
acibenzolar-*S*-methyl (Actigard 50WG)	P1	0.5 to 1 oz/acre	7	0.5	Begin applications 7- to 10-days after thinning, not to exceed 4 applications per a season.
fixed copper (various)	M1	See labels	0	1 to 2	Apply on 7- to 10-day intervals after transplanting or shortly after seeds have emerged. Some reddening on older broccoli leaves and flecking of cabbage wrapper leaves may occur. Check label carefully for recommended rates for each disease.

Table 10-20. Disease Control Products for Broccoli, Brussel Sprout, Cabbage, and Cauliflower (Head and Stem Brassicas)

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
CERCOSPORA LEAF SPOT (*CERCOSPORA BRASSICICOLA*)					
fluopyram + trifloxystrobin (Luna Sensation 500 SC)	7+11	7.6 fl oz/acre	0	0.5	Do not apply more than 15.3 fl oz per acre per season. Make no more than 2 sequential applications before rotating to a fungicide not in Group 7 or 11.
flutriafol (Rhyme 2.08SC)	3	5 to 7 fl oz/acre	7	0.5	Limit of 4 applications per year. Labeled for Alternaria and Cercospora leaf spots.
flutriafol + azoxystrobin (Topguard EQ 4.29 SC)	3+11	4 to 8 fl oz/acre	0	0.5	Limit of 4 applications per year.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	11.4 fl oz/acre	7	0.5	Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action. Maximum 3 applications per year.
CLUBROOT (*PLASMODIOPHORA BRASSICAE*)					
cyazofamid (Ranman 34.5SC)	21	*Transplant:* 12.9 to 25.75 fl oz/ 100-gal water			Either apply immediately after transplanting with 1.7 fl oz of solution per transplant, or as a banded application with soil incorporation of 6 to 8 inches prior to transplanting. Do not apply more than 39.5 fl oz/acre/season or 6 (1 soil+ 5 foliar) applications per season. Do not make more than 3 consecutive applications without rotating to another fungicide with a different mode of action for 3 subsequent applications.
		Banded: 20 fl oz/acre	0.5	0	
fluazinam (Omega 500F)	29	*Transplant:* 6.45 fl oz/100-gal water			Apply either directly as a drench to transplants or as a banded application with soil incorporation of 6 to 8 inches prior to transplanting. Use of product can delay harvest and cause some stunting without adverse effects on final yields.
		Banded: 2.6 pts/acre	50	50	
DOWNY MILDEW (*HYALOPERONOSPORA PARASITICA*)					
ametoctradin + dimethomorph (Zampro 525SC)	40+45	14 fl oz/acre	0	0.5	Do not make more than 2 sequential applications before alternating to a fungicide with a different mode of action. Addition of an adjuvant may improve performance (see label for specifics).
cyazofamid (Ranman 400SC)	21	2.75 fl oz/acre	0	0.5	Begin applications on a 7- to 10-day schedule when disease first appears, or weather is conducive. Do not apply more than 39.5 fl oz/acre/season; or 6 (1 soil + 5 foliar) applications per season. Do not make more than 3 consecutive applications without rotating to another fungicide with a different mode of action for 3 subsequent applications.
dimethomorph (Forum 4.16SC)	40	6 oz/acre	0	0.5	Alternate every application with a non-FRAC Group 40 fungicide. Limit of 3 applications per season.
fenamidone (Reason 500SC)	11	5.5 to 8.2 oz/acre	2	0.5	Begin applications as soon as conditions become favorable for disease development. Applications should be made on a 5- to 10-day interval. Do not make more than one application of Reason 500SC before alternating with a fungicide from a different resistance management group.
fluopicolide (Presidio 4 SC)	43	3 to 4 fl oz/acre	2	0.5	Must be tank mixed with another fungicide with a different mode of action. No more than 2 sequential applications before rotating to another effective product of a different mode of action. Limited to 4 applications 12 fl oz/acre per season.
fosetyl-AL (Aliette)	33	2 to 5 lb/acre	3	1	Apply when disease first appears; then repeat on 7- to 21-day intervals. Do not tank mix with copper fungicides. A maximum of 7 applications can be made per season.
mandipropamid (Revus 2.08SC)	40	8 fl oz/acre	1	0.5	Apply prior to disease development and continue throughout season at 7- to 10-day intervals; maximum 32 fl oz per season.
oxathiapiprolin + mandipropamid (Orondis Ultra A + Orondis Ultra B2.33SC)	U15+40	5.5 to 8 fl oz/acre	0	4 hr	Apply prior to disease development at 10-day intervals. Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. Maximum of 4 applications per crop per year of all Orondis products.
potassium phosphite (various)	33	2 to 4 pt/acre	0	4 hr	Apply when weather is foggy as a preventative. Do not apply to plants under water or temperature stress. Spray solution should have a pH greater than 5.5. Apply in at least 30-gal water per acre.

Table 10-20. Disease Control Products for Broccoli, Brussel Sprout, Cabbage, and Cauliflower (Head and Stem Brassicas)

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DOWNY MILDEW, ALTERNARIA LEAF SPOT					
azoxystrobin (Quadris 2.08F)	11	6.0 to 15.5 fl oz/ acre	0	4 hr	Do not make more than 2 applications before alternating to a fungicide with a different mode of action. Do not apply more than 92.3 fl oz per acre per season.
chlorothalonil (various)	M5	See labels	7	2	Apply after transplanting, seedling emergence, or when conditions favor disease development. Repeat as needed on a 7- to 10-day interval.
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz/acre	2	0.5	Begin applications on a 5- to 10-day schedule when disease first appears, or weather is conducive. Do not apply more than 24.6 fl oz/acre/season. Do not make more than 1 application without rotating to another fungicide with a different mode of action.
fluazinam (Omega 500 F)	29	15.35 fl oz/acre	7	0.5	**Apply to cabbage only.** DO NOT apply more than 5.75 pints (6 applications) per acre per year.
mancozeb (various)	M3	1.6 to 2.1 lb/acre	10	1	Spray at first appearance of disease and continue on a 7- to 10-day interval. No more than 12.8 lbs/acre per season.
mefenoxam + chlorothalonil (Ridomil Gold/ Bravo)	4+M5	1.5 lb/acre	7	2	Begin applications when conditions favor disease but prior to symptoms. Under severe diseases pressure use additional fungicides between 14-day intervals. Do not make more than four applications per crop.
oxathiapiprolin + mandipropamid (Orondis Opti)	U15+M5	1.75 to 2.5 fl oz/ acre	7	0.5	Apply prior to disease development at 10-day intervals. Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. Maximum of 8 applications at the low rate or 4 applications at the high rate per year of Orondis Opti, if Ultra and Opti are both used, then the maximum is 4 applications each.
POWDERY MILDEW (*ERYSIPHE* SPP.)					
azoxystrobin + difenoconazole (Quadris Top 2.72 SC)	11+3	14 fl oz/acre	1	0.5	Apply prior to disease, but when conditions are favorable, on 7-to 14-day schedule. Alternate to a non-FRAC 11 fungicide after 1 application. No more than 4 applications per season.
boscalid (Endura 70 EG)	7	6 to 9 oz/acre	0	0.5	Begin applications prior to disease development and continue on a 7- to 14-day interval. Make no more than 2 applications per season; disease suppression only.
cyprodinil + difenoconazole (Inspire Super 2.82SC)	9+3	16 to 20 fl oz/acre	7	0.5	Begin applications prior to disease development and continue on a 7- to10-day interval. Make no more than 2 sequential applications before rotating to another effective fungicide with a different mode of action. Do not exceed 80 fl oz per season.
cyprodinil + fludioxonil (Switch 62.5WG)	9+12	10 to 12 oz/acre	7	0.5	Apply when disease first appears and continue on 7- to 10-day intervals. Do not exceed 56 oz of product per acre per year.
fluxapyroxad + pyraclostrobin (Priaxor 500 SC)	7+11	6.0 to8.2 fl oz/acre	3	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Maximum of 3 applications. Do not apply to turnip greens or roots.
fluopyram + trifloxystrobin (Luna Sensation 500 SC)	7+11	5.0 to 7.6 fl oz/acre	0	0.5	Do not apply more than 15.3 fl oz per acre per season. Make no more than 2 sequential applications before rotating to a fungicide not in Group 7 or 11.
flutriafol (Rhyme 2.08SC)	3	5 to 7 fl oz/acre	7	0.5	Limit of 4 applications per year. Labeled for Alternaria and Cercospora leaf spots.
flutriafol + azoxystrobin (Topguard EQ 4.29 SC)	3+11	4 to 8 fl oz/acre	0	0.5	Limit of 4 applications per year.
penthiopyrad (Fontelis 1.67 SC)	7	14 to 30 fl oz/acre	0	0.5	Do not exceed 72 fl oz of product per year. Make no more than 2 sequential applications per season before rotating to another effective product with a different mode of action.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	11.4 fl oz/acre	7	0.5	Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action. Maximum 3 applications per year.
sulfur (various)	M2	See labels	0	1	Apply when disease first appears; then repeat as needed on a 14-day interval. Avoid applying on days over 90°F. Also, for use on greens (collard, kale, and mustard), rutabaga, and turnip.
triflumizole (Procure 480SC)	3	6 to 8 fl oz/acre	1	0.5	Apply when disease first appears and continue on a 14-day interval. Do not exceed 18 fl oz per season.

Table 10-20. Disease Control Products for Broccoli, Brussel Sprout, Cabbage, and Cauliflower (Head and Stem Brassicas)

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
PYTHIUM DAMPING OFF, PHYTOPHTHORA BASAL STEM ROT					
fluopicolide (Presidio 4 F)	43	3 to 4 fl oz/acre	2	0.5	Apply as a soil drench at transplant. As plants enlarge, use apply directly to soil by chemigation on a 10-day schedule as conditions favor disease, but prior to disease development. No more than 2 sequential applications before rotating to another effective product of a different mode of action. Limited to 4 applications, 12 fl oz/ acre per season.
mefenoxam (Ridomil Gold 4 SL)	4	0.25 to 2 pt/acre	—	2	Apply 1 to 2 pt per acre as a broadcast, preplant application to soil and incorporate in top 2 in. of soil. For Pythium control, use only 0.25 to 0.5 pt per acre.
metalaxyl (MetaStar 2 EAG)	4	4 to 8 pt/ trt acre	—	2	Preplant incorporated or surface application.
WIRESTEM, RHIZOCTONIA BOTTOM ROT (*RHIZOCTONIA SOLANI*)					
azoxystrobin (Quadris 2.08 SC)	11	5.8 to 8.7 fl oz/ acre on 36-in.rows	0	4 hr	Rate is equivalent to 0.4 to 0.6 fl oz per 1000 row feet. Apply at planting as a directed spray to the furrow in a band 7 inches wide. See label for other row spacings.
boscalid (Endura 70 EG)	7	6 to 9 oz/acre	0	0.5	Begin applications prior to disease development and continue on a 7- to 14-day interval. Make no more than 2 applications per season.
WIRESTEM, RHIZOCTONIA BOTTOM ROT (*RHIZOCTONIA SOLANI*) (cont'd)					
flutolanil (Moncut 3.8SC)	7	26 fl oz/acre	45	0.5	Apply to the row at planting as an in-furrow spray or a spray directed at the base of transplants immediately after transplanting. Limit of 2 applications per year.
penthiopyrad (Fontelis 1.67 SC)	7	16 to 30 fl oz/acre	0	0.5	Do not exceed 72 fl oz of product per year. Make no more than 2 sequential applications per season before rotating to another effective product with a different mode of action.
SCLEROTINIA STEM ROT, WHITE MOLD (*SCLEROTINIA SCLEROTIORUM*)					
boscalid (Endura 70 EG)	7	6 to 9 oz/acre	0	0.5	Begin applications prior to disease development and continue on a 7- to 14-day interval. Make no more than 2 applications per season.
fluopyram + trifloxystrobin (Luna Sensation 500 SC)	7+11	7.6 fl oz/acre	0	0.5	Do not apply more than 15.3 fl oz per acre per season. Make no more than 2 sequential applications before rotating to a fungicide not in Group 7 or 11.
penthiopyrad (Fontelis 1.67 SC)	7	16 to 30 fl oz/acre	0	0.5	Do not exceed 72 fl oz of product per year. Make no more than 2 sequential applications per season before rotating to another effective product with a different mode of action.
Coniothyrium minitans (Contans WG)	—	1 to 4 lb/acre	0	4 hr	**OMRI listed product.** Apply to soil surface and incorporate no deeper than 2 inches. Works best when applied prior to planting or transplanting. Do not apply other fungicides for 3 weeks after applying Contans.
WHITE RUST (*ALBUGO CANDIDA*)					
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	11.4 fl oz/acre	7	0.5	Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action. Maximum 3 applications per year.

Table 10-21. Efficacy of Products for Disease Control in Brassicas
A. Keinath, Plant Pathologist, Clemson University

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

Active Ingredient [1, 2]	Product	Crop Group [2]	Fungicide group [F]	Preharvest interval (Days)	Alternaria Leaf Spot	Bacterial Soft Rot	Black Rot	Black Leg	Bottom Rot (*Rhizoctonia*)	*Cercospora* & *Cercosporella*	Clubroot	Downy Mildew	Powdery Mildew	Pythium damping-off	*Sclerotinia*/ Raisin Head	Wirestem (*Rhizoctonia*)
acibenzolar-*S*-methyl	Actigard	H&S	P01	7	NC	ND	F	NC	NC	NC	NC	G	P	ND	ND	NC
ametoctradin + dimethomorph	Zampro	B	45+40	0	NC	NC	NC	NC	NC	NC	NC	E	NC	NC	NC	NC
azoxystrobin	various	B	11	0	E [R]	NC	NC	F	ND	F	NC	G	F	NC	NC	F
azoxystrobin + difenoconazole	Quadris Top	B	11+3	1	E	NC	NC	ND	ND	G	NC	G	F	NC	NC	F
boscalid [3]	Endura	B	7	0 to 14	G	NC	NC	NC	NC	NC	NC	NC	P	NC	F	F
chlorothalonil	various	H&S	M05	7	F	NC	NC	NC	P	F	NC	F	F	NC	NC	NC
fixed copper [4]	various	B	M01	0	P	NC	P	NC	NC	P	NC	F	F	NC	NC	NC
cyazofamid	Ranman	B	21	0	NC	NC	NC	NC	NC	NC	NC	G	NC	NC	NC	NC
cyprodinil + fludioxonil	Switch	B	9+12	7	F	NC	NC	NC	NC	F	NC	NC	F	NC	NC	NC
difenoconazole + cyprodinil	Inspire Super	B	3+9	7	G	NC	NC	ND	NC	G	NC	NC	F	NC	P	NC
dimethomorph	Forum	B	40	0	NC	NC	NC	NC	NC	NC	NC	G	NC	NC	NC	NC
fenamidone	Reason	B	11	2	F	NC	NC	NC	NC	F	NC	E	NC	NC	NC	NC
fluazinam [5]	Omega 500	B	29	20 to 50	F	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	G
fluopicolide	Presidio	B	43	2	NC	NC	NC	NC	NC	NC	NC	E	NC	NC	NC	NC
fluopyram + trifloxystrobin	Luna Sensation	H&S	7+11	0	G	NC	NC	ND	ND	ND	NC	NC	ND	NC	ND	ND
flutolanil	Moncut	B&T	7	45	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	G
flutriafol	Rhyme	B	3	7	NC	NC	NC	ND	ND	ND	NC	NC	ND	NC	ND	ND
fluxapyroxad + pyraclostrobin	Priaxor	B	7+11	3	G	NC	ND	G	ND	G	NC	F	F	NC	ND	NC
fosetyl-Al	Aliette	B	33	3	NC	NC	NC	NC	NC	NC	NC	F	NC	NC	NC	NC
iprodione	Rovral	Broc	2	0	F	NC	NC	F	NC	NC	NC	NC	NC	NC	P	P
mandipropamid	Revus	B	40	1	NC	NC	NC	NC	NC	NC	NC	E	NC	NC	NC	NC
mancozeb	various	H&S	M03	7	F	NC	NC	NC	NC	F	NC	F	P	NC	NC	NC
mancozeb + azoxystrobin	Dexter Max	B&C	M03+11	7	F	NC	NC	NC	NC	F	NC	F	P	NC	NC	NC
mefenoxam (pre-plant)	Ridomil Gold	B	4	—	NC	NC	NC	NC	NC	NC	NC	F	NC	F [R]	NC	NC
mefenoxam + chlorothalonil	Ridomil Gold Bravo	H&S	4+M05	7	F	NC	NC	NC	P	F	NC	F	F	NC [R]	NC	NC
oxathiapiprolin + mandipropamid	Orondis Ultra	H&S	U15+40	7	NC	NC	NC	NC	NC	NC	NC	E	NC	ND	NC	NC
penthiopyrad	Fontelis	B	7	0	G	NC	NC	ND	NC	ND	NC	NC	G	NC	G	NC
phosphonates	various	B	P07	0	NC	NC	NC	NC	NC	NC	NC	G	NC	NC	NC	NC
pyraclostrobin [3]	Cabrio, Pyrac	B	11	0 to 3	G	NC	NC	ND	NC	E	NC	F	F	NC	NC	P
sulfur	various	B	M02	0	P	NC	NC	NC	NC	P	NC	P	F	NC	NC	NC
tebuconazole	various	B	3	7	P	NC	NC	ND	NC	F	NC	NC	ND	NC	NC	NC
triflumizole	Procure	B	3	1	NC	NC	NC	NC	NC	NC	NC	NC	G	NC	NC	NC

[1] Efficacy ratings do not necessarily indicate a labeled use for every disease.
[2] H&S = fungicides registered only on head and stem brassicas(broccoli, Brussels sprouts, cabbage, and cauliflower); B= fungicides registered on all brassica crops except turnip greens and root turnips; see Tables 10-30 and 10-45 for products registered on turnips. B&T = fungicides registered on all brassica leafy vegetables, including turnip greens(but not grown for roots). Broc = fungicide registered on broccoli only. B&C = fungicide registered on broccoli and cabbage only. Always refer to product labels prior to use.
[3] Shorter PHI is for head and stem brassicas (broccoli, Brussel sprout, cabbage, and cauliflower) and longer PHI is for leafy brassica greens.
[4] Phytotoxicity is seen when fosetyl-Al is tank-mixed with copper.
[5] Use a 20-day PHI for Omega 500 on leafy greens and a 50-day PHI for head and stem brassicas.
[F] To prevent resistance in pathogens, alternate fungicides within a group with fungicides in another group. Fungicides in the “M” group are considered “low risk” with no signs of resistance developing.
[R] Resistance reported in the pathogen.

Importance of Alternative Management Practices for Disease Control in Brassicas

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Table 10-22. Importance of Alternative Management Practices for Disease Control in Brassicas

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

Strategy	*Alternaria* lea spot	Bacterial soft rot	Black rot	Black leg	Bottom rot (*Rhizoctonia*)	*Cercospora*	Clubroot	Downy mildew	Powdery mildew	*Pythium*	*Sclerotinia* head	Wirestem (*Rhizoctonia*)
Avoid field operations when leaves are wet	P	F	G	F	F	P	NC	P	NC	NC	NC	NC
Avoid overhead irrigation	E	E	E	E	F	E	NC	G	P	NC	NC	NC
Change planting date	P	P	NC	NC	P	NC	NC	NC	NC	P	NC	F
Cover cropping with antagonist	NC	NC	NC	NC	NC	NC	P	NC	NC	P	NC	NC
Crop rotation	F	F	G	G	P	F	NC	F	NC	NC	P	P
Deep plowing	F	F	G	G	F	F	NC	F	NC	NC	F	F
Destroy crop residue	F	F	G	G	F	F	NC	F	NC	NC	P	P
Encourage air movement	F	P	P	P	F	F	NC	F	NC	P	F	NC
Increase between-plant spacing	F	P	P	P	F	F	NC	F	NC	P	F	NC
Increase soil organic matter	NC	NC	NC	NC	P	NC	P	NC	NC	NC	NC	P
Hot water seed treatment	P	NC	E	G	NC	NC	NC	NC	NC	NC	NC	NC
pH management	NC	NC	NC	NC	NC	NC	E	NC	NC	NC	NC	NC
Plant in well-drained soil	P	F	P	P	G	P	E	P	NC	F	F	G
Plant on raised beds	NC	F	P	NC	G	NC	E	P	NC	F	F	G
Plastic mulch bed covers	P	NC	NC	NC	F	NC	NC	NC	NC	NC	NC	NC
Postharvest temperature control	NC	E	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Reflective mulch	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Reduce mechanical injury	NC	E	G	NC	NC	NC	NC	NC	NC	NC	F	P
Rogue diseased plants	P	NC	NC	F	P	NC	NC	NC	NC	NC	NC	NC
Row covers	NC	P	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Soil solarization	NC	NC	NC	P	F	NC	NC	NC	NC	P	P	F
Pathogen-free planting material	F	NC	E	E	F	NC	G	NC	NC	NC	P	F
Resistant cultivars	F	NC	E	NC	NC	NC	P	F	F	NC	NC	P
Weed control	F	NC	F	F	NC	F	F	F	F	NC	F	NC

For Cantaloupe — See Cucurbits

For Celery — See Leafy Petiole Vegetables

Corn, Sweet

D. Langston, Extension Plant Pathologist, Virginia Tech

Table 10-23. Disease Control Products for Corn, Sweet

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
SEEDLING DISEASES CAUSED BY RHIZOCTONIA AND PENICILLIUM					
pyraclostrobin (Stamina 1.67FC)	11	0.8 to 1.6 fl oz/ 100 lbs of seed	NA	NA	Seed treatment. Seed treated on-farm must be dyed.
SOILBORNE DISEASES, RHIZOCTONIA ROOT AND STALK ROT					
fluoxastrobin (Aftershock)	11	0.16 to 0.24 fl oz/ 1000 row feet	7	0.5	May be applied as a banded or in-furrow spray. Consult label for specifics.
azoxystrobin (various)	11	0.4 to 0.8 fl oz/ 1000 row feet	7	4 hr	See label for banded or in-furrow sprays. Apply no more than 2.88 qt per crop per acre per season, including soil applications.
ANTHRACNOSE, EYE- SPOT, GRAY LEAF SPOT (CERCOSPORA LEAF SPOT), NORTHERN CORN LEAF BLIGHT (*EXSEROHILUM* [*HELMINTHOSPORIUM*] *TURCICUM*), NORTHERN CORN LEAF SPOT (*BIPOLARIS ZEICOLA* [*HELMINTHOSPORIUM CARBONUM*]), SOUTHERN CORN LEAF BLIGHT (*BIPOLARIS* [*HELMINTHOSPORIUM*] *MAYDIS*), RUST, SOUTHERN RUST					
azoxystrobin (various)	11	See labels	7	4 hr	Use lower rate for rust. Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. Apply no more than 123 fl oz per crop per acre per season. **Not registered for Southern rust.**
azoxystrobin + flutriafol (Topguard EQ)	11+3	5 to 7 fl oz/acre	7	3	Apply when disease symptoms first appear and re-apply on a 7- to 10-day interval. Use high rate under heavy disease pressure.
azoxystrobin + propiconazole (Quilt, Quilt XCEL, Avaris)	11+3	7 or 10.5 to 14 fl oz/acre	14	0.5	Use 7 fl oz of Quilt or Avaris for 3 Helminthosporium diseases. Must rotate every application with a non-Group 11 fungicide. Maximum 56 fl oz/acre (4 applications at the high rate) per crop.
chlorothalonil (various)	M05	See labels	14	2	Spray at first appearance, 4-to 14-day intervals. **Not registered for anthracnose, eyespot, or gray leaf spot.**
fluoxastrobin (Aftershock)	11	2.0 to 3.8 fl oz/ acre	30	0.5	Soil and foliar treatments. Maximum 2 applications per season. Do not apply after R4 early dough stage.
flutriafol (Topguard)	3	7 to 14 fl oz/acre	7	0.5	Apply preventively when conditions are favorable for disease and on a 7-day schedule thereafter.
flutriafol (Xyway LFR)	3	7.6 to 15.2 fl oz/ acre	-	0.5	Xyway LFR Fungicide soil applications provide foliar disease control/ suppression through the growing season. For control of late-season infestations, heavy disease pressure situations, or foliar diseases not listed above, a supplemental foliar application may be needed.
fluxapyroxad + pyraclostrobin (Priaxor)	7+11	4 to 8 fl oz/acre	7	0.5	Do not make more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 4 (high rate) or 2 applications (low rate) per crop. Crop damage may occur when an adjuvant is used; read label for specifics.
mancozeb (various)	M03	See labels	7	1	Start applications when disease first appears and repeat at 4- to 7-day intervals. **Not registered for anthracnose, eyespot, gray leaf spot, or Southern rust.**
Penthiopyrad (Vertisan)	7	10 to 24 fl oz/ acre	7	0.5	No more than 2 sequential applications of the fungicide before switching to a fungicide with another mode of action. **Not registered for eyespot.**
propiconazole (various)	3	See labels	14	0.5	16 fl oz per acre per crop maximum. **Not registered for anthracnose.**
propiconazole + azoxystrobin + benzovindiflupyr (Trivapro)	3+11+7	13.7 fl oz/acre	14	0.5	Begin applications prior to disease development. Continue applications through season on a 14-day interval, following the resistance management guidelines.
propiconazole + azoxystrobin + pydiflumetofen (Miravis Neo)	3+11+7	13.7 fl oz/acre	14	0.5	Begin applications prior to disease development. Continue applications through season on a 7- to 14-day interval, following the resistance management guidelines.
prothioconazole + trifloxystrobin (Delaro)	3+11	8 fl oz/acre	0	0.5	Apply Delaro 325 SC Fungicide when disease first appears and continue on 5- to 14-day interval if favorable conditions for disease development persist. Use of an adjuvant may enhance performance of Delaro 325 SC Fungicide. If utilized, apply the lowest label recommended rate of a NIS adjuvant to enhance disease control.
prothioconazole + trifloxystrobin + fluopyram (Delaro Complete)	3+11+7	8 fl oz/acre	0	0.5	Spray Delaro Complete when disease first appears and continue on a 5- to 14-day interval if favorable conditions for disease development persist. Use of an adjuvant may enhance the performance of Delaro Complete. If utilized, apply the lowest label recommended rate of a NIS adjuvant to enhance disease control.

Table 10-23. Disease Control Products for Corn, Sweet

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
ANTHRACNOSE, EYE- SPOT, GRAY LEAF SPOT (CERCOSPORA LEAF SPOT), NORTHERN CORN LEAF BLIGHT (*EXSEROHILUM* [*HELMINTHOSPORIUM*] *TURCICUM*), NORTHERN CORN LEAF SPOT (*BIPOLARIS ZEICOLA* [*HELMINTHOSPORIUM CARBONUM*]), SOUTHERN CORN LEAF BLIGHT (*BIPOLARIS* [*HELMINTHOSPORIUM*] *MAYDIS*), RUST, SOUTHERN RUST (cont'd)					
prothioconazole + tebuconazole (Prosaro)	3+3	6.5 fl oz/acre		0.5	Apply Prosaro when disease first appears. In sweet corn, continue applications on a 5- to 14-day interval if favorable conditions for disease development persist. In all other corn, continue applications on a 7- to 14-day interval if favorable conditions for disease development persist. Application of Prosaro is not recommended at times when corn is under severe environmental stress conditions.
pyraclostrobin (Headline SC & EC)	11	6 to 12 fl oz/acre	7	0.5	Do not make more than 2 sequential applications or 6 applications of this fungicide or other group 11 fungicides per crop. **Not registered for eyespot.**
pyraclostrobin + metconazole (Headline AMP)	11+3	10 to 14.4 fl oz/ acre	7	0.5	No more than 2 sequential applications before alternating with a different mode of action. Maximum 4 (high rate) or 5 applications (low rate) per crop. **Not registered for eyespot.**
trifloxystrobin + propiconazole (Stratego)	11+3	10 fl oz/acre	14	0.5	Apply Stratego when disease first appears and continue on a 7- to 14-day interval. Alternate applications of Stratego with another product with a different mode of action than Group 11 fungicides. Maximum 3 applications per crop. **Not registered for the 3 Helminthosporium diseases.**
trifloxystrobin + propiconazole (Stratego YLD)	11+3	4 to 5 fl oz/acre	0	0.5	Alternate Stratego YLD sprays with another mode of action than a group 11 fungicide. Maximum 4 (high rate) or 5 applications (low rate) per crop. **Not registered for the 3 Helminthosporium diseases.**
trifloxystrobin + tebuconazole (Absolute Maxx)	11+3	5 to 6 fl oz/acre	7	19	Apply when disease first appears and continue on a 10- to14-day interval if favorable conditions for disease development persist. Use of shorter spray intervals and higher rates are recommended when disease pressure is severe.
BROWN SPOT (*PHYSODERMA MAYDIS*)					
fluxapyroxad + pyraclostrobin (Priaxor)	7+11	4 to 8 fl oz/acre	7	0.5	Do not make more than 2 sequential applications of Priaxor before switching to a fungicide with a different mode of action. Maximum 4 (high rate) or 2 applications (low rate) per crop. Crop damage may occur when an adjuvant is used; read label for specifics.
Penthiopyrad (Vertisan)	7	16 to 24 fl oz/ acre	0	0.5	No more than 2 sequential applications of the fungicide before switching to a fungicide with another mode of action.
pyraclostrobin (Headline SC & EC)	11	6 to 12 fl oz/acre	7	0.5	Do not exceed 2 sequential applications of this fungicide or with other group 11 fungicides.
pyraclostrobin + metconazole (Headline AMP)	11+3	10 to 14.4 fl oz/ acre	7	0.5	No more than 2 sequential applications before alternating with a different mode of action.
YELLOW LEAF BLIGHT (*PEYRONELLAEA ZEAMAYDIS* [*PHYLLOSTICTA MAYDIS*])					
fluxapyroxad + pyraclostrobin (Priaxor)	7+11	4 to 8 fl oz/acre	7	0.5	Do not make more than 2 sequential applications of Priaxor before switching to a fungicide with a different mode of action. Maximum 4 (high rate) or 2 applications (low rate) per crop. Crop damage may occur when an adjuvant is used; read label for specifics.

For Cucumbers — See Cucurbits

Cucurbits (Cucumber, Cantaloupe, Melon, Pumpkin, Squash, Watermelon)

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Table 10-24. Disease Control Products for Cucurbits

Crop/Disease/ Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
ANGULAR LEAF SPOT (*PSEUDOMONAS*)					
fixed copper (various)	M01	See labels	See label	See label	See label. Rates vary depending on the formulation. Repeated use may cause leaf yellowing.
acibenzolar-S-methyl (Actigard 50 WP)	P01	0.5 to 1 oz/acre	0	0.5	Apply to healthy, actively growing plants. Do not apply to stressed plants. Apply no more than 8 oz per acre per season.
BACTERIAL LEAF SPOT (XANTHOMONAS)					
fixed copper (various)	M01	See labels	See label	See label	See label. Rates vary depending on the formulation. Repeated use may cause leaf yellowing.
acibenzolar-S-methyl (Actigard 50 WP)	P01	0.5 to 1 oz/acre	0	0.5	Apply to healthy, actively growing plants. Do not apply to stressed plants. Apply no more than 8 oz per acre per season.
BACTERIAL FRUIT BLOTCH (ACIDOVORAX)					
fixed copper (various)	M01	See labels	0	0	See label. Rates vary depending on the formulation. Start applications at first bloom; ineffective once fruit reaches full size. Repeated use may cause leaf yellowing.
acibenzolar-Sp-methyl (Actigard 50 WP)	P01	0.5 to 1 oz/acre	0	0.5	Apply to healthy, actively growing plants. Do not apply to stressed plants. Apply no more than 8 oz per acre per season.
BACTERIAL WILT (ERWINIA)					
NA	NA	NA	NA	NA	See Insect Control section for Cucumber Beetles.
BELLY (FRUIT) ROT (RHIZOCTONIA)					
azoxystrobin (various)	11	See labels	1	4 hr	Make banded application to soil surface or in-furrow application just before seed are covered.
azoxystrobin + chlorothalonil (Quadris Opti)	11 + M05	3.2 pints/acre	1	0.5	Do not apply more than one foliar application before alternating with a fungicide with a different mode of action. Do not make more than 4 applications of QoI group 11 fungicides per crop per acre per year.
difenoconazole + benzovindiflupyr (Aprovia Top)	7 + 3	8.5 to 13.5 fl oz/ acre	0	0.5	For belly rot control, the first application should be made at the 1- to 3-leaf crop stage with a second application just prior to vine tip or 10 to 14 days later, whichever occurs first.
fluopyram + tebuconazole (Luna Experience)	7 + 3	17 fl oz/acre	7	0.5	**APPLY ONLY TO WATERMELON**. Make no more than 2 applications before alternating to a fungicide with different active ingredients. **Do not rotate with tebuconazole. Not labeled for use in Louisiana.**
thiophanate-methyl (Topsin M 70 WP)	1	0.5 lb/acre, , 10.5 fl oz/acre	0	0.5	Apply in sufficient water to obtain runoff to soil surface.
COTTONY LEAK (*PYTHIUM* SPP.)					
metalaxyl (MetaStar 2 E)	4	4 to 8 pt/treated acre	0	2	Soil surface application in 7 in. band.
DAMPING OFF (*PYTHIUM* SPP.) AND FRUIT ROT					
mefenoxam (Ridomil Gold) (Ultra Flourish)	4	1 to 2 pt/ acre 2 to 4 pt/ acre	0	2	Preplant incorporated (broadcast or band); soil spray (broadcast or band) or injection (drip irrigation).
metalaxyl (MetaStar 2 E)	4	4 to 8 pt/acre	0	2	Preplant incorporated or surface application.
propamocarb (Previcur Flex)	28	12.8 fl oz/100 gal	2	0.5	Rates based on rock wool cube saturation in the greenhouse. See label for use in seedbeds, drip system, and soil drench.
DOWNY MILDEW (PSEUDOPERONOSPORA CUBENSIS)					
ametoctradin + dimethomorph (Zampro)	45 + 40	14 oz/acre	0	0.5	Make no more than 2 applications before alternating to a fungicide with different active ingredients. Do not rotate with Forum. Maximum of 3 applications per crop per season.
chlorothalonil (various)	M05	See label	See label	See label	See labels. Rates vary depending on the formulation. Spray at first appearance and then at 7 to 14 day interval. Avoid late-season application after plants have reached full maturity.
chlorothalonil + cymoxanil (Cymbol Advance)	M05 + 27	1.9 to 3.0 pt/acre	3	0.5	Repeat application at 7-day intervals. Alternate applications with different MOA fungicide. Maximum of 17.5 pints of product per acre per year. Maximum of 15.75 lb a.i. chlorothalonil per acre per year.
chlorothalonil + potassium phosphite (Catamaran)	M05 + 33	6 pints/acre	0	0.5	Apply no more than 50 pints per crop per acre per season.

Table 10-24. Disease Control Products for Cucurbits

Crop/Disease/ Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DOWNY MILDEW (PSEUDOPERONOSPORA CUBENSIS) (continued)					
chlorothalonil + zoxamide (Zing!)	M + 22	36 fl oz/acre	0	0.5	May cause sunburn in watermelon fruit, see label for details.
cyazofamid (Ranman)	21	2.1 to 2.75 fl oz/ acre	0	0.5	Do not apply more than 6 sprays per crop. Make no more than 3 consecutive applications followed by 3 applications of fungicides from a different resistance management group.
cymoxanil + propamocarb (Cymbol Balance)	27 + 28	28.5 fl oz/acre	3	0.5	Repeat application at 5 to 7 day intervals. Maximum of five (5) applications per year. Maximum of 142.5 fl oz of product per acre per year. Maximum of 4.5 lb a. i. propamocarb per acre per year. Maximum of 1.125 lb a. i. cymoxanil per acre per year.
ethaboxam (Elumin)	22	8 fl oz/acre	2	0.5	Do not make more than two applications per year. Do not apply at intervals of less than 14 days.
fixed copper (various)	M01	See labels	See label	See label	See label. Rates vary depending on the formulation. Repeated use may cause leaf yellowing.
fluazinam (Omega 500F)	29	0.75 to 1.5 pints/ acre	7 or 307	0.5	Initiate applications when conditions are favorable for disease development or when disease symptoms first appear. Repeat applications on a 7 to 10 day schedule. PHI is 7 days for cucumber squash, pumpkin (subgroup 9A). PHI is 30 days for melon, watermelon, cantaloupe (subgroup 9B).
fluopicolide (Presidio)	43	3 to 4 fl oz/acre	2	0.5	Tank mix with another downy mildew fungicide with a different mode of action.
fosetyl-AL (Aliette WDG)	P07	2 to 5 lb/acre	0.5	0.5	Do not tank mix with copper-containing products. Mixing with surfactants or foliar fertilizers is not recommended.
mandipropamid (Revus)	40	8 fl oz/acre	1	0.5	For disease suppression only. Resistance reported.
mancozeb (various)	M03	See labels	See label	See label	See label. Rates vary depending on the formulation. Labeled on all cucurbits.
mefenoxam + chlorothalonil (Ridomil Gold Bravo)	4 + M05	2 to 3 lb/acre	7	2	Spray at first appearance and repeat at 14-day intervals. Apply full rate of protectant fungicide between applications. Avoid late-season application when plants reach full maturity. Resistance reported.
oxathiapiprolin + chlorothalonil (Orondis Opti)	49 + M05	1.7 to 2.5 pt/acre	0	0.5	Limit to 10 pt per acre per year. Limit of six foliar applications per acre per year for the same crop. Do not follow soil applications of Orondis with foliar applications of Orondis. Begin foliar applications prior to disease development and continue on a 5- to 14-day interval. Use the higher rates when disease is present.
oxathiapiprolin + mandipropamid (Orondis Ultra)	49 + 40	5.5 to 8 fl oz/acre	0	4 hr	Limit to 32 fl oz per acre per year. Limit of six foliar applications per acre per year for the same crop. Do not follow soil applications of Orondis with foliar applications of Orondis. Begin foliar applications prior to disease development and continue on a 5- to 14-day interval. Use the higher rates when disease is present.
propamocarb (Previcur Flex)	28	1.2 pt/acre	2	0.5	Begin applications before infection; continue on a 7 to 14 day interval. Do not apply more than 6 pt per growing season. Always tank mix with another Downy mildew product.
zoxamide + mancozeb (Gavel 75 DF)	22 + M03	1.5 to 2 lb/acre	5	2	Begin applications when plants are in 2-leaf stage, and repeat at 7 to 10 day intervals. Now labeled on all cucurbits. Maximum 8 applications per season.
FUSARIUM WILT (FUSARIUM)					
prothioconazole (Proline 480 SC)	3	5.7 fl oz/acre	7	0.5	One soil and two foliar applications allowed by either ground or chemigation application equipment (including drip irrigation). Do not use in water used for hand trans- planting. Not for use in greenhouse/ transplant house.
pydiflumetofen + fludioxonil (Miravis Prime)	7 + 12	11.4 fl oz/acre	1	0.5	For Suppression Only. Do not make more than two applications before alternating with a non-Group 7 or 12 fungicide. Follow label application methods and timing.
GUMMY STEM BLIGHT, BLACK ROT (DYDIMELLA BRYONIAE)					
chlorothalonil + cymoxanil (Cymbol Advance)	M05 + 27	3.0 pt/acre	3	0.5	Repeat application at 7-day intervals. Alternate applications with different MOA fungicide. Maximum of 17.5 pints of product per acre per year. Maximum of 15.75 lb a.i. chlorothalonil per acre per year.
prothioconazole (Proline 480 SC)	3	5.7 fl oz/acre	7	0.5	One soil and two foliar applications allowed by either ground or chemigation application equipment (including drip irrigation). Do not use in water used for hand trans- planting. Not for use in greenhouse/ transplant house.

Table 10-24. Disease Control Products for Cucurbits

Crop/Disease/ Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
GUMMY STEM BLIGHT, BLACK ROT (DYDIMELLA BRYONIAE) (continued)					
tebuconazole (Monsoon)	3	8 oz/acre	7	0.5	Maximum 3 applications per season. Apply as a protective spray at 10 to 14 day intervals. Add a surfactant.
LEAF SPOTS: *ALTERNARIA*, ANTHRACNOSE (*COLLETOTRICHUM*), CERCOSPORA, GUMMY STEM BLIGHT (*DIDYMELLA*), TARGET SPOT (*CORYNESPORA*)					
azoxystrobin (Quadris)	11	11 to 15.4 fl oz/acre	1	4 hr	Make no more than one application before alternating with a fungicide with a different mode of action. Apply no more than2.88 qt per crop per acre per season. Do not use for gummy stem blight where resistance to group 11(QoI) fungicides exists.
azoxystrobin + chlorothalonil (Quadris Opti)	11 + M05	3.2 pints/acre	1	0.5	Do not apply more than one foliar application before alternating with a fungicide with a different mode of action. Do not make more than 4 applications of QoI group 11 fungicides per crop per acre per year. Do not use for gummy stem blight where resistance to group 11(QoI) fungicides exists.
azoxystrobin + difenoconazole (Quadris Top)	11 + 3	12 to 14 fl oz/acre	1	0.5	Not for Target spot. Make no more than one application before alternating with fungicides that have a different mode of action. Apply no more than 56 fl oz per crop per acre per season. Do not use for gummy stem blight where resistance to group 11(QoI) fungicides exists.
chlorothalonil (various)	M05	See label	See label	See label	See labels. Rates vary depending on the formulation.
chlorothalonil + cymoxanil (Cymbol Advance)	M05 + 27	3.0 pt/acre	3	0.5	Repeat application at 7-day intervals. Alternate applications with different MOA fungicide. Maximum of 17.5 pints of product per acre per year. Maximum of 15.75 lb a.i. chlorothalonil per acre per year.
chlorothalonil + potassium phosphite (Catamaran)	M05 + 33	6 pints/acre	0	0.5	Apply no more than 50 pints per crop per acre per season. Do not apply to watermelon fruit when stress conditions conducive to sunburn occur.
cyprodinil + fludioxonil (Switch 62.5WG)	9 + 12	11 to 14 oz/acre	1	0.5	Only for Alternaria and gummy stem blight. Make no more than 2 applications before alternating to a different fungicide. Maximum of 4 to 5 applications at high and low rates.
difenoconazole + benzovindiflupyr (Aprovia Top)	7 + 3	10.5 to 13.5 fl oz/ acre	0	0.5	Make no more than 2 applications before alternating to a fungicide with different active ingredients. Apply no more than 53.6 fl oz per acre per year.
difenoconazole + cyprodinil (Inspire Super)	3 + 9	16 to 20 fl oz/acre	7	0.5	Not for Target spot. Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Apply no more than 80 fl oz per crop per acre per season.
famoxadone + cymoxanil (Tanos)	11 + 27	8 oz/acre	3	0.5	Only for Alternaria and Anthracnose; do not make more than one application before alternating with a fungicide that has a different mode of action; must be tank-mixed with contact fungicide with a different mode of action.
fenamidone (Reason)	11	5.5 fl oz/acre	14	0.5	Begin applications when conditions favor disease development, and continue on 5 to 10 day interval. Do not apply more than 22 fl oz per growing season. Alternate with fungicide from different resistance management group, and make no more than 4 total applications of Group 11 fungicides per season.
fixed copper (various)	M01	See label	See label	See label	See labels. Rates vary depending on the formulation. Repeated use may cause leaf yellowing.
fluazinam (Omega 500F)	29	0.75 to 1.5 pts/acre	30	0.5	Initiate applications when conditions are favorable for disease development or when disease symptoms first appear. Repeat applications on a 7 to 10 day schedule.
mancozeb (various)	M03	See label	See label	See label	See labels. Rates vary depending on the formulation. Labeled on all cucurbits.
fluopyram + tebuconazole (Luna Experience)	7 + 3	8 to 17 fl oz/acre	7	0.5	Not for Cercospora or target spot. Make no more than 2 applications before alternating to a fungicide with different active ingredients. Do not rotate with tebuconazole.
fluopyram + trifloxystrobin (Luna Sensation)	7 + 11	7.6 fl oz/acre	0	0.5	**APPLY ONLY TO WATERMELON** and only to control Alternaria and Anthracnose. Make no more than 2 applications before alternating to a fungicide with different active ingredients. Maximum 4 applications per season.
fluxapyroxad + pyraclostrobin (Merivon Xemium)	7 + 11	4 to 5.5 fl oz/acre	0	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Maximum of 3 applications per crop.

Table 10-24. Disease Control Products for Cucurbits

Crop/Disease/ Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
potassium phosphite + tebuconazole (Viathon)	P07 + 3	4 pints/acre	7	0.5	**APPLY ONLY TO WATERMELON.** Maximum 3 applications per crop.
LEAF SPOTS: *ALTERNARIA*, ANTHRACNOSE (*COLLETOTRICHUM*), CERCOSPORA, GUMMY STEM BLIGHT (*DIDYMELLA*), TARGET SPOT (*CORYNESPORA*)					
pydiflumetofen + fludioxonil (Miravis Prime)	7 + 12	9.2 to 11.4 fl oz/ acre	1	0.5	**Begin applications prior to disease development. Follow resistance management guidelines.**
pyraclostrobin (Cabrio)	11	12 to 16 oz/acre	0	0.5	Do not use for Gummy stem blight where resistance to group11 (QoI) fungicides exists. Make no more than one application before alternating to a fungicide with a different mode of action.
pyraclostrobin + boscalid (Pristine)	11 + 7	12.5 to 18.5 oz/acre	0	1	Not for target spot. Do not use for gummy stem blight where resistance to group 7 and group 11 fungicides exists. Use highest rate for anthracnose. Make no more than 4 applications per season.
thiophanate-methyl (Topsin M 70 WP)	1	0.5 lb/acre, 10.9 fl oz/acre	0	0.5	Spray at first appearance and then at 7 to 10 day intervals. Resistance reported in gummy stem blight fungus.
zoxamide + mancozeb (Gavel)	22 + M03	1.5 to 2 lb/acre	5	2	Cercospora and Alternaria only. Begin applications when plants are in 2-leaf stage and repeat at 7 to 10 day intervals. Now labeled on all cucurbits. Maximum 8 applications per season.
PHYTOPHTHORA BLIGHT (PHYTOPHTHORA CAPSICI)					
ametoctradin + dimethomorph (Zampro)	45 + 40	14 oz/acre	0	0.5	Make no more than 2 applications before alternating to a fungicide with different active ingredients. Do not rotate with Forum. Maximum of 3 applications per crop per season. Apply at planting as a preventative drench treatment. Addition of a spreading or penetrating adjuvant is recommended.
cyazofamid (Ranman)	21	2.75 fl oz/acre	0	0.5	Do not apply more than 6 sprays per crop. Make no more than 3 consecutive applications followed by 3 applications of fungicides from a different resistance management group. Resistant isolates have been found.
dimethomorph (Forum)	40	6 fl oz;/acre	0	0.5	Must be applied as a tank mix with another fungicide with a different mode of action. Do not make more than two sequential applications.
ethaboxam (Elumin)	22	8 fl oz/acre	2	0.5	Make no more than 2 applications before alternating to a fungicide with different active ingredients. Apply no more than 16 fl oz/acre per year.
fluazinam (Omega 500F)	29	0.75 to 1.5 pt/acre	7 or 30	0.5	Initiate applications when conditions are favorable for disease development or when disease symptoms first appear. Repeat applications on a 7 to 10 day schedule. PHI is 7 days for cucumber squash, pumpkin (subgroup 9A). PHI is 30 for melon, watermelon, cantaloupe (subgroup 9B).
fluopicolide (Presidio)	43	3 to 4 fl oz/acre	2	0.5	Tank mix with another Phytophthora fungicide with a different mode of action. May be applied through drip irrigation to target crown rot phase.
mandipropamid (Revus)	40	8 fl oz/acre	0	0.5	For disease suppression only, apply as a foliar spray with copper-based fungicide.
oxathiapiprolin + mefenoxam (Orondis Gold 200)	49 + 4	4.8 to 9.6 fl oz/acre	0	4 hr	Limit to 38.6 fl oz per acre per year. Limit of 6 applications per acre per year for the same crop. Do not follow soil applications of Orondis with foliar applications of Orondis. Apply at planting in furrow, by drip, or in transplant water. Use the higher rates for heavier soils, for longer application intervals, or for susceptible varieties.
oxathiapiprolin + mandipropamid (Orondis Ultra)	49 + 40	5.5 to 8 fl oz/acre	0	4 hr	Limit of 6 applications per acre per year for the same crop. Do not follow soil applications of Orondis with foliar applications of Orondis. Use the higher rates when diseases is present.
PLECTOSPORIUM BLIGHT (PLECTOSPORIUM)					
azoxystrobin (Quadris)	11	11 to 15.4 fl oz/acre	1	4 hr	Make no more than one application before alternating with a fungicide with a different mode of action. Apply no more than 2.88 qt per crop per acre per season, and do not make more than 4 applications of Group 11 products.
azoxystrobin + difenoconazole (Quadris Top)	11 + 3	12 to 14 fl oz/acre	1	0.5	Make no more than one application before alternating with fungicides that have a different mode of action. Apply no more than 56 fl oz per crop per acre per season.
fluxapyroxad + pyraclostrobin (Merivon Xemium)	7 + 11	4 to 5.5 fl oz/acre	0	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Maximum of 3 applications per crop.
trifloxystrobin (Flint)	11	1.5 to 2 oz/acre	0	0.5	Make no more than one application before alternating with fungicides that have a different mode of action. Begin applications preventively when conditions are favorable for disease and continue as needed on a 7 to 14 day interval.

Table 10-24. Disease Control Products for Cucurbits

Crop/Disease/ Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
pyraclostrobin (Cabrio)	11	12 to 16 oz/acre	0	0.5	Make no more than 1 application before alternating to a fungicide with a different mode of action.
POWDERY MILDEW					
acibenzolar-*S*-methyl (Actigard 50WP)	P01	0.5 to 1 oz/ac	0	0.5	Make no more than 1 application before alternating to a fungicide with a different mode of action.
azoxystrobin + chlorothalonil (Quadris Opti)	11 + M05	3.2 pt/acre	1	0.5	Do not apply more than one foliar application before alternating with a fungicide with a different mode of action. Do not make more than 4 applications of Group 11 fungicides per crop per acre per year.
azoxystrobin + difenoconazole (Quadris Top)	11 + 3	12 to 14 fl oz/acre	1	0.5	Make no more than one application before alternating with fungicides that have a different mode of action. Apply no more than 56 fl oz per crop per acre per season.
chlorothalonil (various)	M05	See label	See label	See label	Spray at first appearance and then at 7 to 14 days intervals. Avoid late-season application after plants have reached full maturity. Does not control PM on leaf undersides.
chlorothalonil + cymoxanil (Cymbol Advance)	M05 + 27	3.0 pt/acre	3	0.5	Repeat application at 7-day intervals. Alternate applications with different MOA fungicide. Maximum of 17.5 pints of product per acre per year. Maximum of 15.75 lb a.i. chlorothalonil per acre per year.
chlorothalonil + potassium phosphite (Catamaran)	M05 + P07	6 pints/acre	0	0.5	Apply no more than 50 pints per crop per acre per season. Do not apply to watermelon fruit when stress conditions conducive to sunburn occur.
difenoconazole + benzovindiflupyr (Aprovia Top)	7 + 3	10.5 to 13.5 fl oz/ acre	0	0.5	Make no more than 2 applications before alternating to a fungicide with different active ingredients. Apply no more than 53.6 fl oz per acre per year.
difenoconazole + cyprodinil (Inspire Super)	3 + 9	16 to 20 fl oz/acre	7	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Apply no more than 80 fl oz per crop per acre per season.
cyflufenamid (Torino)	U6	3.4 oz/acre	0	4 hr	Do not make more than 2 applications per crop.
cyprodinil + fludioxonil (Switch 62.5 WG)	9 + 12	11 to 14 oz/acre	1	0.5	Make no more than 2 applications before alternating to a different fungicide. Maximum of 4 to 5 applications at high and low rates. Not for target spot, anthracnose, or Cercospora.
fixed copper (various)	M01	See label	See label	See label	See label. Rates vary depending on the formulation. Repeated use may cause leaf yellowing.
fluopyram + tebuconazole (Luna Experience)	7 + 3	8 to 17 fl oz/acre	7	0.5	Make no more than 2 applications before alternating to a fungicide with different active ingredients. Do not rotate with tebuconazole.
flutianil (Gatten)	U13	6 to 8 fl oz/acre	0	0.5	**Not labeled for watermelon.** Do not make more than five applications per year.
fluxapyroxad + pyraclostrobin (Merivon Xemium)	7 + 11	4 to 5.5 fl oz/acre	0	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Maximum of 3 applications per crop.
metrafenone (Vivando)	50	15.4 fl oz/acre	0	0.5	Begin applications prior to disease and continue in a 7- to 10- day interval.
myclobutanil (Rally)	3	2.5 to 5 oz/acre	0	1	Apply no more than 1.5 lb per acre per crop. Observe a 30- day plant-back interval.
penthiopyrad (Fontelis)	7	12 to 16 fl oz/acre	1	0.5	Make no more than 2 sequential applications before switching to another fungicide. Do not rotate with Pristine or Luna Experience.
pyraclostrobin + boscalid (Pristine)	11 + 7	12.5 to 18.5 oz/acre	0	1	Make no more than 4 applications per season
Pyriofenone (Prolivo)	50	4 to 5 fl oz/acre	0	0.17	Make fungicide applications prior to disease on a 7 to 10 day interval.Do not apply more than 16 fl oz/A/year.
quinoxyfen (Quintec)	13	4 to 6 fl oz/acre	3	0.5	Make no more than 2 applications before alternating to a different fungicide. Maximum of 24 fl oz/acre per year. **DO NOT USE ON SUMMER SQUASH or CUCUMBER**; labeled on winter squashes, pumpkins, gourds, melon and watermelon.
sulfur (various)	M02	See label	See label	See label	See labels. Rates vary depending on the formulation. Do not use when temperature is over 90°F or on sulfur-sensitive varieties.
tebuconazole (Monsoon)	3	4 to 6 fl oz/acre	7	0.5	Apply before disease appears when conditions favor development and repeat at 10 to 14 day intervals; max 24 fl oz per season.

Table 10-24. Disease Control Products for Cucurbits

Crop/Disease/ Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
triflumizole (Procure)	3	4 to 8 oz/acre	0	0.5	Begin applications at vining or first sign of disease, and repeat at 7 to 10 day intervals.
SCAB					
acibenzolar-S-methyl (Actigard 50 WP)	P01	0.5 to 1 oz/acre	0	0.5	Apply to healthy, actively growing plants. Do not apply to stressed plants. Apply no more than 8 oz per acre per season.
chlorothalonil (various)	M05	See label	See label	See label	See labels. Rates vary depending on the formulation.
chlorothalonil + potassium phosphite (Catamaran)	M05 + P07	6 pints/acre	0	0.5	Apply no more than 50 pints per crop per acre per season. Do not apply to watermelon fruit when stress conditions conducive to sunburn occur.
VINE DECLINE					
fludioxonil (Cannonball)	12	4 to 8 oz/acre	14	0.5	**APPLY ONLY TO MELONS.**

Table 10-25. Efficacy of Products for Disease Control in Cucurbits
L. Quesada-Ocampo, Plant Pathologist, North Carolina State University, A. Keinath, Plant Pathologist, Clemson University, and B. Dutta, Plant Pathologist, University of Georgia

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data.

Active Ingredient [1, 2]	Product	Fungicide group [F]	Preharvest interval (Days)	Alternaria Leaf Blight	Angular Leafspot	Anthracnose	Bacterial Fruit Blotch	Belly Rot	Cercospora Leaf Spot	Cottony Leak	Damping off (Pythium)	Downy Mildew [DM]	Fusarium wilt	Gummy Stem Blight	Phytophthora Blight (foliage and fruit)	Phytophthora Blight (crown and root)	Plectosporium Blight	Powdery Mildew	Target Spot
acibenzolar-*S*-methyl	Actigard	P01	0	NC	ND	NC	F	NC	NC	ND	ND	P	ND	NC	ND	ND	NC	ND	NC
ametoctradin + dimethomorph	Zampro	45+40	0	ND	NC	NC	NC	NC	NC	ND	ND	F	ND	NC	F	F	NC	NC	NC
azoxystrobin [2]	Quadris/Arius 250	11	1	G	NC	G R	NC	F	G	NC	NC	NC [R]	ND	NC [R]	NC	NC	F	NC [R]	G
azoxystrobin + chlorothalonil	Quadris Opti/ Arius Advance	11+ M05	0	G	NC	P R	NC	F	G	NC	NC	NCR	ND	F-P	NC	NC	F	F	F
azoxystrobin + difenoconazole	Quadris Top	11+3	1	ND	NC	P R	NC	ND	ND	ND	ND	ND	ND	F-P	ND	ND	F	F	ND
boscalid	Endura	7	0	ND	NC	NC	NC	NC	ND	NC	NC	NC	ND	NC [R]	NC	NC	ND	F R	ND
chlorothalonil [5]	various	M05	0	F	NC	G	NC	NC	G-F	NC	NC	P	ND	F	NC	NC	F	F	G
cyazofamid	Ranman	21	0	NC	NC	NC	NC	NC	NC	ND	NC	G-F	ND	NC	F	NC	NC	NC	NC
cyflufenamid	Torino	U06	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	ND	NC	NC	NC	NC	FR	NC
cymoxanil	Curzate	27	3	NC	NC	NC	NC	NC	NC	ND	ND	P R	ND	NC	F	NC	NC	NC	NC
cyprodinil + fludioxonil	Switch	9+12	1	ND	NC	F	NC	ND	ND	NC	NC	NC	ND	F	NC	NC	F	F	NC
difenoconazole + benzovindiflupyr	Aprovia Top	3+7	0	ND	NC	F	NC	ND	ND	NC	NC	NC	ND	G	NC	NC	ND	ND	ND
difenoconazole + cyprodinil	Inspire Super	3+9	7	F	NC	P	NC	NC	F	NC	NC	NC	ND	F	NC	NC	F	F	ND
dimethomorph	Forum	40	0	NC	NC	NC	NC	NC	NC	NC	NC	P	ND	NC	P	NC	NC	NC	NC
ethaboxam	Elumin	22	2	NC	NC	NC	NC	NC	NC	NC	NC	G-F	NC	NC	G-F	ND	NC	NC	NC
famoxadone [2] + cymoxanil	Tanos	11+27	3	ND	NC	P	NC	NC	ND	NC	NC	F	ND	NC	ND	NC	NC	NC	NC
fenamidone	Reason	11	14	F	NC	ND	NC	NC	NC	ND	NC	P R	ND	NC	P	NC	NC	NC	NC
fixed copper	various [P, 5]	M01	1	P	F	P	F	NC	P	NC	NC	P	ND	P	ND	NC	P	P	P
fluazinam	Omega	29	30,7	ND	NC	NC	NC	NC	NC	NC	NC	F	NC	ND	ND	NC	NC	NC	NC
fluopicolide	Presidio	43	2	NC	NC	NC	NC	NC	NC	NC	NC	P R	ND	NC	F R	F R	NC	NC	NC
fluopyram + tebuconazole	Luna Experience	7+3	7	ND	NC	NC	NC	ND	NC	NC	NC	NC	ND	G-F	NC	NC	NC	G	NC
fluopyram + trifloxystrobin	Luna Sensation	7+11	0	ND	NC	F	NC	NC	NC	NC	NC	NC	ND	F	NC	NC	NC	F	NC
fluoxastrobin	Evito	11	1	G	NC	G	NC	F	G	NC	NC	NC [R]	ND	NC [R]	NC	NC	F	NC [R]	F
flutianil	Gatten	U13	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	ND	NC	NC	NC	NC	G	NC

Table 10-25. Efficacy of Products for Disease Control in Cucurbits

L. Quesada-Ocampo, Plant Pathologist, North Carolina State University, A. Keinath, Plant Pathologist, Clemson University, and B. Dutta, Plant Pathologist, University of Georgia

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data.

Active Ingredient [1,2]	Product	Fungicide group [F]	Preharvest interval (Days)	Alternaria Leaf Blight	Angular Leafspot	Anthracnose	Bacterial Fruit Blotch	Belly Rot	Cercospora Leaf Spot	Cottony Leak	Damping off (Pythium)	Downy Mildew [DM]	Fusarium wilt	Gummy Stem Blight	Phytophthora Blight (foliage and fruit)	Phytophthora Blight (crown and root)	Plectosporium Blight	Powdery Mildew	Target Spot
flutriafol	Rhyme, Topguard [P]	3	0	ND	NC	NC	NC	NC	ND	NC	NC	NC	F	F	NC	NC	NC	P	NC
flutriafol + azoxystrobin	Topguard EQ	3+11	0	ND	NC	P	NC	NC	ND	NC	NC	NC	ND	P	NC	NC	P	P	F
fluxapyroxad + pyraclostrobin	Merivon	7+11	0	G	NC	F	NC	ND	ND	NC	NC	NC	ND	F	NC	NC	F	ND	ND
kresoxim-methyl	Sovran	11	0	ND	NC	ND	NC	ND	ND	NC	NC	ND	ND	NC [R]	ND	NC	ND	NC [R]	ND
mancozeb	Various [5]	M03	5	F	NC	G	NC	NC	G	NC	NC	P	ND	F	P	NC	F	P	G
mancozeb + azoxystrobin	Dexter Max	M03+11	5	F	NC	G	NC	NC	G	NC	NC	P	ND	F	P	NC	F	P	G
mancozeb + fixed copper [4]	ManKocide	M03+ M05	5	P	F	F	F	NC	P	NC	NC	P	ND	NC	P	NC	P	P	F
mandipropamid	Revus	40	0	NC	NC	NC	NC	NC	NC	NC	NC	P	ND	NC	F	P	NC	NC	NC
mefenoxam 2	Ridomil Gold EC, Ultra Flourish	4	0	NC	NC	NC	NC	NC	NC	F R	G R	NC	ND	NC	F R	F R	NC	NC	NC
mefenoxam 2+chlorothalonil 5	Ridomil Gold/ Bravo, Flouronil	4+M05	0	F	NC	F	NC	NC	F	F R	F R	F R	ND	F	F R	NC	F	F	F
mefenoxam 2 + copper 5	Ridomil Gold/ Copper	4+M01	5	P	P	NC	P	NC	P	F R	F R	F R	ND	NC	F R	NC	P	NC	P
mefenoxam 2 + mancozeb 5	Ridomil Gold MZ	4+M03	5	F	NC	F	NC	NC	F	F R	F R	F R	ND	P	F R	NC	F	NC	F
metrafenone	Vivando	50	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	ND	NC	NC	NC	NC	G	NC
myclobutanil 2	Rally	3	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	ND	NC	NC	NC	NC	F	NC
oxathiapiprolin + chlorothalonil	Orondis Opti	49+ M05	0	F	NC	F	NC	ND	F	NC	NC	G	ND	F	G	G	F	P	F
oxathiapiprolin + mandipropamid	Orondis Ultra	49+40	0	ND	NC	ND	NC	ND	ND	NC	NC	G	ND	ND	G	G	ND	ND	ND
oxathiapiprolin + mefenoxam	Orondis Gold	49+4	0	ND	NC	ND	NC	ND	ND	F R	NC	G	ND	ND	G	G	ND	ND	ND
penthiopyrad	Fontelis	7	1	ND	NC	F	NC	ND	F	NC	NC	NC	ND	NC [R]	NC	NC	NC	F	NC
phosphonate 6	various	P07	0.5	NC	NC	NC	NC	NC	NC	NC	NC	P	ND	NC	NC	F	NC	NC	NC
potassium phosphite + tebuconazole	Viathon	P07+3	7	ND	NC	ND	NC	ND	ND	ND	ND	P	ND	F	ND	ND	NC	F	NC
propamocarb	Previcur Flex/ Bruin	28	2	NC	NC	NC	NC	NC	NC	NC	ND	FR	ND	NC	F	NC	NC	NC	NC
prothioconazole	Proline	3	7	ND	NC	F	NC	ND	F	NC	NC	NC	G	G	NC	NC	ND	F	ND
pydiflumetofen + fludioxonil	Miravis Prime	7+12	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	F	G	ND	ND	ND	ND	ND
pyraclostrobin 2	Cabrio, Pyrac	11	0	G	NC	F	NC	NC	ND	NC	NC	NC [R]	ND	NC [R]	P	NC	G	NC [R]	E
pyraclostrobin 2 + boscalid 2	Pristine	11+7	0	G	NC	P	NC	ND	G	NC	NC	NC [R]	ND	NC [R]	P	NC	F	F	E
quinoxyfen	Quintec	13	3	NC	NC	NC	NC	NC	NC	NC	NC	NC	ND	NC	NC	NC	NC	GR	NC
sulfur	various P,5	M02	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	ND	NC	NC	NC	NC	F	NC
tebuconazole	Monsson	3	7	ND	NC	NC	NC	NC	F	NC	NC	NC	F	FR	NC	NC	NC	F	NC
thiophanate-methyl 3	Topsin M	1	1	F	NC	G	NC	F	F	NC	NC	NC	ND	NC [R]	NC	NC	F	NC [R]	P
trifloxystrobin 2	Flint	11	0	G	NC	F	NC	ND	ND	NC	NC	NC [R]	ND	NC [R]	NC	NC	G	NC [R]	G
triflumizole	Procure	3	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	ND	NC	NC	NC	NC	F	NC
zoxamide + chlorothalonil	Zing!	22+ M05	5	F	NC	F	NC	NC	F	NC	NC	P	ND	F	P	NC	F	P	F
zoxamide + mancozeb	Gavel	22+ M03	5	F	NC	F	NC	NC	F	NC	NC	P	ND	F	P	NC	F	P	F

[1] Efficacy ratings do not necessarily indicate a labeled use for every disease.

[2] Curative activity; locally systemic.

[3] Systemic.

[4] When used in combination with chlorothalonil or mancozeb, gives increased control.

[5] Contact control only; no systemic control.

[6] Check manufacturers label for compatibility with other products.

[P] Can be phytotoxic at temperatures above 90°F; read label carefully.

[F] To prevent resistance in pathogens, alternate fungicides within a group with fungicides in another group. Fungicides in the "M" group are generally considered "low risk" with no signs of resistance developing to most fungicides.

[R] Resistance reported in the pathogen.

[DM] Ratings are based on efficacy and resistance on cucumber.

Importance of Alternative Management Practices for Disease Control in Cucurbits

L. Quesada-Ocampo, Plant Pathologist, North Carolina State University; A. Keinath, Plant Pathologist, Clemson University

Table 10-26. Importance of Alternative Management Practices for Disease Control in Cucurbits

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

Strategy	Alternaria leaf blight	Angular leaf spot	Anthracnose	Bacterial fruit blotch	Bacterial wilt	Belly rot	Cercospora leaf spot	Choanephora fruit rot	Cottony leak	Downy mildew	Fusarium wilt	Gummy stem blight	Mosaic virus	Phytophthora blight	Plectosporium blight	Powdery mildew	Pythium damping off	Root knot nematode	Target spot
Avoid field operations when leaves are wet	P	F	P	F	F	NC	NC	P	NC	P	NC	P	NC	NC	ND	NC	NC	NC	NC
Avoid overhead irrigation	F	F	F	F	P	NC	P	NC	NC	F	NC	F	NC	F	P	P	NC	NC	P
Change planting date from Fall to Spring [1]	G	P	G	P	P	F	G	F	F	G	P	G	F	F	F	F	G	G	G
Cover cropping with antagonist	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	NC	NC	F	NC
Crop rotation with non-host (2 to 3 years)	F	F	F	F	NC	P	F	NC	NC	NC	F	F	NC	F	F	NC	P	F	F
Deep plowing	P	NC	P	NC	NC	F	P	NC	NC	NC	F	F	NC	P	P	NC	P	F	P
Destroy crop residue immediately	F	P	F-G	P	P	P	P	NC	P	F	F	F	F	P	P	F	NC	F	P
Encourage air movement [2]	F	P	F	P	NC	NC	F	F	F	F	NC	F	NC	NC	P	NC	NC	NC	F
Soil organic amendments [3]	ND	NC	ND	NC	NC	P	ND	NC	F	NC	P	ND	NC	P	ND	NC	F	F	ND
Insecticidal/horticultural oils [4]	NC	NC	NC	NC	F	NC	NC	NC	NC	NC	NC	NC	F	NC	NC	F	NC	NC	NC
pH management (soil)	NC	NC	NC	NC	NC	NC	NC	NC	ND	NC	NC	NC	NC	ND	NC	NC	ND	ND	NC
Plant in well-drained soil	NC	NC	NC	NC	NC	F	NC	P	F	NC	NC	NC	NC	F	NC	NC	F	P	NC
Plant on raised beds	NC	NC	NC	NC	NC	P	NC	P	F	NC	NC	F	NC	F	NC	NC	F	P	NC
Plastic mulch bed covers	NC	NC	NC	NC	NC	F	NC	P	F	NC	G	F	NC	F	P	NC	NC	NC	NC
Postharvest temperature control (fruit)	NC	NC	F	P	NC	F	NC	F	F	NC	NC	F	NC	F	F	NC	NC	NC	NC
Reflective mulch (additional effect over plastic mulch)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	NC	NC
Reduce mechanical injury	P	P	P	P	F	P	P	P	P	NC	P	P	P	P	P	NC	NC	NC	P
Rogue diseased plants/fruit (home garden)	F	P	P	P	P	NC	P	P	P	P	P	P	F	F	NC	NC	P	F	P
Row covers (insect exclusion)	NC	NC	NC	NC	G	NC	NC	NC	NC	NC	NC	NC	G	NC	NC	NC	NC	NC	NC
Soil solarization (reduce soil inoculum)	P	NC	P	NC	NC	F	P	NC	P	NC	F	P	NC	P	P	NC	F	P	P
Pathogen-free planting material	P	E	F	E	NC	NC	NC	NC	NC	NC	G	E	NC	NC	NC	NC	F	NC	NC
Resistant cultivars [5]	ND	ND	E	ND	ND	E	ND	ND	ND	G	E	ND	E	ND	ND	E	ND	ND	ND
Grafting [5]	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	E	NC	NC	NC	NC	NC	NC	G	NC
Destroy volunteer plants	F	F	F	F	F	NC	F	NC	NC	F	G	F	F	F	NC	F	NC	P	F

[1] Early planting reduces risk.
[2] Air movement can be encouraged by increasing plant spacing, orienting beds with prevailing wind direction and increasing exposure of field to prevailing wind.
[3] Soil organic amendments = cover crops; composted organic wastes.
[4] Insecticidal/Horticultural oil = Sunspray Ultra-Fine Spray Oil (Sun Company, Inc.), JMS Stylet oil; Safe-T-Side (Brandt Consolidated, Inc.); PCC 1223 (United Ag Products).
[5] Resistance available in some cucurbits.

Example Spray Program for Foliar Disease Control in Watermelon Production

A. Keinath, Plant Pathologist, Clemson University

This spray program is based on research conducted at the Clemson Coastal Research and Education Center, Charleston, SC, and on a survey of watermelon fields in South Carolina in 2015 and 2016.The most common diseases in both survey years were gummy stem blight and powdery mildew. The spring program is designed to manage bacterial fruit blotch, various bacterial leaf spots, gummy stem blight, powdery mildew, anthracnose, and downy mildew. The fall program is designed to manage gummy stem blight, downy mildew, powdery mildew, and anthracnose.

- Protectants (chlorothalonil and mancozeb) are effective against anthracnose all season, but other disease-specific fungicides must be used against gummy stem blight, downy mildew, and powdery mildew. See Tables 10-24 and 10-25. Products rated as good (G) in Table 10-25 may be substituted for products in the spray program below.
- Start spraying when vines start to run or no later than when the first blooms (the male ones) open.
- Check cdm.ipmpipe.org to see where and when downy mildew has been reported on watermelon. Rotate Orondis Ultra with Ranman if downy mildew is present in your field.
- From vine run until mid-May, spray every 10 days. After mid-May or when powdery and downy mildew typically show up in your area, spray every week through harvest regardless of the weather. Weekly sprays are needed to protect watermelon from powdery and downy mildew. Dry weather limits gummy stem blight but promotes powdery mildew; dry weather does not limit downy mildew or anthracnose if they are already present in a field.
- Do not stop spraying until you stop harvesting. Downy and powdery mildew can attack a crop any time it goes more than one week without a fungicide spray. Fungicides with a 7-day PHI are not recommended during the harvest period (usually after week 5); note that mancozeb and Gavel have a 5-day PHI.

If this spray schedule is used to select fungicides for other cucurbits (vine crops), note that cucumber does not need to be sprayed for powdery mildew, and most hybrid cantaloupe cultivars are resistant to powdery mildew. For cantaloupe, substitute a FRAC 11 fungicide for mancozeb in weeks 5 and 7 to manage *Alternaria* leaf spot.

Table 10-27 Example Spray Program for Foliar Disease Control in Watermelon Production

Spray	Fungicide Program for Spring Watermelon*	Comments on Spring Program	Fungicide Program for Fall Watermelon*	Comments on Fall Program
1 (vine run)	mancozeb + fixed copper	For prevention of bacterial leaf spots and fruit blotch.	chlorothalonil	
2	chlorothalonil	If fruit blotch or bacterial leaf spot is a concern, use mancozeb + fixed copper instead. Do not tank mix copper with chlorothalonil.	chlorothalonil	
3a**	tebuconazole	If fruit blotch is a concern, add fixed copper.	tebuconazole + **Ranman**	Apply Ranman if downy mildew has been reported on watermelon in your state.
3b**	OR tebuconazole + (Flint Extra)	Add Flint if anthracnose was found the previous year.	OR tebuconazole + Gatten	Apply Gatten if weather is unusually dry to prevent powdery mildew.
4	chlorothalonil (or mancozeb)	If fruit blotch or bacterial leaf spot is a concern, substitute mancozeb + fixed copper.	Quadris Top	Quadris Top protects against anthracnose and gummy stem blight.
5a**	mancozeb + Gatten	Starting week 5, use mancozeb to avoid injury to fruit on hot, sunny days. Note 5-day PHI on mancozeb.	**Gavel**	Gavel protects against anthracnose, gummy stem blight, and downy mildew.
5b**	OR Inspire Super or Miravis Prime	Use this program if gummy stem blight is present. If harvest has started note 7-day PHI for Inspire Super, and 1-day PHI for Miravis Prime.	(same as 5a)	
6	Gavel	Note 5-day PHI.	Miravis Prime	
6b	OR mancozeb plus **Orondis Ultra**	Apply Orondis Ultra if downy mildew has been re- ported on watermelon in your state or a neighboring state. Tank mix Orondis Ultra with mancozeb to protect against gummy stem blight and anthracnose.	(same as 6a)	
7a**	mancozeb + Vivando	Note 5-day PHI on mancozeb.	mancozeb + **Ranman**	If downy mildew is present. Note 5-day PHI on mancozeb.
7b**	Miravis Prime + Vivando	If gummy stem blight is present.	Miravis Prime	If gummy stem blight is present.
8	mancozeb + **Ranman**		chlorothalonil	
9-12	If more sprays are needed after spray 8 until the last harvest, apply sprays 5 to 8 again, BUT check maximum number of applications allowed per crop			

* Fungicides for downy mildew are in bold and should be used if downy mildew has been reported on watermelon in the current season (visit *http://cdm.ipmpipe.org/* to access the downy mildew forecast). Fungicides for powdery mildew are underlined and should be applied in spring and during dry periods in fall.

** Option "a" is a lower cost treatment that may be less effective. Option "b" is a more expensive systemic fungicide that is more effective when disease is already in the field or when weather conditions favor disease getting worse.

Eggplant

A. Keinath, Plant Pathologist, Clemson University

Table 10-28. Disease Control Products for Eggplant

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
ANTHRACNOSE FRUIT ROT (*COLLETOTRICUM* SPP.)					
azoxystrobin (various)	11	See labels	0	4 hr	Apply at flowering to prevent green fruit rot. Limit of 61.5 fl oz per acre per season .Make no more than **one** application before alternating with fungicides that have a different mode of action.
chlorothalonil + cymoxanil (Cymbol Advance)	M5+27	2 to 2.4 pint/acre	3	0.5	Make no more than 8 applications at the low rate or 7 applications at the high rate per year.
difenoconazole + benzovindiflupyr (Aprovia Top 1.62EC)	3+7	10.5 to 13.5 fl oz/acre	14	0.5	Make no more than 2 consecutive applications before switching to a non-Group 7 fungicide. Make no more than 5 applications at the low rate or 4 applications at the high rate per year.
flutriafol (Rhyme 2.08SC)	3	7 fl oz/acre	0	0.5	Limit of 4 applications per year.
flutriafol + azoxystrobin (Topguard EQ 4.29 SC)	3+11	4 to 8 fl oz/acre	0	0.5	Limit of 4 applications per year.
ANTHRACNOSE FRUIT ROT (*COLLETOTRICUM* SPP.), EARLY BLIGHT (*ALTERNARIA* SPP.), GRAY MOLD (*BOTRYTIS CINEREA*), GRAY LEAF SPOT (*STEMPHYLIUM* SPP.), SEPTORIA LEAF SPOT (*SEPTORIA LYCOPERSICI*)					
NOTE: THESE LEAF SPOTS ARE NOT COMMON ON EGGPLANT IN THE SOUTHEASTERN U.S., SO PREVENTATIVE APPLICATIONS ARE NOT NEEDED.					
boscalid (Endura 70 WG)	7	2.5 to 3.5 oz/acre	0	0.5	Limit of 21 oz per acre per season. Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Labeled for early blight and gray mold ONLY.
chlorothalonil (various)	M5	1.5 pt/acre	3	1	Limit of 12 pt per acre per season**. Labeled for anthracnose and gray mold ONLY.**
chlorothalonil + cymoxanil (Cymbol Advance)	M5+27	2 to 2.4 pint/acre	3	0.5	Make no more than 8 applications at the low rate or 7 applications at the high rate per year.
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz/acre	14	0.5	Limit of 24.6 fl oz per growing season. Make no more than **one** application before rotating to another effective fungicide with a different mode of action. Labeled for early blight only.
fludioxonil + pydiflumetofen (Miravis Prime 2.09SC)	12+7	9.2 to 11.4 fl oz/acre	0	0.5	Use high rate for gray mold. Limit of 2 applications per crop per year. Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action **Do not use in enclosed structures.**
fluopyram + trifloxystrobin (Luna Sensation 500 SC)	7+11	5.0 to 7.6 fl oz/acre	7	0.5	Limit of 27.1 fl oz (3 and 5 applications at high and low rates, respectively) per acre per year. Make no more than 2 consecutive applications before switching to a non-Group 7 and non-Group 11 fungicide.
fluoxastrobin (Aftershock, Evito 280 SC)	11	2 to 5.7 fl oz/acre	3	0.5	Limit of 22.8 fl oz per acre per season. Make no more than **one** application before alternating with fungicides that have a different mode of action. **NOTE: Do not overhead irrigate for 24 hours following a spray application.** Labeled for early blight only.
mefentrifluconazole (Cevya)	3	3 to 5 fl oz/acre	0	0.5	Limit of 15 fl oz (5 and 3 applications at high and low rates, respectively) per acre per year.
penthiopyrad (Fontelis1.67 SC)	7	16 to 24 fl oz/ acre	0	0.5	Limit of 72 fl oz per acre per year. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action.
pyraclostrobin (various)	11	8 to 12 oz/acre	0	4 hr	Apply at flowering to manage green fruit rot. Limit of 96 oz per acre per season. Make no more than **one** application before alternating with fungicides that have a different mode of action.
pyraclostrobin + fluxapyroxad (Priaxor 500 SC)	11+7	4.0 to 8.0 fl oz/ acre	0	0.5	Limit of 24 fl oz per acre per season. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action. Labeled for anthracnose and early blight ONLY.
tetraconazole (Mettle 125 ME)	3	6 to 8 fl oz/acre	0	0.5	Limit of 16 fl oz per acre per season. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action.
trifloxystrobin (Flint Extra 42.6 SC)	11	3.0 to 3.8 fl oz/ acre	3	0.5	Limit of 16 fl oz or 5 applications per acre per season. Alternate every application with a non-FRAC Group 11 fungicide.
zoxamide + chlorothalonil (Zing! 4.9 SC)	22+M5	34 fl oz/acre	3	0.5	Limit of 8 applications per year. Do not use in greenhouses.

Table 10-28. Disease Control Products for Eggplant

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
PHOMOPSIS BLIGHT (*DIAPORTHE VEXANS*)					
copper (various)	M1	See labels	See labels	2	Make the first application at flowering. If disease is present, make additional applications at 7- to 10-day intervals. Do not spray copper when temperatures are above 90°F. Phomopsis fruit rot may develop in postharvest storage.
PHYTOPHTHORA BLIGHT (*PHYTOPHTHORA CAPSICI*)					
ametoctradin + dimethomorph (Zampro 525 SC)	45+40	14 fl oz/acre	4	0.5	Limit of 3 applications per acre per season. Make no more than two sequential applications before rotating to another effective fungicide with a different mode of action.
cyazofamid (Ranman 400SC)	21	2.75 fl oz/acre	0	0.5	Limit of 16.5 fl. oz per acre per season. Apply to the base of the plant at transplanting or in the transplant water. Make no more than three consecutive applications followed by three consecutive applications of another effective fungicide with a different mode of action.
copper (various)	M1	See labels	0	2	Begin applications when conditions first favor disease development and repeat at 3-to10-day intervals if needed depending on disease severity. Use the higher rates when conditions favor disease. Do not spray copper when temperatures are above 90°F.
dimethomorph (Acrobat, Forum)	40	6 fl oz/acre	0	0.5	**SUPPRESSION ONLY**. Limit of 30 fl oz per acre per season. Make no more than two sequential before alternating with fungicides that have a different mode of action. **NOTE: Must tank mix with another fungicide with a different mode of action.**
ethaboxam (Elumin 4SC)	22	8 fl oz/acre	2	0.5	Soil spray or foliar applications. 2 applications per crop per year. Must rotate with a non-FRAC Group 22 fungicide in between applications.
famoxadone + cymoxanil (Tanos 50 DF)	11+27	8 to 10 oz/acre	3	0.5	**SUPPRESSION ONLY**. Make no more than **one** application before alternating with a fungicide with a different mode of action. **NOTE: Must tank mix with another fungicide with a different mode of action (i.e., copper).**
fluazinam (Omega 500 F, Ventana 500F)	29	1 to 1.5 pt/acre	30	0.5	Apply as a soil drench at 1.5 pt per acre. For foliar applications, use 1 pt per acre. Limit of 9 pt per acre per season.
fluopicolide (Presidio 4 SC)	43	3 to 4 fl oz/acre	2	0.5	Limit of 4 applications at the low rate or 3 applications at the high rate per season. Apply no more than two times sequentially before alternating with fungicides that have a different mode of action. **NOTE: Must be tank-mixed with another mode of action product.**
mefenoxam + copper hydroxide (Ridomil Gold + Copper)	4+M1	2 lb/acre	7	2	See label for an optimal spray program. Limit of four applications per crop per year. Do not exceed 0.4 lb a.i. per acre per season of mefenoxam + metalaxyl (MetaStar).
oxathiapiprolin + mefenoxam (Orondis Gold 200)	U15+4	4.8 to 9.6 fl oz/ acre	0	4 hr	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Maximum 9.2 fl oz/acre per year in each field.
oxathiapiprolin + mandipropamid (Orondis Ultra 2.33 SC)	U15+40	5.5 to 8.0 fl oz/ acre	1	4 hr	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Maximum 32 fl oz/acre per year.
mandipropamid (Revus 2.08 F, Micora)	40	8 fl oz/acre	1	0.5	**SUPPRESSION ONLY**. Limit of 4 applications per acre per season. **NOTE: Must tank mix with another fungicide with a different mode of action (i.e., copper).**
POWDERY MILDEW (*LEVEILLULA TAURICA*)					
Powdery mildew has not been reported on eggplant in the U.S. If you see it, contact your county Extension agent.					
PYTHIUM ROOT ROT					
mefenoxam (various)	4	See labels	—	2	**MAY ONLY BE APPLIED AT PLANTING**. Apply in a 12 to 16 in. band or in 20-to 50-gal water per acre in transplant water. Mechanical incorporation or 0.5 to 1 in. irrigation water is needed for movement into root zone if rain in not expected. After initial application, 2 supplemental applications (1 pt per treated acre) can be applied.
metalaxyl (MetaStar2 E)	4	4 to 8 pt/treated acre	7	2	Limit of 12 pt per acre per season. Preplant (soil incorporated), at planting (in water or liquid fertilizer), or as a basil-directed spray after planting. See label for the guidelines for supplemental applications.

Table 10-28. Disease Control Products for Eggplant

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
PYTHIUM ROOT ROT (continued)					
cyazofamid (Ranman 400SC)	21	2.75 fl oz/acre	0	0.5	Limit of 16.5 fl. oz per acre per season. Apply to the base of the plant at transplanting or in the transplant water. Make no more than three consecutive applications followed by three consecutive applications of another effective fungicide with a different mode of action.
pyraclostrobin (various)	11	12 to 16 oz/acre	0	4 hr	**SUPPRESSION ONLY**. Apply at flowering to manage green fruit rot. Limit of 4 applications per acre per season. Make no more than **one** application before alternating with fungicides that have a different mode of action.
pyraclostrobin + fluxapyroxad (Priaxor 500 SC)	11+7	4.0 to 8.0 fl oz/ acre	0	0.5	Limit of 2 applications per season. Best option based on tests on tomato in SC.
RHIZOCTONIA SEEDLING AND ROOT ROT (*RHIZOCTONIA SOLANI*)					
azoxystrobin (various)	11	0.4 to 0.8 fl oz/1,000 row feet	—	4 hr	Make in-furrow or banded applications shortly after plant emergence. Under cool, wet conditions, crop injury from soil directed applications may occur.
difenoconazole + benzovindiflupyr (Aprovia Top 1.62 EC)	3+7	10.5 to 13.5 fl oz/acre	14	0.5	Make no more than 2 consecutive applications before switching to a non-Group 7 fungicide. Make no more than 5 applications at the low rate or 4 applications at the high rate per year.
SOUTHERN BLIGHT (*ATHELIA ROLFSII*)					
fluoxastrobin (Aftershock, Evito 280SC)	11	2 to 5.7 fl oz/acre	3	0.5	Limit of 22.8 fl oz per acre per season. Make no more than **one** application before alternating with fungicides that have a different mode of action. **NOTE: Do not overhead irrigate for 24 hours following a spray application.**
penthiopyrad (Fontelis1.67 SC)	7	16 to 24 fl oz/ acre	0	0.5	Apply 5- to 10-days after transplanting and again 14 days later. Limit of two applications per crop. Follow with a FRAC Group 11 fungicide if additional protection is needed.
VERTICILLIUM WILT (*VERTICILLIUM DAHLIAE*)					
polyoxin D (OSO 5%)	19	6.5 to 13 fl oz/ acre	0	4 hr	**SUPPRESSION ONLY.** Can be applied using banded or irrigation water applications. Limit of 6 applications at maximum rate per acre per season.

For Fennel — See Leafy Petioles

Garlic

N. Gauthier, Plant Pathologist, University of Kentucky

Table 10-29. Disease Control Products for Garlic

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
BOTRYTIS BLIGHT (*BOTRYTIS* SPP.), CLADOSPORIUM LEAF BLOTCH (*CLADOSPORIUM ALLII*), PURPLE BLOTCH (*ALTERNARIA PORRI*), DOWNY MILDEW (*PERONOSPORA DESTRUCTOR*), RUST (*PUCCINIA ALLII*)					
azoxystrobin (various)	11	6.2 to 15.4 fl oz/acre	0	4 hr	High risk for resistance; use premix products when possible. Use higher rate for downy mildew and Botrytis. Do not make more than two sequential applications.
azoxystrobin + difenoconazole (Quadris Top)	11+3	14 fl oz/acre	7	0.5	Begin sprays prior to disease onset and spray on a 7- to 14-day schedule. Do not rotate with Group 11 fungicides.
azoxystrobin + chlorothalonil (Quadris Opti)	11+M	1.6 to 3.2 pt/acre	14	0.5	Make no more than one application before alternating with a fungicide with a different mode of action. Use higher rates for downy mildew.
azoxystrobin + mancozeb (various)	11+M	3.2 lb/acre	7	0.5	Follow a protective 7-day schedule. Observe season limit for azoxystrobin applications.
azoxystrobin + propiconazole (various)	3+11	14 to 26 oz/acre	0 to 14	0.5	Also labeled for white rot. Apply preventatively on a 7- to 14-day schedule. Season limit 56 oz/acre.
azoxystrobin + tebuconazole (various)	11+3	8.6 to 32 oz/acre	7	0.5	Also labeled for drip-irrigation or banded applications for white rot. Apply preventatively on a 10- to 14-day schedule. Season limit 70 oz/acre.
benzovindiflupyr + difenoconazole (Aprovia Top)	7+3	10.5 oz/acre	7	0.5	Not Botrytis. Includes Stemphylium and powdery mildew. Spreading/penetrating type adjuvant recommended.
boscalid (Endura) 70 WG	7	6.8 oz/acre	7	0.5	Not for downy mildew. Do not make more than 2 sequential applications or more than 6 applications per season.
chlorothalonil (various)	M	See label	7	2	Spray at first appearance; 7- to 14-day intervals.
chlorothalonil + cymoxanil (Ariston)	M+27	1.6 to 2.4 pt/acre	7	0.5	No efficacy on Botrytis blight; limited efficacy on downy mildew. Apply prior to favorable infection periods; continue on 7- to 9-day interval; alternate with a different mode of action.
chlorothalonil + oxathiapiprolin (Orondis Opti)	M5+49	1.75 to 2.5 pt/ acre	7	0.5	Do not combine with other products containing oxathiapiprolin (any Orondis product).
chlorothalonil + tebuconazole (Muscle ADV)	M5+3	1.1 to 1.6 pt/acre	7 to 14	0.5	Rust and purple blotch only.
chlorothalonil + zoxamide (Zing!)	M+22	30 fl oz/acre	7	0.5	Follow protective spray schedule when diseases are in the area; continue on 7-day interval. Moderate efficacy on downy mildew.
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/ acre	14	0.5	Make no more than two applications before alternating with a fungicide with a different mode of action.
famoxadone + cymoxanil (Tanos)	11+27	8 oz/acre	3	0.5	No efficacy on Botrytis blight; low to moderate efficacy on downy mildew.
fenamidone (Reason)	11	5.5 oz/acre	7	0.5	No efficacy on Botrytis blight; low to moderate efficacy on downy mildew.
fixed copper (various)	M	various	1	1	Also effective against foliar bacterial diseases.
fluazinam (various)	29	1.0 pt/acre	7	1	Initiate sprays when conditions are favorable for disease at disease onset. Spray on a 7- to 10-day or schedule.
fluopyram + tebuconazole (Luna Experience)	7+3	8 to 12.8 oz/acre	7	0.5	Not for downy mildew but labeled for white rot suppression. Apply preventatively on 10- to 14-day schedule.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	16 to 27 oz/acre	7	0.5	Not for downy mildew but labeled for white rot suppression. Apply preventatively on 10-to 14-day schedule.
fluxapyroxad + pyraclostrobin (Merivon)	7+11	4 to 11 fl oz/acre	7	0.5	Use higher rates for downy mildew suppression. Apply at disease onset; continue on a 7- to 14-day schedule. No more than 3 applications/season.
mancozeb + zoxamide (Gavel)	M3+22	1.5 to 2 lb/acre	7	2	Apply on a protective spray schedule. Do not apply to exposed bulbs.
mancozeb + azoxystrobin (Dexter Max)	M3+11	3.2 lb/acre	7	1	Do not apply to exposed bulbs.
mefenoxam + chlorothalonil (Ridomil Gold/Bravo)	4+M	2.5 pt/acre	7	2	Spray at first appearance; 7- to 14-day intervals.

Table 10-29. Disease Control Products for Garlic

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
BOTRYTIS BLIGHT (*BOTRYTIS* SPP.), CLADOSPORIUM LEAF BLOTCH (*CLADOSPORIUM ALLII*), PURPLE BLOTCH (*ALTERNARIA PORRI*), DOWNY MILDEW (*PERONOSPORA DESTRUCTOR*), RUST (*PUCCINIA ALLII*) (cont'd)					
penthiopyrad (Fontelis)	7	16 to 24 oz/acre	3	0.5	Not for downy mildew, but also labeled for white rot in-furrow, drenched, or drip irrigated. Use preventatively on a 7- to 14-day schedule.
propiconazole (various)	3	2 to 8 oz/acre	0 to 14	0.5	Purple blotch and Botrytis suppression. Apply preventatively in no less than 15 gal/acre, on a 7- to 10-day schedule (16 oz/acre season limit).
pyraclostrobin (Cabrio)	11	8 to 12 oz/acre	7	0.5	Not for *Botrytis* blight. QOIs have lost their efficacy against downy mildew.
mancozeb + zoxamide (Gavel)	M3+22	1.5 to 2 lb/acre	7	2	Make no more than 2 sequential applications and no more than 6 applications per season.
mancozeb + azoxystrobin (Dexter Max)	M3+11	3.2 lb/acre	7	1	Do not apply to exposed bulbs.
pyraclostrobin +boscalid (Pristine 38 WG)	11+7	10.5 to 18.5 oz/acre	7	1	Use the highest rate for suppression only on downy mildew. Make no more than 6 applications per season.
pyrimethanil (Scala 5F)	9	9 or 18 fl oz/acre	7	0.5	Not for downy mildew. Use lower rate in a tank-mix with broad-spectrum fungicide and higher rate when applied alone. Do not apply more than 54 fl oz per crop.
tebuconazole (various)	3	4 to 6 oz/acre	7	0.5	Rust and purple blotch only. Also labeled for white rot. Apply preventatively on a 10- to 14-day schedule. Season limit 12 oz/acre.
DOWNY MILDEW (*PERONOSPORA DESTRUCTOR*)					
acibenzolar-*S*-methyl (Actigard 50 WG)	P01	0.75 to 1 oz/acre	7	0.5	Downy mildew, iris yellow spot virus, and bacterial leaf streak. Apply preventatively; avoid usage during periods of plant stress.
ametoctradin + dimethomorph (Zampro)	45+40	14.0 fl oz/acre	0	12 hr	Tank-mix with a broad-spectrum fungicide like chlorothalonil or mancozeb.
cyazofamid (Ranman)	21	2.75 to 3 oz/acre	0		
dimethomorph (Forum 50 WP)	40	6.4 oz/acre	0	0.5	Must be applied as a tank mix with another fungicide active against downy mildew; apply every 7- to 10-days. Do not make more than two sequential applications.
fluopicolide (Presidio)	43	3 to 4 oz/acre	2	0.5	Tank-mix with a nonionic surfactant and apply on preventative schedule.
mandipropamid (Revus)	40	8.0 fl oz/acre	7	0.5	Apply as a tank mix with another fungicide active against downy mildew. Apply with a silicone-based adjuvant. 7- to 10-day schedule.
mandipropamid + oxathiapiprolin (Orondis Ultra)	40+49	5.5 to 8 oz/acre	7	4 hr	Do not combine with other products containing oxathiapiprolin (any Orondis product).
mefenoxam + mancozeb (Ridomil Gold MZ)	4+M	2.5 lb/acre	7	2	Use with a suitable adjuvant.
WHITE ROT (*SCLEROTIUM CUPARTUM*)					
azoxystrobin (various)	11	See labels	0	4 hr	Do not make more than two sequential applications.
azoxystrobin + chlorothalonil (Quadris Opti)	11+M	1.6 to 3.2 pt/acre	7	0.5	Make no more than one application before alternating with a fungicide with a different mode of action.
boscalid (Endura)	7	6.8 oz/acre	7	0.5	Apply at planting in a 4- to 6-inch banded spray. Under high disease pressure, apply as a foliar spray.
dicloran (Botran)	14	2 to 3.2 qt/acre	14	0.5	Also, for Botrytis diseases.
fludioxonil (Cannonball)	12	0.5 oz/1000 row ft	7	0.5	In-furrow application only.
iprodione (Rovral 50 WP)	2	4 lb/acre	—	1	Spray cloves as they are being covered by soil (38 to 40 in. bed spacing). One application per year.
PCNB (Blocker 4F)	14	29 oz/1000 row ft	—	0.5	In-furrow, at-planting treatment only.
thiophanate-methyl (various)	1	43.6 oz/acre	—	3	Spray directly into open furrow at planting.

Greens, Leafy Brassica (Collard, Kale, Mustard, Rape, Salad Greens, Turnip Greens)

A. Keinath, Plant Pathology, Clemson University

Table 10-30. Disease Control Products for Greens, Leafy Brassica
Note: For turnip harvested for roots, see Remarks and Table 10-45 Root Vegetables

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
SEEDLING BLIGHT, DAMPING OFF, ROOT ROT (*PYTHIUM* SPP., *RHIZOCTONIA SOLANI*)					
azoxystrobin + mefenoxam (Uniform 3.72SC)	11+4	0.34 fl oz/ 1,000 row ft	--	0	Apply as an in-furrow spray in 5 gal of water per acre prior to covering seed. Make only 1 application per season. **May be applied to turnip grown for roots.**
azoxystrobin (Quadris 2.08 SC)	11	0.4 to 0.8 fl oz per 1000 row feet	0	4 hr	Apply at planting as a directed spray to the furrow in a band 7 inches wide.
ALTERNARIA LEAF SPOT (*ALTERNARIA* SPP.), CERCOSPORA LEAF SPOT (*CERCOSPORA* SPP.), ANTHRACNOSE (*COLLETOTRICHUM HIGGINSIANUM*), WHITE SPOT (*PSEUDOCERCOSPORELLA CAPSELLAE*), AND VARIOUS FOLIAR FUNGAL DISEASES (SEE SPECIFIC LABELS)					
azoxystrobin (various)	11	See labels	0	4 hr	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. **May be applied to turnip grown for roots. Note that lack of control has been observed in Georgia and Virginia.**
azoxystrobin + difenoconazole (Quadris Top 2.72 SC)	11+3	12 to 14 fl oz/ acre	1	0.5	Make no more than one application before alternating to another fungicide with a different mode of action (NOT FRAC 11).
boscalid (Endura 70 WG)	7	6 to 9 oz/acre	14	0.5	Begin applications prior to disease development and continue on a 7- to 14-day interval. Make no more than 2 applications per season. **Do not apply to turnip greens or roots.**
cyprodonil + fludioxonil (Switch 62.5WG)	9+12	11 to 14 oz/acre	7	0.5	Apply when disease first appears and continue on a 7- to 10-day intervals. See label for complete list of greens.
difenoconazole + cyprodinil (Inspire Super 2.82SC)	3+9	16 to 20 fl oz/ acre	7	0.5	Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action.
flutriafol (Rhyme 2.08SC)	3	5 to 7 fl oz/acre	7	0.5	Limit of 4 applications per year. Labeled for Alternaria and Cercospora leaf spots.
flutriafol + azoxystrobin (Topguard EQ 4.29 SC)	3+11	4 to 8 fl oz/acre	0	0.5	Limit of 4 applications per year.
fluopyram + tebuconazole (Luna Experience 400 SC)	7+3	6 to 8.6 fl oz/acre	7	0.5	Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action. Limit of 34 fl oz (4 applications at the high rate) per acre per year. Not labeled for white spot. **Do not apply to turnip grown for roots.**
fluopyram + trifloxystrobin (Luna Sensation 500 SC)	7+11	5 to 7.6 fl oz/acre	7	0.5	Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action. Limit of 15.3 fl oz (2 applications at the high rate) per acre per year. Not labeled for white spot. **May be applied to turnip grown for roots.**
fluxapyroxad + pyraclostrobin (Priaxor 500 SC)	7+11	6.0 to 8.2 fl oz/ acre	3	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Maximum of 3 applications. **Do not apply to turnip greens or roots.**
mefentrifluconazole (Cevya)	3	3 to 5 fl oz/acre	0	0.5	**For Alternaria leaf spot only.** Limit of 15 fl oz (5 and 3 applications at high and low rates, respectively) per acre per year. **Do not apply to turnip grown for roots.**
penthiopyrad (Fontelis 1.67 SC)	7	14 to 30 fl oz/ acre	0	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. **May be applied to turnips grown for roots.**
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	11.4 fl oz/acre	7	0.5	Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action. Maximum 3 applications per year **EXCEPT 2 APPLICATIONS ON MUSTARD GREENS**. **Do not apply to turnip grown for roots or mustard greens.**
pyraclostrobin (Cabrio 20 EG) (Pyrac 2 EC)	11	12 to 16 oz/acre 8 to 12 oz/acre (turnip greens)	3	0.5	Begin applications prior to disease development and continue on a 7- to 10-day interval. Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action.
tebuconazole (various)	3	3 to 4 oz/acre	7	0.5	For optimum results use as a preventative treatment. Folicur 3.6 F must have 2 to 4 hours of drying time on foliage for the active ingredient to move systemically into plant tissue before rain or irrigation occurs

Table 10-30. Disease Control Products for Greens, Leafy Brassica
Note: For turnip harvested for roots, see Remarks and Table 10-45 Root Vegetables

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
BACTERIAL BLIGHT (*PSEUDOMONAS*), XANTHOMONAS LEAF BLIGHT					
none					Based on field trials in SC, no fungicides, bactericides, or biopesticides are effective against these diseases. Use a 1-yr crop rotation away from all brassicas and early or once-over harvesting if disease appears.
GRAY MOLD (*BOTRYTIS CINEREA*)					
difenoconazole + cyprodinil (Inspire Super 2.82SC)	3+9	16 to 20 fl oz/ acre	7	0.5	Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action.
fluopyram + tebuconazole (Luna Experience 400 SC)	7+3	6 to 8.6 fl oz/acre	7	0.5	Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action. Limit of 34 fl oz (4 applications at the high rate) per acre per year. Not labeled for white spot. **Do not apply to turnip grown for roots.**
penthiopyrad (Fontelis 1.67 SC)	7	14 to 30 fl oz/ acre	0	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. **Maybe applied to turnips grown for roots.**
CLUBROOT (*PLASMODIOPHORA BRASSICAE*)					
cyazofamid (Ranman 34.5SC)	21	*Transplant:* 12.9 to 25.75 fl oz/100-gal water *Banded:* 20 fl oz/A	0.5	0	Either apply immediately after transplanting with 1.7 fl oz of solution per trans- plant, or as a banded application with soil incorporation of 6 to 8 inches prior to transplanting. Do not apply more than 39.5 fl oz/acre/year, including foliar sprays made for downy mildew.
fluazinam (Omega 500 F, Ventana 500F)	29	*Transplant:* 6.45 fl oz/100 gal. *Soil incorporation:* 2.6 pints/acre	20	0.5	Transplant soil drench: Immediately after transplanting, apply 3.4 fl oz of trans- plant solution per plant. Soil incorporation: Apply in a 9-in. band and incorporate 6 to 8 in. deep before transplanting. Note: Omega may delay harvest; see label. **Do not apply to turnips grown for roots.**
DOWNY MILDEW (*HYALOPERONOSPORA PARASITICA*)					
ametoctradin + dimethomorph (Zampro 525 SC)	45+40	14 fl oz/acre	0	0.5	Do not make more than 2 sequential applications before alternating to a fungicide with a different mode of action. Addition of an adjuvant may improve performance (see label for specifics).
cyazofamid (Ranman 400SC)	21	2.75 fl. oz/acre	0	0.5	Make applications on a 7- to 10-day schedule. Do not apply more than 39.5 fl. oz/acre per crop growing season, including soil applications made for clubroot.
dimethomorph (Forum 4.16SC)	40	6.4 oz/acre	0	0.5	Must be tank-mixed with another fungicide active against Phytophthora blight. Do not make more than 2 sequential applications before alternating to another effective fungicide with a different mode of action. Do not make more than 5 apps/season. **Do not apply to turnip greens or roots.**
fenamidone (Reason 500SC)	11	5.5 to 8.2 oz/acre	2	0.5	Begin applications as soon as conditions become favorable for disease development. Applications should be made on a 5- to 10-day interval. Do not make more than one application of Reason 500SC before alternating with a fungicide from a different resistance management group.
fluopicolide (Presidio 4 SC)	43	3 to 4 fl. oz/acre	2	0.5	Make applications on a 7- to 10-day schedule. Presidio must be tank mixed with another fungicide with a different mode of action. Make no more than 2 sequential applications before rotating to a fungicide with different mode of action. Apply no more than12 oz per acre and make no more than 4 applications per season.
fluopyram + trifloxystrobin (Luna Sensation 500 SC)	7+11	5 to 7.6 fl oz/acre	7	0.5	Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action. Limit of 15.3 fl oz (2 applications at the high rate) per acre per year. **May be applied to turnip grown for roots.**
fosetyl-Al (Aliette 80W DG)	33	2 to 5 lb/acre	3	1	Apply when disease first appears; then repeat o, 7- to 21-day intervals. Do not tank mix with copper fungicides. A maximum of 7 applications can be made per season. **Do not apply to turnip greens or roots.**

Table 10-30. Disease Control Products for Greens, Leafy Brassica
Note: For turnip harvested for roots, see Remarks and Table 10-45 Root Vegetables

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DOWNY MILDEW (*HYALOPERONOSPORA PARASITICA*) (continued)					
potassium phosphite (various)	33	2 to 4 pt/acre	0	4 hr	Apply when weather is foggy as a preventative. Do not apply to plants under water or temperature stress. Spray solution should have a pH greater than 5.5. Apply in at least 30-gal water per acre.
pyraclostrobin (Cabrio 20 EG)	7	12 to 16 oz/acre	3	0.5	Begin applications prior to disease development and continue on a 7- to 10-day interval. Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action.
POWDERY MILDEW (*ERYSIPHE* SPP.)					
azoxystrobin + difenoconazole (Quadris Top 2.72 SC)	11+3	12 to 14 fl oz/ acre	1	0.5	Make no more than one application before alternating to another fungicide with a different mode of action (NOT FRAC 11).
boscalid (Endura 70 WG)	7	6 to 9 oz/acre	14	0.5	Begin applications prior to disease development and continue on a 7- to 14-day interval. Make no more than 2 applications per season: disease suppression only. **Do not apply to turnip greens or roots.**
cyprodonil + fludioxonil (Switch 62.5WG)	9+12	11 to 14 oz/acre	7	0.5	Apply when disease first appears and continue on 7- to 10-day intervals. See label for complete list of greens. May be used on turnip where leaves only will be harvested. **Do not apply to turnip grown for roots.**
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/ acre	7	0.5	Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action.
fluopyram + trifloxystrobin (Luna Sensation 500 SC)	7+11	5 to 7.6 fl oz/acre	7	0.5	Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action. Limit of 15.3 fl oz (2 applications at the high rate) per acre per year. **May be applied to turnip grown for roots.**
flutriafol (Rhyme 2.08SC)	3	5 to 7 fl oz/acre	7	0.5	Limit of 4 applications per year. Labeled for Alternaria and Cercospora leaf spots.
fluxapyroxad + pyraclostrobin (Priaxor 500 SC)	7+11	6.0 to 8.2 fl oz/ acre	3	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Maximum of 3 applications. **Do not apply to turnip greens or roots.**
mefentrifluconazole (Cevya)	3	3 to 5 fl oz/acre	0	0.5	Limit of 15 fl oz(5 and 3 applications at high and low rates, respectively) per acre per year.
penthiopyrad (Fontelis1.67 SC)	7	14 to 30 fl oz/ acre	0	0.5	Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. **May be applied to turnips grown for roots.**
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	11.4 fl oz/acre	7	0.5	Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action. Maximum 3 applications per year **EXCEPT 2 APPLICATIONS ON MUSTARD GREENS**. **Do not apply to turnip grown for roots.**
pyraclostrobin (Cabrio 20 EG, Pyrac 2 EC)	11	12 to 16 oz/acre	3	0.5	Begin applications prior to disease development and continue on a 7-to 10-day interval. Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action.
triflumizole (Procure 480SC)	3	6 to 8 oz/acre	1	0.5	Make no more than two sequential applications before rotating with a fungicide with a different mode of action. Do not rotate with Rally or Nova.
tebuconazole (various)	3	3 to 4 oz/acre	7	0.5	For optimum results use as a preventative treatment. Folicur 3.6 F must have 2 to 4 hours of drying time on foliage for the active ingredient to move systemically into plant tissue before rain or irrigation occurs. **May be applied to turnip grown for roots.**
RHIZOCTONIA BOTTOM ROT (*RHIZOCTONIA SOLANI*)					
boscalid (Endura 70 WG)	7	6 to 9 oz/acre	14	0.5	Begin applications prior to disease development and continue on a 7-to 14-day interval. Make no more than 2 applications per season: disease suppression only. **Do not apply to turnip greens or roots.**
fluopyram + tebuconazole (Luna Experience 400 SC)	7+3	8.6 fl oz/acre	7	0.5	Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action. Limit of 34 fl oz (4 applications at the high rate) per acre per year. **Do not apply to turnip grown for roots.**

Table 10-30. Disease Control Products for Greens, Leafy Brassica
Note: For turnip harvested for roots, see Remarks and Table 10-45 Root Vegetables

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
SCLEROTINIA STEM ROT, WHITE MOLD (*SCLEROTINIA SCLEROTIORUM*)					
fluopyram + tebuconazole (Luna Experience 400 SC)	7+3	8.6 fl oz/acre	7	0.5	Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action. Limit of 34 fl oz (4 applications at the high rate) per acre per year. **Do not apply to turnip grown for roots.**
fluopyram + trifloxystrobin (Luna Sensation 500 SC)	7+11	5 to 7.6 fl oz/acre	7	0.5	Make no more than 2 sequential applications before alternating to a fungicide with a different mode of action. Limit of 15.3 fl oz (2 applications at the high rate) per acre per year. **May be applied to turnip grown for roots.**
penthiopyrad (Fontelis1.67 SC)	7	16 to 30 fl oz/ acre	0	0.5	Do not exceed 72 fl oz of product per year. Make no more than 2 sequential applications per season before rotating to another effective product with a different mode of action.
Coniothyrium minitans (Contans WG)	—	1 to 4 lb/acre	0	4 hr	**OMRI listed product.** Apply to soil surface and incorporate no deeper than 2 inches. Works best when applied prior to planting or transplanting. Do not apply other fungicides for 3 weeks after applying Contans.
WHITE RUST (*ALBUGO CANDIDA*)					
azoxystrobin (Quadris 2.08 SC)	11	6.2 to 15.4 fl oz/acre	0	4 hr	Make no more than 2 sequential applications.
fenamidone (Reason 500SC)	11	8.2 oz/acre	2	0.5	Begin applications as soon as conditions become favorable for disease development. Applications should be made on a 5- to 10-day interval. Do not make more than 1 application of Reason 500SC before alternating with a fungicide from a different resistance management group.
fluxapyroxad + pyraclostrobin (Priaxor 500 SC)	7+11	6.0 to 8.2 fl oz/ acre	3	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Maximum of 3 applications. **Do not apply to turnip greens or roots.**
WIRESTEM (*RHIZOCTONIA SOLANI*)					
flutolanil (Moncut 3.8 SC)	7	26 fl oz/acre	45	0.5	Apply to the row at planting as an in-furrow spray or a spray directed at the base of transplants immediately after transplanting. Limit of 2 applications per year.

Hop

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Table 10-31. Disease Control Products for Hop

Crop/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DOWNY MILDEW (*PSEUDOPERONOSPORA HUMULI*)					
ametoctradin + dimethomorph (Zampro)	45 + 40	11 to 14 fl oz/acre	7	0.5	Begin applications prior to disease and continue at 10- day intervals. Do not make more than two sequential applications or three applications per year.
Bacillus subtilis strain IAB/BS03 (Aviv)	BM02	10-30 fl oz/100 gallons of water	0	4 hr	Foliar application. Apply preventatively or when environmental conditions are conducive to rapid disease development. Re-apply on a 7 day interval or as needed.
Basic copper sulfate (Basic Copper 53)	M01	0.53 lbs/acre	0	48 hr	Make crown treatment after pruning, but before training. After training, make additional applications at 10-day intervals as needed.
Copper hydroxide (AmeriCop 40 DF)	M01	1.32 lbs/acre	14	48 hr	Make crown treatment after pruning, but before training. After training, apply at 10 day intervals if needed.
Copper octanoate (Cueva Fungicide Concentrate)	M01	16.8 gal/acre	0	4 hr	Do not reapply within 10 days. DO not apply more than 0.53 lbs/ Cu/acre.
Copper oxychloride (Badge SC)	M01	0.75-1.8 pints/ acre	0	48 hr	Make crown treatment after pruning, but before training. After training, additional treatments are needed at about 10 day intervals. Discontinue use 2 weeks before harvest.
Copper oxychloride sulfate (C-O-C-S- Copodust)	M01	40-50 lbs/acre	0	24 hr	Use as a crown treatment for early downy mildew control and apply in the early spring.
cyazofamid (Ranman 400SC)	21	2.5 to 2.75 fl oz/ acre	3	0.5	Begin applications prior to disease and continue at 7- to 10- day intervals. Do not apply more than 32 fl oz per season.
cymoxanil (Curzate 60 DF)	27	3.2 oz/acre	7	0.5	Tank mix with a protectant fungicide. Begin applications prior to disease and continue at 10- to 14-day intervals.
dimethomorph (Forum)	40	6 fl oz/acre	7	0.5	Begin sprays prior to disease. Minimum interval is 10 days. Maximum 3 applications per season.
Extract of Swinglea glutinose (Ecoswing Botanical Fungicide)	BM01	1.5-2 pints/acre	0	4 hr	Use a minimum of ten gallons of water per acre for ground application. Apply every 7-14 days on a regular basis.
famoxadone + cymoxanil (Tanos)	27 + 11	8 oz/acre	7	0.5	Begin applications prior to disease and continue at 6- to 8-day intervals. Do not make more than 6 applications per season.
Copper sulfate pentahydrate (KOP-5 Algaecide/Bactericide/ Fungicide)	M01	9-19.2 fl oz/acre	2 weeks	2	Make crown treatments after pruning but before training. After training, additional treatments are needed at minimum of 10 day intervals.
Extract of Reynoutria (Regalia)	P5	1-4 qt/100 gal of water/acre	0	4 hr	Use higher rates when disease pressure is expected.
Oxathiapiprolin + mefenoxam (Orondis gold (premix) fungicide)	49 +4	22-36 fl oz/acre	45	2	Soil application. Make a single soil application at planting.
fluopicolide (Presidio)	43	4 fl oz/acre	24	12 hr	Limit of 12 fl oz per acre per year. Make no more than two sequential applications. Alternate with a fungicide with a different mode of action.
fosetyl-Al (Aliette WDG)	P07	2.5 lbs/acre	24	12 hr	Apply as a directed foliar spray. When conditions are warm and humid applications should be made as follows: (1) when shoots are 6-12 inches high; (2) after training when vines are 5-6 feet tall; (3) approximately three weeks after the second application; and (4) during bloom. Use sufficient volume of water to insure complete coverage of foliage.
mandipropamid (Revus)	40	8 fl oz/acre	7	4 hr	Begin applications prior to disease and continue at 7- to 10-day intervals. Do not make more than 3 applications per season.
Thyme oil (Guarda)	BM01	1 gal per 29-159 gal of water	0	0 hr	Apply preventatively when disease symptoms are first visible. Spray at 7 day intervals.
mefenoxam (Ridomil Gold SL)	4	0.50 pt/acre	45	2	Can apply as soil drench or foliar spray, see label for details. Tank mix with fixed copper. May also be applied via drip/micro-sprinkler irrigation.
metalaxyl (MetaStar 2E)	4	1 qt/acre	45	2	Apply as a soil drench (1qt/acre in 20 gal) and follow with foliar fixed copper applications. Apply as foliar spray (1 qt/acre in 50 gal) in combination with fixed copper. Do not make more than 3 applications per season.
Flopet (Folpan 80 WDG)	M4	2.5 lbs/acre	14	1	For best results, apply in combination with a systemic fungicide. Maximum of 4 times per season at 28 day intervals. Do not make more than 10 lbs per acre per year.

Table 10-31. Disease Control Products for Hop

Crop/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DOWNY MILDEW (*PSEUDOPERONOSPORA HUMULI*) (continued)					
Potassium bicarbonate (carb-o-nator)	M01	2.5-5 lbs/100 gal water	0	4 hr	Do not apply through any kind of irrigation system. Start application at the first sign of disease. For best protection, repeat at one to two week intervals until conditions are no longer favorable for disease development. Shorten the interval during rainy weather or during periods of high relative humidity.
Streptomyces lydicus WYEC 108 (Actinovate AG)	BM02	3-12 oz/acre	0	4 hr	Reapply every 7-14 days. For best results, use with a spreader-sticker.
POWDERY MILDEW (*SPHAEROTHECA HUMULI, S. MACULARIS*)					
Bacillus subtilis strain IAB/BS03 (Aviv)	BM02	10-30 fl oz/100 gallons of water	0	4 hr	Foliar application. Apply preventatively or when environmental conditions are conducive to rapid disease development. Re-apply on a 7 day interval or as needed.
cyflufenamid (Torino) 0.85 SC	U6	6 - 8 oz/acre	6	4 hr	Do not make more than 2 applications per crop. Begin application at first sign of disease.
Thyme oil (Guarda)	BM01	1 gal per 29-159 gal of water	0	0 hr	Apply preventatively when disease symptoms are first visible. Spray at 7 day intervals.
Cyflufenamid (Fastback)	U6	6.0-8.0 oz/acre	6	4 hr	Begin application at first sign of disease development. DO not make more than 2 application per year.
Oil, paraffinic (JMS Stylet-Oil)	NC	1-2 gal/100 gal water	0	4 hr	Initiate spray at early leaf stage and continue spray every 10-14 days.
Oil, mineral (415 Superior Spray Oil)	NC	1-5 gal/100 gal water	0	12 hr	Apply this product with ground equipment only. Do not exceed 5 gal per acre. Repeat every 7-14 day depending on new growth.
Flutianil (Gatten)	U13	6-8 fl oz/acre	7	12 hr	Water volume of 50-200 gallons per acre. Repeat applications in 7-14 day intervals. Do not apply more than 16 fl oz per acre per year.
Tebuconazole + fluopyram (Luna Experience)	7 + 3	8-17 fl oz/acre	14	12 hr	Make application in 14 day intervals with sufficient water volume (15-200 gallons per acre).
Fenazaquin (Magister SC)	39	32-36 fl oz/acre	7	12 hr	Apply in at least 25 gallons of water per acre. DO not make more than one application per year.
Extract of Swinglea glutinose (Ecoswing Botanical Fungicide)	BM01	1.5-2 pints/acre	0	4 hr	Use a minimum of ten gallons of water per acre for ground application. Apply every 7-14 days on a regular basis.
Copper octanoate (Cueva Fungicide Concentrate)	M01	16.8 gal/acre	0	4 hr	Do not reapply within 10 days. DO not apply more than 0.53 lbs/ Cu/acre.
Extract of Reynoutria (Regalia)	P5	1-4 qt/100 gal of water/acre	0	4 hr	Use higher rates when disease pressure is expected.
Flutriafol (Rhyme Fungicide)	3	5-7 fl oz/acre	14	12 hr	Apply preventatively and repeat as necessary if the conditions are favorable for disease development. Apply a minimum of 30 gal per acre for ground applications and 10 gal per acre for aerial applications.
metrafenone (Vivando)	50	15.4 fl oz/acre	3	0.5	Begin applications prior to disease and continue at 7- to 14-day intervals. Do not make more than 2 applications per season.
Potassium bicarbonate (carb-o-nator)	M01	2.5-5 lbs/100 gal water	0	4 hr	Do not apply through any kind of irrigation system. Start application at the first sign of disease. For best protection, repeat at one to two week intervals until conditions are no longer favorable for disease development. Shorten the interval during rainy weather or during periods of high relative humidity.
pyraclostrobin + boscalid (Pristine)	11 + 7	28 oz/acre	14	0.5	Ground and aerial applications allowed, see label for details. Begin ground applications prior to disease and continue at 10- to 21-day intervals. Do not make more than 3 applications per season.
quinoxyfen (Quintec)	13	4- 8.2 fl oz/acre	21	0.5	Do not make more than 4 applications per season.
Sodium chloride (Amicos KPM)	NC	2.5-5 lbs/acre	0	0	Spray directly onto pests or pathogens. Apply before noticeable foliar damage occurs. Thorough spray coverage is essential for desired pest control. Repeat at 10-14 day intervals.
Streptomyces lydicus WYEC 108 (Actinovate AG)	BM02	3-12 oz/acre	0	4 hr	Reapply every 7-14 days. For best results, use with a spreader-sticker.
tebuconazole (Tebucon 3.6F)	3	4 to 8 fl oz/acre	14	12 hr	Begin applications prior to disease and continue at 10- to 14- day intervals. Do not apply more than 32 fl oz per acre per season.
trifloxystrobin (Flint)	11	See label	14	0.5	Several rates available. Begin applications prior to disease and continue at 10- to 14-day intervals.
triflumizole (Procure 480 SC)	3	12 fl oz/acre	7	0.5	Begin applications prior to disease and continue at 14-day intervals. Do not apply more than 36 fl oz per acre per season.

Table 10-31. Disease Control Products for Hop

Crop/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
CANKER *(FUSARIUM SPP., PHYTOPHTHORA SPP.)*					
Streptomyces lydicus WYEC 108 (Actinovate AG)	BM02	3-12 oz/A	0	4 hr	Foliar spray is not applicable.
Oxathiapiprolin + mefenoxam (Orondis gold (premix) fungicide)	49 +4	22-36 fl oz/acre	45	2	Soil application. Make a single soil application at planting.
VERTICILLIUM WILT (*VERTICILLIUM SPP.)*					
Streptomyces lydicus WYEC 108 (Actinovate AG)	BM02	3-12 oz/A	0	4 hr	Foliar spray is not applicable.
GRAY MOLD (*BOTRYTIS CINEREA)*					
Streptomyces lydicus WYEC 108 (Actinovate AG)	BM02	3-12 oz/A	0	4 hr	Reapply every 7-14 days. For best results, use with a spreader-sticker.
Aureobasidium pullulans strain DSM 14940 and 14941 (Botector)	BM02	15 oz/acre	0	4 hr	Start application at emergence or transplant until harvest. Apply every 5-10 days depending on growth rate and infection pressure.
ANTHRACNOSE *(COLLETOTRICHUM SPP.)*					
Aureobasidium pullulans strain DSM 14940 and 14941 (Botector)	BM02	15 oz/acre	0	4 hr	Start application at emergence or transplant until harvest. Apply every 5-10 days depending on growth rate and infection pressure.
Copper octanoate (Cueva Fungicide Concentrate)	M01	16.8 gal/acre	0	4 hr	Do not reapply within 10 days. DO not apply more than 0.53 lbs/Cu/acre.
Potassium bicarbonate (carb-o-nator)	M01	2.5-5 lbs/100 gal water	0	4 hr	Do not apply through any kind of irrigation system. Start application at the first sign of disease. For best protection, repeat at one to two week intervals until conditions are no longer favorable for disease development. Shorten the interval during rainy weather or during periods of high relative humidity.
LEAF SPOT *(SEPTORIA)*					
Potassium bicarbonate (carb-o-nator)	M01	2.5-5 lbs/100 gal water	0	4 hr	Do not apply through any kind of irrigation system. Start application at the first sign of disease. For best protection, repeat at one to two week intervals until conditions are no longer favorable for disease development. Shorten the interval during rainy weather or during periods of high relative humidity.
CERCOSPORA LEAF SPOT					
Copper octanoate (Cueva Fungicide Concentrate)	M01	16.8 gal/acre	0	4 hr	Do not reapply within 10 days. DO not apply more than 0.53 lbs/Cu/acre.
SCLEROTINIA SCLEROTIORUM					
Coniothyrium minitans strain CON/M/91-08 (Contans WG)	BM02	1-4 lbs/acre	0	4 hr.	Apply prior to planting, or at planting, after crop emergence, or after transplant, or postharvest. Ca be applied to plant debris in field after harvest.
SCLEROTINIA MINOR					
Coniothyrium minitans strain CON/M/91-08 (Contans WG)	BM02	1-4 lbs/acre	0	4 hr.	Apply prior to planting, or at planting, after crop emergence, or after transplant, or postharvest. Ca be applied to plant debris in field after harvest.

Jerusalem Artichoke (Sunchoke)

A. Keinath, Plant Pathologist, Clemson University

Table 10-32. Disease Control Products for Jerusalem Artichoke (Sunchoke)

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
PYTHIUM ROOT AND CROWN ROT					
cyazofamid (Ranman 34.5SC)	21	0.42 fl oz/1,000 row feed	7	0.5	Apply in a 6- to 8-inch band directly over the seed pieces before closing the furrow.
fluopicolide (Presidio 4 SC)	43	3 to 4 fl oz/acre	7	0.5	Apply every 10 days if needed. Do not apply more than 2 times sequentially and not more than 4 times at the low rate or 3 times at the high rate per acre per season.
mefenoxam (Ridomil Gold 4 SL) (Ultra Flourish 2 SL)	4	1 to 2 pt/treated acre 2 to 4 pt/treated acre	1	2	Soil incorporation. See label for row rates.
GRAY MOLD (*BOTRYTIS CINEREA*), POWDERY MILDEW (*GOLOVINOMYCES* SPP.), RUST (*PUCCINIA HELIANTHI*), SEPTORIA LEAF SPOT (*Septoria helianthi*) (SEE LABEL FOR DETAILS)					
azoxystrobin (various)	11	See labels	14	4 hr	Must rotate every other application with a non-Group 11 fungicide. Maximum of 8 applications per crop per year.
azoxystrobin + difenoconazole (Quadris Top 2.72 SC)	11+3	8 to 14 fl oz/acre	1	0.5	Make no more than 2 applications before alternating to another fungicide with a different mode of action (NOT Quadris).
difenoconazole + benzovindiflupyr (Aprovia Top 1.62 EC)	3+7	10.5 to 13.5 fl oz/acre	14	0.5	Make no more than 2 consecutive applications before switching to a non-Group 7 fungicide. Make no more than 3 applications at the low rate or 2 applications at the high rate per year.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	11.4 fl oz/acre	7	0.5	Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action. Maximum 3 applications per year.
POWDERY MILDEW (*GOLOVINOMYCES* SPP.)					
metconazole (Quash 50 WDG)	3	2.5 to 4.0 oz/acre	1	0.5	Make no more than 4 applications per year. Make no more than 2 consecutive applications before switching to a non-FRAC Group 3 fungicide.
pyrimethanil + fluopyram (Luna Tranquility 4.16 F)	9+7	8 to 11.2 fl oz/acre	7	0.5	Limit of 54.7 fl oz or 5 to 7 applications per acre per year. Make no more than 2 consecutive applications before switching to a non-FRAC Group 7 and non-FRAC Group 9 fungicide for one application.
trifloxystrobin (Flint Extra 42.6 SC)	11	3.0 to 3.8 fl oz/acre	0 (broadcast) 20 (banded)	0.5	Limit of 7.6 fl oz or 2 applications per acre per season.
SOUTHERN BLIGHT (*ATHELIA ROLFSII*)					
azoxystrobin (Quadris 2.08 SC)	11	6.0 to 15.5 fl oz/acre	14	4 hr	Make one application at the high rate before symptoms typically are seen, based on prior year observations.
WHITE MOLD (SCLEROTINIA BASAL STALK ROT) (*SCLEROTINIA SCLEROTIORUM*) Note: White mold is most likely to be seen after planting in the spring during cool, rainy periods.					
boscalid (Endura 70 EG)	7	10 oz/acre	30	0.5	2 applications per crop per season.
Coniothyrium minitans (Contans WG)	NA	1 to 4 lb/acre	0	4 hr	**OMRI listed product.** Apply to soil surface and incorporate no deeper than 2 inches. Works best when applied prior to planting or transplanting. Do not apply other fungicides for 3 weeks after applying Contans. Product is difficult to find in the eastern U.S.
fluazinam (Omega 500 F, Ventana 500F)	29	5.5 to 8 fl oz/acre	14	0.5	Make no more than 10 applications at the low rate or 7 applications at the high rate per year.
metconazole (Quash 50 WDG)	3	4.0 oz/acre	1	0.5	Make first application at row closure or first flowering. Make second application 14 days later if needed. Make no more than 4 applications per year.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	11.4 fl oz/acre	7	0.5	Apply at or before row closure followed by a second application 14 days later. Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action. Maximum 3 applications per year.
pyrimethanil + fluopyram (Luna Tranquility 4.16 F)	9+7	11.2 fl oz/acre	7	0.5	Limit of 54.7 fl oz or 5 applications per acre per year. Make no more than 2 consecutive applications before switching to a non-FRAC Group 7 and non- FRAC Group 9 fungicide for one application.

Leafy Petiole Vegetables

A. Keinath, Plant Pathologist, Clemon University

Note: Some fungicides are not registered on all leafy petiole crops; check Remarks section for exceptions before applying any fungicide to any crop included in this section.

Table 10-33. Disease Control Products for Leafy Petiole Vegetables (Celery, Fennel, Rhubarb, and Swiss Chard)

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DAMPING OFF AND ROOT ROT (PYTHIUM, PHYTOPHTHORA)					
mefenoxam (Ridomil Gold 4 SL) (Ultra Flourish 2 EC)	4	1 to 4 pt/treated acre (see label)	0	0.5	Apply preplant incorporated or surface application at planting.
metalaxyl (Metalaxyl 2E AG, MetaStar 2 E)	4	2 to 8 pt/treated acre (see label)	0	2	Banded over the row, preplant incorporated, or injected with liquid fertilizer.
SEEDLING BLIGHT, DAMPING OFF, ROOT ROT (*PYTHIUM* SPP., *RHIZOCTONIA SOLANI*)					
azoxystrobin + mefenoxam (Uniform 3.72 SC)	11+4	0.34 fl oz/ 1,000 row ft	--	0	Apply as an in-furrow spray in 5 gal of water per acre prior to covering seed. Make only one application per season.
ALTERNARIA LEAF SPOT (*ALTERNARIA* SPP.), CERCOSPORA LEAF SPOT (EARLY BLIGHT, *CERCOSPORA* SPP.), POWDERY MILDEW (*ERYSIPHE* SPP.), SEPTORIA LEAF SPOT (LATE BLIGHT, *SEPTORIA* SPP.)					
azoxystrobin (various)	11	See labels	0	4 hr	Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. Apply no more than 1.88 lb per crop per acre per season. **Do not use in greenhouses.**
boscalid (Endura 70 WG	7	4.5 to 9 oz/acre	14	0.5	Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. Limit of 18 oz/acre per year. **Do not use in greenhouses**
cyprodinil + fludioxonil (Switch 62.5WG)	9+12	11 to 14 oz/acre	0	0.5	Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action for two applications. Apply no more than 56 oz per crop per acre per season. Also controls gray mold.
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz/ acre	2	0.5	Limit of 24.6 fl oz/acre per year. Alternate each application with a non- FRAC Group 11 fungicide. Not labeled to control Septoria or powdery mildew.
fixed copper (generic)	M1	See label	0	0	Spray at first disease appearance, 7- to 10-day intervals.
fludioxonil + pydiflumetofen (Miravis Prime 2.09 SC)	12+7	9.2 to 13.4 fl oz/ acre	0	0.5	Limit of 2 applications per crop per year. **Not labeled on fennel. Do not use in greenhouses.**
fluopyram + trifloxystrobin (Luna Sensation 500 SC)	7+11	5.0 to 7.6 fl oz/ acre	7	0.5	Limit of 15.3 fl oz (2 to 3 applications at low and high rate, respectively) per acre per year. Use higher rate for gray mold.
flutriafol (Rhyme 2.08SC)	3	5 to 7 fl oz/acre	7	0.5	Make no more than 4 applications (28 fl oz) per crop per year. **Do not use in greenhouses.**
flutriafol + azoxystrobin	3+11	6 to 8 fl oz/acre	7	0.5	Make no more than 4 applications per crop per year. **Do not use in greenhouses.**
fluxapyroxad + pyraclostrobin (Merivon 500 SC)	7+11	4 to 11 fl oz/acre	3	0.5	Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. Maximum of 3 applications per crop. **Do not use in greenhouses.**
fluoxastrobin (Aftershock 4 SC, Evito 480SC)	11	5.7 fl oz/acre	3	0.5	Make no more than 4 applications per acre per year. Alternate each application with a non-FRAC Group 11 fungicide. Not labeled to control Alternaria or powdery mildew.
mancozeb (various)	M03	1.6 qt/acre	14	1.0	Make no more than 8 applications per acre per season. **Labeled only on fennel.**
penthiopyrad (Fontelis 1.67 F)	7	14 to 24 fl oz	3	0.5	Do not make more than 2 sequential applications. Maximum of 72 fl oz/ acre per year
propiconazole (various)	3	3 to 4 fl oz/acre	14	0.5	Begin at first sign of disease and repeat at 14-day intervals. Make no more than 2 consecutive applications before rotating to another fungicide with a different mode of action. Not labeled to control Alternaria or powdery mildew.
pydiflumetofen + fludioxonil (Miravis Prime 2.09 SC)	7+12	9.2 to 13.4 fl oz/ acre (13.4 fl oz/ acre for gray mold)	7	0.5	Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action. Maximum 2 applications per year. Not labeled for Septoria leaf spot. **Not labeled on fennel. Do not use in greenhouses.**

Table 10-33. Disease Control Products for Leafy Petiole Vegetables (Celery, Fennel, Rhubarb, and Swiss Chard)

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
ALTERNARIA LEAF SPOT (*ALTERNARIA* SPP.), CERCOSPORA LEAF SPOT (EARLY BLIGHT, *CERCOSPORA* SPP.), POWDERY MILDEW (*ERYSIPHE* SPP.), SEPTORIA LEAF SPOT (LATE BLIGHT, *SEPTORIA* SPP.) (continued)					
pyraclostrobin (Cabrio 20 EG, Pyrac 2 EC)	11	12 to 16 oz/acre	0	0.5	Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. Apply no more than 64 oz per crop per acre per season. **Do not use in greenhouses.**
trifloxystrobin (Flint Extra 42.6 SC)	11	2.5 to 2.9 fl oz/ acre	0 (broad cast) 14 (banded)	0.5	Limit of 11.6 fl oz per acre per season.
WHITE MOLD (*SCLEROTINIA SCLEROTIORUM*), PINK ROT (*SCLEROTINIA SCLEROTIORUM)*					
boscalid (Endura 70 WG)	7	4.5 to 9 oz/acre	0	0.5	Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. Limit of 18 oz/acre per year. **Do not use on cilantro. Do not use in greenhouses**
cyprodinil + fludioxonil (Switch 62.5WG)	9+12	11 to 14 oz/ acre	0	0.5	Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action for two applications. Apply no more than 56 oz per crop per acre per season. First application at thinning and second application 2 weeks later. Also controls gray mold.
dicloran (Botran 75 W)	14	2 lb/acre or 5.3 lb/acre (single application)	7	0.5	**Apply only once at 5.3 lb/acre or twice at 2 lb/acre.** Suggested application time is 10 weeks before harvest. **Labeled only on celery and fennel.**
fludioxonil (various)	12	see label	0	0.5	Make no more than 4 applications per crop per year. Appling excessive water after application may decrease efficacy. Also controls gray mold.
fludioxonil + pydiflumetofen (Miravis Prime 2.09 SC)	12+7	13.4 fl oz/acre	0	0.5	Limit of 2 applications per crop per year. **Not labeled on fennel. Do not use in greenhouses.**
penthiopyrad (Fontelis1.67 F)	7	16 to 30 fl oz/ acre	3	0.5	Do not make more than two sequential applications. Maximum of 72 fl oz/acre per year.
Coniothyrium minitans (Contans WG)	NA	1 to 4 lb/acre	0	4 hr	**OMRI listed product.** Apply to soil surface and incorporate no deeper than 2 inches. Works best when applied prior to planting or transplanting. Do not apply other fungicides for 3 weeks after applying Contans.

Lettuce and Endive

L. Quesada-Ocampo, Plant Pathologist, North Carolina State University

Table 10-34. Disease Control Products for Lettuce and Endive

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
BOTTOM ROT (*RHIZOCTONIA*)					
2,6-dichloro-4-nitroaniline (Botran 5F)	29	0.6 qt/acre	14	12 hr	Spray at time of planting in a 4-to-6-inch band over seedlings after or before transplanting. Do not apply more than 3.2 qt formulated product per acre per year.
azoxystrobin (various)	11	0.4 to 0.8 fl oz/ 1,000 row feet	—	4 hr	Rhizoctonia only. Make in-furrow or banded applications shortly after plant emergence.
azoxystrobin + mefenoxam (Uniform)	4 + 11	0.34 fl oz/1000 ft row	0	0	Apply uniform as an in-furrow spray in a minimum of 5 gal of water per acre at planting. Make only one application per crop season.
Bacillus amyloliquefaciens strain MBI 600 (Serifel)	44	4 to 16 oz/acre	0	4 hr	See label for soil application instructions. Apply a high enough water volume to soak the root zone.
Streptomyces lydicus WYEC 108 (Actinovate AG)	BM 02	3 to 12 oz/acre	0	4 hr	Soil application only except for watercress. This product might be used in overhead drip or other irrigation systems.
trifloxystrobin + fluopyram (Luna Sensation)	7 +11	7.6 fl. oz/acre	0	12 hr	Apply with ground, aerial, or chemigation equipment. apply at critical timings for disease control and continue as needed at 14-day intervals. Can be applied in a band. 20 PHI for banded applications
SEED DECAY, SEEDLING BLIGHT, DAMPING-OFF					
fludioxonil (Spirato 480 FS) (Maxim 4 FS)	12	0.08 to 0.16 fl oz/ 100 lb of seed	—	12	Used to control diseases of seed such as Aspergillus, Fusarium, and Rhizoctonia, among others. Does NOT control Pythium or Phytophthora.
Streptomyces lydicus WYEC 108 (Actinovate AG)	BM 02	3 to 12 oz/acre	0	4 hr	Soil application only except for watercress. This product might be used in overhead drip or other irrigation systems.
DOWNY MILDEW					
acibenzolar-*S*-methyl (Actigard 50 WG)	P01	0.75 to 1 oz/acre	7	0.5	Do not apply prior to thinning or within 5 days after transplanting. Apply preventatively every 7- to 10-days, not to exceed 4 applications(4 oz) per season.
ametoctradin + dimethomorph (Zampro 525 SC)	45+40	14 fl oz/acre	0	12 hr	Do not make more than 2 sequential applications before alternating to a fungicide with a different mode of action. Addition of an adjuvant may improve performance (see label for specifics). Do not apply more than 42 fl oz per acre per season.
azoxystrobin (various)	11	6.2 to 15.4 fl oz/ acre	0	4 hr	Make no more than two sequential applications before alternating with a fungicide with a different mode of action.
cyazofamid (Ranman 400SC)	21	2.75 fl oz/acre	0	0.5	Apply on a 7- to 10-day interval when disease first appears or when conditions favorable for disease development. Do not make subsequent applications, and limit applications to six per year.
cymoxanil (Curzate)	27	3.2 to 5.0 oz/acre	3	0.5	Curzate is only labeled for lettuce and spinach. Use only in combination with a protectant fungicide. Apply on a 5- to 7-day schedule.
cymoxanil + famoxadone (Tanos)	27+11	8.0 oz	1	0.5	See label for directions.
dimethomorph (various)	40	6.4 oz/acre	0	0.5	Must be applied as a tank-mix with another fungicide active against downy mildew. Do not make more than two sequential applications.
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz	2	0.5	Alternate with fungicides with a different mode of action.
fluopicolide (Presidio)	43	3 to 4 fl oz/acre	2	0.5	Tank mix with another downy mildew fungicide with a different mode of action.
mandipropamid (various)	40	See label	See label	See label	Begin applications as soon as crop and/or environmental conditions become favorable for disease development. Apply on a 7- to 10-day interval depending upon disease conditions.
mono- and di-potassium salts of phosphorous acid (Alude, K-Phite)	P07	1 to 4 quarts in a minimum of 10 gal/acre	0	4 hr	Do not apply at a less than 3-day interval.

Table 10-34. Disease Control Products for Lettuce and Endive

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DOWNY MILDEW (continued)					
oxathiapiprolin + mandipropamid (Orondis Ultra)	49+40	5.5 to 8 fl oz/acre	0	4 hr	Limit of six applications per acre per year for the same crop. Do not follow soil applications of Orondis with foliar applications of Orondis. Use the higher rates when disease is present.
oxathiapiprolin + mefenoxam (Orondis Gold 200)	49+4	4.8 to 9.6 fl oz/ acre	0	4 hr	Limit to 38.6 fl oz per acre per year. Limit of six applications per acre per year for the same crop. Do not follow soil applications of Orondis with foliar applications of Orondis. Apply at planting in furrow, by drip, or in transplant water. Use the higher rates for heavier soils, for longer application intervals, or for susceptible varieties.
propamocarb (Previcur Flex)	28	2 pt/acre	2	0.5	Previcur Plus is only labeled for head and leaf lettuce. Do not apply more than 8 pt per growing season; begin applications before infection and continue on 7- to 10-day interval.
DOWNY MILDEW, LEAF SPOTS					
azoxystrobin (various)	11	6.2 to 15.4 fl oz/ acre	7	4 hr	Use the highest rate for downy mildew. Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. Apply no more than 2.88 qt per crop per acre per season.
fixed copper (various)	M01	See label	See label	See label	See label. Rates vary depending on the formulation.
pyraclostrobin (various)	11	12 to 16 oz/acre	0	0.5	Begin applications prior to disease development and continue on 7- to 14-day intervals.
fluxapyroxad + pyraclostrobin (Merivon 500 SC)	7+11	4 to 11 fl oz/acre	1	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Suppression only for downy mildew.
mancozeb (various)	M03	See labels	See label	See label	Rates vary depending on the formulation. Spray at first appearance of disease and continue on a 7- to 10-day intervals.
LEAF SPOTS					
Bacillus amyloliquefaciens strain MBI 600 (Serifel)	44	4 to 16 oz/acre	0	4 hr	Apply at 7- to 10 days interval. Apply product with enough water to coverage the foliage.
cyprodinil + fludioxonil (Switch 62.5 WDG)	9+12	11 to 14 oz/acre	0	0.5	Switch also has activity against basal rot, Sclerotinia, and Gray mold. Alternate with a fungicide with a different mode of action after 2 applications.
flutriafol (Rhyme)	3	5 to 7 oz/acre	7	0.5	Apply preventatively or when conditions are favorable for disease development.
penthiopyrad (Fontelis)	7	14 to 24 fl oz/ acre	3	0.5	Begin applications before disease development. **DO NOT** make more than two consecutive applications before switching to a fungicide with a different mode of action.
trifloxystrobin + Fluopyram (Luna Sensation)	7 +11	7.6 fl. oz/acre	0/20	12 hr	Apply with ground, aerial, or chemigation equipment. apply at the critical timings for disease control and continue as needed at 14-day intervals. Can be applied in a band. 20 PHI for banded applications
GRAY MOLD					
2,6-dichloro-4-nitroaniline (Botran 5F)	29	1.8 to 3.2 qt/acre	14	12 hr	Post-thinning and established transplants: apply as a basal drench in 50-100 gallons. Do not apply more than 3.2 qt formulated product per acre per year.
azoxystrobin + flutriafol (Topguard EQ)	3 + 11	6.0 to 8.0 fl oz/ acre	7	12 hr	Apply preventatively at a higher rate in 7 days interval. For multiple applications refer to the guidelines under resistance management.
boscalid (Endura)		7 to 9 oz/acre	14	0.5	Begin applications prior to the onset of disease and continue on a 7-day interval.
penthiopyrad (Fontelis)	7	14 to 24 fl oz/ acre	3	0.5	Begin applications before disease development. **DO NOT** make more than two consecutive applications before switching to a fungicide with a different mode of action.
trifloxystrobin + Fluopyram (Luna Sensation)	7 +11	7.6 fl. oz/acre	0/20	12 hr	Apply with ground, aerial, or chemigation equipment. apply at the critical timings for disease control and continue as needed at 14-day intervals. Can be applied in a band. 20 PHI for banded applications

Table 10-34. Disease Control Products for Lettuce and Endive

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
SEED DECAY, SEEDLING BLIGHT, DAMPING-OFF					
fludioxonil (Spirato 480FS) (Maxim 4FS)	12	0.08 to 0.16 fl oz 100 lb of seed	—	12	Used to control diseases of seed such as Aspergillus, Fusarium, and Rhizoctonia, among others. Does NOT control Pythium or Phytophthora.
POWDERY MILDEW					
azoxystrobin (various)	11	6.2 to 15.4 fl oz/acre	0	4 hr	Make no more than two sequential applications before alternating with a fungicide with a different mode of action.
azoxystrobin + flutriafol (Topguard EQ)	3 + 11	6.0 to 8.0 fl oz /acre	7	12 hr	Apply preventatively at a higher rate in 7 days interval. For multiple applications refer to the guidelines under resistance management.
fluxapyroxad + pyraclostrobin (Merivon 500 SC)	7+11	4 to 11 fl oz/acre	1	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action.
myclobutanil (Rally) 40WSP	3	5 oz/acre	3	1	For use on lettuce only. Apply when disease first appears and continue on a 14-day interval.
penthiopyrad (Fontelis)	7	14 to 24 fl oz/ acre	0	0.5	Begin applications before disease development. **DO NOT** make more than two sequential applications before switching to a fungicide with a different mode of action.
quinoxyfen (Quintec)	13	6 fl oz	1	1	Alternate with a fungicide with a different mode of action.
sulfur (various)	M02	See label	See label	See label	Apply at early leaf stage and repeat every 10- to 14-days or as needed. Do not apply if temperatures are expected to exceed 90°F within 3 days of application due to the risk of crop injury.
triflumizole (various)	3	6 to 8 fl oz/acre	0	0.5	Applications should begin prior to disease development. Repeat on a 14-day schedule. Do not apply more than 18 fl oz per acre per season.
trifloxystrobin + fluopyram (Luna Sensation)	7 +11	7.6 fl. oz/acre	0/20	12 hr	Apply with ground, aerial, or chemigation equipment. apply at the critical timings for disease control and continue as needed at 14-day intervals. Can be applied in a band. 20 PHI for banded applications
PYTHIUM DAMPING-OFF					
cyazofamid (Ranman 400SC)	21	2.75 fl oz/acre	0	0.5	Apply on a 7- to 10-day interval when disease first appears or when conditions favorable for disease development. Do not make subsequent applications, and limit applications to six per year.
mefenoxam (various)	4	See label	—	2	Apply preplant incorporated or surface application at planting.
metalaxyl (various)	4	See label	—	2	Banded over the row, preplant incorporated, or injected with liquid fertilizer
propamocarb (Previcur Flex)	28	2 pt/acre	2	0.5	Previcur Plus is only labeled for head and leaf lettuce. Various application methods; see label.
RUST, WHITE RUST					
cyazofamid (Ranman 400SC)	21	2.75 fl oz/acre	0	0.5	Apply on a 7-to-10-day interval when disease first appears or when conditions favorable for disease development. Do not make subsequent applications, and limit applications to six per year.
penthiopyrad (Fontelis)	7	14 to 24 fl oz/ acre	3	0.5	Begin applications before disease development. **DO NOT** make more than two sequential applications before switching to a fungicide with a different mode of action.
sulfur (various)	M02	See labels	14	1	Apply at early leaf stage and repeat every 10- to 14-days or as needed. Do not apply if temperatures are expected to exceed 90°F within 3 days of application due to the risk of crop injury.
SCLEROTINIA					
boscalid (Endura)	7	See label	14	0.5	Begin applications prior to onset of disease. Use higher rate when disease pressure is high.
cyazofamid (Ranman 400SC)	21	2.75 fl oz/acre	0	0.5	Apply on a 7- to 10-day interval when disease first appears or when conditions favorable for disease development. Do not make subsequent applications, and limit applications to six per year.
Coniothyrium minitans (Contans WG)	NA	1 to 4 lb/acre	0	4 hr	**OMRI listed product.** Apply to soil surface and incorporate no deeper than 2 inches. Works best when applied prior to planting or transplanting. Do not apply other fungicides for 3 weeks after applying Contans.

Table 10-34. Disease Control Products for Lettuce and Endive

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
SCLEROTINIA (continued)					
dicloran (Botran)	14	See label	14	0.5	Rate depends on the specific crop and timing of application. See label.
fludioxonil (Cannonball WP)	12	7 oz/acre	0	0.5	Ground applications only. Do not apply more than 28 oz/acre per year.
fluazinam (Orbus 4F)	29	16 to 24 fl oz/ acre	30	12 hr	Apply as either foliar, band or broadcast spray or as soil drench application at thinning. Use at least 50 gal/water per acre. Do not apply after thinning. Apply every 14 days.
isofetamid (Kenja)	7	12.3 fl oz/acre	14	0.5	Application timing depends on the planting method. Make no more than two sequential applications.
trifloxystrobin + fluopyram (Luna Sensation)	7 +11	7.6 fl. oz/acre	0/20	12 hr	Apply with ground, aerial, or chemigation equipment. apply at the critical timings for disease control and continue as needed at 14-day intervals. Can be applied in a band. 20 PHI for banded applications
iprodione (Rovral)	2	1.5 to 2 lb/acre	14	1	Only for use on lettuce. Also effective for bottom rot and Botrytis. Use higher rate when disease pressure is high.
penthiopyrad (Fontelis)	7	16 to 24 fl oz/ acre	3	0.5	Begin applications before disease development. Continue on 7- to 14-day intervals. Do not make more than 2 consecutive applications before switching to a fungicide with a different mode of action.
Pseudomonas chlororaphis strain AFS0009 (Howler)	BM02	5 to 15 lb/acre	0	0.17	In furrow or foliar spray, Repeat at 7- to 21-day intervals. Thoroughly cover plant foliage and soil surfaces.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	13.4 fl oz/acre	0	0.5	Application timing depends on the planting method. Apply no closer than a 7-day interval. For best results, use a soil-directed spray.

For Melons – See Cucurbits

Okra

E. Sikora, Plant Pathologist, Auburn University

Table 10-35. Disease Control Products for Okra

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
ALTERNARIA, GRAY MOLD, POWDERY MILDEW					
cyprodinil + fludioxonil (various)	9+12	11 to 14 oz/acre	0	0.5	Begin applications before disease development and continue on 7- to 10-day interval. Make no more than 2 consecutive applications before alternating to a fungicide with a different. Do not apply more than 56 oz per acre per season.
ANTHRACNOSE, BACTERIAL LEAF SPOT, LEAF SPOTS, POD SPOTS, POWDERY MILDEW					
fixed copper (various)	M	See label	0	2	Begin applications when conditions favor disease development and repeat on 5- to10-day intervals.
ANTHRACNOSE, BOTRYTIS LEAF MOLD, POWDERY MILDEW, CERCOSPORA LEAF SPOT					
chlorothalonil; cymoxanil (Ariston)	M+27	2 to 2.4 pints/ acre	3	0.5	Begin applications before disease development and continue on a 7-day interval.
ANTHRACNOSE, GRAY LEAF SPOT, POWDERY MILDEW, CERCOSPORA LEAF SPOT					
difenoconazole; azoxystrobin (Quadris Top)	3+11	8 to 14 fl oz/acre	0	0.5	Begin applications before disease development and continue on 7- to 10-day interval. Make no more than 2 consecutive applications before alternating to a fungicide with a different mode of action. Do not apply more than 55 fl oz per acre per season
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/ acre	0	0.5	Begin applications before disease development and continue 7- to 10-day interval. Make no more than 2 consecutive applications before alternating to a fungicide with a different mode of action. Do not apply more than 80 fl oz per acre per season.
fludioxonil (various)	12	5 to 7 fl oz/acre	0	0.5	Begin applications before disease development and continue on 7-day interval.
ANTHRACNOSE, GRAY LEAF SPOT, POWDERY MILDEW, CERCOSPORA LEAF SPOT, RHIZOCTONIA STEM ROT					
difenoconazole + benzovindiflupyr (Aprovia Top)	3+7	10.5 to 13.5 oz/ acre	0	0.5	Begin applications before disease development and continue on 7- to 10-day interval. Make no more than 2 consecutive applications before alternating to a fungicide with a different mode of action. Refer to label for information on addition of an adjuvant.
ANTHRACNOSE, POWDERY MILDEW					
azoxystrobin (various)	11	6.0 to 15.5 fl oz/ acre	0	4	Do not apply more than two sequential applications before alternating with a fungicide with a different mode of action. Do not make more than 4 applications of strobilurin-type fungicides per acre per season.
chlorothalonil (various)	M	2 to 2.4 pt/acre	3	0.5	Begin applications when disease is expected. Repeat every 7- to 10-days.
fluoxastrobin (Aftershock)	11	3 to 5.7 fl oz/acre	1	0.5	Begin application preventively and continue as needed on a 7- to 14-day interval. Alternate after each application with another registered non-group 11 product.
myclobutanil (various)	3	2.5 to 5 oz/acre	0	1	For powdery mildew only. Do not make more than 4 applications per season. Minimum re-treatment interval: 10- to 14-days.
tetraconazole (Mettle 125 ME)	3	6 to 8 fl oz/acre	0	0.5	Begin application before onset of disease and continue on at 7- to 14-day intervals. Make no more than 2 consecutive applications before switching to a fungicide with a different mode of action.
ANTHRACNOSE, BLACK MOLD, EARLY BLIGHT, POWDERY MILDEW					
mefentrifluconazole (Provysol)	3	3 to 5 oz/acre	0	0.5	Apply before onset of disease on a minimum interval of 7 days.
BLACK MOLD, EARLY BLIGHT, GRAY LEAFSPOT, LEAF MOLD, POWDERY MILDEW, SEPTORIA LEAFSPOT, TARGET SPOT					
penthiopyrad (Fontelis)	7	16 to 24 fl oz/ acre	0	0.5	Begin applications prior to disease onset and continue on a 7- to 14-day interval.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	5 to 7.6 fl oz/acre	3	0.5	Apply when needed on a 7- to 14-day schedule.
Pydiflumetofen + fludioxonil (Miravis Prime)	7+12	9.2 to 11.4 fl oz/ acre	0	0.5	Begin applications before disease development. If disease pressure is high, use the shortest interval and highest rate. Minimum application interval is 7 days. Do not make more than 2 applications at the maximum rate per year.

Table 10-35. Disease Control Products for Okra

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
CERCOSPORA LEAF SPOT					
chlorothalonil (various)	M	2 to 2.4 pt/acre	3	0.5	Begin applications when disease is expected. Repeat every 7- to 10-days.
tebuconazole (various)	3	4 to 6 fl oz/acre	3	0.5	DO NOT apply more than 24 fl oz per acre per season.
PHYTOPHTHORA BLIGHT					
cyazofamid (Ranman)	21	2.1 to 2.75 fl oz/ acre	0	0.5	See label for instructions.
ethaboxam (Elumin)	22	8 fl oz/acre	2	0.5	For best results, begin application at planting/transplanting. Do not apply at intervals of less than 14 days.
fluazinam (various)	29	16 to 24 fl oz/ acre	30	0.5	Can be applied as a foliar drench at transplanting followed by foliar applications thereafter. See label.
Fluopicolide (Presidio)	43	3 to 4 fl oz/acre	2	0.5	See label.
oxathiapiprolin + mandipropamid (Orondis Ultra)	49+40	5.5 to 8 fl oz/acre	1	4	Apply at planting, in furrow, by drip, or in transplant water. Disease suppression only. Do not make more than 2 applications before switching to a different mode of action.
POWDERY MILDEW					
cyflufenamid (Fastback)	U6	3.4 oz/acre	0	4	Begin applications at first sign of disease.
pyriofenone (Prolivo 300 SC)	50	4 to 5 fl oz/acre	0	4	Make applications on a 7- to 14-day interval when conditions favor disease development. See label.
sulfur (various)	M2	3 to 10 lb/acre	—	—	Apply at early leave stage and repeat every 14 days or as needed.
metrafenone (Vivando)	U8	15.4 fl oz/acre	12	0	Begin applications prior to disease development and continue on a 7- to 14-day interval.
POWDERY MILDEW, ANTHRACNOSE, CERCOSPORA LEAF SPOT					
azoxystrobin + flutriafol (Topguard EQ)	3+11	4 to 8 fl oz/acre	0	0.5	Apply preventatively or when conditions are favorable for disease development.
flutriafol (Topguard)	3	14 fl oz/acre	0	0.5	Apply preventatively or when conditions are favorable for disease development.
RHIZOCTONIA SEEDLING ROT					
azoxystrobin (various)	11	0.4 to 0.8 fl oz/ 1,000 row feet	—	4	Make in-furrow or banded applications shortly after plant emergence.

Onion

N. Gauthier, Plant Pathologist, University of Kentucky; B. Dutta, Plant Pathologist, University of Georgia

Table 10-36. Disease Control Products for Onion

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
ONION (GREEN)					
DAMPING OFF (*PYTHIUM* SPP.)					
mefenoxam (Ridomil Gold 4 SL)	4	0.5 to 1 pt/trt acre	—	2	See label for low rates. Also, for dry onion.
metalaxyl (MetaStar)	4	2 to 4 pt/trt acre	—	2	Preplant incorporated or soil surface spray.
DOWNY MILDEW (*PERONOSPORA DESTRUCTOR*)					
ametoctradin + dimethomorph (Zampro)	45+40	14.0 fl oz/acre	0	0.5	Begin applications prior to disease development and continue on a 5- to 7-day spray interval.
chlorothalonil (various)	M	See labels	14	2	**For suppression only.** Maximum of three sprays.
chlorothalonil + cymoxanil (Ariston)	M+27	2.0 to 2.4 pt/acre	14	0.5	Apply prior to favorable infection periods; continue on 7- to 9-day interval; alternate with a different mode of action.
fixed copper (various)	M	See labels	1	1	May also reduce bacterial rots.
dimethomorph (Forum)	40	6 fl oz/acre	0	0.5	Do not make more than one sequential application
famoxadone + cymoxanil (Tanos)	11+27	8 oz/acre	3	0.5	Must be tank-mixed with a contact fungicide such as mancozeb. Do not make more than one sequential application before rotating to a different mode of action.
fenamidone (Reason 500SC)	11	5.5 fl oz/acre	7	0.5	Begin applications when conditions favor disease development and continue on 5- to 10-day interval. Do not apply more than 22 fl oz per growing season. Alternate with fungicide from different resistance group.
fluazinam (Omega 500)	29	1.0 pt/acre	7	1	Initiate sprays when conditions are favorable for disease or at disease onset. Spray on a 7- to 10-day schedule.
mandipropamid (Revus 2.08F)	40	8 fl oz/acre	7	0.5	Apply prior to disease development and continue throughout season at 7- to 10-day intervals; maximum 24 fl oz per season.
mefenoxam + chlorothalonil (Ridomil Gold/Bravo)	4+M	2.5 lb/acre	14	2	
oxathiapiprolin + mandipropamid (Orondis Ultra)	49+40	5.5 to 8.0 fl oz/ acre	7	4hr	Use higher rate if disease is present. For the best results, begin the disease resistance program with an initial treatment at planting or transplanting with a fungicide registered for its use. Apply Orondis Ultra as a foliar spray in a mixture with copper-based fungicide beginning at first appearance of symptoms.
potassium phosphite + tebuconazole (Viathon)	49+3	2 to 3 pt/acre	7	0.5	Use as a preventative treatment.
LEAF BLIGHT (*BOTRYTIS* SPP.)					
azoxystrobin (Quadris)	11	9.0 to 15.5 fl oz/ acre	0	4 hr	Resistance reported in the Southeast; use premix products when possible. Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Apply no more 90 fl oz Quadris per crop per acre per season. See individual labels for application instructions and rates.
azoxystrobin + difenoconazole (Quadris Top)	11+3	12 to 14 oz/acre	7	0.5	Make no more than one application before alternating with a fungicide with a different mode of action.
azoxystrobin + chlorothalonil (Quadris Opti)	11+M	1.6 to 3.6 pts/ acre	14	2	Applications should begin prior to disease onset and subsequent applications should be made on a 7- to 14-day interval.
azoxystrobin + propiconazole (Quilt Xcel)	11+3	17.5 to 21 fl oz	0	0.5	Make only one application before rotating to a non-group 11 fungicide.
azoxystrobin + tebuconazole (Custodia)	11+3	8.6 to 12.9 fl oz	7	0.5	Use higher rate and shorter interval when disease conditions are severe.
benzovindiflupyr + difenoconazole (Aprovia Top)	7+3	10.5 oz/acre	7	0.5	Cladosporium, powdery mildew, purple blotch, rust, and Stemphylium. Spreading/penetrating type adjuvant recommended.

Table 10-36. Disease Control Products for Onion

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
LEAF BLIGHT (*BOTRYTIS* SPP.) (cont'd)					
boscalid (Endura 70 WG)	7	6.8 oz/acre	7	0.5	Do not make more than 2 sequential applications or more than 6 applications per season.
chlorothalonil (various)	M	See labels	14	0.5	Spray at first appearance. Maximum of three sprays.
cyprodinil (Vangard WG)	9	10 oz/acre	7	0.5	Do not make more than 2 sequential applications before alternating to a different mode of action.
cyprodinil + fludioxonil (Switch)	9+12	11 to 14 oz/acre	7	0.5	Do not plant rotational crops other than onions or strawberries for 12 months following the last application.
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/ acre	14	0.5	Make no more than two applications before alternating with a fungicide with a different mode of action.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	16 to 27 fl oz/ acre	7	0.5	When disease pressure is high, use higher rates and shorter intervals.
fluopyram + tebuconazole (Luna Experience)	7+3	8.0 to 12.8 fl. oz/acre	7	0.5	Observe seasonal application limits for both group 7 and group 3 fungicides.
fluxapyroxad + pyraclostrobin (Merivon)	7+11	4 to 11 fl oz/acre	7	0.5	Apply at disease onset; continue on 7- to 14-day schedule. No more than 3 applications/season.
penthiopyrad (Fontelis)	7	16 to 24 fl oz/ acre	3	0.5	Begin sprays prior to disease development and continue on a 7- to 14-day schedule.
propiconazole (Quilt)	3	14 to 27.5 oz/ acre	0	0.5	Alternate with a different mode of action.
pyraclostrobin (Cabrio)	11	8 to 12 oz/acre	7	0.5	Make no more than 2 sequential applications and no more than 6 applications per season.
pyraclostrobin + boscalid (Pristine)	11+7	14.5 to 18.5 oz/acre	7	1	Make a maximum of 6 applications per season.
pyrimethanil (Scala)	9	9 or 18 fl oz/acre	7	0.5	Resistance reported in the Southeast. Use lower rate in a tank-mix with broad-spectrum fungicide and higher rate when applied alone. Do not apply more than 54 fl oz per crop.
PURPLE BLOTCH (*ALTERNARIA PORRI*)					
azoxystrobin (Quadris)	11	6 to 12 fl oz/acre	0	4 hr	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Apply no more 90 fl oz Quadris per crop per acre per season. See individual labels for application instructions and rates
azoxystrobin + difenoconazole (Quadris Top)	11+3	12 to 14 oz/acre	7	0.5	Make no more than one application before alternating with a fungicide with a different mode of action.
azoxystrobin + chlorothalonil (Quadris Opti)	11+M	1.6 to 3.2 pt/acre	14	0.5	Make no more than one application before alternating with a fungicide with a different mode of action.
azoxystrobin + propiconazole (Quilt Xcel)	11+3	14 to 21 fl oz	0	0.5	Make only one application before rotating to a non-group 11 fungicide.
azoxystrobin + tebuconazole (Custodia)	11+3	8.6 to 12.9 fl oz	7	0.5	Use higher rate and shorter interval when disease conditions are severe.
boscalid (Endura) 70WG	7	6.8 oz/acre	7	0.5	Do not make more than 2 sequential applications or more than 6 applications per season.
chlorothalonil (various)	M	See labels	14	2	Spray at first appearance. Maximum of three sprays.
chlorothalonil + cymoxanil (Ariston)	M+27	2.0 to 2.4 pt/acre	14	0.5	Apply prior to favorable infection periods; continue on 7- to 9-day interval; alternate with a different mode of action.
chlorothalonil + tebuconazole (Muscle ADV)	M+3	1.1 to 1.6 pt/acre	7	0.5	Apply in a protective schedule or when weather is favorable for disease.
cyprodinil (Vangard WG)	9	10 oz/acre	7	0.5	Do not make more than 2 sequential applications before alternating to a different mode of action.
cyprodinil + fludioxonil (Switch)	9+12	11 to 14 oz/acre	7	0.5	Do not plant rotational crops other than onions or strawberries for 12 months following the last application.
difenoconazole + benzovindiflupyr (Aprovia Top)	3+7	10.5 oz/acre	7	0.5	Also, for Stemphylium leaf blight. Use preventatively with a penetrating spreader.
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/ acre	14	0.5	Make no more than two applications before alternating with a fungicide with a different mode of action.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	16 to 27 fl oz/ acre	7	0.5	When disease pressure is high, use higher rates and shorter intervals.
fluopyram + tebuconazole (Luna Experience)	7+3	8.0 to 12.8 fl. oz/ acre	7	0.5	Observe seasonal application limits for both group 7 and group 3 fungicides.

Table 10-36. Disease Control Products for Onion

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
PURPLE BLOTCH (*ALTERNARIA PORRI*) (continued)					
fluxapyroxad + pyraclostrobin (Merivon)	7+11	4 to 11 fl oz/acre	7	0.5	Apply at disease onset; continue on 7- to 14-day schedule. No more than 3 applications/season.
mefenoxam + chlorothalonil (Ridomil Gold/Bravo)	4+M	2.5 lb/acre	14	2	
penthiopyrad (Fontelis)	7	16 to 24 fl oz/ acre	3	0.5	Begin sprays prior to disease development and continue on a 7- to 14-day schedule.
potassium phosphite + tebuconazole (Viathon)	49+3	2 to 3 pt/acre	7	0.5	Use as a preventative treatment.
propiconazole (Quilt)	3	14 to 27.5 fl oz	0	0.5	Alternate with a different mode of action.
pyraclostrobin (Cabrio)	11	8 to 12 oz/acre	7	0.5	Make no more than 2 sequential applications and no more than 6 applications per season.
pyraclostrobin + boscalid (Pristine)	11+7	10.5 to 18.5 oz/acre	7	1	Make a maximum of 6 applications per season.
pyrimethanil (Scala)	9	9 or 18 fl oz/acre	7	0.5	Use lower rate in a tank-mix with broad-spectrum fungicide and higher rate when applied alone. Do not apply more than 54 fl oz per crop.
STEMPHYLIUM LEAF BLIGHT (*STEMPHYLIUM VESICARIUM*)					
azoxystrobin (Quadris)	11	6 to 12 fl oz/acre	0	4 hr	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Apply no more 90 fl oz Quadris per crop per acre per season. See individual labels for application instructions and rates.
azoxystrobin + difenoconazole (Quadris Top)	11+3	12 to 14 oz/acre	7	0.5	Make no more than one application before alternating with a fungicide with a different mode of action.
azoxystrobin + propiconazole (Quilt Xcel)	11+3	14 to 26 fl oz	0	0.5	Make only one application before rotating to a non-group 11 fungicide.
fluopyram + pyrimethanil (Luna Tranquility)	7 + 9	16 to 27 oz/acre	7	0.5	See label
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/ acre	14	0.5	Make no more than two applications before alternating with a fungicide with a different mode of action.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	16 to 27 fl oz/ acre	7	0.5	When disease pressure is high, use higher rates and shorter intervals.
fluxapyroxad + pyraclostrobin (Merivon)	7+11	4 to 11 fl oz/acre	7	0.5	Apply at disease onset; continue on 7- to 14-day schedule. No more than 3 applications/season.
pyraclostrobin + boscalid (Pristine)	11+7	10.5 to 18.5 oz/acre	7	1	Make no more than 6 applications per season.
ONION (DRY)					
DAMPING OFF (*PYTHIUM* SPP.)					
mefenoxam (Ridomil Gold)	4	0.5 to 1 pt/trt acre	—	2	See label for row rates. Also, for green onion.
metalaxyl (MetaStar)	4	2 to 4 pt/trt acre	—	2	Preplant incorporated or soil surface spray.
azoxystrobin + mefenoxam (Uniform)	11+4	0.34 fl oz /1000 ft	—	0	In-furrow treatment.
DOWNY MILDEW (*PERONOSPORA DESTRUCTOR*)					
ametoctradin + dimethomorph (Zampro)	45+40	14.0 fl oz/acre	0	0.5	Begin applications prior to disease development and continue on a 5- to 7-day spray interval.
chlorothalonil + cymoxanil (Ariston)	M+27	1.6 to 2.4 pt/acre	7	0.5	Apply prior to favorable infection periods; continue on a 7- to 9-day interval; alternate with a different mode of action.
chlorothalonil + zoxamide (Zing!)	M+22	30 fl oz	7	0.5	Do not apply to exposed bulbs.
cyazofamid (Ranman)	21	2.75 to 3.0 oz/ acre	0	0.5	Use a surfactant for best results.
dimethomorph (Forum)	40	6 fl oz	0	0.5	Do not make more than one sequential application
famoxadone + cymoxanil (Tanos)	11+27	8.0 oz/acre	3	0.5	Must be tank-mixed with a contact fungicide such as mancozeb. Do not make more than one sequential application before rotating to a different mode of action.

Table 10-36. Disease Control Products for Onion

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DOWNY MILDEW (*PERONOSPORA DESTRUCTOR*) (continued)					
fenamidone (Reason)	11	5.5 fl oz/acre	7	0.5	Use as soon as environmental conditions become favorable.
fluazinam (Omega 500F)	29	1.0 pt/acre	7	1	Initiate sprays when conditions are favorable for disease or at disease onset. Spray on a 7- to 10-day schedule.
mancozeb + zoxamide (Gavel 75 DF)	M+22	1.5 to 2 lb/acre	7	2	Do not make more than 8 applications per season. Do not apply to exposed bulbs.
mancozeb + azoxystrobin + tebuconazole (Dexter Xcel)	M+11+3	56 to 72 fl oz/ acre	14	1	Do not make more than 2 sequential applications before rotating with a product other than FRAC 11.
mandipropamid (Revus 2.08 F)	40	8 fl oz/acre	7	0.5	Apply prior to disease development and continue throughout season at 7- to 10- day intervals; maximum 24 fl oz per season.
mefenoxam + chlorothalonil (Ridomil Gold/Bravo)	4+M	2.5 lb/acre	14	2	Use with a suitable adjuvant.
oxathiapiprolin + mandipropamid (Orondis Ultra)	49+40	5.5 to 8.0 fl oz/ acre	7	4hr	Use higher rate if disease is present. For the best results, begin the disease resistance program with an initial treatment at planting or transplanting with a fungicide registered for its use. Apply Orondis Ultra as a foliar spray in a mixture with copper-based fungicide beginning at first appearance of symptoms.
potassium phosphite + tebuconazole (Viathon)	49+3	2 to 3 pt/acre	7	0.5	Use as a preventative treatment.
LEAF BLIGHT (*BOTRYTIS* SPP.)					
azoxystrobin (Quadris)	11	9 to 15.5 fl oz/ acre	7	4 hr	Make no more than two sequential applications before alternating with fungicides with a different mode of action. Apply no more than 90 fl oz of Quadris per crop per acre per season. See individual labels for application instructions and rates.
azoxystrobin + chlorothalonil (Quadris Opti)	11+M	1.6 to 3.2 pt/acre	14	0.5	Make no more than one application before alternating with a fungicide with a different mode of action.
azoxystrobin + tebuconazole (Custodia)	11+3	12.9 fl oz	7	0.5	Use higher rate and shorter interval when disease conditions are severe.
chlorothalonil + zoxamide (Zing!)	M+22	30 fl oz	7	0.5	Do not apply to exposed bulbs.
cyprodinil (Vangard WG)	9	10 oz/acre	7	0.5	Do not make more than 2 sequential applications before alternating to a different mode of action.
cyprodinil + fludioxonil (Switch)	9+12	11 to 14 oz/acre	7	0.5	Do not plant rotational crops other than onions or strawberries for 12 months following the last application.
dicloran (Botran)	14	1.5 to 2.7 lb/acre	14	0.5	Use lower rate in a tank-mix with broad-spectrum fungicide and higher rate when applied alone. Do not apply more than 54 fl oz per crop.
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/ acre	7	0.5	Make no more than two applications before alternating with a fungicide with a different mode of action.
fixed copper (various)	M	See labels			Spray at first appearance, 7- to 10-day intervals. Do not apply to exposed bulbs.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	16 to 27 fl oz/ acre	7	0.5	When disease pressure is high, use higher rates and shorter intervals.
mancozeb + azoxystrobin + tebuconazole (Dexter Xcel)	M+11+3	56 to 72 fl oz/ acre	14	1	Do not make more than 2 sequential applications before rotating with a product other than FRAC 11.
mancozeb + zoxamide (Gavel 75 DF)	M+22	1.5 to 2 lb/acre	7	2	Do not make more than 8 applications per season. Do not apply to exposed bulbs.
penthiopyrad (Fontelis)	7	16 to 24 fl oz/ acre	3	0.5	Begin sprays prior to disease development and continue on a 7- to 14-day sched ule.
pyraclostrobin (Cabrio)	11	12 oz/acre	7	0.5	Make no more than 2 sequential applications and no more than 6 applications per season.
pyrimethanil (Scala)	9	9 or 18 fl oz/acre	7	0.5	Use lower rate in a tank-mix with broad-spectrum fungicide and higher rate when applied alone. Do not apply more than 54 fl oz per crop.

Table 10-36. Disease Control Products for Onion

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
NECK ROT (*BOTRYTIS* SPP.), PURPLE BLOTCH (*ALTERNARIA PORRI*), DOWNY MILDEW (*PERONOSPORA DESTRUCTOR*)					
azoxystrobin (Quadris and various)	11	9 to 15.5 fl oz/ acre	7	4 hr	Make no more than two sequential applications before alternating with fungicides with a different mode of action. Apply no more than 90 fl oz of Quadris per crop per acre per season. See individual labels for application instructions and rates.
azoxystrobin + chlorothalonil (Quadris Opti)	11+M	1.6 to 3.2 pt/acre	14	0.5	Make no more than one application before alternating with a fungicide with a different mode of action.
azoxystrobin + mancozeb (Dexter Max)	11+M	3.2 lb/acre	7	0.5	Follow a protective 7-day schedule. Observe season limit for azoxystrobin applications.
azoxystrobin + propiconazole (various)	11+3	14 to 26 oz /acre	14	0.5	
azoxystrobin + tebuconazole (various)	11+3	See labels	7	0.5	See labels for specific rates and application instructions.
boscalid (Endura)	7	6.8 oz/acre	7	0.5	Not for downy mildew. Do not make more than 2 sequential applications or more than 6 applications per season.
chlorothalonil (various)	M	0.9 to 1 lb/acre	7	0.5	Will only suppress neck rot and downy mildew.
chlorothalonil + tebuconazole (Muscle ADV)	M+3	1.1 to 1.6 pt/acre	7 to 14	0.5	Rust and purple blotch only.
chlorothalonil + zoxamide (Zing)	M+22	30 fl oz/acre	7	0.5	Follow protective spray schedule when diseases are in the area.
cyprodinil (Vanguard)	12	10 oz/acre	7	0.5	Suppressive only on neck rot.
difenoconazole + benzovindiflupyr (Aprovia Top)	3+7	10.5 oz/acre	7	0.5	Purple blotch and Stemphylium leaf blight. Use preventatively with a tank-mixed containing a penetrating spreader. Cladosporium, powdery mildew, purple blotch, rust, and Stemphylium. Spreading/penetrating type adjuvant recommended.
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 oz/acre	7	0.5	Make no more than two applications before alternating with a fungicide with a different mode of action.
fluazinam (Omega 500)	29	1.0 pt/acre	7	1	Initiate sprays when conditions are favorable for disease or at disease onset. Spray on a 7- to 10-day schedule.
fluopyram + tebuconazole (Luna Experience)	7+3	8 to 12.8 oz/acre	7	0.5	Not for downy mildew. Suppresses *Sclerotium* spp.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	16 to 27 oz/acre	7	0.5	Not for downy mildew. Suppresses *Sclerotium* spp.
fluxapyroxad + pyraclostrobin (Merivon)	7+11	4 to 11 fl oz/acre	7	0.5	Use higher rates for downy mildew suppression. Apply at disease onset; continue on a 7- to 14-day schedule. No more than 3 applications per season.
iprodione (Rovral 4F)	2	1.5 lb/acre	7	0.5	Not for downy mildew. Apply when conditions are favorable; 14-day intervals.
mancozeb (various)	M	2 to 3 lb/acre	7	1	Do not exceed 30 lb per acre per crop.
mancozeb + zoxamide (Gavel 75 DF)	M+22	1.5 to 2 lb/acre	7	2	Do not make more than 8 applications per season. Do not apply to exposed bulbs.
mancozeb + azoxystrobin (Dexter Max)	M3+11	3.2 lb/acre	7	1	Do not apply to exposed bulbs.
mancozeb + azoxystrobin + tebuconazole (Dexter Xcel)	M+11+3	48 to 72 fl oz/ acre	14	1	Do not make more than 2 sequential applications before rotating with a product other than FRAC 11.
mefenoxam + chlorothalonil (Ridomil Gold/Bravo)	4+M	2.5 pt/acre	7	2	
penthiopyrad (Fontelis)	7	16 to 24 fl oz/ acre	3	12 hr	Begin sprays prior to disease development and continue on a 7- to 14-day schedule.
propiconazole (various)	3	4 to 8 oz/acre	14	0.5	Not for downy mildew. Alternate with a different mode of action.
pyraclostrobin + boscalid (Pristine)	11+7	14.5 to 18.5 oz/ acre	7	1	Make no more than 6 applications per season.

Table 10-36. Disease Control Products for Onion

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
NECK ROT (*BOTRYTIS* SPP.), PURPLE BLOTCH (*ALTERNARIA PORRI*), DOWNY MILDEW (*PERONOSPORA DESTRUCTOR*) (continued)					
tebuconazole (Toledo 36F)	3	4 to 6 fl oz/acre	7	0.5	Not for downy mildew or Botrytis. Suppresses *Sclerotium* spp.
tebuconazole + chlorothalonil (Muscle)	3+M	1.1 to 1.6 pt/acre	7 to 14	0.5	Not for downy mildew or Botrytis.
tebuconazole + potassium phosphate (Viathon)	3+33	2 to 3 pts/acre	7	0.5	
zoxamide + mancozeb (Zing!)	22+M	1.5 to 2 lb/acre	7	0.5	Use preventatively.
penthiopyrad (Fontelis)	7	24 oz/acre	3	0.5	**GA only.** Apply as a broadcast or banded spray over seeds or seedlings.
mancozeb (various)	M	3 lb/29,000 ft row	—	—	
azoxystrobin + difenoconazole (Quadris Top)	11+3	14 fl oz/acre	7	0.5	Begin sprays prior to disease onset and spray on a 7- to 14-day schedule. Do not rotate with Group 11 fungicides.
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/acre	7	0.5	Make no more than two applications before alternating with a fungicide with a different mode of action.
fluxapyroxad + pyraclostrobin (Merivon)	7+11	4 to 11 fl oz/acre	7	0.5	Apply at disease onset; continue on 7- to 14-day schedule. No more than 3 applications/season.
penthiopyrad (Fontelis)	7	16 to 24 fl oz/acre	3	0.5	Begin sprays prior to disease development and continue on a 7- to 14-day schedule.
PINK ROOT (*PHOMA* SPP.)					
iprodione (various)	2	1.5 lb/acre 50 to 100 gal/acre	7	0	Start 7-day foliar sprays at first appearance of favorable conditions.
SMUT (*UROCYSTIS* SPP.)					
pyraclostrobin + boscalid (Pristine)	11+7	10.5 to 18.5 oz/acre	7	1	Make no more than 6 applications per season.
STEMPHYLIUM LEAF BLIGHT (*STEMPHYLIUM VESICARIUM*)					
azoxystrobin (Quadris and various)	11	9 to 15.5 fl oz/acre	7	4 hr	Make no more than two sequential applications before alternating with fungicides with a different mode of action. Apply no more than 90 fl oz of Quadris per crop per acre per season. See individual labels for application instructions and rates.
fluazinam (Omega 500F)	29	1.0 pt/acre	7	2	Initiate sprays when conditions are favorable for disease or at disease onset. Spray on a 7- to 10-day schedule.
iprodione (Rovral 4F)	2	1.5 lb/acre	7	0.5	Not for downy mildew. Apply when conditions are favorable; 14-day intervals.
WHITE ROT (*SCLEROTIUM CEPIVORUM*)					
azoxystrobin + chlorothalonil (Quadris Opti)	11+M	1.6 to 3.2 pt/acre	14	0.5	Make no more than one application before alternating with a fungicide with a different mode of action.
azoxystrobin + tebuconazole (Custodia)	11+3	32 fl oz	7	0.5	Make one application at 32 fl oz per acre in furrow at planting. Additional control may be obtained by including two foliar applications at 8.6 to 12.9 fl oz/acre.
dicloran (Botran)	14	5.3 lb/acre	14	0.5	Apply 5-in. band over seed row and incorporate in top 1.5 to 3 in. of soil, 1 to 2 weeks before seeding.
fludioxonil (Cannonball WG)	12	7 oz/acre	7	0.5	In furrow treatment only.
penthiopyrad (Fontelis)	7	16 to 24 fl oz/acre	3	0.5	Begin sprays prior to disease development and continue on a 7- to 14-day schedule.
tebuconazole (Toledo 36F and various)	3	20.5 fl oz/acre	7	0.5	Make one application in furrow at time of planting.
thiophanate-methyl (various)	1	See label			Spray into open furrow at time of seeding or planting in a row.

Table 10-37. Efficacy of Products for Disease Control in Onion
N. Gauthier, Plant Pathologist, University of Kentucky and B. Dutta, Plant Pathologist, University of Georgia

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data.

Active Ingredient[1]	Product[1]	Fungicide group[F]	Preharvest interval (Days)	Bacterial Streak (*Pseudomonas viridiflava*)	Black mold (*Aspergillus niger*)	Botrytis Leaf Blight (*B. squamosa*)	Botrytis Neck Rot (*B. allii*)	Damping off (*Pythium* spp.)	Downy Mildew (*P. destructor*)	Fusarium Basal Rot (*F. oxysporum*)	Onion Smut (*Urocystis colchici*)	Center Rot (*Pantoea ananatis*)	Pink Root (*Phoma terrestris*)	Purple Blotch (*Alternaria porri*)	Stemphylium Leaf Blight and Stalk Rot	White Rot (*Sclerotium cepivorum*)
ametoctradin + dimethomorph	Zampro	40+45	0	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	NC	NC	NC
azoxystrobin	Quadris	11	7	NC	G	P	NC	NC	ND	NC	ND	NC	NC	F	P	ND
azoxystrobin + difenoconazole	Quadris Top	11+3	1	NC	NC	P	NC	NC	ND	NC	NC	NC	NC	G-F	F	NC
boscalid	Endura	7	7	ND	ND	F	ND	ND	ND	ND	ND	ND	G	ND	P	ND
chlorothalonil	Bravo	M	14	NC	NC	F	NC	NC	F-P	NC	NC	NC	NC	F	F	NC
chlorothalonil + zoxamide	Zing!	M+22	7	ND	ND	ND	ND	ND	F-P	ND	ND	ND	ND	ND	ND	ND
chlorothalonil + cymoxanil	Ariston	M+27	7	ND	ND	ND	ND	ND	F-P	ND	ND	ND	ND	ND	ND	ND
cyprodinil + fludioxonil	Switch	9+12	7	NC	NC	F	ND	NC	NC	NC	NC	NC	NC	F	F	NC
cyprodinil + difenoconazole	Inspire Super	9+3	7	ND	ND	G	ND	ND	ND	ND	ND	ND	ND	ND	G-F	ND
dichloropropene + chloropicrin, fumigant	Telone C-1	—	—	NC	NC	NC	NC	P	NC	F	NC	NC	F	NC	NC	F
difenoconazole + benzovindiflupyr	Aprovia Top	3+7	7	ND	ND	G	ND	ND	ND	ND	ND	ND	ND	ND	F	ND
dimethomorph	Forum	40	0	NC	NC	NC	NC	NC	P	NC	NC	NC	NC	NC	NC	NC
fenamidone	Reason	11	7	NC	NC	P	NC	NC	F-P	NC	NC	NC	NC	P	P	NC
famoxadone + cymoxanil	Tanos	11+27	3	NC	NC	P	NC	NC	P	NC	NC	NC	NC	F-P	P	NC
fixed copper	various	M	1	F-G	NC	F	NC	NC	F	NC	NC	F	NC	F	NC	NC
fluazinam	Omega 50	29	2	NC	NC	G	NC	NC	G-F	NC	NC	NC	NC	E-G	G	NC
fluopyram + pyrimethanil	Luna Tranquility	7+9	7	ND	ND	G-F	ND	ND	ND	ND	ND	ND	ND	ND	G-F	ND
fluopyram + tebuconazole	Luna Experience	7+3	7	ND	ND	F	ND	ND	ND	ND	ND	ND	ND	ND	F	ND
fluxapyroxad + pyraclostrobin	Merivon	7+11	7	ND	ND	G-F	ND	ND	ND	ND	ND	ND	ND	G	F	ND
iprodione	various	2	7	NC	NC	F	P	NC	NC	NC	NC	NC	NC	F	F-P	F
mancozeb	various	M	7	NC	NC	F	NC	NC	F	NC	E	NC	NC	F	F-P	NC
mancozeb + copper	ManKocide	M+M	7	F	NC	F	NC	NC	F	NC	F	F	NC	F	F-P	NC
mandipropamid	Revus	40	7	NC	NC	NC	ND	F	F	NC	NC	NC	NC	NC	NC	NC
mefenoxam	Ridomil Gold EC	4	7	NC	NC	NC	NC	F	ND	NC	NC	NC	NC	NC	NC	NC
mefenoxam + chlorothalonil	Ridomil Gold Bravo	4+M	14	NC	NC	P	NC	P	F	NC	NC	NC	NC	F	P	NC
mefenoxam + copper	Ridomil Gold/ Copper	4+M	7	F	NC	NC	NC	P	F	NC	NC	F	NC	NC	NC	NC
mefenoxam + mancozeb	Ridomil Gold MZ	4+M	7	NC	NC	P	NC	P	F	NC	F	NC	NC	P	P	NC
metam sodium, fumigant	Vapam	—	—	NC	NC	NC	NC	F	NC	F	NC	NC	E	NC	NC	F
penthiopyrad	Fontelis	7		ND	ND	F	ND	ND	ND	ND	ND	ND	ND	G	ND	ND
potassium phosphite + tebuconazole	Viathon	33+3	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	G	ND	ND
pyraclostrobin	Cabrio	11	7	NC	ND	P	NC	NC	P	NC	ND	NC	NC	G	P	ND
pyraclostrobin + boscalid	Pristine	11+7	7	NC	ND	F	F	NC	P	NC	ND	NC	NC	G-F	F	ND
pyrimethanil	Scala	9	7	NC	ND	F	NC	NC	NC	NC	ND	NC	NC	F	F	NC
tebuconazole	Toledo	3	7	ND	ND	F	ND	ND	ND	ND	ND	ND	ND	F	ND	ND
oxathiapiprolin + mandipropamid	Orondis Ultra	49+40	7	NC	NC	NC	ND	ND	G-F	ND	ND	ND	ND	ND	ND	ND

[1] Efficacy ratings do not necessarily indicate a labeled use for every disease.

[F] To prevent resistance in pathogens, alternate fungicides within a group with fungicides in another group. Fungicides in the "M" group are generally considered "low-risk" with no signs of resistance developing to most fungicides.

[R] Resistance reported in the pathogen.

Parsley and Cilantro

A. Keinath, Plant Pathologist, Clemson University

Note: Some fungicides are registered on parsley but not on cilantro; check Remarks section before applying any product to cilantro.

Table 10-38. Disease Control Products for Parsley and Cilantro

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days Harv.	Minimum Days Reentry	Method, Schedule, and Remarks
DAMPING OFF AND ROOT ROT (*PYTHIUM, PHYTOPHTHORA*)					
fenamidone (Reason 500SC)	11	8.2 fl oz/acre	14	0.5	Limit of 24.6 fl oz/acre per year. Alternate each application with a non- FRAC Group 11 fungicide.
mefenoxam (Ridomil Gold 4 SL) (Ultra Flourish 2 EC)	4	 1 to 2 pt/treated acre 2 to 4 pt/treated acre	0	0.5	Apply preplant incorporated or surface application at planting.
metalaxyl (MetaStar 2 E)	4	2 to 8 pt/treated acre	0	2	Banded over the row, preplant incorporated, or injected with liquid fertilizer.
SEEDLING BLIGHT, DAMPING OFF, ROOT ROT (*PYTHIUM* SPP.*, RHIZOCTONIA SOLANI)*					
azoxystrobin + mefenoxam (Uniform 3.72 SC)	11+4	0.34 fl oz/ 1,000 row ft	—	0	Apply as an in-furrow spray in 5 gal of water per acre prior to covering seed. Make only 1 application per season. **Do not use on cilantro.**
ALTERNARIA LEAF SPOT (*ALTERNARIA* SPP.), CERCOSPORA LEAF SPOT (EARLY BLIGHT, *CERCOSPORA* SPP.) POWDERY MILDEW (*ERYSIPHE HERACLEI*), SEPTORIA LEAF SPOT (LATE BLIGHT, *SEPTORIA PETROSELINI*)					
azoxystrobin (various)	11	See labels	0	4 hr	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Apply no more than 1.88 lb per crop per acre per season.
azoxystrobin + flutriafol (Topguard EQ 4.3 SC)	11+3	6 to 8 fl oz/acre	7	0.5	Make no more than 4 applications per crop per year. **Do not use on cilantro. Do not use in greenhouses.**
boscalid (Endura 70 WG)	7	4.5 to 9 oz/acre	14	0.5	Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. Limit of 18 oz/acre per year. **Do not use in greenhouses**
cyprodinil + fludioxonil (Switch 62.5WG)	9+12	11 to 14 oz/acre	0	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action for two applications. Apply no more than 56 oz per crop per acre per season.
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz/ acre	14	0.5	Limit of 24.6 fl oz/acre per year. Alternate each application with a non- FRAC Group 11 fungicide. Not labeled to control Septoria or powdery mildew. Use higher rate on parsley.
fixed copper (generic)	M1	See label	0	0	Spray at first disease appearance, 7- to 10-day intervals.
fludioxonil + pydiflumetofen (Miravis Prime 2.09 SC)	12+7	9.2 to 13.4 fl oz/acre	0	0.5	Limit of 2 applications per crop per year. Not labeled for Cercospora leaf spot. **Do not use in greenhouses. Do not use on cilantro.**
flutriafol (Rhyme 2.08SC)	3	5 to 7 fl oz	7	0.5	Make no more than 4 applications (28 fl oz) per crop per year. **Do not use in greenhouses. Do not use on cilantro.**
fluxapyroxad + pyraclostrobin (Merivon 500 SC)	7+11	4 to 11 fl oz/acre	3	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Maximum of 3 applications per crop.
penthiopyrad (Fontelis 1.67 F)	7	14 to 24 fl oz	3	0.5	Do not make more than two sequential applications. Maximum of 72 fl oz/ acre per year.
propiconazole (various)	3	3 to 4 fl oz/acre	14	0.5	Begin at first sign of disease and repeat at 14-day intervals. Make no more than two consecutive applications before rotating to another fungicide with a different mode of action.
pydiflumetofen + fludioxonil (Miravis Prime 2.09 SC)	7+12	9.2 to 13.4 fl oz/ acre	7	0.5	Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action. Maximum 2 applications at high rate and 3 applications at the low rate per year. **Do not use in greenhouses. Do not use on cilantro.**
pyraclostrobin (Cabrio 20 EG, Pyrac 2 EC)	11	12 to 16 oz/acre	0	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Apply no more than 64 oz per crop per acre per season.
trifloxystrobin (Flint Extra 42.6 SC)	11	3.0 to 3.8 fl oz/ acre	0 (broad-cast) 20 (banded)	0.5	Limit of 7.6 fl oz or 2 applications per acre per season. Not labeled for Cercospora or Septoria.

Table 10-38. Disease Control Products for Parsley and Cilantro

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
ALTERNARIA LEAF SPOT (*ALTERNARIA* SPP.), CERCOSPORA LEAF SPOT (EARLY BLIGHT, *CERCOSPORA* SPP.) POWDERY MILDEW (*ERYSIPHE HERACLEI*), SEPTORIA LEAF SPOT (LATE BLIGHT, *SEPTORIA PETROSELINI*) (continued)					
triflumizole (Procure 480SC)	3	6 to 8 fl oz/acre	0	0.5	Limit of 2 applications per crop per year. Not labeled for Cercospora or Septoria.
GRAY MOLD (*BOTRYTIS CINEREA*), POWDERY MILDEW (*ERYSIPHE HERACLEI*)					
fluopyram + trifloxystrobin (Luna Sensation 500 SC)	7+11	5.0 to 7.6 fl oz/ acre	7	0.5	Limit of 15.3 fl oz (2 to 3 applications) at low and high rate, respectively) per acre per year. Use higher rate for gray mold. **Do not use on cilantro.**
pydiflumetofen + fludioxonil (Miravis Prime 2.09 SC)	7+12	9.2 to 13.4 fl oz/acre (use high rate for gray mold)	7	0.5	Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action. Maximum 3 applications at high rate and 4 applications at the low rate per year. **Do not use in greenhouses. Do not use on cilantro.**
ROOT ROT (*PHYTOPHTHORA* SPP.)					
potassium phosphite (various)	P07	2.5 to 5.0 pints/acre	0	4 hr	Limit of 7 applications per season. Do not treat plants during dormancy or when plants are under stress due to heat or inadequate moisture.
WEB BLIGHT AND ROOT ROT (*RHIZOCTONIA SOLANI*)					
azoxystrobin (Quadris 2.08F)	11	0.125 to 0.25 oz/ 1000 row ft soil application or 6.0 to 15.5 fl oz/ acre foliar application	0	4 hr	Apply as banded spray to the lower stems and soil surface. Make no more than two sequential applications. Soil applications are included in this maximum.
fluopyram + trifloxystrobin (Luna Sensation 500 SC)	7+11	7.6 fl oz/acre	7	0.5	Limit of 15.3 fl oz (2 applications) at low and high rate, respectively, per acre per year. **Do not use on cilantro.**
WHITE MOLD (*SCLEROTINIA SCLEROTIORUM)					
boscalid (Endura 70 WG)	7	4.5 to 9 oz/acre	14	0.5	Make no more than 2 sequential applications before alternating with fungicides that have a different mode of action. Limit of 18 oz/acre per year. **Do not use on cilantro. Do not use in greenhouses.**
cyprodinil + fludioxonil (Switch 62.5 WG)	9+12	11 to 14 oz/acre	0	0.5	Make no more than two sequential applications before alternating with fungicides that have a different mode of action for two applications. Apply no more than 56 oz per crop per acre per season. First application at thinning and second application 2 weeks later.
fludioxonil (various)	12	7 oz/acre	0	0.5	Make no more than 4 applications per crop per year. Appling excessive water after application may decrease efficacy. **Do not use on cilantro.**
fludioxonil + pydiflumetofen (Miravis Prime 2.09 SC)	12+7	13.4 fl oz/acre	0	0.5	Make no more than 2 sequential applications of Miravis Prime or other Group 7 and 12 fungicides before rotating to another effective fungicide with a different mode of action Limit of 2 applications per crop per year. **Do not use in greenhouses. Do not use on cilantro.**
penthiopyrad (Fontelis1.67 F)	7	16 to 30 fl oz	3	0.5	Do not make more than two sequential applications. Maximum of 72 fl oz/acre per year.
Coniothyrium minitans (Contans WG)	NA	1 to 4 lb/acre	0	4 hr	**OMRI listed product.** Apply to soil surface and incorporate no deeper than 2 inches. Works best when applied prior to planting or transplanting. Do not apply other fungicides for 3 weeks after applying Contans.

Table 10-39. Importance of Alternative Management Practices for Disease Control in Parsley and Cilantro

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data.

Strategy	Alternaria leaf spot	Cercospora leaf spot	Powdery mildew	Pythium damping off and root rot	Rhizoctonia damping off and root rot	Root knot nematode	Sclerotinia white mold	Septoria blight
Avoid field operations when leaves are wet	G	G	NC	NC	NC	NC	P	G
Avoid overhead irrigation	G	G	NC	NC	NC	NC	G	G
Biofungicide	ND	ND	F	ND	ND	ND	F	ND
Change planting date	NC	NC	NC	NC	E (early)	E (early)	G (late)	NC
Suppressive cover crops	NC	NC	NC	NC	NC	F	NC	NC
Crop rotation with non-host	E	E	NC	P	P	P	F	E
Deep plowing	G	G	P	NC	F	P	F	G
Destroy crop residue	G	G	P	NC	F	P	P	G
Encourage air movement	G	G	P	P	NC	NC	E	G
Flooding(where feasible)	NC	NC	NC	NC	F	G	G	NC
Increase soil organic matter	NC	NC	F	P	P	F	NC	NC
Hot water seed treatment	ND	ND	NC	NC	NC	NC	NC	E
Plant in well-drained soil	P	P	NC	E	G	NC	F	P
Plant on raised beds	NC	NC	NC	E	G	NC	F	NC
Plastic mulch bed covers	NC	NC	F	F	F	NC	P	NC
Postharvest temperature control	NC	NC	NC	NC	NC	NC	E	NC
Reduce mechanical injury	NC	NC	NC	NC	P	NC	G	NC
Soil solarization	F	F	NC	P	F	F	P	F
Pathogen-free seed	E	E	P	NC	NC	NC	P	E
Resistant/tolerant cultivars	NC	NC	NC	NC	P	NC	NC	F
Weed control	P	P	F	NC	NC	F	F	P

Pea

E. Sikora, Plant Pathologist, Auburn University

Table 10-40. Disease Control Products for Pea

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
PEA (ENGLISH, GARDEN)					
ANTHRACNOSE					
azoxystrobin (various)	11	6.2 to 15.4 fl oz/ acre	0	4 hr	Do not make more than two sequential applications.
penthiopyrad (Fontelis) 1.67 F	7	14 to 30 fl oz	0	0.5	Do not make more than two sequential applications. Maximum of 72 fl oz/acre per crop.
pyraclostrobin + fluxapyroxad (Priaxor) 500 SC	11+7	4.0 to 8.0 fl oz/ acre	7	0.5	Do not make more than two sequential applications. Maximum of 16 fl oz/acre per crop. See label for specific directions for edible-podded legumes and dried-shelled legumes.
fluoxastrobin (Evito 480 SC)	11	2.0 to 4.75 fl oz/ acre	7	0.5	Begin applications preventively and continue as needed on a 7- to 14-day interval.
ANTHRACNOSE, BLACK MOLD, EARLY BLIGHT, POWDERY MILDEW					
mefentriflufluconazole (Provysol)	3	2.5 to 5 oz/acre	21	0.5	Apply at 7-to-14-day intervals.
azoxystrobin (various)	11	6.2 to 15.4 fl oz/acre	0	4 hr	Do not make more than two sequential applications.
ASCOCHYTA LEAF SPOT AND BLIGHT					
azoxystrobin (various)	11	6.2 to 15.4 fl oz/acre	0	4 hr	Do not make more than two sequential applications.
fluoxastrobin (Evito 480 SC)	11	2.0 to 4.75 fl oz/acre	7	0.5	Begin applications preventively and continue as needed on a 7- to 14-day interval. To be grown for pea and bean, dry seed only.
boscalid (Endura) 70 WG	7	8 to 11 oz/acre	7	0.5	Maximum of 2 applications per crop.
penthiopyrad (Fontelis) 1.67 F	7	14 to 30 fl oz	0	0.5	Do not make more than two sequential applications. Maximum of 72 fl oz/acre per crop.
pyraclostrobin + fluxapyroxad (Priaxor) 500 SC	11+7	4.0 to 8.0 fl oz/acre	7	12 hr	Do not make more than two sequential applications. Maximum of 16 fl oz/acre per crop. See label for specific directions for edible-podded legumes and dried-shelled legumes.
GRAY MOLD (BOTRYTIS), WHITE MOLD (SCLEROTINIA)					
boscalid (Endura) 70 WG	7	8 to 11 oz/acre	7	0.5	Maximum of 2 applications per crop.
fluazinam (various)	29	8 to 13.6 fl oz/acre	30	0.5	PHI varies by crop; see label restrictions.
isofetamid (Kenja 400SC)	7	17 fl oz/acre	See label	0.5	Apply at 10 to 30% bloom and 7- to 14- days later, if needed. Do not allow livestock to graze in treated areas.
penthiopyrad (Fontelis) 1.67 F	7	14 to 30 fl oz	0	0.5	Do not make more than two sequential applications. Maximum of 72 fl oz/acre per year.
pyraclostrobin + fluxapyroxad (Priaxor) 500 SC	11+7	4.0 to 8.0 fl oz/acre	7	12 hr	Do not make more than two sequential applications. Maximum of 16 fl oz/acre per crop. See label for specific directions for edible-podded legumes and dried-shelled legumes.
WHITE MOLD (SCLEROTINIA)					
Coniothyrium minitans (Contans WG)	—	1 to 4 lb/acre	0	4 hr	**OMRI listed product.** Apply to soil surface and incorporate no deeper than 2 inches. Works best when applied prior to planting or transplanting. Do not apply other fungicides for 3 weeks after applying Contans.
POWDERY MILDEW					
boscalid (Endura) 70 WG	7	8 to 11 oz/acre	7	0.5	Maximum of 2 applications per crop.
fixed copper (various)	M	See label	0	1 to 2	See label
penthiopyrad (Fontelis) 1.67 F	7	14 to 30 fl oz	0	0.5	Do not make more than two sequential applications. Maximum of 72 fl oz/acre per year.
pyraclostrobin + fluxapyroxad (Priaxor) 500 SC	11+7	4.0 to 8.0 fl oz/acre	7	12 hr	Do not make more than two sequential applications. Maximum of 16 fl oz/acre per crop. See label for specific directions for edible-podded legumes and dried-shelled legumes.
sulfur (various)	M	See labels	0	1	Spray at first appearance, 10- to 14-day intervals. Do not use sulfur on wet plants or on hot days (more than 90°F).

Table 10-40. Disease Control Products for Pea

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
PYTHIUM DAMPING OFF					
mefenoxam (Ridomil Gold) 4 EC	4	0.5 to 1 pt/trt acre	—	2	Incorporate in soil. See label for row rates.
RHIZOCTONIA ROOT ROT					
pyraclostrobin + fluxapyroxad (Priaxor) 500 SC	11+7	4.0 to 8.0 fl oz/acre	7	0.5	Purchase treated seed for control of *Rhizoctonia solani* only.
RHIZOCTONIA SEED DECAY AND SEEDLING BIGHT					
sedaxane (Vibrance)	7	See label	—	—	Seed treatment for seed Decay, Seedling Blight and Damping-off caused by Rhizoctonia solani
RUST (*UROMYCES)*					
azoxystrobin (various)	11	6.2 fl oz/acre	0	4 hr	Do not make more than two sequential applications.
penthiopyrad (Fontelis) 1.67 F	7	14 to 30 fl oz	0	0.5	Do not make more than two sequential applications. Maximum of 72 fl oz/ acre per year.
pyraclostrobin + fluxapyroxad (Priaxor) 500 SC	11+7	4.0 to 8.0 fl oz/acre	7	12 hr	Do not make more than two sequential applications. Maximum of 16 fl oz/ acre per crop. See label for specific directions for edible-podded legumes and dried-shelled legumes.
PEA (SOUTHERN)					
SEED DECAY (PHOMOPSIS, FUSARIUM); SEEDLING BLIGHT (FUSARUM, RHIZOCTONIA)					
thiophanate-methyl (various)	1	0.14 to 0.28 fl oz/ 100 lbs seed			Seed treatment.
ANTHRACNOSE, RUST					
azoxystrobin (various)	11	2 to 5 oz/acre	14 (dry) 0 (succulent)	4 hr	Make no more than 2 sequential applications before alternating with a fungicide with a different mode of actions. Use no more than 1.5 lb a.i. per acre per season.
ASCOCHYTA BLIGHT, GRAY MOLD, WHITE MOLD					
boscalid (Endura 70 WG)	7	8 to 11 oz/acre	21 (dry) 7 (succulent)	0.5	Maximum of 2 applications per season.
ASCOCHYTA BLIGHT, RUST, WHITE MOLD					
prothioconazole (various)	3	5.7 fl oz /acre	7	0.5	Maximum of 3 applications per year. Use no more than17.1 fl oz per acre per year.
ASCOCHYTA BLIGHT, WHITE MOLD					
metconazole (Quash)	3	4 oz/acre	21 (dry)	0.5	For dried shelled pea and beans only. Do not make more than 2 applications per year, but applications may be sequential. Do not apply to cowpea and field pea used for livestock feed. For suppression of white mold only.
DOWNY MILDEW, BACTERIAL BLIGHTS					
fixed copper (various)	M	See label	See label	See label	See label
DOWNY MILDEW, *CERCOSPORA*, ANTHRACNOSE, RUST					
chlorothalonil (various)	M	1.4 to 2 pt/acre	14	2	Spray early bloom; repeat at 7- to 10-day intervals; for dry beans only.
ALTERNARIA, ANTHRACNOSE, ASCOCHYTA, POWDERY MILDEW, RUST, CERCOSPORA					
difenoconazole + benzovindiflupyr (Aprovia Top)	3+7	10.5 to 11 fl oz	14	0.5	Begin prior to disease development and continue on 14-day schedule.
ALTERNARIA, ASCOCHYTA, CERCOSPORA, POWDERY MILDEW, MYCOSPHAERELLA, RUST					
pydiflumetofen + difenoconazole (Miravis Top)	3+7	13.7 fl oz/acre	14	0.5	For dried shelled peas only. Begin applications prior to disease development. Continue applications on a 14-day interval. Do not make more than 4 applications per season. **DO NOT** feed or harvest cowpeas for forage and hay.
mefentriflufluconazole (Provysol)	3	2.5 to 5 fl oz/acre	21	0.5	Apply to 7- to 14- day intervals.
ALTERNARIA, ANTHRACNOSE, ASCOCHYTA, RUST, SOUTHERN BLIGHT, WEB BLIGHT					
azoxystrobin + propiconazole (various)	3+11	10.5 to 14 oz/acre	7 (succulent) 14 (dry)	0.5	Apply when conditions are conducive for disease. Up to three applications may be made on 7- to 14-day intervals

Table 10-40. Disease Control Products for Pea

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
ALTERNARIA, ANTHRACNOSE, ASCOCHYTA, DOWNY MILDEW, POWDERY MILDEW, RUST, CERCOSPORA, WHITE MOLD					
picoxystrobin (Approach)	11	6 to 12 fl oz	14	0.5	Do not apply more than three sequential applications. For white mold, use higher rates.
fluoxastrobin (Evito 480 SC)	11	2.0 to 4.75 fl oz/acre	14	0.5	Begin applications preventively and continue as needed on a 7- to 14-day interval.
penthiopyrad (Fontelis) 1.67 F	7	14 to 30 fl oz	0	0.5	Do not make more than two sequential applications. Maximum of 72 fl oz/acre per year.
DOWNY MILDEW, CERCOSPORA, ANTHRACNOSE, RUST, POWDERY MILDEW					
pyraclostrobin (various)	7	6 to 9 fl oz	21	0.5	Make no more than 2 sequential applications before alternating with a fungicide with a different mode of action. Use no more than 18 fl oz/acre per season.
sulfur (various)	M	See label	0	1	Spray at first appearance; 7- to 10-day interval.
PYTHIUM DAMPING OFF					
mefenoxam (various)	4	0.5 to 1 pt/treated acre	—	0.5	Broadcast or banded over the row as a soil spray at planting or preplant incorporation into the top 2 inches of soil.
metalaxyl (various)	4	2 to 4 pt/treated acre	—	2	Broadcast or banded over the row as a soil spray at planting or preplant incorporation into the top 2 inches of soil.
RHIZOCTONIA ROOT ROT					
azoxystrobin (various)	11	0.4 to 0.8 fl oz/ 1,000 row feet	—	4 hr	Make in-furrow or banded application shortly after plant emergence.
penflufen (Evergol Prime)	7	0.05 to 0.1 fl oz of product/ 100,000 seeds	—	0.5	Apply using commercial slurry or mist-type seed treatment equipment.
RHIZOCTONIA AND FUSARIUM SEED AND SEEDLING DECAY					
fluxapyroxad (various)	7	0.24 to 0.47 fl oz/ 100 lbs seed	—	—	Seed treatment
sedaxane (Vibrance)	7	0.08 0 0.16 fl oz/ 100 lbs seed	—	—	Seed treatment for seed Decay, Seedling Blight and Damping-off caused by *Rhizoctonia solani*
DOWNY MILDEW					
mefenoxam + copper hydroxide (Ridomil Gold Copper)	4+M1	5 lb/2.5 acres	3	2	For black-eyed, southern and cowpea. Begin foliar applications at onset of disease and continue on 7-day interval. Do not exceed 4 applications per season.
RHIZOCTONIA, AND FUSARIUM SEED ROT, DAMPING-OFF, BOTRYTIS SEEDLING BLIGHT, PHOMOPSIS SEED DECAY					
penflufen + trifloxystrobin (various)	11	Apply 0.25 to 0.5 fl oz/ 100 lbs seed	—	—	Apply using commercial slurry or mist-type seed treatment equipment.
WHITE MOLD (SCLEROTINIA)					
Coniothyrium minitans (Contans WG)	—	1 to 4 lb/acre	0	4 hr	**OMRI listed product.** Apply to soil surface and incorporate no deeper than 2 inches. Works best when applied prior to planting or transplanting. Do not apply other fungicides for 3 weeks after applying Contans.
COTTONY LEAK (*PYTHIUM* SPP.)					
fenamidone (Reason 500 C)	11	5.5 to 8.2 fl oz/acre	3	0.5	Begin applications as soon as crop and/or environmental conditions become favorable for disease development. Will also suppress pod rot caused by *Phytophthora capsici*. **DO NOT** use on COWPEA.
COTTONY LEAK, DOWNY MILDEW, *PHYTOPHTHORA CAPSICI*					
cyazofamid (Ranman)	21	2.75 fl oz/acre	0	0.5	Application instructions vary by disease; please follow label directions. **DO NOT** apply to cowpeas used for livestock feed.
SCLEROTINIA WHITE MOLD AND BOTRYTIS GRAY MOLD					
fluazinam (Omega 500F)	29	0.5 to 0.85 pt/acre	30	0.5	**DO NOT** use more than 1.75 pints of per acre. PHI varies by crop; see label restrictions.

Pepper

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Table 10-41. Disease Control Products for Pepper

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
APHID-TRANSMITTED VIRUSES: PVY, TEV, WMV, CMV					
JMS Stylet-Oil		3 qt/100-gal water	0	Dry	Use in 50 to 200 gal per acre depending on plant size. Spray weekly when winged aphids first appear.
ANTHRACNOSE FRUIT ROT					
azoxystrobin (various)	11	See label	0	4 hr	Apply at flowering to manage green fruit rot. Limit of 61.5 fl oz per acre per season. Make no more than **one** application before alternating with fungicides that have a different mode of action.
azoxystrobin + difenoconazole (Quadris Top)	11+3	8 to 14 fl oz/acre	0	0.5	Limit of 55.3 fl oz per acre per season. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action.
azoxystrobin + flutriafol (Topguard EQ)	11+3	See label	0	12 hr	Apply preventatively or when conditions are favorable for disease development. Repeat on a 7- to 14-day interval as necessary if conditions are favorable for disease development.
chlorothalonil (various)	M5	See labels	7	1	See labels. Rates vary depending on the formulation.
difenoconazole + benzovindiflupyr (Aprovia Top)	11+3	10.5 to 13.5 fl oz/acre	0	0.5	Limit of 53.6 fl oz per acre per year. Not labeled for greenhouse use. No more than two applications of Aprovia Top may be applied on a 7-day inter- val.
Difenoconazole + tea tree oil (Regev)		4 to 8.5 fl oz/acre	2	0.5	Limit to 34 fl oz/acre per year. Begin application in early plant stages and repeat on a 7- to 14-day intervals. Do not make more than 2 sequential applications before alternating to a fungicide with a different mode of action
fluopyram + difenoconazole (Luna Flex)	7+3	8 to 13.6 fl oz/ acre	0	0.5	Limit to 27.2 fl oz/acre per year. Begin applications prior to disease development. Continue applications through season on a 7- to 10-day interval.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	7.6 fl oz/acre	3	0.5	**Suppression only**. Limit to 27.1 fl oz/acre per year. Begin applications prior to disease development. Continue applications through season on a 7- to 10-day interval.
Flutriafol (Rhyme)	3	7 fl oz/acre	0	0.5	Limit to 28 fl oz/acre per year. Applt when conditions are favorable for disease. Repeat as necessary on a 7 day interval.
mancozeb (various)	M3	See labels	7	1	See labels. Rates vary depending on the formulation.
mancozeb + azoxystrobin (Dexter Max)	M3+11	1.7 to 3.4 lb/acre	7	1	For states East of the Mississippi and including Mississippi, do not exceed 20.5 lbs of product/acre/season. States West of Mississippi use 1.7 to 2.25 lbs of product/acre/season; do not exceed 13.7 lbs of product/acre/season. Do not make more than one application before alternating with a fungicide not in Group 11. Tank mixture with dimethoate may cause crop injury.
mancozeb + copper (ManKocide)	M3+M1	2 to 3 lb/acre	7	2	**SUPPRESSION ONLY**. Limit of 39 lbs per acre per season.
mefenoxam (Ridomil Gold, Ultra Flourish)	3	3 to 5 fl oz/acre	0	0.5	**Do not make more than 3 applications at the 5 fl oz rate per acre per year.**
mefentrifluconazole (Ceyva)	3	3 to 5	0		Limit to 15 fl oz/acre per year. Begin application before onset of disease and repeat on a 7 day interval.
oxathiapiprolin + chlorothalonil (Orondis Opti premix)	49+M05	1.75 to 2.5 pt/ acre	3	0.5	Limit to 10 pt/A per year. Begin applications when disease is expected. Minimum application interval of 7 days. Make no more than 2 sequential applications before alternating with a fungicide with a different mode of action.
penthiopyrad (Fontelis)	7	24 fl oz/acre	0	0.5	**SUPPRESSION ONLY**. Limit of 72 fl oz per acre per year. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action.
pyraclostrobin (Cabrio EG)	11	8 to 12 oz/acre	0	4 hr	Apply at flowering to manage green fruit rot. Limit of 96 oz per acre per sea- son. Make no more than **one** sequential application before alternating with fungicide that have a different mode of action.

Table 10-41. Disease Control Products for Pepper

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
ANTHRACNOSE FRUIT ROT (continued)					
pyraclostrobin + fluxapyroxad (Priaxor Xemium)	11+7	4.0 to 8.0 fl oz/ acre	0	0.5	**RIPE ROT ONLY**. Limit of 24 fl oz per acre per season. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action.
trifloxystrobin (Flint)	11	3 to 4 oz/acre	3	0.5	**SUPPRESSION ONLY**. Limit of 16 oz per acre per year. Make no more than **one** application before alternating with fungicides that have a different mode of action.
BACTERIAL SPOT (FIELD)					
acibenzolar-*S*-methyl (Actigard 50WG)	21	0.33 oz to 0.75 oz/acre	14	0.5	**FOR CHILI PEPPERS ONLY EXCEPT IN SOME STATES.** Begin applications within one week of transplanting or emergence. Make up to six weekly, consecutive applications.
Bacillus amyloliquefaciens (Serifel)	44	4 to 16 oz/acre	0	4 hr	Begin applications shortly after emergence or transplanting and continue on 2- to 7-day intervals if conditions conducive to disease development. For improved suppression of bacterial spot and speck, tank mix or rotate with labeled copper-based bactericides.
Difenoconazole + tea tree oil (Regev)		4 to 8.5 fl oz/acre	2	0.5	Limit to 34 fl oz/acre per year. Begin application in early plant stages and repeat on a 7- to 14-day intervals. Do not make more than 2 sequential applications before alternating to a fungicide with a different mode of action
fixed copper (various)	M1	See labels	0	2	See label. Rates vary depending on the formulation. Make first application 7- to 10-days after transplanting. Carefully examine field for disease to deter- mine need for additional applications. If disease is present, make additional applications at 5-day intervals. Applying mancozeb with copper significantly enhances bacterial spot control. **Do not spray copper when temperatures are above 90°F.**
mancozeb (various)	M3	See labels	7	1	See label. Rates vary depending on the formulation.
mancozeb + copper (ManKocide)	M3+M1	2 to 3 lb/acre	7	2	Limit of 39 lbs per acre per season.
methyl salicylate + *Bacillus thuringiensis* subsp. *kurstaki* (Leap)	BM02	16 to 64 fl oz/ acre	See label	0.5	Apply preventatively on a 5- to 10-day schedule. For best disease control, Leap should be used in tank mix or rotation with other registered pathogen control products, especially if disease already observed in crop.
quinoxyfen (Quintec)	13	6.0 fl oz/acre	3	0.5	Use 6 oz of product per acre in no less than 30 gallons of water per acre. **NOTE: May only be used to manage bacterial spot in Florida, Georgia, North Carolina, and South Carolina (Section 2 (ee)).**
BACTERIAL SPOT (TRANSPLANTS)					
fixed copper (various)	M1	See labels	0	2	See labels. Rates vary depending on the formulation. Begin applications when conditions first favor disease development, repeat at 3- to 10-day intervals if needed depending on disease severity. Use higher rates when conditions favor disease. Do not spray copper when temperatures are > 90°F.
streptomycin sulfate (Agri-Mycin 17, Firewall, Streptrol)	25	1 lb/100 gal	—	1	**MAY ONLY BE APPLIED TO TRANSPLANTS.** Spray when seedlings are in the 2-leaf stage, continue on 5-day intervals until transplanted into field. **NOTE: Some pathogen strains are resistant to streptomycin sulfate.**
BACTERIAL SPOT (SEED)					
sodium hypochlorite (Clorox 5.25%, regular formulation)	—	1 pt + 4 pt water	—	—	Add 1 TSP of surfactant (Tween-20 or 80, Silwet) to improve coverage on seed.
CERCOSPORA LEAF SPOT					
azoxystrobin + difenoconazole (Quadris Top 29.6SC)	11+3	8 to 14 fl oz/acre	0	0.5	Limit of 55.3 fl oz per acre per season. Make no more than two consecutive applications before rotating to another effective fungicide with different mode of action. The addition of non-ionic based surfactant or oil concentrate is recommended.
azoxystrobin + flutriafol (Topguard EQ)	11+3	See label	0	0.5	Apply preventatively or when conditions are favorable for disease development. Repeat on a 7- to 14-day interval as necessary if conditions favorable for disease development.
benzovindiflupyr + difenoconazole (Aprovia Top)	7+3	10.5 to 13.5 fl oz/ acre	0	0.5	Begin applications prior to disease development and continue throughout the season on a 7- to 14-day interval. For resistance management, do not apply more than two consecutive applications before switching to a non-Group 7 fungicide.

Table 10-41. Disease Control Products for Pepper

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
CERCOSPORA LEAF SPOT (continued)					
Fenbuconazole (Enable)	3	6 to 12 fl oz/acre	7		Limit to 48 fl oz/acre per year. Begin application when disease is first observed and repeat on 10- to 14-day intervals. Minimum spray volume of 30 gal/acre. A surfact should be tank mixed for optimum performance. Do not make more the 2 sequential applications with rotating to a fungicide with adifferent mode of action.
fixed copper (various)	M01	See labels	0	2	See labels. Rates vary depending on formulation. Begin applications when conditions first favor disease development, repeat at 3- to 10-day intervals if needed depending on severity. Use higher rates when conditions favor disease. Do not spray when temperature > 90 °F.
fluopyram + difenoconazole (Luna Flex)	7+3	8 to 13.6 fl oz/ acre	0	0.5	Limit to 27.2 floz/acre per year. Begin applications prior to disease development. Continue applications through season on a 7- to 10-day interval.
Flutriafol (Rhyme)	3	7 fl oz/acre	0	0.5	Limit to 28 fl oz/acre per year. Applt when conditions are favorable for disease. Repeat as necessary on a 7 day interval.
mancozeb (various)	M3	See labels	7	1	See labels. Rates vary depending on the formulation.
mancozeb + copper (ManKocide)	M3+M1	2 to 3 lb/acre	7	2	Limit of 39 lbs per acre per season.
mancozeb + azoxystrobin (Dexter Max)	M03+11	1.7 to 3.4 lb/acre	7	1	For states East of the Mississippi and including Mississippi, do not exceed 20.5 lbs of product/acre/season. States West of Mississippi use 1.7 to 2.25 lbs of product/acre/season and do not exceed 13.7 lbs of product/acre/ season. Do not make more than one application before alternation with a fungicide not in Group 11. On fresh market tomato, do not tank mix with an adjuvant or an EC formulation. **Tank mixture with dimethoate may cause crop injury.**
oxathiapiprolin + chlorothalonil (Orondis Opti premix)	49+M05	1.75 to 2.5 pt/ acre	3	0.5	Limit to 10 pt/A per year. Begin applications when disease is expected. Minimum application interval of 7 days. Make no more than 2 sequential applications before alternating with a fungicide with a different mode of action.
pyraclostrobin (Cabrio)	11	8 to12 fl oz/acre	0	0.5	Limit of 96 fl oz per acre per season. Do not make more than one application of product before alternating to a labeled fungicide with different mode of action.
PHYTOPHTHORA FOLIAR BLIGHT AND FRUIT ROT (*PHYTOPHTHORA CAPSICI*)					
ametoctradin + dimethomorph (Zampro)	45+40	14 fl oz/acre	4	0.5	**SUPPRESSION ONLY.** Limit of 42 fl oz per acre per season. Make no more than two sequential applications before rotating to another effective fungicide with a different mode of action.
cyazofamid (Ranman 400SC)	21	2.75 fl oz/acre	0	0.5	Limit to 16.5 fl oz/acre per year. Apply in transplant water at the time of transplant. Additional foliar applications can be made ona 7- to 10-day interval. For foliar sprays, a surfactant should be tank mixed.
dimethomorph (Acrobat, Forum)	40	6 fl oz/acre	0	0.5	**SUPPRESSION ONLY**. Limit of 30 fl oz per acre per season. Make no more than two sequential before alternating with fungicides that have a different mode of action. **NOTE: Must tank mix with another fungicide with a different mode of action.**
ethaboxam (Elumin)	22	8 fl oz/acre	2	0.5	**ONLY EFFECTIVE ON PHYTOPHTHORA.** Make soil spray or foliar fungicide applications beginning when conditions are favorable for disease development and prior to disease onset; continuing throughout the season. For best results, begin application at planting/transplanting. Inject (via drip irrigation) for soilborne diseases: Inject Elumin into the irrigation water at the listed application rate (see label).
famoxadone + cymoxanil (Tanos)	11+27	8 to 10 oz/acre	3	0.5	**SUPPRESSION ONLY**. Make no more than **one** application before alternating with a fungicide with a different mode of action. **NOTE: Must tank mix with another fungicide with a different mode of action (i.e., maneb or copper).**
fenamidone (Reason 500SC)	11	8.2 fl oz/acre	14	0.5	**SUPRESSION ONLY.** Limit of 24.6 fl oz per growing season. Make no more than one application before rotating to another effective fungicide with a different mode of action.

Table 10-41. Disease Control Products for Pepper

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days Harv.	Minimum Days Reentry	Method, Schedule, and Remarks
PHYTOPHTHORA FOLIAR BLIGHT AND FRUIT ROT *(PHYTOPHTHORA CAPSICI)* (continued)					
fluazinam (Omega 500F, Lektivar 40SC)	29	1 to 1.5 pt/acre	30	0.5	**SUPPRESSION ONLY**. Apply as a soil drench at 1.5 pt per acre. For foliar applications, use 1 pt per acre. Limit of 9 pt per acre per season.
fluopicolide (Presidio)	43	3 to 4 fl oz/acre	2	0.5	Limit of 12 fl oz per acre per season. Make no more than two times sequentially before alternating with fungicides that have a different mode of action. **NOTE: Must be tank-mixed with another mode of action product. Recently, insensitivity to this fungicide has been observed in south- eastern US.**
mandipropamid (Revus, Micora)	40	8 fl oz/acre	1	0.5	**SUPPRESSION ONLY**. Limit of 32 fl oz per acre per season. **NOTE: Must tank mix with another fungicide with a different mode of action (i.e., copper).**
oxathiapiprolin + mefenoxam (Orondis Gold)	49+4	4.8 to 9.6 fl oz/acre	0	4 h	Limit of 19.2 fl oz per acre per season. Do not follow soil applications of Orondis Gold 200 with foliar applications of Orondis Opti A or Orondis Ultra A.
oxathiapiprolin + mandipropamid (Orondis Ultra; premix)	49+40	5.5 to 8.0 fl oz/acre	See label	4hr	Use higher rate if disease is present. For best results, begin disease resistance program with initial treatment at planting or transplanting with fungicide registered for its use. Apply Orondis Ultra as a foliar spray in a mixture with copper-based fungicide beginning at 1st appearance of symptoms.
PHYTOPHTHORA OR PYTHIUM ROOT ROT (FIELD)					
mefenoxam (Ridomil Gold, Ultra Flourish)	4	See label	—	2	**MAY ONLY BE APPLIED AT PLANTING**. Apply in a 12 to 16 in. band or in 20- to 50-gal water per acre in transplant water. Mechanical incorporation or 0.5 to 1 in. irrigation water needed for movement into root zone if rain is not expected. After initial application, 2 supplemental applications (1 pt per treated acre) can be applied. **NOTE: Strains of *Phytophthora capsici* insensitive to Ridomil Gold have been detected in some Louisiana and North Carolina pepper fields.**
metalaxyl (MetaStar 2E)	4	4 to 8 pt/ treated acre	7	2	Limit of 12 pt per acre per season. Preplant (soil incorporated), at planting (in water or liquid fertilizer), or as a basal-directed spray after planting. See label for the guidelines for supplemental applications.
oxathiapiprolin + mefenoxam (Orondis Gold)	49+4	28 to 55 fl oz/acre	7	2	See labels
POWDERY MILDEW					
chlorothalonil + cymoxanil (Ariston)	M5+27	2 to 2.44 pt/acre	3	0.5	Limit of 18.1 pt per acre per year.
cyprodinil + fludioxonil (Switch)	9+12	11 to 14 oz/acre	0	0.5	Limit to 56 oz/acre per year. Begin application at or before onset of disease and repeat on a 7- to 10-day interval. Do not make more than 2 sequential applications with alternating to a fungicide with a different mode of action.
benzovindiflupyr + difenoconazole (Aprovia Top)	7+3	10.5 to 13.5 fl oz/acre	0	0.5	Limit of 53.6 fl oz per acre per year. Make more than 2 applications before alternating to fungicide with a non-Group 7 mode of action.
Difenoconazole + tea tree oil (Regev)		4 to 8.5 fl oz/acre	2	0.5	Limit to 34 fl oz/acre per year. Begin application in early plant stages and repeat on a 7- to 14-day intervals. Do not make more than 2 sequential applications before alternating to a fungicide with a different mode of action
cyflufenamid (Torino)	U6	3.4 oz/acre	0	4 hr	Limit to 10.2 oz/acre per year. Begin application at onset of disease. Minimum application interval of 14 days.
fenbuconazole (Enable)	3	6 to 12 fl oz/acre	7	0.5	Limit to 48 fl oz/acre per year. Begin application when disease is first observed and repeat on 10- to 14-day intervals. Minimum spray volume of 30 gal/acre. A surfact should be tank mixed for optimum performance. Do not make more the 2 sequential applications with rotating to a fungicide with adifferent mode of action.
fluopyram (Velum Prime)	7	5 to 6.84	0	0.5	Limit 13.7 fl oz/acre per year. Soil applications should be at planting/transplanting. A second application may be made 7 days later.
fluopyram + difenoconazole (Luna Flex)	7+3	8 to 13.6 fl oz/ acre	0	0.5	Limit to 27.2 floz/acre per year. Begin applications prior to disease development. Continue applications through season on a 7- to 10-day interval.

Table 10-41. Disease Control Products for Pepper

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
POWDERY MILDEW (continued)					
fluopyram + trifloxystrobin (Luna Sensation)	7+11	5 to 7.6 fl oz/acre	3	0.5	Limit to 27.1 fl oz/acre per year. Begin applications prior to disease development. Continue applications through season on a 7- to 10-day interval.
flutriafol (Rhyme)	3	7 fl oz/acre	0	0.5	Limit to 28 fl oz/acre per year. Applt when conditions are favorable for disease. Repeat as necessary on a 7 day interval.
mefentrifluconazole (Ceyva)	3	3 to 5	0	0.5	Limit to 15 fl oz/acre per year. Begin application before onset of disease and repeat on a 7 day interval.
metrafenone (Vivando)	U8	15.4 fl oz.A	0	0.5	Limit to 46.2 fl oz/acre per year. Begin application prior to disease development. Make no more than 2 sequential applications before alternating with a fungicide with a different mode of action.
oxathiapiprolin + chlorothalonil (Orondis Opti premix)	49+M05	1.75 to 2.5 pt/ acre	3	0.5	Limit to 10 pt/A per year. Begin applications when disease is expected. Minimum application interval of 7 days. Make no more than 2 sequential applications before alternating with a fungicide with a different mode of action.
penthiopyrad (Fontelis)	7	16 to 24 fl oz/acre	0	0.5	Limit of 72 fl oz per acre per year. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action.
pyraclostrobin + fluxapyroxad (Priaxor Xemium)	11+7	6.0 to 8.0 fl oz/acre	0	0.5	Limit of 24 fl oz per acre per season. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	9.2 to 11.4 fl oz/acre	0	0.5	Limit to 22.8 fl oz per acre per year. Begin applications prior to disease development. Continue applications through season on a 7- to 10-day interval.
pyriofenone (Prolivo 300SC)	50	4 to 5 fl oz	0	4 hr	Do not exceed 16 fl oz per acre per year. Do not make more than 2 sequential applications of Prolivo or of another FRAC 50-containing fungicide before alternating to a fungicide with a different mode of action. Do not exceed 4 applications/year.
quinoxyfen (Quintec)	13	4.0 to 6.0 fl oz/acre	3	0.5	Limit of 24 fl oz per acre per year. Make no more than two consecutive applications before alternating with fungicides that have a different mode of action. **NOTE: Under certain environmental conditions leaf spotting or chlorosis may occur after application; discontinue use if symptoms occur.**
sulfur (various)	M2	See label	See label	See label	See labels. Rates vary depending on the formulation. Apply at first appearance and repeat at 14-day intervals as needed.
trifloxystrobin (Flint)	11	1.5 to 2 oz/acre	3	0.5	Limit of 16 oz per acre per year. Make no more than **one** application before alternating with fungicides that have a different mode of action.
SOUTHERN BLIGHT (*ATHELIA ROLFSII = SCLEROTIUM ROLFSII*)					
Bacillus amyloliquefaciens (Serifel)	44	4 to16 oz/acre	0	4 hr	See label for Soil Application Instructions for In-Furrow, Drench, Shanked-In and Injected Applications.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	7.6 fl oz/acre	3	0.5	**Suppression only.** Limit to 27.1 fl oz/acre per year. Begin applications prior to disease development. Continue applications through season on a 7- to 10-day interval.
fluoxastrobin (Aftershock, Evito 280SC)	11	2 to 5.7 fl oz/acre	3	0.5	Limit of 22.8 fl oz per acre per season. Make no more than **one** application before alternating with fungicides that have a different mode of action. **NOTE: Do not overhead irrigate for 24 hours following a spray application.**
penthiopyrad (Fontelis)	7	16 to 24 fl oz/ acre	0	0.5	Limit of 19.2 fl oz per acre per season. Make no more than two sequential applications of Fontelis before switching to a fungicide with different mode of action. **For non-bell peppers only.**
PCNB (Blocker 4F) ***Transplanting***	14	4.5 to 7.5 pt/ 100-gal (Use 0.5 pt of solution per plant)	NA	0.5	**Transplanting:** Apply at the time of transplanting for southern blight suppression. The solution should be agitated often to maintain a uniform mixture to assure proper dosage. Limit of 7.5 lb a.i. per acre/season.
(Blocker 4F) ***In-furrow***	14	1.2 to 1.9 gal (10.6 to 16.7 fl oz/ 1,000 ft of row)	NA	0.5	**In furrow**: Apply in 8 to 10 gal of water per acre based on 36-inch row spacing. Apply as in-furrow sprays to the open "V" trench prior to planting. When cultivating, set plows as flat as possible to avoid getting non-treated soil against stems or plants. Limit of 7.5 a.i. per acre/season.

Table 10-41. Disease Control Products for Pepper

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
SOUTHERN BLIGHT (*ATHELIA ROLFSII* = *SCLEROTIUM ROLFSII*) (continued)					
pyraclostrobin (Cabrio 20EG)	11	12 to 16 oz/acre	0	4 hr	**SUPPRESSION ONLY.** Apply at flowering to manage green fruit rot. Limit of 96 oz per acre per season. Make no more than one sequential application before alternating with fungicides that have a different mode of action.
pyraclostrobin + fluxapyroxad (Priaxor)	11+7	4.0 to 8.0 fl oz/acre	0	0.5	**SUPPRESSION ONLY.** Limit of 24 fl oz per acre per season. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action.
TARGET SPOT (*CORYNESPORA CASSIICOLA*)					
boscalid (Endura)	7	3.5 oz/acre	0	0.5	Limit of 21 oz per acre per season. Make no more than two sequential applications before alternating with fungicides that have a different mode of action.
cyprodinil + difenoconazole (Inspire Super)	9+3	16 to 20 fl oz/acre	0	0.5	Limit of 80 fl oz per acre per season.
Difenoconazole + tea tree oil (Regev)		4 to 8.5 fl oz/acre	2	0.5	Limit to 34 fl oz/acre per year. Begin application in early plant stages and repeat on a 7- to 14-day intervals. Do not make more than 2 sequential applications before alternating to a fungicide with a different mode of action
fluopyram + difenoconazole (Luna Flex)	7+3	10 to 13.6 fl oz/ acre	0	0.5	Limit to 27.2 floz/acre per year. Begin applications prior to disease development. Continue applications through season on a 7- to 10-day interval.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	7.6 fl oz/acre	3	0.5	Limit to 27.1 fl oz/acre per year. Begin applications prior to disease development. Continue applications through season on a 7- to 10-day interval.
fluoxastrobin (Aftershock, Evito 480SC)	11	2 to 5.7 fl oz/acre	3	0.5	Limit of 22.8 fl oz per acre per season. Make no more than one application before alternating with fungicides that have a different mode of action. **NOTE**: **Do not overhead irrigate for 24 hours following a spray application.**
penthiopyrad (Fontelis)	7	16 to 24 fl oz/acre	0	0.5	**SUPPRESSION ONLY.** Limit of 72 fl oz per acre per year. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action.
pyraclostrobin (Cabrio 20EG)	11	8 to 12 oz/acre	0	4 hr	Apply at flowering to manage green fruit rot. Limit of 96 oz per acre per sea- son. Make no more than one sequential application before alternating with fungicides that have a different mode of action.
pyraclostrobin + fluxapyroxad (Priaxor)	11+7	4.0 to 8.0 fl oz/acre	0	0.5	Limit of 24 fl oz per acre per season. Make no more than two consecutive applications before rotating to another effective fungicide with a different mode of action.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	9.2 to 11.4 fl oz/acre	0	0.5	Limit to 22.8 fl oz per acre per year. Begin applications prior to disease development. Continue applications through season on a 7- to 10-day interval.

Table 10-42. Relative Effectiveness of Various Chemicals for Pepper Disease Control

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

Active Ingredient[1]	Product	Fungicide group[F]	Preharvest interval (Days)	Anthracnose (immature fruit rot)	Bacterial spot	Phytophthora blight (root and crown)	Phytophthora blight (fruit and foliage)	Pythium damping-off	Southern blight
azoxystrobin	Quadris	11	0	F	NC	NC	NC	NC	ND
chlorothalonil	Various	M05	3	P	NC	NC	P	NC	NC
difenoconazole + benzovindiflupyr	Aprovia Top	7+3	0	G-F	NC	NC	NC	NC	NC
cyazofamid	Ranman	21	0	NC	NC	P	P	NC	NC
oxathiapiprolin + mefenoxam	Orondis Gold 200	49+4	0	NC	NC	G	F	NC	NC
oxathiapiprolin + chlorothalonil	Orondis Opti	49+M05	0	NC	NC	G-F	G	NC	NC
dimethomorph	Acrobat, Forum	40	4	NC	NC	NC	P	NC	NC
dimethomorph + ametoctradin	Zampro	40+45	4	NC	NC	F	F	ND	NC
famoxadone + cymoxanil	Tanos	11+27	3	P	NC	NC	P	NC	ND
fixed copper	Various	M01	See label	P	F	NC	P	NC	NC
fluopicolide	Presidio	43	2	NC	NC	F[R]	F[R]	NC	NC
fluoxastrobin	Evito	11	3	F	NC	NC	NC	NC	ND
fluxapyroxad + pyraclostrobin	Priaxor	11+7	7	F	NC	NC	NC	NC	P
mancozeb[2]	Dithane, Manzate	M03	5	P	P	P	P	NC	NC
mandipropamid	Revus	40	1	NC	NC	F	F	NC	NC
mefenoxam[R]	Ridomil Gold EC, Ultra Flourish	4	0	NC	NC	P	NA	G	NC
mefenoxam[R] + copper	Ridomil Gold + copper	4+M01	14	P	F-P	NA	F	NC	NC
methyl salicylate + *Bacillus thuringiensis* subsp. *kurstaki*	Leap	BM02	See label	NC	G-F	NC	NC	NC	NC
penthiopyrad	Fontelis	7	0	ND	NC	NC	NC	NC	G-F
propamocarb (greenhouse use)	Previcur Flex	28	5	NC	NC	NC	NC	F	NC
pyraclostrobin	Cabrio	11	0	G-F	NC	NC	NC	NC	ND
quinoxyfen	Quintec	13	3	NC	P	NC	NC	NC	NC
streptomycin sulfate[3]	Agri-Mycin, Streptrol, Firewall	25	Not for field use	NC	F	NC	NC	NC	NC

[1] Efficacy ratings do not necessarily indicate a labeled use for every disease.

[2] Copper tank-mixed with mancozeb enhances the efficacy against bacterial spot.

[3] Streptomycin may only be used on transplants; not registered for field use.

[F] To prevent resistance in pathogens, alternate fungicides within a group with fungicides in another group. Fungicides in the "M" group are generally considered "low-risk" with no signs of resistance developing to most fungicides.

[R] Resistance reported in the pathogen.

Table 10-43. Importance of Alternative Management Practices for Disease Control in Pepper
B. Dutta, Plant Pathologist, University of Georgia; L. Quesada-Ocampo, Plant Pathologist, North Carolina State University; R. Singh, Plant Pathologist, Louisiana State University Agricultural Center

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

Strategy	Anthracnose (immature fruit)	Aphid-transmitted viruses (PVX,CMV,TEV,AM- V,PVY)	Bacterial soft rot of fruit	Bacterial spot	Blossom-end rot	*Phytophthora* blight (fruit and foliage)	*Phytophthora* blight (root and crown)	*Pythium* damping off	Root-knot nematode	Southern blight	Tomato spotted wilt virus
Avoid field operations when foliage is wet	F	NC	NC	G	NC	F	P	NC	NC	NC	NC
Avoid overhead irrigation	G	NC	F	G	NC	G	G	P	NC	NC	NC
Change planting date within a season	NC	F (early)	NC	F (early)	NC	NC	NC	P (late)	F (early)	P (early)	Variable
Cover cropping with antagonist	NC	NC	NC	NC	NC	NC	NC	NC	F	NC	NC
Rotation with non-host (2 to 3 years)	G	NC	NC	NC	NC	P	P	NC	F	P	NC
Deep plowing	F	NC	NC	NC	NC	NC	NC	NC	P	F	NC
Prompt destruction of crop residue	F	F	NC	P	NC	P	P	NC	F	P	NC
Promote air movement	P	NC	NC	F	NC	P	P	NC	NC	NC	NC
Use of soil organic amendments	NC	NC	NC	NC	NC	P	P	P	F	P	NC
Application of insecticidal/horticultural oils	NC	F	NC	NC	NC	NC	NC	NC	NC	NC	NC
pH management (soil)	NC	NC	NC	NC	F	NC	NC	NC	F	NC	NC
Plant in well-drained soil/raised beds	NC	NC	NC	NC	NC	NC	G	G	NC	NC	NC
Eliminate standing water/saturated areas	NC	NC	NC	NC	NC	NC	G	G	NC	NC	NC
Postharvest temp control (fruit)	NC	NC	G	NC	NC	NC	NC	NC	NC	NC	NC
Use of reflective mulch	NC	F	NC	NC	NC	NC	NC	NC	NC	NC	G
Reduce mechanical injury	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Rogue diseased plants and/or fruit	NC	NC	NC	NC	NC	F	F	NC	NC	NC	NC
Soil solarization	NC	NC	NC	NC	NC	NC	P	NC	F	NC	NC
Use of pathogen-free planting stock	F	NC	NC	G	NC	NC	NC	NC	NC	NC	NC
Use of resistant cultivars	NC	NC	NC	G	F	F	F	NC	G	NC	G
Weed management	P	F	NC	NC	NC	P	P	NC	F	NC	P

Potato

S. Rideout, Plant Pathologist, Virginia Tech

Table 10-44. Disease Control Products for Potato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
BLACK SCURF (*RHIZOCTONIA SOLANI*) AND SILVER SCURF (*HELMINTHOSPORIUM SOLANI*)					
azoxystrobin (various)	11	See label	See label	See label	See labels. Rates may vary depending on the product. Apply in furrow at planting according to label direction. Do not apply more than one application without alternating away from fungicides in Group 11.
azoxystrobin + benzovindiflupyr (Elatus)	11+7	0.34 to 0.5 oz/1000 linear row feet	0.5	—	Limit 9.5 oz/acre per application.
fludioxonil (Maxim PSP)	12	0.5 lb/ 100 lb seed pieces	—	0.5	Ensure thorough coverage of each seed piece.
fludioxonil + mancozeb (Maxim MZ)	12+M	0.5 lb/ 100 lb seed pieces	—	0.5	Ensure thorough coverage of each seed piece.
fludioxonil + thiamethoxam (Cruiser Maxx Potato)	12+ insecticide	0.19 to 0.27 fl oz/ 100 lb seed pieces	—	0.5	Rate depends on seeding rate – see label. See label for additional restrictions.
fludioxonil + difenoconazole + sedazane + thiamethoxam (Cruiser Maxx Vibrance Potato)	12+3+7+ insecticide	0.5 fl oz/ 100 lb seed pieces	—	0.5	See label for additional restrictions.
fluopyram (Luna Privilege)	7	5.47 fl oz/acre (ground) 2.82 oz/acre (aerial)	7	0.5	Use on a 5- to 7-day interval. Do not apply more than 10.95 oz/acre/ season for ground application and no more than 8.46 oz/acre/season for aerial application. Do not make more than 2 applications before alternating with a fungicide with a different mode of action. Labeled for **silver scurf only.**
fluoxastrobin (Aftershock, Evito 480 SC)	11	0.16 to 0.24 fl oz/ 1,000 ft of row	7	0.5	Apply in furrow at planting according to label directions. Do not apply more than 22.8 fl oz of product per acre per year including seed treatment use. Alternate with fungicide from different resistance management group.
flutolanil (Moncut 70DF, Moncut SC)	7	0.71 to 1.1 lb./ acre 16.0 to 25.0 fl oz/ acre	—	0.5	For **black scurf only**. Apply as an in-furrow spray by directing spray uniformly around and over the seed-piece inch a 4 to 8 in band prior to covering with soil.
flutolanil + mancozeb (MonCoat MZ)	7+M	0.75 lb to 1.0 lb/ 100 lb seed piece	—	1	Apply to seed-pieces immediately after cutting. Ensure thorough cover- age.
mancozeb (various)	M	See label	—	1	For **black scurf only.**
penthiopyrad (Vertisan)	7	0.7 to 1.6 fl oz/ 1,000 ft of row	7	0.5	Maximum rate is 24 fl oz per acre per year. No more than 2 applications before switching to a different mode of action. Provides suppression of **black scurf only**.
thiophanate-methyl (various)	1	0.5 to 0.7 fl oz/ 100 lb seed pieces	—	0.5	
FUSARIUM SEEDPIECE DECAY, RHIZOCTONIA STEM CANKER, STREPTOMYCES COMMON SCAB					
Fludioxonil (various)	12	See label	—	0.5	Label rates may vary depending on the product.
fludioxonil + mancozeb (Maxim MZ)	12+M	0.5 lb/100 lb seed	—	1	Do not use treated seedpieces for feed or food. **NOT** labeled for Streptomyces common scab. See label for treatment instructions.
mancozeb (various)	M	See label	—	1	Label rates may vary depending on the product.
penthiopyrad (Vertisan)	7	0.7 to 1.6 oz/ 1,000 ft of row	7	0.5	Maximum rate is 24 fl oz per application. Labeled for **Rhizoctonia stem canker only.**
EARLY BLIGHT, WHITE MOLD					
azoxystrobin + difenoconazole (Quadris Top)	11+3	8 to 14 fl oz/acre	14	0.5	Apply at 7- to 14-day intervals. Apply no more than 2 sequential applications without alternating with a fungicide with a different mode of action. Limit of 55.3 lb product per acre per year. Limit of 0.46lb a.i./acre/year of difenoconazole-containing products; limit of 2.0 lb a.i. per acre/year of azoxystrobin-containing products**. Labeled for early blight only.**

Table 10-44. Disease Control Products for Potato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
EARLY BLIGHT, WHITE MOLD (continued)					
boscalid (Endura)	7	3.5 to 10 oz/acre	10	0.5	For control of Sclerotinia white mold, use 5.5 to 10 oz rate and begin ap- plications prior to row closure or at the onset of disease. Make a second application 14 days later if conditions favor disease development. Do not exceed 2 applications per season. For Early blight control, use 3.5 to 4.5 oz rate. Do not exceed four applications per season. Limit of 20.5 oz of product per acre per season. Limit of 2 applications before alternating with a fungicide with a different mode of action.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	11.2 oz/acre	7	0.5	Apply at 7- to 14-day intervals. Do not make more than 2 sequential applications without switching to fungicide outside of Group 7 or Group 9.
fluxapyroxad + pyraclostrobin (Priaxor Xemium)	7+11	4 to 8 oz/acre	7	0.5	Apply at 7- to 14-day intervals. Do not apply more than 24 oz/acre/season including in furrow and foliar uses. Use 6 to 8 oz/acre for **SUPPRESSION of white mold**. Maximum of 3 applications.
iprodione (various)	2	See label	14	1	Rates may vary depending on the product.
metconazole (Quash)	3	2.5 to 4 oz/acre	1	0.5	Limit 16 oz/acre/season. Make no more than 2 applications before changing modes of action. Limit to 4 applications per year. Use the 4 oz rate for white mold.
metiram + pyraclostrobin (Cabrio Plus)	M+11	2.0 to 2.9 lb/acre	14	1	Apply at 7- to 14-day intervals. Do not apply more than 17.4 lb/acre product per season. Do not apply more than 2 sequential applications before alternating with a fungicide with a different mode of action. Use at 2.9 lb/acre rate for **SUPPRESSION of white mold.**
penthiopyrad (Vertisan)	7	10 to 24 oz/acre	7	0.5	Apply at 7- to 14-day intervals. Make no more than 2 applications before alternating with a fungicide with a different mode of action. For **SUPPRESSION of white mold**, use at 14 to 24 oz/acre. Do not exceed 72 oz per acre per year. Do not apply more than 11.25 oz a.i. per acre per year in total from any combination of seed, soil, or foliar applications.
pyraclostrobin (Headline, Headline SC)	11	6 to 12 fl oz/acre	3	0.5	**DO NOT** exceed more than six foliar applications or 72 total oz of product per acre per season. For early blight, use 6 to 9 oz rate; for **SUPPRESSION of white mold**, use 6 to 12 oz rate, depending on weather conditions and disease pressure. Do not apply more than one time before alternating with a fungicide with a different mode of action.
pyrimethanil (Scala SC)	9	7 fl oz/acre	7	0.5	Apply at 7- to 14-day intervals. Do not apply more than 35 fl oz per acre per season. For control of **early blight only.**
thiophanate-methyl (various)	1	See label	See label	0.5	Rates may vary depending on the product.
LATE BLIGHT, WHITE MOLD					
fluazinam (Omega 500 F)	29	5.5 to 8 fl oz/acre	14	0.5	Begin applications when plants are 6 to 8 in. tall or when conditions favor disease development. Repeat applications at 7- to 10-day intervals. For late blight, use the 5.5 fl oz rate. **DO NOT** apply more than 3.5 pt per acre during each growing season.
BLACK SCURF (*RHIZOCTONIA SOLANI)* AND SILVER SCURF (*HELMINTHOSPORIUM SOLANI)*					
azoxystrobin (various)	11	See label	14	4 hr	Rates may vary depending on the product. Do not apply more than one application without alternating away from fungicides in Group 11. See label for limits of active ingredients
azoxystrobin + chlorothalonil (Quadris Opti)	11+M	1.6 pt/acre	14	0.5	Apply at 5- to 7-day intervals. Do not apply more than one application without alternating away from fungicides in Group 11. See label for limits of active ingredients.
chlorothalonil (various)	M	See label	7	0.5	Rates may vary depending on the product.
chlorothalonil + cymoxanil (Ariston)	M+27	2 pt/acre	14	0.5	Apply at 5- to 7-day intervals. Do not exceed 17.5 pt of product per acre per 12-month period.
chlorothalonil + zoxamide (Zing!)	M+22	24 to 34 fl oz/acre	7	0.5	Apply at 5- to 7-day intervals. Do not make more than 2 sequential applications before alternating with a fungicide that has a different mode of action. Do not make more than 8 applications per acre per season. Use 30 to 34 fl oz rate for late blight.

Table 10-44. Disease Control Products for Potato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
BLACK SCURF (*RHIZOCTONIA SOLANI)* AND SILVER SCURF (*HELMINTHOSPORIUM SOLANI)* (continued)					
fixed copper (various)	M1	See label	0	1	See label. Rates vary depending on the formulation.
cymoxanil + famoxadone (Tanos)	27+C3	6 to 8 oz/acre	14	0.5	Use rate of 6 fl oz only for early blight. Do not apply more than 48 oz/ acre per crop season and no more than 72 oz/acre per 12 months. Do not make more than one application before alternating with a fungicide with a different mode of action.
dimethomorph (Forum)	40	4 to 6 fl oz/acre	4	1	Must tank mix if using less than 6 fl oz rate; if used alone, use 6 oz rate. **DO NOT** make more than 5 applications per season. Limit 30 fl oz/acre/season.
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz/ acre	14	0.5	Begin applications when conditions favor disease development and continue on 5- to 10-day interval. Do not apply more than 24.6 fl oz per growing season. Alternate with fungicide from different resistance management group.
fluoxastrobin (Aftershock, Evito 480 SC)	11	2 to 3.8 fl oz/acre	7	0.5	Begin applications when conditions favor disease development on 7- to 10-day intervals. Do not apply more than once before alternating with fungicides that have a different mode of action. Do not apply more than 22.8 fl oz per acre per season. For late blight, apply at full label rate.
fluxapyroxad + pyraclostrobin (Priaxor Xemium)	7	4 to 8 fl oz/acre	7	0.5	Apply at 7- to 14-day intervals. Do not apply more than 24 oz per acre per season including in furrow and foliar uses.
mancozeb + azoxystrobin (Dexter Max)	M+11	1.6 to 2.1 lb/acre	14	1	Do not exceed 16 lbs product/acre/crop. Season limits apply for azoxystrobin.
mancozeb + chlorothalonil (Elixir)	M+M	1.8 to 2.4 lb/acre	14	1	Do not apply more than 18 lbs product/crop/year.
metiram (Polyram 80DF)	M	1.5 to 2 lb/acre	14	1	Do not apply more than 14 lb product/crop/year.
mandipropamid + difenoconazole (Revus Top)	40+3	5.5 to 7 fl oz/acre	14	0.5	After 2 applications, switch to a different mode of action. Do not apply more than 28 fl oz/acre/season.
mefenoxam + chlorothalonil (Ridomil Gold Bravo SC)	4+M	2.5 pints/acre	14	2	See label for limits on application limits per season and application interval.
mefenoxam + mancozeb (Ridomil Gold MZ WG)	4+M	2.5 lb/acre	14	2	Apply at 14-day intervals for up to 3 applications.
propamocarb hydrochloride (Previcur Flex)	28	0.7 to 1.2 pints/ acre	14	0.5	Tank mix with a protectant fungicide such as mancozeb or chlorothalonil. Do not exceed 6 pints of product/acre/season.
pyraclostrobin (Headline, Headline SC)	11	6 to 12 fl oz/acre	3	1	**DO NOT** exceed more than six foliar applications or 72 total oz of product per acre per season. For early blight, use 6 to 9 oz rate. Do not apply more than one time before alternating with a fungicide with a different mode of action.
pyraclostrobin + chlorothalonil (Cabrio Plus)	11+M	2.0 to 2.9 lb/acre	14	1	Do not apply more than 2 applications before switching to a different mode of action. Do not exceed 17.4 lbs/acre/season. For late blight, use 12 lb/acre rate.
pyrimethanil (Scala 5F)	9	7 fl oz/acre	7	0.5	**Only labeled for early blight**. Do not apply more than 35 fluid ounces per crop.
trifloxystrobin (Gem 500SC)	11	2.9 to 3.8 fl oz/ acre	7	0.5	Must tank mix with a non-Group 11 fungicide for late blight. Use the 3.8 of oz rate for late blight. Do not make more than 1 application without switching to a different mode of action. Do not exceed 6 applications or 23 fl oz product/acre/season.
triphenyltin hydroxide (Super Tin 4L) (Super Tin 80WP, Agri Tin)	30	4 to 6 fl oz/acre 2.5 to 3.75 oz/ acre	7	2	For Super Tin 4L, the 3.0 fl oz rate may be used if tank mixed. Add to 3 to 15 gallons of water depending on method of application. Season application limit apply–see label.
zoxamide + mancozeb (Gavel 75DF)	22 M	1.5 to 2.0 lb/acre	14	2	Do not make more than 6 applications or apply more than 12 lbs product/acre/season.
LATE BLIGHT					
ametoctradin + dimethomorph (Zampro)	45+40	11 to 14 fl oz/acre	4		Do not make more than 2 applications without switching to a different mode of action. Do not exceed 42 fl oz/acre/season and 3 applications/season.
cyazofamid (Ranman 400SC)	21	1.4 to 2.75 fl oz/ acre	7	0.5	Do not apply more than 10 sprays per crop. Make no more than 3 consecutive applications, and then follow with 3 applications of another mode of action.
cymoxanil (Curzate 60DF)	27	3.2 oz/acre	14	0.5	**USE ONLY WITH A PROTECTANT FUNGICIDE** such as mancozeb or chlorothalonil. No more than 7 applications/crop/ year.

Table 10-44. Disease Control Products for Potato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
LATE BLIGHT (continued)					
dimethomorph (Forum)	40	4 to 6 fl oz/acre	4	0.5	If applying less than 6 fl oz rate, must tank mix with non-Group 40 fungicide. Do not exceed 5 applications or 30 fl oz product/ acre/season.
fluazinam (Omega 500F, Omega Top MP)	29	5.5 to 8 fl oz/acre	14	0.5	Begin applications when plants are 6 to 8 in. tall or when conditions favor disease development. Repeat applications at 7- to 10-day intervals. For late blight, use the 5.5 fl oz rate. **DO NOT** apply more than 3.5 pt per acre during each growing season.
mefenoxam + copper hydroxide (Ridomil Gold/Copper)	4+M	2 lb/acre	14	2	**MUST** tank-mix with a protectant fungicide. Apply at 14-day intervals for up to 3 applications; alternated and followed by the full rate of a protectant.
mono- and di-potassium salts of phosphorous acid (various)	33	See label	0	4 h	Mix with a fungicide labeled for control of late blight. See label for in-furrow application or foliar application rates.
oxathiapiprolin + chlorothalonil (Orondis Opti A+ Orondis Opti B)	U15+M	1.6 to 4.8 fl oz/ acre + 0.75 to 1.5 pints/ acre	7	0.5	Do not make more than 2 sequential applications without switching to a different mode of action and no more than 6 total applications per season. Do not mix soil applications and foliar applications. Apply no more than 27.2 fl oz of Orondis Opti A per season and no more than 15 pints of Orondis Opti B per season. See label for pre-mix.
oxathiapiprolin + mandipropamid (Orondis Ultra A + Orondis Ultra B)	U15+40	1.6 to 4.8 fl oz acre + 8.0 fl oz/acre	5 14	4 hr	Do not make more than 2 sequential applications without switching to a different mode of action and no more than 6 total applications per season. Do not mix soil applications and foliar applications. Apply no more than 27.2 fl oz of Orondis Ultra A per season and no more than 32 fl oz of Orondis Ultra B per season.
azoxystrobin + mefenoxam (Quadris Ridomil Gold SL)	11+4	0.82 fl oz / 1,000 ft of row	—	0	Apply as an in-furrow spray in 3 to 15 gal of water per acre at planting.
cyazofamid (Ranman 400SC)	21	1.4 to 2.75 fl oz/ acre (foliar) 0.42 fl oz/1,000 ft (in-furrow)	7	0.5	For pink rot and Pythium leak, apply at the high rate. Do not apply more than 10 sprays per crop or more than 27.5 fl oz/ acre/season. Make no more than 3 consecutive applications followed by 3 applications from a different resistance management group.
PINK ROT, PYTHIUM LEAK, TUBER ROT					
ethaboxam (Elumin)	22	8 fl oz	N/A	0.5	Apply using a 6” to 8” band directly over seedpiece or in furrow where seedpiece will be dropped, prior to furrow closure. Apply as a side dressing between hilling and tuber initiation. Do not exceed 2 applications/year or 16 fl oz/acre/year.
mefenoxam (Ridomil Gold SL, Ultra Flourish)	4	0.42 fl oz/1,000 ft of row 0.84 fl oz/1,000 ft of row	7	2	See labels for maximum amount of product allowable per season. PHI is based on foliar application for Ultra Flourish.
mefenoxam + chlorothalonil (Ridomil Gold/Bravo)	4+M	2.5 pt/acre	14	2	Apply at flowering and then continue on a 14-day interval. Do not exceed more than four applications per crop.
mefenoxam + copper hydroxide (Ridomil Gold/Copper)	4+M	2 lb/acre	14	2	Apply at 14-day intervals for up to 3 applications. Alternate with a protectant fungicide.
mefenoxam + mancozeb (Ridomil Gold MZ)	4+M	2.5 lb/acre	14	2	Apply at 14-day intervals for up to 4 applications.
metalaxyl (Metalaxyl 2E AG, MetaStar 2E)	4	12.8 fl oz/acre	14	2	Preplant incorporated or soil surface spray
mono- and di-potassium salts of phosphorous acid (various)	33	2.5 to 10 pints/ acre	0	4h	See label for in-furrow application or foliar application rates.
POWDERY MILDEW					
azoxystrobin (various)	11	See label	14	4h	See label. Rates may vary depending on the product. Apply in furrow at planting according to label direction. Do not apply more than one application without alternating away from fungicides in Group 11.
azoxystrobin + chlorothalonil (Quadris Opti)	11+M	1.6 pt/acre	14	0.5	Do not apply more than 1.5 lb a.i./acre/year of azoxystrobin; do not apply more than 11.25 lb a.i./acre/year of chlorothalonil. Do not make more than 1 application before alternating with a fungicide with a different mode of action. Do not apply this product or other fungicides in Group 11 more than 6 times in a season.

Table 10-44. Disease Control Products for Potato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
POWDERY MILDEW (continued)					
azoxystrobin + difenoconazole (Quadris Top)	11+3	8 to 14 fl oz/acre	14	0.5	Apply at 7- to 14-day intervals. Apply no more than 2 sequential applications without alternating with a fungicide with a different mode of action. Do not apply more than 55.3 lb product per acre per year. Do not apply more than 0.46 lb a.i./ acre/year of difenoconazole-containing products; do not apply more than 2.0 lb a.i./acre /year of azoxystrobin-containing products.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	11.2 fl oz/acre	7	0.5	Do not make more than 2 sequential applications without switching to a fungicide outside of Group 7 or Group 9. Limit 54.7 fl oz/acre/season.
fluxapyroxad + pyraclostrobin (Priaxor Xemium)	7+11	6 to 8 fl oz/acre	7	0.5	Limit 3 applications per season and no more than 2 applications before switching to a different mode of action. Do not apply more than 24 fl oz/ acre/season including in furrow and foliar uses.
mancozeb + azoxystrobin (Dexter Max)	M+11	1.6 to 2.1 lb/acre	14	1	Do not exceed 16 lbs product/acre/crop. Season limits apply for azoxystrobin. For suppression of powdery mildew.
mandipropamid + difenoconazole (Revus Top)	40+3	5.5 to 7 fl oz/acre	14	0.5	Begin applications when conditions favor disease development, on 7- to 10- day intervals. Do not apply more than twice before alternating with fungicides that have a different mode of action. Do not apply more than 28 fl oz per acre per season.
metconazole (Quash)	3	2.5 to 4 oz/acre	1	0.5	Limit 16 oz/acre/season. Make no more than 2 applications before changing modes of action. Limit to 4 applications per year. Use the 4 oz rate for white mold.
metiram + pyraclostrobin (Cabrio Plus)	M+11	2.9 lb/acre	14	1	Apply at 7- to 14-day intervals. Do not apply more than 17.4 lb/ acre product per season. Do not apply more than 2 sequential applications before alternating with a fungicide with a different mode of action.
penthiopyrad (Vertisan)	7	10 to 24 fl oz/ acre	7	0.5	Apply at 7- to 14-day intervals. Make no more than 2 applications before alternating with a fungicide with a different mode of action. Do not exceed 72 oz per acre per year. Do not apply more than 11.25 oz a.i. per acre per year in total from any combination of seed, soil, or foliar applications.
pyraclostrobin (Headline; Headline SC)	11	6 to 12 fl oz/acre	3	0.5	**DO NOT** exceed more than six foliar applications or 72 total oz of product per acre per season. Do not apply more than one time before alternating with a fungicide with a different mode of action.
sulfur (various)	M2	See label	—	1	Rates vary among products; see label.

For Pumpkin, Winter Squash, and Summer Squash — See Cucurbits
For Radish — See Root Vegetables
For Rhubarb — See Leafy Petiole Vegetables

Root Vegetables (Except Sugar Beet)

Z. Hansen, Plant Pathologist, University of Tennessee

Table 10-45. Disease Control Products for Root Vegetables (Except Sugar Beet)

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
BEET (RED, GARDEN, TABLE), CARROT, PARSNIP, RADISH, TURNIP – HARVESTED FOR ROOTS ONLY (UNLESS NOTED)					
ALTERNARIA LEAF BLIGHT, CERCOSPORA LEAF SPOT					
azoxystrobin (various)	11	6 to 15.5 fl oz/ acre	0	4 hr	No more than 1 application before alternating with a fungicide with a different mode of action. Make no more than 120 fl oz per acre per year. Also labeled on harvested garden beet, turnip, and radish leaves.
azoxystrobin + chlorothalonil (Quadris Opti)	11+M	2.4 pt/acre	0	0.5	**FOR USE ON CARROTS ONLY**.
azoxystrobin + difenoconazole (Quadris Top)	11+3	12 to 14 fl oz/ acre	7	0.5	**FOR USE ON CARROTS ONLY**.
azoxystrobin + propiconazole (various)	11+3	14 fl oz	14	0.5	**FOR USE ON CARROTS ONLY**. No more than 1 application before alternating with a non-Group11 fungicide. Make no more than 42 fl oz per acre per year.
boscalid (Endura)	7	4.5 oz/acre	0	0.5	**Not for *Cercospora***. Do not make more than 2 consecutive applications or more than 5 applications per season. Also labeled for use on harvested radish leaves for *Alternaria* control.
chlorothalonil (various)	M	1.5 to 2 pt/acre	See label	0.5	**FOR USE ON CARROTS AND PARSNIPS ONLY.** Spray at first appearance, 7- to 10-day intervals.
cyprodinil + fludioxonil (Switch)	9+12	11 to 14 oz/acre	7	0.5	**Not for *Cercospora*.** Apply when disease first appears and continue on 7- to 10-day intervals if conditions remain favorable for disease development. Do not exceed 56 oz of product per acre per year. For radish, make no more than 2 applications per year. For other root crops, do not exceed 56 oz of product per acre per year. Also labeled for use on harvested garden beet, turnip, and radish leaves.
fenamidone (Reason 500SC)	11	8.2 fl oz/acre	14	0.5	**NOT LABELED FOR RADISH GROWN AS ROOT VEGETABLES OR FOR CARROT FOLIAR DISEASES.** Apply no more than 24.6 fl oz per season. Apply with sprayer or in sprinkler irrigation. Do not use a spreader/sticker on carrots. Pythium control only for carrot. Also labeled for use on harvested turnip greens.
fixed copper (various)	M	See labels	0	1 to 2	**CHECK LABEL FOR SPECIFIC CROP LISTINGS.** Make sure product is labeled in state prior to use. Make sure crop is listed on label.
fluazinam (Omega)	29	16 fl oz/acre	7	0.5	**FOR USE ON CARROTS AND TURNIP GREENS ONLY.** Turnip roots treated with Omega are not for human or animal consumption.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	see label	7	0.5	**Not for *Cercospora* except on carrots.** Do not make more than 2 consecutive applications before rotating to a labeled non-Group 7 or non-Group 11 fungicide. Carrot rate is 4.0 to 7.6 fl oz/acre. Other root crop rates are 5 to 5.8 fl oz/acre.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	8 to 11.2 fl oz/ acre	7	0.5	**Not for *Cercospora*.** Do not make more than 2 consecutive applications be- fore rotating to a labeled non-Group 7 or non- Group 9 fungicide. **Not labeled for use in Louisiana.**
fluxapyroxad + pyraclostrobin (Merivon)	7+11	4 to 5.5 fl oz/acre	7	0.5	Do not make more than 2 consecutive applications before rotating to a labeled on-Group 7 or non-Group 11 fungicide. Make no more than 3 applications per season. Use maximum rate for Cercospora leafspot.
iprodione (various)	2	1 to 2 pt/acre	0	1	**FOR USE ON CARROTS ONLY. Not for *Cercospora***. Make no more than 4 applications per season.
penthiopyrad (Fontelis)	7	16 to 30 fl oz/ acre	0	0.5	Make no more than 2 consecutive applications before alternating with fungicide with different mode of action. Apply no more than 61 fl oz/acre/ year. Also labeled for harvested garden beet, turnip, and radish leaves.
propiconazole (various)	3	3 to 4 fl oz/acre	14	1	Use higher rate for carrots. Make no more than 2 consecutive applications before alternating with a fungicide with a different mode of action. Apply no more than 16 fl oz/acre/season.
pyraclostrobin (Cabrio)	11	8 to 12 oz/acre	0	0.5	Alternate with a fungicide with a different mode of action. Apply no more than 48 oz/acre/season. Also labeled for use on harvested garden beet, turnip, and radish leaves.
pyraclostrobin + boscalid (Pristine)	11+7	8 to 10.5 oz/acre	0	0.5	Make no more than 2 consecutive applications before alternating with a different mode of action. Use no more than 63 oz or make no more than 6 applications per season.

Table 10-45. Disease Control Products for Root Vegetables (Except Sugar Beet)

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
ALTERNARIA LEAF BLIGHT, CERCOSPORA LEAF SPOT (continued)					
tebuconazole (various)	3	3 to 7.2 fl oz/acre	7	0.5	**FOR USE ON TURNIPAND GARDEN BEETS ONLY**. Repeat applications at 12- to 14-day intervals. Apply no more than 28.8 fl oz/acre/season. Turnip root rate: 4 to 7.2 fl oz/acre. Turnip greens rate: 3 to 4 fl oz/acre. Garden beet root and greens rate: 3 to 7.2 fl oz/acre.
trifloxystrobin (Flint) (Gem 500SC)	11	2 to 4 oz/acre 1.9 to 2.9 fl oz/acre	7	0.5	**NOT FOR RADISHES.** Make no more than 1 application before alternating with a fungicide with another mode of action. Make no more than 4 applications of trifloxystrobin or other strobilurin fungicides per season. Flint rate for radish is 2 to 4 oz/acre; other crops use 2 to 3 oz/acre. Gem 500SC is not registered for radish.
CERCOSPORA LEAF SPOT OR BLIGHT, POWDERY MILDEW					
azoxystrobin (various)	11	6 to 15.5 fl oz/acre	0 4 hr		No more than 1 application before alternating with a fungicide with a different mode of action. Make no more than 120 fl oz/acre/year. Also labeled for use on harvested garden beet, turnip, and radish leaves.
azoxystrobin + difenoconazole (Quadris Top)	11+3	12 to 14 fl oz/acre	7	0.5	**FOR USE ON CARROTS ONLY**.
azoxystrobin + propiconazole (various)	11+3	14 fl oz	14	0.5	**FOR USE ON CARROTS ONLY**. No more than 1 application before alternating with a non-Group11 fungicide. Make no more than 42 fl oz/acre/year.
boscalid (Endura)	7	4.5 oz/acre	0	0.5	Not for *Cercospora*. Do not make more than 2 consecutive applications or more than 5 applications per season. Also labeled for use on harvested radish leaves.
fixed copper (various)	M	See labels	0	1 to 2	**CHECK LABEL FOR SPECIFIC CROP LISTINGS.** Make sure product is labeled in state prior to use.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	8.0 to 11.2 fl oz/acre	7	0.5	**Not for *Cercospora***. Do not make more than 2 consecutive applications before rotating to a labeled non-Group 7 or non-Group 9 fungicide. **Not labeled for use in Louisiana.**
fluopyram + trifloxystrobin (Luna Sensation)	7+11	see label	7	0.5	**Not for *Cercospora* except on carrot.** Do not make more than 2 consecutive applications before rotating to a labeled non-Group 7 or non-Group 11 fungicide. Carrot rate is 4.0 to 7.6 fl oz/acre.
fluxapyroxad + pyraclostrobin (Merivon)	7+11	4 to 5.5 fl oz/acre	7	0.5	Do not make more than 2 consecutive applications before rotating to a labeled non-Group 7 or non-Group 11 fungicide. Make no more than 3 applications per season. Use maximum rate for Cercospora leaf spot.
cyprodinil + fludioxonil (Switch)	9+12	11 to 14 oz/acre	7	0.5	**Not for *Cercospora.*** Apply when disease first appears and continue on 7- to 10- day intervals if conditions remain favorable for disease development. For radish, make no more than 2 applications per year. For other root crops, do not exceed 56 oz of product per acre per year. Also labeled for use on harvested garden beet, turnip, and radish leaves.
penthiopyrad (Fontelis)	7	16 to 30 fl oz/acre	0	0.5	Make no more than 2 consecutive applications before alternating with a fungicide with a different mode of action. Apply no more than 61 fl oz/acre per year. Also labeled for use on harvested garden beet, turnip, and radish leaves.
propiconazole (various)	3	3 to 4 fl oz/acre	14	0.5	Use higher rate for carrots. Make no more than 2 consecutive applications be- fore alternating with a fungicide with a different mode of action. Apply no more than 16 fl oz/acre/season.
pyraclostrobin (Cabrio)	11	8 to 12 oz/acre	0	0.5	Alternate with a fungicide with a different mode of action. Apply no more than 48 oz/acre/season. Also labeled for use on harvested garden beet, turnip, and radish leaves.
pyraclostrobin + boscalid (Pristine)	11+7	8 to 10.5 oz/acre	0	0.5	Make no more than 2 consecutive applications before alternating with a different mode of action. Use no more than 63 oz or make no more than 6 applications per season.
sulfur (various)	M	3 to 10 lb/acre		1	**POWDERY MILDEW ONLY.** Spray at first appearance. Avoid applying on days > 90°F. Also labeled for harvested garden beet and turnip leaves.
trifloxystrobin (Flint) (Gem 500 SC)	11	2 to 4 fl oz/acre 1.9 to 2.9 fl oz/acre	7	0.5	Make no more than 1 application before alternating with a fungicide with another mode of action. Make no more than 4 applications of trifloxystrobin or other strobilurin fungicides per season. Flint rate for radish is 2 to 4 oz/acre, other crops use 2 to 3 oz/acre. Gem 500SC not labeled for radish. Flint not labeled for powdery mildew on radish but may be used for Cercospora.

Table 10-45. Disease Control Products for Root Vegetables (Except Sugar Beet)

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
PHYTOPHTHORA BASAL STEM ROT					
mefenoxam (Ridomil Gold 4 SL) (Ultra Flourish 2 EC)	4	 1 to 2 pt/trt acre 2 to 4 pt/trt acre	—	2	Apply preplant incorporated into top 2 inches, as a soil spray at planting. Surface spray must be incorporated by rainfall or irrigation.
metalaxyl (various)	4	4 to 8 pt/trt acre	—	2	May be applied preplant incorporated or as soil surface spray after planting.
fenamidone (Reason)	11	8.2 fl oz/acre	14	0.5	**NOT LABELED FOR RADISH OR CARROT ROOTS.** Make no more than 1 application before alternating with a mefenoxam-containing fungicide. Apply no more than 24.6 fl oz per growing season. Applied with sprayer or in sprinkler irrigation.
fluopicolide (Presidio)	43	3 to 4 fl oz/acre	7	0.5	Can be applied with a sprayer or in sprinkler irrigation. Regardless of method, must be applied in combination with fungicide with different mode of action and labeled for that method. No more than 2 consecutive applications before alternating with a Pythium fungicide with different mode of action. Maximum of 12 fl oz/acre/year. For carrots only, may be applied preplant incorporated. Do not use on turnips intended for livestock. Not labeled for Phytophthora on carrot.
PYTHIUM ROOT ROT, ROOT DIEBACK, CAVITY SPOT (*PYTHIUM* SPP.)					
cyazofamid (Ranman)	21	6 fl oz/acre	14	0.5	**FOR USE ON CARROTS ONLY**. May be applied preplant incorporated, as a pre-emergent surface band, or in sprinkler irrigation. Applications can be repeated at 14-day intervals but must alternate with a Pythium fungicide with a different mode of action. Do not apply more than 30 fl oz per season. Do not use any adjuvant.
azoxystrobin + mefenoxam (Uniform)	11+4	0.34 fl oz/ 1000 row ft	—	0	**NOT FOR CARROTS.** In-furrow treatment only at planting.
azoxystrobin (various)	11	0.4 to 0.8 fl oz/ 1000 row ft	0	4 hr	Make one application, applied either in-furrow at planting, in a 7-inch band over the row prior to or shortly after planting, or in drip irrigation.
fluopicolide (Presidio)	43	3 to 4 fl oz/acre	7	0.5	Can be applied with a sprayer or in sprinkler irrigation. Regardless of method, must be applied in combination with a fungicide with a different mode of action and labeled for that method. No more than 2 consecutive applications before alternating with a Pythium fungicide with a different mode of action. Maximum of 12 fl oz/acre/year. For carrots only, may also be applied preplant incorporated. Do not use on turnips intended for livestock. Use with highest rate for carrot.
fenamidone (Reason 500SC)	11	8.2 fl oz/acre	14	0.5	**NOT LABELED FOR RADISH ROOTS.** Make no more than 1 application before alternating with a mefenoxam-containing fungicide. Apply no more than 24.6 fl oz per season. Apply with sprayer or in sprinkler irrigation. Do not use a spreader/sticker on carrots. Pythium control only for carrot.
mefenoxam (Ridomil Gold 4 SL) (Ultra Flourish 2 EC)	4	 1 to 2 pt/trt acre 2 to 4 pt/trt acre	—	2	Apply preplant incorporated into top 2 inches or as a pre-emergent soil spray. Surface spray must be incorporated by rainfall or irrigation
metalaxyl (various)	4	4 to 8 pt/trt acre	—	2	May be applied preplant incorporated or to soil surface spray after planting.
RUST (*PUCCINIA* SPP.)					
fluopyram + trifloxystrobin (Luna Sensation)	7+11	see label	7	0.5	**Not for *Cercospora* except on carrots.** Do not make more than 2 consecutive applications before rotating to a labeled non-Group 7 or non-Group 11 fungicide. Carrot rate is 4.0 to 7.6 fl oz/acre. Other root crop rates are 5 to 5.8 fl oz/acre.
penthiopyrad (Fontelis)	7	16 to 30 fl oz/acre	0	0.5	Make no more than 2 consecutive applications before alternating with a fungicide with a different mode of action. Apply no more than 61 fl oz/acre per year.
sulfur (various)	M	see label		1	Spray at first appearance. Avoid applying on days over 90°F. Also labeled for use on harvested garden beet and turnip leaves.
trifloxystrobin (Flint) (Gem 500SC)	11	 2 to 3 oz/acre 1.9 to 2.9 fl oz/ acre	7	0.5	Make no more than 1 application before alternating with a fungicide with another mode of action. Make no more than 4 applications of trifloxystrobin or other strobilurin fungicides per season. Flint is not labeled for rust on radish. Gem 500SC not labeled for radish.

Table 10-45. Disease Control Products for Root Vegetables (Except Sugar Beet)

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
WHITE MOLD (*SCLEROTINIA* SPP.) AND GRAY MOLD (*BOTRYTIS* SPP.)					
boscalid (Endura)	7	7.8 oz	0	0.5	No more than 2 applications before alternating with a fungicide with a different mode of action. Limit of 3 applications per season.
chlorothalonil (various)	M	1.5 to 2 pt/acre	Check label	0.5	**FOR USE ON CARROTS AND PARSNIPS ONLY.** For gray mold on parsnip only. Spray at first appearance, 7- to 10-day intervals.
fluazinam (Omega)	29	1 pt/acre	7	0.5	**FOR USE ON CARROTS ONLY.** For white mold only.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	see label	7	0.5	**Not for *Cercospora* except on carrots.** Do not make more than 2 consecutive applications before rotating to a labeled non-Group 7 or non-Group 11 fungicide. Carrot rate is 4.0 to 7.6 fl oz/acre. Other root crop rates are 5 to 5.8 fl oz/acre.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	11.2 fl oz/acre	7	0.5	Do not make more than 2 consecutive applications before rotating to a labeled non-Group 7 or non-Group 9 fungicide. Use 11.2 fl oz/acre for white mold. **Not labeled for use in Louisiana.**
WHITE MOLD (*SCLEROTINIA* SPP.) AND GRAY MOLD (*BOTRYTIS* SPP.), (POSTHARVEST) SOUTHERN BLIGHT (*SCLEROTIUM ROLFSII*)					
azoxystrobin (various)	11	0.4 to 0.8 fl oz/ 1000 row ft	0	4 hr	Make one application, applied either in-furrow at planting, in a 7-inch band over the row prior to or shortly after planting, or in drip irrigation.
azoxystrobin + difenoconazole (Quadris Top)	11+3	12 to 14 fl oz/acre	7	0.5	**FOR USE ON CARROTS ONLY**.
fluazinam (Omega)	29	16 fl oz/acre	7	0.5	**FOR USE ON CARROTS AND TURNIP GREENS ONLY.** Turnip roots treated with Omega are not for human or animal consumption.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	see label	7	0.5	Do not make more than 2 consecutive applications before rotating to a labeled non-Group 7 or non-Group 11 fungicide. Carrot rate for *Sclerotinia* suppression is 7.6 fl oz/acre.
penthiopyrad (Fontelis)	7	16 to 30 fl oz/acre	0	0.5	Make no more than 2 consecutive applications before alternating with a fungicide with a different mode of action. Apply no more than 61 fl oz/ acre per year. Also labeled for use on harvested garden beet, turnip, and radish leaves.
thiabendazole (Mertect)	1	41 fl oz/100 gal	—	0.5	**FOR USE ON CARROTS ONLY.** Dip harvested roots for 5 to 10 seconds. Do not rinse.
azoxystrobin (various)	11	0.4 to 0.8 fl oz/ 1000 row ft	0	4 hr	Make one application, applied either in-furrow at planting, in a 7-inch band over the row prior to or shortly after planting, or in drip irrigation.
azoxystrobin + difenoconazole (Quadris Top)	11+3	12 to 14 fl oz/acre	7	0.5	**FOR USE ON CARROTS ONLY**.
SOUTHERN BLIGHT (*SCLEROTIUM ROLFSII*), WHITE RUST (*ALBUGO* SPP.)					
azoxystrobin + difenoconazole (Quadris Top)	11+3	12 to 14 fl oz/acre	7	0.5	**FOR USE ON CARROTS ONLY**.
fluazinam (Omega)	29	1 pt/acre	7	0.5	**FOR USE ON CARROTS ONLY.**
penthiopyrad (Fontelis)	7	16 to 30 fl oz/acre	0	0.5	Make no more than 2 consecutive applications before alternating with a fungicide with a different mode of action. Apply no more than 61 fl oz/ acre per year. Not registered for white rust.
pyraclostrobin + boscalid (Pristine)	11+7	8 to 10.5 oz/acre	0	0.5	Make no more than 2 consecutive applications before alternating with a different mode of action. Use no more than 63 oz or make no more than 6 applications per season. Not registered for white rust.
azoxystrobin (various)	11	6 to 15.5 fl oz/acre	0	4 hr	No more than 1 application before alternating with a fungicide with a different mode of action. Apply no more than 123 fl oz per acre per season.
WHITE RUST (*ALBUGO* SPP.)					
mefenoxam + copper hydroxide (Ridomil Gold/Copper)	4+M	1 to 2 pt/acre	7	1	**FOR USE ON CARROTS AND RADISHES ONLY.** Preplant or at-planting application.
pyraclostrobin (Cabrio EG)	11	8 to 16 oz/acre	0	0.5	Alternate with a fungicide with a different mode of action. Apply no more than 48 oz/acre/season. Also labeled for use on harvested garden beet, turnip, and radish leaves.

Table 10-46. Importance of Alternative Management Practices for Disease Control in Carrot
E. Sikora, Plant Pathologist, Auburn University

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

Strategy	*Alternaria* blight	*Cercospora* blight	Powdery mildew	*Pythium* cavity spot	*Pythium* damping off	Southern blight	*Rhizoctonia* cavity spot	*Sclerotinia* postharvest	*Botrytis* postharvest	Bacterial leaf blight	Root-knot nematode
Avoid field operations when leaves wet	P	P	NC	NC	NC	NC	NC	NC	NC	F	NC
Avoid overhead irrigation	F	F	NC	NC	NC	NC	NC	F	NC	F	NC
Change planting date	P	P	NC	F	F	F	NC	NC	NC	NC	F
Cover cropping with antagonist	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	F
Crop rotation	F	F	NC	P	P	P	P	P	NC	F	P
Deep plowing	G	G	P	NC	NC	F	F	F	P	G	NC
Destroy crop residue	E	E	P	NC	NC	NC	P	NC	P	E	P
Encourage air movement	F	F	NC	NC	NC	NC	NC	F	NC	NC	NC
Plant in well-drained soil	NC	NC	NC	G	G	P	F	F	NC	NC	NC
Plant on raised beds	NC	NC	NC	F	F	NC	F	P	NC	NC	NC
Postharvest temperature control	NC	NC	NC	NC	NC	NC	NC	E	E	NC	NC
Reduce mechanical injury	NC	NC	NC	NC	NC	NC	NC	F	G	NC	NC
Destroy volunteer carrots	F	F	P	NC	NC	NC	NC	NC	NC	NC	NC
Pathogen-free planting material	E	E	NC	NC	NC	NC	NC	NC	NC	E	NC
Resistant cultivars	G	G	F	NC	NC	NC	NC	NC	NC	NC	NC

For Scallion — See Onion, Green
For Shallot — See Onion, Dry

Spinach

Z. Hansen, Plant Pathologist, University of Tennessee

Table 10-47. Disease Control Products for Spinach

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DAMPING OFF (*PYTHIUM* SPP.)					
cyazofamid (Ranman 400SC)	21	2.75 fl oz/acre	0	0.5	Apply to soil in a banded application or in transplant water at time of transplanting.
mefenoxam (Ridomil Gold SL) (Ultra Flourish)	4	1 to 2 pt/acre 2 to 4 pt/acre	21	2	Broadcast or banded over the row as a soil spray or pre-plant incorporation into the top two inches of soil. For Ultra Flourish, PHI = 3 days only if soil applications do not exceed 4 pt/acre and foliar mefenoxam applications do not exceed 0.25 lb a.i./ acre, otherwise PHI = 21 days.
metalaxyl (various)	4	4 to 8 pt/acre	21	2	Broadcast or banded over the row as a soil spray or pre-plant incorporation into the top two inches of soil.
oxathiapiprolin + mefenoxam (Orondis Gold)	49+4	13.9 to 27.8 fl oz/acre	21	2	Apply using any of the following methods: in-furrow, transplant water, banded spray, and drip irrigation. If using drip irrigation, delay until after emergence. PHI is 3 days if soil application does not exceed 1.0 lb mefenoxam/acre/year and foliar application does not exceed 0.25 lb mefenoxam/acre/year.
phosphorous acid (mono- and di-potassium salts) (Reliant, Fungi-Phite)	P07	1 to 2 qt/acre	0	4 hr	Do not apply more than 6 times per crop cycle.
propamocarb hydrochloride (Previcur Flex)	F4	2 pt/acre	2	0.5	Do not exceed two applications per crop.
SEEDLING BLIGHT, DAMPING OFF, ROOT ROT (*PYTHIUM* SPP., *RHIZOCTONIA SOLANI*)					
azoxystrobin + mefenoxam (Uniform)	11+4	0.34 fl oz/ 1,000row ft	--	0	Apply as an in-furrow spray in 5 gal of water per acre prior to covering seed. Make only application per season.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	7.6 fl oz/acre	0	0.5	Use a rotation partner outside of groups 7 and 11.
DOWNY MILDEW (*PERONOSPORA FAINOSA* F. SP. *SPINACIAE*)					
ametoctradin + dimethomorph (Zampro)	45+40	14 fl oz/acre	0	0.5	Do not apply with or in rotation with mandipropamid or dimethomorph.
cymoxanil (Curzate)	27	5 oz/acre	1	0.5	Apply with a protectant fungicide. Apply no more than 30 oz per acre in a12-month period. **Not labeled for use in Louisiana.**
dimethomorph (Forum)	40	6 fl oz/acre	0	0.5	Do not apply with or in rotation with mandipropamid.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	7.6 fl oz/acre	0	0.5	Use a rotation partner outside of groups 7 and 11.
mandipropamid (Revus)	40	8 fl oz/acre	1	4 hr	Make no more than 2 consecutive applications before alternating with a fungicide with a different mode of action. Apply no more than 32 fl oz/acre/season. Do not apply with or in rotation with dimethomorph.
oxathiapiprolin (Orondis Gold 200)	49+4	4.8 to 9.6 fl oz/ acre	0	4 hr	Apply at planting in furrow or by drip, or in subsequent drip irrigation. Make no more than 2 consecutive applications before alternating with a fungicide with a different mode of action. Do not apply more than 19.2 fl oz/acre per year.
phosphorous acid (mono- and di-potassium salts) (Reliant, Fungi-Phite)	P07	1 to 2 qt/acre	0	4 hr	Do not apply more than 6 times per crop cycle.
propamocarb hydrochloride (Previcur Flex)	F4	2 pt/acre	2	0.5	Use 1.33 to 2 pints per acre if mixing with another fungicide. Do not exceed two applications per crop.
DOWNY MILDEW (*PERONOSPORA FAINOSA* F. SP. *SPINACIAE*), WHITE RUST (*ALBUGO OCCIDENTALIS*)					
acibenzolar-*S*-methyl (Actigard)	P01	0.5 to 0.75 oz/ acre	7	0.5	Do not apply to young seedlings or plants stressed due to drought, excessive moisture, cold weather, or herbicide injury.
aluminum tris (O-ethyl phosphonate) (Aliette WDG)	P07	2 to 5 lbs/acre	3	0.5	Do not mix with copper. The lower rate (2 to 3 lbs/acre) can be used when mixed with another fungicide labeled for downy mildew. Otherwise, 3 to 5 lbs/acre should be used. **Not labeled for use in MS.**
azoxystrobin + flutriafol (Topguard EQ)	11+3	6 to 8 fl oz/acre	7	0.5	Use a rotation partner outside of groups 3 and 11. Do not apply more than 4 applications per year.
cyazofamid (Ranman)	21	2.75 fl oz/acre	0	0.5	Do not make more than 3 consecutive applications before alternating to a fungicide with a different mode of action.

Table 10-47. Disease Control Products for Spinach

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DOWNY MILDEW (*PERONOSPORA FAINOSA* F. SP. *SPINACIAE*), WHITE RUST (*ALBUGO OCCIDENTALIS*) (continued)					
famoxadone + cymoxanil (Tanos)	11+27	8 to 10 oz/acre	1	0.5	Must be tank-mixed with a contact downy mildew fungicide with a different mode of action. Make no more than 1 application before alternating with a fungicide with a different mode of action. Apply no more than 84 oz/acre per cropping season.
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz/ acre	2	0.5	Make no more than 1 application before alternating with a fungicide with a different mode of action. Apply no more than 24.6 fl oz/acre per cropping season.
fixed copper (various)	M	See labels	0	2	Some formulations of copper may cause leaf flecking.
fluopicolide (Presidio)	43	3 to 4 fl oz/acre	2	0.5	Tank mix with another downy mildew fungicide with a different mode of action. Apply as a foliar spray or in drip irrigation.
fluxapyroxad + pyraclostrobin (Merivon)	7+11	4 to 11 fl oz/acre	1	0.5	**Do not tank-mix Merivon with any pesticides, adjuvants, fertilizers, nutrients, or any other additives.** Do not make more than 2 consecutive applications before rotating to a labeled non-Group 7 or non-Group 11 fungicide. Make no more than 3 applications per season.
laminarin (Vacciplant)	P04	14 to 22 fl oz/ acre	0	4 hr	Use preventatively. Tank mix with another registered fungicide under moderate to severe disease pressure.
mefenoxam (Ridomil Gold) (Ultra Flourish)	4	 0.25 pt/acre 0.25 to 0.5 pt/ acre	21	2	Shank application 21 days after planting or after first cutting. Two shanked applications may be made on a 21-day interval.
polyoxin D zinc salt (OSO 5%SC)	19	6.5 to 13 fl oz/ acre	0	4 hr	Do not make more than 6 applications per season at the maximum-labeled rate.
pyraclostrobin (Cabrio)	11	8 to 16 oz/acre	0	0.5	Make no more than 2 consecutive applications before alternating with a fungicide with a different mode of action. Apply no more than 64 oz per acre per growing season.
mefenoxam + copper hydroxide (Ridomil Gold/Copper)	4+M01	2 lb/acre	3	2	Spray to foliage. Use with preplant Ridomil Gold soil application.
metalaxyl (various)	4	1 pt/trt acre	21	2	Shank in 21 days after planting. Apply no more than 2-shanked applications on a 21-day interval.
VARIOUS LEAF SPOTS					
azoxystrobin + flutriafol (Topguard EQ)	11+3	6 to 8 fl oz/acre	7	0.5	Use a rotation partner outside of groups 3 and 11. Do not apply more than 4 applications per year.
cyprodinil + fludioxonil (Switch 62.5WG)	9+12	11 to 14 fl oz/acre	0	0.5	Make no more than 1 application before alternating with a fungicide with a different mode of action. Apply no more than 24.6 fl oz/acre per growing season.
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz/ acre	2	0.5	Make no more than 1 application before alternating with a fungicide with a different mode of action. Apply no more than 24.6 fl oz/acre per growing season.
fixed copper (various)	M	See labels	0	2	Some formulations of copper may cause flecking on the leaves.
fludioxonil (Cannonball WG)	12	7 fl oz/acre	7	0.5	Make no more than 2 consecutive applications before alternating with a fungicide with a different mode of action.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	7.6 fl oz/acre	0	0.5	Use a rotation partner outside of groups 7 and 11.
flutriafol (Rhyme)	3	5 to 7 fl oz/acre	0	0.5	Do not apply more than 28 fl oz/acre per year.
fluxapyroxad + pyraclostrobin (Merivon)	7+11	4 to 11 fl oz/acre	1	0.5	**Do not tank-mix Merivon with any pesticides, adjuvants, fertilizers, nutrients, or any other additives.** Do not make more than 2 consecutive applications before rotating to a labeled non-Group 7 or non-Group 11 fungicide. Make no more than 3 applications per season.
laminarin (Vacciplant)	P04	14 to 22 fl oz/ acre	0	4 hr	Use preventatively. Tank mix with another registered fungicide under moderate to severe disease pressure.
penthiopyrad (Fontelis)	7	16 to 24 fl oz/ acre	3	0.5	Make no more than 2 consecutive applications before alternating with a fungicide with a different mode of action. Apply no more than 72 fl oz/acre/year.
phosphorous acid (mono- and di-potassium salts) (Reliant, Fungi-Phite)	P07	1 to 2 qt/acre	0	4 hr	Do not apply more than 6 times per crop cycle.

Table 10-47. Disease Control Products for Spinach

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
VARIOUS LEAF SPOTS (continued)					
polyoxin D zinc salt (OSO 5%SC)	19	3.75 to 13 fl oz/ acre	0	4 hr	Do not make more than 6 applications per season at the maximum-labeled rate. Not registered for use in KY, MS, AR, OK, or KS.
pyraclostrobin (Cabrio EG)	11	12 to 16 oz/acre	0	0.5	Make no more than 2 consecutive applications before alternating with a fungicide with a different mode of action. Apply no more than 64 oz per acre per growing season.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	9.2 to 13.4 fl oz/ acre	0	0.5	Make no more than 2 consecutive applications before alternating with a fungicide with a different mode of action. Apply no more than 36.5 fl oz per acre per growing season.
trifloxystrobin (Flint Extra)	11	3 to 3.8 fl oz/acre	See label	0.5	REI is 0 days for broadcast foliar uses and 20 days for banded applications. Apply no more than 7.6 fl oz per acre per growing season.

Sweetpotato

L. Quesada-Ocampo and A. Gorny Plant Pathologists, North Carolina State University

Table 10-48A. Disease Control Products for Sweetpotato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
BLACK ROT (*CERATOCYSTIS FIMBRIATA*), SCURF (*MONILOCHAETES INFUSCANS*), AND FOOT ROT (*PLENODOMUS DESTRUENS*)					
thiabendazole (Mertect 340 F)	1	107 fl oz/100 gal	0.5	0.5	Dip seed roots 1 to 2 minutes and plant immediately.
POSTHARVEST BLACK ROT (*CERATOCYSTIS FIMBRIATA*)					
azoxystrobin + fludioxonil + difenoconazole (Stadium)	11+12 +3	1 fl oz per 2,000 lbs of roots	–	–	**Section 2 (ee) label for NC and CA expires 12/31/2025.** Ensure proper coverage, use tumbling, and mix the fungicide solution in sufficient water volume. Do not make more than one postharvest application.
thiabendazole (Mertect 340 F)	1	0.42 fl oz per 2,000 lb of roots or 0.42 fl oz/gal	0.5	0.5	Postharvest treatment of sweetpotato for control of black rot. Limit to one application during packing. Mist washed roots on a conveyor line, with tumbling action, before packing with 0.42 fl oz of Mertect to each 2,000 lb of roots in sufficient water for complete coverage. Alternatively, dip the roots for 20 seconds in 0.42 fl oz of Mertect per gal of water. Ensure roots are dry before packing.
CIRCULAR SPOT (*SCLEROTIUM ROLFSII*), SCLEROTIAL BLIGHT (*SCLEROTIUM ROLFSII*), RHIZOCTONIA STEM CANKER (*RHIZOCTONIA SOLANI*), PYTHIUM ROOT ROT (*PYTHIUM*)					
azoxystrobin (Quadris) 2.08 F	11	0.4 to 0.8 fl oz/ 1,000 row feet	—	4 hr	Make in-furrow or banded applications shortly after transplanting.
dichloran (Botran) 5F	14	0.6 qt/7.5 gal (Seed Dip) 5.73 oz in 14 gal/ 1000 linear feet of plant bed (Plant bed spray)	—	0.5	Labeled for Southern blight (*Sclerotium rolfsii*). **Seed dip:** Dip seed sweetpotatoes 10 to 15 seconds in a well-agitated fungicide suspension. Drain sweetpotatoes and bed promptly. Prepare fresh fungicide suspension daily. **Plant bed spray:** Spray or sprinkle over bedded sweetpotatoes before covering them with soil. **Note: Not for use in Virginia, Tennessee, or South Carolina.**
fluazinam (Omega) 500F	29	5.5 to 8 fl oz/acre	14	0.5	Labeled for control of white mold (Sclerotinia). Begin applications when plants are 6 to 8 inches tall. Repeat applications at intervals of 7 to 10 days. See label for rate. Do not apply more than 3.5 pints/acre/year.
SEED-BORNE AND SOILBORNE FUNGI THAT CAUSE DECAY, DAMPING OFF OR SEEDLING BLIGHT					
azoxystrobin (Dynasty) 0.83 F	11	0.19 to 0.38 fl oz per 100 lb of propagating roots	—	4 hr	Apply uniformly to seed roots as a water-based slurry.
fludioxonil (Maxim 4 FS)	12	0.08 to 0.16 fl oz/ 100 lb of propagating roots	—	0.5	Apply uniformly to seed roots as a water-based slurry.

Table 10-48A. Disease Control Products for Sweetpotato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
DAMPING OFF (*PYTHIUM* SPP.)					
Azoxystrobin + Mefenoxam (Uniform)	11+4	0.34 fl oz/1000 row ft	36	0	Apply as in-furrow spray at planting. Make one application per crops season.
cyazofamid (Ranman 400SC)	21	6.1 fl oz/acre	7	0.5	Apply at planting. Refer to label for details.
ethaboxam (Elumin)	22	8 fl oz/acre	—	0.5	Apply in-furrow or as a side dressing over seed piece. Do not make more than two applications per year or apply more than 16 fl oz/acre/year.
fluopicolide (Presidio)	43	3 to 4 fl oz/acre	7	0.5	Must be tank mixed with a labeled rate of another fungicide active against the target pathogen, but with a different moved of action. Repeat applications at 10- day intervals.
mefenoxam (Ridomil Gold) 4 SL	4	1 to 2 pt/ treated acre	—	2	Incorporate in soil. See label for row rate.
mefenoxam + oxathiapiprolin (Orondis Gold)	4+49	27.8 fl oz/acre	14	2	Apply in-furrow at planting.
metalaxyl (MetaStar) 2 E	4	4 to 8 pt/ treated acre	7	2	Preplant incorporated or soil surface spray.
FOLIAR DISEASES (*ALTERNARIA*)					
azoxystrobin (Aframe, generic)	11	6 to 15.5 fl oz/ acre	0	4 hr	Limit to 123 fl oz per acre per season. For soilborne disease control, refer to label. Begin foliar applications prior to disease and continue on a 5- to 7-day interval.
azoxystrobin+ difenoconazole (Quadris Top)	11+3	8 to 14 fl oz/acre	14	0.5	Begin foliar applications prior to disease and continue on a 7- to 14-day interval.
cyprodinil + fludioxonil (Switch 62.5WG)	9+12	11 to 14 oz/acre	7	0.5	Begin foliar applications prior to disease and continue on a 7- to 10-day interval.
difenoconazole + benzovindiflupyr (Aprovia Top)	7+3	10.5 to 13.5 fl oz/acre	14	0.5	No more than two applications can be made at a 7-day interval; all other applications must be made at a 14-day interval. Apply no more than 27 fl oz per acre per year.
Difenoconazole + tea tree oil	3+BM01	4 to 8.5 fl oz/acre	14		Limit to 34 fl oz/acre per year. Apply in early plant stages and repeat on 7 to 14 day intervals. Do not make more than 2 sequential applications.
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz/ acre	14	0.5	Begin foliar applications prior to disease and continue on a 5- to 10- day interval.
fluoxastrobin (Aftershock)	11	2 to 3.8 fl oz/acre	7	0.5	Limit to 22.8 fl oz per acre per year. For soilborne disease control, refer to label. Begin foliar applications prior to disease and continue on a 7- to 10-day interval.
Picoxystrobin (Aproach)	11	6 to 12 fl oz/acre	7	0.5	Apply at 100% bloom of primary inflorescence, or prior to to row closure. Apply again 14 days later. Use higher rate when disease pressure is high.
pydiflumetofen + difenoconazole (Miravis Top)	3+7	13.7 fl oz/acre	14	0.5	Apply a sufficient volume of water to ensure good coverage. Do not make more than two applications of Miravis Top or other Group 3 and 7 fungicides before alternation with a fungicide that is not in Group 3 or 7. Do not make more than 4 applications at the maximum application rate per year.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	6.8 fl oz/acre	7	0.5	Limit to 20.4 fl oz/acre per year. Begin applications prior to disease development. Continue applications through season on a 7- to 10-day interval.
pyraclostrobin (Cabrio) 20 WG	11	8 to 12 oz/acre	0	0.5	Do not apply more than 48 fl oz per acre per season. Alternate with a fungicide with a different mode of action after each use.
pyrimethanil (Scala SC)	9	7 fl oz/acre	7	0.5	Begin foliar applications prior to disease and continue on a 7- to 14- day interval.
trifloxystrobin (Flint Extra)	11	3 to 3.8 oz/acre	7	0.5	Apply on a 7- to 10-day interval as needed. Do not make more than six applications per year or apply more than 23 fl oz per acre per year.
POSTHARVEST FUSARIUM ROT (*FUSARIUM)*					
azoxystrobin + fludioxonil + difenoconazole (Stadium)	11+12 +3	1.25 fl oz per 2,000 lbs of roots	_	_	Ensure proper coverage, use tumbling, and mix the fungicide solution in sufficient water volume. Do not make more than one postharvest application.
MOTTLE NECROSIS (PYTHIUM POSTHARVEST)					
potassium phosphite (Alude)	P07	1 1/4 quarts/acre	0	4 hr	Foliar spray at 5- to 14-day intervals depending on disease incidence.

Table 10-48A. Disease Control Products for Sweetpotato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
POWDERY MILDEW					
azoxystrobin+ difenoconazole (Quadris Top)	11+3	8 to 14 fl oz/acre	14	0.5	Begin foliar applications prior to disease and continue on a 7- to 14-day interval.
cyprodinil + fludioxonil (Switch 62.5WG)	9+12	11 to 14 oz/acre	7	0.5	Begin foliar applications prior to disease and continue on a 7- to 10-day interval.
difenoconazole + benzovindiflupyr (Aprovia Top)	7+3	10.5 to 13.5 fl oz/acre	14	0.5	No more than two applications can be made at a 7-day interval; all other applications must be made at a 14-day interval. Apply no more than 27 fl oz per acre per year.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	11.2 fl oz/acre	7	0.5	Limit to 54.7 fl oz per acre per year. Do not make more than two sequential applications of Group 7-containing fungicides. Labeled for Alternaria and Sclerotinia. Apply at 7- or 14-day intervals.
mefentrifluconazole	3	3 to 5 fl oz/acre	7	0.5	Limit to 15 fl oz/acre per year. Apply on 7 to 14 day intervals.
mefentrifluconazole + pyraclostrobin (Veltyma)	3+11	5 to 10 fl oz/acre	7	0.5	Limit to 30 fl oz/acre per year. Apply before onset of disease and repeat on a minimum interval of 14 days.
metconazole (Quash)	3	2.5 to 4 oz/acre	1	0.5	Begin foliar applications prior to disease and continue on a 7- to 10-day interval. Do not apply more than 16 fl oz per year or four times per year. Do not make more than two sequential applications before alternating with products with different modes of action.
penthiopyrad (Vertisan)	7	0.7 to 24 fl oz/ acre	7	0.5	For soilborne disease control, refer to label. Begin foliar applications prior to disease and continue on a 7- to 14-day interval.
pyraclostrobin (Cabrio) 20 WG	11	8 to 12 oz/acre	0	0.5	Do not apply more than 48 fl oz per acre per season. Alternate with a fungicide with a different mode of action after each use.
pydiflumetofen + difenoconazole (Miravis Top)	3+7	13.7 fl oz/acre	14	0.5	Apply a sufficient volume of water to ensure good coverage. Do not make more than two applications of Miravis Top or other Group 3 and 7 fungicides before alternation with a fungicide that is not in Group 3 or 7. Do not make more than 4 applications at the maximum application rate per year.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	6.8 fl oz/acre	7	0.5	Limit to 20.4 fl oz/acre per year. Begin applications prior to disease development. Continue applications through season on a 7- to 10-day interval.
POSTHARVEST RHIZOPUS SOFT ROT (*RHIZOPUS*)					
azoxystrobin + fludioxonil + difenoconazole (Stadium)	11+12 +3	1 fl oz per 2,000 lbs of roots	_	_	**Section 2 (ee) label for NC and CA expires 12/31/2025.** Ensure proper coverage, use tumbling, and mix the fungicide solution in sufficient water volume. Do not make more than one postharvest application.
dicloran (Botran) 75 W	14	1 lb/100 gal	—	—	Spray or dip. Dip for 5 to 10 seconds in well-agitated suspension. Add ½-pound Botran to 100 gallons of treating suspension after 500 bushels treated. Do not rinse.
fludioxonil (Scholar 1.9 SC)	12	16 to 32 fl oz/ 100 gal	—	—	Dip for approximately 30 seconds in well-agitated solution and allow sweetpotatoes to drain. Add 8 fl oz to 100 gals after 500 bushels are treated. ALTERNATIVELY, mix 16 fl oz in 7 to 25 gal of water, wax/emulsion, or aqueous dilution of wax/oil emulsion. Can also be used to disinfest tanks, refer to label.
WHITE MOLD (*SCLEROTINIA*)					
Bacillus amyloliquefaciens (Serifel)	44	4 to 16 oz/acre	0	4 hr	Begin foliar applications shortly after emergence or transplanting and continue on 7- to 10-day intervals
boscalid (Endura)	7	5.5 to 10 oz/acre	10	0.5	Begin applications prior to disease development and apply again at a 7- to 14-day interval. Do not apply more than 20 fl oz per year. Do not make more than two sequential applications before alternating with products with different modes of action.
Fluazinam (Vantana)	29	5.5 to 8 fl oz/acre	14	12	Limit to 56 fl oz/acre per year. Begin applications when plants 6 to 8 inches tall and continue on a 7 to 14 day interval.
pydiflumetofen + difenoconazole (Miravis Top)	3+7	13.7 fl oz/acre	14	0.5	Apply a sufficient volume of water to ensure good coverage. Do not make more than two applications of Miravis Top or other Group 3 and 7 fungicides before alternation with a fungicide that is not in Group 3 or 7. Do not make more than 4 applications at the maximum application rate per year.

Table 10-48A. Disease Control Products for Sweetpotato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
WHITE MOLD (*SCLEROTINIA*) (continued)					
Coniothyrium minitans (Contans WG)	BM02	1 to 4 lb/acre	0	4 hr	**OMRI listed product.** Apply to soil surface and incorporate no deeper than 2 inches. Works best when applied prior to planting or transplanting. Do not apply other fungicides for 3 weeks after applying Contans.
fluazinam (Omega 500F, Lektivar 40SC)	29	5.5 to 8 fl oz/acre	14	0.5	Initiate applications when conditions are favorable for disease development or when disease symptoms first appear. Repeat applications on a 7- to 10- day schedule. Do not apply more than 3.5 pints per year.
metconazole (Quash)	3	4 oz/acre	1	0.5	Make an application prior to disease development and apply again 14 days later. Do not apply more than 16 fl oz per year or four times per year. Do not make more than two sequential applications before alternating with products with different modes of action.
pydiflumetofen + difenoconazole (Miravis Top)	3+7	13.7 fl oz/acre	14	0.5	Apply a sufficient volume of water to ensure good coverage. Do not make more than two applications of Miravis Top or other Group 3 and 7 fungicides before alternation with a fungicide that is not in Group 3 or 7. Do not make more than 4 applications at the maximum application rate per year.
SCURF (*MONILOCHAETES INFUSCANS*) AND SCLEROTIAL BLIGHT (*SCLEROTIUM ROLFSII*)					
dicloran (Botran) 75 W	14	1 lb/100 gal	—	—	**Seed dip:** Dip seed sweetpotatoes 10 to 15 seconds in a well-agitated fungicide suspension. Drain sweetpotatoes and bed promptly. Prepare fresh fungicide suspension daily. **Plant bed spray:** Spray or sprinkle over bedded sweetpotatoes before covering them with soil.
thiabendazole (Mertect 340 F)	1	107 fl oz/100 gal	0.5	0.5	Dip seed roots 1 to 2 minutes and plant immediately.
SOUTHERN BLIGHT (*SCLEROTIUM ROLFSII*)					
dicloran (Botran) 75 W	14	1 lb/100 gal	—	—	**Seed dip**: Dip seed sweetpotatoes 10 to 15 seconds in a well-agitated fungicide suspension. Drain sweetpotatoes and bed promptly. Prepare fresh fungicide suspension daily. **Plant bed spray:** Spray or sprinkle over bedded sweetpotatoes before covering them with soil.
difenoconazole + benzovindiflupyr (Aprovia Top)	7+3	10.5 to 13.5 fl oz/acre	14	0.5	No more than two applications can be made at a 7-day interval; all other applications must be made at a 14-day interval. Apply no more than 27 fl oz per acre per year.
WHITE RUST (*ALBUGO IPOMOEA-PANDURATAE*)					
azoxystrobin (Quadris) 2.08 F	11	6.2 to 15.4 fl oz/acre	7	4 hr	Make no more than two sequential applications before alternating with fungicides that have a different mode of action. Apply no more than 2.88 quarts per crop per acre per season.
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz/acre	14	0.5	Begin applications when conditions favor disease development and continue on 5- to 10-day interval. Do not apply more than 16.4 fluid ounces per growing season. Alternate with a fungicide from different resistance management group.
pyraclostrobin (Cabrio) 20 WG	11	8 to 16 oz/acre	0	0.5	Do not apply more than 48 ounces per acre per season. Alternate with a fungicide with a different mode of action after each use.

Table 10-48B. Sweetpotato Storage House Sanitation

I. Quesada-Ocampo, Plant Pathologist, North Carolina State University

Material	Rate per 1,000 Cubic Feet of Space	Methods and Remarks
Heat	140°F 4 to 8 hr/day for 7 days or 180°F for 30 min	See remarks under water, produce, and equipment sanitation. The storage house, ventilation system, and equipment must be very clean and moist during the procedure. *Caution:* rot-causing organisms inside a drain will probably not be exposed to lethal temperature.

Table 10-49. Efficacy of Products for Disease Control in Sweetpotato

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

Active Ingredient	Product	Fungicide Group	Nematicide (N) or Fungicide (F)	*Alternaria* leaf spot	Black rot (*C. fimbriata*)	*Fusarium*	Java black rot (*D. gossypina*)	Nematodes	*Pythium*	*Rhizopus* soft rot (*R. stolonifer*)	Southern blight (*S. rolfsii*)	*Sclerotinia*	Scurf (*M. infuscans*)	Soil rot/Pox (*S. ipomoea*)
azoxystrobin + fludioxonil + difenoconazole	Stadium	11+12 +3	F	ND	E	ND	ND	ND	ND	E	ND	ND	ND	ND
boscalid	Endura	7	F	ND	ND	ND	ND	ND	ND	ND	ND	E	ND	ND
chlorine sanitizer postharvest		N/A	F	ND	F	ND	P	ND	ND	F	ND	ND	P	NC
chloropicrin		N/A	N, F	ND	P	F	F	F	ND	ND	F	ND	ND	F
Coniothyrium minitans	Contans WG	BM02	F	ND	ND	ND	ND	ND	ND	ND	ND	F	ND	ND
dicloran	Botran 75W	14	F	ND	P	ND	P	ND	ND	F	P	G	F	NC
1,3-dichloropropene	Telone II	N/A	N	ND	ND	P	ND	G	ND	ND	ND	ND	ND	ND
ethaboxam	Elumin	22	F	ND	ND	ND	ND	ND	G	ND	ND	ND	ND	ND
ethoprop	Mocap	N/A	N	ND	ND	ND	ND	P	ND	ND	ND	ND	ND	ND
fludioxonil	Scholar	12	F	ND	F	ND	ND	NC	ND	F	NC	ND	ND	NC
fluopicolide	Presidio	43	F	ND	ND	ND	ND	ND	G	ND	ND	ND	ND	ND
fluopyram	Velum Prime	7	N, F	ND	ND	ND	ND	G	ND	ND	ND	ND	ND	ND
mefenoxam	Ridomil Gold	4	F	ND	ND	ND	ND	ND	G	ND	ND	ND	ND	ND
metconazole	Quash	3	F	ND	E	ND	ND	ND	ND	ND	ND	ND	ND	ND
metam sodium	Vapam	N/A	N	ND	P	F	ND	F	ND	ND	ND	ND	ND	ND
metalaxyl	MetaStar	4	F	ND	ND	ND	ND	ND	F	ND	ND	ND	ND	ND
oxamyl	Vydate	N/A	N	ND	ND	ND	ND	F	ND	ND	ND	ND	ND	ND
Pseudomonas syringae	Bio-Save	N/A	F	ND	ND	ND	ND	ND	ND	P	ND	ND	ND	ND
thiabendazole	Mertect 340-F	1	F	ND	E	P	F	ND	ND	E	F	ND	P	NC

Table 10-50. Importance of Alternative Management for Disease Control in Sweetpotato

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

Strategy	*Alternaria* leaf spot	Black rot (*C. fimbriata*)	*Fusarium*	Java black rot (*D .gossypina*)	Nematodes	*Pythium*	*Rhizopus* soft rot (*R. stolonifer*)	*Sclerotinia*	Southern blight	Scurf (*M. infuscans*)	Soil rot/Pox (*S .ipomoea*)	Sweetpotato Feathery Mottle virus
Crop rotation (3 to 4 years)	P	F	F	F	F	P	NC	F	F	P	F	NC
Disease-free planting stock	NC	E	G	G	F	P	NC	NC	P	E	P	G
Resistant cultivars	F	NC	F	F	F[S]	P	F	F	F	P	G	F
Careful handling to reduce mechanical injury	NC	F	F	NC	NC	P	E	F	NC	NC	NC	NC
Cutting plants (in beds) above soil line	NC	G	F	F	G[X]	P	NC	NC	NC	G	P	NC
Soil sample for nematode analysis	NC	NC	NC	NC	E	P	NC	NC	NC	NC	NC	NC
Sanitation (equipment, fields, storage houses)	F	E	P	F	NC	P	E	NC	NC	P	NC	NC
Manage insects that transmit pathogens	NC	P	NC	NC	NC	P	NC	NC	NC	NC	NC	NC
Sulfur added to soil to reduce pH	NC	NC	NC	NC	NC	P	NC	NC	NC	NC	F	NC
Prompt curing and proper storage conditions	NC	E	F	F	NC	P	E	NC	NC	NC	NC	NC
Site selection (drainage)	P	NC	F	F	NC	E	F	G	P	NC	P	NC
Manage insects that cause feeding injuries to roots	NC	G	NC	P	NC	P	P	NC	NC	NC	NC	NC
Avoid harvesting when soils are wet	F	G	NC	F	NC	G	F	F	NC	NC	NC	NC

[S] Resistant cultivars for root knot nematode are susceptible to reniform nematode. Cultivars resistant to Southern root-knot nematode (*Meloidogyne incognita*) may not be resistant to Guava root-knot nematode (*Meloidogyne enterolobii*).

[X] Cutting plants above soil line provides good reduction in movement in nematodes but will not control nematodes already established in soil.

For Swiss Chard — See Leafy Petiole Vegetables

Tomatillo

I. Meadows, Extension Plant Pathologist, North Carolina State University

Table 10-51. Disease Control Products for Tomatillo

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
EARLY BLIGHT (*ALTERNARIA*)					
azoxystrobin (various)	11	5 to 6.2 fl oz/acre	0	4 h	Limit of 37 fl oz per crop per acre per season. Make no more than **one** application before alternating with fungicides that have a different mode of action.
azoxystrobin + difenoconazole (Quadris Top 2.72F)	11+3	8 fl oz/acre	0	0.5	Limit of 47 fl oz per acre per season. Do not apply until 21 days after transplanting or 35 days after seeding.
boscalid (Endura 70WDG)	7	2.5 to 3.5 oz/acre	0	0.5	Limit of 21 oz per acre per season. Make no more than two sequential applications before alternating with fungicides that have a different mode of action.
cyprodinil + difenoconazole (Inspire Super 2.82F)	9+3	16 to 20 fl oz/ acre	0	0.5	Limit of 80 fl oz per acre per season.
cyprodinil + fludioxonil (Alterity 62.5WG, Switch 62.5WG)	9+12	11 to 14 oz/acre	0	0.5	Limit of 56 oz per acre per year. After two applications, rotate to another fungicide with a different mode of action for two applications.
difenoconazole + benzovindiflupyr (Aprovia Top)	3+7	10.5 to 13.5 fl oz/acre			Apply on a 7- to 14-day interval. No more than 2 consecutive applications allowed before switching to a non-FRAC 7. Use of a spreading adjuvant is recommended.
difenoconazole + mandipropamid (Revus Top 4.16F)	3+40	5.5 to 7 fl oz/acre	1	0.5	Limit of 28 fl oz per acre per season. Make no more than 2 consecutive applications per season before alternating with fungicides that have a different mode of action.
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz/ acre	14	0.5	Limit of 24.6 fl oz per growing season. Make no more than **one** application before rotating to another effective fungicide with a different mode of action.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	5 to 7.5 fl oz/acre	3	0.5	Apply on a 7- to 14-day interval.
fluoxastrobin (Aftershock, Evito 480SC, 4F)	11	2.0 to 5.7 fl oz/ acre	3	0.5	Limit of 22.8 fl oz per acre per season. Make no more than **one** application before alternating with fungicides that have a different mode of action. **NOTE: Do not overhead irrigate for 24 hours following a spray application.**
mefentrifluconazole (Cevya)	3	3 to 5 fl oz/acre	0	0.5	Maximum of 15 fl oz/acre/year.
penthiopyrad (Fontelis 1.67F)	7	10 to 24 fl oz/ acre	0	0.5	Do not exceed 72 fl oz of product per year. Make no more than two sequential applications per season before alternating with fungicides that have a different mode of action.
polyoxin D zinc salt (Ph-D; OSO 5% SC) (OSO)	19	 6.2 oz/acre (Ph-D) 3.75 to 13.0 fl oz/acre	0	4 h	Limit of five applications per season. Make no more than **one** application before alternating with fungicides that have a different mode of action.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	9.2 to 11.4 fl oz/acre	0	0.5	Do not make more than two applications of Miravis Prime or other Group 7 and 12 fungicides before alternation with a fungicide that is not in Group 7 or 12. Do not exceed 22.8 fl oz/ acre/season. Apply by ground, air, or chemigation.
pyraclostrobin (Cabrio 20EG)	11	8 to 16 oz/acre	0	4 h	Limit of 96 oz per acre per season. Make no more than **one** application before alternating with fungicides that have a different mode of action.
tetraconazole (Mettle125 ME)	3	6 to 8 fl oz/acre	0	0.5	Make no more than 2 sequential applications before switching to a fungicide with a different mode of action. Can be applied by ground, air, or chemigation. Do not apply more than 16 fl oz or exceed 5 applications of Mettle per acre per year. Do not apply more than 0.125 lb/acre/year of tetraconazole containing products.
trifloxystrobin (Flint Extra) (Flint) (Gem 500SC)	11	 3 fl oz/acre 3 oz/acre 2 to 3 oz/acre	3	0.5	Application limits apply – see label. Make no more than **one** application before alternating with a fungicide that has a different mode of action.

Table 10-51. Disease Control Products for Tomatillo

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
POWDERY MILDEW (*LEVEILULLA*, *OIDIUM*)					
azoxystrobin (various)	11	5 to 6.2 fl oz/acre	0	4 hr	Limit of 37 fl oz per crop per acre per season. Make no more than **one** application before alternating with fungicides that have a different mode of action.
azoxystrobin + difenoconazole (Quadris Top 2.72F)	11+3	8 fl oz/acre	0	0.5	Limit of 47 fl oz per acre per season. Do not apply until 21 days after transplanting or 35 days after seeding.
chlorothalonil (Bravo Weather Stick 6F)	M5	1.5 pt/acre	3	0.5	Limit of 12 pints per acre per season.
chlorothalonil + cymoxanil (Ariston 4.34F, Cymbol Advance)	M5+27	2 to 2.44 pt/acre	3	0.5	Limit of 17.5 pt per acre per year.
cyflufenamid (Fastback)	U6	4 oz/acre	0	4 hr	Make no more than 3 applications/year. Minimum application interval is 14 days.
cyprodinil + difenoconazole (Inspire Super 2.82F)	9+3	16 to 20 fl oz/ acre	0	0.5	Limit of 80 fl oz per acre per season.
cyprodinil + fludioxonil (Alterity 62.5WG, Switch 62.5WG)	9+12	11 to 14 oz/acre	0	0.5	Limit 56 oz per acre per year. After two applications, rotate to another fungicide with a different mode of action for two applications.
difenoconazole + benzovindiflupyr (Aprovia Top)	3+7	10.5 to 13.5 fl oz/ acre			Apply on a 7- to 14-day interval. No more than 2 consecutive applications allowed before switching to a non-FRAC 7. Use of a spreading adjuvant is recommended.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	5 to 7.5 fl oz/acre	3	0.5	Apply on a 7- to 14-day interval.
mefentrifluconazole (Cevya)	3	3 to 5 fl oz/acre	0	0.5	Maximum of 15 fl oz/acre/year.
penthiopyrad (Fontelis 1.67F)	7	16 to 24 fl oz/ acre	0	0.5	Do not exceed 72 fl oz of product per year. Make no more than two consecutive applications per season before rotating to a fungicide with a different mode of action.
polyoxin D (Ph-D 11.3WDG)	19	6.2 oz/acre	0	4 h	Limit of five applications per season. Make no more than **one** application before alternating with fungicides that have a different mode of action.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	9.2 to 11.4 fl oz/acre	0	0.5	Do not make more than two applications of Miravis Prime or other Group 7 and 12 fungicides before alternation with a fungicide that is not in Group 7 or 12. Do not exceed 22.8 fl oz/ acre/season. Apply by ground, air, or chemigation.
pyraclostrobin (Cabrio 20EG)	11	8 to 16 oz/acre	0	4 h	Limit of 96 oz per acre per season. Make no more than **one** application before alternating with fungicides that have a different mode of action.
mandipropamid + difenoconazole (Revus Top 4.16F)	40+3	5.5 to 7 fl oz/acre	0	0.5	Limit of 28 fl oz per acre per season. Make no more than two consecutive applications before alternating with fungicides that have a different mode of action.
tetraconazole (Mettle125 ME)	3	6 to 8 fl oz/acre	0	0.5	Make no more than 2 sequential applications before switching to a fungicide with a different mode of action. Can be applied by ground, air, or chemigation. Do not apply more than 16 fl oz or exceed 5 applications of Mettle per acre per year. Do not apply more than 0.125 lb/acre/year of tetraconazole containing products.
trifloxystrobin (Flint Extra)	11	3 fl oz/acre	3	0.5	**DISEASE SUPPRESSION ONLY**. Application limits apply – see label. Make no more than **one** application before alternating with a fungicide that has a different mode of action.

Tomato

I. Meadows, Plant Pathologist, North Carolina State University and R. Singh, Plant Pathologist, Louisiana State University Agricultural Center

Table 10-52. Disease Control Products for Tomato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
TOMATO (TRANSPLANTS produced in a greenhouse or other controlled environment)					
It is strongly recommended to treat seed to eliminate plant pathogens on or within the seed. See section on SEED TREATMENTS for information on treating raw(naked) seed.					
BACTERIAL CANKER (*CLAVIBACTER*)					
sodium hypochlorite (CPPC Ultra Bleach 2; 6.15%)	NC	1 qt+4 qt water	NA	0	Wash seed for 40 min in solution with continuous agitation; air dry promptly. Use 1 gal of solution per 1 lb seed. **NOTE: Ultra Bleach 2 seed treatment is not compatible with pelleted (coated) seed.**
streptomycin sulfate (various)	25	1 lb/100 gal	NA	0	Begin application at first true leaf stage; repeat weekly until transplant.
BACTERIAL SPOT (*XANTHOMONAS*), BACTERIAL SPECK (*PSEUDOMONAS*)					
bacteriophage (AgriPhage)	NC	3 to 8 oz/9,600 sq ft	NA	0	Consult your vegetable Extension Specialist for information on requirements needed to use bacteriophage. Bacteriophages are most effective when applied during or after last watering of the day.
copper (various)	M1	See label	NA	0	Begin application at first true leaf stage, repeat at 3- to 7-day intervals until trans planting. Alternating with streptomycin sulfate is recommended.
mancozeb (various)	M3	See label	NA	1	See label for state restrictions and rates. **NOTE: Use a full rate of fixed copper in combination with mancozeb. Mancozeb alone does not control bacteria.**
streptomycin sulfate (various)	25	1 lb/100 gal	NA	0	Begin application at first true leaf stage, repeat weekly until transplanting. For plant bed use only.
EARLY BLIGHT (*ALTERNARIA*), GRAY MOLD (*BOTRYTIS*), LATE BLIGHT (*PHYTOPHTHORA INFESTANS*)					
mancozeb (various)	M3	See label	NA	1	See label for state restrictions and rates**. NOTE: Use full rate of fixed copper in combination with mancozeb if bacteria control required**.
GRAY MOLD (*BOTRYTIS*), BOTRYTIS STEM CANKER, EARLY BLIGHT (*ALTERNARIA)*, POWDERY MILDEW (*ERYSIPHE, OIDIUM*)					
cyprodinil + fludioxonil (Alterity 62.5WG, Switch 62.5WG)	9+12	11 to 14 oz/acre	NA	0.5	**DO NOT APPLY TO GRAPE OR CHERRY TOMATO.** After 2 applications, switch to a different mode of action for 2 applications.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	11.2 fl oz/acre	NA	0.5	See label for limits on application amounts per season. Do not make more than 2 applications of Group 7 or 9 fungicides without switching to a different mode of action. **NOT REGISTERED FOR USE IN LA.**
penthiopyrad (Fontelis 1.67SC)	7	0.5 to 0.75 fl oz/gal	NA	0.5	Use 1 gallon of spray per 1,360 ft ^{2}. Do not make more than 2 applications before switching to a different mode of action.
LATE BLIGHT (*PHYTOPHTHORA INFESTANS*)					
mandipropamid (Micora)	40	5.5 to 8.0 fl oz/ acre (5,000 ft ^{2})	NA	4 h	Apply no more than 2 applications before switching to another mode of action.
propamocarb (Previcur Flex 6F)	28	0.7 to 1.5 pt/acre	NA	0.5	Can be used as a drench before or after transplanting.
PYTHIUM DAMPING OFF (*PYTHIUM*)					
cyazofamid (Ranman 400SC)	21	3.0 fl oz/100 gal	NA	0.5	Apply as a soil drench to seedling tray or at the time of transplant.
propamocarb (Previcur Flex 6F)	28	1.5 pt/acre	NA	0.5	Limit of 7.5 pt per acre per season. Do not make more than 1 application before alternating to a fungicide with a different mode of action.

Table 10-52. Disease Control Products for Tomato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
TOMATO (FIELD)					
ANTHRACNOSE (*COLLETOTRICHUM*)					
azoxystrobin (various)	11	See label	0	4 h	See label. Do not make more than 1 application before alternating to a fungicide with a different mode of action.
azoxystrobin + chlorothalonil (Quadris Opti)	11+M5	1.6 pt/acre	0	0.5	Do not make more than 1 application before alternating to a fungicide with a different mode of action. Do not apply within 21 days after transplanting or 35 days after seeding.
azoxystrobin + difenoconazole (Quadris Top)	11+3	8 fl oz/acre	0	0.5	Do not make more than 1 application before alternating to a fungicide with a different mode of action. Limit 47 fl oz/acre/season. Do not apply within 21 days after transplanting or 35 days after seeding.
azoxystrobin + flutriafol (Topguard EQ)	11+3	4 to 8 fl oz	0	0.5	Do not use adjuvants or EC formulated tank mix partners on fresh market tomatoes. Do not exceed 4 applications per year or 8 fl oz of product/acre. Limits of each a.i. apply – see label.
chlorothalonil (various)	M5	See label	0	0.5	Refer to individual labels for rates and restrictions.
copper (various)	M1	See label	3	2	Refer to individual labels for rates and restrictions.
cymoxanil + chlorothalonil (Ariston)	27+M5	1.9 pt/acre	3	0.5	Check copper labels for specific precautions and limitations for mixing with this product.
difenoconazole + benzovindiflupyr (Aprovia Top)	7+3	10.5 to 13.5 fl oz/acre	0	0.5	Do not make more than 2 consecutive applications before alternating to a non-Group 7 fungicide. Limit of 53.6 fl oz/acre/season. Limits of each a.i. application – see label. Use of a spreading adjuvant is recommended.
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/acre	0	0.5	Limit of 80 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action. Limits of each a.i. application – see label.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	7.6 fl oz/acre	3	0.5	**DISEASE SUPPRESSION ONLY.** Do not exceed 5 applications or 27.1 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
flutriafol (Rhyme)	3	5 to 7 fl oz/acre	0	0.5	Do not exceed 4 applications or 28 fl oz of product/acre/season.
fluxapyroxad + pyraclostrobin (Priaxor Xemium)	7+11	4 to 8 fl oz/acre	7	0.5	Limit of 24 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
famoxadone + cymoxanil (Tanos)	11+27	8 oz/acre	3	0.5	Limit of 72 fl oz/acre/12-month period. Do not make more than one application before alternating to a fungicide with a different mode of action. **NOTE: Must be tank-mixed with a contact fungicide that has a different mode of action.**
mancozeb (various)	M3	See label	5	1	See label for rates.
mancozeb + azoxystrobin (Dexter Max)	M3+11	0.8 to 1.6 lb/acre	5	1	For states East of the Mississippi including Mississippi, do not exceed 12 lb of product/acre/season. States West of Mississippi use 0.8 to 1.1 lb/acre and do not exceed 9.14 lb of product/acre/season. Do not exceed 12 lb of product/acre/season. Do not make more than 1 application before alternation with a fungicide not in Group 11. On fresh market tomato, do not tank mix with an adjuvant or an EC formulation. **Tank mixture with dimethoate may cause crop injury**.
mandipropamid + difenoconazole (Revus Top)	40+3	5.5 to 7 fl oz/acre	1	0.5	Limit of 28 fl oz/acre/season. Do not make more than 2 consecutive ap- plications before alternating to a fungicide with a different mode of action. Limits of each a.i. apply – see label.
mefentrifluconazole (Cevya)	3	3 to 5 fl oz/acre	0	0.5	Maximum of 15 fl oz per acre per year.
penthiopyrad (Fontelis 1.67SC)	7	24 fl oz/acre	0	0.5	**DISEASE SUPPRESSION ONLY.** Limit of 72 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	9.2 to 11.4 fl oz/acre	0	0.5	Do not make more than 2 applications of Miravis Prime or other Group 7 and 12 fungicides before alternation with a fungicide that is not in Group 7 or 12. Do not exceed 22.8 fl oz/acre/season. Apply by ground, air, or chemigation.

Table 10-52. Disease Control Products for Tomato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
TOMATO (FIELD) (continued)					
ANTHRACNOSE (*COLLETOTRICHUM*) (continued)					
pyraclostrobin (Cabrio EG)	11	8 to 12 oz/acre	0	0.5	Limit of 96 fl oz/acre/season. Do not make more than 2 applications before alternating to a fungicide with a different mode of action.
tetraconazole (Mettle125ME)	3	6 to 8 fl oz/acre	0	0.5	Make no more than 2 sequential applications before switching to a fungicide with a different mode of action. Can be applied by ground, air, or chemigation. Do not apply more than 16 fl oz or exceed 5 applications of Mettle/acre/year. Do not apply more than 0.125 lb/acre/year of tetraconazole containing products.
trifloxystrobin (Flint Extra, Gem 500SC) (Flint)	11	3 to 3.8 fl oz/acre 3 to 4 oz/acre	3	0.5	**DISEASE SUPPRESSION ONLY.** Seasonal limits apply – see label. Do not make more than 1 application before alternating to a fungicide with a different mode of action.
BACTERIAL SPOT (*XANTHOMONAS*), BACTERIAL SPECK (*PSEUDOMONAS*)					
acibenzolar-*S*-methyl (Actigard 50WG)	21	0.33 to 0.75 oz/ acre	14	0.5	Should only be applied to healthy, actively growing plants. Do not exceed 8 applications/crop/season.
Bacillus mycoides isolate J (LifeGard WG)		4.5 oz/100 gal	0	4 hr	Apply before or immediately after transplant. Repeat on a 7-day interval.
bacteriophage (AgriPhage)	NC	3 to 8 oz/9,600 sq ft	0	0	Consult your vegetable Extension Specialist for information on requirements needed to use bacteriophage. Bacteriophages are most effective when applied during or after last watering of the day.
copper (various)	M1	See label	0	0	Use a full rate of fixed copper in combination with mancozeb for best results.
mancozeb (various)	M3	See label	5	1	For states East of the Mississippi, use 1.5 to 3 lb of product/ acre. States West of the Mississippi use 1.5 to lb of product/ acre. **NOTE: Use a full rate of fixed copper in combination with mancozeb. Mancozeb alone does not control bacteria.**
GRAY MOLD (*BOTRYTIS*)					
boscalid (Endura 70 WG)	7	9 to 12.5 oz/acre	0	0.5	Limit of 25 oz/acre/season. Do not make more than 2 consecutive applications and no more than 2 applications/crop/ year.
chlorothalonil (various)	M5	See label	0	0.5	Refer to individual labels for rates and restrictions.
chlorothalonil + cymoxanil (Ariston)	M5+27	1.9 pt/acre	3	0.5	Limit of 17.5 pt/acre/12-month period. If mixing with copper, check copper label for limitations.
cyprodinil + fludioxonil (Alterity 62.5WG, Switch 62.5WG)	9+12	11 to 14 oz/acre	0	0.5	Limit of 56 oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action for 2 applications. Limits of each a.i. application – see label.
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/ acre	0	0.5	Limit of 80 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	11.2 fl oz/acre	1	0.5	See label for limits on application amounts per season. Do not make more than 2 applications of Group 7 or 9 fungicides without switching to a different mode of action. **NOT REGISTERED FOR USE IN LA.**
fluopyram + trifloxystrobin (Luna Sensation)	7+11	7.6 fl oz/acre	3	0.5	Do not exceed 5 applications or 27.1 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with different mode of action. Limits of each a.i. application – see label.
fluxapyroxad + pyraclostrobin (Priaxor Xemium)	7+11	4 to 8 fl oz/acre	7	0.5	**DISEASE SUPPRESSION ONLY**. Limit of 24 fl oz and 3 applications/acre/ season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
penthiopyrad (Fontelis 1.67SC)	7	16 to 24 fl oz/ acre	0	0.5	Limit of 72 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	11.4 fl oz/acre	0	0.5	**DISEASE SUPPRESSION ONLY.** Do not make more than 2 applications of Miravis Prime or other Group 7 and 12 fungicides before alternation with a fungicide that is not in Group 7 or 12. Do not exceed 22.8 fl oz/acre/season. Apply by ground, air, or chemigation.

Table 10-52. Disease Control Products for Tomato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
TOMATO (FIELD) (continued)					
GRAY MOLD (*BOTRYTIS*) (continued)					
pyraclostrobin (Cabrio EG)	11	12 to 16 oz/acre	0	0.5	**DISEASE SUPPRESSION ONLY**. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action. Do not exceed 96 oz/acre/season.
pyrimethanil (Scala SC)	9	7 fl oz/acre	1	0.5	Limit of 35 fl oz/acre/season.
BUCKEYE ROT AND PHYTOPHTHORA FRUIT ROT (*PHYTOPHTHORA* SPP.)					
azoxystrobin (various)	11	See label	0	4 h	Do not make more than one application before alternating to a fungicide with a different mode of action.
azoxystrobin + chlorothalonil (Quadris Opti)	11+M5	1.6 pt/acre	0	0.5	Limit of 5 applications of any Group 11 fungicide. Do not make more than 1 application before alternating to a fungicide with a different mode of action. Do not apply earlier than 21 days after transplant.
famoxadone + cymoxanil (Tanos)	11+27	8 oz/acre	3	0.5	**DISEASE SUPPRESSION ONLY**. Do not make more than 1 application before alternating to a fungicide with a different mode of action. **NOTE: Must be tank- mixed with a contact fungicide that has a different mode of action.**
mancozeb + azoxystrobin (Dexter Max)	M3+11	0.8 to 1.6 lb/acre	5	1	For states East of the Mississippi and including Mississippi, do not exceed 12 lb of product/acre/season. States West of Mississippi use 0.8 to 1.1 lb/acre and do not exceed 9.14 lb of product/acre/season. Do not make more than 1 application before alternation with a fungicide not in Group 11. On fresh market tomato, do not tank-mix with an adjuvant or an EC formulation. **Tank mixture with dimethoate may cause crop injury.**
mancozeb + zoxamide (Gavel 75DF)	M3+22	1.5 to 2 lb/acre	5	2	For states East of Mississippi, do not exceed 16 lb/acre/year. States West of Mississippi, do not exceed 8 lb/acre/year.
mefenoxam + copper hydroxide (Ridomil Gold Copper)	4+M3	2 lb/acre	14	2	Tank mix with 0.8 lb a.i./acre of either maneb or mancozeb. Make up to 3 applications; alternate with full rate of protectant.
oxathiapiprolin + chlorothalonil (Orondis Opti)	49+M5	1.75 to 2.5 pt/acre	0	0.5	Do not make more than 2 consecutive applications before alternating to a fungicide with different mode of action and no more than 6 total applications/season. Do not exceed 10 pints of product/acre/year. Do not mix soil applications and foliar applications. See labels for application limits.
oxathiapiprolin + mefenoxam (Orondis Gold)	49+4	28 to 55 fl oz/acre	7	4h	Apply at-plant by in-furrow, transplant water, banded surface spray, or drip irrigation. Do not follow soil applications with foliar applications with any product containing FRAC 49 fungicide. Do not make more than one soil application per crop. Not for use in nursery production of transplants. **NOT REGISTERED FOR USE in FL, GA, or MS.**
oxathiapiprolin + mandipropamid (Orondis Ultra)	40+49	5.5 to 8.0 fl oz/acre	1	4h	Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action and no more than 6 total applications/season. Do not exceed 32 fl oz of product/acre/year. Do not mix soil applications and foliar applications. See labels for application limits.
DAMPING-OFF (*PYTHIUM)*					
fosetyl-Al (Aliette WDG, Linebacker WDG)	P7	2.5 to 5 lb/acre	14	0.5	Do not tank mix with copper. Do not exceed 20 lb product/season. Check label for specific counties in each state where use is prohibited
mefenoxam (various)	4	See label	7	2	Apply uniformly to soil at time of planting. Incorporate mechanically if rain- fall is not expected before seeds germinate. A second application may be made up to 4 weeks before harvest. See labels for application limits.
oxathiapiprolin + mefenoxam (Orondis Gold)	49+4	28 to 55 fl oz/acre	7	4 h	Apply at-plant by in-furrow, transplant water, banded surface spray, or drip irrigation. Do not follow soil applications with foliar applications with any product containing FRAC 49 fungicide. Do not make more than one soil application per crop. Not for use in nursery production of transplants. See label for season limits.
phosphorous acid, mono- and dipotassium salts (K-Phite 7LP)	P7	2 to 4 qt/acre (chemigation, soil application) See label for other application types	0	4 h	Do not apply at less than 3-day intervals. Do not apply to plants when plants will remain wet for longer than 4 hours.

Table 10-52. Disease Control Products for Tomato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
TOMATO (FIELD) (continued)					
DAMPING-OFF (*PYTHIUM*) (continued)					
propamocarb (Previcur Flex)	28	1.5 pt/acre	5	0.5	Limit of 7.5 pt/acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action.
GRAY LEAF SPOT (*STEMPHYLIUM* SPP.)					
azoxystrobin + difenoconazole (Quadris Top)	11+3	8 fl oz/acre	0	0.5	Do not apply until 21 days after transplanting or 35 days after seeding. Limit of 47 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action. See label for tank mix cautions.
chlorothalonil (various)	M5	See label	0	0.5	Refer to individual labels for rates and restrictions.
difenoconazole + benzovindiflupyr (Aprovia Top)	7+3	10.5 to 13.5 fl oz/acre	0	0.5	Do not make more than 2 applications before alternating to a non-Group 7 fungicide. See label for application intervals and limits per season. Use of a spreading adjuvant is recommended.
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/acre	0	0.5	Limit of 80 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	7.6 fl oz/acre	3	0.5	Do not exceed 5 applications or 27.1 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a difference mode of action.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	11.2 fl oz/acre	1	0.5	See label for limits on application amounts per season. Do not make more than 2 applications of Group 7 or 9 fungicides without switching to a different mode of action. **NOT REGISTERED FOR USE IN LA.**
mancozeb (various)	M3	See label	5	1	See label for limits on application amounts per season.
mancozeb + azoxystrobin (Dexter Max)	M3+11	0.8 to 1.6 lb/acre	5	1	For states East of the Mississippi including Mississippi, do not exceed 12 lb of product/acre/season. States West of Mississippi use 0.8 to 1.1 lb/acre and do not exceed 9.14 lb of product/acre/season. Do not exceed 12 lbs of product/acre/season. Do not make more than 1 application before alternating to a fungicide not in Group 11. On fresh market tomato, do not tank mix with an adjuvant or an EC formulation. **Tank mixture with dimethoate may cause crop injury.**
mancozeb + copper (ManKocide)	M3+M1	1 to 3 lb/acre	5	2	Limit of 58 lb/acre/season East of the Mississippi River.
mancozeb + zoxamide (Gavel 75DF)	M3+22	1.5 to 2 lb/acre	5	2	Limit of 16 lb/acre/season East of the Mississippi River.
mandipropamid + difenoconazole (Revus Top)	40+3	5.5 to 7 fl oz/acre	1	0.5	Limit of 28 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	9.2 to 11.4 fl oz/acre	0	0.5	Do not make more than two applications of Miravis Prime or other Group 7 and 12 fungicides before alternation with a fungicide that is not in Group 7 or 12. Do not exceed 22.8 fl oz/acre/season. Apply by ground, air, or chemigation.
tetraconazole (Mettle125 ME)	3	6 to 8 fl oz/acre	0	0.5	Make no more than 2 sequential applications before switching to a fungicide with a different mode of action. Can be applied by ground, air, or chemigation. Do not apply more than 16 fl oz or exceed 5 applications of Mettle/acre/year. Do not apply more than 0.125 lb/acre/year of tetraconazole containing products.
trifloxystrobin (Flint Extra, Gem 500SC) (Flint)	11	 3.8 fl oz/acre 4 oz/acre	3	0.5	Season limits apply – see label. Do not make more than 1 application before alternating to a fungicide with a different mode of action.
EARLY BLIGHT (*ALTERNARIA*), SEPTORIA LEAF SPOT (*SEPTORIA*), AND TARGET SPOT (*CORYNESPORA*)					
azoxystrobin (various)	11	5 to 6.2 fl oz/acre	0	4 hr	Limit of 37 fl oz/acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action. **NOTE: Under high temperatures, azoxystrobin in combination with some additives or adjuvants may cause crop injury.**
azoxystrobin + chlorothalonil (Quadris Opti)	11+M5	1.6 pt/acre	0	0.5	Must alternate with a non-FRAC code 11; use of an adjuvant may cause phytotoxicity. Do not make more than 5 applications of a Group 11 fungicide/acre/season.

Table 10-52. Disease Control Products for Tomato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
TOMATO (FIELD) (continued)					
EARLY BLIGHT (*ALTERNARIA*), SEPTORIA LEAF SPOT (*SEPTORIA*), AND TARGET SPOT (*CORYNESPORA*) (continued)					
azoxystrobin + difenoconazole (Quadris Top)	11+3	8 fl oz/acre	0	0.5	Do not apply until 21 days after transplanting or 35 days after seeding. Limit of 47 fl oz per acre per season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
azoxystrobin + flutriafol (Topguard EQ)	11+3	4 to 8 fl oz/acre	0	0.5	Do not use adjuvants or EC formulated tank mix partners on fresh market tomatoes. Do not exceed 4 applications per year. Limits on both a.i.' s apply - see label.
chlorothalonil (various)	M5	See label	0	0.5	Refer to individual labels for rates and restrictions.
chlorothalonil + cymoxanil (Ariston)	M5+27	1.9 pt/acre	3	0.5	Limit of 17.5 pt/acre/12-month period. If mixing with copper, check copper label for limitations.
cyprodinil + fludioxonil (Alterity 62.5WG, Switch 62.5WG)	9+12	11 to 14 oz/acre	0	0.5	Limit of 56 oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with different mode of action for two applications. **For early blight control only.**
difenoconazole + benzovindiflupyr (Aprovia Top)	7+3	10.5 to 13.5 fl oz/ acre	0	0.5	Do not make more than 2 consecutive applications before alternating a non-Group 7 fungicide. See label for application intervals and limits per season. Use of a spreading adjuvant is recommended.
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz	0	0.5	Limit of 80 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
famoxadone + cymoxanil (Tanos)	11+27	6 to 8 oz/acre	3	0.5	Limit of 72 fl oz/acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action. **Must be tank-mixed with a contact fungicide that has a different mode of action. For Septoria leaf spot and target spot use 8 oz/acre.**
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz/ acre	14	0.5	Limit of 24.6 fl oz/acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action. **NOT labeled for target spot control.**
fluopyram + trifloxystrobin (Luna Sensation)	7+11	5 to 7.6 fl oz/acre	3	0.5	Do not exceed 5 applications or 27.1 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action. **Use 7.6 fl oz rate for gray leaf spot and target spot**.
fluopyram + pyrimethanil (Luna Tranquility)	7+9	11.2 fl oz/acre	1	0.5	See label for limits on application amounts/season. Do not make more than 2 applications of Group 7 or 9 fungicides before alternating to a fungicide with a different mode of action. **NOT REGISTERED FOR USE IN LA.**
fluoxastrobin (Aftershock, Evito 480SC)	11	2.0 to 5.7 fl oz/ acre	3	0.5	Limit of 22.8 fl oz/acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action. **Controls target spot and early blight only**.
flutriafol (Rhyme)	3	5 to 7 fl oz/acre	0	0.5	Tank mix with mancozeb for improved early blight control. Do not exceed more than 4 applications or 28 fl oz product/acre/ season. **Not labeled for Septoria leaf spot control.**
fluxapyroxad + pyraclostrobin (Priaxor Xemium)	7+11	4 to 8 fl oz/acre	0	0.5	Limit of 24 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
mancozeb (various)	M3	See label	5	1	**See label.**
mancozeb + azoxystrobin (Dexter Max)	M3+11	0.8 to 1.6 lb/acre	5	1	For states East of the Mississippi and including Mississippi, do not exceed 12 lb of product/acre/season. States West of Mississippi use 0.8 to 1.1 lb/ acre and do not exceed 9.14 lb of product/acre/season. Do not exceed 12 lb of product/ acre/ season. Do not make more than 1 application before alternating to a fungicide not in Group 11. On fresh market tomato, do not tank mix with an adjuvant or an EC formulation. Tank mixture with dimethoate may cause crop injury. **For target spot control East of the Mississippi, use highest rate.**
mancozeb + zoxamide (Gavel 75DF)	M3+22	1.5 to 2 lb/acre	5	2	For states East of the Mississippi, do not exceed 16 lb/acre/ year. States West of the Mississippi do not exceed 8 lb/acre/ year. **Not labeled for target spot.**

Table 10-52. Disease Control Products for Tomato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
TOMATO (FIELD) (continued)					
EARLY BLIGHT (*ALTERNARIA*), SEPTORIA LEAF SPOT (*SEPTORIA*), AND TARGET SPOT (*CORYNESPORA*) (continued)					
mandipropamid + difenoconazole (Revus Top)	40+3	5.5 to 7 fl oz/acre	1	0.5	Limit of 28 fl oz/acre/season. Do not apply more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
mefentrifluconazole (Cevya)	3	3 to 5 fl oz/acre	0	0.5	Maximum of 15 fl oz/acre/year.
penthiopyrad (Fontelis 1.67SC)	7	16 to 24 fl oz/acre	0	0.5	Limit of 72 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
propamocarb (Previcur Flex)	28	0.7 to 1.5 pt/acre	5	0.5	Limit of 7.5 pt/acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action. Tank-mix with a compatible fungicide for optimal early blight control. **For early blight control only.**
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	9.2 to 11.4 fl oz/ acre	0	0.5	Do not make more than two applications of Miravis Prime or other Group 7 and 12 fungicides before alternation with a fungicide that is not in Group 7 or 12. Do not exceed 22.8 fl oz/ acre/season. Apply by ground, air, or chemigation.
pyraclostrobin (Cabrio EG)	11	8 to 12 oz/acre	0	0.5	Limit of 96 fl oz/acre/season. Do not make more than 2 applications before alternating to a fungicide with a different mode of action.
pyrimethanil (Scala SC)	9	7 fl oz/acre	1	0.5	Limit of 35 fl oz/acre/season. Use only in a tank-mix with another fungicide recommended for early blight. **For early blight control only.**
tetraconazole (Mettle125 ME)	3	6 to 8 fl oz/acre	0	0.5	Make no more than 2 sequential applications before switching to a fungicide with a different mode of action. Can be applied by ground, air, or chemigation. Do not apply more than 16 fl oz or exceed 5 applications of Mettle per acre per year. Do not apply more than 0.125 lb/acre/year of tetraconazole containing products.
trifloxystrobin (Flint Extra, Gem 500SC) (Flint)	11	3 to 3.8 fl oz/acre 2 to 4 oz/acre	3	0.5	Limit of 16 fl oz or 5 applications/acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action**. Not labeled for target spot. Disease suppression for Septoria leaf spot.**
zinc dimethyldithiocarbamate (Ziram 76DF)	M3	3 to 4 lb/acre	7	2	Limit of 24 lb per acre per season. **DO NOT USE ON CHERRY TOMATOES. For early blight and Septoria leaf spot only.**
zoxamide + chlorothalonil (Zing!)	22+M3	36 fl oz/acre	5	0.5	Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action. See label for application limits. **For early blight and Septoria leaf spot only.**
POWDERY MILDEW (*LEVEILULLA*, *OIDIUM*)					
azoxystrobin (various)	11	5 to 6.2 fl oz/acre	0	4 hr	Limit of 37 fl oz/acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action. **NOTE: Under high temperatures, azoxystrobin in combination with some additives or adjuvants may cause crop injury.**
azoxystrobin + chlorothalonil (Quadris Opti)	11+M3	1.6 pt/acre	0	0.5	Must alternate with a non-FRAC code 11; use of an adjuvant may cause phytotoxicity. Do not make more than 5 applications of a Group11 fungicide/acre/season.
azoxystrobin + difenoconazole (Quadris Top)	11+3	8 fl oz/acre	0	0.5	Do not apply until 21 days after transplanting or 35 days after seeding. Limit of 47 fl oz/acre/season. Make no more than 2 consecutive applications before alternating to a fungicide with a different mode of action. See label for tank-mix cautions.
azoxystrobin + flutriafol (Topguard EQ)	11+3	4 to 8 fl oz/acre	0	0.5	Do not use adjuvants or EC formulated tank-mix partners on fresh market tomatoes. Do not exceed 4 applications/year. Limits on both a.i. apply-see label.
chlorothalonil (various)	M5	See label	0	0.5	Refer to individual labels for rates and restrictions.
cyflufenamid (Fastback)	U6	4 oz/acre	0	4 hr	Make no more than 3 applications/year. Minimum application interval is 14 days.
cyprodinil + fludioxonil (Alterity 62.5WG, Switch 62.5WG)	9+12	11 to 14 oz/acre	0	0.5	Limit of 56 oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with different mode of action for 2 applications

Table 10-52. Disease Control Products for Tomato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
TOMATO (FIELD) (continued)					
POWDERY MILDEW (*LEVEILULLA*, *OIDIUM*) (continued)					
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz	0	0.5	Limit of 80 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
difenoconazole + benzovindiflupyr (Aprovia Top)	7+3	10.5 to 13.5 fl oz/ acre	0	0.5	Do not make more than 2 consecutive applications before alternating a non-Group 7 fungicide. See label for application intervals and limits per season. Use of a spreading adjuvant is recommended.
fluopyram + trifloxystrobin (Luna Sensation)	7+11	5 to 7.6 fl oz/acre	3	0.5	Do not exceed 5 applications or 27.1 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action. **Use 7.6 fl oz rate for gray leaf spot and target spot**.
flutriafol (Rhyme)	3	5 to 7 fl oz/acre	0	0.5	Tank-mix with mancozeb for improved disease control. Use lower rate if tank mixed. Do not exceed 4 applications/year or more than 28 fl oz of product/acre/year.
fluxapyroxad + pyraclostrobin (Priaxor Xemium)	7+11	4 to 8 fl oz/acre	7	0.5	Limit of 24 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
mancozeb + azoxystrobin (Dexter Max)	M3+11	1.6 lb/acre	5	1	Do not exceed 12 lb of product/acre/season. Do not make more than 1 application before alternating to a fungicide not in Group 11. On fresh market tomato, do not tank-mix with an adjuvant or an EC formulation. **Tank mixture with dimethoate may cause crop injury.**
mefentrifluconazole (Cevya)	3	3 to 5 fl oz/acre	0	0.5	Maximum of 15 fl oz/acre/year.
myclobutanil (various)	3	See label	1	0	Spray weekly beginning at first sign of disease. Do not apply more than 1.25 lb/ acre. Observe a 30-day plant back interval between last application and planting new crop.
penthiopyrad (Fontelis 1.67SC)	7	16 to 24 fl oz/acre	0	0.5	Limit of 72 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
pyraclostrobin (Cabrio EG)	11	8 to 16 oz/acre	0	0.5	Limit of 96 fl oz/acre/season. Do not make more than 2 applications before alternating to a fungicide with a different mode of action.
pyriofenone (Prolivo 300SC)	50 (U08)	4 to 5 fl oz	0	4 hr	Do not exceed 16 fl oz/acre/year. Do not make more than 2 sequential applications of Prolivo or of another FRAC 50-containing fungicide before alternating to a fungicide with a different mode of action. Do not exceed 4 applications/year.
pydiflumetofen + fludioxonil (Miravis Prime)	7+12	9.2 to 11.4 fl oz/ acre	0	0.5	Do not make more than two applications of Miravis Prime or other Group 7 and 12 fungicides before alternation with a fungicide that is not in Group 7 or 12. Do not exceed 22.8 fl oz/ acre/season. Apply by ground, air, or chemigation.
tetraconazole (Mettle125 ME)	3	6 to 8 fl oz/acre	0	0.5	Make no more than 2 sequential applications before switching to a fungicide with a different mode of action. Can be applied by ground, air, or chemigation. Do not apply more than 16 fl oz or exceed 5 applications of Mettle per acre per year. Do not apply more than 0.125 lb/acre/year of tetraconazole containing products.
trifloxystrobin (Flint Extra, Gem 500SC)	11	3.0 to 3.8 fl oz/ acre	3	0.5	**DISEASE SUPPRESSION ONLY.** Do not exceed 16 fl oz/acre/ crop or 5 applications per acre per season. Do not exceed 1 application before switching to a fungicide with a different mode of action.
tolfenpyrad (Torac)	39	21 fl oz/acre	1	0.5	**DISEASE SUPPRESSION ONLY**. Do not exceed 42 fl oz/ acre/crop. Do not exceed 2 applications/crop cycle and do not exceed 4 applications/ year. **Provides SUPPRESSION of powdery mildew.**
sulfur (various)	M2	See label	See label	1	Follow labels. **May cause leaf burn if used under high temperatures.**

Table 10-52. Disease Control Products for Tomato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
TOMATO (FIELD) (continued)					
LATE BLIGHT (*PHYTOPHTHORA INFESTANS*)					
azoxystrobin (various)	11	6.2 fl oz/acre	0	4 hr	Limit of 37 fl oz/acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action. **NOTE: Apply at 5- to 7-day intervals for effective late blight management.**
chlorothalonil (various)	M5	See label	0	0.5	Refer to individual labels for rates and restrictions.
azoxystrobin + chlorothalonil (Quadris Opti)	11+M5	1.6 pts/acre	0	0.5	Must alternate with a non-FRAC code 11; use of an adjuvant may cause phytotoxicity. Do not make more than 5 applications of a Group11 fungicide/acre/season.
azoxystrobin + flutriafol (Topguard EQ)	11+3	4 to 8 fl oz/acre	0	0.5	Do not use adjuvants or EC formulated tank-mix partners on fresh market tomatoes. Do not exceed 4 applications/year. Limits on both a.i.'s apply-see label.
cymoxanil + chlorothalonil (Ariston)	27+M5	1.9 to 3.0 pts/acre	3	0.5	Limit of 17.5 pints /acre/12-month period. Check copper labels for specific precautions and limitations for mixing with this product.
cyazofamid (Ranman 400SC)	21	2.1 to 2.75 fl oz/acre	0	0.5	Limit of 16.5 fl oz/acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action.
cymoxanil (Curzate 60DF)	27	3.2 to 5 oz/acre	3	0.5	Limit of 30 oz/acre/12-month period. Use only in combination with a labeled rate of a protectant fungicide. If late blight is present, use 5 oz/acre on a 5-day sched ule. **NOT REGISTERD FOR USE IN LA.**
dimethomorph (Forum 4.18F)	40	6 fl oz/acre	4	0.5	Limit of 30 fl oz and 5 applications/acre/season. Performance is improved if tank- mixed with another fungicide with a different mode of action.
dimethomorph + ametoctradin (Zampro)	40+45	14 fl oz/acre	4	0.5	Limit of 42 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action. The addition of a spreading or penetrating adjuvant is recommended to improve product performance.
fenamidone (Reason 500SC)	11	5.5 to 8.2 fl oz/ acre	14	0.5	Limit of 24.6 fl oz/acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action.
fluopicolide (Presidio 4F)	43	3 to 4 fl oz/acre	2	0.5	Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action. Use only in combination with a labeled rate of another fungicide product with a different mode of action.
fluoxastrobin (Aftershock, Evito 480 SC)	11	5.7 fl oz/acre	3	0.5	**DISEASE SUPPRESSION ONLY**. Limit of 22.8 fl oz/ acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action.
fluxapyroxad + pyraclostrobin (Priaxor 500 SC)	7+11	8 fl oz/acre	7	0.5	**DISEASE SUPPRESSION ONLY**. Limit of 24 fl oz/acre/ season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
mancozeb (various)	M3	See label	5	1	
mancozeb + azoxystrobin (Dexter Max)	M3+11	0.8 to 1.6 lb/acre	5	1	For states East of the Mississippi and including Mississippi, do not exceed 12 lb of product/acre/season. States West of Mississippi use 0.8 to 1.1 lb/ acre and do not exceed 9.14 lb of product/acre/season. Do not exceed 12 lb of product/ acre/season. Do not make more than 1 application before alternating to a fungicide not in Group 11. On fresh market tomato, do not tank mix with an adjuvant or an EC formulation. **Tank mixture with dimethoate may cause crop injury.**
mancozeb + copper hydroxide (ManKocide)	M3+M1	1 to 3 lb/acre	5	2	Apply at 7- to 10-day interval.
mancozeb + zoxamide (Gavel 75DF)	M3+22	1.5 to 2 lb/acre	5	2	For states East of the Mississippi River, do not exceed 16 lb/ acre/year. States West of the Mississippi River, do not exceed 8 lb/acre/year.
mandipropamid + difenoconazole (Revus Top)	40+3	5.5 to 7 oz/acre	1	0.5	Limit of 28 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to fungicide with different mode of action.

Table 10-52. Disease Control Products for Tomato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
TOMATO (FIELD) (continued)					
LATE BLIGHT (*PHYTOPHTHORA INFESTANS*) (continued)					
mefenoxam + chlorothalonil (Ridomil Gold Bravo)	4+M5	2.5 pt/acre	5	2	See label for application limits.
mefenoxam + mancozeb (Ridomil Gold MZ WG)	4+M3	2.5 lb/acre	5	2	Do not make more than 3 applications or 7.5 lb/acre/season of Ridomil Gold MZ.
oxathiapiprolin + chlorothalonil (Orondis Opti)	49+M	1.75 to 2.5 pints/acre	0	0.5	Do not make more than 2 sequential applications before alternating to a fungicide with a different mode of action and no more than 6 total applications on multiple crops in the same year. Do not mix soil applications and foliar applications. See label for application limits.
oxathiapiprolin + mandipropamid (Orondis Ultra)	49+40	5.5 to 8.0 fl oz/ acre	1	4 hr	Do not make more than 2 sequential applications before alternating to a fungicide with a different mode of action and no more than 6 total applications on multiple crops per season. Limit applications apply—see label. Do not mix soil applications and foliar applications.
pyraclostrobin (Cabrio EG)	11	8 to 16 oz/acre	0	0.5	Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action. Do not exceed 96 oz/acre/season.
propamocarb (Previcur Flex)	28	0.7 to 1.5 pt/acre	5	0.5	Limit of 7.5 pt/acre/season. Do not make more than 1 application before alternating to a fungicide with a different mode of action.
trifloxystrobin (Flint Extra, Gem 500SC) (Flint)	11	3.8 fl oz/acre 4 oz/acre	3	0.5	Season limits apply – see label. Must tank mix and alternate Flint Extra with a protectant for late blight control.
zoxamide + chlorothalonil (Zing!)	22+M5	36 fl oz/acre	5	0.5	Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action. Do not tank-mix with another fungicide if the target pest is only late blight. Tank-mix only if a partner product is required to control other diseases.
LEAF MOLD (*FULVIA FULVA = PASSALORA FULVA*)					
azoxystrobin + difenoconazole (Quadris Top)	11+3	8 fl oz/acre	0	0.5	Do not apply until 21 days after transplanting or 35 days after seeding. Limit of 47 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to fungicide with different mode of action.
chlorothalonil + cymoxanil (Ariston)	M5+27	1.9 pt/acre	3	0.5	Limit of 17.5 pt/acre/12-month period. If mixing with copper, check copper label for limitations.
difenoconazole + benzovindiflupyr (Aprovia Top)	7+3	10.5 to 13.5 fl oz/acre	0	0.5	Do not make more than 2 applications before alternating to a non-Group 7 fungicide. See label for application intervals and limits per season. Use of a spreading adjuvant is recommended.
difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/acre	0	0.5	Limit of 80 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action.
difenoconazole + mandipropamid (Revus Top)	3+40	5.5 to 7 fl z/acre	1	0.5	Make no more than 2 consecutive applications before switching to another fungicide with a different mode of action. See label for application limits
famoxadone + cymoxanil (Tanos)	11+27	8 oz/acre	3	0.5	Do not make more than 1 application before alternating to a fungicide with a different mode of action. **NOTE: Must be tank-mixed with a contact fungicide that has a different mode of action.** See label for application limits.
mancozeb (various)	M3	See label	5	1	
mancozeb + azoxystrobin (Dexter Max)	M3+11	0.8 to 1.6 lb/acre	5	1	For states East of the Mississippi and including Mississippi, do not exceed 12 lb of product/acre/season. States West of Mississippi use 0.8 to 1.1 lb/ acre and do not exceed 9.14 lb of product/acre/season. Do not exceed 12 lb of product/ acre/season. Do not make more than 1 application before alternation to a fungicide not in Group 11. On fresh market tomato, do not tank mix with an adjuvant or an EC formulation. **Tank mixture with dimethoate may cause crop injury**.
mancozeb + copper hydroxide (ManKocide 61DF)	M3+M1	1 to 3 lb/acre	5	2	Apply at 7- to 10-day intervals.

Table 10-52. Disease Control Products for Tomato

Disease/Material	FRAC Code	Rate of Material Formulation	Minimum Days		Method, Schedule, and Remarks
			Harv.	Reentry	
mancozeb + zoxamide (Gavel 75DF)	M3+22	1.5 to 2 lb/acre	5	2	For states East of the Mississippi River, do not exceed 16 lb/acre/year. States West of the Mississippi River, do not exceed 8 lb/acre/year.
TOMATO (FIELD) (continued)					
SOUR ROT (*GEOTRICHUM CANDIDUM*)					
fludioxonil + propiconazole (Chairman)	3+12	See label	0	0	Use as a post-harvest dip, drench, or high-volume spray to control certain post-harvest rots. See label for details.
propiconazole (various)	3	See label	0	0	Use as a post-harvest dip, drench, or high-volume spray to control certain post-harvest rots. See label for details.
fludioxonil (Scholar SC)	12	See label	0	0	Use as a post-harvest dip, drench, or high-volume spray to control certain post-harvest rots. See label for details.
SOUTHERN BLIGHT (*ATHELIA ROLFSII = SCLEROTIUM ROLFSII*)					
difenoconazole + benzovindiflupyr (Aprovia Top)	7+3	10.5 to 13.5 fl oz/acre	0	0.5	**DISEASE SUPPRESSION ONLY.** Do not make more than 2 applications before alternating to a non-Group 7 fungicide. See label for application intervals and limits per season.
fluoxastrobin (Aftershock, Evito 480SC)	11	2.0 to 5.7 fl oz/acre	3	0.5	**DISEASE SUPPRESSION ONLY.** Begin applications when conditions favor disease development, on 7- to 10-day intervals. Do not make more than 1 application before alternating to a fungicide with a different mode of action. Do not apply more than 22.8 fl oz/acre/season.
fluxapyroxad + pyraclostrobin (Priaxor Xemium)	7+11	4 to 8 fl oz/100 gal	7	0.5	**DISEASE SUPPRESSION ONLY.** Limit of 24 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action. Do not mix Priaxor with any other products, adjuvants, additives, or nutrients for application to fresh market tomatoes at less than 20 gal/ acre spray volume.
PCNB (Blocker 4F) ***Transplanting***	14	4.5 to 7.5 pt/100 gal; (apply 0.5 pt of solution per plant)	NA	0.5	**Transplanting:** Apply at the time of transplanting for southern blight suppression. In furrow: Apply in 8 to 10 gal of water per acre based on 36-inch row spacing. Limit of 7.5 lb a.i. per acre/season. **MAY CAUSE STUNTING ON TOMATO PLANTS.**
PCNB (Blocker 4F) ***In furrow***	14	1.2 to 1.875 gal/acre (10.6 to 16.7 fl oz/1000 ft of row	NA	0.5	
penthiopyrad (Fontelis 1.67SC)	7	1 to 1.6 fl oz/1000 row ft	0	0.5	Apply as a soil drench to seedling tray or at the time of transplant. See label for application limits.
pyraclostrobin (Cabrio EG)	11	12 to 16 oz/acre	0	4 hr	**DISEASE SUPPRESSION ONLY.** Limit of 96 fl oz/acre/season. Do not make more than 2 applications before alternating to a fungicide with a different mode of action.
TIMBER ROT, WHITE MOLD, OR SCLEROTINIA STEM ROT (*SCLEROTINIA*)					
Coniothyrium minitans strain CON/M/91-08 (Contans WG)		1 to 4 lb/acre	0	4 hr	Apply at crop emergence or crop transplant. Do not tank mix or apply other fungicides within 7 days before or after use.
fluxapyroxad + pyraclostrobin (Priaxor Xemium)	7+11	4 to 8 fl oz/100 gal	7	0.5	**DISEASE SUPPRESSION ONLY.** Limit of 24 fl oz/acre/season. Do not make more than 2 consecutive applications before alternating to a fungicide with a different mode of action. See label for application limits. Do not mix Priaxor with any other products, adjuvants, additives, or nutrients for application to fresh market tomatoes at less than 20 gal/acre spray volume.
pyraclostrobin (Cabrio EG)	11	12 to 16 oz/acre	0	4 hr	**DISEASE SUPPRESSION ONLY.** Limit of 96 fl oz/acre/season. Do not make more than 2 applications before alternating to a fungicide with a different mode of action.

Importance of Alternative Management Practices for Disease Control in Tomato

I. Meadows, Plant Pathologist, North Carolina State University and R. Singh, Plant Pathologist, Louisiana State University Agricultural Center

Table 10-53. Importance of Alternative Management Practices for Disease Control in Tomato

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; NA = not applicable, ND = no data

Strategy	Bacterial canker *	Bacterial speck	Bacterial spot	Bacterial wilt	Buckeye rot	Alternaria stem canker/Early blight	Fusarium wilt	Gray mold (Botrytis)	Late blight	Leaf mold (greenhouse or open field)	Powdery mildew	Septoria leaf spot	Southern blight	Target spot (greenhouse or open field)	Tomato spotted wilt virus **	Tomato yellow leaf curl virus	Verticillium wilt
Use of resistant cultivars	NA	P	P	NA	NA	F	G***	NA	G	P	F	NR	NA	P	G	G	G***
Use of disease-free seed or transplants	G	G	G	NA	NC	NC	NA	NC	NC	F	NC	P	NA	F	NA	G	NA
Use of seed treatments	G	G	G	NA	NC	P	NA	NC	P	F	NA	P	NA	ND	NA	NA	NA
Use of sanitation practices at transplant stage	G	G	G	NA	NC	G	NA	G	NC	F	NC	NC	NA	F	NC	F	NA
Use of grafted rootstocks	NC	NC	NC	G***	NC	NC	G***	NC	NC	NC	NC	NC	NC	NC	NC	NA	NC
Crop rotation (3-4 years) or tomato-free period	F	P	P	F	F	F	F	NC	NC	F	NC	P	F	P	NC	G	F
Control of solanaceous weeds	F	NC	NC	NC	F	F	NC	F	F	F	F	F	NC	F	F	NA	NC
Fertility	NC	NC	NC	NC	NC	F	NC	F	NC	ND	NC	NC	NC	ND	NC	NA	NC
Deep plow	NC	NC	NC	NC	NC	NC	NC	NC	NC	ND	NC	NC	F	ND	NC	NA	NC
Use of cover crops	NC	NC	NC	NC	F	P	NC	NC	NC	ND	NC	NC	NC	ND	NC	NA	NC
Destroy crop residue	F	NC	NC	P	NC	P	F	NC	NC	F	NC	F	F	F	ND	NA	F
Rogue plants	F	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NC
Promote air movement	F	F	F	NC	P	P	NC	F	F	F	P	F	NC	F	NA	NA	NC
Use of plastic or reflective mulches	NC	NC	NC	NC	F	F	NC	NC	NC	NC	NC	F	NC	NC	G	G	NC
Do not handle plants when wet	G	G	G	NC	NC	P	NC	NC	P	F	NC	P	NC	F	NC	NA	NC
Use drip irrigation (avoid overhead irrigation)	F	F	F	NC	P	F	NC	F	F	F	NC	F	NC	F	NC	NA	NC
Use of biological control or biorational products	P	P	F	NC	NC	P	P	P	P	P	P	NC	P	P	NC	F	NC
Use of foliar fungicides/ bactericides	F	F	F	NC	G	G	NC	G	G	G	G	G	NC	F	NA	NA	NC
Use of insecticides	NC	NC	NC	NA	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	F	G	NC
Soil fumigation	NC	NC	NC	NC	F	P	G	NC	NC	NC	NC	NC	G	NC	NC	NA	F

* Bacterial canker (foliar or systemic) is rarely observed on open field grown tomatoes in deep Southern states.

** Tomato spotted wilt virus is transmitted by thrips.

*** Race specific.

Efficacy of Products for Disease Control in Tomato

I. Meadows, Plant Pathologist, North Carolina State University and R. Singh, Plant Pathologist, LSU AgCenter

Table 10-54. Efficacy of Products for Disease Control in Tomato

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

Active ingredient	Product	Fungicide Group[F]	Preharvest Interval (days)	Anthracnose	Bacterial canker (foliar)	Bacterial speck	Bacterial spot	Early blight	Gray mold (*Botrytis*)	Gray leaf spot (*Stemphylium* spp.)	Late blight and Buckeye Rot	Leaf mold (*Fulvia fulva*)	Powdery mildew	*Septoria* leaf spot	Southern blight	Target spot
azoxystrobin[2]	Quadris	11	0	G	NC	NC	ND	E[R]	NC	E	F	NC	E	G	ND	P[R]
azoxystrobin + chlorothalonil	Quadris Opti	11+M	0	G	NC	NC	ND	E[R]	NC	E	F	NC	E	G	ND	P[R]
azoxystrobin + difenoconazole	Quadris Top	11+3	0	ND	NC	NC	NC	G	ND	G	F	ND	G	G	ND	ND
azoxystrobin + flutriafol	Topguard EQ	11+3	0	G	NC	NC	NC	G	ND	G	ND	ND	ND	ND	P	G
acibenzolar-*S*-methyl[9]	Actigard	21	14	P	ND	F	F	NC	NC	NC	NC	NC	NC	NC	NC	NC
bacteriophage	AgriPhage	NG	0	NC	NC	P	P	NC	NC	NC	NC	NC	NC	NC	NC	NC
benzovindiflupyr + difenoconazole	Aprovia Top	7+3	0	ND	NC	NC	NC	G	ND	G	ND	ND	ND	F	P	ND
boscalid	Endura	7	0	ND	NC	NC	NC	G	G	G	NC	ND	ND	ND	NC	P[R]
chlorothalonil	Bravo, Chloronil, Echo, Equus, Initiate	M	0	F	NC	NC	NC	F	F	F	G	F	P	F	NC	F
chlorothalonil + cymoxanil	Ariston	M+27	3	ND	NC	NC	NC	F	F	F	G	F	P	F	NC	F
cyazofamid	Ranman	21	0	NC	NC	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	NC
cymoxanil	Curzate	27	3	NC	NC	NC	NC	NC	NC	NC	F	ND	NC	ND	NC	NC
cyprodinil + fludioxonil	Switch, Alterity	9+12	0	ND	NC	NC	NC	F	F	F	NC	NC	F	NC	ND	NC
dimethomorph	Forum	40	4	NC	NC	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	NC
difenoconazole + cyprodinil	Inspire Super	3+9	0	ND	NC	NC	NC	G	G	G	NC	G	G	F	ND	F
dimethomorph + ametoctradin	Zampro	40+45	4	NC	NC	NC	NC	NC	NC	NC	G	NC	NC	NC	NC	NC
famoxadone + cymoxanil	Tanos	11+27	3	ND	P	P	P	F	NC	F	F	F	ND	F	NC	F[R]
fenamidone	Reason	11	14	ND	NC	NC	NC	F	NC	F	F	NC	ND	P	ND	NC
fixed copper[4]	(various)	M	1	P	F	F	P[R]	F	NC	F	F	F	P	F	NC	NC
fluopicolide	Presidio	43	2	NC	NC	NC	NC	NC	NC	NC	G	NC	NC	NC	NC	NC
fluoxastrobin	Evito 480SC, Aftershock	11	3	ND	NC	NC	NC	E[R]	P	E	F	NC	E[R]	G	F	F[R]
fluopyram + trifloxystrobin	Luna Sensation	7+11	3	ND	NC	NC	NC	G	NC	G	ND	ND	G	ND	ND	ND
fluopyram + pyrimethanil	Luna Tranquility	7+9	1	ND	NC	NC	NC	G	ND	G	ND	ND	G	F	ND	ND
flutriafol	Rhyme	3	0	ND	NC	NC	NC	G	ND	G	ND	ND	ND	ND	P	G
fluxapyroxad + pyraclostrobin	Priaxor	7+11	0	ND	NC	NC	NC	G	P	G	P	G	G	F	F	F
mancozeb	Dithane, Koverall, Manzate, Penncozeb	M	5	F	NC	NC	P	F	P	F	F	F	NC	F	NC	F
mancozeb + fixed copper	ManKocide	M+M	5	F	NC	F	F	F	NC	F	F	F	NC	F	NC	NC
mancozeb + azoxystrobin	Dexter Max	M+11	5	ND	ND	ND	ND	G	ND	G	ND	ND	ND	ND	ND	ND
mancozeb + zoxamide	Gavel	M+22	3	ND	NC	P	P	F	NC	F	F	F	NC	F	NC	NC
mandipropamid + difenoconazole	Revus Top	40+3	1	ND	NC	NC	NC	F	NC	F	G	F	F	F	NC	G
mefenoxam[8]	Ridomil Gold SL	4	7	NC	NC	NC	NC	P	P	P	E[R]	F	NC	F	NC	NC
mefenoxam[8] + chlorothalonil	Ridomil Gold Bravo	4+M	5	NC	NC	NC	NC	P	P	P	E[R]	F	NC	F	NC	NC
mefenoxam + copper	Ridomil Gold/ Copper	4+M	14	NC	NC	NC	NC	NC	NC	NC	E[R]	NC	NC	NC	NC	NC
mefenoxam + mancozeb	Ridomil Gold MZ	4+M	5	NC	NC	NC	NC	NC	NC	NC	G[R]	NC	NC	NC	NC	NC
mono- and dipotassium salts of phosphorous acid	K-Phite 7LP	P07	0	NC	NC	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	NC
myclobutanil	(various)	3	0	ND	NC	NC	NC	NC	NC	NC	NC	NC	G	NC	NC	ND

Table 10-54. Efficacy of Products for Disease Control in Tomato

Scale: E = excellent; G = good; F = fair; P = poor; NC = no control; ND = no data

Active ingredient	Product	Fungicide Group[F]	Preharvest Interval (days)	Anthracnose	Bacterial canker (foliar)	Bacterial speck	Bacterial spot	Early blight	Gray mold (*Botrytis*)	Gray leaf spot (*Stemphylium* spp.)	Late blight and Buckeye Rot	Leaf mold (*Fulvia fulva*)	Powdery mildew	*Septoria* leaf spot	Southern blight	Target spot
oxathiapiprolin + chlorothalonil	Orondis Opti	49+ M05	0	NC	NC	NC	NC	P	NC	P	E	NC	NC	NC	NC	NC
oxathiapiprolin + mefenoxam	Orondis Gold	49+4	7	NC	NC	NC	NC	NC	NC	NC	NA	NC	NC	NC	NC	NC
oxathiapiprolin + mandipropamid	Orondis Ultra	49+40	1	NC	NC	NC	NC	NC	NC	NC	E	NC	NC	NC	NC	NC
penthiopyrad	Fontelis	7	0	ND	NC	NC	NC	G	F	G	NC	ND	F	F	F	F
PCNB	Blocker	14	NA	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	F[11]	NC
phosphonate(aluminum tris)	Aliette WDG	P07	14	NC	NC	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	NC
polyoxin D zinc salt	Ph-D: OSO 5% SC	19	0	ND	ND	ND	ND	F	F	F	ND	ND	F	ND	NC	F
propamocarb	Previcur Flex	28	5	NC	NC	NC	NC	P	NC	P	F	NC	NC	NC	NC	NC
pydiflumetofen + fludioxonil	Miravis Prime	7+12	0	ND	NC	NC	NC	E	ND	E	NC	ND	ND	E	ND	ND
pyraclostrobin	Cabrio	11	0	ND	NC	NC	NC	E[R]	P	E	F	NC	E	G	F	F[R]
pyrimethanil	Scala	9	1	ND	NC	NC	NC	F	F	F	NC	ND	ND	ND	NC	F
streptomycin[5]	Agri-Mycin 17, Ag-Streptomycin, Harbour	25	0	NC	NC	F	F	NC	NC	NC	NC	NC	NC	NC	NC	NC
sulfur[6]	(various)	M	0	ND	NC	NC	NC	NC	NC	NC	NC	NC	F	NC	NC	NC
tetraconazole	Mettle	3	0.5	ND	NC	NC	NC	G	ND	G	NC	ND	E	G	ND	G
tolfenpyrad	Torac	39		ND	NC	NC	NC	ND	ND	ND	NC	ND	E	ND	ND	ND
trifloxystrobin	Flint, Flint Extra	11	3	ND	NC	NC	NC	E[R]	P	E	F	NC	E	G	F	F[R]
zinc dimethyldithiocarbamate[10]	Ziram	M	7	ND	NC	NC	NC	F	NC	F	ND	NC	ND	F	NC	ND
zoxamide + chlorothalonil	Zing!	22+M	5	NC	NC	NC	NC	F	ND	F	F	F	ND	F	NC	ND

[1] Efficacy ratings do not necessarily indicate a labeled use for every disease.
[2] Contact control only; not systemic.
[3] Biological control products consisting of a virus that attacks pathogenic bacteria.
[4] Fixed coppers include: Basicop, Champ, Champion, Citcop, Copper-Count-N, Kocide, Nu-Cop, Super Cu, Tenn-Cop, Top Cop with Sulfur, and Tri-basic copper sulfate.
[5] Streptomycin may only be used on transplants; not registered for field use.
[6] Sulfur may be phytotoxic; follow label carefully.
[7] Curative activity; not systemic.
[8] Curative activity; systemic.
[9] Systemic activated resistance.
[10] Do not use on cherry tomatoes.
[11] Can cause stunting on tomatoes.
[F] To prevent resistance in pathogens, alternate fungicides within a group with fungicides in another group. Fungicides in the "M" group are generally considered "low-risk" with no signs of resistance developing to most fungicides. "NG" indicates that the product has not been classified into a group.
[R] Resistance reported in the pathogen.

Example Spray Programs for Foliar Disease Control in Fresh Market Tomato Production

I. Meadows, Plant Pathologist, North Carolina State University and R. Singh, Plant Pathologist, Louisiana State University Agricultural Center

Table 10-55. Example Spray Programs for Foliar Disease Control in Fresh Market Tomato Production

Week	Program 1	Program 2	Program 3	Program 4 [1]
BEFORE HARVEST (weeks 1 to 8)				
1	mancozeb (M) + copper (M) + Actigard (21)	mancozeb (M) + copper (M) + Actigard (21)	mancozeb (M) + copper (M) + Actigard (21)	mancozeb (M) + copper (M) + Actigard (21)
2	mancozeb (M) + copper (M)	mancozeb (M) + copper (M)	mancozeb (M) + copper (M)	mancozeb (M) + copper (M)
3	mancozeb (M) + Inspire Super (3+9) + Actigard (21)	mancozeb (M) + Priaxor (7+11) + Actigard (21)	mancozeb (M) + Aprovia Top (7+3) OR Luna Tranquility (7+9) + Actigard (21)	mancozeb (M) + strobilurin [1] (11) + Actigard (21)
4	mancozeb (M) + copper (M)	mancozeb (M) + copper (M)	mancozeb (M) + copper (M)	mancozeb (M) + copper (M)
5	mancozeb (M) + Fontelis (7) OR Endura (7) + Actigard (21)	mancozeb (M) + Switch (9+12) + Actigard (21)	mancozeb (M) + Aprovia Top (7+3) OR Luna Tranquility (7+9) + Actigard (21)	mancozeb (M) + Fontelis (7) OR Endura (7) + Actigard (21)
6	mancozeb (M) + copper (M)	mancozeb (M) + copper (M)	mancozeb (M) + copper (M)	mancozeb (M) + copper (M)
7 [2]	mancozeb (M) + Inspire Super (3+9) + Actigard (21)	mancozeb (M) + Priaxor (7+11) + Actigard (21)	mancozeb (M) + Aprovia Top (7+3) OR Luna Tranquility (7+9) + Actigard (21)	mancozeb (M) + strobilurin [1] (11) + Actigard (21)
8 [2]	mancozeb (M) + copper (M)	mancozeb (M) + copper (M)	mancozeb (M) + copper (M)	mancozeb (M) + copper (M)
DURING HARVEST (weeks 9 to 15)				
9	Fontelis (7) OR Endura (7) + chlorothalonil (M)	Switch (9+12) + chlorothalonil (M)	Aprovia Top (7+3) OR Luna Tranquility (7+9) + chlorothalonil (M)	Fontelis (7) OR Endura (7) + chlorothalonil (M)
10	For late blight: Presidio (43) OR Ranman (21) OR Orondis Ultra (49+40) OR Zampro (45+40) OR Revus Top (40+3) For early blight: chlorothalonil (M)			
11 [3]	For late blight: chlorothalonil (M) For early blight: Fontelis (7) OR Endura (7) OR Switch (9+3)			
12 [3]	For late blight: Presidio (43) OR Ranman (21) OR Orondis Ultra (49+40) OR Zampro (45+40) OR Revus Top (40+3) For early blight: chlorothalonil (M)			
13 [3]	For late blight: chlorothalonil (M) For early blight: Fontelis (7) OR Endura (7) OR Switch (9+3)			
14 [3]	Finish season with chlorothalonil			

[1] Resistance to strobilurins is known to occur in the early blight pathogen in NC: if resistance is suspected, use alternate program.

[2] For late season plantings: If late blight is in the area, consider chlorothalonil for late blight control.

[3] Continue early blight program or use Revus Top if early blight pressure is high for weeks 11-14.

For Turnip Greens – see Greens and Leafy Brassicas

For Turnip Roots – see Root Vegetables

For Watermelons – see Cucurbits

Nematode Control in Vegetable Crops

J. Desaeger, Nematologist, University of Florida

Crop losses due to nematodes can be avoided or reduced by using the following management tactics:

1. Practice crop rotation using poor or non-host (cover) crops.
2. Plow out and expose roots immediately after the last harvest.
3. Plow or disk the field two to four times before planting.
4. Use nematode-free planting material.
5. Sample soil and have it assayed for nematodes, preferably at the end of each crop cycle. There is a fee for each sample. Ship sample via DHL, FedEx, or UPS to: State Agency.
6. Where warranted, fumigate or use other nematicides according to guidelines listed on the label. (For fumigation, soil should be warm, well worked, and free from undecomposed plant debris and have adequate moisture for proper diffusion of chemical properties into soil pores.)
7. For in-row application, insert chisels 6 to 8 inches deep and throw a high, wide bed up over it; do not rework rows after fumigating. In deep sand soils, deep shanking (up to 18 inches deep) may give better results.
8. For broadcast treatments, insert chisels 6 to 8 inches deep, and space chisels 12 inches apart for most fumigants; use 5-inch spacing for Vapam.
9. Row rates in this section are stated for rows on 40-inch spacing. For other row spacings, multiply the stated acre rate by the appropriate conversion factor to determine the amount of material applied per acre (Do not alter stated amount per 100-foot row).

This will be a guide to the amount of material to purchase for the acreage you want to treat:

Table 10-56.

Your Row Spacing (inches)	Conversion Factor
24	1.67
26	1.54
28	1.43
30	1.33
32	1.25
34	1.18
36	1.11
38	1.05
40	1.00
42	0.952
44	0.909
46	0.870
48	0.833
5 ft	0.667
6 ft	0.556
7 ft	0.476
8 ft	0.417

For example, if 10 gallons per acre are used on 40-inch rows, for 36-inch rows, it will take 11.1 gallons to treat an acre.

CAUTION: Read labels carefully. Some products have restrictive crop rotations.

Fumigants

New labels require extensive risk mitigation measures including fumigant management plans (FMPs), buffer restrictions, Worker Protection Safety (WPS) standards and other measures. Details are on the labels and see *https://www.epa.gov/soil-fumigants*. Some fumigants are registered on many vegetable crops but with crop or soil-type specific rates; others are registered for specific crops and/or in certain states only. Follow all labels carefully. The label is the law.

Efficacy of Fumigants or Fumigant Combinations for Managing Soilborne Nematodes, Diseases, and Weeds

A. Hajihassani, Nematologist, University of Georgia; J. Desaeger, Nematologist, University of Florida; A. Gorny, Nematologist, North Carolina State University

Table 10-57. Efficacy of Fumigants or Fumigant Combinations for Managing Soilborne Nematodes, Diseases, and Weeds

Scale: ranges from "—" = not effective to "+++++" = most efficacious

	Rate per Treated Acre[2]					
Product	**Volume (gal)**	**Weight (lb)**	**Nematodes**	**Disease**	**Nutsedge**	**Weeds: Annual[1]**
Telone II (1,3-D)	15 to 27	153 to 275	+++++	+	—	—
Telone EC[3]	9 to 24[4]	91 to 242[4]	+++++	+	—	—
Telone C17 (1,3-D + chloropicrin)	32.4 to 42	343 to 445	+++++	+++	+	+
Telone C35 (1,3-D + chloropicrin)	39 to 50	437 to 560	+++++	+++++	+	++
InLine (1,3-D + chloropicrin)[3]	29 to 57.6 (*See Label*)	325 to 645 (*See Label)*	+++++	+++++	+	+++
Pic-Clor 60 (chloropicrin + 1,3-D)	48.6	588	+++++	+++++	+	+++
Pic-Clor 80 (chloropicrin + 1,3-D)	32.4 to 42	343 to 445	++++	+++++	+	+++
Pic-Clor 60 EC[3]	42.6	503	+++++	+++++	+	+++
Metam potassium[5]	30 to 62	318 to 657	+++	+++	+	++++
Metam sodium[5] (MS)	37.5 to 75	379 to 758	+++	+++	+	++++
Chloropicrin + MS[5]	19.5 to 31.5 + 37.5 to 75	275 to 444 + 379 to 758	+++	+++++	++	++++
Chloropicrin	48.6	150 to 350	++	+++++	++	—
Tri-Pic 100[3]	8 to 24	100 to 300	+	+++++	—	—
Dominus (allyl isothiocyanate)[6]	25 to 40[4]	212 to 340[4]	++	+++	+	+++

1 Fumigants with lower efficacy against weeds may require a complementary herbicide or hand-weeding program, although use of virtually impermeable film (VIF) or impermeable film (TIF) may increase weed control, particularly with Telone C35 or Paladin. Refer to the Herbicide Recommendation section of this guide for directions pertaining to herbicide applications. To prevent phytotoxicity, soil should be undisturbed and unplanted for 7- to 14-days after Telone application. How- ever, the planting interval depends upon soil temperature and moisture. Telone can persist for more than 21 days under cool or wet soil conditions.

2 Rates can sometimes be reduced if products are applied with VIF or TIF.

3 Product is formulated for application through drip lines under a plastic mulch; efficacy is dependent on good distribution of the product in the bed profile.

4 Labelled rates are per *broadcast-equivalent* acre, NOT per treated acre.

5 Metam potassium can be Metam KLR, K-Pam, Sectagon K54 or other registered formulations, and should be used in soils with high sodium content. Metam sodium can be Vapam, Sectagon 42, Metam CLR or other registered formulations.

6 Dominus is registered but there is limited experience with the product through university or independent trials in our region; growers may want to consider this on an experimental basis. Planting interval is 10 days. The active ingredient allyl isothiocyanate is like the active ingredient in metam sodium products (methyl isothiocyanate) and is likely to behave in a similar manner with a similar pest control profile.

Management of Soilborne Nematodes with Non-Fumigant Nematicides

J. Desaeger, Nematologist, University of Florida; A. Gorny, Nematologist, North Carolina State University

Nematodes are best managed through an integrated program (IPM). Key management options may include securing advisory/ predictive soil samples, crop rotation, fallow periods, host resistance, soil amendments, flooding, soil solarization, suppressive cover crops, and other options.

Table 10-58. Management of Soilborne Nematodes with Non-Fumigant Nematicides

Material (Product)	Vegetable Crop	Application Method	Rate/Acre	Rate/1000 Ft Row	Schedule and Remarks
ethoprop (Mocap 15G)	Bean (snap & lima)	Band	13 to 20 lb	0.9 to 1.4 lb	Do not place in-furrow or allow granules to contact seed. Incorporate 2 to 4” deep in 12” to 15” band, at planting. Use higher rates for higher nematode populations
		Broadcast	40 to 54 lb	N/A	Do not place in-furrow or allow granules to contact seed. Incorporate 2 to 4” deep no more than 3 days before planting. Use higher rates for higher nematode populations.
	Cabbage	Band	13 lb	0.9 lb	Do not place in-furrow or allow granules to contact seed. Incorporate 2 to 4” deep in 15” band at planting.
		Broadcast	34 lb	N/A	Do not place in-furrow or allow granules to contact seed. Incorporate 2 to 4” deep no more than 1 week before planting.
	Corn (field and sweet)	Band	—	0.75 to 1.0 lb	Incorporate 2 to 4” deep in 12 to 15” band.
		Broadcast	40 lb	N/A	Incorporate 2 to 4” deep no more than 3 days before, to at planting.
	Cucumber	Band	13 lb	2.1 lb	Do not place in-furrow or allow granules to contact seed. Incorporate 2 to 4” deep in 12 to 15” band (7 ft row spacing) at planting.
	Potatoes	Band	20 lb	1.4 lb	For suppression of stubby root nematode populations. Incorporate 2 to 4” deep; Band should be 12” to 15” wide (36” row spacing) at planting; do not apply once seedlings have begun to emerge.
		Broadcast	40 to 60 lb	N/A	For suppression of moderate to heavy stubby root nematode populations; apply within 2 wk before planting; do not apply once seedlings have begun to emerge.
	Sweetpotato	Band only	20 to 26 lb	1.6 to 2.1 lb	Incorporate 2 to 4” deep in centered 12 to 15” band (at least 42” row spacing) 2 to 3 wk before planting. Use no more than one application per season.
ethoprop (Mocap EC)	Potatoes	Band	63.9 fl. oz	4.4 fl. oz	For suppression of stubby root nematode populations. Incorporate 2 to 4” deep; Band should be 12’ wide (36” row spacing) at planting or before crop emergence.
		Broadcast	1 to 1.5 gal	N/A	For suppression of moderate to heavy stubby root nematode populations; apply and immediately incorporate no more than 2 wk before planting or before crop emergence.
	Sweetpotato	Band only	63.5 to 85.9 fl. oz	5.1 to 6.9 fl. oz.	Incorporate 2 to 4” deep in centered 12 to 15” band (at least 42” row spacing) 2 to 3 wk before planting. Use no more than one application per season.
oxamyl (Vydate L)	Carrot, Cucumber, Cantaloupe, Honeydew melon, Watermelon, Squash, Pumpkin, Eggplant, Pepper (bell and non-bell), Sweetpotatoes, Tomatoes	Preplant Foliar, Drip/ soil injection; Chemigation In-furrow	See label	—	Note: Vydate L is labeled for these crops to manage nematodes and certain insects. However, the label varies by crop, method of application and state. Therefore, follow the label carefully for the best method, rate, and timing.
oxamyl (Vydate C-LV)	Potatoes	Foliar ground; Chemigation Aerial; At-plant In-furrow	See label	—	Note: Vydate C-LV is labeled for potatoes to manage nematodes and certain insects. However, the label varies by crop, method of application, timing, crop rotation program, and state. Therefore, follow the label carefully for the best method, rate, and timing.

Table 10-58. Management of Soilborne Nematodes with Non-Fumigant Nematicides

Material (Product)	Vegetable Crop	Application Method	Rate/Acre	Rate/1000 Ft Row	Schedule and Remarks
fluopyram (Velum)	Brassica (Cole) Leafy Vegetables (group 5) Cucurbits (group 9) Fruiting vegetables (tomato subgroup)	Chemigation	6.5 to 6.84 fl oz	—	See label for specific labeled crops within the subgroups. Chemigation into root zone through low-pressure drip, trickle, micro-sprinkler, or equivalent equipment. Can be applied the day of harvest. Do not make more than 2 sequential applications with this product or any other product in FRAC group 7. Velum is also labeled for powdery mildew control. The first foliar fungicide application after Velum Prime should be a product from a different FRAC group.
	Potato	Chemigation	6.5 to 6.84 fl oz	—	Apply specified dosage using overhead chemigation equipment. May offer suppression only if root-knot pressure is high and other methods of suppression should also be employed. Velum Prime is also registered to suppress early blight (*Alternaria solani*) and suppress white mold (*Sclerotinia sclerotiorum*).
	Sweetpotato	Chemigation	6.0 to 6.84 fl oz	—	Apply as post-planting drench, or hill drench. May offer suppression only if root-knot pressure is high and other methods of suppression should also be employed. Velum Prime is also registered to suppress white mold (*Sclerotinia sclerotiorum*).
fluensulfone (Nimitz)	Cucurbits (group 9); Fruiting Vegetables (groups 8-10); Brassica Leafy Vege- tables (group 5) Celery, lettuce, spinach (group 4) Potato, Sweetpotato	Broadcast soil	3.5 to 7.0 pt	N/A	Apply and incorporate 6 to 8” deep at least 7 days before transplanting. Irrigate with 0.5 to 1.0” of water 2 to 5 days after application.
		Banded soil	See label	See label	Table 2 on label specifies rate based on row spacing. Incorporate 6 to 8” deep at least 7 days before transplanting. Irrigate with 0.5 to 1.0 in. water 2 to 5 days after application.
		Drip irrigation	—	—	Table 3 on label specifies rate based on bed width. Uniformly wet entire bed width and root zone 6 to 8 in. deep at least 7 days before trans- planting. Irrigate with 0.5 to 1.0” of water 2 to 5 days after application.
terbufos (Counter 20G)	Sweet corn	Band	—	4.5 to 6 fl oz	Place granules in 4-5” band over the open seed furrow and incorporate thoroughly into top 1” of the soil. Apply no more than 6.5 lb. per acre.
		In-furrow	—	4.5 to 6 fl oz	Place granules directly into the open seed furrow behind the planter seed opener.
spirotetramat (Movento)	Brassica (Cole) Leafy Vegetables (group 5) Fruiting Vegetables (groups 8-10) Leafy vegetables (group 4, except Brassica) Potato and other tubers	Foliar Chemigation	—	4.0 to 5.0 fl oz	Note: Movento is labeled for these crops to suppress or control nematode and insect pests. Must be tank-mixed with a spray adjuvant/ additive to maximize leaf uptake. Follow the label carefully for the application method, interval, and timing.

Greenhouse Vegetable Crop Disease Control

R. A. Melanson, Extension Plant Pathologist, Mississippi State University; A. Keinath, Plant Pathologist, Clemson University; A. Cato, Extension Horticulture IPM, University of Arkansas; I. Meadows, Extension Plant Pathologist, North Carolina State University

Note: Follow manufacturer's directions on label in all cases.

Caution: At the time this table was prepared, the entries were believed to be useful and accurate, however, labels change rapidly, and errors are possible, so the user must follow all directions on the pesticide container. See product labels for application limits per crop/season.

Information in the following table must be used in the context of a total disease control program. For example, many diseases are controlled using resistant varieties, crop rotation, sanitation, seed treatment, and cultural practices. Always use top-quality seed or plants obtained from reliable sources. Seeds are ordinarily treated by the seed producer for the control of seed decay and damping-off.

Most foliar diseases can be reduced or controlled by maintaining relative humidity below 90%, by keeping the air circulating in the house with a large overhead polytube, and by avoiding water on the leaves.

Caution: The risk of pesticide exposure in the greenhouse is high. Use protective clothing laundered daily or after each exposure. Ventilate during application and use appropriate personal protective equipment (PPE).

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
GREENHOUSE						
Sanitation	Solarization	NA	140°F, 4 to 8 hr for 7 days	—	—	Close greenhouse during hottest and sunniest part of summer for at least one week. Greenhouse must reach at least 140°F each day. Remove debris, heat sensitive materials, and keep greenhouse and contents moist. Will not control pests 0.5 inches or deeper in soil. Not effective against tobacco mosaic virus (TMV).
	Added heat	NA	180°F for 30 min	—	—	Remove all debris and heat-sensitive materials. Keep house and contents warm.
SOIL						
Soilborne diseases and weeds		—	See soil fumigants table and check soil fumigant label if registered for greenhouse use.	Preplant soil treatment.		
BASIL						
Anthracnose, Alternaria blight, bacterial blight, Botrytis, downy mildew, leaf spot, Rhizoctonia leaf blight	copper, fixed (various)	M01	See label	See label	See label	**Some products are OMRI-listed.** See product labels for complete application instructions, specific crop and disease labels, and greenhouse usage. **Check state registration status prior to use.**
Alternaria leaf spot (*Alternaria* spp.), Botrytis leaf blight (*Botrytis* spp.), Fusarium blight (*Fusarium* spp.)	cyprodinil + fludioxonil (Switch 62.5WG)	9+12	11 to 14 oz/ acre	7	0.5	***Not prohibited for greenhouse use.*** After two applications, alternate with another fungicide with a different mode of action for two applications. Do not exceed 56 oz of product per acre per year. See label for application limits of active ingredients.
Downy mildew (*Peronospora belbahrii*)	cyazofamid (Ranman 400SC, Segway O)	21	2.75 to 3.0 fl oz/ acre	0	0.5	Do not exceed 9 applications of product per crop. Alternate applications with fungicides that have a different mode of action. Do not make more than three consecutive applications before switching to products that have a different mode of action for three applications before returning to Ranman 400SC or Segway O. Do not exceed 27 fl oz of product per acre per year. See label for surfactant recommendations. Segway O is also labeled for use against Phytophthora root rot (*Phytophthora* spp.).
Alternaria leaf spot (*Alternaria* spp.), Botrytis leaf blight (*Botrytis* spp.), Fusarium blight (*Fusarium* spp.)	fludioxonil (Spirato GHN)	12	5.5 to 7 fl oz/ acre	7	0.5	After two applications of product, alternate to a fungicide with a different mode of action for two applications. Do not exceed 28 fl oz of product per acre per year.

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
BASIL (continued)						
Gray mold (*Botrytis cinerea*), powdery mildew (*Golovinomyces* spp.[2])	fluopyram + trifloxystrobin (Luna Sensation)	7+11	5.0 to 7.6 fl oz/acre (powdery mildew) 7.6 fl oz/acre (gray mold)	7	0.5	***Not prohibited for greenhouse use.*** Do not exceed 15.3 fl oz of product per acre per year. Do not apply more than 0.446 lb fluopyram or 0.25 lb trifloxystrobin per acre per year. Do not make more than two sequential applications of product or of any FRAC 7- or FRAC 11-containing fungicide before alternating with a fungicide from a different FRAC group.
Labels may include: Anthracnose, Downy mildew, powdery mildew	hydrogen peroxide + peroxyacetic acid (OxiDate 2.0, OxiDate 5.0 ZeroTol 2.0)	NG	See label	0	See label	**OMRI-listed.** See labels for additional instructions and labeled diseases, and precautions, including those related to the use and application of metal-based chemicals. Do not store spray solution. **OxiDate 2.0: *Not prohibited for greenhouse use.*** **OxiDate 5.0: *Not prohibited for greenhouse use. Determine if product can be used safely on greenhouse crops prior to application.***
Downy mildew (*P. belbahrii*)	mandipropamid (Micora)	40	8.0 fl oz/acre (0.9 fl oz/5,000 sq ft)	1	4 hr	***For basil transplants grown in enclosed greenhouses with permanent flooring for resale to consumers.*** Do not make more than two applications per crop before switching to a fungicide with a different mode of action. Do not apply within 1 day of shipping. See label for additional restrictions and recommendations.
Labels may include: Downy mildew, root rots	phosphonates (mono- and dibasic salts of phosphites, phosphorous acid, potassium phosphite) (various)	P07	See label	See label	See label	See product labels for complete application instructions, labeled diseases, restrictions, and crop and greenhouse usage. **Check state registration status prior to use.**
Labels may include: Botrytis, downy mildew, powdery mildew	potassium bicarbonate (Carb-O-Nator, MilStop)	NC	2.5 to 5.0 lb/100 gal (Carb-O-Nator) 1.25 to 5.0 lb/100 gal (MilStop)	0	4 hr (Carb-O-Nator) 1 hr (MilStop)	**OMRI-listed.** Do not store unused spray solution. See labels for additional labeled diseases and instructions. **Carb-O-Nator:** Final spray solution should not be below pH 7.0. Some tank-mixes may be incompatible and may cause phytotoxicity. **MilStop:** Do not exceed 0.5 lb of product per 4,350 sq ft or 1.15 lb product per 10,000 sq ft per application. Do not adjust pH after mixing. Do not mix with other soluble pesticide or fertilizers.
Powdery mildew (*Golovinomyces* spp.[2])	trifloxystrobin (Flint Extra)	11	3.8 fl oz/acre	0	0.5	***Not prohibited for greenhouse use.*** Do not exceed 7.6 fl oz per acre per year. Do not apply more than 2 sequential applications of another FRAC 11-containing fungicide before rotating with fungicide from different FRAC group. Minimum interval between applications is 7 days.
CUCURBITS –*TRANSPLANTS PRODUCTION*						
Alternaria leaf blight (*Alternaria cucumerina*), Alternaria leaf spot (*A. alternata*), anthracnose (*Colletotrichum orbiculare*), Cercospora leaf spot (*C. citrullina*), downy mildew (*Pseudoperonospora cubensis*), gummy stem blight (*Stagonosporopsis* spp. [2]), Myrothecium canker (*Paramyrothecium roridum* [2]); Phoma blight (*Boeremia exigua* [2]), Phyllosticta leaf spot (*P. cucurbitacearum*), Plectosporium blight (*Plectosphaerella cucumerina* [2]), powdery mildew (*Podosphaera xanthii* [2] *Golovinomyces cichoracearum* [2]), Septoria leaf blight (*S. cucurbitacearum*)	azoxystrobin + benzovindiflupyr (Mural)	11+7	0.6 to 0.8 oz/5,000 sq ft	—	0.5	***Allowed for use on transplants grown for resale to consumers.*** Do not exceed two applications of product per crop. See label for restrictions for product use when multiple crops are grown in the same area. Do not apply more than one application of a FRAC 11-containing fungicide before alternating to another fungicide with a different mode of action.

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
CUCURBITS –*TRANSPLANTS PRODUCTION* (continued)						
Gray mold (*Botrytis cinerea*)	fenhexamid (Decree 50 WDG)	17	1.5 lb/acre (stand-alone) 1.0 to 1.5 lb/ acre (tank-mix)	—	0.5	**Labeled for cucumbers ONLY.** Do not make more than two consecutive applications. See label for tank-mixing instructions. Do not exceed 6.0 lb product per acre to transplants.
Corynespora leaf spot (*Corynespora cassiicola*), early blight (*Alternaria* sp.), gray mold (*Botrytis*), gummy stem blight (*Stagonosporopsis* spp.[2]), powdery mildew (*Podosphaera* sp.[2]), scab (*Cladosporium* sp.)	polyoxin D zinc salt (Affirm WDG)	19	6.2 oz/acre	—	4 hr	***Allowed for use in greenhouses ONLY in the pro- duction of seedlings and transplants; product is not for use in the production of edible commodities.*** See product labels for maximum limits of active ingredient and applications per season. See product labels for additional application instructions and labeled diseases.
CUCURBITS – *AFTER TRANSPLANTING IN A GREENHOUSE*						
Alternaria leaf blight (*A. cucumerina*), Alternaria leaf spot (*A. alternata*), anthracnose (*C. orbiculare*), Cercospora leaf spot (*C. citrullina*), downy mildew (*P. cubensis*), gummy stem blight (*Stagonosporopsis* spp.[2]), Phoma blight (*P. exigua* [2]), Phyllosticta leaf spot (*P. cucurbitacearum*), Plectosporium blight (*P. cucumerina* [2]), powdery mildew (*P. xanthii* [2] *G. cichoracearum* [2]), Septoria leaf blight (*S. cucurbitacearum*)	azoxystrobin + difenoconazole (Quadris Top)	11+3	12 to 14 fl oz/ acre	1	0.5	***Not prohibited for greenhouse use.*** **Do not use for transplant production** Make no more than one application of a QoI-containing fungicide (FRAC Group 11) before alternating to another fungicide with a different mode of action. Do not exceed 56 fl oz of product per acre per year. See label for application limits of active ingredients. The addition of a spreading/penetrating type adjuvant is recommended. See label for additional instructions.
Labels may include: Alternaria leaf spot, angular leaf spot, anthracnose, bacterial fruit blotch (suppression), downy mildew, gray mold, gummy stem blight, powdery mildew, scab, Ulocladium leaf spot	copper, fixed (various)	M01	See label	See label	See label	**Some products are OMRI-listed.** See product labels for complete application instructions, specific crop and disease labels, and greenhouse usage. **Check state registration status prior to use.**
Powdery mildew	cyflufenamid (Torino)	U06	3.4 oz/acre	0	4 hr	**Not prohibited for greenhouse use.** Do not make more than two applications per year. Do not exceed 6.8 oz of product per acre per calendar year. See label for other application instructions and restrictions. **Use with caution as resistance has been reported in NY.**
Downy mildew (*P. cubensis*)	cymoxanil (Curzate 60DF)	27	3.2 to 5.0 oz/ acre	3	0.5	**Not prohibited for greenhouse use.** Always apply in a tank mix with the labeled rate of a protectant fungicide. Do not exceed 30 oz of product per 12-month period. **Curzate is not registered for use in LA. Resistance has been observed.**
Alternaria leaf blight and spot (*A. cucumerina* and *A. alternata*), gummy stem blight (*Stagonosporopsis* spp.[2]), powdery mildew (*P. xanthii, G. cichoracearum*) [2]	cyprodinil + fludioxonil (Switch 62.5WG)	9+12	11 to 14 oz/ acre	1	0.5	**Not prohibited for greenhouse use.** After two applications, alternate with another fungicide with a different mode of action for two applications. Do not exceed 56 oz of product per acre per year. See label for application limits of active ingredients.

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
CUCURBITS – *AFTER TRANSPLANTING IN A GREENHOUSE* (continued)						
Alternaria leaf blight and spot (*A. cucumerina* and *A. alternata*), anthracnose (*C. orbiculare*), Cercospora leaf spot (*C. citrullina*), gummy stem blight (*Stagonosporopsis* spp.[2]), powdery mildew (*P. xanthii, G. cichoracearum* [2]), Septoria leaf blights (*S. cucurbitacearum*)	difenoconazole + cyprodinil		0.37 to 0.46 fl oz/ 1,000 sq ft	7	0.5	**Only allowed for use in the greenhouse on cucumber.** Do not apply more than 80 fl oz of product per acre per season. Do not apply product for more than 50% of sprays per crop. See label for application limits of active ingredients. Make no more than two consecutive applications per season before alternating with fungicides that have a different mode of action.
Alternaria leaf blight and spot (*A. cucumerina* and *A. alternata*), anthracnose (*Colletotrichum spp.*), downy mildew (*P. cubensis*) **Suppression:** Phytophthora blight (*Phytophthora capsici*)	famoxadone + cymoxanil	(Tanos)	8 oz/acre 8 to 10 oz/ acre (for diseases listed under suppression	3	0.5	**Not prohibited for greenhouse use.** Product must be tank- mixed with a contact fungicide with a different mode of action. Do not exceed 32 oz of product per acre per crop cycle or 72 oz per acre per 12-month period. Do not make more than one application of product before alternating with a fungicide that has a different mode of action. See label for tank-mixing instructions. Do not exceed four applications of Tanos or FRAC Group 11 fungicides per cropping cycle. For suppression of foliar and fruit phases ONLY of Phytophthora blight**.**
Alternaria leaf spot *(A. cucumerina*), downy mildew (*P. cubensis*)	fenamidone (Reason 500SC)	11	5.5 fl oz/acre	14	0.5	***Not prohibited for greenhouse use.*** Do not exceed 22.0 fl oz of product per acre per year. Do not make more than one application of product before alternating with a fungicide from a different FRAC group. Do not make more than four applications of FRAC 11 fungicides per season. The minimum interval between applications is 5 days.
Gray mold (*B. cinerea*)	fenhexamid (Decree 50WDG)	17	1.5 lb/acre (stand-alone) 1.0 to 1.5 lb/ acre (tank-mix)	0	0.5	**Labeled for cucumbers ONLY.** For use in transplant production and greenhouse production. Do not make more than two consecutive applications. See label for additional tank-mixing instructions. Do not exceed 6.0 lb product per acre (transplants) or per acre per season (greenhouse production).
Downy mildew (*P. cubensis*), gummy stem blight (*Stagonosporopsis* spp.[2]), Phytophthora blight (*P. capsici*)	fluazinam (Lektivar 40SC, Omega 500F, Orbus 4F)	29	12 to 24 fl oz/ acre	30	0.5	***Not prohibited for greenhouse use.*** See labels for specific rate instructions for Phytophthora blight and gummy stem blight and for additional restrictions. **Lektivar:** Do not exceed 144 fl oz of product per acre per year. **Lektivar is not registered for use in AR, KY, LA, MS, OK, or VA.** **Omega:** Do not exceed 144 fl oz of product per acre per year. **Orbus:** Do not exceed 144 fl oz of product per acre per year. **Orbus is not registered for use in AL, AR, KY, LA, MS, TN, VA, or WV.**
Alternaria leaf blight (*A. cucumerina*), Alternaria leaf spot (*A. alternata*), gummy stem blight (*Stagonosporopsis* [2]), powdery mildew (*P. xanthii, G. cichoracearum*) [2]	fludioxonil (Spirato GHN)	12	5.5 to 7 fl oz/ acre	1	0.5	After two applications of product, alternate to a fungicide with a different mode of action for two applications. Do not exceed 28 fl oz of product per acre per year.
Alternaria leaf spot (*A. cucumerina*), anthracnose (*Colletotrichum* spp.), Botrytis gray mold (*B. cinerea*), gummy stem blight (*Stagonosporopsis* spp.[2]), powdery mildew (*P. xanthii* [2])	fluopyram + trifloxystrobin (Luna Sensation)	7+11	4.0 to 7.6 fl oz/acre (powdery mildew) 7.6 fl oz/acre (other listed diseases)	0	12	***Not prohibited for greenhouse use.*** Do not exceed 27.1 fl oz of product per acre per year. Do not apply more than 0.446 lb fluopyram or 0.5 lb trifloxystrobin per acre per year. Do not make more than four applications per year. Do not make more than two sequential applications of product or of any FRAC 7- or FRAC 11-containing fungicide before alternating with a fungicide from a different FRAC group. ***See label for information regarding potential foliar discoloration after product application.***

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
CUCURBITS – *AFTER TRANSPLANTING IN A GREENHOUSE* (continued)						
Downy mildew (*P. cubensis*) and Phytophthora root and fruit rots (*Phytophthora* spp.)	fosetyl-Al (Aliette WDG, Linebacker WDG)	P07	2.0 to 5.0 lb/ acre	0.5	0.5 (Aliette) 1 (Line-backer)	***Not prohibited for greenhouse use.*** For foliar application. Phytotoxicity may occur if products are tank-mixed with copper products, applied to plants with copper residues, or mixed with adjuvants. Do not tank-mix products with copper products. See labels for additional restrictions, season limits, and application instructions. **Aliette WDG:** Do not exceed seven applications per season. **See label for county restrictions in some states.** **Linebacker WDG:** Do not make more than seven applications per season. **Check county registration status prior to use. See label for county restrictions in some states.**
Labels may include: Alternaria, anthracnose, downy mildew, powdery mildew, root rots	hydrogen peroxide + peroxy-acetic acid (OxiDate 2.0, OxiDate 5.0 ZeroTol 2.0)	NG	See label	0	See label	**OMRI-listed.** See labels for list of labeled cucurbits. See labels for additional instructions, labeled diseases, and precautions, including those related to the use and application of metal-based chemicals. Do not store spray solution. **OxiDate 2.0: *Not prohibited for greenhouse use.*** **OxiDate 5.0: *Not prohibited for greenhouse use. Determine if product can be used safely on greenhouse crops prior to application.***
Labels may include: Alternaria leaf spot, anthracnose, Cercospora leaf spot, downy mildew, gummy stem blight, scab	mancozeb (various)	M03	See label	See label	See label	See product labels for complete application instructions, specific crop and disease labels, and greenhouse usage. **Check state registration status prior to use.**
Alternaria blight, Alternaria leaf spot, anthracnose, Cercospora leaf spot, gummy stem blight, scab, target leaf spot ***Suppression*:** Plectosporium blight, powdery mildew	mancozeb + azoxystrobin (Dexter Max)	M03+11	2.1 to 3.2 lb/ acre	5	1	***See label for restrictions on greenhouse use.*** Do not apply more than one application of product of FRAC Group 11 fungicide before alternating to a fungicide with a different mode of action. Do not exceed 12.8 lb of product per acre per season. See label for application limits of active ingredients. Do not exceed four applications per year. See label for additional instructions and cautions regarding adjuvants and tank mixing.
Alternaria leaf spot, angular leaf spot, anthracnose, bacterial fruit blotch, Cercospora leaf spot, downy mildew, gummy stem blight, powdery mildew, scab	mancozeb + copper hydroxide (ManKocide)	M03+ M01	2 to 3 lb/acre	5	See label	***Not prohibited for greenhouse use.*** Do not exceed 17.5 lb of product per acre per year. Do not apply more than 5 applications per year at the maximum application rate. Phytotoxicity may occur when spray solution has a pH of less than 6.5 or when certain environmental conditions occur.
Alternaria leaf spot, Cercospora leaf spot, downy mildew, Phytophthora rot (*P. capsici*)	mancozeb + zoxamide (Gavel 75DF)	M03+22	1.5 to 2.0 lb/ acre	5	2	***Not prohibited for greenhouse use.*** Do not exceed 16 lb per acre per year. Do not make more than eight applications per acre per year.
Powdery mildew (*Golovinomyces* spp. [2] and *Podosphaera* spp. [2])	myclobutanil (AgriStar Sonoma 20 EW AG, AgriStar Sonoma 40WSP)	3	4.75 to 9.5 fl oz/acre (20 EW AG) 2.5 to 5 oz/ acre (40WSP)	0	1	***Not prohibited for greenhouse use.*** Do not exceed 0.6 lb myclobutanil per acre per crop. See product labels for additional instructions and restrictions. **Sonoma 20EW AG:** Do not exceed 46 fl oz of product per acre per crop. **Sonoma 20EW AG is not registered for use in AL, AR, FL, KY, MS, OK, SC, TN, or TX.** **Sonoma 40WSP:** Do not exceed 1.5 lb of product per acre per crop. **Sonoma 40WSP is not registered for use in AL, AR, FL, GA, KY, LA, MS, OK, SC, TN, TX, or WV**
Alternaria leaf spot and blight (*Alternaria* spp.), gray mold (*B. cinerea*), gummy stem blight (*Stagonosporopsis* spp.[2]), powdery mildew (*P. xanthii, G. cichoracearum* [2]), Sclerotinia stem rot (*S. sclerotiorum*)	penthiopyrad (Fontelis)	7	0.375 to 0.5 fl oz/gal of spray per 1,360 sq ft	1	0.5	***Allowed for use in greenhouse production of edible-peel cucurbits (cucumbers, summer squash).*** Do not exceed 67 fl oz of product per acre per year. Make no more than two consecutive applications per season before alternating with fungicides that have a different mode of action. ****Resistance in *Stagonosporopsis* [2] (gummy stem blight) is widespread.****

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
CUCURBITS – *AFTER TRANSPLANTING IN A GREENHOUSE* (continued)						
Labels may include: Downy mildew, root rots	phosphonates (mono- and dibasic salts of phosphites, phosphorous acid, potassium phosphite) (various)	P07	See label	See label	See label	See product labels for complete application instructions, labeled diseases, restrictions, and crop and greenhouse usage. **Check state registration status prior to use.**
Corynespora leaf spot (*Corynespora cassiicola*), early blight (*Alternaria* spp.), gray mold (*Botrytis*), gummy stem blight (*Stagonosporopsis* spp.[2]), powdery mildew (*Podosphaera* spp. [2]), scab (*Cladosporium* spp.)	polyoxin D zinc salt (OSO 5%SC)	19	6.5 to 13.0 fl oz/acre	0	4 hr	***Not prohibited for greenhouse use.*** See product labels for maximum limits of active ingredient and applications per season. See product labels for additional application instructions and labeled diseases. **OSO 5%SC is not registered for use in AR, KY, MS, or OK.**
Labels may include: Alternaria leaf spot, anthracnose, Botrytis, downy mildew, powdery mildew, Septoria leaf spot	potassium bicarbonate (Carb-O-Nator, MilStop)	NC	2.5 to 5.0 lb/100 gal (Carb-O-Nator) 1.25 to 5.0 lb/100 ga l(MilStop)	0	4 hr (Carb-O-Nator) 1 hr (MilStop)	**OMRI-listed.** Do not store unused spray solution. See labels for additional labeled diseases and instructions. **Carb-O-Nator:** Labeled for use on cucumber. Final spray solution should not be below pH 7.0. Some tank-mixes may be incompatible and may cause phytotoxicity. **MilStop:** Do not exceed 0.5 lb of product per 4,350 sq ft or 1.15 lb product per 10,000 sq ft per application. Do not adjust pH after mixing. Do not mix with other soluble pesticide or fertilizers.
Damping off and root rots (*Phytophthora* spp., *Pythium* spp.)	propamocarb hydrochloride (Previcur Flex)	28	See label	See label	0.5	See label for application uses. Product can be applied through a drip system or as a soil drench. Do not apply more than six total applications(preseeding and/or seedling treatment and after transplanting). Do not apply more than two preseeding and/or seedling treatment applications or four applications of product after transplanting per cropping cycle. Do not mix with other products. Phytotoxicity may occur if applied to dry growing media. See label for other application instructions.
Gray mold (*B. cinerea*)	pyrimethanil (Scala SC)	9	18 fl oz/acre	1	0.5	***Only allowed for use in the greenhouse on cucumber.*** Use only in well-ventilated plastic tunnel or glass houses; ventilate for at least two hours after ap- plication of product. Do not exceed 36 fl oz of product per acre per crop. Do not exceed two applications per crop(maximum of three crop cycles per year). See label for cautions.
Powdery mildew	pyriofenone (Prolivo 300SC)	50 (U08)	4 to 5 fl oz	0	4 hr	***Not prohibited for greenhouse use.*** Do not exceed 16 fl oz per acre per year. Do not make more than two applications of Prolivo or of another FRAC 50-containing fungicide in a row before rotating to a fungicide from a different FRAC group. **Prolivo is not registered for use in KY.**
	sulfur (various)	M02	See label	See label	See label	**Some products are OMRI-listed.** See product labels for complete application instructions, specific crop and disease labels, and greenhouse usage. **Check *C. melo* cultivars for phytotoxicity prior to use. Check state registration status prior to use.**
Anthracnose (*Colletotrichum* spp.), gummy stem blight (*Stagonosporopsis* spp.[2]), powdery mildew (*Golovinomyces* [2] and *Podosphaera* [2]), target spot (*Corynespora*), Powdery mildew	thiophanate-methyl (various)	1	See label	See label	See label	***Not prohibited for greenhouse use.*** See product labels for complete application instructions, specific crop and disease labels, and greenhouse usage. **Check state registration status prior to use. **Resistance in *Stagonosporopsis* [2] (gummy stem blight) is widespread.****
Suppression: Downy mildew	tolfenpyrad (Torac)	39	21.0 fl oz/acre	1	0.5	***Not prohibited for greenhouse use.*** Do not exceed 42 fl oz or two applications of product or 0.42 lb of tolfenpyrad per acre per crop cycle. Do not exceed four applications of product per year. Allow at least 14 days between applications. IRAC 21A.

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
CUCURBITS – *AFTER TRANSPLANTING IN A GREENHOUSE* (continued)						
Plectosporium blight (*P. tabacinum*), powdery mildew (*P. xanthii* [2], *G. cichoracearum* [2]) ***Suppression:*** Downy mildew (*P. cubensis*)	trifloxystrobin (Flint Extra)	11	2.0 to 3.8 fl oz/acre 3.8 fl oz/ acre (downy mildew)	7	0.5	***Not prohibited for greenhouse use.*** Alternate every FRAC 11 fungicide application with at least one ap- plication of a fungicide from a different FRAC group to reduce the potential for resistance. Do not exceed four applications or 15.2 fl oz of product per acre per year. The minimum interval between applications is 7 days. ****Resistance in *P. cubensis* (downy mildew) is widespread.****
Powdery mildew	triflumizole (Procure 480SC, Terraguard SC)	3	4 to 8 fl oz/acre (Procure) 2 to 4 fl oz/100 gal (Terraguard)	0 (Procure) 1 (Terra -guard)	0.5	**Procure: *Not prohibited for greenhouse use.*** Do not exceed 24 fl oz of product per crop per year. If applying to a crop grown from seed, do not exceed four applications per crop per year at the 4 to 6 oz/ acre rate or three applications per crop per year at the 8 oz/acre rate. If applying to a transplanted crop, do not apply more than three applications of product per crop per year. Label specifies the following powdery mildew species: *G. cichoracearum* [2], *P. xanthii*. **Terraguard SC:** For use only as a foliar spray. For use in commercial greenhouse production only. Can be used on greenhouse transplants. Do not exceed 16 fl oz of product per acre per cropping system. See label for additional application instructions. Do not exceed four applications per crop. Do not exceed two applications per crop when applying to transplants.
EGGPLANT AND PEPPER - *TRANSPLANT PRODUCTION*						
Anthracnose (*Colletotrichum* spp.), Cercospora leaf spot (*C. capsici*), gray leaf spot (*Stemphylium solani*), powdery mildew (*Oidiopsis sicula*), Rhizoctonia stem rot (*R. solani*) ***Suppression*:** Southern blight (*Athelia rolfsii* [2])	azoxystrobin + benzovindiflupyr (Mural)	11+7	0.6 to 0.8 oz/ 5,000 sq ft	—	0.5	***Allowed for use on transplants grown for resale to consumers*.** Do not exceed two applications of product per crop. See label for restrictions for product use when multiple crops are grown in the same area. Do not apply more than two consecutive applications of product before alternating to another fungicide from a different FRAC group.
Gray mold (*Botrytis cinerea*)	fenhexamid (Decree 50 WDG)	17	1.5 lb/acre (stand-alone) 1.0 to 1.5 lb/ acre (tank-mix)	—	0.5	Do not make more than two consecutive applications. See label for additional tank-mixing instructions. Do not exceed 6.0 lb product per acre to transplants. Do not exceed six applications per acre per crop cycle at the lowest use rate or four applications per acre per crop cycle at the highest use rate.
Botrytis rot (*Botrytis* spp.), early blight (*A. linariae* [2]), powdery mildew (*L. taurica*, *O. sipula*) ***Suppression***: Anthracnose (*C. coccodes*)	polyoxin D zinc salt (Affirm WDG)	19	6.2 oz/acre	—	4 hr	***Allowed for use in greenhouses ONLY in the production of seedlings and transplants; product is not for use in the production of edible commodities.*** See product labels for maximum limits of active ingredient and applications per season. See product labels for additional application instructions and labeled diseases.
Botrytis rot (*Botrytis* spp.), early blight (*A. linariae* [2]), powdery mildew (*L. taurica, O. sipula*) **Suppression:** Anthracnose (*C. coccodes*)	polyoxin D zinc salt (Affirm WDG)	19	6.2 oz/acre	—	4 hr	**Allowed for use in greenhouses ONLY in the production of seedlings and transplants; product is not for use in the production of edible commodities.** See product labels for maximum limits of active ingredient and applications per season. See product labels for additional application instructions and labeled diseases
LETTUCE						
Downy mildew (*Bremia lactucae*)	acibenzolar-*S*-methyl (Actigard 50WG)	21	0.75 to 1 oz/ acre	7	0.5	***Not prohibited for greenhouse use.*** For use on head and leaf lettuce. Product should be applied to healthy, actively growing plants. Product should not be applied to stressed plants. Do not apply more than one application of product on head lettuce intended for bag purposes. Do not apply prior to thinning or within 5 days of transplanting. See label for other instructions, restrictions, and precautions.

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
LETTUCE (continued)						
Anthracnose, downy mildew, leaf spot, powdery mildew, Septoria leaf spot	copper, fixed (various)	M01	See label	See label	See label	**Some products are OMRI-listed.** See product labels for complete application instructions, specific crop and disease labels, and greenhouse usage. **Check state registration status prior to use.**
Downy mildew (*Bremia lactucae*), Pythium damping-off (*Pythium* spp.), white rust (*Albugo occidentalis*)	cyazofamid (Ranman 400SC)	21	2.75 fl oz/acre	0	0.5	***Not prohibited for greenhouse use.*** For use on head and leaf lettuce. Do not exceed 16.5 fl oz of product or 0.43 lb cyazofamid per acre per year. Do not apply more than six applications of product per crop. Alternate applications with a fungicide from a different FRAC group. See label for additional application instructions specific to each disease and regarding resistance management and tank-mixing.
Downy mildew (*Bremia lactucae*)	cymoxanil (Curzate 60 DF)	27	3.2 to 5.0 oz/acre (head) 5.0 oz/acre (leaf)	3 (head) 1 (leaf)	0.5	***Not prohibited for greenhouse use.*** For use on head and leaf lettuce. Use only with the labeled rate of a protectant fungicide. Do not exceed 30 oz of product per 12-month period. **Curzate not registered for use in LA.**
Alternaria leaf spot (*Alternaria* spp.), gray mold (*B. cinerea*), Sclerotinia rot (*Sclerotinia* spp.), basal rot (*B. exigua*), Septoria leaf spot (*Septoria lactucae*) ***Suppression***: Powdery mildew (*Golovinomyces cichoracearum* [2])	cyprodinil + fludioxonil (Switch 62.5WG)	9+12	11 to 14 oz/acre	0	0.5	***Not prohibited for greenhouse use.*** For use on head and leaf lettuce. After two applications, alternate with another fungicide with a different mode of action for two applications. Do not exceed 56 oz of product per acre per year. See label for application limits of active ingredients.
Botrytis gray mold rot (*B. cinerea*), drop rot, *Sclerotinia minor*, watery soft rot (*Sclerotinia sclerotiorum*)	dicloran (Botran 5F)	14	See label	14	0.5	For use on head and leaf lettuce. Product has different application rates for at planting, pre-thinning, and post-thinning and established transplants. See label for detailed application instructions. Do not exceed 3.2 qt of product per acre per year. **Not registered for use in SC, VA, or WV.**
Downy mildew (*B. lactucae*), white rust (*A. occidentalis*)	famoxadone + cymoxanil (Tanos)	11+27	8 to 10 oz/acre	1	0.5	***Not prohibited for greenhouse use.*** For use on head and leaf lettuce. Product must be tank-mixed with a contact fungicide with a different mode of action. Do not exceed 48 oz of product per acre per crop season. Do not make more than one application of product before alternating with a fungicide that has a different mode of action. See label for tank mixing instructions. No more than 50% of total applications in cropping season should contain Tanos or other FRAC Group 11 fungicides.
Gray mold (*B. cinerea*)	fenhexamid (Decree 50 WDG)	17	1.5 lb/acre (stand-alone) 1.0 to 1.5 lb/acre (tank-mix)	3	0.5	For use in transplant production and greenhouse production. Do not make more than two consecutive applications. See label for additional tank-mixing instructions. Do not exceed 3.0 lb product per acre (transplants) or per acre per crop (greenhouse production).
Alternaria leaf spot (*Alternaria* spp.), basal rot (*B. exigua*), gray mold (*B. cinerea*), Sclerotinia rot (*Sclerotinia* spp.), Septoria leaf spot (*S. lactucae*) ***Suppression*:** Powdery mildew (*G. cichoracearum* [2])	fludioxonil (Spirato GHN, Cannonball WG, Cannonball WP)	12	5.5 to 7 fl oz/acre (Spirato GHN) 7.0 oz/acre (Cannonball)	0	0.5	For use on head and leaf lettuce. **Spirato GHN:** After two applications of product, alternate to a fungicide with a different mode of action for two applications. Do not exceed 28 fl oz of product per acre per year. **Cannonball WG and Cannonball WP: *Not prohibited for greenhouse use.*** Products are labeled for use against basal rot, gray mold, and Sclerotinia rot. Do not exceed 28 oz of product per acre per year. After two applications of product, alternate to a fungicide with a different mode of action for two applications. See product labels for additional instructions and restrictions. **Cannonball WP is not registered for use in AL, AR, FL, KY, GA, LA, MO, MS, NC, SC, TN, VA, or WV.**

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
LETTUCE (continued)						
Gray mold (*Botrytis* spp.), lettuce drop (*S. minor*, *S. sclerotiorum*), powdery mildew (G. *cichoracearum*)	fluopyram + trifloxystrobin (Luna Sensation)	7+11	7.6 fl oz/acre	See label	0.5	***Not prohibited for greenhouse use.*** Do not exceed 5.3 fl oz of product per acre per year. Do not apply more than 0.446 lb fluopyram or 0.375 lb trifloxystrobin per acre per year. Do not make more than two sequential applications of product or of any FRAC7- or FRAC 11-containing fungicide before alternating with a fungicide from a different FRAC group.
Downy mildew (*B. lactucae*)	fosetyl-Al (Aliette WDG, Linebacker WDG)	P07	2.5 to 5.0 lb/ acre	3	0.5 (Aliette) 1 (Line-backer)	***Not prohibited for greenhouse use.*** For foliar application on head and leaf lettuce. Phytotoxicity may occur if products are tank-mixed with copper products, applied to plants with copper residues, or mixed with adjuvants. Do not tank-mix products with copper products. See labels for additional restrictions, season limits, and application instructions not included below. **Aliette WDG:** Do not exceed seven applications per season. Speckling can occur when applied to lettuce. **Linebacker WDG:** Do not exceed 35 lb of product per acre per year. Do not make more than seven applications per season. **Check state registration status prior to use.**
Labels may include: Botrytis gray mold, downy mildew, powdery mildew	hydrogen per-oxide + peroxyacetic acid (OxiDate 2.0, OxiDate 5.0, ZeroTol 2.0)	NG	See label	0	See label	**OMRI-listed.** See labels for additional instructions, labeled diseases, and precautions, including those related to the use and application of metal-based chemicals. Do not store spray solution. **OxiDate 2.0:** ***Not prohibited for greenhouse use.*** **OxiDate 5.0:** ***Not prohibited for greenhouse use. Determine if product can be used safely on greenhouse crops prior to application.***
Bottom rot (*Rhizoctonia solani*), gray mold (*Botrytis cinerea*), lettuce drop (*Sclerotinia* spp.)	iprodione (Meteor, Nevado 4F, Rovral 4F)	2	1.5 to 2.0 pt/ acre	14	1	***Not prohibited for greenhouse use.*** Do not make more than three applications of product per crop. See product labels for application instructions and additional restrictions.
Sclerotinia drop (*S. minor* and *S. sclerotiorum*)	isofetamid (Kenja 400SC)	7	12.3 fl oz	14	0.5	For use on head and leaf lettuce. ***Not prohibited for greenhouse use.*** Do not exceed two applications of product per acre per year. Do not make more than two applications of Kenja or of another FRAC 7-containing fungicide in a row before rotating to a fungicide from a different FRAC group.
Labels may include: Alternaria leaf spot, anthracnose, downy mildew	mancozeb (various)	M03	See label	See label	See label	See product labels for complete application instructions, specific crop and disease labels, and greenhouse usage. **Check state registration status prior to use.**
Alternaria leaf spot, anthracnose, downy mildew, Septoria	mancozeb + azoxystrobin (Dexter Max)	M03+ 11	1.7 to 2.25 lb/ acre	10	1	***See label for restrictions on greenhouse use.*** For use on head and leaf lettuce. Do not apply more than one application of product or FRAC Group 11 fungicide before alternating to a fungicide with a different mode of action. Do not exceed 13.7 lb of product per acre per season. See label for application limits of active ingredients. See label for additional instructions and cautions regarding residues, adjuvants, and tank mixing.
Anthracnose, downy mildew	mancozeb + copper hydroxide (ManKocide)	M03+ M01	1 to 2 lb/acre	10	See label	**Not prohibited for greenhouse use.** Do not exceed 26 lb of product per acre per year. Plant injury may occur in some varieties. Determine crop sensitivity prior to use. Phytotoxicity may occur when spray solution has a pH of less than 6.5 or when certain environmental conditions occur.
Downy mildew (*B. lactucae*)	Mandipropamid (Micora)	40	5.5 to 8.0 fl oz/acre (0.65 to 0.9 fl oz per 5,000 sq ft)	—	4 hr	For use on head and leaf lettuce. ***For lettuce transplants grown in enclosed greenhouses with permanent flooring for resale to consumers.*** Do not apply more than two applications of product per crop. Do not apply consecutive applications. Apply in a tank-mix with another downy mildew fungicide with a different mode of action. The addition of a spreading/penetrating type adjuvant is recommended.

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
LETTUCE (continued)						
Powdery mildew (*G. cichoracearum* [2])	myclobutanil (AgriStar Sonoma 20 EW AG, AgriStar Sonoma 40WSP)	3	9.5 fl oz/acre (20 EWAG) 5 oz/acre (40WSP)	3	1	***Not prohibited for greenhouse use.*** For use on head and leaf lettuce. Do not exceed 0.5 lb myclobutanil per acre per season. See product labels for additional instructions and restrictions. Do not make more than four applications of product per season. The minimum retreatment interval is 14 days. **Sonoma 20EW AG:** Do not exceed 9.5 fl oz of product per acre per application or 38.0 fl oz of product per acre per season. **Sonoma 20EW AG is not registered for use in AL, FL, KY, MS, OK, SC, TN, or TX.** **Sonoma 40WSP:** Do not exceed 5 oz of product per acre per application or 20 oz of product per acre per season. **Sonoma 40WSP is not registered for use in AL, FL, GA, KY, LA, MS, SC, TN, TX, and WV.**
Labels may include: Downy mildew	phosphonates (mono- and dibasic salts of phosphites, phosphorous acid, potassium phosphite) (various)	P07	See label	See label	See label	See product labels for complete application instructions, labeled diseases, restrictions, and crop and greenhouse usage. **Check state registration status prior to use.**
Alternaria leaf spot (*Alternaria* spp.); Botrytis damping off, leaf blight, and rot (*Botrytis* spp.); bottom rot (*R. solani*), lettuce drop (*Sclerotinia* spp.), powdery mildew (*G. cichoracearum*) ***Suppression:*** Downy mildew (*B. lactucae*)	polyoxin D zinc salt (OSO 5%SC)	19	6.5 to 13.0 fl oz/acre	0	4 hr	***Not prohibited for greenhouse use.*** For use on head, leaf, iceberg, and romaine lettuce. Check products labels for maximum limits of active ingredient per acre per season. See product label for additional application instructions.
Labels may include: Alternaria leaf spot, Botrytis, downy mildew, powdery mildew	potassium bicarbonate (Carb-O-Nator, MilStop)	NC	2.5 to 5.0 lb/100 gal (Carb-O-Nator) 1.25 to 5.0 lb/100 gal (MilStop)	0	4 hr (Carb-O-Nator) 1 hr (MilStop)	**OMRI-listed.** Do not store unused spray solution. See labels for additional labeled diseases and instructions. **Carb-O-Nator:** Final spray solution should not be below pH 7.0. Some tank-mixes may be incompatible and may cause phytotoxicity. **MilStop:** Do not exceed 0.5 lb of product per 4,350 sq ft or 1.15 lb product per 10,000 sq ft per application. Do not adjust pH after mixing. Do not mix with other soluble pesticide or fertilizers.
Damping off and root rots (*Phytophthora* spp., *Pythium* spp.)	propamocarb hydrochloride (Previcur Flex)	28	See label	2	0.5	**For greenhouse use on leaf lettuce only.** Product can be applied as a foliar treatment in leaf lettuce. Do not apply more than six total applications (preseeding and/or seedling treatment, after transplanting, and foliar applications). Do not apply more than two preseeding and/or seedling applications, four total applications after transplanting, or two foliar applications of product per crop cycle. Do not mix with other products. Phytotoxicity may occur if applied to dry growing media. See label for other application instructions and maximum use rates.
Powdery mildew	sulfur (various)	M02	See label	See label	See label	**Some products are OMRI-listed.** See product labels for complete application instructions, specific crop and disease labels, and greenhouse usage. **Check state registration status prior to use.**
Powdery mildew ***Suppression:*** Downy mildew	tolfenpyrad (Torac)	39	21.0 fl oz/acre	1	0.5	***Not prohibited for greenhouse use.*** Do not apply until at least 14 days after emergence or transplanting. Do not exceed 42 fl oz or two applications of product or 0.42 lb of tolfenpyrad per acre per crop cycle. Do not exceed four applications of product per year. Allow at least 14 days between applications. IRAC 21A.

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
LETTUCE (continued)						
Alternaria leaf spot (*Alternaria* spp.), anthracnose (*Colletotrichum* spp.), powdery mildew (*G. cichoracearum* [2])	trifloxystrobin (Flint Extra)	11	3.0 to 3.8 fl oz/acre	See label	0.5	***Not prohibited for greenhouse use.*** For use on head and leaf lettuce. Do not exceed 7.6 fl oz of product per acre per year. Do not apply more than two sequential applications of product or another FRAC 11-containing fungicide before rotating with a fungicide from a different FRAC group. The minimum interval between applications is 5 days.
Alternaria leaf spot/ black spot (*Alternaria* spp.), powdery mildew (*Golovinomyces* spp.[2])	triflumizole (Procure 480SC)	3	6 to 8 fl oz/ acre	0	0.5	***See label for greenhouse usage instructions.*** For use on head and leaf lettuce. See label for additional uses on lettuce. Do not exceed two applications of product per crop per year. Do not exceed 16 fl oz of product per crop per year.
TOMATO — *TRANSPLANT PRODUCTION*						
Anthracnose (*Colletotrichum* spp.), black mold (*Alternaria alternata*), early blight (*Alternaria linariae* [2]), gray leaf spot (*Stemphylium* spp.), leaf mold (*Fulvia fulva* [2]), powdery mildew (*Leveilula taurica*), Septoria leaf spot (*Septoria lycopersici*), target spot (*Corynespora cassiicola*)	azoxystrobin + benzovindiflupyr (Mural)	11+7	0.6 oz/5,000 sq ft	—	0.5	***Allowed for use on transplants grown for resale to consumers. Do not apply to tomatoes grown in a greenhouse for the purpose of producing and harvesting fruit.*** Do not exceed two applications of product per crop for plants grown indoors for resale to consumers. Do not apply until 21 days after transplanting or 35 days after seeding. See label for restrictions for product use when multiple crops are grown in the same area. See label for instructions and cautions regarding the use of adjuvants and tank mixing. Do not apply more than two consecutive applications of product before alternating to another fungicide from a different FRAC group.
Damping-off (*Pythium* spp.)	cyazofamid (Ranman 400SC, Segway O)	21	3 fl oz/100 gal	—	0.5	Apply as a soil drench. Do not use a surfactant. One fungicide application can be made to the seedling tray at planting or any time afterwards until one week before transplanting. See label for additional instructions.
Gray mold (*Botrytis cinerea*)	fenhexamid (Decree 50 WDG)	17	1.5 lb/acre (stand-alone) 1.0 to 1.5 lb/ acre (tank-mix)	—	0.5	Do not make more than two consecutive applications. See label for additional tank-mixing instructions. Do not exceed 6.0 lb product per acre per crop cycle to transplants. Do not exceed six applications per acre per crop cycle at the lowest use rate or four applications per acre per crop cycle at the highest use rate.
Late blight (*Phytophthora infestans*)	mandipropamid (Micora)	40	5.5 to 8.0 fl oz/acre (0.65 to 0.9 fl oz/5,000 sq ft)	—	4 hr	***For tomato transplants grown in enclosed greenhouses with permanent flooring for re-sale to consumers.*** Do not make more than two applications of product per crop. Do not make more than two consecutive applications before switching to a fungicide with a different mode of action. The addition of a spreading/penetrating type adjuvant is recommended.
Botrytis rot (*Botrytis* spp.), early blight (*A. linariae*[2]), powdery mildew (*L. taurica*, *O. sipula*) ***Suppression***: Anthracnose (*C. coccodes*)	polyoxin D zinc salt (Affirm WDG)	19	6.2 oz/acre	—	4 hr	***Allowed for use in greenhouses ONLY in the pro- duction of seedlings and transplants; product is not for use in the production of edible commodities.*** See product labels for maximum limits of active ingredient and applications per season. See product labels for additional application instructions.
Damping off and root rots (*Phytophthora* spp., *Pythium* spp.)	Propamocarb hydrochloride (Previcur Flex)	28	See label	—	0.5	**For pre-seeding and/or seedling treatment (before transplanting).** Do not apply more than two pre-seeding and/or seedling applications per cropping cycle. Do not mix with other products. See label for specific use directions and maximum use rates. Phytotoxicity may occur if applied to dry growing media.

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
TOMATO — *TRANSPLANT PRODUCTION* (continued)						
Crown and basal rot (*Fusarium* spp., *Rhizoctonia solani*, *Sclerotinia* spp.), damping-off (*Pythium* spp., *Rhizoctonia* spp.), spots and blights (*Alternaria* spp., *Cercospora* spp., *Phoma* spp., *Septoria* spp.), Phytophthora blight (*Phytophthora* spp.), powdery mildew (*Leveilula* spp. and *Oidiopsis* spp.), rots and blights (*Botrytis* spp.)	pyraclostrobin + boscalid (Pageant Intrinsic)	11+7	See label	—	0.5	**For transplant production for the home consumer market; not for use on transplants intended for agricultural production fields.** Do not tank-mix with adjuvants or other agricultural products. Do not apply more than two consecutive applications in any crop production cycle or more than three applications to any crop during a growing cycle. Do not apply to consecutive transplant crops within the same production structure. Do not exceed 118 oz product per year to the same production crop. Product application rates vary depending on target disease. See label for application rates and additional restrictions and instructions.
Labels may include: Bacterial canker, speck, and/ or spot	Streptomycin sulfate (Agri-Mycin 50, Firewall 17 WP, Firewall 50 WP, Harbour)	25	See labels	—	0.5	See labels for restrictions, cautions, application instructions, and labeled diseases for each product. **Not all products are registered for use in all states. Check state registration status prior to use.**
Powdery mildew	triflumizole (Terraguard SC)	3	2 to 4 fl oz/100 gal	—	0.5	Commercial greenhouse production only. Use only as a foliar spray. Can be used on greenhouse transplants. Do not exceed 16 fl oz of product per acre per cropping system. Do not exceed 4 applications per crop.
TOMATO — *AFTER TRANSPLANTING IN A GREENHOUSE*						
Bacterial speck (*Pseudomonas syringae* pv. *tomato*), bacterial spot (*Xanthomonas* spp.)	acibenzolar-*S*-methyl (Actigard 50 WG)	P01	0.33 to 0.75 oz/acre	14	0.5	***Not prohibited for greenhouse use.*** Product should be applied to healthy, actively growing plants. Product should not be applied to stressed plants. Do not apply on intervals less than 7 days. Do not exceed 6 oz of product per acre per year. See label for other instructions, restrictions, and precautions.
Anthracnose (*Colletotrichum* spp.), black mold (*A. alternata*), early blight (*A. linariae* [2]), gray leaf spot (*Stemphylium* spp.), leaf mold (*F. fulva* [2]), powdery mildew (*L. taurica*), Septoria leaf spot (*S. lycopersici*), target spot (*C. cassiicola*)	azoxystrobin + difenoconazole (Quadris Top)	11+3	8 fl oz/acre	0	0.5	***Not prohibited for greenhouse use.*** **Do not use for transplant production.** Do not make more than two consecutive applications before switching to a fungicide with a different mode of action. Do not exceed 47 fl oz of product per acre per year. See label for application limits of active ingredients. Do not apply until 21 days after transplanting or 35 days after seeding. Do not use with adjuvants or tank mix with any EC product on fresh market tomatoes. Plant injury may occur with the use of adjuvants or when product is tank-mixed with dimethoate.
Gray mold (*Botrytis cinerea*), late blight (*Phytophthora infestans*), leaf mold (*F. fulva*[2]), powdery mildew (*L. taurica*, *Oidium neolycopersici*), target spot (*C. cassiicola*), white mold (*S. sclerotiorum*)	Banda de Lupinus albus doce (BLAD) (ProBLAD Verde)	BM01	18.1 to 45.7 fl oz/acre	1	4 hr	***Not prohibited for greenhouse use.*** **OMRI-listed.** Do not make more than two sequential applications before alternating to a fungicide with a different mode of action. Do not make more than five foliar applications of product per harvest cycle. **Check state registration status prior to use.**
Labels may include: Alternaria blight, anthracnose, bacterial speck and spot, Cercospora leaf spot, early blight, gray mold, late blight, leaf mold, Phomopsis, Septoria leaf spot	copper, fixed (various)	M01	See label	See label	See label	**Some products are OMRI-listed.** See product labels for complete application instructions, specific crop and disease labels, and greenhouse usage. **Check state registration status prior to use.**
Powdery mildew	cyflufenamid (Torino)	U06	3.4 oz/acre	0	4 hr	***Not prohibited for greenhouse use.*** Do not make more than three applications per year. Do not exceed 10.2 oz product per acre per calendar year. See label for other application instructions and restrictions.

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
TOMATO — *AFTER TRANSPLANTING IN A GREENHOUSE* (continued)						
Late blight (*P. infestans*), Phytophthora blight (*P. capsici*)	cyazofamid (Ranman 400SC)	21	2.1 to 2.75 fl oz/acre (late blight) 2.75 fl oz/acre (Phytophthora blight)	0	0.5	Do not exceed 16.5 fl oz per acre per year. Do not exceed six applications of product per crop. See label for surfactant recommendations. Alternate applications with fungicides that have a different mode of action. Do not make more than three consecutive applications before switching to products that have a different mode of action for three applications before returning to Ranman 400SC. See label for application instructions.
Late blight (*P. infestans*)	cymoxanil (Curzate 60DF)	27	3.2 to 5.0 oz/ acre	3	0.5	***Not prohibited for greenhouse use.*** Use only with the labeled rate of a protectant fungicide with a different mode of action. Do not exceed 30 oz of product or six applications per year. **Curzate not registered in LA.**
Early blight (*A. linariae* [2]), gray mold (*B. cinerea)*, powdery mildew (*L. taurica*)	cyprodinil + fludioxonil (Switch 62.5WG)	9+12	11 to 14 oz/ acre	0	0.5	***Not prohibited for greenhouse use.*** After two applications, alternate with another fungicide with a different mode of action for two applications. Do not exceed 56 oz of product per acre per year. See label for application limits of active ingredients. Do not exceed four applications per year.
Anthracnose (*Colletotrichum* spp.), black mold (*A. alternata*), early blight (*A. linariae* [2]), gray mold (*B. cinerea*), gray leaf spot (*S. botryosum*), leaf mold (*F. fulva* [2]), powdery mildew (*L. taurica*), Septoria leaf spot (*S. lycopersici*), target spot (*C. cassiicola*)	difenoconazole + cyprodinil (Inspire Super)	3+9	16 to 20 fl oz/ acre	0	0.5	***Not prohibited for greenhouse use.*** Do not exceed 80 fl oz of product per acre per year. See label for application limits of active ingredients. Make no more than two consecutive applications per season before alternating with fungicides that have a different mode of action.
Anthracnose (*Colletotrichum* spp.), early blight (*A. linariae* [2]) late blight (*P. infestans*), leaf mold (*P. fulva*[2]), Septoria leaf spot (*S. lycopersici*), target spot (*C. cassiicola*) ***Suppression:*** Bacterial canker (*Clavibacter michiganensis* subsp. *michiganensis*), bacterial speck (*Pseudomonas syringae* pv. *syringae*), bacterial spot (*Xanthomonas* spp.), buck-eye rot (*Phytophthora* spp.)	famoxadone + cymoxanil (Tanos)	11+27	6 to 8 oz/acre (early blight) 8 oz/acre (other labeled diseases)	3	0.5	***Not prohibited for greenhouse use.*** Product must be tank-mixed with a contact fungicide with a different mode of action. Do not exceed more than 72 oz per acre per crop cycle or 12-month period. Do not make more than one application of product before alternating with a fungicide that has a different mode of action. See label for tank-mixing instructions. No more than 50% of total applications in a cropping season should contain Tanos or other FRAC Group 11 fungicides.
Botrytis gray mold (*B. cinerea*)	fenhexamid (Decree 50 WDG)	17	1.5 lb/acre (stand-alone) 1.0 to 1.5 lb/ acre (tank-mix)	0	0.5	Do not make more than two consecutive applications. See label for additional tank-mixing instructions. Do not exceed 6.0 lb product per acre per crop cycle for greenhouse production. Do not exceed six applications per acre per crop cycle at the lowest use rate or four applications per acre per crop cycle at highest use rate.
Early blight (*A. linariae* [2]), gray mold (*B. cinerea*), powdery mildew (*L. taurica*)	fludioxonil (Spirato GHN)	12	5.5 to 7 fl/oz/ acre	0	0.5	After two applications of product, alternate to a fungicide with a different mode of action for two applications. Do not exceed 28 fl oz of product per acre per year. Do not exceed four applications per year.

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
TOMATO — *AFTER TRANSPLANTING IN A GREENHOUSE* (continued)						
Black mold (*A. alternata*), early blight (*A. linariae* [2]), gray mold (*B. cinerea*), gray leaf spot (*Stemphylium* spp.), powdery mildew (*O. taurica*, *L. taurica*), Septoria leaf spot (*S. lycopersici*), target spot (*C. cassiicola*) ***Suppression:*** Anthracnose (*Colletotrichum* spp.), southern blight (*A. rolfsii* [2]), white mold (*Sclerotinia* spp.)	fluopyram + trifloxystrobin (Luna Sensation)	7+11	5.0 to 7.6 fl oz/acre (early blight, powdery mildew, Septoria leaf spot) 7.6 fl oz/acre (other listed diseases)	3	0.5	***Not prohibited for greenhouse use.*** Do not exceed 27.1 fl oz of product per acre per year. See label for application limits of active ingredients. Do not apply more than 0.446 lb fluopyram or 0.5 lb trifloxystrobin per acre per year. Do not make more than five applications per year. Do not make more than two sequential applications of product or of any FRAC 7- or FRAC 11-containing fungicide before alternating with a fungicide from a different FRAC group.
Black mold (*A. alternata*), early blight (*A. linariae* [2]), gray mold (*B. cinerea*), gray leaf spot (*Stemphylium* spp.), Septoria leaf spot (*S. lycopersici*), target spot (*C. cassiicola*) ***Suppression:*** Powdery mildew (*O. taurica*, *L. taurica*),	fluopyram + pyrimethanil (Luna Tranquility)	7+9	11.2 fl oz/acre	1	0.5	Do not exceed 54.7 fl oz of product per acre per year. Do not apply more than 0.446 lb fluopyram or 1.4 lbs pyrimethanil per acre per year. Do not make more than two sequential applications of product or of any FRAC 7- or FRAC 9-containing fungicide before alternating with a fungicide from a different FRAC group. Apply only in well-ventilated plastic tunnel houses or glass houses. Ventilate for at least 2 hours after application. **Luna Tranquility is not registered for use in LA.**
Damping-off (*Pythium* spp.), root rots (*Phytophthora spp.*)	fosetyl-Al (Aliette WDG, Linebacker WDG)	P07	2.5 to 5.0 lb/ acre	14	0.5 (Aliette) 1 (Line-backer)	***Not prohibited for greenhouse use.*** For foliar application. Phytotoxicity may occur if products are tank-mixed with copper products, applied to plants with copper residues, or mixed with adjuvants. Do not tank-mix products with copper products. See labels for additional restrictions and application instructions not included below. **Products are not labeled for use on tomato in certain counties in AL, KY, LA, NC, and TN.** **Aliette WDG:** Do not exceed 20 lb of product per acre per season. **Aliette is not labeled for use on tomato in certain counties in AL, KY, LA, NC, and TN. Aliette has a 2 (ee) Recommendation for suppression of bacterial spot in FL;** see label for application instructions and restrictions. **Linebacker WDG:** Do not exceed 20 lb of product per acre per year. Do not exceed four applications of product per acre per year. Ch**eck state registration status prior to use. Linebacker is not labeled for use on tomato in certain counties in AL, KY, LA, NC, and TN.**
Labels may include: Anthracnose, *Alternaria,* bacterial speck and spot, Botrytis gray mold, leaf mold, early blight, *Fusarium,* late blight, powdery mildew, *Pythium, Rhizoctonia*	hydrogen peroxide + peroxyacetic acid (OxiDate 2.0, OxiDate 5.0, ZeroTol 2.0)	NG	See label	0	See label	**OMRI-listed.** See labels for additional instructions, labeled diseases, and precautions, including those related to the use and application of metal-based chemicals. Do not store spray solution. **OxiDate 2.0:** Not prohibited for greenhouse use. Determine if product can be used safely on greenhouse crops prior to application. **OxiDate 5.0:** Not prohibited for greenhouse use. Determine if product can be used safely on greenhouse crops prior to application. **ZeroTol 2.0:** Determine if product can be used safely on green- house crops prior to application.
Labels may include: Anthracnose, bacterial speck and spot, early blight, gray leaf spot, late blight, leaf mold, Septoria leaf spot	mancozeb (various)	M03	See label	See label	See label	See product labels for complete application instructions, specific crop and disease labels, and greenhouse usage. **Check state registration status prior to use.**
Anthracnose, bacterial speck and spot, early blight, gray leaf spot, late blight, leaf mold, Septoria leaf spot *East of the Mississippi:* black mold, buckeye rot, powdery mildew, target spot	mancozeb + azoxystrobin (Dexter Max)	M03+ 11	See label	5	1	***See label for restrictions on greenhouse use.*** **Do not use for commercial transplant production.** See product label for complete application instructions, including seasonal product limits and restrictions and/or cautions for mixing with other products, additives, or adjuvants. Product rates vary depending on location and disease.

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
TOMATO — *AFTER TRANSPLANTING IN A GREENHOUSE* (continued)						
Anthracnose, bacterial speck and spot, early blight, gray leaf spot, late blight, leaf mold, Septoria leaf spot	mancozeb + copper (ManKocide)	M03+ M01	1.7 lb/acre (processing) 1 to 3 lb/acre (fresh market)	5	See label	***Not prohibited for greenhouse use.*** Do not exceed 26.7 lb of product per year(fresh market). See label for restrictions on season limits for processing tomatoes. Phytotoxicity may occur when spray solution has a pH of less than 6.5 or when certain environmental conditions occur. Product may be reactive on some surfaces. Avoid contact with metal surfaces. See label for additional cautions.
Bacterial speck and spot, buckeye rot, early blight, gray leaf spot, late blight, leaf mold, Septoria leaf spot	mancozeb + zoxamide (Gavel 75DF)	M03+22	1.5 to 2.0 lb/ acre (all others) 2.0 lb/acre (bacterial speck and spot)	5	2	***Not prohibited for greenhouse use.*** Do not exceed 8 lb per acre per year (west of the Mississippi River) or 16 lb per acre per year (east of the Mississippi River). Do not make more than four applications per acre per year (west of the Mississippi River) or eight applications per acre per year (east of the Mississippi River). For bacterial speck and spot, apply the full rate of product in a tank-mix with a full rate of a fixed copper. See label for other application limits. **Product has a 2 (ee) recommendation for anthracnose management in AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, VA, and WV.**
Late blight (*P. infestans*)	Mandipropamid (Revus)	40	8.0 fl oz/acre	1	4 hr	**Do not use for transplant production.** Do not make more than two consecutive applications per season before alternating with a fungicide that has a different mode of action. Do not use for transplant production. Do not exceed 32 fl oz of product per acre per season. See label for application limits when multiple croppings are produced.
Anthracnose (*Colletotrichum* spp.), black mold (*A. alternata*), early blight (*A. linariae* [2]), gray leaf spot (*S. botryosum*), late blight (*P. infestans*), leaf mold (*F. fulva* [2]), powdery mildew (*L. taurica*), Septoria leaf spot (*S. lycopersici*), target spot (*C. cassiicola*)	mandipropamid + difenoconazole (Revus Top)	40+3	5.5 to 7.0 fl oz/acre	1	0.5	***Not prohibited for greenhouse use.*** Do not make more than two consecutive applications per season before alternating with a fungicide that has a different mode of action. Do not exceed 28 fl oz of product per acre per season. See label for application limits of active ingredients. The addition of a spreading/penetrating type adjuvant is recommended.
Late blight (*P. infestans*)	mefenoxam + mancozeb (Ridomil Gold MZ WG)	4+M03	2.5 lb/acre	5	2	***Not prohibited for greenhouse use.*** Do not exceed 7.5 lb of product per acre per year. Do not exceed three applications per year. See label for application limits. Apply a protectant fungicide in between applications of product. See label for other restrictions.
Powdery mildew (*Leveilula* spp.)	myclobutanil (AgriStar Sonoma 20 EW AG)	3	4.75 to 7.6 fl oz/acre	0	1	***Not prohibited for greenhouse use.*** Do not exceed 38.0 fl oz of product or 0.5 lb myclobutanil per acre per crop. See product labels for additional instructions and restrictions. **Sonoma 20EW AG is not registered for use in AL, FL, KY, MS, OK, SC, TN, or TX.**
Buckeye rot, late blight, Phytophthora blight (foliar)	oxathiapiprolin + mandipropamid (Orondis Ultra)	49+40	See comments	1	4 hr	**Do not use in nursery production of transplanted crops.** Do not make more than two consecutive applications before alternating with fungicides that have a different mode of action. Use a rate range of 2 to 5 ml (0.07 to 0.167 fl oz or 0.42 to 1 tsp) per gallon of spray per 1,518 sq ft. See label for additional restrictions and yearly limits.
Labels may include: Late blight, root rots	phosphonates (mono- and dibasic salts of phosphites, phosphorous acid, potassium phosphite) (various)	P07	See label	See label	See label	See product labels for complete application instructions, labeled diseases, restrictions, and crop and greenhouse usage. **Check state registration status prior to use.**

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
TOMATO — *AFTER TRANSPLANTING IN A GREENHOUSE* (continued)						
Botrytis gray mold (*Botrytis* spp.), early blight (*A. linariae* [2]), leaf mold (*F. fulva* [2]) powdery mildew (*Leveilula, Oidiopsis*) ***Suppression****:* Anthracnose (*Colletotrichum* spp.), late blight (*P. infestans*), target spot (*C. cassiicola*)	polyoxin D zinc salt (OSO 5% SC)	19	6.5 to 13.0 fl oz/acre	0	4 hr	***Not prohibited for greenhouse use.*** Check products labels for maximum limits of active ingredient and applications per season.
Labels may include: Alternaria diseases, anthracnose, Botrytis, powdery mildew, Septoria leaf spot	potassium bicarbonate (Carb-O-Nator, MilStop SP)	NC	2.5 to 5.0 lb/100 gal (Carb-O-Nator) 1.25 to 5.0 lb/100 gal (MilStop SP)	0	4 hr (Carb-O-Nator) 1 hr (Mil-Stop SP)	**OMRI-listed.** Do not store unused spray solution. See labels for additional labeled diseases and instructions. **Carb-O-Nator:** Final spray solution should not be below pH 7.0. Some tank-mixes may be incompatible and may cause phytotoxicity. Spray solution should be applied within 12 hours of preparation. **MilStop:** Do not exceed 0.5 lb of product per 4,350 sq ft or 1.15 lb of product per 10,000 sq ft per application. Do not adjust pH after mixing. Do not mix with other soluble pesticide or fertilizers not compatible with mild alkaline solutions.
Damping off and root rots (*Phytophthora* spp., *Pythium* spp.)	Propamocarb hydrochloride (Previcur Flex)	28	See label	See label	0.5	Product applied through a drip system or as a soil drench. Do not apply more than four applications of product after transplanting per crop cycle. Do not mix with other products. Phytotoxicity may occur if applied to dry growing media. See label for other application instructions and maximum use rates.
Anthracnose (*Colletotrichum* spp.), black mold (*A. alternata*), Botrytis gray mold (*B. cinerea*), early blight (*A. linariae* [2]), target spot (*C. cassiicola*)	pyraclostrobin + boscalid (Pageant Intrinsic)	11+7	12.25 to 23 oz/acre (all other diseases) 18 oz/acre (target spot) 23 oz/acre (Botrytis)	0	0.5	Do not make more than one application of product before switching to a fungicide with a different mode of action. Do not exceed 69 oz of product per acre per crop cycle. Do not make more than three applications of product or of other FRAC Group 7 or 11 fungicides per crop cycle. Do not tank mix with adjuvants or other agricultural products.
Gray mold (*B. cinerea*), early blight (*A. linariae* [2])	pyrimethanil (Scala SC)	9	7 fl oz/acre	1	0.5	Use only in well-ventilated plastic tunnel or glass houses; ventilate for at least 2 hours after application of product. Use only in a tank-mix with another fungicide for early blight. Do not exceed 35 fl oz per acre per crop, with a maximum of two crop cycles per year. See label for cautions.
Powdery mildew (*Leveilula, Oidium* spp.)	Pyriofenone (Prolivo 300 SC)	50	4 to 5 fl oz/ acre	0	4 hr	***Not prohibited for greenhouse use.*** Do not make more than two sequential applications of Prolivo or another Group 50-containing fungicide before rotating to a fungicide with a different mode of action. Do not apply more than 16 fl oz of product or 0.32 lb of pyriofenone per acre per year. Do not apply more than four applications per year.
Powdery mildew	sulfur (various)	M02	See label	See label	See label	***Some products are OMRI-listed. See product labels for complete application instructions, specific crop and disease labels, and greenhouse usage. Check state registration status prior to use.***
Suppression: Powdery mildew	tolfenpyrad (Torac)	39	21.0 fl oz/acre	1	0.5	***Not prohibited for greenhouse use.*** Do not exceed 42 fl oz or two applications of product or 0.42 lb of tolfenpyrad per acre per crop cycle. Do not exceed four applications of product per year. Allow at least 14 days between applications. IRAC 21A.
Early blight (*A. linariae* [2]), gray leaf spot (*Stemphylium* spp.), late blight (*P. infestans*) ***Suppression*:** Anthracnose (*Colletotrichum* spp.), Septoria leaf spot (*S. lycopersici*), powdery mildew (*O. taurica*)	trifloxystrobin (Flint Extra)	11	See label 3.0 to 3.8 fl oz/acre (only for suppressed diseases)	3	0.5	***Not prohibited for greenhouse use.*** See label for application rates specific for early blight, gray leaf spot, and late blight. Alternate every FRAC 11 fungicide application with at least one application of a fungicide from a different FRAC group. Product must be tank-mixed and alternated with a protectant fungicide for control of late blight. Do not exceed five applications or 16 fl oz of product per acre per year. The minimum interval between applications is 7 days.

Table 10-59. Greenhouse Disease Control for Various Vegetable Crops

Crop/Disease	Product[1]	FRAC	Rate of Material	Minimum Days		Method, Schedule, and Remarks
				Harv.	Reentry	
TOMATO — *AFTER TRANSPLANTING IN A GREENHOUSE* (continued)						
Powdery mildew	triflumizole (Terraguard SC)	3	2 to 4 fl oz/100 gal	1	0.5	Commercial greenhouse production only. For use only as a foliar spray. Do not exceed 16 fl oz of product per acre per cropping system. Do not exceed four applications per crop.
Anthracnose, early blight, Septoria leaf spot	zinc dimethyl-dithiocarbamate (Ziram 76 DF)	M03	3 to 4 lb/acre	7	2	***Not prohibited for greenhouse use.*** Do not use on cherry tomatoes. Do not exceed 23.7 lb of product per acre per crop cycle. Product can be mixed with copper fungicides to enhance bacterial disease control.

[1] Products registered for field use may be used on greenhouse crops (but not transplants) unless excluded on the label. Always check the label before applying a product. Additional products not prohibited for greenhouse use on basil, cucurbits, and lettuce not listed in this table are available.

[2] Former names of diseases and pathogens listed in this table that may be still be listed on fungicide labels are as follows: *Acidovorax citrulli* (formerly *Acidovorax avenae* subsp. *citrulli*) Alternaria *linariae* (formerly *A. solani* and *A. tomatophila*); *Athelia rolfsii* (formerly *Sclerotium rolfsii*); *Golovinomyces* spp. (formerly *Erysiphe* spp.) or *Golovinomyces cichoracearum* (formerly *Erysiphe cichoracearum*); *Fulvia fulva* (formerly *Cladosporium fulvum* and *Passalora fulva*); *Boeremia exigua* (formerly *Phoma exigua*); *Plectosphaerella cucumerina* (formerly *Plectosporium tabacinum*); *Podosphaera xanthii* (formerly *Sphaerotheca fuliginea*); *Stagonosporopsis* spp. (formerly *Didymella*); Xanthomonas leaf spot (formerly bacterial leaf spot); and (*Xanthomonas cucurbitae* (formerly *X. campestris* pv. *cucurbitae*).

Efficacy of Products for Greenhouse Tomato Disease Control

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Table 10-60. Efficacy of Products for Greenhouse Tomato Disease Control

Scale: E, excellent; G, good; F, fair; P, poor; NC, no control; ND, no data

Active Ingredient [1]	Product (s)	Fungicide (FRAC) Group F	Preharvest Interval (Days)	Anthracnose (*Colletotrichum coccodes*)	Bacterial Soft Rot (*Erwinia* spp.)	Bacterial Canker (*Clavibacter michiganensis* subsp. *michiganensis*)	Botrytis Gray mold (*Botrytis cinerea*)	Buckeye Rot (*Phytophthora* spp.)	Early Blight (*Alternaria linariae*=*A. tomatophila*) [3]	Late blight (*Phytophthora infestans*)	Leaf mold (*Passalora fulva*) [3]	Powdery Mildew (*Leveilula taurica*)	Pythium Root Rot (*Pythium* spp.)	Rhizoctonia Root Rot (*Rhizoctonia solani*)	Septoria Leaf Spot (*Septoria lycopersici*)	Target Spot (*Corynespora cassiicola*)	Timber Rot (White mold) (*Sclerotinia sclerotiorum*)
acibenzolar-*S*-methyl	Actigard	P01	14	NC	F	F	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
azoxystrobin + difenoconazole	Quadris Top	11+3	0	ND	NC	NC	ND	NC	G	F	ND	G	NC	ND	G	G	ND
bacteriophage	AgriPhage-CMM	NC	0	NC	P	F	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Bacillus subtilis	various	BM02	0	ND	ND	NC	P	NC	P	NC	ND	P	NC	NC	ND	P	ND
BLAD	Fracture	BM01	1	ND	NC	NC	F	NC	ND	NC	ND	F	NC	ND	ND	ND	ND
cyprodinil + fludioxonil	Switch 62.5WG	9+12	0	G	NC	NC	E	NC	F	NC	ND	G	NC	F	F	ND	ND
cyazofamid	Ranman	21	0	NC	NC	NC	NC	NC	NC	G	NC	NC	F	NC	NC	NC	NC
cymoxanil	Curzate	27	0	NC	NC	NC	NC	NC	NC	G	NC	NC	F	NC	NC	NC	NC
difenoconazole + cyprodinil	Inspire Super	3+9	0	G	NC	NC	E	NC	G	NC	ND	G	NC	NC	ND	G	F
famoxadone + cymoxanil	Tanos	11+27	3	F	ND	P	ND	NC	F	NC	F	P	NC	NC	F	F	ND
fenamidone	Reason	11	14	ND	NC	NC	ND	NC	G	F	ND	G	NC	ND	G	G	ND
fenhexamid	Decree 50 WDG	17	1	NC	NC	NC	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	NC
fixed copper	various	M01	0	P	F	F	P	NC	F	NC	P	P	NC	NC	P	P	NC
mancozeb	various	M03	5	G	NC	NC	F	NC	G	NC	F	ND	NC	NC	F	F	ND
mancozeb + azoxystrobin	Dexter Max	M03+11	5	ND	NC	NC	ND	NC	G	G[R]	ND	G	NC	ND	G	G	ND
mandipropamid	Revus	40	1	NC	NC	NC	NC	NC	NC	G	NC	NC	F	NC	NC	NC	NC
mandipropamid + difenoconazole	Revus Top	40+3	1	G	NC	NC	NC	G	G	G	NC	G	F	NC	G	ND	ND
neem oil	Triact 7	NC	0	ND	ND	ND	ND	ND	ND	NC	ND	ND	ND	ND	ND	ND	ND
oxathiapiprolin + mandipropamid	Orondis Ultra	49+40	1	NC	NC	NC	NC	NC	NC	G	NC	NC	F	NC	NC	NC	NC
penthiopyrad	Fontelis	7	0	P	NC	NC	F	NC	G	NC	G	G	NC	NC	F	G	ND
polyoxin D zinc salt	Affirm WDG, OSO 5%SC	19	0	F	NC	NC	F[R]	ND	F	NC	ND	F	ND	ND	ND	F	ND
propamocarb hydrochloride	Previcur Flex	28	5	NC	NC	NC	NC	F	NC	G	NC	NC	F	NC	NC	NC	NC
pyrimethanil	Scala	9	1	NC	NC	NC	F[R]	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Streptomyces sp. strain K61	Mycostop	NC	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	F	F	NC	NC	NC
streptomycin sulfate [2]	Agri-Mycin 50, Firewall17 WP, Firewall 50 WP, Harbour	25	0	NC	F	F	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
sulfur [P]	various	M02	0	P	NC	NC	NC	NC	NC	NC	NC	F	NC	NC	NC	NC	NC

[1] Efficacy ratings do not necessarily indicate a labeled use for every disease.

[2] For use on transplants only.

[3] Former names of pathogens listed in this table that may still be listed on fungicide labels are as follows: *Alternaria linariae* (formerly *A. solani* and *A. tomatophila*) and *Passalora fulva* (formerly *Cladosporium fulvum* and *Fulvia fulva*).

[P] Sulfur may be phytotoxic; follow label carefully.

[F] To prevent resistance in pathogens, alternate fungicides within a group with fungicides in another group. Fungicides in the "M" groups are generally considered "low-risk" with no signs of resistance developing to most fungicides. "NC" indicates that the product has not been classified into a fungicide group.

[R] Resistance reported in the pathogen.

Seed Treatments

Seed sanitation to eradicate bacterial or viral plant pathogens: When treating vegetable seeds, it is critical to follow the directions exactly, because germination can be reduced by the treatment or the pathogen may not be eliminated. The effect of a treatment on germination should be determined on a small lot of seeds prior to treating large amounts of seed. Treatments should not be applied to (1) pelleted seed, (2) previously treated seed, or (3) old or poor-quality seed. A protective fungicide treatment (see below) can be applied to the seed following treatment for bacterial pathogens.

Seed treatments to prevent damping off diseases: Most commercially available vegetable seeds come treated with at least one fungicide or insecticide. Vegetable producers who would like to apply their own seed treatment should purchase non-treated seed. While many fungicides are labeled for use on vegetable seed, most fungicides are restricted to commercial treatment only and should not be applied by producers. Labeled fungicides can be applied to seed following treatment for bacterial pathogens. Do not use fungicide-treated seed for food or feed.

HOT WATER TREATMENT

By soaking seed in hot water, seed-borne fungi and bacteria can be reduced, if not eradicated, from the seed coat. Hot water soaking will not kill pathogens associated with the embryo nor will it remove seed-borne plant viruses from the seed surface.

1. Place seed loosely in a weighted cheesecloth or nylon bag.
2. Warm the seed by soaking it for 10 minutes in 100°F (37°C) water.
3. Transfer the warmed seed into a water bath already heated to the temperature recommended for the vegetable seed being treated (Table 10-61). The seeds should be completely submerged in the water for the recommended amount of time (Table 10-61). Agitation of the water during the treatment process will help to maintain a uniform temperature in the water bath.
4. Transfer the hot water treated seed into a cold-water bath for five minutes to stop the heating action.
5. Remove seed from the cheesecloth or nylon bag and spread them evenly on clean paper towel or a sanitized drying screen to dry. Do not dry seed in areas where fungicides, pesticides, or other chemicals are located.
6. Seed can be treated with a labeled fungicide to protect against damping off pathogens.

CHLORINE BLEACH TREATMENT

Treating seeds with a solution of chlorine bleach can effectively remove bacterial pathogens and some viruses (for instance, Tobacco Mosaic Virus) that are borne on the surface of seeds.

1. Add 1 quart (946 ml) of household bleach to 5 quarts (4.7 L) of potable water.
2. Add a drop or two of liquid dish detergent or a commercial surfactant such as Activator 90 or Silwet to the disinfectant solution. Add seed to the disinfectant solution (1 pound of seed per 4 quarts of disinfectant solution) and agitate for 1 minute.
3. Prepare fresh disinfectant solution for each batch of seeds to be treated.
4. Rinse the seed in a cold-water bath for 5 minutes to remove residual disinfectant.
5. Spread seeds evenly on clean paper towel or a sanitized drying screen to dry. Do not dry seed in area where fungicides, pesticides, or other chemicals are located.
6. Seed can be treated with a labeled fungicide to protect against damping off pathogens.

HYDROCHLORIC ACID TREATMENT

Tomato seed can be treated with a dilute solution of hydrochloric acid (HCl) solution to eliminate seed-borne bacterial pathogens such as *Xanthomonas* spp. (Bacterial leaf spot), *Pseudomonas syringae* pv. *tomato* (Bacterial speck) and *Clavibacter michiganensis* subsp. *michiganensis* (Bacterial canker). Hydrochloric acid can also be used to remove TMV from the surface of tomato seed. Do not use HCL-treated seed for food or animal feed.

1. Prepare a 5% solution of HCl by adding one part acid to 19 parts potable water. Prepare the acid solution in a well-ventilated area and avoid direct skin contact with the acid.
2. Soak seeds for 6 hours with gentle agitation.
3. Carefully drain the acid off the seed and rinse seed under running potable water for 30 minutes. Alternatively, rinse the seeds 10 to 12 times with potable water to remove residual acid.
4. Spread seeds evenly on clean paper towel or a sanitized drying screen to dry. Do not dry seed in area where fungicides, pesticides, or other chemicals are located.
5. Seed can be treated with a labeled fungicide to protect against damping off pathogens.

TRISODIUM PHOSPHATE TREATMENT

Tomato seed can be treated with trisodium phosphate (TSP) to eradicate seed-transmitted TMV. Do not use TSP-treated seed for food or animal feed.

1. Prepare a 10% solution of TSP (1 part TSP in 9 parts potable water). Trisodium phosphate is available at most home supply or paint stores. Avoid direct skin contact with the TSP solution.
2. Soak seed for 15 minutes in the disinfectant solution.
3. Rinse the seed in a cold-water bath for 5 minutes to remove residual disinfectant.
4. Spread seeds evenly on clean paper towel or a sanitized drying screen to dry. Do not dry seed in area where fungicides, pesticides, or other chemicals are located.
5. Seed can be treated with a labeled fungicide to protect against damping off pathogens.

TESTING SEED GERMINATION AFTER SEED TREATMENTS
Randomly select 100 seeds from each seed lot.

1. Treat 50 seeds using one of the sanitizers described above.
2. After the treated seed has dried and before application of a protectant fungicide, plant the treated and non-treated seed separately in flats containing planting mix according to standard practice. Label each group as treated or non-treated.
3. Allow the seeds to germinate and grow until the first true leaf appears (to allow for differences in germination rates to be observed).
4. Count seedlings in each group separately.
5. Determine the percent germination for each group: # seedlings emerged ÷ # seeds planted x 100.
6. Compare percent germination between the treated and non-treated groups. Percent germination should be within 5% of each other.

Table 10-61. Recommended Temperatures and Treatment Times for Hot Water Disinfestation of Vegetable Seed

Vegetable Crop	Water Temperature (°F/°C)	Soaking Time (Minutes)
Broccoli	122/50	20 to 25
Brussels sprout	122/50	25
Cabbage	122/50	25
Carrot	122/50	15 to 20
Cauliflower	122/50	20
Celery	122/50	25
Chinese cabbage	122/50	20
Collard	122/50	20
Cucumber [1]	122/50	20
Eggplant	122/50	25
Garlic	120/49	20
Kale, Kohlrabi	122/50	20
Lettuce	118/48	30
Mint	112/44	10
Mustard, Cress, Radish	122/50	15
Onion	115/46	60
Pepper	125/51	30
Rape, Rutabaga	122/50	20
Shallot	115/46	60
Spinach	122/50	25
Tomato	122/50	25
Turnip	122/50	20

[1] Cucurbits other than cucumbers can be severely damaged by hot water treatment and should be disinfested using chlorine bleach.

Sanitation

Sanitation is a broad term used in the food industry. For produce growers, this term is often defined by requirements within the PSR or standards within GAPs. Sanitation includes the basic sanitary conditions and practices within the food industry for growing and handling of food safely. Measures required to prevent equipment, tools, facilities (for example, packinghouses), and sanitation practices from becoming a route of contamination for produce and food contact surfaces include:

- Pre and postharvest water sanitation
- Cleaning of tools and equipment
- Appropriate storage and maintenance of tools and equipment
- Appropriate use of toilet and handwashing facilities
- Control of pests
- Maintenance of adequate plumbing
- Proper disposal of sewage and waste

PREHARVEST WATER SANITATION

There are many things to consider when choosing a water treatment system, and it is unique to each water source/situation. Selecting the appropriate water system treatment is probably the most difficult part of treating your water. The questions below highlight the basic steps you should consider prior to choosing a water treatment method. If you decide to choose a water treatment method, you should contact your local resources to help you decide the best method for your operation.

CONSIDERATIONS FOR CHOOSING A WATER TREATMENT METHOD FOR YOUR FARM OPERATION

- *Is it EPA approved?* Chemicals must be EPA registered for their use based upon the EPA label for the product. If the product does not have this information, you cannot use it.
- *What is the cost of set-up, continued use, and maintenance?* Some treatment methods require a larger investment than others at set-up, and all costs (including recurring costs such as chemical costs) should be assessed at the start to ensure successful implementation of the treatment.
- *What are the management and monitoring requirements?* All of these treatments require proper management and monitoring in order to treat the water effectively and consistently. Be sure you have the time and resources to invest in order to successfully accomplish these goals on your farm.
- *What infrastructure do you already have on your farm?* The infrastructure you already have in place on the farm may more easily lend itself to one treatment versus another (i.e., electricity, injection point, etc.).
- *What is the source of your water?* Not all sources of water are equal, keep in mind the population of indicator microorganisms like *E. coli* and other factors like turbidity and alkalinity. This can drive increased chemical demand to achieve your goals. In the case of UV treatment, more turbid water might require additional filtration or longer contact time with the UV light.
- *What is the application method?* How you size and implement a water treatment depends on your irrigation system and flow rate.
- *What is the sensitivity of your crops to the treatment?* As some crops may be more sensitive to particular treatments, it is important to consider your crop tolerance.
- *Are there WPS and other restricted entry considerations?* This is another important consideration for resources that may be needed for your employees to implement the treatment.
- *Are there other EPA or local environmental considerations?* Depending on where you are located, environmental considerations for treated water may vary before water is discharged back to the environment.

Source: Buchanan, J.R., Chapin, T.K., Danyluk, M.D., Gunter, C.C., Strawn, L.K., Wszelaki, A.L., Critzer, F.J. 2019. Bridging the GAPs: Approaches for Treating Water On-Farm. Curriculum v1.0.

For more information, visit: vegetables.tennessee.edu/food-safety/preharvest-water/

POSTHARVEST WATER SANITATION

Produce may be washed after harvest to remove dirt and debris. According to FSMA, water used for harvest and postharvest activities must have no detectable generic *E. coli* in a 100 mL water sample. Generic *E. coli* is an indicator organism, with the idea that if there is generic *E. coli* in the water, there is a higher likelihood that there could be other pathogenic organisms.

Growers may use dump tanks or bins for washing produce, which oftentimes relies on recirculated and batch water. Single-pass systems (for example, spray bars) may also be used. For recirculated and batch water systems, it is particularly important to maintain the sanitary quality of the water throughout its use. Potential contamination from produce in a batch water system, like a dump tank, can contaminate the water, thus spreading the microorganisms or cross-contaminating other produce in the dump tank. The use of sanitizers in wash water systems can significantly reduce this risk of cross-contamination. Table 10-63 provides a list of sanitizers that are EPA-approved for use in wash-water systems.

CLEANING AND SANITIZING FOOD CONTACT SURFACES

A critical component within a sanitation program includes procedures for cleaning and sanitizing, particularly for surfaces on which food comes into contact. The Produce Safety Rule states that growers must "inspect, maintain, and clean and, when necessary and appropriate, sanitize all food contact surfaces of equipment and tools used in covered activities as frequently as reasonably necessary to protect against contamination of covered produce."

Identify Food Contact Surfaces

First identify all food contact surfaces, that is, those surfaces that will directly touch the produce. Examples of food contact surfaces can include knives, harvest bins, transportation equipment, tables, conveyor belts, and packing materials. And do not forget about employees' hands – they can be a food contact surface, too – emphasizing the need for proper handwashing.

Cleaning and Sanitizing Procedures

Once the priorities for cleaning and sanitizing have been identified, implement proper cleaning and sanitizing procedures. Proper cleaning and sanitizing procedures follow four basic steps, as described in Table 10-62. Keep in mind that the PSR defines criteria for water used during harvest and postharvest activities that include no detectable generic *E. coli* in a 100 mL water sample.

The use of appropriate detergents is important to consider as they help reduce the surface tension of water and surround and lifts soil from the surface. Upon rinsing the detergent, the surface may appear visually clean; however, microorganisms can still be present even after the cleaning step. Food contact surfaces must include a sanitization step to reduce the number of microorganisms to a safe level. According to EPA definition, food contact sanitizers reduce the bacterial count on a surface by 5 logs or by 99.999%. For instance, if there are 1,000,000 bacteria on a surface before the sanitizer is applied, this number should be reduced to 10 bacterial cells after the sanitizer is applied and dried. A list of commonly used sanitizers can be found in Table 10-63. For food-contact surfaces, sanitizers are often formulated as a last step after cleaning and rinsing.

IMPLEMENTING A CLEANING AND SANITATION PROGRAM

Having a dedicated trained crew and crew leader is critical to implementing a cleaning and sanitation program in farms and packing houses. Depending on the size of the farm, a cleaning crew may be composed of employees that work a regular shift or employees that only focus on cleaning and sanitation procedures. Always conduct daily housekeeping activities in packing areas regardless of the frequency of cleaning and sanitation of other areas. Nonetheless, budget sufficient time for breakdown of equipment, cleaning, sanitation, and reassembly of equipment. The use of personal protective equipment (PPE) must be followed based on the different product label instructions being used. Label instructions must be followed when mixing and applying sanitizers to food contact surfaces and non-food contact surfaces. Note that the use of application equipment for cleaners and sanitizers (such as *foamers*) can greatly reduce the time it takes to clean and sanitizer equipment and can allow for access to hard-to-reach areas especially in packing lines. Having a dedicated set of tools for bathrooms that is never used in any other areas where produce is present is important to prevent cross contamination. Working with a cleaning and sanitation company directly is always helpful. Some companies offer training resources for their products, enhanced labels and provide advice on application equipment. There are different methods to verify that cleaning and sanitation procedures are actually working such as ATP meters and environmental monitoring. Consult with your food safety specialist about what options are feasible for your operation.

TRAINING EMPLOYEES

It is important to train employees about the importance of food contact surfaces and to take time to thoroughly clean and sanitize packing areas and equipment. Training employees on how to clean and sanitize surfaces on the farm is a crucial way to reduce contamination on the farm. Employees must be trained to understand the difference between cleaning and sanitizing, especially noting that an uncleaned surface cannot be sanitized. Training employees with a video, like this one from University of Maryland, (www.youtube.com/watch?v=mXtFlWt67z0) and pausing to demonstrate farm specific cleaning and sanitizing procedures can be an effective training tool.

Table 10-62. Basic Cleaning and Sanitizing Procedures for Food Contact Surfaces

Step	Purpose	Implementation
Remove dirt and debris	Remove all loose soil and food residue.	This could include either the use of clean water or physical removal of soil using a brush or broom; avoid the use of high-pressure sprayers to prevent spreading dirt and microorganisms through the air onto additional surfaces.
Clean	Further removal of soil and food residue to assure effective sanitizer use and prevent the formation of biofilms.	Use an appropriate detergent for the type of soil that needs to be removed.
Rinse	Remove detergent and soil/food residue.	Use clean water.
Sanitize	Reduction of microbial levels.	Apply a sanitizer approved for use on food contact surfaces following the instructions on the label.

Note that sanitizers and disinfectants are not the same. Disinfectants will eliminate all the organisms listed on the product label, which often includes not only bacteria but viruses and fungi, as well. Disinfectants are not generally used for food-contact surfaces because they can leave harmful chemical residues and corrode equipment over time. Sanitizers are formulated to be used on food and food contact surfaces. Both sanitizers and disinfectants are considered antimicrobial pesticides and, therefore, are regulated by the U.S. Environmental Protection Agency (EPA). Following the label is required by law. The label will typically provide information on how the chemical should be handled and whether the chemical and the concentration is meant to be used on food-contact surfaces. This information can also be found on the EPA Pesticide Product Labeling System (PPLS) website: https://www.epa.gov/pesticide-labels/pesticide-product-label-system-ppls-more-information by searching the chemical product with the EPA registration number found on the label.

Verifying and maintaining the correct concentration of a sanitizer is key to effectively reducing microbial levels on surfaces and in the wash water. For more information on using chlorine and peroxyacetic acid for fruit and vegetable washing and packing, visit:

How to Use and Monitor Chlorine (Sodium/Calcium Hypochlorite) in Fruit and Vegetable Wash water and on Equipment and Food Contact Surfaces
extension.tennessee.edu/publications/Documents/SP798-A.pdf

***Using Peroxyacetic Acid (PAA) in Fruit and Vegetable Washing and Packing*: extension.tennessee.edu/publications/Documents/SP798-B.pdf**

Water, Produce, and Equipment Sanitation

The trade names listed are intended to aid in the identification of products and are intended neither to promote the use of specific trade names nor to discourage the use of generic products. The target rate and formulation are based on the current EPA Pesticide Product Label. Make sure to read the product label before preparing any sanitizer solution for the designated use.

Table 10-63. Water, Produce, and Equipment Sanitation

Medium/Sanitizer	Contact time (seconds)	Rate of Material to Use		Method, Schedule, and Remarks
		Target Rate (ppm)*	Formulation	
WASH WATER, DUMP TANK WATER, OR VEGETABLE WASH WATER **				
calcium hypochlorite (Aquafit, ECR aquachlor, PPG Calcium Hypochlorite tablets)	120	25 to 400 chlorine	Varies between commodities	Sanitizing solution: 1 oz/200 gal to make a solution of 25 ppm available chlorine. A second wash is required.
chlorine dioxide (ProOxine, Anthium Dioxcide, Adox 750)	10 to 20	3 to 5 chlorine	Varies between products; see product labels.	Maintain water pH between 6.0 and 10. Restricted to large operations. Requires automated and controlled injection systems. Wear PPE during preparation and handling. After treatment of fruits and vegetables followed by a clean water rinse. **NOTE: Chlorine dioxide is explosive.**
chlorine gas (99.9%)	—	Contact supplier for rates.		Restricted to very large operations. Requires auto- mated and controlled injection systems. Regulated by both the EPA (water) and FDA (food contact surfaces).
hydrogen peroxide + peroxyacetic acid	Contact times vary depending on the governing sanitary code. Post-sanitation rinse is not necessary.			
(BioSide HS)	60	80 peroxyacetic acid	1 fl oz/16.4 gal	
(PAA Sanitizer FP)	45	88 to 100 peroxyacetic acid	3 to 3.5 fl oz/16 gal	
(Perasan A)	60	30 to 300 peroxyacetic acid	0.6 to 6 fl oz/10 gal	
(SaniDate 5.0)	45	27 to 96 peroxyacetic acid	59.1 to 209.5 fl oz/1,000 gal	
(StorOx 2.0)	30 to 180	26 to 93 peroxyacetic acid	1.5 to 5.4 fl oz/10 gal	
(Tsunami 100)	90	80 peroxyacetic acid	6.7 fl oz/100 gal	
(Victory)	90	30 to 80 peroxyacetic acid (foodborne pathogens)	1 fl oz/16.4 gal	
(VigorOx 15 F&V)	—	45 peroxyacetic acid (foodborne pathogens)	0.54 fl oz/16 gal	
(Maguard 5626)	30	28 to 90 peroxyacetic acid	60 to 195 fl oz/ 1,000 gal	
sodium hypochlorite (5.25%)	Monitor free chlorine or change solution when it is visibly dirty. Rinse produce with potable water prior to packing. Wear goggles and rubber gloves when handling. Maintain water pH between 6.0 and 7.5. Noxious chlorine gas can be released when the pH drops below 6.0.			
(Regular Household Bleach)	120	25 chlorine	1 fl oz/15 gal	**NOTE: Household bleach that contains fragrances or anti-splash agents for household use is NOT registered for use with fresh produce.**
sodium hypochlorite (9.2%)				
(Dibac)	120	25 chlorine	1 fl oz/20 gal	
sodium hypochlorite (12.5%)				
(Agclor 310)	120	30 to 400	Varies between commodities	
(Dynachlor)	120	25 chlorine	5 fl oz/200gal	
(Extract-2)	120	25 chlorine	5 fl oz/200gal	
(JP Optimum CRS)	—	25 chlorine	0.75 fl oz/10 gal	
(Zep FS Formula 4665)	120	25 chlorine	5 fl oz/200gal	

Table 10-63. Water, Produce, and Equipment Sanitation

Medium/Sanitizer	Contact time (seconds)	Rate of Material to Use		Method, Schedule, and Remarks
		Target Rate (ppm)*	Formulation	
EQUIPMENT ** (CONVEYORS, SCRUBBERS, PLASTIC HARVEST CONTAINERS, PEELERS, FIELD EQUIPMENT, ETC.)				
calcium hypochlorite (Aquafit, ECR aquachlor, PPG Calcium Hypochlorite Tablets)	120	200 (non-porous surfaces), 600 (porous surfaces)	3 oz/20 gal	Do not rinse or soak equipment overnight.
chlorine dioxide (ProOxine, Sanogene, Anthium Dioxide, Adox 750)	60 to 10 min	10 to 20 (porous or non-porous surfaces) 500 (ceilings, floors, & walls)	Varies between products; see product labels.	Wear PPE during preparation and handling. **NOTE: Chlorine dioxide is explosive.**
hydrogen peroxide + peroxyacetic acid	Contact time varies depending on the governing sanitary code. Consult labels as some products require a post-application rinse with potable water.			
(BioSide HS)	60 or more	93 to 500 peroxyacetic acid	0.7 to 3.8 fl oz/10 gal	
(Oxidate 2.0)	See label	100 to 300 peroxyacetic acid	1.25 to 1.5 fl oz/gal	If treated surfaces will contact food, thoroughly rinse surfaces with clean water. If the product is applied via fogging or spraying, workers must wear appropriate PPE (see label).
(PAA Sanitizer FP)	60 or more	88 to 130 peroxyacetic acid (non-porous surfaces)	1 to 1.5 fl oz/5 gal	
(Perasan A)	60 or more	82 to 500 peroxyacetic acid	1 to 6.1 oz/5 gal	
(SaniDate 5.0)	60	147 to 500 peroxyacetic acid	1.6 to 5.4 fl oz/5 gal	
(StorOx 2.0)	60	86 peroxyacetic acid	0.5 fl. oz/1 gal	
(VigorOx SP-15 F&V)	60	85 to 123 peroxyacetic acid and 57 to 82 hydrogen peroxide	0.31 to 0.45 fl oz/5 gal	
(Maguard 5626)	60	154 peroxyacetic acid	1 fl oz/6 gal	
sodium hypochlorite (5.25%) *(Regular Household Bleach)*	120	100 to 200 chlorine	1 to 1.5 fl oz/3 gal	Noxious chlorine gas can be released when the pH drops below 6.0. Porous surfaces require a thorough post-disinfection rinse with potable water. Allow all surface types to air dry prior to re-use.
sodium hypochlorite (9.2%) (Dibac)	120	600 chlorine (porous surfaces)	12 fl. Oz/10 gal	
	120	100 to 200 chlorine (non-porous surfaces)	6 fl. Oz/5 gal	
sodium hypochlorite (12.5%)				
(Agclor 310)	120	100 to 200 chlorine (non-porous surfaces)	1 fl oz/10 gal	
(Dynachlor)	120	100 to 200 chlorine (non-porous surfaces)	1 to 2 fl oz/10 gal	
	120	600 chlorine (porous surfaces)	6 fl oz/10 gal	
(Extract-2)	120	100 to 200 (non-porous surfaces)	1 to 2 fl oz/10 gal	
(Zep FS Formula 4665)	120	100 to 200 chlorine (non-porous surfaces)	1 to 2 fl oz/10 gal	
	120	600 chlorine (porous surfaces)	6 fl oz/10 gal	
quaternary ammonia (KleenGrow)	10 min	--	1 fl oz/gal	Allow surfaces to air dry. If treated surfaces will contact food, thoroughly rinse surfaces with clean water.

* Recommendations for active/available forms.
** Recommendations are for clean water only. Always wash off organic debris and soil with water prior to sanitizing. Rates and contact time are dependent on surface type.

Various and Alternative Fungicides

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Table 10-64. Various Fungicides for Use on Vegetable Crops

Not all trade names are registered in all states. Check the registration status of each product prior to use. Check product labels to confirm that the product is registered for your intended use.

Common Name (FRAC)	Trade Name (s)		
aluminum tris (O-ethyl phosphate) (FRAC P07)	See fosetyl-Al.		
azoxystrobin (FRAC 11)	Acadia 2SC (Atticus) Aframe (Syngenta) Arius 250 (Sipcam Agro USA) A-Zox 25SC (Sharda USA) Azoxy 2SC Prime (Prime Source) AzoxyStar (Albaugh)	Azoxyzone (LG Life Sciences) AZteroid FC (Vive Crop Protection) AZteroid FC 3.3 (Vive Crop Protection) Gold Rush (Altitude Crop Innovations) Heritage (Syngenta) Mazolin (AgBiome Innovations)	Quadris (Syngenta) Satori Fungicide (Loveland Products) Tetraban (Winfield United) Tigris Azoxy 2SC (Tigris) Trevo (Innvictis Crop Care) Willowood Azoxy 2SC (Willowood USA)
chlorothalonil (FRAC M05)	Bravo Ultrex (Adama) Bravo Weather Stik (Adama) Bravo Zn (Adama) Chloronil 720 (Syngenta)	Chlorothalonil 720 (Drexel) Echo 720 Agricultural Fungicide (Sipcam Agro USA) Echo 90 DF Agricultural Fungicide (Sipcam Agro USA)	Equus 720SST (AMVAC) Initiate 720 (Loveland Products) Praiz (Winfield United) RIALTO 720F (ATTICUS)
copper diammonia diacetate complex (FRAC M01)	Copper-Count-N (Mineral Research & Dev. Corp)		
copper hydroxide (FRAC M01)	Americop 40DF (Industrias Quimicos del Valles, SA) Champ Dry Prill (Nufarm) Champ Formula 2F (Nufarm) Champ WG (Nufarm) ChampION++ (Nufarm) Kalmor (OHP)	Kentan DF (Isagro USA) Kocide 2000 (Certis USA) Kocide 3000 (Certis USA) Kocide 3000-O (Certis USA) Kocide HCu (Certis USA) KOP-Hydroxide (Drexel) KOP Hydroxide 50W (Drexel)	Nu-Cop 3L (Albaugh) Nu-Cop 30HB (Albaugh) Nu-Cop 50DF (Albaugh) Nu-Cop 50WP(Albaugh) Nu-Cop HB (Albaugh) Nu-Cop XLR (Albaugh) Previsto (Gowan) SPINNAKER (SIPCAM AGRO USA)
copper octanoate (FRAC M01)	Camelot-O (SePRO) Cueva Fungicide Concentrate (Certis USA)		
copper oxychloride (FRAC M01)	COC DF (Albaugh)		
copper oxychloride + copper hydroxide (FRAC M01)	Badge SC (Gowan) Badge X2 (Gowan)		
copper(cuprous) oxide (FRAC M01)	Nordox (NORDOX Industrier AS) Nordox 75WG (NORDOX Industrier AS)		
copper sulfate (basic) (FRAC M01)	Basic Copper 53 (Albaugh) Cuprofix Ultra 40 Disperss (UPL)	Cuproxat Flowable (NuFarm)	
copper sulfate pentahydrate (FRAC M01)	KOP-5 (Drexel Chemical Company) Instill (S.T. Biologicals)	Magna-Bon CS 2005 (Magna-Bon Agricultural Control Solutions)	Mastercop (ADAMA) Phyton 35 (Phyton Corporation)
fludioxonil (FRAC 12)	Cannonball WG (Syngenta) Cannonball WP (Syngenta)	Spirato GHN (Nufarm)	
fosetyl-Al aluminum tris (O-ethyl phosphate) (FRAC P07)	Aliette WDG Fungicide (Bayer Crop Science) Linebacker WDG (NovaSource)		
iprodione (FRAC 2)	Meteor (UPL) Nevado 4F (Adama)	Rovral 4 Flowable Fungicide (FMC Corp.)	
mancozeb (FRAC M03)	Dithane F-45 Rainshield (Corteva Agriscience) Dithane M45 (Corteva Agriscience) Fortuna 75WDG (Agria Canada)	Koverall (FMC Corporation) Manzate Max (UPL) Manzate Pro-Stick (UPL)	Penncozeb 75DF (UPL) Penncozeb 80WP (UPL) Roper DF Rainshield (Loveland Products)
mefenoxam (FRAC 4)	Apron XL (Syngenta) Ridomil Gold GR (Syngenta)	Ridomil Gold SL (Syngenta) Ultra Flourish (Nufarm)	

Table 10-64. Various Fungicides for Use on Vegetable Crops

Not all trade names are registered in all states. Check the registration status of each product prior to use. Check product labels to confirm that the product is registered for your intended use.

Common Name (FRAC)	Trade Name (s)		
myclobutanil (FRAC 3)	Rally 40WSP (Corteva Agriscience) Sonoma 25EW AG (Albaugh)	Sonoma 40WSP (Albaugh)	
phosphite, potassium (FRAC P07)	Helena Prophyt (Helena) Reveille (Helena)		
phosphite (mono- and dibasic salts) (FRAC P07)	Helena Prophyt (Helena) Phostrol (Nufarm) Phostrol 500 (Nufarm)		
propiconazole (FRAC 3)	AmTide Propiconazole 41.8% EC (AmTide) Bumper 41.8 EC (Adama) Bumper ES (Adama) Fitness (Loveland Products) Mentor (Syngenta)	Propi-Star EC (Albaugh) Propicure 3.6F (United Supplies, Inc.) PropiMax EC (Dow) Shar-Shield PPZ (Sharda USA)	Tide Propiconazole 41.8EC (Tide International) Tilt (Syngenta) Topaz (Winfield Solutions) Vigil (Innvictis Crop Care)
sulfur (FRAC M02)	Cosavet-DF (Sulphur Mills Limited) CSC 80% Thiosperse (Martin Resources) CSC Dusting Sulfur (Martin Resources) CSC Thioben 90 (Martin Resources) CSC Wettable Sulfur (Martin Resources) Dusting Sulfur (Loveland Products; Wilbur-Ellis) First Choice Dusting Sulfur (Loveland Products) IAP Dusting Sulfur (Independent Agribusiness Professionals)	InteGro Magic Sulfur Dust (InteGro Inc.) Kumulus DF (Micro Flo and Wilbur-Ellis) Liquid Sulfur Six (Helena) Micro Sulf (Nufarm) Microfine Sulfur (Loveland Products) Microthiol Disperss (United Phosphorus) Special Electric Sulfur (Wilbur-Ellis)	Spray Sulfur (Wilbur-Ellis) Sulfur 6L (Arysta and Micro Flo) Sulfur 90W (Drexel) Sulfur DF (Wilbur-Ellis) THAT Flowable Sulfur (Stoller Enterprises) Thiolux (Loveland Products) Yellow Jacket Wettable Sulfur II (Georgia Gulf Sulfur)
tebuconazole (FRAC 3)	Monsoon (Loveland Products) Onset 3.6L (Winfield Solutions) Orius 3.6F (Adama)	Tebu-Crop 3.6F (Sharda USA) Tebucon 3.6F (Repar Corp.) Tebuconazole 3.6F (Solera Source Dynamics)	TebuStar 3.6L (Albaugh) Tebuzol 3.6F (United Phosphorus) Toledo 3.6F (Rotam)
thiophanate-methyl (FRAC 1)	Cercobin (Cheminova) Incognito 4.5F (Makhteshim Agan of North) Incognito 85WDG (MANA)	Thiophanate Methyl 85WDG (Makhteshim Agan of North) T-Methyl 4.5 Ag (Helena) T-Methyl 4.5F (Nufarm)	T-Methyl 70WSB (Nufarm) Topsin 4.5FL (UP) Topsin M WSB (UPL)

Biopesticides, Fungicide, and Nematicide Alternatives for Vegetables

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Table 10-65. Biopesticides, Fungicide, and Nematicide Alternatives for Vegetables

Active Ingredient [1]	Product [1]	Target Diseases/Pests	PHI (days)	REI	Greenhouse Use	OMRI-Listed	Comments [2]
allyl isothiocyanate	Dominus (*Isagro*)	Certain soil-borne fungi and nematodes	—	5 days	Yes	No	Preplant soil biofumigant. See label for other restrictions and application instructions. **Check state registration status prior to use.**
azadirachtin	AzaGuard (*BioSafe Systems*), AzaPro (*Cann-Care*), Ecozin Plus 1.2% ME (Amvac), Molt-X (*BioWorks, Inc*)	Plant parasitic nematodes	0*	4 hr	See label (AzaPro) Yes (others)	Yes	*See label for use rates that may restrict the PHI. See labels for other restrictions and application instructions. **Check state registration status of AzaPro prior to use.**
Bacillus amyloliquefaciens strain D747	Double Nickel 55, Double Nickel LC (*Certis*); Triathlon BA (OHP)	Various diseases (see label for crop-specific diseases)	0	4 hr	Not Prohibited (Double Nickel) Yes (Triathlon)	Yes	Do not use highly acidic or alkaline water to mix sprays. See labels for additional application instructions and restrictions. **Double Nickel 55 and Double Nickel LC are not registered for use in OK. *FRAC BM02.***
Bacillus amyloliquefaciens strain F727 cells and spent fermentation media	Amplitude, Stargus (*Marrone Bio Innovations*)	Various diseases (see label for crop-specific diseases)	0	4 hr	Yes	Yes	See label for application instructions, restrictions, and vegetable crops on which products may be used. ***FRAC BM02.***
Bacillus amyloliquefaciens strain MBI 600	Serifel (*BASF*)	Various foliar and soilborne dis- eases (suppression, see label for crop-specific diseases)	0	4 hr	Not prohibited	Yes	See label for application instructions, restrictions, and vegetable crops on which products may be used. ***FRAC BM02.***
Bacillus mycoides isolate J	LifeGard WG (*Certis*)	Bacterial spot and speck, downy mildew, early blight, late blight, powdery mildew, white mold, and others (see label for crop-specific diseases)	0	4 hr	Yes	Yes	See product label for restrictions and specific application instructions***. FRAC P06.***
Bacillus pumilus strain QST 2808	Sonata (*Bayer*)	Early blight, late blight, downy mildew, powdery mildew, leaf blights, rust (see label for crop-specific diseases)	0	4 hr	Yes*	No	Products are not OMRI-listed, but labels state that they can be used for organic production. *See labels for specifics of greenhouse use.
Bacillus amyloliquefaciens strain ENV503	Companion WP, Companion Maxx (*Douglas Plant Health*)	Root and foliar diseases (see label for crop-specific diseases)	0	4 hr	Yes	Yes (WP) No (Maxx)	See product labels for instructions on various application uses, particularly those in greenhouse production. **Check state registration status of products prior to use. *FRAC BM02.***
Bacillus subtilis strain IAB/BS03	AVIV (*Seipasa*)	Various diseases (see label for crop-specific diseases)	See label	4 hr	Yes	Yes	See product label for restrictions and specific application instructions. **Check state registration status prior to use.**
Bacillus subtilis strain QST 713	Cease (*BioWorks Inc*); Serenade ASO, Serenade Opti (*Bayer*)	Various diseases (see label for crop-specific diseases)	0	4 hr	Yes (Cease, Serenade ASO) Not Prohibited (Serenade Opti)	Yes	See label for product-specific instructions regarding product application. See product labels for specific greenhouse crops to which Cease may be applied. ***FRAC BM02.***

Table 10-65. Biopesticides, Fungicide, and Nematicide Alternatives for Vegetables

Active Ingredient [1]	Product [1]	Target Diseases/Pests	PHI (days)	REI	Greenhouse Use	OMRI-Listed	Comments [2]
Bacillus subtilis var. *amyloliquefaciens* strain FZB24	Taegro 2 (*Isagro/ Novozymes*)	Various seedling diseases caused by *Fusarium*, *Rhizoctonia*, *Phytophthora*, and *Pythium* and suppression of various soil-borne and foliar diseases (see label for crop-specific diseases)	See label	4 hr	See label	Yes	See product label for restrictions, cautions, and specific application instructions. ***FRAC BM02.***
Bacillus thuringiensis subsp. kurstaki strain ABTS-351 fermentation solids, spores, and insecticidal toxins + methyl salicylate	Leap ES (Valent)	Pseudomonas spp. and Xanthomonas spp. (suppression)	See label	12 hr	Yes	No	For use on tomato and pepper. See product label for restrictions and application and mixing instructions. Leap has supplemental labels for Xanthomonas spp. in cabbage in AL, AR, FL, GA, KY, LA, MS, NC, TN, TX, VA, and WV and for Clavibacter michiganensis subsp. nebraskensis in maize (sweet corn) though 24 Apr 2023.
bacteriophage	AgriPhage (OmniLytics/ Certis)	Bacterial spot and speck	--	4 hr	Yes (seedlings)	No	Product is not OMRI-listed, but label states that it can be used for organic production. Product is strain specific (active against Xanthomonas vesicatoria and Pseudomonas syringae pv. tomato) and is labeled for use on tomatoes and peppers. Do not tank-mix product with denaturing agents or copper salts. See label for application instructions. Check state registration status prior to use.
bacteriophage	AgriPhage-CMM (OmniLytics/ Certis)	Bacterial canker	0	4 hr	Yes (see label)	No	Product is not OMRI-listed, but label states that it can be used for organic production. Product is specific for Clavibacter michiganensis pv. michiganensis that causes bacterial canker in tomato and is labeled only for use on tomatoes. See label for application and tank-mixing instructions. Check state registration status prior to use.
Banda de Lupinus albus doce (BLAD)	ProBLAD Verde (SymAgro)	Botrytis gray mold and powdery mildew	1	4 hr	Not prohibited	Yes	For use on some cucurbit and fruiting vegetables. Check state registration stat us prior to use. FRAC BM01.
Burkholderia spp. strain A396 cells (heat-killed) and spent fermentation media	Majestene (Marrone BioInnovations)	Nematodes (see label for list of specific nematodes)	0	4 hr	Yes	Yes	Bionematicide. See label for additional application instructions and restrictions. Product has a 2 (ee) Recommendation for nematodes on carrots.
cinnamon oil	Cinnerate (Seipasa)	Diseases such as powdery mildew and rusts and sporulated forms of fungi as Botrytis cinerea and Fulvia fulva 3	0	See label	Yes	Yes	See label for mixing instructions and restrictions. Cinnerate is not registered for use in AL, AR, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA, or WV.
citric acid	Procidic (*Green-spire*); FungOUT (*Isagro*)	Various diseases (see label for crop-specific diseases)	(Procidic)				**Check state registration status of products prior to use.**
			See label	See label	See label	No	
			(FungOUT)				
			0	4 hr	Yes	Yes	
Coniothyrium minitans strain CON/M/91-08	Contans WG (*Sipcam Agro/ Bayer)*	Sclerotinia diseases (*Sclerotinia sclerotiorum* and *S. minor*)	0	4 hr	Yes	Yes	Apply to soil or potting medium. Do not tank-mix products with other fungicides. Rotation with other fungicides is allowed after 3 weeks following the application of this product. **Tomato is not included in the list of fruiting vegetables on this label.**
copper	See disease control tables for individual crops***. FRAC M01.***						

Table 10-65. Biopesticides, Fungicide, and Nematicide Alternatives for Vegetables

Active Ingredient [1]	Product [1]	Target Diseases/Pests	PHI (days)	REI	Greenhouse Use	OMRI-Listed	Comments [2]
extract of *Reynoutria sachalinensis*	Regalia, Regalia CG (*Marrone BioInnovations)*	Certain bacterial and fungal diseases (see label for crop-specific diseases)	0	4 hr	Not prohibited (Regalia) Yes (Regalia CG)	Yes	See labels for additional application instructions and restrictions. **Regalia has a 2 (ee) recommendation for use against various diseases in leaf vegetable crops. Regalia CG is not registered for use in FL. *FRAC P05***
extract of Swinglea glutinosa	*EcoSwing (Gowan)*	*Fungal diseases such as powdery mildew (oidiums) and Botrytis cinerea*	0	4 hr	Yes	Yes	Rates vary for field and enclosed space production – see label. Dilution water should have a pH less than 8. Use product mixture promptly after mixing; do not tank mix sit for more than 6 hr. FRAC BM01.
fats and glyceridic oils of margosa + azadirachtin	*Debug Turbo (Agro Logistic Systems, Inc.)*	*Nematodes, powdery mildew, rust, Rhizoctonia solani, Sclerotinia sclerotiorum, Athelia rolfsii*	See label	See label	See label	Yes	See label for application instructions and restrictions. Check state registration status prior to use.
garlic oil	Brandt Organics Aleo (Brandt)	Various bacterial and fungal diseases (see label)	None	None	Yes	Yes	Do not apply when temperatures are above 90°F. See label for application instructions and additional restrictions. Check state registration status prior to use.
Gliocladium cantenulatum strain J1446	LALSTOP G46 WG (Lallemand Plant Care)	Seed-borne and soilborne and certain foliar diseases (see labels)	0	4 hr	Not prohibited	Yes	See label for additional instructions, restrictions, & cautions. Check state registration status of product prior to use.
Gliocladium virens strain GL-21	SoilGard (OHP)	Damping-off and root rots	See label	See label	Yes	Yes	Do not apply in conjunction with chemical fungicides. See label for additional application instructions, precautions, & restrictions. FRAC BM02.
harpin protein	Employ, ProAct (*Plant Health Care, Inc)*	Nematodes (suppression)	See label	(Employ) 4 hr (ProAct) See label	Yes See label	No	ProAct and Employ are used to suppress nematode egg production. See product labels for application instructions and restrictions. **Check state registration status of products prior to use.**
hydrogen dioxide + peroxyacetic acid	TerraClean 5.0 (*BioSafe Systems*)	Various diseases (see label for crop-specific diseases)	See label	0	Yes*	Yes	Product is a soil treatment product. See label for instructions on various application uses. *See label for restrictions on greenhouse use.
hydrogen peroxide + peroxyacetic acid	OxiDate 2.0, OxiDate 5.0, ZeroTol 2.0 (*BioSafe Systems*)	Various diseases (see label for crop-specific diseases)	0	See label	Yes (ZeroTol) Not prohibited (OxiDate)	Yes	Use spray solution the same day it is prepared; do not store spray or reuse mixed spray solution. Determine if products can be used safely on greenhouse crops prior to application. See product labels for additional precautions, restrictions, & instructions.
kaolin	Surround WP *(NovaSource)*	Powdery mildew (cucurbit crops)	See label	4 hr	Yes	Yes	Suppression only. See product label for additional precautions, restrictions, and instructions.
laminarin	Vacciplant (*UPL*)	Various diseases (see label for crop-specific diseases)	0	4 hr	Yes*	No	Do not apply product post-harvest. *Product can be used in greenhouse applications prior to transplant. See labels for additional application instructions, precautions, & restrictions. ***FRAC P04.***
milk	N/A	Viruses [(*tomato mosaic virus* (ToMV) and *tobacco mosaic virus* (TMV)]	Until spray dries	0	Yes	Yes	Spray plants until runoff. Dip hands every 5 min while handlings plants. Dip tools for 1 min; do not rinse. Use in combination with seed treatments and sanitation practices. **Sooty mold may develop on treated plants.**

Table 10-65. Biopesticides, Fungicide, and Nematicide Alternatives for Vegetables

Active Ingredient [1]	Product [1]	Target Diseases/Pests	PHI (days)	REI	Greenhouse Use	OMRI-Listed	Comments [2]
mineral oil	SuffOil-X (*BioWorks);* TriTek (*Brandt*)	powdery mildew on certain vegetable crops	See label	4 hr	Yes	Yes	This product may also be used to control certain insects on listed crops. **TriTek is not registered for use in AR or TN.**
mustard oil and capsaicin	Dazitol (Champon Millenium Chemicals)	Various soilborne fungi and nematodes	See label	See label	See label	No	Dazitol is a preplant soil treatment product. See label for additional application instructions, precautions, and restrictions. **Check state registration status of Dazitol prior to use.**
neem oil (extract)	Triact 70 (OHP); Trilogy (Certis USA)	Foliar fungal diseases (see label for specifics)	See label	4 hr	Yes (Triact) Not prohibited (Trilogy)	Yes	May cause leaf burn; test a small number of plants before spraying entire crop. Toxic to honeybees. Check state registration status of Triact 70 prior to use. FRAC NC.
oil from cottonseed, corn, and garlic	GC-3, Mildew Cure (JH Biotech Inc)	Powdery mildew	See label	See label	See label	Yes	See label for application instructions, precautions, and restrictions. Check state registration status of products prior to use.
oil from rosemary, clove, thyme, and peppermint	Sporan EC 2 (KeyPlex)	Various diseases (see label for diseases listed)	None	None	Yes	Yes	See label for application instructions. The use of an adjuvant is highly recommended. Sporan EC 2 is not registered for use in AL, AR, LA, KY, MS, OK, or WV.
Purpureocillium lilacinus strain 251	MeloCon LC (Certis USA)	Nematodes (see label for list of specific species)	See label	4 hr	Not prohibited	Yes	Bionematicide. See product label for mixing restrictions and application instructions.
paraffinic oil	JMS Stylet-Oil, Organic JMS Stylet-Oil (JMS Flower Farms)	Various diseases (see label for crop-specific diseases)	0	4 hr	Yes	Yes	Do not apply to vegetables when temperatures are below 50°F. See labels for additional restrictions on spraying and for compatibility information. JMS Stylet-Oil is not registered for use in KY, MS, OK, or WV. Organic JMS Stylet-Oil is not registered for use in KY, MS, OK, TN, or WV.
phosphorous acid	See disease control tables for individual crops. ***FRAC P07.***						
polyoxin D zinc salt	See disease control tables for individual crops. ***FRAC 19.***						
potassium bicarbonate	Carb-O-Nator (*Certis*), Kaligreen (*OAT Agrio Co*), MilStop SP (*BioWorks*)	Various diseases (see label for crop-specific diseases)	1 (Kaligreen) 0 (other)	1 hr (MilStop) 4 hr (other)	Yes (Carb-O-Nator, MilStop) Not prohibited (Kaligreen)	Yes	See labels for application instructions, pre- cautions, and restrictions. ***FRAC NC.***
potassium salts of fatty acids	Des-X (*Certis*), M-Pede (*Gowan*)	Powdery mildew	(Des-X) 12 hr 12 hr (M-Pede) 0 0		Yes	Yes	See product label for notes regarding plant sensitivity, site uses, and use restrictions.
potassium silicate	Sil-MATRIX LC (*Certis USA*)	Powdery mildew	0	4 hr	Not prohibited	Yes	Avoid contact with glass. Tank-mix with a non-ionic surfactant for best results.
Pseudomonas chlororaphis strain AFS009	Howler (*AgBiome*)	*Rhizoctonia*, *Pythium*, *Fusarium*, *Phytophthora*, *Sclerotinia*, *Colletotrichum*, and *Botrytis*	0	4 hr	Yes	Yes	See label for application instructions, cautions, restrictions, and crops on which this product may be used**. Check state registration status prior to use. Howler has a 2 (ee) Recommendation for some crops/ diseases in TX.**

Table 10-65. Biopesticides, Fungicide, and Nematicide Alternatives for Vegetables

Active Ingredient [1]	Product [1]	Target Diseases/Pests	PHI (days)	REI	Greenhouse Use	OMRI-Listed	Comments [2]
rhamnolipid biosurfactant (from *Pseudomonas aeruginosa*)	Zonix (*Jeneil Biosurfactant Co*)	Certain fungal diseases (zoosporic diseases such as blight and downy mildew; see label for specific pathogen groups)	See label	See label	See label	Yes	See label for application instructions, cautions, and restrictions. **Check state registration status prior to use.**
sodium carbonate peroxyhydrate	PerCarb *(BioSafe Systems)*	Various foliar bacterial and fungal diseases (see label for crop-specific diseases)	0	See label	Yes	Yes	Corrosive. Do not mix PerCarb with other products with an acidic pH. not adjust pH after mixing of product. See label for additional instructions and information regarding compatibility and plant sensitivity. **PerCarb not registered for WV.**
soybean oil	Oleotrol-M (*NTS Research Inc*)	Downy mildew, powdery mildew, Botrytis, rust, sour rot, gray mold	See label	See label	Yes	Yes	Tank-mix with a spreader-sticker. **Check state registration status prior to use.**
Streptomyces sp. strain K61	Mycostop, Mycostop Mix (Verdera/AgBio Inc); LALSTOP K61WP (Lallemand Plant Care)	Seed, root, and stem rots and wilt diseases caused by certain pathogens; suppression of certain diseases (see labels)	See label	See label	Yes	Yes	See labels for additional instructions, restrictions, and cautions. See product labels for crops and specific diseases on which products can be used. Check state registration status of products prior to use. FRAC BM02.
Streptomyces lydicus WYEC 108	Actinovate AG (Valent)	Foliar diseases and/ or damping-off and root rots (see label for crop-specific diseases)	0	See label	Not prohibited	Yes	See label for instructions on various application uses.
sulfur	See disease control tables for individual crops. ***FRAC M02.***						
tea tree oil	Timorex Gold *(Stockton)*	Various foliar diseases (see label for list)	2	12 hr	See label	Yes	Do not spray when temperatures are above 95°F. Do not exceed 1.54 lb tea tree oil per acre per use season. See label for additional instructions, restrictions, and cautions. **Timorex Gold is not registered for use in KY, OK, TN, or WV. *FRAC BM01.***
thyme oil	Promax, Proud 3 *(Huma Gro and Fertilgold/Bio Huma Netics),* Thyme Guard (*Agro Research Intl.)*	See label	See label	See label	See label	Yes	See specific product labels for instructions, cautions, and restrictions. **Check state registration status of products prior to use.**
Trichoderma harzianum Rifai strain T-22	RootShield WP, RootShield Granules (*BioWorks*)	Root pathogens (such as *Pythium, Rhizoctonia*, and *Fusarium*)	See label	See label	Yes	Yes	Products are for use in soil or planting applications or seed or propagative material treatments. Product should not be applied to chickpea. Not for use on aquatic crops. See product labels for instructions and restrictions on various application uses and for information on compatibility.
Trichoderma harzianum Rifai strain KRL-AG2	Trianum-G, Trianum-P (*Koppert Biological Systems)*	Soilborne or root pathogens (such as *Pythium, Rhizoctonia*, and *Fusarium*)	See label	See label	Yes	No	Products are for use in soil or planting mix applications or seed or propagative material treatments. Products should not be applied to chickpea. Not for use on aquatic crops. **Check product labels to determine if product can be applied when aboveground harvestable food is present.** See product labels for instructions on various application uses and on compatibility with other products. **Check state registration status of products prior to use.**

Table 10-65. Biopesticides, Fungicide, and Nematicide Alternatives for Vegetables

Active Ingredient [1]	Product [1]	Target Diseases/Pests	PHI (days)	REI	Greenhouse Use	OMRI-Listed	Comments [2]
Trichoderma harzianum Rifai strain T-22 + *T. virens* strain G-41	RootShield PLUS Granules, RootShield PLUS+WP (*BioWorks*)	Soilborne or root pathogens (such as *Pythium, Rhizoctonia*, and *Fusarium*)	See label (Granules) 0 (WP)	See label	Yes	Yes	Products are for use in soil or planting mix applications or seed or propagative material treatments. Products should not be applied to chickpea. Not for use on aquatic crops. See product labels for instructions on various application uses and on compatibility with other products.
Trichoderma spp. (*T. asperellum* strain ICC 012 and *T. gamsil* strain ICC 080)	BIO-TAM 2.0 (*SePRO*)	Certain fungal diseases (see label)	See label	See label	Yes	Yes	See label for a list of incompatible fungicides and county restrictions in AR, OK, and TX. **Check state registration status of Tenet prior to use.**
Ulocladium oudemansii strain U3	BotryStop (*BioWorks*)	*Botrytis* spp. and *Sclerotinia* spp. (see label for crop-specific diseases)	See label	4hr	Not prohibited	Yes	Product should be stored in a cool, dry place at or below 68°F. See label for tank-mixing and application instructions.
Yeast extract hydrolysate from *Saccharomyces cerevisiae*	KeyPlex 350 OR (*KeyPlex*)	bacterial leaf spot (tomatoes)	See label	4 hr	Not prohibited	No	See product labels for instructions on various application uses. **Check state registration status prior to use.**

[1] Data on efficacy is limited or not available for many products listed in this table. Therefore, products listed in this table are not recommended based on efficacy. Other active ingredients or products may be available.

[2] Consult product labels to determine vegetables for which a particular product is labeled.

[3] Former names of diseases and pathogens listed in this table that may be still be listed on fungicide labels are as follows: *Athelia rolfsii* (formerly *Sclerotium rolfsii*); *Fulvia fulva* (formerly *Cladosporium fulvum* and *Passalora fulva*); *Xanthomonas vesicatoria* (formerly X*anthomonas campestris* pv. *vesicatoria*).

Fungicide Resistance Management

The Fungicide Resistance Action Committee (FRAC, www.frac.info) has organized fungicides according to FRAC groups, which reflect chemical structure and Mode of Action (MoA). Fungicides within a given FRAC group control fungi in a comparable manner and share the same risk for fungicide resistance development. Some fungicides are referred to as high or at-risk fungicides because of their specific MoAs and therefore have an elevated risk for resistance development.

Groups of fungicides, such as the QoI's (FRAC group 11) or Phenylamides (FRAC group 4) are prone to resistance development due to very specific MoAs. Fungicides in high or at-risk groups should be rotated or tank-mixed with broad spectrum protectant fungicides (FRAC group M3 or M5) to delay the development of resistant strains of fungi. For more information on fungicide resistance management see: www.frac.info.

Fungicide Modes of Action for Fungicide Resistance Management

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Table 10-66. Fungicide Modes of Action for Fungicide Resistance Management

FRAC Code	Fungicide Resistance Risk	Group Name	Example Active Ingredients	Example Products
P01	Unknown	Benzo-thiadiazole (BTH)	Acibenzolar-S-methyl	Actigard
M01	Low	Inorganic copper	Fixed copper	Copper (various)
M02	Low	Inorganic sulfur	Sulfur	Sulfur (various)
M03	Low	Dithiocarbamates	Mancozeb	Mancozeb (various)
M05	Low	Chloronitriles	Chlorothalonil	Chlorothalonil (various)
1	High	Methyl benzimidazole carbamates (MBC)	Thiophanate-methyl	Topsin M
2	Medium to high	Dicarboximides	Iprodione	Rovral
3	Medium	Demethylation inhibitors (DMI)	Triflumizole	Procure
			Myclobutanil	Rally
4	High	Phenylamide (PA)	Mefenoxam	Ridomil Gold
7	Medium to high	Succinate dehydrogenase inhibitors (SDHI)	Boscalid	Endura
			Penthiopyrad	Fontelis
9	Medium	Anilino-pyrimidines (AP)	Pyrimethanil	Scala
11	High	Quinone outside Inhibitors (QoI)	Pyraclostrobin	Cabrio
			Trifloxystrobin	Flint
			Azoxystrobin	Quadris
12	Low to medium	Phenylpyrroles (PP)	Fludioxonil	Maxim
13	Medium	Azonaphthalenes (AZN)	Quinoxyfen	Quintec
14	Low to medium	Aromatic hydrocarbons (AH)	Dicloran	Botran
19	Medium	Polyoxins	Polyoxin D	OSO
21	Medium to high	Quinone inside Inhibitors (QiI)	Cyazofamid	Ranman
22	Low to medium	Benzamides (toluamides)	Zoxamide	Gavel (contains zoxamide and mancozeb)
25	High	Glucopyranosyl antibiotics	Streptomycin	Agri-Mycin 17
27	Low to medium	Cyanoacetamide-oximes	Cymoxanil	Curzate
28	Low to medium	Carbamates	Propamocarb	Presidio
29	Low	Dinitroanilines	Fluazinam	Omega
P07	Low	Phosphonates	Fosetyl AL	Aliette
40	Low to medium	Carboxylic acid amides (CAA)	Dimethomorph	Forum
			Mandipropamid	Revus
43	High	Benzamides	Fluopicolide	Presidio
45	Medium to high	Triazolo-pyrimidylamine (QoSI)	Ametoctradin	Zampro (contains ametoctradin and dimethomorph)
49	Medium to high	Oxysterol Binding Protein Inhibitors (OSBPI)	Oxathiapiprolin	Orondis