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Fungicides

for disease control of greenhouse crops

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Successful disease management begins prior to starting any new crop. It is important to know what key diseases commonly attack the crop, the conditions under which these diseases develop, the plant symptoms associated with each disease, and information on how to manage each disease should it occur. By the time disease symptoms appear or become severe, it is often too late to provide effective control.

As a result, prevention is the most important and effective strategy for managing ornamental plant diseases. Understanding the environmental conditions that favor infection and disease development is extremely important in averting or responding to a disease outbreak. While chemical pesticides are extremely important in helping to prevent many plant diseases, they're just one component of a successful integrated pest management program. Choosing a variety that's less susceptible to a particular disease, modifying irrigation practices to reduce leaf moisture or soil wetness, heating and venting the greenhouse to lower the humidity, carefully monitoring plants for disease symptoms, removing old plant debris, sanitizing floors and benches, and preventive fungicide applications are a few examples of cultural, environmental, or chemical practices, that when used

NOTICE TO USERS: Consult product label to ensure the ornamental plant that you wish to treat is listed on the label. For plants not listed, check for phytotoxicity by making trial applications on a smaller number of plants before you treat an entire crop.

collectively, can help to prevent or reduce the incidence and severity of plant diseases in greenhouse floriculture crops. When choosing a fungicide to use, it is important to remember that fungicides are generally protectants or curatives. A protectant acts on contact with the pathogen preventing infection. When using a protectant fungicide, it's important you cover the entire surface of the plant with the chemical to ensure adequate protection.

On the other hand, curative fungicides are at least partially systemic within a plant, moving from the site of application to distant plant tissues. Because the plant absorbs systemic fungicides, they have longer residual activity than protectant fungicides and can be effective after infection has occurred. However, the window to obtain adequate control is often very short (products must be applied within 24 to 72 hours after infection). Most systemic fungicides are also effective protectants.

Once a fungus is no longer inhibited or killed by a fungicide, the fungus is said to have developed resistance to that fungicide. Fungal pathogens that produce a substantial number of spores and have a short generation time are more likely to develop

fungicide resistance. Rotating between chemicals with different modes of action is especially critical when trying to manage downy mildew, powdery mildew, Botrytis, Pythium and Phytophthora diseases.

You can take steps to prevent or reduce the chance of fungicide resistance. These include avoiding long-term, continuous use of chemicals with similar modes of action; alternating between fungicides from different chemical classes or using tank mixes of non-systemic and systemic fungicides; minimizing the number of preventative fungicide applications; using the label-recommended rates and intervals; and practicing good integrated pest management that utilizes all cultural and biological practices available.

Fortunately, chemical companies are now making it easier to determine the chemical class to which a particular fungicide belongs by placing the group number (which represents the mode of action) on the product label. A chemical class chart for fungicides can be found following the fungicide tables in this guide.

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DISCLAIMER: Recommendations for the use of chemicals are included in this publication as convenience to the reader. Not all commercially available products may be listed. The use of brand names and any mention of commercial products or services in the publication do not imply endorsement by Ball Horticultural Co. or discrimination against similar products or services not mentioned. Recommendations of specific chemicals are based upon information on the manufacturer's label and performance in a limited number of trials. Because environmental conditions and methods of application by growers may vary widely, performance of the chemical will not always conform to the safety and pest control standards indicated by experimental data. These recommendations may not comply with laws and regulations in all states. These recommendations were current as of January 2012. Individuals who use agricultural chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. This table is not intended as a substitute for the product label.

Fungicides for Disease Control of Greenhouse Floriculture Crops

DISEASE	PESTICIDE AND FORMULATION	RATE OF FORMULATION	SCHEDULE AND REMARKS
Anthraxnose (<i>Colletotrichum</i> spp.)	azoxystrobin (Heritage)	4 to 8 oz/100 gal	Apply every 7 to 28 days prior to infection. Do not exceed 2 oz/100 gal on impatiens, pansy, or viola. Do not make more than three sequential applications before switching to a nonstrubilurin fungicide.
	chlorothalonil (Chlorothalonil DF) (Chlorothalonil 500ZN) (Chlorothalonil 720 SFT) (Chlorostar VI*, Daconil Weather Stik, Echo 720, Manicure SFL) (Daconil Ultrex) 82-5WDG (ECHO Ultimate) (All Pro Exotherm Termil) *not in California	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	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.
	fludioxonil (Medallion) 50WSP	1 to 2 oz/100 gal	Spray to runoff. Repeat at 7- to 14-day intervals.
	iprodione (OHP Chippo 26019 N/G) (Iprodione E-Pro) (Lesco18 Plus, Iprodione Pro 2SE)	1.0 to 2.5 lb/acre 1 to 2.5 qt/acre 1 to 2.5 qt/100 gal	Foliar applications on some geranium cultivars may cause stunting or chlorosis, especially on young plants. Spray to ensure thorough coverage. Repeat at 7- to 14-day intervals. Do not make more than four applications per year. Do not apply to <i>Spathiphyllum</i> . Do not apply as a soil drench on impatiens or pothos.
	kresoxim-methyl (Cygnus)	1.6 to 3.2 oz/100 gal	Apply as a protective spray at 7- to 14-day intervals.
	mancozeb (Dithane) 75DF, (Fore) 80WSP (Mancozeb DG) (Pentathion DF) (Pentathion LF) (Protect DF)	1.5 lb/100 gal 1 to 2 lb/100 gal 0.8 to 1.6 qt/100 gal 1 to 2 lb/100 gal	Do not use on French dwarf or signet-type marigolds. Begin at first sign of disease. Repeat at 7- to 10-day intervals. Most effective when applied prior to infection. Begin at first sign of disease. Repeat at 7- to 10-day intervals. Begin at first sign of disease. Repeat at 7- to 10-day intervals. To improve performance, add 2 to 4 oz of an effective spreader/sticker. Apply at 7- to 21-day intervals.
	polyoxin D zinc salt (Veranda D, Affirm)	0.25 to 0.5 lb/100 gal/acre	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)	18 oz/100 gal	Use preventatively. Begin applications when conditions are favorable for disease development, prior to symptom development. Apply at 7- to 14-day intervals.
	chlorothalonil + thiophanate-methyl (Spectro) 90WDG (Consyst WDG*, TM/G WDG*) *not in California	1 to 2 lb/100 gal 0.75 to 1.5 lb/100 gal	Minimum re-treat interval is 7 days. Repeat every 7 to 10 days as needed during disease period.
	Bacterial leaf spot (<i>Pseudomonas</i> , <i>Xanthomonas</i>)	<i>Bacillus subtilis</i> (Cease)	2 to 8 qt/100 gal/acre
copper hydroxide (Champion WP) (CuPRO 2005 T/N/O) (Nu-Cop) 50DF		1.5 lb/100 gal 0.75 to 3lbs/acre 1 lb/100 gal	Begin at first sign of disease, and repeat at 7- to 14-day intervals. Spray solution must be > pH 6.5 to help prevent phytotoxicity.
copper hydroxide + mancozeb (Junction)		1.5 to 3.5 lb/100 gal	Begin at first sign of disease, and repeat at 7- to 14-day intervals.
copper, metallic (Copper-Count-N)		1 qt/100 gal	Begin at first sign of disease, and repeat at 7- to 14-day intervals.
copper salts (Camelot) 58E		3 pt/100 gal	Begin at first sign of disease, and repeat at 7- to 14-day intervals.
copper sulfate pentahydrate (Phyton 27)		See label	See label.
Black root rot (<i>Thielaviopsis basicola</i>)		etridiazole + thiophanate-methyl (Banrot) 40W* *not in California	6 to 12 oz/100 gal
	fludioxonil (Medallion)	1 to 2 oz/100 gal	Apply as a PREVENTIVE drench at seeding or transplanting. Make only one application to seeding 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.
	polyoxin D zinc salt (Veranda O)	0.25 to 0.5 lb/100 gal/acre	Apply as a soil drench every 14 to 28 days.
	thiophanate-methyl (AllBan Flo) (3336) 50WP (3336) F (OHP 6672) 50W, (T-Storm) 50WSE (SysTec 1998, TM 85 WDG) (TM 4.5) (T-Storm Flowable), (OHP 6672) 4.5L	7.5 to 20 oz/100 gal 8 to 16 oz/100 gal 8 to 16 fl oz/100 gal 12 to 16 oz/100 gal 0.8 lb/100 gal 10 to 20 fl oz/100 gal 20 fl oz/100 gal	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. Apply as heavy spray or drench at a rate of 1 to 2 pints per sq ft. Repeat at 2- to 4-week intervals.

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DISEASE	PESTICIDE AND FORMULATION	RATE OF FORMULATION	SCHEDULE AND REMARKS
Black Root cont'd	Triflumizole (Terraguard) 50W	1 to 4 oz/100 gal	Apply as soil drench at 2- to 4-week intervals as a preventative. Use higher rate under heavy disease pressure.
Botrytis blight	azoxystrobin (Heritage)	4 to 8 oz/100 gal	Apply every 7 to 21 days prior to infection. Do not exceed 2 oz/100 gal on impatiens, pansy, or viola. Do not make more than three sequential applications before switching to a nonstrubolurin fungicide.
	<i>Bacillus subtilis</i> (Cease)	2 to 8 qt/100 gal/acre	Repeat at 3- to 10-day intervals. Thorough coverage is essential. Begin applications when conditions favor disease development prior to the onset of disease.
	chlorothalonil (Chlorothalonil DF) (Chlorothalonil 500Z) (Chlorothalonil 720 SF7) (Chlorostar W)*, Daconil Weather Silk, Echo 720, Manicure 6FL) (Daconil Ultrex) 82.5WDG (Echo Ultimate) (All Pro Exotherm Termal) *not in California	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	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. On rose, use 1 pt/100 gal. Use prior to flowering. On rose, use 1 lb/100 gal. On rose, use 0.78 lb/100 gal (Echo 90) DF or 0.9 lb/100 gal (Echo Ultimate). See label for method of application.
	chlorothalonil + thiophanate-methyl (Spectro) 90WDG (Consyst WDG*, TM/C WDG*) *not in California	1 to 2 lb/100 gal 0.75 to 1.5 lb/100 gal	Minimum re-treat interval is 7 days. Repeat every 7 to 10 days as needed during disease period.
	copper hydroxide (Champion WP) (CuPRO 2005 T/N/O) (Nu-Cop) 50 DF	1.5 lb/100 gal 0.75 to 3 lbs/acre 1 lb/100 gal	Repeat at 7- to 14-day intervals. See label for rate on Easter Lily and crops in California. Spray solution must be > pH 6.5 to help prevent phytotoxicity
	copper hydroxide + mancozeb (Junction)	1.5 to 3.5 lb/100 gal	Repeat at 7- to 14-day intervals.
	copper, metallic (Copper Count N)	1 qt/100 gal	Begin at first sign of disease, and repeat at 7- to 14-day intervals.
	copper sulfate pentahydrate (Phyton 27)	See label	See label.
	cyprodinil + fludioxonil (Palladium)	4 to 6 oz/100 gal	Apply at 7- to 14-day intervals while conditions are favorable for disease development. Consult label for resistance management information. May cause stunting or chlorosis, especially on young geranium, impatiens and New Guinea impatiens. See label for approved crops.
	dichloran (Botran) 75W	1 lb/150 to 200 gal See label	Apply to stock cuttings or greenhouse plants. Begin when disease is anticipated or first appears. Spray foliage and flowers at 7- to 14-day intervals.
	fenhexamid (Decree) 50WDG	0.75 to 1.5 lb/100 gal	Avoid making more than two 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) 50WSP	2 to 4 oz/100 gal	Spray to runoff. Repeat at 7- to 14-day intervals. Use no more than two consecutive applications before switching to another fungicide with a different mode of action. Do not use after bract formation on poinsettia. Foliar applications on impatiens, New Guinea impatiens, and some geranium cultivars may cause stunting or chlorosis, especially on young plants.
	iprodione (OHP Chipco 26019 N/G) (Iprodione E-Pro) (18 Plus, Iprodione Pro 2SE)	1.0 to 2.5 lb/acre 1 to 2.5 qt/acre 1 to 2.5 qt/100 gal	Spray to ensure thorough coverage. Repeat at 7- to 14-day intervals. Do not make more than four applications per year. Do not apply to Spathiphyllum. Do not apply as a soil drench on impatiens or pothos.
	iprodione + thiophanate-methyl (26/36)	33 to 84 fl oz/acre	Spray to ensure thorough coverage. Repeat at 7 to 14 day intervals. Do not use as a drench on impatiens or pothos. Do not use on Spathiphyllum.
	mancozeb (Dithane) 75DF, (Fore) 80WSP, (Mancozeb DG) (Pentathlon DF) (Pentathlon LF) (Protect DF)	1.5 lb/100 gal 1 to 2 lb/100 gal 0.8 to 1.6 qt/100 gal 1 to 2 lb/100 gal	Do not use on French dwarf or signet-type marigolds. Begin at first sign of disease. Repeat at 7- to 10-day intervals. Most effective when applied prior to infection. Begin at first sign of disease. Repeat at 7 to 10 day intervals. Begin at first sign of disease. Repeat at 7 to 10 day intervals. To improve performance, add 2 to 4 oz of an effective spreader-sticker. Apply at 7- to 21-day intervals.
	mancozeb + myclobutanil (Clevis, MANhandle*) *not in California	2 lb/100 gal	Addition of Latron B-1956 will improve performance. Apply at 7- to 10-day intervals.
	polyoxin D zinc salt (Veranda O, Affirm)	0.25 to 0.5 lb/100 gal/acre	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)	12 to 18 oz/100 gal	Use preventatively. Begin applications when conditions are favorable for fungal infection, prior to disease symptom development.
	thiophanate-methyl + mancozeb (Zyban) 79WSB	4 bags/100 gal (24 oz/100 gal)	Do not use on French marigold or gloxinia. Apply weekly.

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DISEASE	PESTICIDE AND FORMULATION	RATE OF FORMULATION	SCHEDULE AND REMARKS
Botrytis blight cont'd	trifloxystrobin (Compass O) 50WDG	2 to 4 oz/100 gal	Repeat at 7- to 14-day intervals until the threat of disease is over. Rotate to another nonstrobilurin fungicide after each application of Compass O. Make no more than four foliar applications per crop cycle or season.
	triflumizole (Terraguard) 50W	4 to 8 oz/100 gal	Make initial application prior to or at first sign of disease. Repeat at 7- to 14-day intervals. Do not use on impatiens plugs.
Bulb and Corm Rots (Fusarium, Penicillium)	iprodione (OHP Chipco 26019 N/G) (Lesco 18 Plus, Iprodione E-Pro, Iprodione Pro 2SE)	2 lb/100 gal 2 qt/100 gal	Dip 5 minutes prior to storage.
	iprodione + thiophanate-methyl (26/36)	66 fl oz/100 gal	Dip 5 minutes prior to storage.
	thiabendazole (Merckert) 340-F	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 <i>Fusarium</i> control, or dip bulbs 10 to 15 minutes for <i>Penicillium</i> (blue mold) control.
	thiophanate-methyl (AliBan Flo) (Cleary's 3336) 50W (OHP 6672) 50W, (T-Storm) 50WSB (SysTec 1998, TM R5 WDG) (T-Storm Flowable), (TM 4.5), (OHP 6672) 4.5L	14.5 to 33 fl oz/100 gal 16 to 24 oz/100 gal 12 to 16 oz/100 gal 1.4 lb/100 gal 33 fl oz/100 gal	Soak clean bulbs for 15 to 30 minutes in warm (80-85 degrees F) solution. Treat bulbs within 48 hours of digging. Dry well before storing.
Cylindrocladium root rot	fludioxonil (Medallion) 50WSP	1 to 2 oz/100 gal	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.
	thiophanate-methyl (AliBan Flo) (Cleary's 3336) 50WP	7.5 to 20 fl oz/100 gal 8 to 16 oz/100 gal	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.
	(OHP 6672) 50W, (T-Storm) 50WSB	12 to 16 oz/100 gal	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.
	(SysTec 1998, TM R5 WDG*) *not in California (TM 4.5)	0.8 lb/100 gal	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.
	(T-Storm Flowable), (OHP 6672) 4.5L	10 to 20 fl oz/100 gal 20 fl oz/100 gal	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.	Can be used as a cutting soak or soil drench.
Downy Mildew	azoxystrobin (Heritage)	1 to 2 oz/100 gal 2 to 4 oz/100 gal (rose)	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.
	<i>Bacillus subtilis</i> (Cease)	2 to 8 qt/100 gal/acre	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 (Champion WP) (CuPRO 2005 T/N/O)	1.5 lb/100 gal 0.75 to 3 lbs/acre	Begin applications at first sign and repeat at 7- to 14-day intervals. Use shorter intervals during rainy periods or when severe symptoms appear. May cause speckling on snapdragons. To avoid phytotoxicity, do not use any copper compound on alyssum.
	copper, metallic (Copper-Count-N)	1 qt/100 gal	Begin at first sign of disease, and repeat at 7- to 14-day intervals. To avoid phytotoxicity, do not use any copper compound on alyssum.
	copper sulfate pentahydrate (Phyton 27)	See label	See label. To avoid phytotoxicity, do not use any copper compound on alyssum.
	cyazofamid (Segway)	2.1 to 3.5 fl oz/100 gal	Apply on 14-21 day schedule, using 50-100 gallons per acre. Wet foliage to point of run-off. Tank mix or alternate with another downy mildew fungicide with a different mode of action.
	dimethomorph (Stature SC) (In Canada: Acrobat. 50WP +DiThiane)	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. Rotate with another registered fungicide with a different mode of action or apply as a tank mix to help prevent the development of fungicide resistance.
fenamidone (FenStop)	1 to 4 fl oz/100 gal	Spray until wet. Repeat at 28-day intervals. Higher rate has shown more consistent efficacy in research trials. Use a non-strobilurin fungicide (MOA group 11) for rotation.	
	fluopicolide (Adorn)	2 to 4 fl oz/100 gal	Must be tank-mixed with the labeled rate of fungicides from a different target site or action group that is effective on downy mildew such as mancozeb (Protect), azoxystrobin (Heritage), mefenoxam (Subdue MAXX). Reapply after 14-28 days. Do not apply sequentially, alternate with another fungicide.
	fluoxastrobin (Disarm 480 SC)	2 to 4 fl oz/100 gal	Apply in sufficient amount to wet leaf surfaces to point of drip. Most effective when applied preventatively before disease is widespread.

Fungicides for Disease Control of Greenhouse Floriculture Crops

DISEASE	PESTICIDE AND FORMULATION	RATE OF FORMULATION	SCHEDULE AND REMARKS	
Downy Mildew cont'd	fosetyl-Al (Alette) 80WDG	1.25 to 4 lb/100 gal (bedding plants) 2.5 lb/100 gal (rose)	Systemic. Repeat as necessary, but do not make more than one application every 14 days.	
	kresoxim-methyl (Cygnus)	3.2 to 6.4 oz/100 gal	Apply strictly as a protective spray, and continue on a 7- to 10-day interval. Follow label recommendation for resistance management.	
	mancozeb (Dithane) 75DF, (Fore) 80WSP (Mancozeb DG) (Penlathion DF) (Pentathion LF) (Protect DF)	1.5 lb/100 gal 1 to 2 lb/100 gal 0.8 to 1.6 qt/100 gal 1 to 2 lb/100 gal	Repeat at 7- to 10-day intervals. Begin at first sign of disease. Repeat 7- to 10-day intervals. Begin at first sign of disease. Repeat 7- to 10-day intervals. To improve performance, add 2-4 oz of an effective spreader-sticker. Repeat at 7- to 21-day intervals.	
	mancozeb + copper hydroxide (Junction)	1.5 to 3.5 lb/ acre	Begin applications at first sign of disease and repeat at 7- to 14-day intervals.	
	mancozeb + myclobutanil (Clevis, MANhandle*) *not in California	2 lbs/100 gal	Begin applications at first sign of disease and repeat at 7- to 10-day intervals. Limited trials have shown very good to excellent control of downy mildew on alyssum, stock, and snapdragon.	
	mefenoxam (Subdue MAXX)	0.5 to 1.0 fl. oz./100 gal or 1.0 fl. oz./100 gal drench	Tank mix with non-Group 4 fungicide (such as Protect) when making foliar applications. Consult label for specific crops and applications. Apply preventatively for best results. Some populations of <i>Plasmopara obducens</i> are resistant to mefenoxam.	
	phosphorous acid (Alcide, Fosphite, K-Phite, Reliant*) *not in California	See label for rates	Apply prior to disease development. Spray to thoroughly wet all foliage. Repeat at 14- to 21-day intervals. See label for list of approved crops.	
	polyoxin D zinc salt (Veranda O, Affirm)	0.25 to 0.5 lb/100 gal/acre	Apply as a foliar spray every 7 to 10 days. Apply prior to disease development and when conditions are conducive for disease.	
	potassium phosphite (Vital*) *not in California	4 pt/100 gal	Apply prior to disease onset, and repeat at 14-day intervals.	
	thiophanate-methyl + mancozeb (Zyban)	1.5 lb/100 gal	Apply at first sign of disease, and repeat at 7-day intervals. Use as a rotational product.	
	trifloxystrobin (Compass O) 50WDG	2 to 4 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.	
	Fungal leaf spots (consult label for specific fungi controlled)	azoxystrobin (Heritage)	1 to 4 oz/100 gal	Repeat at 7- to 28-day intervals. Do not make more than three sequential applications before switching to a nonstrobilurin fungicide. Good control of <i>Alternaria</i> leaf spot.
		<i>Bacillus subtilis</i> (Cease)	2 to 8 qt/100 gal/acre	Repeat at 3- to 10-day intervals. Thorough coverage is essential. Not effective on <i>Alternaria</i> .
		chlorothalonil (Chlorothalonil DF) (Chlorothalonil 500ZN) (Chlorothalonil 720 SFT) (Chlorostar W*) Echo 720, Manicure 6 FL) (Daconil Ultrex) 82.5WDG (Echo Ultimate) *not in California	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	Repeat at 7- to 14-day intervals. Works well for control of <i>Alternaria</i> leaf spot. Discontinue applications prior to bract formation on poinsettias. Applications made during bloom may damage flowers. Apply to plants when both foliage and flowers are dry or nearly dry.
chlorothalonil + thiophanate-methyl (Spectro) 90WDG (Consyst WDG*, TM/C WDG*) *not in California		1 to 2 lb/100 gal 0.75 to 1 lb/100 gal	Apply when foliage and flowers are dry, or nearly dry. Repeat at 7-day intervals. Good control of <i>Colletotrichum</i> (anthracnose) and <i>Alternaria</i> . Not recommended for Swedish Ivy, Boston Fern, and Easter Cactus. Thorough, uniform coverage is essential for good control. Repeat in 7- to 10 days.	
copper hydroxide + mancozeb (Junction)		1.5 to 3.5 lb/100 gal/acre	Repeat at 7- to 21-day intervals. Discoloration of foliage and/or blooms is possible on some varieties of azalea, carnation, chrysanthemum, and rose. Do not use on French marigold.	
copper, metallic (Copper-Count-N)		1 qt/100 gal	Begin at first sign of disease, and repeat at 7- to 14-day intervals	
copper salts (Carnelot) 58E		3 pt/100 gal	Begin at first sign of disease, and repeat at 7- to 10-day intervals.	
copper sulfate pentahydrate (Phyton 27)		See label	See label. Has been shown to reduce disease severity of <i>Alternaria</i> on impatiens in a research trial.	
fludioxonil (Medallion)		1 to 2 oz/100 gal	Repeat at 7- to 14-day intervals. Good control of <i>Alternaria</i> leaf spot.	
hydrogen dioxide (Zerotol)		See label	At the first sign of disease spray for 1 to 3 consecutive days and then resume weekly preventative applications. Has been shown to reduce disease severity of <i>Alternaria</i> on impatiens in a research trial. Has been shown to cause minor phytotoxicity on impatiens.	
hydrogen peroxide (Zeroton)* *not in California		See label	At the first sign of disease spray for 1 to 3 consecutive days and then resume weekly preventative applications. Has been shown to reduce disease severity of <i>Alternaria</i> on impatiens in a research trial.	
iprodione (OHP Chipco 26019 N/G) (Iprodione E-Pro) (Lesco 18 Plus, Iprodione Pro 25E)		1.0 to 2.5 lb/acre 1 to 2.5 qt/acre 1 to 2.5 qt/100 gal	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 <i>Spathiphyllum</i> . Good control of <i>Alternaria</i> leaf spot.	
iprodione + thiophanate-methyl (26/36)		33 to 84 fl oz/acre	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 <i>Spathiphyllum</i> .	
kresoxim-methyl (Cygnus)		1.5 to 3.2 oz/100 gal	Apply as a protective spray at 7- to 14-day intervals.	

Fungicides for Disease Control of Greenhouse Floriculture Crops

DISEASE	PESTICIDE AND FORMULATION	RATE OF FORMULATION	SCHEDULE AND REMARKS
Fungal leaf spots cont'd	mancozeb (Dithane) 75DF, (Fore) 80WSP (Mancozeb DG) (Pentathlon DF) (Pentathlon LF) (Protect DF)	1.5 lb/100 gal 1 to 2 lb/100 gal 0.8 to 1.6 qt/100 gal 1 to 2 lb/100 gal	Do not use on French dwarf or signet-type marigolds. Begin at first sign of disease. Repeat at 7- to 10-day intervals. Most effective when applied prior to infection. Begin at first sign of disease. Repeat at 7- to 10-day intervals. Begin at first sign of disease. Repeat at 7- to 10-day intervals. To improve performance, add 2-4 oz of an effective spreader-sticker. Apply at 7- to 21-day intervals.
	mancozeb + myclobutanil (Clevis, MANhandle*) *not in California	2 lb/100 gal	Apply at first sign of disease, and repeat at 7- to 10-day intervals. The addition of Latron B-1956 will improve performance. Good control of Alternaria.
	myclobutanil (Eagle) 20EW (Hoist+Eagle) 40WP (Systhane) 40WSP* *not in California	6 to 12 fl oz/100 gal 3 to 6 oz/100 gal 4 oz/100 gal	Apply at 10- to 14-day intervals, not to exceed 21 days. For chrysanthemums, see label for specific rates. Good control of Phyllosticta and Ascochyta leaf spots.
	polyoxin D zinc salt (Veranda O, Affirm)	0.25 to 0.5 lb/100 gal/acre	Control of Alternaria blight, anthracnose (<i>Colletotrichum</i>), and Curvularia leaf spot. Apply as a foliar spray every 7 to 10 days. Apply prior to disease development and when conditions are conducive for disease.
	pyraclostrobin (Insignia)	See label	Use preventatively. Begin applications when conditions are favorable for fungal infection, prior to disease symptom development. Good control of <i>Cercospora</i> .
	pyraclostrobin + boscalid (Pageant)	See label	Use preventatively. Begin applications when conditions are favorable for fungal infection, prior to disease symptom development. Good control of Alternaria.
	thiophanate-methyl (AliBan Flo)	10 to 20 fl oz/100 gal	Begin applications 14 to 21 days prior to when disease is expected, or at very first sign of disease. Repeat at 7- to 10-day intervals. Poor control of Alternaria leaf spot.
	(3336) 50WP, (OHP 6672) 50W, (T-Storm) 50WSB (Systec 1998, TM 85 WDG)	12 to 16 oz/100 gal 0.3 to 0.8 lb/100 gal	Begin when disease first appears and repeat at 7- to 14-day intervals. Begin when disease first appears and repeat at 10- to 14-day intervals.
	(TM 4.5, T-Storm Flowable)	20 fl oz/100 gal	Begin when disease first appears and repeat at 10- to 14-day intervals.
	triadimefon (Strike) 50WDG	See label	Apply at first sign of disease. Apply as full coverage spray to point of drip. Good control of Alternaria leaf spot. See label for reapplication interval.
trifloxystrobin (Compass D) 50WDG	1 to 4 oz/100 gal	Repeat at 7- to 14-day intervals until threat of disease is over. Rotate to another nontribolurin fungicide after each application. Good control of Alternaria leaf spot.	
triflumizole (Terraguard) 50W	4 to 8 oz/100 gal	Apply at very first sign of disease. Do not use on impatiens plugs, and do not exceed 2 oz/100 gal for impatiens transplants. Repeat at 7- to 14-day intervals.	
Fusarium root and crown rot	azoxystrobin (Heritage)	1 to 4 oz/100 gal (directed spray) 0.2 to 0.9 oz/100 gal (drench)	Apply as a directed spray every 7 to 21 days, or as a soil drench at 7- to 28-day intervals.
	etridiazole + thiophanate-methyl (Banrot) 40W* *not in California	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.
	fludioxonil (Medallion)	1 to 2 oz/100 gal	Apply as a drench at seeding or transplanting. Make only one application to seeding crop. If needed, re-treat transplants 21 to 28 days after initial application. See label for incorporation into potting mixture. Do not apply as a seed or soil drench to impatiens or New Guinea impatiens.
	fludioxonil + mefenoxam (Hurricane) 48WP	See label	Apply as a pre-planting or growing media drench per label directions. Application to impatiens, New Guinea impatiens, pothos, geranium, and Easter lily may cause stunting and/or chlorosis.
	<i>Streptomyces griseoviridis</i> (Mycostop)	See label	Apply inoculant as a seed dressing, soil drench spray, or transplant dip. Must be applied prior to onset of disease. See label.
	thiophanate-methyl (AliBan Flo)	7.5 to 20 fl oz/100 gal	Apply as a heavy spray or drench at a rate of 0.5 to 2 pints per sq ft. Repeat at 4- to 8-week intervals.
	(3336) 50WP	8 to 16 oz/100 gal	Apply 8 oz as a drench or directed spray after seeding or sticking or 12 to 16 oz after transplanting. Repeat at 21- to 28-day intervals.
	(OHP 6672) 50W, (T-Storm) 50WSB	12 to 16 oz/100 gal	Soak growing medium after transplanting. Repeat every 21 to 28 days.
	(SysTec 1998, TM 85 WDG)	0.8 lb/100 gal	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.
	(TM 4,5)	10 to 20 fl oz/100 gal	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.
(T-Storm Flowable), (OHP 6672) 4.5L	20 fl oz/100 gal	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	4 to 8 oz/100 gal	Apply soil drenches weekly as needed. Use higher rate under heavy disease pressure.	

Fungicides for Disease Control of Greenhouse Floriculture Crops

DISEASE	PESTICIDE AND FORMULATION	RATE OF FORMULATION	SCHEDULE AND REMARKS
Myrothecium leaf blight, crown, or petiole rot	azoxystrobin (Heritage)	1 to 4 oz/100 gal	Apply every 7 to 21 days. Do not exceed 2 oz per 100 gal on impatiens, pansy, or violas.
	chlorothalonil (Chlorostar VI*, Daconil Weather Stik, Echo 720, Manicure 6 FL) (Chlorothalonil DF) (Chlorothalonil 500 ZN) (Chlorothalonil 720 SFT) (Daconil Ultrex) 82.5WDG (Echo Ultimate) *not in California	1.3/8 pt/100 gal See label 1.9 pt/100 gal 1.37 pt/100 gal 1.37 lb/100 gal 1.25 lb/100 gal	Repeat applications at 7- to 14-day intervals.
	fludioxonil (Medallion)	1 to 2 oz/100 gal	Spray to runoff at 7- to 14-day intervals. See label for media mix and drench applications. Drench applications to impatiens or New Guinea impatiens may cause stunting and/or chlorosis.
	triflumizole (Terraguard) 50W	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. Do not use on impatiens plugs. Do not exceed 2 oz per 100 gallons on impatiens transplants.
Phytophthora aerial shoot blight	azoxystrobin (Heritage)	1 to 2 oz/100 gal	Apply every 7 to 28 days. Do not make more than three sequential applications before switching to another effective fungicide with a different mode of action.
	chlorothalonil + thiophanate-methyl (Spectro) 90 WDG	1 to 2 lb/100 gal	Apply when plants are dry. Spectro has protective and curative action. Repeat at 7-day intervals.
	copper salts (Camelot) 58E	3 pt/100 gal	Begin at first sign of disease, and repeat at 7- to 14-day intervals.
	cyazofamid (Segway)	3.0 to 6.0 fl oz/100 gal	Apply at a 14-28 day interval using another registered fungicide with a different mode of action between applications. Apply to point of run-off, not to exceed 100 gal per acre.
	dimethomorph (Stature SC)	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.
	fosetyl-AI (Aliette) 80 WDG	1.25 to 4 lb/100 gal	Apply prior to disease development. Apply as a foliar spray. Repeat as necessary, but do not exceed one application every 14 days.
	potassium phosphate (Vital)* *not in California	See label	Apply as a soil drench or foliar spray as a preventative.
Phytophthora crown and root rot	cyazofamid (Segway)	3.0 to 6.0 fl oz/100 gal	Apply on 14-21 day interval using another registered fungicide with a different mode of action between applications of Segway.
	dimethomorph (Stature SC)	3.06 to 6.12 fl oz/50 to 100 gal water See label for rates for container-grown perennials and woody ornamentals	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. Not effective against <i>Pythium</i> root rot.
	dipotassium phosphonate + dipotassium phosphate (Biophos) 1% (v/v)* *not in California	See label for rates	Apply as a soil drench or foliar spray as a preventive.
	etridiazole (Truban) 30WP*	3 to 10 oz/100 gal	Apply in sufficient volume to saturate soil. Irrigate immediately. Repeat at 4- to 12-week intervals.
	(Terrazole) 35WP* *not in California	3.5 to 10 oz/100 gal	Drench 4-in. pot with a minimum of 2 oz and a 6-in. pot with 4 oz. Re-treat at 4- to 12-week intervals. Use higher rates for peat or other high organic potting media.
	(Terrazole-CA) for use in California	See label	See label for application restrictions.
	etridiazole + thiophanate-methyl (Banrot) 40W* *not in California	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.
fenamidone (FenStop)	7.0 to 14.0 fl oz/ 50 to 100 gal/ 400 sq ft	Apply as a drench using 1, 1 to 2 pts 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 for Phytophthora control.	
fluopicolide (Adom)	1 to 4 fl oz/100 gal	See label for amount to apply. Do not make more than one application per cropping cycle on poinsettia. Test on a small number of plants before making large scale applications.	
fludioxonil + mefenoxam (Hurricane) 48WP	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 and/or chlorosis.	
	fosetyl-AI (Aliette) 80WDG	1.25 to 4 lb/100 gal	Apply as a foliar spray prior to disease development. Repeat as necessary, but do not exceed one application every 14 days.
	mefenoxam (Fenix ME*, Mefenoxam 2 AQ, Subdue MAXX) *not in California	See label for rates	Can be applied as a drench, soil surface spray, or incorporated into the soil mix. Consult label for specific crops and applications.

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DISEASE	PESTICIDE AND FORMULATION	RATE OF FORMULATION	SCHEDULE AND REMARKS
Phytophthora crown and root rot cont'd	phosphorous acid (Alude, Fosphite, Reliant*) *not in California	See label for rates	Apply as a soil drench or foliar spray as a preventative.
	potassium phosphite (Vital)* *not in California	See label for rates	Apply as a soil drench or foliar spray as a preventative.
	pyraclostrobin (Insignia) 20WP	8 to 16 oz/100 gal	Use as a preventative treatment. Apply as a drench (200-250 ml/6" pot) to obtain thorough coverage and wetting of root zone, crown and base of the plant, and surrounding substrate. Repeat applications within 7 to 21 days as needed. Variable control dependent on Phytophthora species present.
Powdery mildew	azoxystrobin (Heritage)	1 to 4 oz/100 gal	Spray every 7 to 28 days as needed. To avoid fungicide resistance, do not make more than two sequential applications of Heritage before rotating with non-strobilurin products.
	Bacillus subtilis (Cease)	2 to 4 qt/100 gal/acre	Repeat at 3- to 10-day intervals. Thorough coverage is essential. Begin applications when conditions favor disease development prior to the onset of disease.
	chlorothalonil (Chlorostar VI*, Daconil Weather Stik, Echo 720, Manicure 6 FL) (Chlorothalonil DF) (Chlorothalonil 5002N) (Chlorothalonil 720 SFT) (Daconil Ultrex) 82-5WDG (Echo Ultimate) *not in California	1.3/8 pt/100 gal See label 1.9 pt/100 gal (1.6 pt/100 gal on rose) 1.37 pt/100 gal 1.4 lb/100 gal 1.25 lb/100 gal	Apply until runoff when flowers and foliage are dry. Repeat at 7- to 14-day intervals. Avoid applications during bloom where flower injury is unacceptable. Discontinue use on poinsettias prior to bract formation.
	chlorothalonil + thiophanate-methyl (Spetpro) 90WDG (ConSyst*, TM/C*) 50WDG *not in California	1 to 2 lb/100 gal 0.75 lb/100 gal	Apply when foliage and flowers are dry, or nearly dry. Re-treat at 7-day intervals. Repeat at 7- to 10-day intervals.
	copper hydroxide (Champion WP) CuPRO 2005 T/N/O	1.5 lb/100 gal 0.75 to 2 lb/acre	Begin application at first sign of disease and repeat at 7- to 14-day intervals.
	copper salts (Camelot) 5SE	48 oz/100 gal	Begin at first sign of disease, and repeat at 7- to 10-day intervals.
	copper sulfate pentahydrate (Phyton 27)	15 to 25 fl oz/100 gal	Under heavy disease pressure, reapply in 3 to 5 days.
	fenarimol (Rubigan A.S.)	3 to 5 fl oz/100 gal (See label)	For prevention or therapeutic control of powdery mildew. Repeat at 10- to 14-day intervals depending on disease severity.
	mancozeb + myclobutanil (Clevis, MANhandle*) *not in California	16 oz/100 gal	Begin at first sign of disease, and repeat at 7- to 10-day intervals. In a limited number of trials, gave excellent control of powdery mildew on rose.
	myclobutanil (Eagle) 20EW (Hoist+Eagle) 40WSP (Systhane) 40WSP* *not in California	6 to 12 fl oz/100 gal 3 to 6 oz/100 gal 4 oz/100 gal	Apply at 10- to 14-day intervals. Use caution if applying to Gerbera daisy as phytotoxicity may occur.
	kresoxim-methyl (Cygnus)	1.6 to 3.2 oz/100 gal	Apply as a protective spray or at first sign of disease. Continue on a 7- to 14-day interval. Alternate each application with two sequential applications of nonstrobilurin fungicides.
	neem oil (Triact 70)	1 gal/100 to 200 gal	Trial first on open blooms. Re-treat at 7- to 14-day intervals. Use 1:200 rate as a preventive and 1:100 rate if disease is evident.
	piperalin (Pipron) LC	4 to 8 fl oz/100 gal	See label for precautions on hydrangea, begonia, and poinsettia. Use high rate if disease is already present.
	potassium bicarbonate (Armcarb 100)* *not in California (Kalligreen) (MiiStop)	2 to 2.5 lb/100 gal 1 to 3 lb/100 gal 4 to 8 oz/100 gal/0.1 acre	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 7-10 day intervals. See label for precautions for poinsettia, impatiens, and pansy. Repeat at 7- to 14-day intervals.
	polyoxin D zinc salt (Veranda O, Affirm)	0.25 to 0.5 lb/100 gal/acre	Apply as a foliar spray every 7 to 10 days. Apply prior to disease development and when conditions are conducive for disease.
pyraclostrobin (Insignia)	See label	Use preventatively. Begin applications when conditions are favorable for fungal infection, prior to disease symptom development.	
pyraclostrobin + boscalid (Pageant)	See label	Use preventatively. Begin applications when conditions are favorable for fungal infection, prior to disease symptom development.	
thiophanate-methyl (AliBan Flo) (3336) 50WP, (OHP 6672) 50W, (T-Storm) 50WSB (Systec 1998, TM 85 WDG) (TM 4.5, T-Storm Flowable)	10 to 20 fl oz/100 gal	Apply when disease first appears and repeat at 7- to 14-day intervals.	
	12 to 24 oz/100 gal 0.4 lb/100 gal 10 fl oz/100 gal	Apply when disease first appears and repeat at 7- to 14-day intervals. Apply when disease first appears and repeat at 10- to 14-day intervals. Apply when disease first appears and repeat at 10- to 14-day intervals.	

Fungicides for Disease Control of Greenhouse Floriculture Crops

DISEASE	PESTICIDE AND FORMULATION	RATE OF FORMULATION	SCHEDULE AND REMARKS
Powdery mildew cont'd	thiophanate-methyl + mancozeb (Zyban) 79W	4 bags/100 gal (24 oz/100 gal)	Repeat at weekly intervals.
	triadimefon (Strike) 50WDG	1 to 24 oz/100 gal (See label)	Apply at first sign of disease. Repeat at not less than 30-day intervals.
	trifloxystrobin (Compass O) 50WDG	2 to 4 oz/100 gal	Good eradicant. Repeat at 7- to 14-day intervals. Rotate to another fungicide of nonstrobilurin chemistry after each Compass application. Use caution when applying to petunia, violets, and New Guinea impatiens due to possible phytotoxicity.
	triflumizole (Terraguard) 50W	4 to 16 oz/100 gal	Use 16 oz/100 gal for initial applications of existing infections. Use 4 to 8 oz/100 gal for subsequent applications and preventative sprays. Do not exceed 2 oz/100 gal for impatiens transplants. Repeat at 7- to 14-day intervals.
Pythium root rot	cyazofamid (Segway)	1.5 to 3.0 fl oz/100 gal	Apply on 14-21 day schedule using another registered fungicide with a different mode of action between applications of Segway.
	etridiazole (Truban) 30WP*	3 to 10 oz/100 gal	<i>Pythium control:</i> Apply in sufficient volume to saturate soil. Irrigate immediately. Repeat at 4- to 12-week intervals.
	(Terrazole) 35WP* *not in CA (Terrazole-CA) for use in California	3.5 to 10 oz/100 gal See label	Drench 4-in. pot with a minimum of 2 oz and a 6-in. pot with 4 oz. Re-treat at 4- to 12-week intervals. Use higher rates for peat or other high organic potting media. See label for application restrictions.
	etridiazole + thiophanate-methyl (Banrot) 40W* *not in California	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.
	fenamidone (FenStop)	7.0 to 14.0 fl oz/50 to 100 gal/400 sq ft	Apply as a drench using 1 to 2 pts 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.
	fluopicolide (Adorn)	1 to 4 fl oz/100 gal	See label for amount to apply. Do not make more than one application per cropping cycle on poinsettia. Test on a small number of plants before making large scale applications. Not effective against all <i>Pythium</i> species.
	fludioxonil + metfenoxam (Hurricane) 48WP	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 and/or chlorosis.
	fosetyl-Al (Aliette) 80WDG	1.25 to 4 lb/100 gal	Apply as a foliar spray prior to disease development. Repeat as necessary, but do not exceed one application every 14 days.
	phosphorous acid (Alude, Fosphite, Reliant*) *not in California	See label for rates	Apply as a soil drench or foliar spray as a preventative.
	potassium phosphite (Vital)* *not in California	See label for rates	Apply as a soil drench or foliar spray as a preventative.
Rhizoctonia aerial blight	pyraclostrobin (Insignia) 20WP	8 to 16 oz/100 gal	Use as a preventative treatment. Apply as a drench (200-250 ml/6" pot) to obtain thorough coverage and wetting of root zone, crown and base of the plant, and surrounding substrate. Repeat applications within 7 to 21 days as needed.
	propamocarb (Banol)	20 to 30 fl oz/100 gal	Apply at seeding or transplanting. See label. Effective for preventing <i>Pythium</i> infections. Not for greenhouse use.
	azoxystrobin (Heritage)	1 to 4 oz/100 gal	Reapply every 7-21 days.
	chlorothalonil (Chlorostar VI*, Daconil Weather Stik, Echo 720, Manicure 6 FL) (Chlorothalonil DF, Chlorothalonil 720 SFT) (Chlorothalonil 500 ZN) (Daconil Ultrex) 82.5WDG (Echo Ultimate) *not in California	1.3/8 pt/100 gal See label 1.9 pt/100 gal 1.4 lb/100 gal 1.25 lb/100 gal	Apply when foliage and flowers are dry. Repeat at 7- to 14-day intervals. Apply to hydrated foliage only. Avoid application during bloom period on plants where flower injury is unacceptable.
	chlorothalonil + thiophanate-methyl (Spectro) 90WDG	1 to 2 lb/100 gal	Re-treat at a minimum of 7-day intervals.
	fludioxonil (Medallion)	1 to 2 oz/100 gal	Spray to runoff. Repeat at 7- to 14-day intervals until conditions no longer favor disease.
	flutolanil (Contrast*, Prostar) 70WSP *not in California	3 to 12 oz/100 gal	Apply at 14- to 21-day intervals.
	iprodione (OHP Chipco 26019 N/G) (38 Plus, Iprodione E-Pro, Iprodione Pro 2SE)	1 to 2 lb/acre 1.0 to 2.5 qt/acre	Spray plants to ensure thorough coverage. Repeat at 7- to 14-day intervals. Do not make more than four applications per crop per year. Do not use as a soil drench on impatiens or pothos. Do not use on <i>Spathiphyllum</i> .
	iprodione + thiophanate-methyl (26/36)	33 to 84 fl oz/100 gal	Spray plants to ensure thorough coverage. Repeat at 7- to 14-day intervals. Do not make more than four applications per year. Do not use as a soil drench on impatiens or pothos. Do not use on <i>Spathiphyllum</i> .

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DISEASE	PESTICIDE AND FORMULATION	RATE OF FORMULATION	SCHEDULE AND REMARKS
Rhizoctonia aerial blight cont'd	polyoxin D zinc salt (Veranda O, Affirm)	0.25 to 0.5 lb/100 gal/acre	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)	12 to 18 oz/100gal	Discoloration of flowers is possible following application to flowers and has been observed for impatiens and petunia. Use preventatively. Begin applications when conditions are favorable for infection, prior to symptom development. Thoroughly cover the crown and surrounding potting substrate.
	thiophanate-methyl (AliBan Flo) (3336) 50WP	10 to 14.5 fl oz/100 gal 12 to 16 oz/100 gal	Apply when disease symptoms first appear. Repeat at 7- to 14-day intervals.
	thiophanate-methyl + flutolanil (SysStar WDG)* *not in California	4 to 8 oz/100 gal	For best results apply before disease development.
	triflumizole (Terraguard) 50W	4 to 8 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.
Rhizoctonia stem and root rot	azoxystrobin (Heritage)	1 to 4 oz/100 gal	Apply as a preventative drench treatment. Do not make more than three sequential applications of Heritage before alternating with a nonstrobilurin fungicide. Repeat at 7 to 21 days. Do not exceed 2 oz/100 gal on impatiens.
	chlorothalonil + thiophanate-methyl (Spectro) 90WDG	1 to 2 lb/100 gal	Spray uniformly over area to be treated. Re-treat at 7-day intervals.
	etrudiazole + thiophanate-methyl (Barrot) 40W* *not in California	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.
	fludioxonil (Medallion)	1 to 2 oz/100 gal	Apply as a drench at seeding or transplanting. Apply sufficient mix to wet the upper one-half of the growing medium. Make only one application to seeding 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.
	fludioxonil + mefenoxam (Hurricane)	See label	Use as a pre-potting or growing media drench. See label for specific application information for use in California.
	flutolanil (Contrast*, Prostar) 70WSP *not in California	3 to 6 oz/100 gal	Apply drench at 2 oz per 4-in. pot. Repeat 21 to 28 days after initial application. Make no more than four applications per year.
	iprodione (OHP Chipco 26019 fl/G) (18 Plus, Iprodione E-Pro, Iprodione Pro 2SE)	6.5 oz/100 gal 13 fl oz/100 gal	Apply 1 to 2 pints per square foot at seeding or transplanting. Do not apply as a drench on impatiens or pothos. Repeat every 14 days. Do not make more than six applications per year. Do not use on Spathiphyllum.
	iprodione + thiophanate-methyl (26/36)	13.5 fl oz/100 gal	Apply 1 to 2 pt/sq ft at seeding or transplanting. Do not apply as a drench on impatiens or pothos. Do not use on Spathiphyllum. Repeat every 14 days. Do not make more than 6 applications per year.
	PCNB (Terraclor) 75WP	4 to 8 oz/100 gal	See label for amount to apply. One repeat application can be made 4 to 6 weeks later, if necessary.
	(Revere) 10G	1 to 1.5 lb/yd ³ media	Incorporate into growing media. See label for specific applications.
	polyoxin D zinc salt (Veranda O, Affirm)	0.25 to 0.5 lb/100 gal/acre	Apply as a soil drench every 14 to 28 days.
	pyraclostrobin (insignia)	8 to 16 oz/100 gal	Do not apply to flowering impatiens or petunias. Use as a preventative treatment. Thorough coverage and wetting of root zone, crown and base of the plant, and surrounding growth medium is needed for best control.
	pyraclostrobin + boscalid (Pageant)	12 to 18 oz/100gal	Do not apply to flowering impatiens or petunias. Use as a preventative treatment. Thorough coverage of root zone, crown, base of plant and surrounding growth media is needed for best control. Avoid water for several hours after application. Apply at 7- to 21-day intervals.
	thiophanate-methyl (AliBan Flo) (3336) 50WP	7.5 to 20 fl oz/100 gal 8 to 16 oz/100 gal	Apply as a heavy spray or drench at a rate of 0.5 to 2 pints per sq ft. Repeat at 4- to 8-week intervals.
	(OHP 6672) 50W, (T-Storm) 50WSB	12 to 16 oz/100 gal	Apply 8 oz as a drench or directed spray after seeding or 12 to 16 oz after transplanting. Repeat at 21- to 28-day intervals.
(OHP 6672) 4.5L, (T-Storm Flowable)	20 fl oz/100 gal	Apply as a drench at a rate of 1 to 3 pints per sq ft after transplanting. Repeat at 21- to 28-day intervals.	
(SysTec 1998, TM 85 WDG)	0.8 lb/100 gal	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.	
(TM 4,5)	10 to 20 fl oz/100 gal	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.	
thiophanate-methyl + flutolanil (SysStar WDG)* *not in California	2 to 4 oz/100 gal	Apply according to label directions.	
trifloxystrobin (Compass O) 50WDG	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.	

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DISEASE	PESTICIDE AND FORMULATION	RATE OF FORMULATION	SCHEDULE AND REMARKS
Rhizoctonia cont'd	triflumizole (Terraguard) 50W	4 to 8 oz/100 gal	Apply as soil drench at 2- to 4-week intervals. Use higher rate under heavy disease pressure.
Rust	azoxystrobin (Heritage)	1 to 4 oz/100 gal	Apply at 7- to 28-day intervals. Do not make more than three sequential applications of Heritage before alternating with a nonstrobilurin fungicide. Not effective for rust control on Hypericum. Rotate with mancozeb or triflumizole.
	chlorothalonil (Chlorostar VI*, Daconil Weather Slik, Echo 720, Manicure 6 FL) (Chlorothalonil DF, Chlorothalonil 720 SFT) (Chlorothalonil 500 ZN) (Daconil Ultrex) 82.5WDG (Echo Ultimate) *not in California	1 3/8 pt/100 gal See label 1.9 pt/100 gal 1.4 lb/100 gal 1.25 lb/100 gal	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 + thiophanate-methyl (Spectro) 90WDG	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.
	kresoxim-methyl (Cygnus)	3.2 to 6.4 oz/100 gal	Only apply as a protective spray, and continue at 7- to 10-day intervals.
	mancozeb (Dithane) 75DF, (Fore) 80WSP, (Mancozeb DG) (Pentathion DF) (Pentathion LF) (Protect DF)	1.5 lb/100 gal 1 to 2 lb/100 gal 0.8 to 1.6 qt/100 gal 1 to 2 lb/100 gal	Begin at first sign of disease. Repeat at 7- to 10-day intervals.
	mancozeb + myclobutanil (Clevis, MANhandle*) *not in California	2 lb/100 gal	Apply at first sign of disease, and repeat at 7- to 10-day intervals. The addition of Latron B-1956 will improve performance. In a limited number of trials, gave very good to excellent control of rust on geranium (18 oz/100 gal) and snapdragon (16 oz/100 gal).
	myclobutanil (Eagle) 20EW (Hoist+Eagle) 40WP** (Systhane) 40WSP* *not in California	6 to 12 fl oz/100 gal 3 to 6 oz/100 gal 4 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. **consult label for restrictions in N.Y.
	neem oil (Tract 70)	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* *not in California	16 to 24 oz/100 gal	Apply at first sign of disease. Repeat at 2-week intervals for a maximum of two to four applications per season.
	thiophanate-methyl (AliBan Flo) (3336) 50WP	10.75 to 20 fl oz/100 gal 12 to 16 oz/100 gal	Begin applications at first sign of disease. Repeat at 7- to 14-day intervals.
	triadimephon (Strike) 50WDG	1 to 2 oz/100 gal	Apply as full coverage foliar spray to the point of drip. Refer to label for application restrictions in California and application interval.
	triflumizole (Terraguard) 50WP	2 to 8 oz/100 gal	Apply prior to, or at first sign of disease. Repeat at 7- to 14-day intervals.
Scab, Poinsettia (Sphaceloma)	azoxystrobin (Heritage)	1 to 4 oz/100 gal	Apply at 7- to 21-day intervals. Test for phytotoxicity prior to treating entire crop. Do not make more than three sequential applications of Heritage before alternating with a nonstrobilurin fungicide.
	chlorothalonil + thiophanate-methyl (Spectro) 90WDG	1 to 2 lb/100 gal	Repeat at 7-day intervals.
	copper sulfate pentahydrate (Phyton 27)	20 to 35 oz/100 gal	Apply at 7-day intervals.
	mancozeb (Dithane) 75DF, (Fore) 80WSP, (Mancozeb DG) (Protect DF)	1.5 lb/100 gal 1 to 2 lb/100 gal	Spray at first sign of disease. Apply at 7- to 21-day intervals. May leave a residue.
	mancozeb + myclobutanil (Clevis, MANhandle*) *not in California	2 lb/100 gal	Apply at first sign of disease. The addition of Latron B-1956 will improve performance.
	myclobutanil (Eagle) 20EW (Hoist+Eagle) 40WP** (Systhane) 40WSP* *not in California	6 to 12 fl oz/100 gal 3 to 6 oz/100 gal 4 oz/100 gal	Re-treat at 10- to 14-day intervals. **consult label for restrictions in N.Y.
	thiophanate-methyl (AliBan Flo) (3336) 50WP	10 to 14.5 fl oz/100 gal 12 to 16 oz/100 gal	Apply at 7- to 14-day intervals.
	triflumizol (Terraguard) 50W	4 to 8 oz/100 gal	Repeat at 7- to 14-day intervals.

Fungicides for Disease Control of Greenhouse Floriculture Crops

DISEASE	PESTICIDE AND FORMULATION	RATE OF FORMULATION	SCHEDULE AND REMARKS
Sclerotinia blight and rot (<i>Sclerotinia sclerotiorum</i>)	azoxystrobin (Heritage)	1 to 4 oz/100 gal	Apply as a directed spray at 7- to 21-day intervals. Test for phytotoxicity prior to treating entire crop. Do not exceed 2 oz/100 gal on impatiens, pansy and violas.
	chlorothalonil (Chlorothalonil DF) (Chlorothalonil 500 ZN) (Chlorothalonil 720 SFT) (Chlorostar V)*, Daconil Weather Stik, Echo 720, Manicure 6 FL) (Daconil Ultrex) 82.5WDG (Echo Ultimate) *not in California	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	Apply at 7- to 14-day intervals. Apply when foliage and flowers are dry or nearly dry. Applications made during bloom may damage flowers. Do not use mistblowers or high pressure spray equipment when applying inside greenhouses.
	chlorothalonil + thiophanate-methyl (Spectro) 90WDG	1 to 2 lb/100 gal	Apply when both foliage and flowers are dry or nearly dry. Repeat at 7-day intervals. Do not use on Swedish ivy, Boston fern or Easter cactus.
	fenhexamid (Decree) 50WDG	0.75 to 1.5 lb/100 gal	Apply at 7- to 14-day intervals. Maintain agitation during application. May cause phytotoxicity on poinsettia bracts.
	fludioxonil (Medallion)	1 to 2 oz/100 gal	Apply as a drench at seeding or transplanting. Completely drench the growing medium. Make only one application to seedling crop. If needed, re-treat transplants 21 to 28 days after initial application. Foliar applications may also be made to prevent stem infections. Do not apply as a seed or soil drench to impatiens or New Guinea impatiens. May cause stunting or chlorosis on some geranium cultivars.
	iprodione (OHP Chippo 26019 N/G) (Iprodione E-Pro) (Lesco18 Plus, Iprodione Pro 2SE)	1.0 to 2.5 lb/acre 1 to 2.5 qt/acre 1 to 2.5 qt/100 gal	Spray to ensure thorough coverage. Repeat at 7- to 14-day intervals. Do not make more than four applications per year. Do not apply to Spatifiphyllum. Do not apply as a soil drench on impatiens or pothos. May damage petunia.
	PCNB (Terraclor) 75WP	See label	Apply as a drench or bulb soak according to label directions.
	pyraclostrobin (Insignia) 20WP	8 to 16 oz/100 gal	Use as a preventative treatment. Apply as a banded spray targeted at the foliage or crown of the plant. Apply in sufficient volume to thoroughly wet the foliage, crown, and surrounding substrate for best control. Repeat applications at 7- to 14-day intervals.
	pyraclostrobin+boscalid (Pageant)	12 to 18 oz/100gal	Use preventatively. Thoroughly cover and wet the crown and base of plant, and the potting medium surrounding the crown. Avoid watering plants for several hours after treatment. Reapply at 7-21 day intervals.
	thiophanate-methyl (AliBan Flo) (3336) 50WP (OHP 6672) 50W, (T-Storm) 50WSB (Systec 1998, TM 85 WDG) (OHP 6672) 4.5L, (T-Storm Flowable) (TM 4.5)	7.5 to 20 fl oz/100 gal 8 to 16 oz/100 gal 12 to 16 oz/100 gal 0.8 lb/100 gal 20 fl oz/100 gal 10 to 20 fl oz/100 gal	Apply as a drench or heavy spray. Repeat at 4- to 8-week intervals. Repeat at 21- to 28-day intervals. Repeat at 21- to 28-day intervals. Repeat at 2- to 4-week intervals. Repeat at 2- to 4-week intervals. Repeat at 2- to 4-week intervals.
trifloxystrobin (Compass O) 50WDG	1 to 4 oz/100 gal	Apply as a foliar spray. Repeat at 7- to 14-day intervals.	
Thielaviopsis root rot	See Black root rot		