

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS

Chemical control is an important tool in the prevention of vegetable crop diseases. However, cultural controls are effective against many diseases and should be integrated into vegetable production systems. For some diseases, cultural controls are the only effective management strategy.

CULTURAL PRACTICES for vegetable disease control include the following:

Resistant varieties: Varieties of some vegetable crops are resistant to one or more diseases and should be planted in place of susceptible varieties (i.e., those with no resistance claimed).

Exclusion: Avoid introducing plant pathogens into fields or gardens. Use certified or otherwise healthy seed and transplants obtained from reputable sources. Do not transport soil on equipment or boots from diseased areas to disease-free areas.

Crop rotation: Practice crop rotation to avoid the build-up of disease problems. Apply long rotations (2 to 4 years) where diseases have become established. Use non-related crops for rotations. Avoid rotating within legume, crucifer, cucurbit, and solanaceous (tomato, pepper, potato) crop groups. Diseases often attack several crops within each group.

Sanitation: Remove and destroy diseased plants from plantings to help prevent spread to healthy plants. Residue management consisting of removal, soil incorporation, or burning of old plant parts, weeds, and trash is important for reducing survival of pathogens and resulting inoculum available for infection of the next crop.

FUNGICIDES: Fungicides and other disease control chemicals are most effective when they are applied before infection. Because new plant growth is vulnerable to infection and fungicides are subject to weathering, fungicides must be reapplied at regular intervals during the period of pathogen activity in order to keep plants adequately protected. Carefully read the manufacturer's label and use according to the instructions. Pay particular attention to recommended protective clothing, the number of days allowed between the last application and harvest (i.e., the pre-harvest interval), and the total allowable amount per season.

Inorganic fungicides are sold under various brands and formulations. Copper fungicides include basic copper sulfate, Kocide, Copper Count N, Tenn-Cop, and many other brands. Sulfurs include sulfur dusts, dry flowables (e.g. Mircothiol Special), liquid flowables (e.g. Red Ball F), and wettable powders (Sulfur 90W). Bordeaux mixture is a mixture of copper sulfate and lime. TopCop is a mixture of copper and sulfur. Coppers are generally suggested for control of bacterial diseases, but they also may provide adequate control of fungus diseases. Coppers may burn foliage of some crops when applied under cool and wet conditions. Lime is added to the bordeaux mixture to soften the copper sulfate component. Bordeaux mixture can be made by adding 2-10 lbs (2-10 tbs) of copper sulfate and 2-24 lbs (2-24 tbs) of lime to 100 gal (1 gal) of water. The higher rates of lime should be used for copper-sensitive crops. Sulfurs are effective for powdery mildews, but may burn foliage when temperatures are hot (>90°F). A few common brands are specified in the crops listing. Check the labels for recommended rates and use patterns for other coppers and sulfurs.

Fungicide resistance management - The potential for development of resistance in leaf spot fungi is a concern for several fungicide classes that have a site-specific mode of action. Resistance development can result in loss of effectiveness and control failures. Most of the at-risk fungicides are systemic to some degree. At-risk fungicides can be grouped according to mode of action. Group 1 fungicides (benzimidazoles) such as Topsin, and Group 11 (strobilurin) fungicides such as Quadris and Cabrio are very prone to resistance development and sudden losses in effectiveness have been reported for some diseases. Other fungicide groups are less prone to resistance development, but may be still at risk. The following resistance management guidelines should be followed when using at-risk fungicides:

- 1) Reduce initial pathogen levels through the use of good cultural practices such as crop rotation.
- 2) Follow label directions - do not exceed the maximum number of consecutive applications, and do not use less than the minimum labeled rate.
- 3) Do not exceed the maximum allowed amount or number of applications per season. Extending the allowed amount of one Group 11 fungicide with another will increase the risk of resistance development.
- 4) Keep the disease pressure low by using an effective application schedule.
- 5) Calibrate the sprayer. Configure spray tips to apply a sufficient volume of water to achieve good coverage.
- 6) Avoid using Group 11 fungicides all season long. Use alternating sprays or blocks of sprays of these fungicides with unrelated fungicides or tank-mix with unrelated fungicides. For example, Group 3 and Group 11 fungicides can be applied in alternating blocks with protectant (multi-site, Group M) fungicides such as chlorothalonil (eg. Bravo) or mancozeb (eg. Dithane), or with each other. Tank mixes of at risk fungicides with a protectant or with fungicides in another group are appropriate.
- 7) Alternating or tank-mixing one Group 3 fungicide with another or one Group 11 fungicide with another will not help prevent resistance development.

Commercial crops: The rates of fungicide are listed in Table 4 on a per acre or 100 gal basis unless otherwise specified. When making applications on a per acre basis, be sure to calibrate the sprayer and apply in a sufficient volume of water to achieve thorough plant coverage. Fungicides act like paint to protect plants from infection, so use adequate pressure and spray volumes. When making applications on a per 100 gal basis, mix the specified amount in 100 gal and spray to runoff. Be sure to use agitation to keep any of the various formulations in suspension.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

Home gardens: Most of the fungicides listed for commercial vegetable crops (see Table 4) can be used in home gardens, but they are not usually available in small quantities. Table 1 lists home and garden products recommended for disease control in vegetable crops. Table 1 does not include ready to use products or fungicides formulated in combination with insecticides. When using commercial products in gardens or small plantings that list rates per acre or per 100 gallons, consult Table 2 to convert the suggested per acre or 100 gal rate to the per gallon rate. When using fungicide in gardens and small plantings on a per gallon rate, frequently agitate the spray tank and spray plants to runoff. Registered fungicides are listed under the common name of the active ingredient. Always check the label for diseases controlled, crop-specific rates, and days to harvest restrictions.

TABLE 1. HOME GARDEN FUNGICIDES AVAILABLE IN SMALL QUANTITIES FOR VEGETABLE CROPS.

COMMON NAME: (MOA GROUP) FORMULATION AND RATE PER GAL	BRAND	CROP USES AND REMARKS
chlorothalonil (M): Broadpectrum Lanscape and Garden Fungicide 1.12F 4 to 8 tsp Fung-onil Multipurpose Fungicide 2.7F 1.5 tsp to 1 tbsp Daconil Fungicide Concentrate 2.7F 1.5 tsp to 1 tbsp Garden Disease Control, Disease B Gon Garden Fungicide, or Max Garden Disease Control 2.7F 1.5 to 2.75 tsp Fruit, Veg. and Ornamental Fungicide 2.7F 1.5 tsp to 1 tbsp Veg., Flower, Fruit, and Orn. Fungicide 1.12F 5 to 8 tsp SA-50 Liquid Orn. and Vegetable Fungicide 1.12F 2 to 4 tbsp	Ferti-lome Bonide Garden Tech Ortho Monterey Hi-Yield Southern Ag	Foliar spray for fungal diseases on beans, carrots, cole crops, cucurbits, garlic, onions, potatoes, sweet corn, and tomatoes. Apply on a 7 to 14 day schedule.
copper ammonium complex (M): Liqui-Cop (8%) 1 to 6 tsp Liquid Copper Fungicide (8%) 1 to 6 tsp	Monterey Southern Ag	Foliar spray for bacterial and fungal diseases on beans, carrots, cole crops, cucurbits, eggplant, onions, peas, peppers, spinach, and tomatoes. Apply on a 5 to 10 day schedule.
copper octanoate (M): Copper Soap Liquid Fungicide (10%) 1 to 4 tbsp Liquid Copper Fungicide (10%) 1 to 4 tbsp Disease B Gon Copper Fungicide (10%) 1 to 4 tbsp	Natural Guard Bonide Ortho	Foliar spray for bacterial and fungal diseases on most vegetable crops. Apply on a 5 to 10 day schedule.
copper sulfate (M): Bordeaux Mix Fungicide (12.5%) 4 to 4.5 tbsp Copper Spray or Dust (7%) 4 to 12 tbsp	Hi-Yield Bonide	Foliar spray for bacterial and fungal diseases on tomatoes (Hi-Yield) and most vegetable crops (Bonide). Apply on a 7 to 10 day schedule.
mancozeb (M): Mancozeb Flowable 4F 2 to 5 tsp	Bonide	Foliar spray for fungal diseases on asparagus, cucurbits, onions, potatoes, sweet corn, and tomatoes. Apply on a 7 to 10 day schedule.
maneb (M): Maneb Garden Fungicide 80W 1.5 tbsp	Hi-Yield	Foliar spray for fungal diseases on cucurbits, dry beans, eggplant, peppers, and tomatoes. Apply on a 7 to 10 day schedule.
phosphorous acid (33): Agri-Fos Systemic Fungicide 3.35L 2 tsp to 4 tbsp Exel LG 3.35L 2 tsp to 4 tbsp	Monterey Organic Labs Inc.	Foliar spray for control of downy mildews, late blight, white rust, and <i>Pythium</i> and <i>Phytophthora</i> diseases. Apply on a 7 to 21 day schedule.
propiconazole (3): Fungi-Fighter 1.55% 2 tbsp Fung-onil 1.55% 2 tbsp Liquid Systemic Fungicide 1.55% 2 tbsp	Monterey Bonide Ferti-lome	Foliar spray for rust and leaf spots on sweet corn only. Apply on a 14-day schedule.
sulfur (M): Dusting Wettable Sulfur 90W 4 tbsp Dusting Sulfur 90W 4 tbsp/gal Garden Fungicide 12%F 4 tbs Wettable Dusting Sulfur 90W 2 tbsp/gal Wettable Dusting Sulfur 90W 2 tbsp/gal Sulfur Dust 90W 3 tbsp/gal Sulfur Plant Fungicide 90W 3 tbsp/gal	Hi-Yield Ferti-lome Safer Green Light, Southern Ag Lilly Miller Bonide	For powdery mildew on beans, cole crops, cucumbers, onions, peas, and squash. Apply on a 7 to 10 day schedule.

TABLE 2. CONVERSION TABLE FOR MIXING SMALL QUANTITIES OF LIQUID AND DRY FUNGICIDES

DRY FORMULATIONS

RATE/ACRE OR 100 GAL	1/4 lb	½ lb	1 lb	2 lb	3 lb	4 lb	5 lb
RATE/GAL	½ tsp	1 tsp	2 tsp	1 tbsp	1.5 tbsp	2 tbsp	3 tbsp

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

TABLE 2. CONVERSION TABLE FOR MIXING SMALL QUANTITIES OF LIQUID AND DRY FUNGICIDES (CONT'D)

LIQUID FORMULATIONS

RATE/ACRE OR 100 GAL	1/4 pt	½ pt	1 pt	2 pt	3 pt	4 pt	5 pt
RATE/GAL	1/4 tsp	½ tsp	1 tsp	2 tsp	3 tsp	4 tsp	5 tsp

Seed treatment: Use of seed treatment fungicides is suggested for all vegetable crops including indoor transplant production. Vegetable crop seed is expensive and many of the crops are prone to damping off, particularly small seeded crops and super sweet corn varieties, which lack seedling vigor. Table 3 lists seed treatment fungicides registered for use on vegetable crops. Purchased vegetable seed often is pretreated and ready to plant. Use products in Table 3 for untreated seed or for special orders from seed dealers.

TABLE 3. SEED TREATMENT FUNGICIDES FOR VEGETABLE CROPS

DISEASE	COMMON NAME: (MOA GROUP) FORMULATION AND RATE/100 lb SEED	REMARKS
Damping off (<i>Fusarium</i> , <i>Pythium</i> , <i>Rhizoctonia</i>)	azoxystrobin (11): Dynasty 0.83F 0.15 to 0.76 fl oz	Beans and sweet corn.
	<i>Bacillus subtilis</i> (Biological): Kodiak HB 3 to 8 oz Integral 0.6 to 2.4 fl oz	Biological seed protectant. Planter box treatment for most vegetable crops. Beans, sweet corn, and peas.
	<i>Bacillus plumilus</i> (Biological): Yield Shield 0.1 oz	Biological seed protectant for beans, peas, and southern peas.
	captan (M): Captan 400 4F 1 to 12 fl oz	Most vegetable crops. Apply at the crop-specific rate.
	carboxin (7): Vitavax 3F 2 to 4 fl oz	Beans, sweet corn.
	carboxin (7) + thiram (M): RTU-Vitavax-Thiram 6.8 fl oz Vitavax M or CT 12 fl oz VitaFlo 280 4 to 4.5 fl oz	Liquid planter box treatments for dry beans. Liquid planter box treatments for dry beans. Beans and sweet corn.
	carboxin (7) + PCNB (14) + metalaxyl (4): Prevail 3 to 5 oz	Planter box or dry seed treatment for beans and sweet corn.
	difenoconazole (3) + mefenoxam (4): Dividend Extreme 0.96F 2 to 5 fl oz	Sweet corn.
	fludioxonil (12): Maxim 4FS 0.08 to 0.16 fl oz	For control of <i>Fusarium</i> and <i>Rhizoctonia</i> on most vegetable crops. Mix with metalaxyl or mefenoxam for <i>Pythium</i> control.
	ipconazole (3): Rancona 3.8FS 0.05 to 0.34 fl oz	For control of <i>Fusarium</i> and <i>Rhizoctonia</i> on most vegetable crops. Mix with metalaxyl or mefenoxam for <i>Pythium</i> control.
	maneb (M): Manex 4F 12.8 fl oz	Tomatoes.
	mancozeb (M): Dithane, Manzate, or Penncozeb 75DF 8.5 oz Dithane F-45, Manzate, or Penncozeb 4F 12.8 fl oz	Tomatoes.
	mefenoxam (4): Apron XL LS or Apron XL 3F 0.085 to 0.64 fl oz	Systemic fungicide for enhanced <i>Pythium</i> control on most vegetable crops. Mix with captan, thiram, or fludioxonil for <i>Fusarium</i> and <i>Rhizoctonia</i> .
mefenoxam (4) + fludioxonil (12): ApronMaxx RTA 0.16F 5 fl oz ApronMaxx RFC 0.54F 1.5 fl oz Maxim XL 4.6F 0.17 to 0.33 fl oz	Beans, peas, southern peas. Beans, beets, carrots, lettuce, peas, spinach, southern peas, and sweet corn.	

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME: (MOA GROUP) FORMULATION AND RATE/100 lb SEED	REMARKS
Damping off (<i>Fusarium</i> , <i>Pythium</i> , <i>Rhizoctonia</i>) (cont'd)	metalaxyl (4): Allegiance, Acquire, Belmont, Dynashield Metalaxyl, MetaStar ST, or Sebring 2.65F 0.7 to 1.5 fl oz Sebring 4F 0.5 to 1 fl oz Allegiance Dry 1.5 to 2 oz	A systemic fungicide for enhanced <i>Pythium</i> control on beans, beets, carrots, cucumbers, okra, peas, spinach, sweet corn. Mix with captan or thiram for <i>Fusarium</i> and <i>Rhizoctonia</i> . Planter box treatment for beets, beans, okra, southern peas, peas, and sweet corn.
	metalaxyl (4) + ipconazole (3): Rancona Summit 0.21F 4 fl oz Rancona Xtra 0.24F 3.5 fl oz	Beans, peas, southern peas.
	metalaxyl (4) + trifloxystrobin (11): Trilex AL 5.7 fl oz Trilex 2000 1.15F 0.5 to 1 fl oz	Beans, peas, southern peas. Beans, peas, southern peas, sweet corn.
	metalaxyl (4) + PCNB (14) + <i>Bacillus subtilis</i> ; System 3 3.3D to 6.7 oz	Planter box or dry seed treatment for beans, peas, southern peas and sweet corn.
	pyraclostrobin (11): Stamina 1.67F 0.38 to 0.76 fl oz	Beans, peas, southern peas, sweet corn.
	pyraclostrobin (11) + boscalid (7): Coronet 2.5F 5.1 to 6.2 fl oz	Greens (Brassica), cole crops, onions, garlic.
	thiram (M): Thiram 42S, Flosan, or Signet 480FS 4F 2 to 8 fl oz Protector-D 35D 4.5 oz	Most vegetable crops. Apply at crop-specific rate. Planter box treatment for peas and beans.
	trifloxystrobin (11): Trilex Flowable 0.32 to 0.96 fl oz	Beans, peas, southern peas, sweet corn.

TABLE 4. CROP LISTING FOR DISEASE CONTROL IN COMMERCIAL VEGETABLE CROPS.

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
ASPARAGUS		
Fusarium stem, crown, and root rot (decline)	See next column	Plant hybrid varieties tolerant to <i>Fusarium</i> . Select a well-drained site and correct acid soils with lime. Avoid planting diseased crowns or replanting into problem fields.
	mancozeb (M): Dithane, Manzate, or Penncozeb 75DF 1 lb Dithane, Manzate, or Penncozeb 4F 1.6 pt	Dip crowns in specified dosage in 100 gal water for 5 minutes prior to planting.
Cercospora blight Rust Purple spot	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Purple spot only. Apply on a 14-day schedule in alternation with a non-group 11 fungicide.
	chlorothalonil (M): Bravo, Echo, Equus, Chloronil, Chlorothalonil, or Initiate 6F 2 to 4 pt Bravo or Equus 82.5DF 1.8 to 3.6 lb	Apply after harvest when ferns fully develop and repeat on 2 to 4-week intervals.
	mancozeb (M): Dithane, Manzate, or Penncozeb 75DF 2 lb Dithane, Manzate, or Penncozeb 4F 1.6 qt	Cercospora: Apply on 2 to 4-wk intervals beginning after harvest when ferns lap between rows. Rust: Apply on 10-day intervals when rust first appears.
	myclobutanil (3): Rally 40W 5 oz	Rust only: Apply on 14-day intervals when rust first appears.
	sulfur (M): Mircothiol 80DF 10 to 30 lb other sulfur fungicides	Rust only: Apply on 10 to 14-day intervals when rust first appears.
	tebuconazole (3): Folicur, Monsoon, Onset, Orius, Tebu, Tebucon, Tebuconazole, Tebusha, TebuStar, Tebuzol, Toledo, or Uppercut 3.6F 4 to 6 fl oz	Rust only. Apply on 14-day intervals when rust first appears in alternation with a fungicide from a different mode of action group.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
ASPARAGUS (CONT'D)		
Cercospora blight Rust Purple spot (cont'd)	trifloxystrobin (11): Flint 50WG 3 to 4 fl oz	Purple spot only. Apply on a 14-day schedule in alternation with a non-group 11 fungicide.
Phytophthora crown and spear rot	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 1 pt Ultra Flourish or Twist 2E 2 pt MetaStar 2E AG 4 pt	Broadcast over cutting beds 30 to 60 days before cutting and again just before cutting. Treat new plantings after covering crowns or transplanting seedlings.
	fosetyl-AL (33): Aliette or Legion 80WDG 5 lb	Apply once to fully expanded ferns.
BEANS (snap, dry [navy, pinto, kidney, lima])		
Damping off and root rot (<i>Pythium</i> and <i>Rhizoctonia</i>)	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz / 1000 ft row	<i>Rhizoctonia</i> only. Apply in furrow at planting.
	azoxystrobin (11) + mefenoxam (4): Uniform 3.72F 0.34 fl oz / 1000 ft row	Apply in-furrow at planting.
	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 0.5 to 1 pt Ultra Flourish or Twist 2E 1 to 2 pt MetaStar 2E AG 2 to 4 pt	<i>Pythium</i> only. Broadcast at suggested rate or band over the seed row and incorporate before or water in after planting.
	mefenoxam (4) + PCNB (14): Ridomil Gold PC 0.75 lb / 1000 ft row	Apply in furrow at planting.
	PCNB (14): Terraclor 75W 1.4 to 2.2 oz / 1000 ft row Blocker 10G 11 to 16 oz / 1000 ft row Blocker 4F 2.2 to 3.3 fl oz / 1000 ft row	<i>Rhizoctonia</i> only. Apply in furrow at planting.
Bacterial blights (common, halo, and brown spot)	See next column	Plant disease-free seed and practice crop rotation.
	copper hydroxide (M): Kocide 101, Kocide DF, Nu-Cop DF, or Champ WG 1 to 3 lb Kocide 2000 or Champ DP 0.75 to 2.25 lb Kocide LF, NuCop, or Champ 3F 0.7 to 2 pt Kocide 3000 or Nu-Cop HB 0.5 to 1.5 lb	Begin when plants are 6-inches tall and repeat on 7 to 14-day intervals.
	copper sulfate (M): Cuprofix Ultra 40DF 0.75 to 2 lb	Begin when plants are 6-inches tall and repeat on 7 to 14-day intervals.
Anthracnose Cercospora leaf spot Downy mildew Rust Powdery mildew	chlorothalonil (M): Bravo, Echo, Equus, Chloronil, Chlorothalonil, or Initiate 6F 1.3 to 3 pt Bravo or Equus 82.5DF 1.2 to 2.7 lb Echo 90DF 1.1 to 2.5 lb	Rust on snap beans; and anthracnose, downy mildew, Cercospora, and rust on dry beans. Apply at early bloom and repeat on 7 to 10-day intervals. Rates vary by bean type and disease (see labels).
	chlorothalonil (M) + phosphorous acid (33): Catamaran 3.27F 4 pt	Apply on 7 to 14 day intervals.
	maneb (M): Maneb 75DF or 80W 1.5 to 2 lb Manex 4F 1.2 to 1.6 qt	Anthracnose, downy mildew, and rust on dry beans only. Apply when plants are small and repeat on 5 to 7-day intervals. Do not apply within 30 days of harvest.
	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz Amistar 80DF 2 to 5 oz	Apply on 7 to 14-day intervals in alternation with a fungicide in a different group (mode of action).
	azoxystrobin (11) + chlorothalonil (M): Quadris Opti 5.5F 1.6 to 2.4 pt	Dry beans only. Apply on 7 to 14-day intervals.
	thiophanate methyl (1): Topsin M or T-Methyl 70W 1 to 2 lb Topsin or T-Methyl 4.5F 1.25 to 2.5 pt Thiophanate Methyl 85WDG 0.8 to 1.6 lb	Anthracnose only. Apply the low rate at early bloom and repeat 7 to 10 days later or apply the high rate once at full bloom. Also controls white and gray molds (see below).

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME: (MOA GROUP) FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
BEANS (CONT'D)		
Anthracnose Cercospora leaf spot Downy mildew Rust Powdery mildew (Cont'd)	sulfur (M): Microthiol 80DF 3 to 10 lb other sulfur formulations*	Rust and powdery mildew only. Apply on 7 to 14-day intervals at the first appearance of disease. See labels.
	myclobutanil (3): Rally 40W 4 to 5 oz	Rust on snap beans only. Apply on 7 to 10-day intervals when rust first appears. Also controls Rhizoctonia web blight (see below).
	pyraclostrobin (11): Headline 2.08E 6 to 9 fl oz	Apply on 7-14 day intervals in alternation with a fungicide in a different group (mode of action).
	pyraclostrobin (11) + boscalid (7): Pristine 38WG 10 to 15 oz	Dry beans only. Apply on 7-14 day intervals in alternation with a fungicide in a different group (mode of action). Also control gray and white molds (see below).
	tebuconazole (3): Folicur, Monsoon, Onset, Orius, Tebu, Tebucon, Tebuconazole, Tebusha, TebuStar, Tebuzol, Toledo, or Uppercut 3.6F 4 to 6 fl oz	Rust only. Apply on 14-day intervals in alternation with a fungicide from a different mode of action group beginning when rust first appears.
Rhizoctonia web blight and pod rot	myclobutanil (3): Rally 40W 4 to 5 oz	Apply on 7 to 10-day intervals when pods begin to develop.
	azoxystrobin: (11) Quadris 2.08F 6.2 to 15.4 fl oz	Same as for anthracnose (see above)
White mold (<i>Sclerotinia</i>) Gray mold (<i>Botrytis</i>)	dicloran (14): Botran 75W 2.25 to 4 lb	White mold on snap beans only. Apply low rate to bush types and high rate to pole types on 7-day intervals beginning at early bloom.
	boscalid (7): Endura 70WG 8 to 11 oz	Apply at early bloom and again at full bloom.
	fludioxonil (12): Cannonball 50W 7 oz	Apply at early bloom and repeat at full bloom if needed.
	fluazinam (29): Omega 4F 0.5 to 0.85 pt	Apply at early bloom and again at full bloom.
	pyraclostrobin (11) + boscalid (7): Pristine 38WG 10 to 15 oz	Dry beans only. Apply at early bloom and again at full bloom. Also controls anthracnose etc. (see above).
	cyprodinil (9) + fludioxonil (12): Switch 62.5WG 11 to 14 oz	Apply at early bloom and again at full bloom.
	iprodione (2): Rovral, Enclosure, Iprodione, or Nevado 4F 1.5 to 2 pt	Apply at early bloom and again at full bloom.
	thiophanate-methyl (1): Topsin M or T-Methyl 70W 1 to 2 lb Topsin or T-Methyl 4.5F 1.25 to 2.5 pt Thiophanate Methyl 85WG 0.8 to 1.6 lb	Apply the low rate at early bloom and repeat 7-10 days later or make a single application of the high rate at full bloom. Also controls anthracnose (see above).
BEETS		
Damping off and root rot (<i>Pythium</i> and <i>Rhizoctonia</i>)	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz/ 1000 ft row	<i>Rhizoctonia</i> only. Apply in furrow at planting.
	azoxystrobin (11) + mefenoxam (4): Uniform 3.72F 0.34 fl oz /1000 ft row	Apply in-furrow at planting.
	fenamidone (11): Reason 500SC 8.2 fl oz	<i>Pythium</i> only. Apply on 14 to 21 day intervals in alternation with a mefenoxam or metalaxyl fungicide
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	<i>Pythium</i> only. Apply in a tank mix with another fungicide on 10-day intervals.
	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 1 to 2 pt Ultra Flourish or Twist 2E 2 to 4 pt Metastar 2E AG 4 to 8 pt	<i>Pythium</i> only. Broadcast at suggested rate or band over the seed row and incorporate before or water in after planting.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP) FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
BEETS (CONT'D)		
Cercospora leaf spot Powdery mildew	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	copper hydroxide (M): Kocide 101, Kocide DF, Nu-Cop DF, or Champ WG 2 to 5 lb Kocide 2000 or Champ DP 1.3 to 2.7 lb Kocide LF, Champ, or Nu-Cop 3F 1.3 to 2 pt Kocide 3000 or Nu-Cop HB 0.7 to 2.5 lb	Apply on 10 to 14-day intervals.
	copper sulfate (M): Cuprofix Ultra 40DF 1.25 to 3 lb	Apply on 10 to 14-day intervals.
	cyprodinil (9) + fludioxanil (12): Switch 62.5WG 11 to 14 oz	Powdery mildew only. Apply on 7 to 10-day intervals.
	pyraclostrobin (11): Cabrio 20EG 8 to 12 oz	Apply on 7 to 14-day intervals. Make up to 2 sequential applications before alternating with a non-group 11 fungicide.
	trifloxystrobin (11): Flint 50WG 2 to 3 oz Gem 25WG 4 to 6 oz or Gem 500SC 2 to 3 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	sulfur (M): Microthiol 80DF 3 to 5 lb other sulfur formulations:	Powdery mildew only. Apply on 10 to 14-day intervals. See labels.
	propiconazole (3): Tilt or Propi-Star 3.6E 3 to 4 fl oz	Cercospora leaf spot and powdery mildew only. Apply on 14-day intervals in alternation with a non-group 3 fungicide.
	tebuconazole (3): Folicur, Monsoon, Onset, Orius, Tebu, Tebucon, Tebuconazole, Tebusha, TebuStar, Tebuzol, Toledo, or Uppercut 3.6F 3 to 7.2 fl oz	Cercospora leaf spot and powdery mildew only. Apply on 14-day intervals in alternation with a non-group 3 fungicide fungicide.
CARROTS		
Pythium damping off and root dieback	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 1 to 2 pt/A Ultra Flourish or Twist 2E 2 to 4 pt Metastar 2E AG 4 to 8 pt	Broadcast at suggested rate or band over the seed row and incorporate before or water in after planting.
	cyazofamid (21): Ranman 3.3F 6 fl oz	Preplant incorporate or make surface application after planting.
Rhizoctonia damping off and root rot	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz /1000 ft row	Apply in furrow or as a band over the row after emergence.
Early blight (<i>Cercospora</i>) Late blight (<i>Alternaria</i>) Bacterial blight	azoxystrobin (11): Quadris 2.08F 9.2 to 20.3 fl oz	Early and late blights only. Apply on 7 to 14-day intervals in alternation with a fungicide in a different group (mode of action).
	azoxystrobin (11) +chlorothalonil (M): Quadris Opti 5.5F 2.4 pt	Early and late blights only. Apply on 7 to 14-day intervals.
	azoxystrobin (11) + difenoconazole (3): Quadris Top 2.72F 12 to 14 fl oz	Early and late blights only. Apply on 7 to 14-day intervals. See label for resistance management.
	azoxystrobin (11) + propiconazole (3): Quilt 1.66F or Quilt Xcel 2.2F 14 fl oz	Early and late blights only. Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	boscalid (7): Endura 70WG 4.5 oz	Late blight only. Apply on 7 to 14-day intervals. See label for resistance management.
	copper hydroxide (M): Kocide 101, Kocide DF, Nu-Cop DF, Champ WG 2 lb Kocide 2000 or Champ DP 1.3 to 1.5 lb Kocide LF, Champ, or Nu-Cop 3F 1.3 to 2.7 pt Kocide 3000 or Nu-Cop HB 0.75 to 1.5 lb	Apply when plants are small and repeat on 5 to 7-day intervals.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
CARROTS (CONT'D)		
Early blight (<i>Cercospora</i>) Late blight (<i>Alternaria</i>) Bacterial blight (cont'd)	copper sulfate (M): Cuprofix Ultra 40DF 1.25 lb	Apply on 7 to 14-day intervals.
	chlorothalonil (M): Bravo, Echo, Equus, Chloronil, Chlorothalonil, or Initiate 6F 1.5 to 2 pt Bravo or Equus 82.5DF 1.4 to 1.8 lb Echo 90DF 1.25 to 1.6 lb	Early and late blights only. Apply when plants are small and repeat on 7 to 10-day intervals.
	cyprodinil (9) + fludioxanil (12): Switch 62.5WG 11 to 14 oz	Late blight only. Apply on 7 to 10-day intervals.
	iprodione (2): Rovral, Enclosure, Iprodione, or Nevado 4F 1 to 2 pt	Late blight only. Apply up to 4 times on 14-day intervals when conditions favor disease development.
	propiconazole (3): Tilt, Bumper, Fitness, Propicon, Propiconazole, PropiMax, or Propi-star 3.6E 4 fl oz	Early and late blight only. Apply on 7 to 10 day intervals in alternation with a non-group 3 fungicide.
	pyraclostrobin (11): Cabrio 20EG 8 to 12 oz	Early and late blights only. Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	pyraclostrobin (11) + boscalid (7): Pristine 38WG 8 to 10.5 oz	Early and late blights only. Apply on 7 to 14-day intervals. See label for resistance management.
	trifloxystrobin (11): Flint 50WG 2 to 3 oz Gem 25DF 4 to 6 oz or Gem 500SC 2 to 3 fl oz	Early and late blights only. Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
White mold (<i>Sclerotinia</i>) Gray mold (<i>Botrytis</i>)	thiabendazole (1): Mertect 340F 2.5 pt/100 gal	Dip carrots in suspension for 5 to 10 seconds before storage.
Cavity spot (<i>Pythium</i>)	cyazofamid (21): Ranman 3.3F 6 fl oz	Apply on 14 to 21 day intervals in alternation with another fungicide.
	fenamidone (11): Reason 500SC 8.2 fl oz	Apply on 14 to 21 day intervals in alternation with a non-group 11 fungicide.
	mefenoxam (4) + copper hydroxide (M): Ridomil Gold/Copper 65W 2 lb	Apply 40 days after using Ridomil at planting (see Pythium). Make 2 to 4 applications on a 14-day schedule.
	mefenoxam (4) + chlorothalonil (M): Ridomil Gold/Bravo 76W 1.5 to 2 lb Ridomil Gold/Bravo SC 6.67F 1.5 to 2.5 pt	Also controls early and late blights. Apply 40 days after using Ridomil Gold at planting (see Pythium). Make 2 to 4 applications on a 14-day schedule.
COLE CROPS (broccoli, Brussels sprouts, cabbage, cauliflower)		
Pythium damping off Basal stem rot (<i>Phytophthora</i>)	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 0.25 to 0.5 pt or 1 to 2 pt Ultra Flourish or Twist 2E 0.5 to 1 pt or 2 to 4 pt Metastar 2E 1 to 2 or 4 to 8 pt	Broadcast at suggested rate or band over the seed row and incorporate before or water in after planting. Use the low rate range for Pythium and the high rate range for Phytophthora.
Club root Rhizoctonia damping off, wire stem, and bottom rot	See next column	Maintain soil pH above 7.2.
	cyazofamid (21): Ranman 3.3F 12.9 to 25.7 fl oz	Club root only. Mix in 100 gal and apply as transplant drench or spray 20 fl oz/A in a band and incorporate before planting.
	PCNB (14): Terraclor 75W 2 lb / 100 gal Blocker or Terraclor 4F 3 pt / 100 gal or Terraclor 75W 12 to 18 oz or 2.3 lb/1000 ft row Blocker or Terraclor 4F 18 to 55 fl oz / 1000 ft row	Club root - drench plants with ½ pt solution per plant after transplanting with the high rate for club root. Apply the low rates in furrow at planting for Rhizoctonia, or apply the high rate in a 12-inch band and incorporate before planting for club root.
	fluazinam (29): Omega 4F 2.8 pts	Club root only. Apply as a transplant drench (6.5 fl oz/100 gal) or in a 9-inch band and incorporate 6 to 8 inches deep before planting.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
COLE CROPS (CONT'D)		
Black leg	See next column	Use disease-free seed.
	iprodione (2): Rovral, Enclosure, Iprodione, or Nevado 4F 2 pt	Broccoli only. Apply as a basal spray at 2 to 4-leaf stage and repeat 2 to 3 weeks later if needed.
Black rot (bacterial)	See next column	Plant disease-free seed or soak seeds in hot water at 122°F for 25 min (cabbage and Brussels sprouts) or 20 min (cauliflower and broccoli). Plant resistant varieties and rotate fields with non-hosts for 2 years.
	acibenzolar-s-methyl (21): Actigard 50WG 0.5 to 1 oz	Plant defense activator. Apply on 7 to 10-day intervals.
	copper hydroxide (M): Kocide 101, Kocide DF, Champ WG, or Nu Cop DF 1 to 2 lb Kocide 2000 or Champ DF 0.7 to 1.5 lb Kocide LF, Champ, or Nu Cop 3F 1.3 pt Kocide 3000 or Nu Cop HB 0.5 to 1 lb	Apply on 7 to 10-day intervals after transplanting or emergence.
	copper sulfate (M): Cuprofix Ultra 40DF 0.75 to 1.25 lb	Apply on 7 to 10-day intervals after transplanting or emergence.
Alternaria leaf spot Cercospora leaf spot Downy mildew	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	azoxystrobin (11) + difenoconazole (3): Quadris Top 2.72F 8 to 14 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	boscalid (7): Endura 70WG 6 to 9 oz	Alternaria only. Apply on 7 to 14-day intervals.
	chlorothalonil (M): Bravo, Echo, Equus, Chloronil, Chlorothalonil, or Initiate 6F 1.5 pt Bravo or Equus 82.5DF 1.4 lb Echo 90DF 1.25 lb	Apply on 7 to 10-day intervals after transplanting or emergence.
	chlorothalonil (M) + phosphorous acid (33): Catamaran 3.27F 4 pt/A	Apply on 7 to 10-day intervals.
	copper hydroxide (M):	Same as black rot (see above).
	copper sulfate (M):	Same as black rot (see above).
	cyprodinil (9) + fludioxanil (12): Switch 62.5WG 11 to 14 oz	Alternaria and Cercospora only. Apply on 7 to 10-day intervals.
	cyazofamid (21): Ranman 3.3F 2.75 fl oz	Downy mildew only. Apply on 7 to 10 day intervals 14 to 21 day intervals in alternation with another fungicide.
	difenconazole (3) + cyprodinil (9): Inspire Super 2.82F 16 to 20 fl oz	Alternaria and Cercospora only. Apply on 7 to 10-day intervals.
	fenamidone (11): Reason 4.13F 5.5 to 8.2 fl oz	Apply on 7 to 10 day intervals in alternation with a non-group 11 fungicide.
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	Downy mildew fungicide. Apply in a tank mix with another fungicide on 10 to 14-day intervals.
	fosetyl-AL (33): Aliette or Legion 80WDG 2 to 5 lb	Downy mildew only. Apply on 7 to 14-day intervals. Use 2 to 3 lb in tank mixes or 3 to 5 lb alone.
	phosphorous acid (33): Allude 3.3L, Fosphite 3.9L, Kphite 4.4L, Phostrol 4.3L, Phorcephite 3.9L, Prophyt 4.2L, or Rampart 3.9L 1 to 3 qt Fungi-Phite 68DF 1.25 to 3 lb	Downy mildew only. Apply on 7 to 14 day intervals. Alternate or tank-mix with another fungicide for broad-spectrum disease control.
mandipropamid (40): Revus 2.08F 8 fl oz	Downy mildew only. Apply on 7 to 10-day intervals. Alternate or tank-mix with another fungicide for broad spectrum disease control.	

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME: (MOA GROUP) FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
COLE CROPS (CONT'D)		
Alternaria leaf spot Cercospora leaf spot Downy mildew (Cont'd)	maneb (M): Maneb 75DF or 80W 1.5 to 2 lb Manex 4F 1.2 to 1.6 qt	Apply on 7 to 10-day intervals after transplanting or emergence. Do not apply within 7 days of harvest.
	mefenoxam (4) + chlorothalonil (M): Ridomil Gold/Bravo 76W 1.5 lb Ridomil Gold SC 6.67F 1.5 pt	Make up to four applications on 14-day intervals when conditions favor mildew development. Do not apply within 7 days of harvest.
	pyraclostrobin (11): Cabrio 20EG 0.75 to 1 lb	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	triflumizole (3): Procure 480SC 6 to 8 fl oz	Alternaria only. Apply on 14-day intervals in alternation with a non-group 3 fungicide.
White mold (<i>Sclerotinia</i>)	boscalid (7): Endura 70WG 6 to 9 oz	Apply on 7 to 14-day intervals.
CUCURBITS (cantaloupe, cucumber, pumpkin, squash, watermelon)		
Damping off and root rot (<i>Pythium</i> and <i>Rhizoctonia</i>) Phytophthora blight	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz/ 1000 ft row	<i>Rhizoctonia</i> only. Apply in furrow at planting or as a band over the row after emergence or transplanting.
	azoxystrobin (11) + mefenoxam (4): Uniform 3.72F 0.34 fl oz /1000 ft row	<i>Pythium</i> and <i>Rhizoctonia</i> . Apply in-furrow at planting.
	cyazofamid (21): Ranman 3.3F 2.75 fl oz	<i>Pythium</i> and <i>Phytophthora</i> . Apply as a transplant drench or a basal spray after transplanting. Also controls downy mildew (see below).
	dimethomorph (40): Forum 4.18F 6 fl oz	<i>Phytophthora</i> . Apply on 5 to 7-day intervals in a tank mix with another fungicide. Also controls downy mildew (see below).
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	<i>Pythium</i> and <i>Phytophthora</i> . Apply in a tank mix with another fungicide on 10 to 14-day intervals. Also controls downy mildew (see below).
	mandipropamid (40): Revus 2.08F 8 fl oz	<i>Phytophthora</i> . Apply on 7 to 14-day intervals in a tank mix with a copper fungicide and in alternation with another fungicide. Also controls downy mildew (see below)
	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 1 to 2 pt Ultra Flourish or Twist 2E 2 to 4 pt Metastar 2E AG 4 to 8 pt	Broadcast suggested rates or band over seed row and incorporate before or water in after planting.
	propamocarb hydrochloride (28): Previcur Flex 6L 1.2 pt	<i>Pythium</i> and <i>Phytophthora</i> in greenhouse and field. Apply as a drench at transplanting, as a basal spray, and/or by irrigation.
Angular leaf spot Bacterial leaf spot Bacterial fruit blotch	See next column	Plant disease-free seed, cucumber varieties resistant to angular leaf spot, and practice crop rotation with non-cucurbits. Copper sprays may reduce spread.
	acibenzolar-s-methyl (21): Actigard 50WG 0.75 to 1 oz	A plant defense activator. Apply on 7 to 14-day intervals in a tank mixture or in alternation with copper.
	copper hydroxide (M): Kocide 101, Kocide DF, Nu-Cop DF, or Champ WG 1.5 to 3 lb Kocide 2000 or Champ DP 1 to 2.25 lb Kocide LF, Champ, or Nu-Cop 3F 1.3 pt Kocide 3000 or Nu-Cop HB 0.5 to 1.25 lb	Apply at first sign of foliar disease and repeat on 7-day intervals.
	copper sulfate (M): Cuprofix Ultra 40DF 1.25 to 2 lb	Apply on 5 to 7-day intervals.
Anthracnose Alternaria and Cercospora leaf spots Downy mildew Gummy stem blight Powdery mildew	chlorothalonil (M): Bravo, Echo, Equus, Chloronil, Chlorothalonil, or Initiate 6F 1.5 to 3 pt Bravo or Equus 82.5DF 1.4 to 2.7 lb Echo 90DF 1.25 to 2.5 lb	Apply on 7 to 14-day intervals.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME: (MOA GROUP) FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
CUCURBITS (CONT'D)		
Anthracnose Alternaria and Cercospora leaf spots Downy mildew Gummy stem blight Powdery mildew (cont'd)	chlorothalonil (M) + phosphorous acid (33): Catamaran 3.27F 4 to 7 pt	Apply on 7 to 14 day schedule.
	azoxystrobin (11): Quadris 2.08F 11 to 15.4 fl oz	Apply on 7 to 14 day intervals in alternation with a non-group 11 fungicide.
	azoxystrobin (11) + chlorothalonil (M): Quadris Opti 5.5F 3.2 pt	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	azoxystrobin (11) + difenoconazole (3): Quadris Top 2.72F 10 to 14 fl oz	Apply on 7 to 14 day interval in alternation with a non-group 11 fungicide.
	boscalid (7): Endura 70WG 6.5 oz	Apply on 7 to 14-day interval in alternation with a non-group 7 fungicide. Does not control anthracnose or downy mildew.
	cymoxanil (27): Curzate 60DF 3.2 to 5 oz	Downy mildew fungicide. Apply in a tank mix with a protectant fungicide (group M) on 5 to 7 day intervals.
	copper fungicides (M):	Same as for bacterial leaf spots (see above).
	cyazofamid (21): Ranman 3.3F 2.1 to 2.75 fl oz	Downy mildew fungicide. Apply on 7 to 10-day intervals in alternation with another fungicide.
	cyprodinil (9) + fludioxanil (12): Switch 62.5WG 11 to 14 oz	Gummy stem blight fungicide. Apply on 7 to 10 day intervals in alternation with a protectant (group M) fungicide.
	difenconazole (3) + cyprodinil (9): Inspire Super 2.82F 16 to 20 fl oz	Apply on 7 to 10-day intervals. Does not control downy mildew.
	dimethomorph (40): Forum 4.18F 6 fl oz	Downy mildew fungicide. Apply on 7 to 10-day intervals in a tank mix with a protectant fungicide (group M).
	famoxadone (11) + cymoxanil (27) : Tanos 50DF 8 oz	Downy mildew fungicide. Apply on 7-day intervals in a tank mix with a protectant (group M) fungicide.
	fenamidone (11): Reason 500SC 5.5 fl oz	Downy mildew fungicide. Apply on 5 to 10-day intervals in alternation with a non Group 11 fungicide.
	fosetyl-AI (33): Aliette or Legion 80WDG 2 to 5 lb	Downy mildew fungicide. Apply on 7 to 14-day intervals. Use 2 to 3 lb in tank mixes or 3 to 5 lb alone.
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	Apply in a tank mix with another fungicide on 10 to 14-day intervals. Also controls Phytophthora blight. (see above)
	kresoxim-methyl (11): Sovran 50WG 3.2 to 4.8 oz	Powdery mildew only. Apply on 7 to 14 day intervals in alternation with a non-group 11 fungicide.
	fluoxastrobin (11): Evito 480SC 3 to 5.7 fl oz	Cucumber, squash, and pumpkin. Apply on 7 to 14 day intervals in alternation with a non-group 11 fungicide.
	mefenoxam (4) + chlorothalonil (M): Ridomil Gold Bravo 76W 2 to 3 lb Ridomil Gold Bravo SE 3.67F 2.5 to 3.25 pt	Downy mildew fungicide. Alternate with a protectant (group M) fungicide on 7 to 14-day intervals.
	mefenoxam (4) + copper hydroxide (M): Ridomil Gold Copper 65W 2 lb	Downy mildew fungicide. Alternate with a protectant (group M) fungicide on 7 to 14-day intervals.
	mefenoxam (4) + mancozeb (M): Ridomil Gold MZ 68WG 2.5 lb	Downy mildew fungicide. Alternate with a protectant (group M) fungicide on 7 to 14-day intervals.
mancozeb (M): Dithane, Manzate, or Penncozeb 75DF 2 to 3 lb Dithane, Manzate, or Penncozeb 4F 1.6 to 2.4 qt	Apply on 7 to 14-day intervals, but not within 5 days of harvest.	
maneb (M): Maneb 75DF or 80W 1 to 2 lb Manex 4F 1.2 to 1.6 qt	Apply on 7 to 14-day intervals, but not within 5 days of harvest.	
mandipropamid (40): Revus 2.08F 8 fl oz	Downy mildew fungicide. Apply on 7 to 10-day intervals in a tank mix with another fungicide. (See Phytophthora blight above).	

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME: (MOA GROUP) FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
CUCURBITS (CONT'D)		
Anthracnose Alternaria leaf spot Cercospora leaf spot Downy mildew Gummy stem blight Powdery mildew (cont'd)	mandipropamid (40) + difenoconazole (3): Revus Top 4.16F 7 fl oz	Gummy stem blight and downy mildew only. Apply on 7 to 14-day intervals in alternation with another (non-group 3) fungicide.
	mancozeb (M) + copper hydroxide (M): ManKocide DF 2 to 4 lb	Apply on 7 to 14-day intervals, but not within 5 days of harvest.
	mancozeb (M) + copper sulfate (M): Cuprofix MZ Dispersers 4 to 7.25 lb	Apply on 7 to 10-day intervals, but not within 5 days of harvest.
	myclobutanil (3): Rally 40W 2.5 to 5 oz	Powdery mildew only. Apply on 7 to 10-day intervals when disease first appears.
	phosphorous acid (33): Allude 3.3L, Fosphite 3.9L, Kphite 4.4L, Phostrol 4.3L, Phorcephite 3.9L, Prophyt 4.2L, or Rampart 3.9L 1-3 qt Fungi-Phite 68DF 1.25 to 3 lb	Downy mildew only. Apply on 7 to 14 day intervals. Alternate or tank-mix with another fungicide for broad-spectrum disease control.
	polyoxin d zinc salt (19): Ph-D 11.3WDG 6.2 oz	Alternaria, gummy stem blight, and powdery mildew only. Apply on 10 to 14-day intervals in alternation with another fungicide.
	propamocarb hydrochloride (F): Previcur Flex 6L 1.2 pt	Downy mildew fungicide. Apply in a tank mix with a protectant fungicide (group M) on 7 to 14-day intervals.
	pyraclostrobin (11): Cabrio 20EG 8 to 16 oz	Apply on 7 to 14-day intervals in alternation with a non Group 11 fungicide.
	pyraclostrobin (11) + boscalid (7): Pristine 38WG 12.5 to 18.5 oz	Apply on 7 to 14-day intervals in alternation with a non Group 11 fungicide. Use the high rate for anthracnose.
	quinoxifen (13): Quintec 2.08F 4 to 6 fl oz	Powdery mildew only. Apply on 10 to 14-day intervals in alternation with another fungicide.
	sulfur (M): Microthiol 80DF 2 to 10 lb other sulfur formulations:	Powdery mildew on cucumbers melons, and squash only. Apply on 10 to 14-day intervals. See labels.
	tebuconazole (3): Folicur, Monsoon, Onset, Orius, Tebu, Tebucon, Tebuconazole, Tebusha, TebuStar, Tebuzol, Toledo, or Uppercut 3.6F 4 to 8 fl oz	Powdery mildew and gummy stem blight only. Apply on 7 to 14 day intervals in alternation with a fungicide from a different mode of action group. Use 4 to 6 fl oz for powdery mildew and 8 fl oz for gummy stem blight.
	thiophanate-methyl (1): Topsin or T-Methyl 70W 0.5 lb Topsin or T-Methyl 4.5F 10 fl oz Thiophanate Methyl 85WDG 0.4 lb	Apply on 7 to 14-day intervals in a tank mix with mancozeb or another fungicide.
	trifloxystrobin (11): Flint 50WG 1.5 to 4 oz	Apply on 7-day intervals in alternation with a non Group 11 fungicide.
	triflumizole (3): Procure 50W 4 to 8 oz Procure 480SC 4 to 8 fl oz	Powdery mildew only. Apply on 7 to 14-day intervals.
zoxamide (22) + mancozeb (M): Gavel 75DF 1.5 to 2 lb	Downy mildew fungicide. Apply on 7 to 10 day intervals.	
Bacterial wilt	See next column	Does not affect watermelon. Use insecticide to control cucumber beetles which spread the bacterium.
Fusarium wilt	See next column	Different strains cause wilt in cantaloupe and watermelon. Plant resistant varieties, practice crop rotation, fumigate soil with Vapam or methyl bromide (see Nematode Control).
Belly rot (<i>Rhizoctonia</i>)	azoxystrobin (11): Quadris 2.08F 11 to 15.4 fl oz	Make first application at the 1 to 3-leaf stage followed by a second application 10 to 14-days later.
	chlorothalonil (M): Bravo, Echo, Equus, Chloronil, Chlorothalonil, or Initiate 6F 8.25 pt Bravo or Equus 82.5DF 7.6 lb	Make single application when vines begin to run in a sufficient volume to obtain runoff to soil surface or apply by chemigation.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
CUCURBITS (CONT'D)		
Belly rot (<i>Rhizoctonia</i>) (cont'd)	thiophanate-methyl (1):	Same as for anthracnose (see above).
White mold (<i>Sclerotinia</i>)	dichloran (14): Botran 75W 1.3 lb	Greenhouse cucumbers only. Apply on 14-day intervals when disease first appears.
Gray mold (<i>Botrytis</i>)	fenheximide (17) Decree 50WG 1 to 1.5 lb	Cucumber transplant or crop production in greenhouse only. Apply on 7 to 10 day intervals.
EGGPLANT		
Pythium damping off Phytophthora blight	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 1 pt Ultra Flourish or Twist 2E 2 pt Metastar 2E AG 4 to 8 pt	Broadcast at suggested rate or band over row and incorporate before or water in after planting. For Phytophthora, make up to two more directed applications on 30-day intervals.
	cyazofamid (21): Ranman 3.3F 2.75 fl oz	Apply as a transplant drench and or as a basal spray after transplanting.
	dimethomorph (40): Forum 4.17F 6 fl oz	Apply in a tank mix with another fungicide on 7 to 10-day intervals. Also controls late blight (see below).
	fenamidone (11): Reason 500SC 5.5 to 8.2 fl oz	Fruit and foliage blight only. Apply in alternation with a fungicide from a different mode of action group. Also controls late blight.
	mandiopropanid (40): Revus 2.08F 8 fl oz	Apply 7 to 14 day intervals in a tank mix with a copper fungicide and alternate with another fungicide. Also controls late blight.
Rhizoctonia damping off and root rot	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz /1000 ft row	Apply in furrow at planting or as a band over the row after emergence or transplanting.
Anthracnose Early and late blights	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Apply on 7 to 14-day intervals in alternation with a fungicide in a different group (mode of action).
	azoxystrobin (11) + difenoconazole (3): Quadris Top 2.72F 8 to 14 fl oz	Apply on 7 to 10-day intervals in alternation with a protectant (group M) fungicide.
	boscalid (7): Endura 70WG 2.5 to 3.5 fl oz	Early blight only. Apply on 7 to 14-day intervals. See label for resistance management.
	chlorothalonil (M): Bravo, Echo, Equus, Chloronil, Chlorothalonil, or Initiate 6F 1.5 pt Bravo or Equus 82.5DF 1.4 lb Echo 90DF 1.25 lb	Apply on 7 to 10-day intervals.
	copper hydroxide (M): Kocide 101, Kocide DF, Nu-Cop DF, or Champ WG 2 lb Kocide 2000 or Champ DP 1.3 to 1.5 lb Kocide LF, Champ, or Nu-Cop 3F 1.3 pt Kocide 3000 or Nu-Cop HB 0.75 to 1 lb	Apply at first fruit cluster and repeat on 7 to 10-day intervals.
	copper sulfate (M): Cuprofix Ultra 40 DF 1.25 lb	Apply on 7 to 10-day intervals.
	cyazofamid (21): Ranman 3.3F 2.1 to 2.75 fl oz	Late blight fungicide. Apply on 7 to 10-day intervals in alternation with another fungicide.
	dimethomorph (40): Forum 4.17F 6 fl oz	Late blight fungicide. Apply in a tank mix with another fungicide on 7 to 10-day intervals.
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	Late blight fungicide. Apply in a tank mix with another fungicide on 10 to 14-day intervals.
	fluoaststrobin (11): Evito or Aftershock 480SC 4F 2 to 5.7 fl oz	Apply on 7 to 14-day intervals in alternation with a fungicide in a different group (mode of action).
	maneb (M): Maneb 75DF or 80W 1.5 to 2.0 lb Manex 4F 1.2 to 1.6 qt	Apply at first fruit cluster and repeat on 7 to 10-day intervals. Do not apply within 5 days of harvest.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
EGGPLANT (CONT'D)		
Anthracnose Early and late blights (cont'd)	polyoxin d zinc salt (19): Ph-D 11.3WDG 6.2 oz	Apply on 10 to 14-day intervals in alternation with another fungicide.
	pyraclostrobin (11): Cabrio 20EG 8 to 16 oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	trifloxystrobin (11): Flint 50WG 2 to 4 oz	Apply on 7 to 14-day intervals. For late blight, use the high rate in a tank mix with a protectant (group M) fungicide.
Botrytis gray mold	fenheximid (17) Decree 50WG 1 to 1.5 lb	Transplant or crop production in greenhouse only. Apply on 7 to 10 day intervals.
GREENS (collards, kale, mustard, spinach mustard, turnip)		
Damping off, root rot, and wirestem (<i>Pythium</i> , <i>Rhizoctonia</i>)	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 oz /1000 ft row	Rhizoctonia only. Apply in-furrow at planting or over the row after emergence.
	azoxystrobin (11) + mefenoxam (4): Uniform 3.72F 0.34 fl oz /1000 ft row	Apply in-furrow at planting.
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	Pythium only. Inject into drip irrigation or mix in 100 gal and drench transplants. Also controls downy mildew (see below).
	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 1 to 2 pt Ultra Flourish or Twist 2E 2 to 4 pt Metastar 2E AG 4 to 8 pt	Broadcast at suggested rate or band over the seed row and incorporate before or water in after planting.
Black rot (bacterial) Bacterial leaf spots	See next column	Plant disease-free seed and practice crop rotation with non-hosts for at least 2 years. Copper sprays may reduce disease.
	acibenzolar-s-methyl (21): Actigard 50WG 0.75 to 1 oz	Plant defense activator. Apply on 7 to 10-day intervals in a tank mix or in alternation with copper.
	copper hydroxide (M): Kocide 101, Kocide DF, Nu-Cop DF, or Champ WG 1 to 2 lb Kocide 2000 or Champ DP 1 to 1.5 lb Kocide LF, Champ, or Nu-Cop 3F 1.3 pt Kocide 3000 or Nu-Cop HB 0.5 to 1 lb	Begin applications when plants are small and repeat on 7 to 10-day intervals.
	copper sulfate (M): Cuprofix Ultra 40DF 0.75 to 1.25	Begin applications when plants are small and repeat on 7 to 10-day intervals.
Anthracnose Downy mildew Cercospora leaf spot Black spot (<i>Alternaria</i>) White rust Powdery mildew	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	azoxystrobin (11) + difenoconazole (3): Quadris Top 2.72F 8 to 14 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	boscalid (7): Endura 70WG 6 to 9 oz	Black spot and powdery mildew only. Do not use on turnip. Apply on 7 to 14-day intervals.
	copper fungicides (M)	Same as for black rot (see above).
	cyazofamid (21): Ranman 3.3F 2.75 fl oz	Downy mildew only. Apply on 7 to 10 day intervals in alternation with another fungicide.
	cyprodinil (9) + fludioxanil (12): Switch 62.5WG 11 to 14 oz	Black spot and powdery mildew only. Apply on 7 to 10 day intervals.
Anthracnose Downy mildew Cercospora leaf spot Black spot (<i>Alternaria</i>) White rust Powdery mildew (cont'd)	dimethomorph (40): Forum 4.17F 6 fl oz	Downy mildew only. Apply on 7-day intervals in a tank mix with another fungicide active against downy mildew.
	difenconazole (3) + cyprodinil (9): Inspire Super 2.82F 16 to 20 fl oz	Apply on 7 to 10-day intervals. Does not control white rust or downy mildew.
	fenamidone (11): Reason 500SC 5.5 to 8.2 fl oz	Apply on 5 to 10 day intervals in alternation with a non-group 11 fungicide. Use the high rate for Cercospora leaf spot.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
GREENS (CONT'D)		
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	Downy mildew only. Apply in a tank mix with another fungicide on 7 to 10-day intervals. Also controls Pythium damping off (see above).
	fosetyl-AL (33): Aliette or Legion 80WDG 2 to 5 lb	Downy mildew only. Do not use on turnip. Apply on 7 to 21 day intervals. Do not tank mix with copper fungicides.
	mandipropamid (40): Revus 2.08F 8 fl oz	Downy mildew only. Apply on 7 to 10-day intervals. Alternate or tank-mix with another fungicide for broad-spectrum disease control.
	maneb (M): Maneb 75DF or 80W 1.5 to 2 lb Manex 4F 1.2 to 1.6 qt	Kale only. Apply on 7 to 10-day intervals. Do not apply within 10 days of harvest.
	phosphorous acid (33): Allude 3.3L, Fosphite 3.9L, Kphite 4.4L, Phostrol 4.3L, Phorcephite 3.9L, Propht 4.2L, or Rampart 3.9L 1-3 qt Fungi-Phite 68DF 1.25 to 3 lb	Downy mildew only. Apply on 7 to 14 day intervals. Alternate or tank-mix with another fungicide for broad-spectrum disease control.
	sulfur (M): Microthiol 80DF 3 to 10 lb other sulfur formulations	Powdery mildew only. Apply on 10 to 14-day intervals. See labels.
	pyraclostrobin (11): Cabrio 20EG 12 to 16 oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	tebuconazole (3): Folicur, Monsoon, Onset, Orius, Tebu, Tebucon, Tebuconazole, Tebusha, TebuStar, Tebuzol, Toledo, or Uppercut 3.6F 3 to 4 fl oz	Cercospora, Alternaria, and powdery mildew only. Apply on 7 to 14 day intervals in alternation with a non-group 3 fungicide.
	triflumizole (3): Procure 480SC 6 to 8 fl oz	Alternaria and powdery mildew only. Apply on 14-day intervals in alternation with a non-group 3 fungicide.
	trifloxystrobin (11): Flint 50WG 2 to 3 oz Gem 25DF 4 to 6 oz or Gem 500SC 2 to 3 fl oz	Turnip only. Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
LETTUCE		
Damping off and root rot (<i>Pythium</i> , <i>Rhizoctonia</i> , and <i>Phytophthora</i>) Bottom rot (<i>Rhizoctonia</i>)	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz /1000 ft row	<i>Rhizoctonia</i> only. Apply in furrow at planting or as a band over the row after emergence or transplanting.
	azoxystrobin (11) + mefenoxam (4): Uniform 3.72F 0.34 fl oz /1000 ft row	Apply in-furrow at planting.
	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 1 to 2 pt Ultra Flourish ot Twist 2E 2 to 4 pt Metastar 2E AG 4 to 8 pt	Field use for <i>Pythium</i> , and <i>Phytophthora</i> . Broadcast suggested rates or band over the row and incorporate before or water in after seeding.
	propamocarb hydrochloride (F): Previcur Flex 6L 2 pt	Greenhouse and field use. Apply as a drench at transplanting, as a basal spray, and/or by irrigation.
Botrytis rot (gray mold) Drop (<i>Sclerotinia</i>)	boscalid (7): Endura 70WG 8 to 11 oz	Apply after emergence or transplanting and repeat 14 days later if needed.
	cyprodinil (9) + fludioxonil (12): Switch 62.5WG 11 to 14 oz	Apply after thinning and again 2 weeks later.
	dicloran (14): Botran 75W 2 to 5.3 lb	Field - Apply as a basal spray before and/or after thinning. Greenhouse - Apply after transplanting and repeat if needed.
	fenheximide (17) Decree 50WG 1 to 1.5 lb	Botrytis gray mold on transplant or crop production in greenhouse only. Apply on 7 to 10 day intervals.
	fludioxonil (12): Cannonball 50W 7 oz	Apply after thinning and again 2 weeks later.
	iprodione (2): Rovral, Enclosure, Iprodione, or Nevado 4F 1.5 to 2 pt	Apply at the 3-leaf stage and repeat up to two more times on 10-day intervals. Direct spray to lower plant and adjacent soil.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
LETTUCE (CONT'D)		
Downy mildew Powdery mildew Septoria leaf spot Cercospora leaf spot	acibenzolar-s-methyl (21): Actigard 50WG 0.75 to 1 oz	A plant defense activator for downy mildew only. Apply on 7 to 10-day intervals in alternation with another fungicide.
	azoxystrobin (11): Quadris 2.08F 12.3 to 15.4 fl oz	Apply on 7-day intervals in alternation with a fungicide from a different MOA group.
	copper hydroxide (M): Nu-Cop DF 1 to 2 lb Champ DP 0.7 to 1.3 lb Champ or Nu-Cop 3F 0.7 to 1.3 pt Kocide 3000 or Nu-Cop HB 0.5 to 1.5 lb	Begin applications when plants are small and repeat on 7 to 10-day intervals.
	dimethomorph (40): Forum 4.17F 6 fl oz	Downy mildew fungicide. Apply on 5 to 10 day intervals in a tank mix with another fungicide active against downy mildew.
	famoxadone (11) + cymoxanil (27) : Tanos 50DF 8 oz	Downy mildew fungicide. Apply on 7-day intervals in a tank mix with a protectant (group M) fungicide.
	fenamidone (11): Reason 500SC 5.5 to 8.2 fl oz	Downy mildew fungicide. Apply on 7 to 10-day intervals in alternation with a non-group 11 fungicide.
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	Downy mildew fungicide. Apply in a tank mix with another fungicide on 10 to 14-day intervals.
	fosetyl-AL (33): Aliette or Legion 80WDG 2 to 5 lb	Downy mildew fungicide. Apply on 7 to 21-day intervals when disease threatens. Use low rate in tank mixes and high rate alone.
	mandipropamid (40): Revus 2.08F 8 fl oz	Downy mildew only. Apply on 7 to 10-day intervals. Alternate or tank-mix with another fungicide for broad spectrum disease control.
	maneb (M): Maneb 75DF 1.5 to 2 lb Manex 4F 1.2 to 1.6 qt	Apply when disease appears and repeat on 7 to 10- day intervals. Do not apply within 10 days of harvest.
	myclobutanil (3): Rally 40W 5 oz	Powdery mildew only. Apply on 14-day intervals in alternation with another fungicide.
	phosphorous acid (33): Allude 3.3L, Fosphite 3.9L, Kphite 4.4L, Phostrol 4.3L, Phorcephite 3.9L, Prophyt 4.2L, or Rampart 3.9L 1-3 qt Fungi-Phite 68DF 1.25 to 3 lb	Downy mildew only. Apply on 7 to 14 day intervals. Alternate or tank-mix with another fungicide for broad-spectrum disease control.
	propamocarb hydrochloride (28): Previcur Flex 6L 2 pt	Downy mildew only. Apply on 7 to 10-day intervals.
	pyraclostrobin (11): Cabrio 20EG 12 to 16 oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
quinoxifen (13): Quintec 2.08F 4 to 6 fl oz	Powdery mildew only. Apply on 10 to 14-day intervals in alternation with a fungicide from a different MOA group.	
sulfur (M): Microthiol 80DF 5 to 10 lb other sulfur formulations	Powdery mildew only. Apply on 10 to 14-day intervals. See labels.	
OKRA		
Rhizoctonia damping off	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz/1000 ft row	Apply in furrow at planting or in a band over the row after emergence or transplanting.
Anthracnose Powdery mildew Leaf spots Pod spot	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Apply on 7-14 day intervals in alternation with a fungicide from a different MOA group.
	chlorothalonil (M): Bravo, Chloronil, or Equus 6F 1.5 pt Bravo 82.5DF 1.4 lb	Apply on 7 to 14-day intervals.
	copper hydroxide (M): Kocide 2000 1.5 to 3 lb Kocide 3000 0.75 to 1.75 lb	Apply on 5 to 10-day intervals when disease threatens.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
OKRA (CONT'D)		
Anthracnose Powdery mildew Leaf spots Pod spot (cont'd)	myclobutanil (3): Rally 40W 2.5 to 5 fl oz	Powdery mildew only. Apply on 7 to 14 day intervals when mildew first appears in alternation with a non-group 3 fungicide.
	sulfur (M): Mircothiol Disperss 80DF 3 to 10 lb	Powdery mildew only. Apply on 7 to 14 day intervals when mildew first appears.
	tebuconazole (3): Folicur, Monsoon, Onset, Orius, Tebu, Tebucon, Tebuconazole, Tebusha, TebuStar, Tebuzol, Toledo, or Uppercut 3.6F 4 to 6 fl oz	Cercospora leaf spot only. Apply on 14-day intervals in alternation with a fungicide from a different mode of action group.
ONIONS (dry bulb, green, garlic)		
Damping off (<i>Pythium</i> and <i>Rhizoctonia</i>) Seedling blight Smut	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz/1000 ft row	Apply in furrow at planting or in a band over the row after emergence or transplanting.
	azoxystrobin (11) + mefenoxam (4): Uniform 3.72F 0.34 fl oz /1000 ft row	Apply in-furrow at planting.
	maneb (M): Maneb 75DF or 80DF 1.6 oz /1000 ft row Manex 4F 2.6 fl oz /1000 ft row	Spray in furrow at seeding.
	mancozeb (M): Dithane, Manzate, or Penncozeb 75DF 1.6 oz / 1000 ft row Dithane, Manzate, or Penncozeb 4F 2.6 fl oz /1000 ft row	Spray in furrow at seeding.
	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 0.5 to 1 pt Ultra Flourish or Twist 2E 1 to 2 pt Metastar 2E AG 2 to 4 pt	<i>Pythium</i> only. Broadcast suggested rate or band over the seed row and incorporate before or water in after planting.
Bacterial rots: Slippery skin Sour skin Soft rot	See next column	Allow tops to mature before harvest, but harvest quickly after tops lodge and avoid bruising. Dry well before topping. Carefully examine and cull immature or soft bulbs.
Botrytis blight Downy mildew Purple blotch	acibenzolar-s-methyl (21): Actigard 50WG 0.75 to 1 oz	A plant defense activator for downy mildew only. Apply on 7 to 10-day intervals in alternation with another fungicide.
	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Purple blotch and downy mildew only. Apply on 7 to 14-day intervals in alternation with a fungicide from a different MOA group.
	azoxystrobin (11) + chlorothalonil (M): Quadris Opti 5.5F 1.6 to 3.7 pt	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	azoxystrobin (11) + propiconazole (3): Quilt 1.66F or Quilt Xcel 2.2F 14 to 26 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide. Also controls white rot (see below).
	azoxystrobin (11) + difenoconazole (3): Quadris Top 2.72F 14 fl oz	Botrytis and purple blotch only. Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	boscalid (7): Endura 70WG 6.8 fl oz	Botrytis and purple blotch only. Apply on 7 to 14-day intervals in alternation with a non-group 7 fungicide.
	chlorothalonil (M): Bravo, Echo, Equus, Chloronil, Chlorothalonil , or Initiate 6F 1 to 3 pt Bravo or Equus 82.5DF 1 to 2.7 lb Echo 90DF 0.9 to 2.5 lb	Rates and pre-harvest intervals vary with the type of onion and target disease (see labels). Apply on 7 to 10-day intervals.
	chlorothalonil (M) + phosphorous acid (33): Catamaran 3.27F 4 to 7 pt	Apply on 7 to 10 day schedule.
copper hydroxide (M): Kocide 101, Kocide DF, Nu-Cop DF or Champ WG 1 to 2 lb Kocide 2000 or Champ DP 1.3 to 1.5 lb Kocide LF, Champ, or Nu-Cop 3F 0.7 to 1.3 pt Kocide 3000 or Nu-Cop HB 0.75 to 1 lb	Purple blotch and downy mildew only. Apply on 7 to 10-day intervals.	

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP) FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
ONIONS (CONT'D)		
Botrytis blight Downy mildew Purple blotch (cont'd)	copper sulfate (M): Cuprofix Ultra 40DF 1.25 to 3 lb	Purple blotch and downy mildew only. Apply on 7 to 10-day intervals.
	cyprodinil (9): Vangard 75WG 10 oz	Botrytis and purple blotch only. Apply on 7 to 10-day intervals.
	cyprodinil (9) + fludioxonil (12): Switch 62.5WG 11-14 oz	Botrytis and purple blotch only. Apply on 7 to 10-day intervals.
	dicloran (14): Botran 75W 1.5 to 2.6 lb	Botrytis blight only. Apply when disease threatens and repeat on 14-day intervals.
	difenconazole (3) + cyprodinil (9): Inspire Super 2.82F 16 to 20 fl oz	Botrytis and purple blotch only. Apply on 7 to 10-day intervals.
	dimethomorph (40): Forum 4.18F 6 fl oz	Downy mildew only. Apply on 5 to 7-day intervals in a tank mix with another fungicide.
	famoxadone (11) + cymoxanil (27): Tanos 50DF 6 to 8 oz	Downy mildew and purple blotch only. Apply on 5 to 7-day intervals in a tank-mix with a protectant (group M) fungicide.
	fenamidone (11): Reason 500SC 5.5 fl oz	Downy mildew and purple blotch only. Apply on 7 to 10-day intervals in alternation with a fungicide from a different MOA group.
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	Downy mildew fungicide. Apply in a tank mix with another fungicide on 10 to 14-day intervals.
	fosetyl Al (33): Aliette or Legion 80WDG 2 to 3 lb	Downy mildew and purple blotch on dry bulb only. Apply on 7 to 14-day intervals.
	iprodione (2): Rovral, Enclosure, Iprodione, or Nevado 4F 1.5 pt	Botrytis and purple blotch on dry bulb only. Apply on 14-day intervals when disease threatens.
	mandipropamid (40): Revus 2.08F 8 fl oz	Downy mildew only. Apply on 7 to 10-day intervals. Alternate or tank-mix with another fungicide for broad spectrum disease control.
	maneb (M): Maneb 75DF or 80W 2 to 3 lb Manex 4F 1.2 to 1.6 qt	Apply on 7-day intervals when disease threatens.
	mancozeb (M): Dithane, Manzate, or Penncozeb 75DF 3 lb Dithane, Manzate, or Penncozeb 4F 2.4 qt	Dry bulb only. Apply on 7-day intervals when disease threatens.
	mancozeb (M) + copper hydroxide (M): ManKocide DF 2.5 lb	Dry bulb only. Apply on 7-day intervals when disease threatens.
	mancozeb (M) + copper sulfate (M): Cuprofix MZ Disperserss 5 to 7.25 lb	Dry bulb only. Apply on 7-day intervals when disease threatens.
	mefenoxam (4) + chlorothalonil (M): Ridomil Gold/Bravo 76W 2 lb Ridomil Gold SC 6.67F 2.5 pt	Apply on 7 to 14-day intervals.
	mefenoxam (4) + mancozeb (M): Ridomil Gold MZ 68WG 2.5 lb	Dry bulb only. Apply on 7 to 14-day intervals.
	mefenoxam (4) + copper hydroxide (M): Ridomil/Gold Copper 65W 2 lb	Apply on 7 to 14-day intervals.
	propiconazole (3): Tilt, Bumper, Fitness, Propicon, Propiconazole, PropiMax, or Propi-star 3.6E 4 to 8 fl oz	Purple blotch and botrytis only. Apply on 7 to 10 day intervals in alternation with a non-group 3 fungicide.
	pyraclostrobin (11): Cabrio 20EG 8 to 12 oz	Purple blotch and downy mildew only. Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	pyraclostrobin (11) + boscalid (7): Pristine 38WG 8 to 10.5 oz	Apply on 14-day intervals. See label for resistance management.
pyrimethanil (9): Scala 5F 9 to 18 fl oz	Botrytis and purple blotch only. Apply on 7 to 14-day intervals. Use the low rate in tank mixes with a protectant (group M) fungicide.	

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
ONIONS (CONT'D)		
Botrytis blight Downy mildew Purple blotch (cont'd)	tebuconazole (3): Folicur, Monsoon, Onset, Orius, Tebu, Tebucon, Tebuconazole, Tebusha, TebuStar, Tebuzol, Toledo, or Uppercut 3.6F 4 to 6 fl oz	Rust and purple blotch only. Apply on 10 to 14-day intervals (also controls white rot (see below)) in alternation with a fungicide from a different mode of action group.
Smudge	See next column	Plant colored varieties where the disease is persistent.
White rot	See next column	Avoid infested areas for 8-10 years.
	azoxystrobin (1): Quadris 2.08F 6.2 to 12.3 fl oz	Same as for Botrytis blight (see above).
	azoxystrobin (11) + propiconazole (3): Quilt 1.66F or Quilt Xcel 2.2F 14 to 26 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide. Also controls botrytis, etc. (see above).
	cyprodinil (9) + fludioxonil (12): Switch 62.5WG 0.5 to 1 oz/1000 ft row	Spray in furrow at planting.
	dicloran (14): Botran 75W 5.3 lb	For sets only. Spray in furrow and covering soil in a 5-inch band on 40-inch beds at planting.
	fludioxonil (12): Cannonball 50W 0.5 oz/1000 ft row	Spray in furrow at planting.
	iprodione (2): Rovral, Enclosure, Iprodione, or Nevado 4F 4 pt	Garlic only. Apply the broadcast rate listed as a band in furrow at planting.
	thiophanate-methyl (1): Topsin or T-Methyl 70W 0.75 oz /1000 ft row Topsin or T-Methyl 4.5F 1 fl oz /1000 ft row Thiophanate Methyl 85WDG 0.6 oz /1000 ft row	Onions only. Spray in furrow at planting.
	PCNB (14): Terraclor 75W 20 oz / 1000 ft row Blocker 4F 29.4 fl oz / 1000 ft row Terraclor 75W 1.35 lb / 100 lb cloves Blocker 4F 0.25 gal /100 lb cloves	Garlic only. Spray in furrow and covering soil at planting. Clove treatment. Apply in sufficient water to achieve good coverage.
tebuconazole (3): Folicur, Monsoon, Onset, Orius, Tebu, Tebucon, Tebuconazole, Tebusha, TebuStar, Tebuzol, Toledo, or Uppercut 3.6F 20.5 fl oz	Apply in a 4 to 6-inch band over the furrow at planting. Make up to two foliar applications at 4 to 6 fl oz for additional control.	
Clove rot (<i>Penicillium</i>)	thiophanate-methyl (1): Topsin or T-Methyl 70W 1 lb Topsin or T-methyl 4F 1.25 pt Thiophanate Methyl 85WDG 12.8 oz	Garlic only. Immerse and agitate cloves for 5 minutes in specified rate suspended in 100 gal water. Drain and dry prior to planting
PEAS		
Damping off (<i>Pythium</i> and <i>Rhizoctonia</i>)	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz /1000 ft row	<i>Rhizoctonia</i> only. Apply at planting in furrow or over the row after emergence. See label for resistance management
	azoxystrobin (11) + mefenoxam (4): Uniform 3.72F 0.34 fl oz /1000 ft row	Apply in-furrow at planting.
	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 0.5 to 1 pt Ultra Flourish or Twist 2E 1 to 2 pt Metastar 2E AG 2 to 4 pt	<i>Pythium</i> only. Broadcast suggested rate or band over the seed row and incorporate before or water in after planting.
Anthracnose Ascochyta leaf spot and blight Alternaria leaf spot Powdery mildew	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Apply on 7-14 day intervals in alternation with a non-group 11 fungicide.
	boscalid (7): Endura 70WG 6 to 11 oz	Apply on 7 to 14 day intervals in alternation with a non-group 7 fungicide.
	copper sulfate (M) Cuprofix Ultra 40DF 1 to 2 lb	Apply at first sign of disease and repeat on 7-day intervals.
	pyraclostrobin (11): Headline 2.08E 6 to 9 fl oz	Apply on 7-14 day intervals in alternation with a fungicide in a different group (mode of action).

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
PEAS (CONT'D)		
Anthracnose Ascochyta leaf spot and blight Alternaria leaf spot Powdery mildew (cont'd)	copper hydroxide (M): Kocide 101, Kocide DF, Nu-Cop DF or Champ WG 1.5 to 3 lb Kocide 2000 or Champ DP 1 to 2.25 lb Kocide LF, Champ, Nu-Cop 3F 1 to 2 pt Kocide 3000 or Nu-Cop HB 0.5 to 1.5 lb	Apply at first sign of disease and repeat on 7-day intervals.
	sulfur (M): Microthiol 80DF 3 to 10 lb other sulfur formulations*	Powdery mildew only. Apply on 10 to 14-day intervals. See labels.
PEPPERS		
Pythium damping off	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 1 pt Ultra Flourish or Twist 2E 2 pt Metastar 2E AG 4 to 8 pt	Broadcast at suggested rate or band over the seed row and incorporate before or water in after planting. For Phytophthora blight, make up to two more basal sprays on 30-day intervals.
	propamocarb hydrochloride (F): Previcur Flex 6L 1.2 pt	Greenhouse and field use. Apply as a drench at transplanting, as a basal spray, and/or by irrigation.
Rhizoctonia damping off, stem and root rot	PCNB (14): Terraclor 75W 4 to 8 oz / 100 gal Blocker or Terraclor 4F 6 to 12 fl oz /100 gal	Transplant treatment. Drench plants prior to transplanting.
	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz /1000 ft row	Apply in furrow at planting or as a band over the row after emergence or transplanting.
Anthracnose Cercospora leaf spot Gray leaf spot Powdery mildew Early blight	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Apply on 7 to 14-day intervals in alternation with a fungicide from a different MOA group.
	azoxystrobin (11) + difenoconazole (3): Quadris Top 2.72F 8 to 14 fl oz	Apply on 7 to 10-day intervals in alternation with a protectant (group M) fungicide.
	boscalid (7): Endura 70WG 2.5 to 3.5 fl oz	Early blight only. Apply on 7 to 14-day intervals. See label for resistance management.
	fluoxastrobin (11): Evito or Aftershock 480SC 4F 2 to 5.7 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11.
	chlorothalonil (M): Bravo, Chloronil, or Equus 6F 1.5 pt Bravo 82.5 DF 1.4 lb	Apply on 7 to 10-day intervals.
	maneb (M): Maneb 75DF or 80W 1.5 to 2 lb Manex 4F 1.2 to 1.6 qt	Apply on 7-14 day intervals when disease threatens. Do not apply within 7 days of harvest.
	myclobutanil (3): Rally 40W 2.5 to 5 fl oz	Powdery mildew only. Apply on 7 to 14-day intervals when mildew first appears in alternation with a non-group 3 fungicide.
	polyoxin d zinc salt (19): Ph-D 11.3WDG 6.2 oz	Apply on 10 to 14-day intervals in alternation with another fungicide.
	pyraclostrobin (11): Cabrio 20EG 8 to 12 oz	Not for use in greenhouses. Apply on 7 to 14-day intervals in alternation with a fungicide from a different MOA group.
	quinoxifen (13): Quintec 2.08F 4 to 6 fl oz	Powdery mildew only. Apply on 7 to 14-day intervals when mildew threatens in alternation with a non-group 13 fungicide.
	sulfur (M): Microthiol 80DF 3 to 10 lb other sulfur formulations	Powdery mildew only. Apply on 7 to 14-day intervals. See labels.
	trifloxystrobin (11): Flint 50WG 1.5 to 4 oz	Not for use in greenhouses. Apply on 7 to 14-day intervals. See label for resistance management.
Bacterial spot	See next column	Plant disease-free seed or transplants, use resistant varieties, and rotate with crops other than tomato and pepper for 3 years.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
PEPPERS (CONT'D)		
Bacterial spot (cont'd)	acibenzolar-s-methyl (21): Actigard 50WG 0.33 to 0.75 oz	A plant defense activator for chilli peppers only. Apply on 7-day intervals in a tank mix or in alternation with copper.
	sodium hypochlorite: Chlorox 1 part + 3 parts water	Surface disinfection for suspect seed. Soak in bleach solution for 1 minute, drain, rinse, and dry.
	copper hydroxide (M): Kocide 101, Kocide DF, Nu-Cop DF or Champ WG 2 to 3 lb Kocide 2000 or Champ DP 1.3 to 2.25 lb Kocide LF, Champ, Nu-Cop 3F 1.3 to 2 pt Kocide 3000 or Nu-Cop HB 0.75 to 1.5 lb	Apply before the disease appears and repeat on 5 to 10 day intervals. Tank mix with maneb (see above) for increased control.
	copper sulfate (M): Cuprofix Ultra 40DF 1.25 to 3 lb	Apply on 5 to 10-day intervals. Tank mix with maneb for increased control.
	streptomycin sulfate (25): Agri-Mycin or Firewall 17W 1 lb	Transplant production only. Mix in 100 gal water and apply on 4 to 5-day intervals beginning at the first true leaf stage in tank mix with a copper fungicide.
Botrytis gray mold	fenheximide (17) Decree 50WG 1 to 1.5 lb	Transplant or crop production in greenhouse only. Apply on 7 to 10 day intervals.
Phytophthora blight	cyazofamid (21): Ranman 3.3F 2.75 fl oz	Apply as a transplant drench and or as a basal spray after transplanting.
	dimethomorph (40): Forum 4.18F 6 fl oz	Apply on a 5 to 10 day intervals in a tank mix with another fungicide.
	famoxadone (11) + cymoxanil (27): Tanos 50DF 8 to 10 oz	Apply on 5 to 7-day intervals in a tank mix with a protectant fungicide (group M) fungicide.
	fenamidone (11): Reason 500SC 5.5 to 8.2 fl oz	Fruit and foliage blight only. Apply in alternation with a fungicide from a different mode of action group.
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	Apply in a tank mix with another fungicide on 10 to 14-day intervals.
	mefenoxam or metalaxyl (4):	See Pythium damping off above.
	mefenoxam (4) + copper (M): Ridomil Gold/Copper 65W 2.5 lb	Make up to 4 applications on 10 to 14-day intervals following at least one basal spray of mefenoxam.
	mandipropamid (40): Revus 2.08F 8 fl oz	Apply on 7 to 14-day intervals in a tank mix with a copper fungicide. Alternate with mefenoxam+copper (see above).
Southern blight	PCNB (14): Terraclor 75W 3 lb / 100 gal or 11 oz / 1000 ft row	Apply ½ pt of 100 gal solution per transplant or spray 11 oz rate in furrow.
	Blocker 4F 4.5 pt / 100 gal or 10.6 to 15.8 fl oz / 1000 ft row	Apply ½ pt of 100 gal solution per transplant or spray 10.6 to 15.8 fl oz rate in furrow.
	fluoxastrobin (11): Evito 480SC 4F 3.8 to 5.7 fl oz	Apply on 7 to 14-day intervals in alternation with a non-Group 11 fungicide.
POTATOES		
Black leg & soft rot (bacterial)	streptomycin sulfate (25): Agri-Mycin or Firewall 17W 0.5 lb/100 gal	Purchase certified, disease-free seed or soak cut seed pieces in solution immediately prior to planting.
Fusarium seed piece decay Rhizoctonia stem canker/black scurf Silver scurf	maneb (M): Maneb 75DF or 80W 1 lb/10 gal Manex 4F 0.8 qt/10 gal	Fusarium only. Dip whole or cut seed tubers prior to planting.
	mancozeb (M): Dithane, Manzate, or Penncozeb 75DF 1.25 lb/50 gal Dithane, Manzate, or Penncozeb 4F 1 qt / 50 gal Potato Seed Treater 6D 1 to 1.3 lb/100 lb seed Potato Seed Treater PS 8D 1 lb/100 lb seed	Fusarium only. Dip whole or cut seed tubers prior to planting. Dip whole or cut seed tubers prior to planting. Dust treatment for whole or cut seed tubers. Dust treatment for whole or cut seed tubers.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
POTATOES (CONT'D)		
Fusarium seed piece decay Rhizoctonia stem canker/black scurf Silver scurf (cont'd)	azoxystrobin (11): Dynasty 0.83F 0.1 to 3.75 fl oz 100 lb seed Quadris 2.08F 0.4 to 0.8 fl oz /1000 ft row	Apply so that cut seed pieces are thoroughly covered. Rhizoctonia only. Apply in furrow at planting or as a band over the row after emergence.
	fludioxonil (12): Maxim Potato Seed Protectant 0.5D 0.5 lb/100 lb seed	Apply dust so that cut seed pieces are thoroughly covered.
	fludioxonil (12) + mancozeb (M): Maxim MZ 6.2D 0.5 lb/100 lb seed	Apply dust so that cut seed pieces are thoroughly covered.
	flutolanil (7): Moncut 70DF 0.7 to 1.1 lb	Spray in furrow at planting.
	thiophanate-methyl (1) + mancozeb (M): Tops MZ 8.5D 0.75 to 1 lb/100 lb seed	Apply dust so that cut seed pieces are thoroughly covered.
	PCNB (14): Blocker 10G 1.65 lb / 1000 ft row Blocker 4F 5.2 to 10.4 fl oz / 1000 ft row Terraclor 75W 3.6 to 7.2 oz / 1000 ft row	Apply in furrow at planting.
Late blight (seedborne)	cymoxanil (27): Curzate 60DF 0.25 to 1 oz per 100 lb seed	Apply to cut seed pieces in a mixture with another fungicide.
Early blight Late blight	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Apply on 5 to 7-day intervals in alternation with a non-group 11 fungicide.
	azoxystrobin (11) + chlorothalonil (M): Quadris Opti 5.5F 1.6 pt	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	azoxystrobin (11) + difenoconazole (3): Quadris Top 2.72F 7 to 14 fl oz	Early blight only. Apply on 7 to 10-day intervals in alternation with a protectant (group M) fungicide.
	boscalid (7): Endura 70WG 2.5 to 4.5 oz	Early blight only. Apply on 7 to 14-day interval in alternation with a non-group 7 fungicide. Also controls white mold (See below).
	copper hydroxide (M): Kocide 101, Kocide DF, Nu-Cop DF or Champ WG 1 to 4 lb Kocide 2000 or Champ DP 0.75 to 3 lb Kocide LF, Champ, or Nu-Cop 3F 0.7 to 2 pt Kocide 3000 or Nu-Cop HB 0.5 to 2 lb	Begin applications when plants are 6 inches high and repeat on 7 to 10-day intervals. Increase rates and shorten spray interval as disease pressure increases.
	copper sulfate (M): Cuprofix Ultra 40DF 0.75 to 3 lb	Begin applications when plants are 6 inches high and repeat on 7 to 10-day intervals. Increase rates and shorten spray interval as disease pressure increases.
	cyazofamid (21): Ranman 3.3F 2.1 to 2.75 fl oz	Late blight only. Apply on 7 to 10-day intervals in alternation with another fungicide.
	cymoxanil (27): Curzate 60DF 3.2 oz	Late blight fungicide. Apply in a tank mixture with a protectant fungicide (group M) on 5 to 7-day intervals.
	chlorothalonil (M): Bravo, Echo, Equus, Chloronil, Chlorothalonil, or Initiate 6F 1 to 1.5 pt Bravo or Equus 82.5DF 0.9 to 1.4 lb Echo 90DF 0.9 to 1.25 lb	Apply on 7 to 14-day intervals beginning when plants are 6 inches high or when disease is anticipated. Use the high rates and short interval where late blight is present.
	chlorothalonil (M) + phosphorous acid (33): Catamaran 3.27F 4 to 5.5 pt	Apply on 7 to 10 day schedule.
	difenoconazole (3): Top MP 2.08E 5 to 5.7 fl oz	Early blight only. Apply on 7 to 14-day intervals. See label for resistance management.
	dimethomorph (40): Forum 4.17F 6 fl oz	Late blight fungicide. Apply on 5 to 10-day intervals in a tank mix with a protectant fungicide (group M).
	famoxadone (11) + cymoxanil: (27) Tanos 50DF 6 to 8 oz	Apply on 7 to 10-day intervals in a tank mix with a protectant (group M) fungicide.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
POTATOES (CONT'D)		
Early blight Late blight (cont'd)	fenamidone (11): Reason 500SC 5.5 to 8.2 fl oz	Apply on 5 to 10-day intervals in alternation with a non-group 11 fungicide.
	fluazinam (29): Omega 4F 5.5 fl oz	Late blight only. Apply on 7 to 10-day intervals. Also controls white mold (see below).
	fluoastrobilin (11): Evito or Aftershock 480SC 4F 2 to 3.8 fl oz	Apply on 7 to 10-day intervals in alternation with a non-group 11 fungicide.
	iprodione (2): Rovral, Enclosure, Iprodione, or Nevado 4F 1 to 2 pt	Early blight only. Make up to 4 applications on 10 to 14-day intervals.
	mandipropamid (40): Revus 2.08F 5.5 to 8 fl oz	Late blight only. Apply on 7 to 10-day intervals in a tank mix or alternation with another fungicide.
	mandipropamid (40) + difenoconazole (3): Revus Top 4.16F 5.5 to 7 fl oz	Apply on 7 to 10 day intervals in alternation with a non group 3 fungicide.
	maneb (M): Maneb 75DF or 80W 1.5 to 2 lb Manex 4F 1.2 to 1.6 qt	Apply on a 5 to 10-day interval beginning when plants are 6 inches high or when disease is anticipated. Use the high rates and short interval for late blight.
	mancozeb (M): Dithane, Manzate, or Penncozeb 75DF 1.5 to 2 lb Dithane. Manzate, or Penncozeb 4F 1.2 to 1.6 qt	Apply on a 5 to 10-day interval beginning when plants are 6 inches high or when disease is anticipated. Use the high rates and short interval for late blight.
	mancozeb (M) + copper hydroxide (M): Mankocide DF 1.5 to 5 lb	Apply on 7 to 10-day intervals at 1.5 to 2 lb when plants are 6 inches high and increase rate to 4 to 5 lb when rows close.
	mancozeb (M) + copper sulfate (M): Cuprofix MZ Disperss 1.5 to 4.75 lb	Apply on 7 to 10-day intervals. Do not apply within 14 days of harvest.
	mefenoxam (4) + chlorothalonil (M): Ridomil Gold/Bravo 76W 2 lb Ridomil Gold SC 6.67F 2.5 pt	Make up to 3 applications on 7 to 14-day intervals in alternation with a protectant (group M) fungicide.
	mefenoxam (4) + mancozeb (M): Ridomil Gold MZ 68WG 2.5 lb	Make up to 3 applications on 7 to 14-day intervals in alternation with a protectant (group M) fungicide.
	mefenoxam (4) + copper hydroxide (M): Ridomil Gold/Copper 65W 2 lb	Add 0.8 lb mancozeb and make up to 3 applications on 14-day intervals when disease threatens.
	polyoxin d zinc salt (19): Ph-D 11.3WDG 6.2 oz	Early blight only. Apply on 10 to 14-day intervals in alternation with another fungicide.
	propamocarb hydrochloride (F): Previcur Flex 6L 0.7 to 1.2 pt	Late blight fungicide. Apply on 7 to 10-day intervals in a tank mix with a protectant (group M) fungicide.
	pyraclostrobin (11): Headline 2.08E 6 to 12 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	pyraclostrobin (11) + metiram (M): Cabrio Plus 60W 2 to 2.9 lb	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	pyrimethanil (9): Scala 5F 9 to 18 fl oz	Early blight only. Apply on 7 to 14-day intervals in a tank mix with another fungicide.
	trifloxystrobin (11): Gem 25WG 6 to 8 oz or Gem 500SC 2.9 to 3.8 fl oz	Apply on 7 to 10-day intervals in alternation with a non-group 11 fungicide.
	triphenyltin hydroxide (30): Super Tin or Agri Tin 80W † 2.5 to 3.7 oz Super Tin 4L † 4 to 6 fl oz	Apply on 7-day intervals beginning when plants are 6 inches high or when disease is anticipated.
zoxamide (22) + mancozeb (M): Gavel 75DF 1.5 to 2 lb	Apply on 5 to 10 day intervals depending on disease pressure. Do not apply within 14 days of harvest.	
Scab	See next column	Plant in soil below pH 5.5 and/or apply ammonium sulfate post-emergence.

† Restricted use pesticide.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
POTATOES (CONT'D)		
White mold (<i>Sclerotinia</i>)	boscalid (7): Endura 70WG 5.5 to 10 oz	Apply at row closure or as needed and repeat 14 days later if necessary. Also controls early blight (See above).
	dicloran (14): Botran 75W 2 lb	Apply at the first sign of disease or just prior to row closure and repeat on 10 to 14-day intervals.
	fluazinam (M): Omega 4F 5.5 to 8 fl oz	Apply on 7 to 10-day intervals. Also controls late blight (see above).
	iprodione (2): Rovral, Enclosure, Iprodione, or Nevado 4F 2 pt	Apply at first sign of disease or just prior to row closure and repeat on 2 to 4 week intervals if needed.
Pythium leak Pink root (<i>Phytophthora</i>)	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 0.42 oz / 1000 ft row Ultra Flourish or Twist 2E 0.84 oz / 1000 ft row Metastar 2E AG 1.68 fl oz / 1000 ft row	Apply in a 6 to 8-inch band directly over the seed pieces at planting. Foliar application(s) of a mefenoxam combination product (see below) may also be needed.
	mefenoxam (4) + chlorothalonil (M): Ridomil Gold/Bravo 76W 2 lb Ridomil Gold SC 6.67F 2.5 pt	Make one application at tuber initiation (flowering) and repeat 14-days later. Also controls early and late blight (See above).
	mefenoxam (4) + mancozeb (M): Ridomil Gold MZ 68W 2.5 lb	Make one application at tuber initiation (flowering) and repeat 14-days later. Also controls early and late blight (See above).
	mefenoxam (4) + copper hydroxide (M): Ridomil Gold/Copper 65W 2 lb	Make one application at tuber initiation (flowering) and repeat 14-days later. Also controls early and late blight (See above).
Storage rots: Fusarium dry rot	thiabendazole (1): Mertect 340F 0.42 fl oz / ton tubers or gal water	Mist unwashed tubers on conveyor line with tumbling action in sufficient water to achieve good coverage. A second misting or 20-second dip prior to shipping is permitted.
RADISHES		
Damping off and root rot (<i>Pythium</i> and <i>Rhizoctonia</i>)	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz /1000 ft row	<i>Rhizoctonia</i> only. Apply in furrow at planting or as a band over the row after emergence.
	azoxystrobin (11) + mefenoxam (4): Uniform 3.72F 0.34 fl oz /1000 ft row	Apply in-furrow at planting.
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	<i>Pythium</i> only. Apply in a tank mix with another fungicide on 10-day intervals.
	mefenoxam or metalaxyl (M): Ridomil Gold 4E or 4SL 1 to 2 pt Ultra Flourish or Twist 2E 2 to 4 pt Metastar 2E AG 4 to 8 pt	<i>Pythium</i> only. Broadcast suggested rates or band over seed row and incorporate before or water in after planting.
Downy mildew White rust Cercospora leaf spot Powdery mildew	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	cyprodinil (9) + fludioxanil (12): Switch 62.5WG 11 to 14 oz	Powdery mildew only. Apply on 7 to 10-day intervals.
	mefenoxam (4) + copper hydroxide (M): Ridomil Gold/Copper 65W 2 lb	Apply a 14-day schedule following an application of mefenoxam or metalaxyl at planting (see <i>Pythium</i> damping off).
	pyraclostrobin: (11) Cabrio 20EG 8 to 16 oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	trifloxystrobin (11): Flint 50WG 2 to 4 oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
SPINACH		
Damping off (<i>Pythium</i> and <i>Rhizoctonia</i>)	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz /1000 ft row	<i>Rhizoctonia</i> only. Apply in furrow at planting or as a band over the row after emergence.
	azoxystrobin (11) + mefenoxam (4): Uniform 3.72F 0.34 fl oz /1000 ft row	Apply in-furrow at planting.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
SPINACH (CONT'D)		
Damping off (<i>Pythium</i> and <i>Rhizoctonia</i>) (cont'd)	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 1 to 2 pt Ultra Flourish or Twist 2E 2 to 4 pt Metastar 2E AG 4 to 8 pt	<i>Pythium</i> only. Broadcast suggested rate or band over the seed row and incorporate before or water in after planting.
White rust Blue mold (downy mildew) Anthracnose	See next column.	Plant resistant varieties for blue mold and white rust; practice crop rotation for white rust and anthracnose.
	acibenzolar-s-methyl (21): Actigard 50WG 0.5 to 0.75 oz	A plant defense activator. Apply on 7-day intervals in alternation with another fungicide.
	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Begin applications when plants are small and alternate with a fungicide in a different group (mode of action) on 7-day intervals.
	copper hydroxide (M): Kocide 101, Kocide DF, or Nu-Cop DF 2 to 3 lb Kocide 2000 1.5 to 2.25 lb Kocide LF 2.7 to 4 pt Kocide 3000 or Nu-Cop HB 0.75 to 1.5 lb	Begin applications when plants are small and repeat on 7-day intervals. May cause leaf injury.
	copper sulfate (M): Cuprofix Ultra 40DF 1.25 to 2 lb	Apply on 7 to 10-day intervals. May cause leaf injury.
	cyazofamid (21): Ranman 3.3F 2.1 to 2.75 fl oz	White rust and blue mold. Apply on 7 to 10-day intervals in alternation with another fungicide.
	fosetyl-AL (33): Aliette or Legion 80WG 2 to 5 lb	White rust and blue mold only. Apply on 7-day intervals. Do not mix with copper fungicides. May cause leaf injury.
White rust Blue mold (downy mildew) Anthracnose (cont'd)	famoxadone (11) + cymoxanil (27): Tanos 50DF 8 to 10 oz	White rust and blue mold only. Apply on 5 to 7-day intervals in a tank-mix with a protectant (group M) fungicide.
	fenamidone (11): Reason 500SC 5.5 to 8.2 fl oz	White rust and blue mold only. Apply on 7-day intervals in alternation with a non-group 11 fungicide.
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	Apply in a tank mix with another fungicide on 10 to 14-day intervals.
	mandipropamid (40): Revus 2.08F 8 fl oz	Blue mold only. Apply on 7 to 10-day intervals.
	mefenoxam (4) + copper hydroxide (M): Ridomil Gold Copper 65W 2.5 lb	Apply following use of Ridomil Gold at planting (see <i>Pythium</i> damping off) on 14-day intervals. Do not apply within 21 days of harvest.
	phosphorous acid (33): Allude 3.3L, Fosphite 3.9L, Kphite 4.4L, Phostrol 4.3L, Phorcephite 3.9L, Prophyt 4.2L, or Rampart 3.9L 1-3 qt Fungi-Phite 68DF 1.25 to 3 lb	White rust and blue mold only. Apply on 7-day intervals in alternation with another fungicide.
	pyraclostrobin (11): Cabrio 20EG 8 to 12 oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
SOUTHERN PEAS		
Damping off (<i>Pythium</i> and <i>Rhizoctonia</i>)	azoxystrobin (11): Quadris 2.08F 0.4 to 0.8 fl oz /1000 ft row	<i>Rhizoctonia</i> only. Apply in furrow at planting or as a band over the row after emergence. See label for resistance management.
	azoxystrobin (11) + mefenoxam (4): Uniform 3.72F 0.34 fl oz /1000 ft row	Apply in-furrow at planting.
	mefenoxam or metalaxyl(4): Ridomil Gold 4E or 4SL 0.5 to 1 pt Ultra Flourish or Twist 2E 1 to 2 pt Metastar 2E AG 2 to 4 pt	<i>Pythium</i> only. Broadcast suggested rate or band over the seed row and incorporate before or water in after planting.
Bacterial blights (halo, common, and brown spot)	See next column	Plant disease-free seed.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
SOUTHERN PEAS (CONT'D)		
Bacterial blights (halo, common, and brown spot) (cont'd)	copper hydroxide (M): Kocide 101, Kocide DF, Nu Cop DF or Champ WG 1.5 to 3 lb Kocide 2000 or Champ DP 1 to 2.25 lb Kocide LF, Champ, or Nu-Cop 3F 1 to 2 pt Kocide 3000 or Nu-Cop HB 0.5 to 1.5 lb	Apply on 7 to 14-day intervals beginning when plants are small or disease threatens.
	copper sulfate (M): Cuprofix Disperss 1.5 to 3.5 lb	Apply on 7 to 14-day intervals beginning when plants are small or disease threatens.
Anthracnose Cercospora leaf spot Rust Powdery mildew	azoxystrobin (11): Quadris 2.08F 6.2 to 15.4 fl oz	Apply on 7 to 14-day intervals in alternation with a fungicide in a different mode of action group.
	azoxystrobin (11) + chlorothalonil (M) Quadris Opti 5.5F 1.6 to 2.4 pt	Apply on 7 to 14-day intervals.
	chlorothalonil (M): Bravo, Echo, Equus, Chloronil, Chlorothalonil, or Initiate 6F 1.3 to 3 pt Bravo or Equus 82.5DF 1.2 to 2.7 lb Echo 90DF 1.1 to 1.6 lb	Apply at early bloom and repeat on 7 to 10-day intervals.
	maneb (M): Maneb 75DF or 80W 1.5 to 2 lb Manex 4F 1.2 to 1.6 qt	Anthracnose and rust only. Apply when plants are small and repeat on 5 to 7-day intervals. Do not apply within 30 days of harvest.
	pyraclostrobin (11): Headline 2.08E 6 to 9 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	sulfur (M): Microthiol 80DF 3 to 10 lb other sulfur formulations (see labels)	Rust and powdery mildew only. Apply on 7 to 14-day intervals at the first appearance of disease.
White mold (<i>Sclerotinia</i>) Gray mold (<i>Botrytis</i>)	cyprodinil (9) + fludioxanil (12): Switch 62.5WG 11 to 14 oz	Apply at early bloom and again at full bloom.
SWEET CORN		
Stewart's wilt (bacterial)	See next column	Plant resistant varieties and control flea beetles which spread the bacterium where warranted.
Leaf blights Leaf spots Rust	azoxystrobin (11): Quadris 2.08F 6.2 to 15.5 fl oz	Apply on 7 to 14-day intervals. Use low rates for rust and high rates for leaf spots and blights. See label for resistance management.
	chlorothalonil (M): Bravo, Echo, Equus, Chloronil, Chlorothalonil, or Initiate 6F 1.5 to 2 pt Bravo or Equus 82.5DF 1.4 to 1.8 lb Echo 90DF 1.25 to 1.6 lb	Fresh market only. Apply on 4 to 7 day intervals when disease first appears.
	fluoaxastrobin (11): Evito 4F 2 to 5.7 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	fluoaxastrobin (11) + tebuconazole (3): Evito T 4F 4 to 9 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	maneb (M): Maneb 75DF or 80W 1.5 lb Manex 4F 1.2 qt	Apply on 3 to 10-day intervals when disease first appears.
	mancozeb (M): Dithane, Manzate, or Penncozeb 75DF 1.5 lb Dithane, Manzate, or Penncozeb 4F 1.2 qt	Apply on 4 to 7-day intervals when disease first appears.
	propiconazole (3): Tilt, Bumper, Fitness, Propicon, Propiconazole, PropiMax, or Propi-star 3.6E 2 to 4 fl oz	Apply when disease first appears and repeat on 14-day intervals in alternation with a non-group 3 fungicide. Use the high rate for rust.
	propiconazole (3) + azoxystrobin (11): Quilt or Avaris 1.66F 7 to 14 fl oz Quilt Xcel 2.2F 10.5 to 14 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
SWEET CORN (CONT'D)		
Leaf blights Leaf spots Rust (cont'd)	prothioconazole (3) + trifloxystrobin (11): Stratego YLD 4.18F 4 to 5 fl oz	Apply on 7 to 14-day intervals in alternation with a fungicide from a different mode of action group.
	propiconazole (3) + trifloxystrobin (11): Stratego 2.08F 10 fl oz	Apply on 7 to 14-day intervals in alternation with a fungicide from a different mode of action group.
	pyraclostrobin (11): Headline 2.08E 6 to 12 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	pyraclostrobin (11) + metconazole (3): Headline AMP 1.68F 10 to 14.4 fl oz	Make up to 2 applications on 7 to 14-day intervals before alternating with a fungicide in a different mode of action group.
	tebuconazole (3): Folicur, Monsoon, Onset, Orius, Tebu, Tebucon, Tebuconazole, Tebusha, TebuStar, Tebuzol, Toledo, or Uppercut 3.6F 4 to 6 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 3 fungicide.
Maize dwarf mosaic virus	See next column	Plant resistant hybrids and control Johnsongrass in and around fields.
SWEET POTATOES		
Damping off (<i>Pythium</i> and <i>Rhizoctonia</i>)	azoxystrobin (11) + mefenoxam (4): Uniform 3.72F 0.34 fl oz /1000 ft row	Apply in-furrow at planting.
	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 1 to 2 pt Ultra Flourish or Twist 2E 2 to 4 pt Metastar 2E AG 4 to 8 pt	<i>Pythium</i> only. Broadcast suggested rate or band over the seed row and incorporate before or water in after planting.
Southern blight	dicloran (14): Botran 75W	Same as for scurf (see above).
Black rot Scurf Fusarium stem rot	dicloran (14): Botran 75W 1 lb/7.5 gal Botran 75W 3 to 3.75 lb/1000 sq ft	Scurf only. Dip seed roots 10-15 seconds in suspension, drain and bed promptly. Mix suggested rate in 14 gal water and spray over bedded seed before covering.
	thiabendazole (1): Mertect 340F 8 oz/7.5 gal	Dip seed roots for 1 to 2 minutes and bed immediately. Change solution when dirty.
Storage rot: Rhizopus rot	dicloran (14): Botran 75W 1 lb/100 gal	Spray or dip immediately after washing.
	fludioxanil (12): Scholar SC 1.92F 16 to 32 fl oz /100 gal	Dip for 30 sec and drain.
TOMATOES		
Pythium damping off and root rot Phytophthora root rot	fluopicolide (43): Presidio 4F 3 to 4 fl oz	Apply in a tank mix with another fungicide on 10 to 14-day intervals. Also controls late blight (see below).
	fosetyl-AL (33): Aliette or Legion 80WDG 2.5 to 5 lb	Apply as a foliar spray at the 2 to 4 leaf stage or immediately after transplanting.
	etr Diazole (14): Terramaster 4E 1.3 fl oz / 100 gal	Greenhouse use. Apply through irrigation system 3 wks after transplanting. Reapply on 3 wk intervals.
	mefenoxam or metalaxyl (4): Ridomil Gold 4E or 4SL 1 to 2 pt Ultra Flourish or Twist 2E 2 to 4 pt Metastar 2E 4 to 8 pt Ridomil Gold 2.5G 20 lb	Broadcast suggested rate or band over row and incorporate before or water in after planting or transplanting.
	propamocarb hydrochloride (28): Previcur Flex 6L 1.2 pt	Greenhouse use. Drench rock wool or growing media before transplanting and/or apply through drip system after transplanting.
	cyazofamid (21): Ranman 3.3F 2.75 fl oz	Greenhouse and field use. Apply as a drench to transplants in greenhouse, in transplant water, or as basal spray after transplanting.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
TOMATOES (CONT'D)		
Rhizoctonia damping off and root rot.	PCNB (14): Terraclor 75W 4 to 8 oz / 100 gal Blocker or Terraclor 4F 6 to 12 fl oz / 100 gal	Transplant treatment. Drench plants prior to transplanting.
Southern blight	fluoxastrobin (11): Evito 480SC 4F 3.8 to 5.7 fl oz	Apply on 7 to 10-day intervals in alternation with a non Group 11 fungicide. Also controls early blight and late blight (see below).
	PCNB (14): Terraclor 75W 3 lb / 100 gal or 14.6 oz / 1000 ft row Blocker 4F 6 to 12 fl oz / 100	Apply ½ pint of 100 gal solution per transplant or spray specified rate in furrow.
Bacterial spot Bacterial speck Bacterial canker	See next column	Plant disease free seed or transplants or soak suspect seed at 132°F for 30 min. Rotate away from tomato and pepper crops for 3 years.
	acibenzolar-s-methyl (21): Actigard 50WG 0.33 to 0.75 oz	A plant defense activator. Apply on 7-day intervals in a tank mix or in alternation with copper.
	sodium hypochlorite (M): Chlorox 1 part + 3 parts water	Surface disinfection for suspect seed. Soak in bleach solution for 1 minute, drain, rinse, and dry.
	streptomycin sulfate (25): Agri-Mycin, or Firewall 17W 1 lb / 100 gal	Transplant production. Apply on 7-day intervals beginning at the first true leaf stage in tank mix with a copper fungicide.
	copper hydroxide (M): Kocide 101, Kocide DF, Nu-Cop DF, or Champ WG 2 to 4 lb Kocide 2000 or Champ DP 1.3 to 3 lb Kocide LF, Champ, Nu-Cop 3F 1 to 2.7 pt Kocide 3000 or Nu-Cop HB 0.75 to 2 lb	Apply before the disease appears and repeat on 7-day intervals or more frequently if needed. Tank mix with maneb (see below) for increased control.
	copper sulfate (M): Cuprofix Ultra 40DF 1.25 to 3 lb	Apply before the disease appears and repeat on 7 to 10-day intervals. Tank mix with maneb (see below) for increased control.
Fusarium wilt	See next column	Plant resistant varieties designated "F" on labels or in seed catalogs. Practice crop rotation to avoid the development of new races.
Anthracnose Early and late blights Gray leaf spot and mold Septoria leaf spot Fruit rots	chlorothalonil (M): Bravo, Echo, Equus, Chloronil, Chlorothalonil , or Initiate 6F 1.4 to 2.7 pt Bravo or Equus 82.5DF 1.3 to 2.6 lb Echo 90DF 1.1 to 2.5 lb	Field use only. Apply on 7 to 14-day intervals beginning at fruit set. Use the high rates for control of fruit rots.
	azoxystrobin (11): Quadris 2.08F 5.0 to 6.2 fl oz	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	chlorothalonil (M) + phosphorous acid (33): Catamaran 3.27F 5 to 7 pt	Apply on 7 to 14 day schedule.
	azoxystrobin (11) + difenoconazole (3): Quadris Top 2.72F 8 fl oz	Apply on 7 to 10-day intervals in alternation with a protectant (group M) fungicide.
	azoxystrobin (11) + chlorothalonil (M): Quadris Opti 5.5F 1.6 pt	Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	boscalid (7): Endura 70WG 9 to 12.5 fl oz	Early blight only. Apply on 7-14-day intervals. See label for resistance management. Also controls Botrytis (see below).
	copper hydroxide (M):	Same as for bacterial spot (see above).
	copper sulfate (M):	Same as for bacterial spot (see above).
	cyazofamid (21): Ranman 3.3F 2.1 to 2.75 fl oz	Late blight only. Apply on 7 to 10-day intervals in alternation with another fungicide.
	cymoxanil (27): Curzate 60DF 3.2 to 5 oz	Late blight fungicide. Apply in a tank mixture with a protectant fungicide (group M) on 5 to 7-day intervals.
	cyprodinil (9) + fludioxanil (12): Switch 62.5WG 11 to 14 oz	Apply on 7 to 10 day intervals in alternation with a protectant (Group M) fungicide.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
TOMATOES (CONT'D)		
Anthracnose Early and late blights Gray leaf spot and mold Septoria leaf spot Fruit rots	difenconazole (3) + cyprodinil (9): Inspire Super 2.82F 16 to 20 fl oz	Apply on 7 to 10-day intervals. Does not control late blight.
	copper hydroxide (M) + mancozeb (M): ManKocide 2.7 to 5.3 lb	Apply on 7 to 10-day intervals. Also controls bacterial spots (See above).
	mancozeb (M) + copper sulfate (M): Cuprofix MZ Dispers 1.75 to 4.75 lb	Apply on 7-day intervals. Also controls bacterial spots (See above).
	dimethomorph (40): Forum 4.17F 6 fl oz	Field use only. Late blight fungicide. Apply on 5 to 10-day intervals in a tank mix with a protectant (group M) fungicide.
	famoxadone (11) + cymoxanil (27): Tanos 50DF 6 to 8 oz	Late blight fungicide. Apply on 5 to 7-day intervals in a tank mix with a protectant (group M) fungicide.
	fenamidone (11): Reason 500SC 5.5 to 8.2 fl oz	Late blight fungicide. Apply in alternation with a non-group 11 fungicide.
	fluopicolide (43): Presidio 4F 3 to 4 fl oz	Late blight fungicide. Apply in a tank mix with another fungicide on 10 to 14-day intervals. Also controls Phytophthora (see above).
	fluoxastrobin (11): Evito or Aftershock 480SC 4F 2 to 5.7 fl oz	Apply on 7 to 10-day intervals in alternation with a non Group 11 fungicide. Also controls southern blight (see above).
	mandipropamid (40): Revus 2.08F 5.5 to 8 fl oz	Late blight only. Apply on 7 to 10-day intervals in a tank mix or alternation with another fungicide.
	mandipropamid (40) + difenoconazole (3): Revus Top 4.16F 5.5 to 7 fl oz	Apply on 7 to 10 day intervals in alternation with a non-group 3 fungicide.
	mancozeb: (M) Dithane, Manzate, or Penncozeb 75DF 1.5 to 2 lb Dithane, Manzate, or Penncozeb 4F 1.12 to 1.6 qt	Apply on 7 to 10-day intervals beginning at fruit set. Do not apply within 5 days of harvest.
	maneb (M): Maneb 75DF 1.5 to 2 lb Manex 4F 1.2 to 1.6 qt	Field and greenhouse. Apply on 7 to 10 day intervals beginning at fruit set. Do not apply within 5 days of harvest.
	mefenoxam (4) + chlorothalonil (M): Ridomil Gold/Bravo 76W 2 lb Ridomil Gold SC 6.67F 2.5 pt	Field use only. Apply up to 3 times on 14-day intervals. Alternate with a protectant (group M) fungicide every 7 days when disease pressure is heavy. Do not apply within 14 days of harvest.
	mefenoxam (4) + mancozeb (M): Ridomil Gold MZ 68WG 2.5 lb	Field use only. Apply up to 3 times on 14-day intervals. Alternate with a protectant (group M) fungicide every 7 days when disease pressure is heavy. Do not apply within 5 days of harvest.
	mefenoxam (4) + copper hydroxide (M): Ridomil Gold/Copper 65W 2 lb	Field use only. Tank mix with mancozeb or maneb and apply up to 3 times on 14-day intervals. Alternate with a protectant (group M) fungicide every 7 days when disease pressure is heavy.
	polyoxin d zinc salt (19): Ph-D 11.3WDG 6.2 oz	Early blight and anthracnose only. Apply on 10 to 14-day intervals in alternation with another fungicide.
	propamocarb hydrochloride (F): Previcur Flex 6L 0.7 to 1.5 pt	Late blight fungicide. Apply in a tank mix with a protectant fungicide (group M) on 7 to 10-day intervals.
	pyraclostrobin (11): Cabrio 20EG 8 to 16 oz	Field use only. Apply on 7 to 14-day intervals in alternation with a non-group 11 fungicide.
	pyrimethanil (9): Scala 5F 7 fl oz	Early blight only. Apply on 7 to 14-day intervals in a tank mix with another fungicide. Also controls Botrytis stem canker (see below).
	triflozystrobin (11): Flint 50WG 2 to 4 fl oz	Apply on 7 to 10-day intervals. For late blight, tank mix the high rate and 75% of the labeled rate of a protectant (group M) fungicide.
ziram (M): Ziram 76DF 3 to 4 lb	Anthracnose, early blight, and Septoria only. Apply on 7 to 14-day intervals beginning at fruit set.	
zoxamide (22) + mancozeb (M): Gavel 75DF 1.5 to 2 lb	Late blight fungicide. Apply on 7 to 10 day intervals.	

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

DISEASE	COMMON NAME (MOA GROUP): FORMULATION AND RATE/ACRE OR 100 GAL	REMARKS
TOMATOES (CONT'D)		
Botrytis stem canker (gray mold) Sclerotinia stem canker	See next column.	Maintain greenhouse temperature above 70°F and relative humidity below 90%, avoid wetting plants, and prune petioles flush to stem.
	boscalid: (7) Endura 70WG 9 to 12.5 oz	Make up to 2 applications on 14-day intervals. Also controls early blight (see above).
	dicloran: (14) Botran 75W 1 lb	Greenhouse only. Spray stems to a height of 18-24 inches and repeat weekly or as needed. Do not exceed 4 applications per crop.
	fenheximide (17) Decree 50WG 1 to 1.5 lb	Transplant or crop production in greenhouse only. Apply on 7 to 10 day intervals.
	pyrimethanil (9): Scala 5F 7 fl oz	Botrytis stem canker only (field or greenhouse). Apply on 7 to 14-day intervals in a tank mix with another fungicide. Also controls early blight (see above).
Powdery mildew	myclobutanil: (3) Rally 40W 2.5 to 4 oz	Apply on 7 to 14-day intervals when mildew first appears in alternation with a fungicide from a different mode of action group.
	polyoxin d zinc salt (19): Ph-D 11.3WDG 6.2 oz	Apply on 10 to 14-day intervals in alternation with another fungicide. Also controls early blight and anthracnose (see above).
	pyraclostrobin: (11) Cabrio 20EG 8 to 12 oz	Not for use in greenhouses. Apply on 7 to 14-day intervals. See label for resistance management.
	sulfur: (M) Microthiol 80DF 5 to 10 lb other sulfur formulations*	Apply at first symptoms and repeat as needed on 7-14 day intervals. See labels.

MOA Group Tables start on page 46 of the handbook.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

NEMATODE CONTROL FOR VEGETABLE CROPS

Nematodes are microscopic worms that live in soil. Several species feed on plant roots and are damaging to vegetable crops where high populations develop. Growers are usually not aware of the presence of nematode problems until plants appear stunted, yellowed, wilted, or are eventually killed. Growers should examine roots of plants in areas of poor growth. Galls or swellings on the root system are symptoms of root-knot nematodes. If a nematode problem is suspected, a lab analysis of soil should be done to determine the type and number of nematodes present so that an effective control program can be developed. Control programs are aimed at reducing nematode levels below damaging levels before planting susceptible crops. Nematode problems generally cannot be corrected after planting. Therefore, a nematode analysis, in which the types of nematodes present and their population levels in the soil are determined, is critical to an effective management program. Where nematode problems are suspected, soil and root samples should be collected and submitted to the OSU Plant Disease Diagnostic Laboratory prior to planting any nematode susceptible crop. Samples should be submitted through local county extension offices. It is best to sample late in the growing season before turning under the crop. Consult OSU Extension Facts #7610 for information on taking an adequate sample and proper care and handling of samples.

CULTURAL PRACTICES for nematode control include:

Resistant varieties: Plant varieties known to be resistant to nematodes. Several tomato varieties are resistant to root-knot nematode. These have an "N" designation on labels or in seed catalogs.

Crop rotation: Rotation to non-host crops such as grasses (corn, etc.) for root-knot nematode is an excellent means of reducing nematode populations below damaging levels. Other non-host crops are available depending on the type of nematode infestation. Rotation in home gardens can be applied by moving the location of the different crop types yearly.

Sanitation: Soon after harvest, pull plants and roots and remove to destroy nematodes and eggs in the roots or apply shallow tillage to shred the debris. Work the soil and fallow for several days so the sun will dry out the top layer of soil and kill some of the nematodes. Avoid moving contaminated soil on equipment to clean areas.

Nematode-free transplants: Nematodes can be introduced into fields and gardens in or on roots of tomatoes, peppers, etc. Buy or produce nematode-free plants. Do not transplant material with galled root systems.

CHEMICAL SOIL TREATMENT (COMMERCIAL GROWERS): Several types of chemicals are available which range from those specific for nematode control (nematicides, See Table 5) to multipurpose soil fumigants (See Table 6) which effectively control weed seeds, nematodes, fungi, and soil insects. All of these are restricted use pesticides for commercial use by certified applicators and must be applied before or at planting. There are no chemical treatments available to correct nematode problems during the season. Those registered for vegetable crops are listed below. A good time to apply fumigants is in the fall (September or October) because they all require a waiting period to allow the fumigant to dissipate before it is safe to plant. Spring fumigation may interfere with planting schedules if cold or wet weather prevents fumigation or delays fumigant penetration and dissipation. Specific soil temperature, moisture, and tillage conditions are required for optimum performance of soil fumigants. Check the label to ensure that the product-specific soil requirements are met.

HOME GARDEN TREATMENTS: Home gardeners have fewer options for nematode treatments because all nematicides and fumigants are either restricted use pesticides or they are not available in quantities suitable for home use. However, several safer methods of nematode control have been developed which are best suited to small-scale, garden settings. These include the use of green manures, soil solarization, and chitin application.

Green manures: Incorporation of crucifer green manure (cabbage, mustard, rape, canola) into moist soil results in the release of compounds which act as "biological soil fumigants" and kill nematodes. The practice is most effective where combined with soil solarization.

Soil solarization: Soil solarization is a method of pasteurizing soil using solar radiation. The area to be solarized should be tilled as deep as possible and moistened by irrigation or rainfall. Cover the area with clear plastic (polyethylene) film and seal the edges with soil. Leave the film in place for three to five weeks (the longer the better) during the summer or early fall. The goal is to heat the soil to high temperatures for as long as possible to achieve a good kill. Consult OSU Extension Facts #7640 for more information on solarization.

Chitin application: Hi-Yield Nem-A-Cide Nematode Control (Voluntary Purchasing Groups) is a formulation of chitin (crab shells) and urea which stimulate the growth and activity of soil microbes that destroy nematodes. At 2-4 weeks before planting, broadcast at 5 lb/100 sq ft or band at or band over the row at 2.25 to 7 lb/100 ft of row and incorporate 6 to 8 inches deep.

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

TABLE 5. NEMATICIDES FOR NEMATODE CONTROL IN COMMERCIAL VEGETABLE CROPS

COMMON NAME: (GROUP) FORMULATION	CROPS	APPLICATION METHOD	RATE/1,000 FT ROW OR ACRE	REMARKS
ethoprop (1B): Mocap 15G [†]	Beans (snap,lima)	Row	0.9 to 1.4 lb/1,000 ft	Preplant incorporate, 12 to 15-inch band.
	Cabbage	Row	0.9 lb/1,000 ft	Preplant incorporate, 15-inch band.
	Cucumbers	Row	2.1 lb/1,000 ft	Preplant incorporate, 12 to 15-inch band.
	Potatoes	Row	1.4 lb/1,000 ft	Preplant incorporate, 12-inch band.
	Sweet corn	Row	0.75 to 1 lb/1,000 ft	Preplant incorporate, 12 to 15-inch band.
	Sweet potatoes	Row	1.6 to 2 lb/1,000 ft	Preplant incorporate, 12 to 15-inch band.
ethoprop (1B): Mocap 6E [†]	Cabbage	Row	2.4 fl oz/1,000 ft	Preplant incorporate, 12 to 15-inch band.
	Potatoes	Row	4.4 fl oz/1,000 ft	Preplant incorporate, 12-inch band.
	Sweet potatoes	Row	5.1 to 6.9 fl oz/1,000 ft	Preplant incorporate, 12 to 15-inch band.
aldicarb (1A): Temik 15G [†]	Dry beans	Row	7.5 to 15 oz/1,000 ft	Preplant incorporate in a 6-inch band.
	Sweet potatoes	Row	15 to 30 oz/1,000 ft	12-inch band at planting in open row, hill up immediately and plant in treated zone.
oxamyl (1A): Vydate L [†]	Carrots	Broadcast	2 to 4 gal/acre	Broadcast and incorporate within 1 week of planting.
		chemigation	1 gal/acre	Apply before crop emergence.
		In-furrow	1 to 2 gal/acre	Apply to seed furrow at planting in 20 gal water/acre.
	Cucurbits (cantaloupe, squash, cucumber, pumpkin, watermelon)	Broadcast	1 to 2 gal/acre	Broadcast or band over row (base rate on band width) and incorporate before planting.
		Foliar spray	2 to 4 pt/acre	2 to 4 weeks after the at-plant treatment, make 2 applications 2 to 3 weeks apart.
	Eggplant	Band	1 gal/acre	Band over row 2 to 3 weeks after transplanting and repeat 4 weeks later.
		Foliar spray	2 qt/acre	2 to 4 weeks after the last band application, make two applications 7 to 14 days apart.
	Peppers (bell and non-bell)	Transplant water	2 pt /acre	Apply with transplant water in a minimum of 200 gal/acre
		Foliar spray or drip chemigation	2 to 4 pt/acre	Apply 14 days after transplant treatment and repeat at 7 to 14-day intervals as needed.
	Potatoes	In-furrow	1 to 2 gal	Apply to seed furrow in at least 20 gal water/acre.
		Foliar spray	2 to 4 pt	Follow the in-furrow treatment as needed on 5 to 7-day intervals.
	Sweet potatoes	Broadcast	2 to 3 gal	Band over row (base rate on band width) and incorporate before planting slips.
		In-furrow	1 to 2 gal	Apply in a minimum of 200 gal transplant water during planting of slips.
	Tomatoes	Foliar spray	2 to 4 pt	Apply when plants become established and repeat on 1 to 2-week intervals.
Drip chemigation		2 to 8 pt	Apply on 7 to 14 day intervals increasing the rate as plants grow.	

[†] Restricted use pesticide

DISEASE CONTROL GUIDE FOR VEGETABLE CROPS (CONT'D)

COMMON NAME: (GROUP) FORMULATION	CROPS	APPLICATION METHOD	RATE/ACRE	REMARKS
oxamyl: (1A) Vydate C-LV 3.77L ^r	Potatoes	In-furrow	4.25 to 8.5 pt/acre	Apply to seed furrow in at least 20 gal water/acre.

TABLE 6. MULTIPURPOSE FUMIGANTS FOR COMMERCIAL VEGETABLE CROPS

COMMON NAME: FORMULATION	CROP	APPLICATION METHOD	RATE	REMARKS
chloropicrin (99%) Chlor-O-Pic ^r	Most vegetable crops	Broadcast or row	150 to 500 lb/treated acre	Inject 6 to 8 inches deep at least 14 to 21 days before planting and seal by packing, irrigation, or plastic film. Reduce rate by 33% if sealed by plastic.
dichloropropene (98%): Telone II ^r	Most vegetable crops	Broadcast or row	9 to 12 gal/treated acre	Inject at least 12 inches deep at least 14 days before planting. Seal by light tillage and packing.
dichloropropene (39%)+ chloropicrin (59%): Pic-Clor 60 ^r	Most vegetable crops	Broadcast or row	19 to 31.5 gal/ treated acre	Inject 12 inches deep at least 14 days before planting. Seal by light tillage and packing. Controls nematodes and some soilborne diseases.
dimethyl disulfide: Paladin EC	Tomatoes, peppers, eggplants, cucurbits	Broadcast or row	37 to 54 gal/treated acre	Inject through drip irrigation under sealed plastic tarp or row mulch 3 to 6 weeks before planting.
iodomethane (50%) + chloropicrin (45%): Midas EC Bronze ^r	tomatoes, peppers	Broadcast or row	12.6 to 22 gal/treated acre	Inject through drip irrigation under sealed plastic tarp or row mulch 10 to 21 days before planting.
iodomethane (33%) + chloropicrin (62%): Midas EC Gold ^r	tomatoes, peppers	Broadcast or row	19.8 to 35.1 gal/treated acre	Inject through drip irrigation under sealed plastic tarp or row mulch 10 to 21 days before planting.
iodomethane (98%) + chloropicrin (2%): Midas 98:2 ^r	tomatoes, peppers	Broadcast or row	5.3 to 9.3 gal/treated acre	Inject from 6 to 15 inches deep and seal with plastic tarp or row mulch 10 to 21 days before planting.
iodomethane (50%) + chloropicrin (50%): Midas 50:50 ^r	tomatoes, peppers	Broadcast or row	12.6 to 22 gal/treated acre	Inject from 6 to 15 inches deep and seal with plastic tarp or row mulch 10 to 21 days before planting.
iodomethane (33%) + chloropicrin (67%): Midas 33:67 ^r	tomatoes, peppers	Broadcast or row	19.9 to 35.1 gal/treated acre	Inject from 6 to 15 inches deep and seal with plastic tarp or row mulch 10 to 21 days before planting.
iodomethane (25%) + chloropicrin (75%): Midas 25:75 ^r	tomatoes, peppers	Broadcast or row	27 to 46 gal/treated acre	Inject from 6 to 15 inches deep and seal with plastic tarp or row mulch 10 to 21 days before planting.
metam-sodium: Vapam HL (42%)	Many vegetable crops	Broadcast, row, chemigation, or drip irrigation	30 to 75 gal/treated acre	Inject 8 to 10 inches deep, or apply by irrigation at least 14 to 21 days before planting. Seal by packing, tarp, or light irrigation.
methyl bromide (98%) + chloropicrin (2%): (8A) 98:2 ^{r1} Brom-O-Gas 2% ^{r1} Terr-O-Gas 98 ^{r1}	Many vegetable crops	Broadcast	200 to 400 lb/treated acre	Inject into soil and tarp immediately with plastic film. Application to rows or beds under plastic mulch is more economical.
methyl bromide (67%) + chloropicrin (33%): (8A) Tri-Brom 67 ^{r1} Terr-O-Gas 67 ^{r1}	Many vegetable crops	Broadcast	270 to 350 lb/treated acre	Inject into soil and tarp immediately with plastic film. Application to rows or beds under plastic mulch is more economical.

^r Restricted use pesticide.

¹ Methyl bromide fumigation is dangerous and potentially deadly for inexperienced users. Commercial fumigators are available for training and/or custom fumigation.