Grape

Disease

Symptoms, source of inoculum and management of grape diseases.

Disease	Symptoms	Source of Inoculum	Management
Anthracnose (*Elsinoe ampelina* = *Sphaceloma ampelinum*)	Fruit infections have light gray centers and reddish-brown borders resembling a bird's eye. Stem lesions are similar in color and sunken, with slightly raised borders. Leaf spots are gray with dark borders; later, the center of the lesion drops out, giving a ragged effect. Badly infected leaves become distorted and curl down.	The fungus overwinters in infected fruit on the ground or in infected shoots.	Follow the fungicide spray schedule for grapes. Do not apply Pristine to Concord, Worden, Fredonia, Niagara or related grape varieties because of possible injury.
Black rot (*Guignardia bidwellii*)	The black rot fungus attacks all parts of the grape plant. Leaf infection appears on the upper surface in early June as tiny reddish-brown spots. The lesions enlarge to 1/4 inch or more in diameter and become brown with black borders. A ring of black fungal bodies develops near the outer edge of the brown area. Lesions on stems and tendrils are longer and darker than those on leaves. Stem lesions are narrow, sunken and often split lengthwise on the vine. Infections begin to appear on the fruit when the berries are about half grown. Initially, a small white spot forms that enlarges rapidly until the entire berry is rotten. Affected berries soon turn black, shrivel and dry up. Minute black fungal fruiting bodies develop on the surface of the dried fruit. On muscadines, lesions on berries are small, black and scabby. The fruit does not rot.	The fungus overwinters in mummified fruit on the vine and ground and within lesions on canes.	Pruning out mummies, cankers and dead wood is very important to reduce inoculum load. Follow the fungicide spray schedule for grapes.
Botrytis bunch rot (*Botrytis cinerea*)	Infected blooms rot and dry out. Infected berries develop off-color and either dry out (during dry weather) or burst (during wet weather).	The fungus overwinters on canes or in buds. Spores are wind dispersed.	Prune out diseased tissue and destroy. Rake up fallen grapes and destroy. Follow the fungicide spray schedule for grapes.
Downy mildew (*Plasmopara viticola*)	This is primarily a disease of bunch grapes; muscadines are relatively resistant. All green parts of the vine are susceptible. Leaf lesions are yellowish- to reddish-brown and may appear angular if they are vein delimited. Infected shoot tips tend to curl. Leaves and shoots become covered with white mycelium. Berries appear grayish and are covered with the downy felt-like growth of the pathogen.	The pathogen overwinters in infected leaves. Disease development is boosted by wet weather.	Shred and remove or bury by cultivation diseased leaves. Follow the fungicide spray schedule for grapes.

Disease	Symptoms	Source of Inoculum	Management
Phomopsis cane and leaf spot (*Phomopsis viticola*)	Tiny dark spots with yellow margins form on the leaf blades and veins. Heavily infected basal leaves become distorted and may not develop to full size. Infected fruit turn brown, shrivel and drop from the cluster.	The fungus overwinters in the bark and leaf petioles. During wet springs, fungal spores exude from infected tissues and splash on to new (young) shoot tips. Spores move within the vine, causing localized infections in the vineyard. Fruit and cluster stem infections occur from bloom until the fruit are about the size of a pea.	At pruning, remove dead and diseased wood. Destroy pruned materials and debris by burning, burying or plowing them into the soil. Sanitize pruners with a registered disinfectant after each cut or between vines. Apply a dormant spray of lime sulfur to reduce overwintering inoculum.
Pierce's disease (*Xylella fastidiosa*)	This is a disease of bunch grapes. Muscadines are resistant. Symptoms may vary, but generally are characterized by a scorching of the leaf margins. Grape clusters wilt and dry; bud leaves are slow to develop and show water stress during dry periods.	The bacterium survives in infected vines and other hosts. It is transmitted by several leafhoppers.	Limiting the spread of the insect vector and destruction of wild weed hosts have had limited success. Soil applications of the insecticide Admire Pro or Scorpian 35SL are recommended. Destroy infected vines.
Powdery mildew (*Uncinula necator*)	Produces a whitish-gray, powdery-appearing growth on affected tissues. All green tissues are susceptible. Infection of young expanding leaves causes them to become distorted. Infection of blossoms results in poor fruit set. Infection of berries results in splitting or a netlike pattern on the surface.	The fungus overwinters in dormant buds or on other vine surfaces. Spores are wind dispersed.	Follow the fungicide spray schedule for grapes. Sulfur should be included in a fungicide program.

Table 1. Seasonal fungicide spray schedule for grapes

Developmental Stage	Pesticide Application Timing[1]	Diseases
Dormant	Prior to bud swell (bud is visibly swollen but no green or pink tissue is observed) and break	Anthracnose Phomopsis cane and leaf spot
Bud break and new shoot sprays (prebloom)	Every 7-10 days from 1-inch shoot growth to prebloom	Black rot Downy mildew Phomopsis cane and leaf spot Powdery mildew
Prebloom[2]	<10% bloom	Anthracnose Black rot Downy mildew Phomopsis cane and leaf spot Powdery mildew
Bloom	10%-20% bloom	Black rot Botrytis bunch rot Phomopsis cane and leaf spot Powdery mildew
Postbloom	First cover spray at 7-10 days after the prebloom spray	Anthracnose Black rot Downy mildew Phomopsis cane and leaf spot Powdery mildew
First and second cover sprays	Every 10-14 days following postbloom spray	Anthracnose Black rot Downy mildew Phomopsis cane and leaf spot Powdery mildew
Berry touch and bunch closure		Botrytis and other fruit rots
Third and subsequent cover sprays	Matured berries[3] Every 10-14 days until the preharvest spray	Anthracnose Black rot (foliar) Downy mildew (foliar) Phomopsis cane and leaf spot Powdery mildew (foliar)
Veraison	Onset of ripening	Botrytis bunch rot
Preharvest	10-14 days prior to harvest	Botrytis bunch rot Downy mildew Phomopsis cane and leaf spot Powdery mildew
Postharvest	Every 14-21 days until the first killing frost	Downy mildew Powdery mildew

[1] For more detailed information, see the 2023 Southeast Regional Bunch Grape Integrated Management Guide of the Southern Region Small Fruit Consortium (https://secure.caes.uga.edu/extension/publications/files/pdf/AP%20131-1_1.PDF).

[2] This is one of the most important sprays for downy mildew, powdery mildew, Phomopsis and black rot because it is the stage when grape berries become susceptible to infection by black rot, downy mildew and powdery mildew. All these pathogens become active due to warmer temperatures.

[3] Mature berries are now resistant to black rot, downy mildew and powdery mildew. Sprays are applied to manage foliar infections caused by these diseases

Table 2. Efficacy of selected fungicides against grape diseases.

Table Legend

Efficacy	Rating
Excellent Activity	EA
Good Activity	GA
Moderate Activity	MA
Limited Activity	LA
Very Limited Activity	VLA
No Significant Activity	NSA

Table is reproduced from the 2023 Southeast Regional Bunch Grape Integrated Management Guide of the Southern Region Small Fruit Consortium (https://secure.caes.uga.edu/extension/publications/files/pdf/AP%20131-1_1.PDF).

The efficacy rating could be affected by resistance development. If resistance has occurred, use of fungicides in the same class would likewise show resistance, and a substitute fungicide should be considered for pathogen management.

No data is provided for products not labeled for the specific disease or if the efficacy is unknown. These ratings are benchmarks; actual performance will vary.

Chemical Name	Product Choices	Anthracnose	Black Rot	Botrytis Bunch Rot	Downy Mildew	Phomopsis Cane and Leaf Spot	Powdery Mildew
Azoxystrobin			EA	MA[1]	EA[1]	MA	EA[1]
Benzovindiflupyr, isofetamid	Aprovia, Kenja	MA[2]	GA	EA[2]	EA[2]	N/A	GA[2]
Boscalid	Endura		EA[1]				GA[2]
Boscalid + pyraclostrobin	Pristine	GA	EA	EA[1]	EA[1]	EA	EA
Cyazofami	Ranman				GA		
Captan	Captan, Captec, etc.	MA	MA	LA	GA	GA	NSA
Fixed coppers and bordeaux mixture	various products		MA	MA	MA	LA	LA
Cyflufenamid	Torino		NSA	NSA	NSA	NSA	GA
Cyprodinil	Vangard		NSA	EA[1]	NSA	NSA	LA
Cyprodinil + fludioxonil	Switch			GA[1]			
Cyprodinil + difenoconazole	Inspire Super		GA	GA[1]			GA
Famoxadone + cymoxanil	Tanos				MA[1]		
Fenhexamid	Elevate		NSA	EA[1]	NSA	NSA	NSA
Ferbam	Ferbam		MA	NSA	LA	LA	NSA
Fenarimol	Rubigan		LA	NSA	NSA	NSA	GA[1]
Fluopicolide	Presidio	NSA	NSA	NSA	EA	NSA	NSA
Iprodione	Rovral, Meteor	NSA	NSA	LA[1]	NSA	NSA	NSA
Kresoxim-methyl	Sovran		EA	VLA[1]	LA[1]	MA	GA[1]
Lime sulfur	dormant application	MA		NSA	NSA	MA	LA
Mancozeb	various: Penncozeb, Dithane, etc.		EA	NSA	EA	EA	NSA
Mandipropamid	Revus	NSA	NSA	NSA	EA	NSA	NSA
Mandipropamid + difenoconazole	Revus Top		GA	NSA	EA	LA[2]	GA
Mefenoxam + copper	Ridomil Gold Copper		LA	LA	EA	LA	LA
Mefenoxam + mancozeb	Ridomil Gold MZ		MA	NSA	EA	MA	NSA
Metrafenone	Vivando		NSA	NSA	NSA	NSA	GA
Myclobutanil	Rally		GA	NSA	NSA	NSA	GA[1]

Chemical Name	Product Choices	Anthracnose	Black Rot	Botrytis Bunch Rot	Downy Mildew	Phomopsis Cane and Leaf Spot	Powdery Mildew
Phosphonate	ProPhyt, Phostrol, etc.				GA		
Sulfur[3]	various		NSA	NSA	NSA	LA	EA
Tebuconazole	Elite		EA	NSA	NSA	NSA	GA[1]
Tetraconazole	Mettle						MA[1]
Thiophanate-methyl	Topsin M		LA	NSA	NSA	MA	GA[1]
Trifloxystrobin	Flint		EA	GA	MA	LA	GA[1]
Triflumazol	Procure and Viticure		LA[1]	NSA	NSA	NSA	EA
Ziram	Ziram		GA	LA	GA	MA	NSA

[1] Resistance (or occasional failure of control) has been observed in some southeastern states; thus, if control failure occurs, it could indicate resistance has developed.

[2] Insufficient data for the pathogen-chemical combination. The rating was given based on the general knowledge on the material.

[3] Sulfur will cause burn on sensitive varieties, especially on hot days, >85 F.

Table 3. Recommended pesticides, rates and pesticide use restrictions for anthracnose (*Elsinoe ampelina*) in grapes.

Product Choices[1]	Chemical Name	Product Mode of Action Group[2]	Rate[3,4]	PHI[5]	Maximum Use
Aprovia	benzovindiflupyr	7	8.6-10.5 fl oz	21	31.5 fl oz
Eagle 40WP	myclobutanil	3	3-5 oz	14	1.5 lb
Fosphite	phosphite[8] (phosphorous acid salts)	33	1-3 qt	-	-
Inspire Super[7]	cyprodinil + difenoconazole	3, 9	16-20 fl oz	14	80 fl oz
Kenja 400SC	isofetamid	-	20-22 fl oz	14	66 fl oz
K-phite 7LP	phosphite[8] (phosphorous acid salts)	33	1-3 qt	-	-
Mettle 125ME	tetraconazole	3	3-5 fl oz	14	10 fl oz
Ph-D WDG	polyoxin D zinc salt	19	6.2 oz	7	3 app
Pristine[6]	boscalid + pyraclostrobin	7, 11	8-12.5 oz	14	69 oz
Quadris Top	azoxystrobin+difenoconazole	11,3	12-14 oz	14	56 fl oz
Rampart	phosphite[8] (phosphorous acid salts)	33	1-3 qt	-	-
Revus Top	difenoconazole + mandipropamid	3, 40	7 fl oz	14	28 fl oz

[1] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[2] Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

[3] Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

[4] All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

[5] Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

[6] Do not use on Concord or Noiret. Possible foliar injury may also occur on Worden, Fredonia, Niagara, Steuben or Rougeon. See label for additional restrictions.

[7] Do not use on Concords or Thomcord.

[8] Do not apply when temperatures exceed 90 F, shortly after a rain event, or during color break of the fruit.

Table 4. Recommended pesticides, rates and pesticide use restrictions for bitter rot (*Greeneria uvicola*) in grapes.

Product Choices[1]	Chemical Name	Product Mode of Action Group[2]	Rate[3,4]	PHI[5]	Maximum Use
Incognito 85WDG	thiophanate-methyl	1	0.8-1.2 lb	14	3.2 lb
Thiophanate-methyl 85WDG	thiophanate-methyl	1	0.6-1.2 lb	14	3.2 lb
T-Methyl 70WSB	thiophanate-methyl	1	0.75-1.5 lb	7	6 lb
Topsin M 70WP	thiophanate-methyl	1	0.75-1.5 lb	7	6 lb

[1] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).
[2] Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.
[3] Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.
[4] All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.
[5] Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 5. Recommended pesticides, rates and pesticide use restrictions for black rot (*Guignardia bidwellii*) in grapes.

Product Choices[1]	Chemical Name	Product Mode of Action Group[2]	Rate[3,4]	PHI[5]	Maximum Use
Abound 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Adament 50WG[16]	tebuconazole + trifloxystrobin	3, 11	3-6 oz	14	48 oz
Aframe	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Aprovia	benzovindiflupyr	7	8.6-10.5 fl oz	21	31.5 fl oz
Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
AzoxyStar	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Captan 38.75%[17]	captan	M	1.5-2 qt	0	12 qt
Captec 4L[17]	captan	M	0.75-1 qt/100 gal	0	2 qt
Champ WG[10]	copper hydroxide	M	2-6 lb	0	40 lb
ChampION[10]	copper hydroxide	M	0.75-1.75	0	66.7 lb
Cuprofix Ultra 40 Disperss[10]	copper sulfate	M	1.25-3 lb	14	50 lb
Cuproxat[10]	copper sulfate	M	2.5-6 pt	14	98.6 pt
Dithan F45	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Dithan M45	mancozeb	M	1.5-4 lb	66	24 lb
Eagle 20EW	myclobutanil	3	6-10 fl oz	14	46 fl oz
Eagle 40WP	myclobutanil	3	3-5 oz	14	1.5 lb
Elite 45DF	tebuconazole	3	4 oz	14	2 lb

Product Choices[1]	Chemical Name	Product Mode of Action Group[2]	Rate[3,4]	PHI[5]	Maximum Use
Flint 50WG[7]	trifloxystrobin	11	1.5-4 oz[8]	14	24 oz
Incognito 85WDG	thiophanate-methyl	1	0.8-1.2 lb	14	3.2 lb
Inspire Super[11]	cyprodinil + difenoconazole	3, 9	16-20 fl oz	14	80 fl oz
ManKocide[10]	copper hydroxide + mancozeb	M	2.5 lb	66	66.7 lb
Manzate Flowable	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Manzate Max	mancozeb	M	1.2-3.2 qt	67	19.2 qt
Manzate Pro-Stick	mancozeb	M	1.5-4 lb	66	7.5 lb
Mettle 125ME	tetraconazole	3	3-5 fl oz	14	10 fl oz
Orius 20AQ	tebuconazole	3	8.6 oz	14	68.8 oz
Penncozeb 75DF	mancozeb	M	1.5-4 lb	66	24 lb
Penncozeb 80WP	mancozeb	M	1.5-4 lb	66	24 lb
Ph-D WDG	polyoxin D zinc salt	19	6.2 oz	7	3 app
Pristine[9]	boscalid + pyraclostrobin	7, 11	8-12.5 oz	14	69 oz
Quadris Top	azoxystrobin+difenoconazole	11, 3	12-14 fl oz	14	56 fl oz
Rally 40WSP	myclobutanil	3	3-5 oz	14	1.5 lb
Revus Top	difenoconazole + mandipropamid	3, 40	7 fl oz	14	28 fl oz
Revus Top	difenoconazole + mandipropamid	3, 40	7 fl oz	14	28 fl oz
Roper DF Rainshield	mancozeb	M	1.5-4 lb	66	24 lb
Satori 2.08	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Sonoma 20EW AG	myclobutanil	3	6-10 fl oz	14	45.6 fl oz
Sovran 50WG	kresoxim-methyl	11	3.2-6.4 oz[8]	14	25.6 oz
Sovran 50WG	kresoxim-methyl	11	3.2-6.4 oz[8]	14	25.6 oz
Tebuzol 45DF	tebuconazole	3	4 oz	14	2 lb
Thiophanate-methyl 85WDG	thiophanate-methyl	1	0.6-1.2 lb	14	3.2 lb
T-Methyl 70WS[8]	thiophanate-methyl	1	0.75-1.5 lb	7	6 lb
Topsin M 70WP	thiophanate-methyl	1	0.75-1.5 lb	7	6 lb
Willowood Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Ziram 76DF	ziram	M	3-4 lb	21	28 lb

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[2] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[3] Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

[4] All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

[5] Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

[6] For resistance management purposes, only 2 applications per year is recommended.

[7] Do not use Flint on Concords.

[8] Rates vary depending on disease. Refer to label for rates and timing.

[9] Do not use on Concord or Noiret. Possible foliar injury may also occur on Worden, Fredonia, Niagara, Steuben or Rougeon. See label for additional restrictions.

[10] See label for variety restrictions. Add hydrated lime (1-3 lb) per pound of Champ WG to minimize foliar injury.

[11] Do not use on Concords or Thomcord.

[12] Use a surfactant when Rubigan EC is applied alone.

[13] Prebloom apply 2-4 fl oz/A; Postbloom apply 4-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

[14] Prebloom apply 3-4 fl oz/A; Postbloom apply 5-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

[15] Do not apply when temperatures exceed 90 F, shortly after a rain event, or during color break of the fruit.

[16] See label for variety restrictions.

[17] Suppression only

Table 6. Recommended pesticides, rates and pesticide use restrictions for botrytis bunch rot (*Botrytis cinered*) in grapes.

Product Choices[1]	Chemical Name	Product Mode of Action Group[2]	Rate[3,4]	PHI[5]	Maximum Use
Abound 2SC[17]	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Adament 50WG[16]	tebuconazole + trifloxystrobin	3, 11	3-6 oz	14	48 oz
Aframe[17]	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Aprovia	benzovindiflupyr	7	8.6-10.5 fl oz	21	31.5 fl oz
Azoxy 2SC[17]	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
AzoxyStar[17]	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Dithan F45	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Dithan M45	mancozeb	M	1.5-4 lb	66	24 lb
Elevate 50WDG	fenhexamid	17	1 lb	0	3 lb
Endura 30WG	boscalid	7	8 oz	14	24 oz
Flint 50WG[7]	trifloxystrobin	11	1.5-4 oz[8]	14	24 oz
Gavel 75DF	mancozeb + zoxamide	M, 22	2-2.5 lb	66	15 lb
Inspire Super[11]	cyprodinil + difenoconazole	3, 9	16-20 fl oz	14	80 fl oz
Iprodione 4L AG	iprodione	43	1-2 pt	7	4 app
Kenja 400SC	isofetamid	7	20-22 fl oz	14	66 fl oz
Manzate Flowable	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Manzate Max	mancozeb	M	1.2-3.2 qt	67	19.2 qt
Manzate Pro-Stick	mancozeb	M	1.5-4 lb	66	7.5 lb
Meteor	iprodione	43	1-2 pt	7	4 app
Nevado 4F	iprodione	43	1-2 pt	7	4 app
OSO 5%	polyoxin D zinc salt	19	3.75-13 fl oz	0	6 app
Penncozeb 75DF	mancozeb	M	1.5-4 lb	66	24 lb
Penncozeb 80WP	mancozeb	M	1.5-4 lb	66	24 lb
Ph-D WDG	polyoxin D zinc salt	19	6.2 oz	0	3 app
Pristine[9,17]	boscalid + pyraclostrobin	7, 11	18.5-23 oz	14	69 oz
Quadris Top[17]	azoxystrobin+difenoconazole	11,3	12-14 oz	14	56 fl oz
Roper DF Rainshield	mancozeb	M	1.5-4 lb	66	24 lb
Rovral 4F	iprodione	43	1-2 pt	7	4 app
Satori 2.08[17]	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Scala SC	pyrimethanil	9	18 fl oz (alone) 9 fl oz (tank mix)	7	36 fl oz

Product Choices[1]	Chemical Name	Product Mode of Action Group[2]	Rate[3,4]	PHI[5]	Maximum Use
Sovran 50WG	kresoxim-methyl	11	3.2-6.4 oz[8]	14	25.6 oz
Switch 62.5WG	cyprodinil + fludioxonil	9, 12	11-14 oz	7	56 oz
Topsin M 70WP	thiophanate-methyl	1	0.75-1.5 lb	7	6 lb
Vangard WG	cyprodinil	9	10 oz (alone) 5-10 oz (tank mixtures)	7	30 oz
Vivando	metrafenone	U8	10.3-15.4 fl oz	14	46.2 fl oz
Willowood Azoxy 2SC[17]	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz

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[2] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[3] Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

[4] All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

[5] Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

[6] For resistance management purposes, only 2 applications per year is recommended.

[7] Do not use Flint on Concords.

[8] Rates vary depending on disease. Refer to label for rates and timing.

[9] Do not use on Concord or Noiret. Possible foliar injury may also occur on Worden, Fredonia, Niagara, Steuben or Rougeon. See label for additional restrictions.

[10] See label for variety restrictions. Add hydrated lime (1-3 lb) per pound of Champ WG to minimize foliar injury.

[11] Do not use on Concords or Thomcord.

[12] Use a surfactant when Rubigan EC is applied alone.

[13] Prebloom apply 2-4 fl oz/A; Postbloom apply 4-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

[14] Prebloom apply 3-4 fl oz/A; Postbloom apply 5-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

[15] Do not apply when temperatures exceed 90 F, shortly after a rain event, or during color break of the fruit.

[16] See label for variety restrictions.

[17] Suppression only

Table 7. Recommended pesticides, rates and pesticide use restrictions for downy mildew (*Plasmopara viticola*) in grapes.

Product Choices[1]	Chemical Name	Product Mode of Action Group[2]	Rate[3,4]	PHI[5]	Maximum Use
Abound 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Adament 50WG[10]	tebuconazole + trifloxystrobin	3, 11	3-6 oz	14	48 oz
Aframe	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Aliette	aluminum tris	33	3-5 lb	15	7 app
Alude	phosphite[9]	33	2.5-5 pt	NA	NA
Aprovia	benzovindiflupyr	7	8.6-10.5 fl oz	21	31.5 fl oz
Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
AzoxyStar	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Captan 38.75%	captan	M	1.5-2 qt	0	12 qt
Captec 4L	captan	M	0.75-1 qt/100 gal	0	2 qt
Champ WG[10]	copper hydroxide	M	2-6 lb	0	40 lb
ChampION[10]	copper hydroxide	M	0.75-1.75	0	66.7 lb
Cuprofix Ultra 40 Disperss[10]	copper sulfate	M	1.25-3 lb	14	50 lb
Cuproxat[10]	copper sulfate	M	2.5-6 pt	14	98.6 pt
Dithan F45	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Dithan M45	mancozeb	M	1.5-4 lb	66	24 lb
Dithane F45 Rainshield	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Flint 50WG[11]	trifloxystrobin	11	1.5-4 oz[8]	14	24 oz
Forum	dimethomorph	40	6 fl oz	14	24 fl oz
Fosphite	phosphite[9]	33	1-3 qt	NA	NA
Gavel 75DF	mancozeb + zoxamide	M, 22	2-2.5 lb	66	15 lb
K-phite 7LP	phosphite[9]	33	1-3 qt	NA	NA
ManKocide[7]	copper hydroxide + mancozeb	M	2.5 lb	66	66.7 lb
Manzate Flowable	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Manzate Max	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Manzate Pro-Stick	mancozeb	M	1.5-4 lb	66	7.5 lb
Penncozeb 75DF	mancozeb	M	1.5-4 lb	66	24 lb
Penncozeb 80WP	mancozeb	M	1.5-4 lb	66	24 lb
Phostrol	phosphite[9]	33	2.5-5 pt	NA	NA
Presidio	fluopicolide	43	3-4 fl oz	21	12 fl oz

Product Choices[1]	Chemical Name	Product Mode of Action Group[2]	Rate[3,4]	PHI[5]	Maximum Use
Pristine[6]	boscalid + pyraclostrobin	7, 11	8-12.5 oz	14	69 oz
Quadris Top	azoxystrobin+difenoconazole	11, 3	12-14 fl oz	14	56 fl oz
Rampart	phosphite[9]	33	1-3 qt	NA	NA
Ranman 400SC	cyazofamid	21	2.1-2.75 fl oz	30	16.5 fl oz
Reason 500SC	fenamidone	11	2.7 fl oz	30	8.1 fl oz
Revus	mandipropamid	40	8 fl oz	14	32 fl oz
Ridomil Gold MZ WG	mefenoxam + mancozeb	4, M	2.5 lb	66	11 lb
Ridomil Gold SL, Ultra Flourish	mefenoxam	NA	3.6 pt	60	0.4 lb ai
Ridomil Gold/Copper	mefenoxam + copper hydroxide	4, M	2.5 lb	42	10 lb
Roper DF Rainshield	mancozeb	M	1.5-4 lb	66	24 lb
Satori 2.08	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Sovran 50WG	kresoxim-methyl	11	3.2-6.4 oz[8]	14	25.6 oz
Tanos	famoxodone + cymoxanil	11, 27	8 oz	30	72 oz
Willowood Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Zampro	ametoctradin + dimethomorph	45, 40	11-14 fl oz	14	56 fl oz
Ziram 76DF	ziram	M	3-4 lb	21	28 lb

[1] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[2] Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

[3] Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

[4] All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

[5] Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

[6] Do not use on Concord or Noiret. Possible foliar injury may also occur on Worden, Fredonia, Niagara, Steuben or Rougeon. See label for additional restrictions.

[7] See label for variety restrictions. Add hydrated lime (1-3 lb) per pound of Champ WG to minimize foliar injury.

[8] Rates vary depending on disease. Refer to label for rates and timing.

[9] Do not apply when temperatures exceed 90 F, shortly after a rain event, or during color break of the fruit.

[10] See label for variety restrictions.

[11] Do not use Flint on Concords.

Table 8. Recommended pesticides, rates and pesticide use restrictions for Phomopsis cane and leaf spot (*Phomopsis viticola*) in grapes.

Product Choices[1]	Chemical Name	Product Mode of Action Group[2]	Rate[3,4]	PHI[5]	Maximum Use
Abound 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Adament 50WG[16]	tebuconazole + trifloxystrobin	3, 11	3-6 oz	14	48 oz
Aframe	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Aprovia	benzovindiflupyr	7	8.6-10.5 fl oz	21	31.5 fl oz
Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
AzoxyStar	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Captan 38.75%	captan	M	1.5-2 qt	0	12 qt
Captec 4L	captan	M	0.75-1 qt/100 gal	0	2 qt
Champ WG10	copper hydroxide	M	2-6 lb	0	40 lb
ChampION10	copper hydroxide	M	0.75-1.75	0	66.7 lb
Cuprofix Ultra 40 Disperss[10]	copper sulfate	M	1.25-3 lb	14	50 lb
Cuproxat[10]	copper sulfate	M	2.5-6 pt	14	98.6 pt
Dithan F45	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Dithan M45	mancozeb	M	1.5-4 lb	66	24 lb
Flint 50WG[7]	trifloxystrobin	11	1.5-4 oz[8]	14	24 oz
Gavel 75DF	mancozeb + zoxamide	M, 22	2-2.5 lb	66	15 lb
ManKocide[10]	copper hydroxide + mancozeb	M	2.5 lb	66	66.7 lb
Manzate Flowable	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Manzate Max	mancozeb	M	1.2-3.2 qt	67	19.2 qt
Manzate Pro-Stick	mancozeb	M	1.5-4 lb	66	7.5 lb
Microthiol Disperss	sulfur	M	3-10 lb	NA	NA
Penncozeb 75DF	mancozeb	M	1.5-4 lb	66	24 lb
Penncozeb 80WP	mancozeb	M	1.5-4 lb	66	24 lb
Pristine[9]	boscalid + pyraclostrobin	7, 11	8-12.5 oz	14	69 oz
Quadris Top	azoxystrobin+difenoconazole	11,3	12-14 oz	14	56 fl oz
Revus Top	difenoconazole + mandipropamid	3, 40	7 fl oz	14	28 fl oz
Roper DF Rainshield	mancozeb	M	1.5-4 lb	66	24 lb
Satori 2.08	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Sovran 50WG	kresoxim-methyl	11	3.2-6.4 oz[8]	14	25.6 oz
Willowood Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz

[1] Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

[2] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[3] Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

[4] All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

[5] Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

[6] For resistance management purposes, only 2 applications per year is recommended.

[7] Do not use Flint on Concords.

[8] Rates vary depending on disease. Refer to label for rates and timing.

[9] Do not use on Concord or Noiret. Possible foliar injury may also occur on Worden, Fredonia, Niagara, Steuben or Rougeon. See label for additional restrictions.

[10] See label for variety restrictions. Add hydrated lime (1-3 lb) per pound of Champ WG to minimize foliar injury.

[11] Do not use on Concords or Thomcord.

[12] Use a surfactant when Rubigan EC is applied alone.

[13] Prebloom apply 2-4 fl oz/A; Postbloom apply 4-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

[14] Prebloom apply 3-4 fl oz/A; Postbloom apply 5-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

[15] Do not apply when temperatures exceed 90 F, shortly after a rain event, or during color break of the fruit.

[16] See label for variety restrictions.

Table 9. Recommended pesticides, rates and pesticide use restrictions for powdery mildew (*Uncinula necator*) in grapes.

Product Choices[1]	Chemical Name	Product Mode of Action Group[2]	Rate[3,4]	PHI[5]	Maximum Use
Abound 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Aframe	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Aprovia	benzovindiflupyr	7	8.6-10.5 fl oz	21	31.5 fl oz
Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
AzoxyStar	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Champ WG[10]	copper hydroxide	M	2-6 lb	0	40 lb
ChampION[10]	copper hydroxide	M	0.75-1.75	0	66.7 lb
Cuprofix Ultra 40 Disperss[10]	copper sulfate	M	1.25-3 lb	14	50 lb
Cuproxat[10]	copper sulfate	M	2.5-6 pt	14	98.6 pt
Eagle 20EW	myclobutanil	3	6-10 fl oz	14	46 fl oz
Eagle 40WP	myclobutanil	3	3-5 oz	14	1.5 lb
Elevate 50WDG[17]	fenhexamid	17	1 lb	0	3 lb
Elite 45DF	tebuconazole	3	4 oz	14	2 lb
Endura 30WG	boscalid	7	4.5 oz	14	24 oz
Flint 50WG[7]	trifloxystrobin	11	1.5-4 oz[8]	14	24 oz
Fosphite	phosphite[9]	33	1-3 qt	NA	NA
Incognito 85WDG	thiophanate-methyl	1	0.8-1.2 lb	14	3.2 lb
Inspire Super[11]	cyprodinil + difenoconazole	3, 9	16-20 fl oz	14	80 fl oz
Kenja 400SC	isofetamid	7	20-22 fl oz	14	66 fl oz
K-phite 7LP	phosphite[9]	33	1-3 qt	NA	NA
Liquid Sulfur Six	sulfur	M	1-2 pt/100 gal	NA	8 pt
ManKocide[10]	copper hydroxide + mancozeb	M	2.5 lb	66	66.7 lb
Mettle 125ME	tetraconazole	3	3-5 fl oz	14	10 fl oz
Microfine Sulfur	sulfur	M	3.8-25 lb	NA	NA
Microthiol Disperss	sulfur	M	3-10 lb	NA	NA
Orius 20AQ	tebuconazole	3	8.6 oz	14	68.8 oz
OSO 5%	polyoxin D zinc salt	19	3.75-13 fl oz	0	6 app
Ph-D WDG	polyoxin D zinc salt	19	6.2 oz	7	3 app
Pristine[9]	boscalid + pyraclostrobin	7, 11	8-12.5 oz	14	69 oz
Procure 480SC	triflumizole	3	4-8 oz	7	32 oz

Product Choices[1]	Chemical Name	Product Mode of Action Group[2]	Rate[3,4]	PHI[5]	Maximum Use
Quadris Top	azoxystrobin+difenoconazole	11,3	12-14 oz	14	56 fl oz
Quintec	quinoxyfen	13	3-6.6 fl oz	14	33 fl oz
Rally 40WSP	myclobutanil	3	3-5 oz	14	1.5 lb
Rampart	phosphite[9]	33	1-3 qt	NA	NA
Revus Top	difenoconazole + mandipropamid	3, 40	7 fl oz	14	28 fl oz
Rubigan EC[12]	fenarimol	3	2-6 fl oz[13]	21	19 fl oz
Satori 2.08	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Sonoma 20EW AG	myclobutanil	3	6-10 fl oz	14	45.6 fl oz
Tebuzol 45DF	tebuconazole	3	4 oz	14	2 lb
Thiophanate-methyl 85WDG	thiophanate-methyl	1	0.6-1.2 lb	14	3.2 lb
T-Methyl 70WSB	thiophanate-methyl	1	0.75-1.5 lb	15	6 lb
Topsin M 70WP	thiophanate-methyl	1	0.75-1.5 lb	7	6 lb
Torino	cyflufenamid	U6	3.4 oz	3	6.8 oz
Vangard WG[17]	cyprodinil	9	10 oz (alone) 5-10 oz (tank mixtures)	7	30 oz
Vintage SC	fenarimol	3	3-6 fl oz[14]	21	21 fl oz
Willowood Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Yellow Jacket Dusting	sulfur	M	10-20 lb	NA	NA
Yellow Jacket Wettable	sulfur	M	3.8-25 lb	NA	NA

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[4] All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

[5] Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

[6] For resistance management purposes, only 2 applications per year is recommended.

[7] Do not use Flint on Concords.

[8] Rates vary depending on disease. Refer to label for rates and timing.

[9] Do not use on Concord or Noiret. Possible foliar injury may also occur on Worden, Fredonia, Niagara, Steuben or Rougeon. See label for additional restrictions.

[10] See label for variety restrictions. Add hydrated lime (1-3 lb) per pound of Champ WG to minimize foliar injury.

[11] Do not use on Concords or Thomcord.

[12] Use a surfactant when Rubigan EC is applied alone.

[13] Prebloom apply 2-4 fl oz/A; Postbloom apply 4-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

[14] Prebloom apply 3-4 fl oz/A; Postbloom apply 5-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

[15] Do not apply when temperatures exceed 90 F, shortly after a rain event, or during color break of the fruit.

[16] See label for variety restrictions.

[17] Suppression only

The grape section was revised October 2023 by R. Singh.