

WINEGRAPE SPRAY PROGRAM

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NOTES: The Insecticide Resistance Action Committee (IRAC) groups insecticides into mode of action (MOA) categories. These categories are listed following the pesticide and formulation names. To reduced the risk of resistance development, avoid successive applications of insecticides with the same MOA for the same pest.

Organically acceptable insecticides (OMRI listed) are indicated in Comments and Precautions.

Some insecticide active ingredients are available in several formulations and under several trade names. For simplicity, the most common trade names and associated rates are listed. This is not intended to encourage the use of these products over generic versions.

TABLE 7-6. WINEGRAPE SPRAY PROGRAM

When to Spray and Disease/ Pest	Pesticide, Formulation, and MOA	Amount of Formulation to Use per Acre	Precautions and Remarks
DORMANT Anthracnose, Black rot, Phomopsis	Cuprofix Ultra Dispers	4 lb	Needed only where anthracnose is a problem.
	OR liquid lime sulfur	10 gal	A dormant application of lime sulfur may help reduce the overwintering inoculum of fungi that cause black rot and phomopsis.
BUD SWELL Grape flea beetle	carbaryl, MOA 1A (Sevin XLR Plus)	1 to 2 qt	Apply only if damaging numbers of adult beetles are present.
	OR fenpropathrin, MOA 3 (Danitol 2.4 EC)	8 fl oz	
	OR phosmet, MOA 1B (Imidan 70WP)	2 lb	
Climbing cutworms	<i>Bacillus thuringiensis (Bt)</i> , MOA 11	rates vary	Scout for cutworm if damaged buds are observed. Look for cutworms at night. Cutworm treatment may be justified if greater than 4% of the buds examined are damaged and the variety does not have fruitful secondary buds. Spray in the evening if possible as cutworms are active at night. Entrust is OMRI listed.
	OR carbaryl, MOA 1A (Sevin XLR Plus)	1 to 2 qt	
	OR fenpropathrin, MOA 3 (Danitol 2.4 EC)	10.66 to 21.33 fl oz	
	OR methoxyfenozide, MOA 18 (Intrepid 2F)	12 to 16 fl oz	
	OR spinosad, MOA 5 (SpinTor 2SC) (Entrust 80WP)	8 fl oz 2.5 oz	
	OR flubendiamide, MOA 28 (Belt SC) OR rynaxypyr, MOA 28 (Altacor)	3 to 4 fl oz 3 to 4.5 fl oz	
Mealybugs, European red mite, and scale insects	horticultural oils (Omni Supreme Spray Oil)	0.5 to 1% by volume	Scout for mealybugs and European red mite under bark during dormant season. Use a minimum 10x handlens to observe European red mite (ERM). If mealybugs or ERM were of economic concern during the previous season and present during dormant scouting, a dormant oil treatment may be justified during bud swell. DO NOT apply oil treatments in combination with sulfur or within 30 days of sulfur application. DO NOT apply oils when temperature will exceed 90°F or dip below freezing. Organic JMS Stylet Oil is OMRI listed.
	(JMS Stylet Oil)	1 to 2% by volume	
	(Organic JMS Stylet Oil)	1 to 2% by volume	
AT OR JUST BEFORE BUDBURST Leafhopper/sharshooters (Pierce's Disease suppression), mealybugs	clothianidin, MOA 4A (Clutch)	6 oz	Apply as a soil application; see label for details. Make no more than 1 application per season by drip. Maximum of 14 oz allowable per season. Use either drip irrigation or trench application. Make no more than 1 soil application per season by drip. Only consider a systemic soil applied insecticide for mealybugs if these insects have been a problem in the previous year or if dormant sampling suggests that high populations are present.
	dinotefuran, MOA 4A (Venom)	5 to 6 oz	
	imidacloprid, MOA 4A (Admire Pro)	7 to 14 fl oz	
NEW SHOOTS (7- to 10-day interval beginning at 1-inch shoot growth until Prebloom Spray) Phomopsis, Black rot, Powdery mildew, Downy mildew	mancozeb 75 DF, or 4 F +	2 to 4 lb 1.6 to 3.2 qt	A powdery mildew fungicide is generally not needed in the first spray (1-in. shoot growth) unless the disease has been a problem in previous years. Include a fungicide for powdery mildew control in subsequent sprays (sulfur or a sterol inhibiting fungicide (SI) fungicide: myclobutanil, fenarimol, tebuconazole, triflumizole, tetraconazole). To avoid resistance of the powdery mildew fungus to sterol inhibiting SI fungicides, limit use to 3 applications per season, use the maximum labeled rate, and combine with sulfur. Avoid sulfur on sulfur sensitive varieties. Some sulfur injury may occur on sulfur-tolerant varieties if the temperature exceeds 85° F. The activity of sulfur is reduced at temperatures less than 65° F.
	sulfur (various brands) or fenarimol (various brands) 1E or myclobutanil (various brands)	see label 3 fl oz	
	40 WSP, DF, WDG or tebuconazole (various brands)	4 to 5 oz	
	5 DF, 45 WDG or triflumizole (Procur 50 WS) or tetraconazole (Mettle 125ME)	4 oz 4 to 8 oz 3 to 5 fl oz	

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PREBLOOM Flea beetle	See Bud Swell recommendations		
Grape berry moth	methoxyfenozide, MOA 18 (Intrepid 2F) OR spinosad, MOA 5 (SpinTor 2SC) (Entrust) OR phosmet, MOA 1B (Imidan 70WP) OR methomyl, MOA 1A (Lannate SP) (Lannate LV) OR fenpropathrin, MOA 3 (Danitol 2.4 EC) OR rynaxypyr, MOA 28 (Altacor) OR spinetoram, MOA 5 (Delegate)	12 to 16 fl oz 4 to 8 fl oz 1.25 to 2.5 oz 2 lb 0.5 to 1 lb 1.5 to 3 pt 10.6 fl oz 2 to 4.5 oz 3 to 5 oz	Only treat if grape berry moth adults are captured in pheromone traps. Minimum application of Intrepid for airblast sprayers is 40 gal per acre. Use higher rates for SpinTor or Entrust when infestation is heavy or large larvae are present. Entrust is OMRI listed. Use between 100 to 200 gal total spray volume.
PREBLOOM Leafhoppers/ Sharpshooters (Pierce's Disease suppression) Initiation of foliar treatments should be based on trap captures.	acetamiprid, MOA 4A (Assail WSP) OR dinotefuran, MOA 4A (Venom) OR imidacloprid, MOA 4A (Provado) (Admire Pro) OR clothianidin, MOA 4A (Clutch) OR fenpropathrin, MOA 3 (Danitol 2.4 EC) OR carbaryl, MOA 1A (Sevin 80S) OR malathion, MOA 1B (Malathion 57EC) (Malathion 5) OR phosmet, MOA 1B (Imidan 70WP)	2.5 oz 1 to 3 oz 7 to 14 fl oz 3 to 4 fl oz 1 to 2 oz 5.33 to 10.66 fl oz 1.25 to 2.5 lb 3 pt 3 pt 2 lb	If foliar and soil applications of group 4A pesticides are part of a management plan for Pierce's disease (ie. Admire Pro applied via drip and Venom foliar), at least one application of a different MOA insecticide should occur as a rotation between these treatments. If Venom is applied as a soil application at budburst, a second spray for leafhoppers is not needed within 30 days of the soil application. Venom may be applied to the soil at this time, however, only one soil application can be made per year; see label for details. Provado is a foliar spray. Admire Pro is applied to the soil and may be applied in drip or trickle or microsprinkler irrigation, as a subsurface sidedressing shanked into the root zone followed by irrigation or a drench in sufficient water to ensure penetration into the root zone followed by irrigation. See label. Synthetic pyrethroid insecticides (Group 3) and organophosphates (Groups 1A and 1B) are broad spectrum insecticides and have the potential to flare spider mite populations. Observe spider mites before and after treatments to determine if these populations increase.
BLOOM Botrytis	iprodione (various brands) 75 WG or 4 F OR cyprodinil (Vangard 75 WG) OR fenhexamid (Elevate 50 WDG) OR pyrimethanil (Scala SC) OR boscalid (Endura 30W)	1 to 1.33 lb 1 to 2 pt 10 oz 1 lb 18 fl oz 8 oz	A spray for botrytis during bloom may be beneficial in wet seasons and in vineyards with a botrytis problem. Elevate, Endura, iprodione, and Vangard should be rotated through the season to avoid resistance development. See product labels for complete information on resistance management and use restrictions. Endura will also control powdery mildew.
Phomopsis, Black rot, Powdery mildew, Downy mildew	See prebloom recommendations		A bloom spray should be made if the time interval between the last prebloom spray and the postbloom spray is more than 10 days.
Thrips	spinosad, MOA 5 (SpinTor 2 SC) (Entrust 80WP) spinetoram, MOA 5, (Delegate) dinotefuran, MOA 4A (Venom) azadirachtin, MOA Unknown (Aza-Direct) pyrethrins, MOA 3 (Pyganic 1.4 EC) (Pyganic 5 EC)	4 to 8 fl oz 1.25 to 2.5 oz 3 to 5 oz 1 to 3 oz 1 to 2 pt 16 to 64 fl oz 4.5 to 18 fl oz	Thrips treatment may be justified if populations exceed an average of 10 thrips per cluster. To sample for thrips, beat blossom clusters over a white surface and count the number of thrips dislodged onto the surface. Count immediately after beating the blossom cluster. Sample at least 10 blossom clusters from different locations in the vineyard. During periods of heavy thrips pressure, a second application may be needed, but make it only if thrips numbers remain high. Wait at least 5 days before making a second application. Entrust is OMRI listed Foliar applications of Group 4A insecticides should NOT be used following a long acting soil application of any group 4A insecticide (i.e. Admire Pro, Venom, or Clutch). Aza-direct is OMRI listed. Data on thrips control is limited. Pyganic 1.4 EC and Pyganic 5 EC are OMRI listed. Data on thrips control is limited. Pyganic should be buffered to a pH between 5.5 and 7.

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POSTBLOOM (10 to 14 days after the Prebloom Spray) Phomopsis, Black rot, Powdery mildew, Downy mildew, Bitter rot, Ripe rot	mancozeb 75 DF or 4 F — PLUS —	2 to 4 lb 1.6 to 3.2 qt	Very important spray for black rot, phomopsis, and powdery mildew control. See comments under PREBLOOM spray regarding resistance of the downy mildew fungus to the QoI fungicides. Do not make more than 6 applications per season of Pristine or Adament or 4 applications of QoI fungicides (Flint, Sovran, and Abound). Do not make more than 2 sequential applications of Flint, Sovran, Abound, Pristine, or Adament. See comments under NEW SHOOTS regarding resistance to SI fungicides. Do not make more than 2 applications of Quintec in sequence or 3 applications per season to avoid resistance. Do not make more than 2 applications of Quintec in sequence or 3 applications per season to avoid resistance. Do not add a crop oil to Revus if the Revus application is within 2 weeks of a sulfur or captan application. Do not make more than 2 applications of Quintec in sequence or 3 applications per season to avoid resistance. Do not make more than 6 total applications of Adament per season. Use the high rate on varieties susceptible to powdery mildew or in blocks where powdery mildew has been a problem.
	myclobutanil (various brands) 40 WSP, DF, WGD or tebuconazole (various brands) 45 DF, 45WDG or tetraconazole (Mettle 125ME) or quinoxyfen (Quintec 2 SC)	4 to 5 oz 4 oz 3 to 5 fl oz 3 to 4 fl oz	
	—OR— Ridomil MZ or Gavel 75 DF — PLUS —	2.5 lb	
	mancozeb 75 DF 4 F — PLUS —	1 to 2 lb 0.8 to 1.6 qt	
	myclobutanil (various brands) 40 WSP, DF, WGD or tebuconazole (various brands) 45 DF, 45WDG or tetraconazole (Mettle 125ME) or quinoxyfen (Quintec 2 SC)	4 to 5 oz 4 oz 3 to 5 fl oz 3 to 4 fl oz	
	—OR— flupicolide (Presido) or famoxadone + cymoxanil (Tanos) or mandipropamid (Revus) — PLUS —	3 to 4 fl oz 8 oz 8 fl oz	
	mancozeb 75 DF 4 F — PLUS —	3 lb 2.4 qt	
	myclobutanil (various brands) 40 WSP, DF, WGD or tebuconazole (various brands) 45 DF, 45WDG or tetraconazole (Mettle 125ME) or quinoxyfen (Quintec 2 SC)	4 to 5 oz 4 oz 3 to 5 fl oz 3 to 4 fl oz	
	—OR— azoxystrobin (Abound 2 SC) —OR— kresoxim-methyl (Sovran 50 WG) —OR— trifloxystrobin (Flint 50 WG) —OR— boscalid + pyraclostrobin (Pristine 38W) —OR— tebuconazole + trifloxystrobin (Adament)	11 to 15.4 fl oz 3.2 to 4.8 oz 2 oz 8 to 10.5 oz 3 to 7.2 oz	

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1st COVER SPRAY (7 to 10 days after Postbloom Spray) Grape berry moth, leafhoppers/ sharpshooters (Pierce's Disease suppression)	See Prebloom recommendations		If foliar and soil applications of group 4A pesticides are part of a management plan for Pierce's Disease (ie. Admire Pro applied via drip and Venom foliar), at least one application of a different MOA insecticide should occur as a rotation between these treatments. Current information indicates that in areas where Pierce's disease is a problem, controlling leafhoppers and sharpshooters through July reduces the risk of Pierce's disease. See labels for preharvest intervals.
Japanese beetle, June beetles	acetamiprid, MOA 4A (Assail WSP) OR azadirachtin, MOA Unknown (Aza-Direct) OR carbaryl, MOA 1A (Sevin XLR Plus) OR fenpropathrin, MOA 3 (Danitol 2.4 EC) OR malathion, MOA 1B (7EC) (5) OR phosmet, MOA 1B (Imidan 70W) OR kaolin clay (Surround WP)	1.1 oz 1 to 2 pt 2 qt 10.6 to 21.3 fl oz 34 pt 4 lb 2.7 pt 1.33 to 2.125 lb 25 to 50 lb	Apply when adults are present in damaging numbers. See labels for preharvest intervals. DO NOT use Japanese beetle traps. Foliar applications of Group 4A insecticides should NOT be used following a long-acting soil application of any group 4A insecticide (i.e. Admire Pro, Venom, or Clutch). Aza-Direct is OMRI listed. Data on Japanese beetle control is limited. Do not apply Danitol within 21 days of harvest. Rates are based on 200 gal per acre spray volume. Surround may delay fruit maturity, and therefore, anticipated harvest date. Fruit harvest characters should be carefully monitored if Surround is used to ensure timely harvest. Surround is OMRI listed.
1st COVER SPRAY (10 to 14 days after Postbloom Spray) Phomopsis, Black rot, Powdery mildew, Downy mildew, Bitter rot, Ripe rot	captan 50 W or 4L or 80 WDG + myclobutanil (various brands) 40 WSP, DF, WDG or tebuconazole (various brands) 5 DF, 45 WDG or quinoxyfen (Quintec 2 SC) —OR— mancozeb 75 DF or 4 F + myclobutanil (various brands) 40 WSP, DF, WDG or tebuconazole (various brands) 45 DF, 45 WDG or tetraconazole (Mettle 125ME) or quinoxyfen (Quintec 2 SC)	2 to 4 lb 1 to 2 qt 1.25 to 2.5 lb 4 to 5 oz 4 oz 6 to 10 fl oz 4 oz 3 to 4 oz 4 to 5 lb 1.6 to 3.2 qt 4 to 5 oz 4 oz 3 to 5 fl oz 3 to 4 fl oz	See comments under POSTBLOOM spray. Do not use more than 24 lb of captan 50 W or 12 qt of captan 4F or 15 lb of captan 80 WDG per acre per season. The REI for Captan varies; follow label directions. Mancozeb has a 66-day preharvest interval.
1st COVER SPRAY (10 to 14 days after Postbloom Spray) Downy mildew	Prophyt OR Phostrol OR Agri-Fos	2.4 pt 2.5 to 5 pt 1.5 to 2.5 qt	These phosphorus acid-based products are excellent eradicants and have pre- and post-symptom activity, providing approximately 7 days protectant activity. They all have a 0-day PHI. Use lower rate of Agri-Fos in 100 gal water per acre early in season, and higher rates in 150 to 200 gal of water per acre in late season and when the canopy is thick. Other phosphite fungicides may be available. See label for correct rates.
CLOSING Botrytis	Same as Bloom Spray		At closing, add Elevate, Endura, Rovral, or Vanguard to the appropriate cover spray for botrytis control. See Bloom Spray for information on resistance management when using Elevate, Endura, Rovral, and Vanguard.
Japanese beetle, June beetle	Same as 1st Cover		
Grape berry moth, Leafhopper/ sharpshooter (Pierce's Disease suppression)	Same as Prebloom		Foliar applications of Group 4A insecticides should NOT be used following a long-acting soil application of any group 4A insecticide (i.e. Admire Pro, Venom, or Clutch). Current information indicates that in areas where Pierce's disease is a problem, controlling leafhoppers and sharpshooters through July reduces the risk of Pierce's disease. See labels for preharvest intervals.

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When to Spray and Disease/ Pest	Pesticide, Formulation, and MOA	Amount of Formulation to Use per Acre	Precautions and Remarks
2nd & SUBSEQUENT COVER SPRAYS (10- to 14-day intervals until the Preharvest Spray) Ripe rot, Bitter rot, Macrophoma rot Downy mildew	captan 50 W or 4 L or 80 WGD	2 to 4 lb 2 to 4 qt 1.25 to 2.5 lb	If additional sprays are needed for powdery mildew control, use sulfur. On sulfur-intolerant varieties and when temperatures exceed 85° F, use an SI fungicide (Rally, Elite, Procure, or Rubigan) in rotation with quinoxyfen (Quintec 2 SC) to keep resistance from developing.
	Prophyt OR Phostrol OR Agri-Fos	2.4 pt 2.5 to 5 pt 1.5 to 2.5 qt	These phosphorus acid-based fungicides (phosphite fungicides) are excellent eradicants and have pre- and post-symptom activity, providing approximately 7 days protectant activity. All have a 0-day PHI. Other phosphite fungicides may be available. Use lower rate of Agri-Fos in 100 gal water per acre early in season, and higher rates in 150 to 200 gal of water per acre in late season and when the canopy is thick. Other phosphite fungicides may be available. See label for correct rates.
Phyloxera, Japanese and June beetles	Same as 1st COVER .		Check labels for preharvest intervals.
2nd & SUBSEQUENT COVER SPRAYS (10- to 14-day intervals until the Preharvest Spray) Grape berry moth, Leafhopper/sharpsooter (Pierce's Disease suppression) Mites	Same as Prebloom		Current information indicates that in areas where Pierce's disease is a problem, controlling leafhoppers and sharpshooters through July reduces the risk of Pierce's disease. If Venom was applied as a soil treatment during prebloom, a second soil application is not permitted, but a foliar spray of Venom is permitted at this time. See label for further restrictions.
	Same as Postbloom		
VERAISON Botrytis	Same as Bloom Spray		
PREHARVEST (10 to 14 days before harvest) Ripe rot, Bitter rot, Macrophoma rot, Botrytis	captan 50 W or 4 F or 80 WGD + iprodisone (various brands) 50 WP or 4 F or cyprodinil (Vanguard 75 WG) or fenhexamide (Elevate 50 WDG) or pyrimethanil (Scala SC) or boscalid (Endura 30W) OR azoxystrobin (Abound 2 SC) OR kresoxim-methyl (Sovran 50 WG) OR trifloxystrobin (Flint 50 WG) OR boscalid + pyraclostrobin (Pristine 38W)	4 lb 1 qt 1.25 to 2.5 lb 1 to 2 lb 1 to 2 pt 10 oz 1 lb 18 fl oz 8 oz 15.4 fl oz 4.8 oz 3 oz 18.5 to 23 oz	Captan has a 0-day PHI. The REI varies; follow label directions. Iprodione has a 7-day preharvest interval. Vanguard has a 7-day preharvest interval. Elevate has a 0-day preharvest interval. Endura has a 14-day preharvest interval. Do not apply Abound within 14 days of harvest. Do not apply Sovran within 14 days of harvest. Do not apply Flint within 14 days of harvest. Do not apply Pristine within 14 days of harvest.
	Prophyt OR Phostrol OR Agri-Fos	2.4 pt 2.5 to 5 pt 1.5 to 2.5 qt	Phosphite fungicides are not very good protectants but they are good eradicants and have pre- and post-symptom activity. All have a 0-day PHI. Other phosphite fungicides may be available. Use higher rate of Agri-Fos in 150 to 200 gal of water per acre late in the season when the canopy is thick. Other phosphite fungicides may be available. Check label for correct rates.
PREHARVEST (10 to 14 days before harvest) Downy mildew Drosophila flies	diazinon (various 50WP) OR malathion (25 WP) (8 EC) OR Pyrethrins MOA 3 (Pyganic 5.0 EC)	6 oz 4 lb 2.7 pt 4.5 to 10 fl oz	Check labels for preharvest intervals Efficacy data for Pyganic against <i>Drosophila</i> are limited. Pyganic should be buffered to a pH between 5.5 and 7. Pyganic is OMRI listed. .
HARVEST Yellowjackets and bees			Check to make sure wasps are not nesting in vines. Spot treat or manually remove nests if present. Widespread insecticide treatment for wasps or bees is not recommended, because treatments with short PHI will not provide control, and only foraging worker wasps or bees will be killed, leaving the rest of the nest for reinfestation.
Multicolored Asian lady beetle	imidacloprid, MOA 4A (Provado)	3 to 4 fl oz	MALB can be a contaminant pest at harvest. Sample at least 10 clusters per acre within a few days of harvest, place in a plastic bag for approximately 30 minutes, and count beetles. Treatment thresholds vary by variety. Data on control with Provado is limited.

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POSTHARVEST (14- to 21- day intervals from harvest until first killing frost) Downy mildew	copper compounds (various formulations) OR mancozeb 75 DF, 80 W or 4 F	See label 2 to 4 lb 1.6 to 3.2 qt	Premature defoliation may predispose vines to winter injury. Use shorter spray intervals when conditions are favorable for disease development. Copper may cause injury under cool, slow-drying conditions. Use mancozeb on copper sensitive varieties for downy mildew control. Use JMS Stylet Oil for powdery mildew control on sulfur sensitive varieties. Do not use captan, sulfur, or copper within 2 weeks of a JMS Stylet Oil application. Prophyt or Phostrol can also be used for downy mildew control.
Powdery mildew	sulfur (various formulations) OR JMS Stylet Oil	See label 1.5 to 2% (See label)	
Borer control: Grape root borer	Soil mounding, cultural control chloropyrifos (Lorsban 4E)	NA 4.5 pt	Use clean cultivation, mound soil (July 1 to Aug. 1) or at first moth emergence when using pheromone traps) or using tightly-sealed plastic mulch 3 ft from the base of vines. This practice will inhibit adult emergence from the soil when well timed. Mounded soil needs to be removed by Sept. 1. Apply 2 quarts of mixture to soil at base of each vine. Make a single application 35 days before harvest. Spray should not contact fruit or foliage. Application can be made with flood nozzles and low pressure (40 to 60 psi). The preharvest interval for Lorsban is 35 days.

For further information, see www.smallfruits.org/SmallFruitsRegGuide/Guides/2006/BunchGrapeSprayGuide16Feb06revised.pdf