Diseases and Insects in Vineyards

Douglas G. Pfeiffer, Extension Entomologist, Virginia Tech
Anton B. Baudoin, Plant Pathologist, Virginia Tech
J. Christopher Bergh, Extension Entomologist, Alson H. Smith Jr. AREC
Mizuho Nita, Extension Plant Pathologist, Alson H. Smith Jr. AREC

Additional information on pest and beneficial species identification is available online at *http://www.virginiafruit.ento.vt.edu/*.
Application rates: The rate per acre column gives rates for low-volume or concentrate applications. Sprays may be applied as semi-concentrate (40-100 gal/A) or concentrate (10-40 gal/A) sprays. Use caution with more concentrated sprays; the smaller droplet sizes associated with low-volume application are more prone to drift. Amount of pesticide to be applied for dilute applications (usually 100 gal/A early in early season, 200 gal/A in mid season, and 300 gal/acre in late season) is usually given on the label.

Table 3.1 - Disease and Insect Control

Pest	Chemical and Formulation	Rate/Acre	Spray Timing and Remarks
Dormant			
Anthracnose (Bird's eye rot) Powdery Mildew Phomopsis	lime sulfur solution	10.0 gal	Only necessary where anthracnose, Phomopsis, or powdery mildew have been a **serious** problem. Lime sulfur can reduce overwintering inoculum of these diseases.
Mealybugs	Applaud 70DF Belay 50WDG Venom 70 Scorpion 35SL Assail 30SG Admire Pro Baythroid XL 1EC Movento 2SC Actara 25WDG	9.0-12.0 oz 6.0 fl oz 1.0-3.0 oz (foliar) 5.0-6.0 oz (soil) 2.0-5.0 fl oz (foliar) 9.0-10.5 fl oz (soil) 2.5 oz 1.0-1.4 fl oz (foliar) 7.0-14.0 fl oz (soil) 2.4-3.2 fl oz 6.0-8.0 fl oz 1.5-3.5 oz	If a problem at harvest in the previous year. If a delayed dormant spray does not provide adequate control, a summer application may be made. Baythroid targets only crawlers. Movento prebloom only in table grapes. The use of Baythroid should be delayed until fourth cover in blocks where spotted wing drosophila must be controlled, in order to observe maximum applications per season.
Grape scale	Dormant oil	2% solution	Apply in high volume (dilute) application. Loose bark on vines makes coverage of scale difficult.
Bud Swell			
Grape flea beetle	Danitol 2.4EC Sevin XLR Plus Imidan 70WP Baythroid XL 1EC	8.0 fl oz 2.0 qt 2.0 lb 2.4-3.2 fl oz	If adult beetles are present in damaging numbers. **See Table 3.4 for Restricted Entry Intervals.** The REI for Imidan may render it impractical for most growers. The use of Baythroid and Tombstone should be delayed until fourth cover in blocks where spotted wing drosophila must be controlled, in order to observe maximum applications per season.
European red mite (ERM)	superior oil (70 sec)	2.0 gal	Only where ERM is a problem. Apply as a dilute spray.

Table 3.1 - Disease and Insect Control (cont.)

Pest	Chemical and Formulation	Rate/Acre	Spray Timing and Remarks
Climbing cutworms	*Bacillus thuringiensis* (Bt)	Rates vary	Spray in evening if possible. Various preparations of Bt available. Check label for rates. **See Table 3.4 for Restricted Entry Intervals.** The use of Delegate, Baythroid, Brigade and Sniper 2 should be delayed until fourth cover in blocks where spotted wing drosophila must be controlled, in order to observe maximum applications per season**.**
	Sevin XLR Plus	2.0 qt	
	Danitol 2.4EC	15.0 fl oz.	
	Intrepid 2F	12.0-16.0 fl oz	
	Tourismo	10.0-14.0 fl oz	
	Entrust 2SC	4.0-8.0 fl oz	
	Delegate 25WG	3.0-5.0 oz	
	Baythroid XL 1EC	2.4-3.2 fl oz	
	Brigade 10WSB	8.0-16.0 oz	
	Altacor 35WDG	3.0-4.5 oz	
	Belt 4SC	3.0-4.0 fl oz	
	Sniper 2	3.2-6.4 fl oz	
New Shoots: at weekly intervals or according to label until pre-bloom			
Black rot, Phomopsis cane and leaf spot, Downy mildew	captan 50WP or equivalent	2.0-4.0 lb	Important to maintain protection starting at 1/2 inch to 1 inch shoot length where black rot or Phomopsis has been a problem. Add a surfactant to improve wetting of pubescent young growth. Captan has only fair efficacy against black rot. At high disease pressure, it should be tank-mixed with a more efficaceous material. Do not make captan applications within two weeks of an oil spray.
	mancozeb 75DF	2.0-4.0 lb	
	Ziram	2.0-4.0 lb	
	See Table 3.2		
Powdery mildew	wettable sulfur (81.25% or 92%)	2.0-5.0 lb (See label)	Where powdery mildew is a severe problem. Do not make sulfur applications within two weeks of an oil spray. Do not use sulfur prior to or during periods of excessively high temperatures. Do not apply sulfur to Concord, red-fruited French-American hybrids, and other sulfur sensitive varieties.
	See Table 3.2		
Anthracnose	copper fungicides with lime	see label	Apply at 4- to 10-inch shoot length. Repeat at 10- to 14-day intervals. Only necessary where anthracnose has been a problem.
	See Table 3.2		
Grape cane girdler	Danitol 2.4EC	10.6 fl oz	When shoots are 4- to 6-inches long, where infesting more than 10% of shoots. Mainly a problem when training young vines. **See Table 3.4 for Restricted Entry Intervals.**
	Imidan 70WP	2.0 lb	
	Baythroid 2EC	2.4-3.2 fl oz	
Redbanded leafroller	Altacor 35WDG	3.0-4.5 oz	Where pest has been a problem in past. Various preparations of Bt available. Check rates. **See Table 3.4 for Restricted Entry Intervals.**
	Entrust 2SC	4.0-8.0 fl oz	
	Delegate 25WG	3.0-5.0 oz	
	Intrepid 2F	12.0-16.0 fl oz	
	Imidan 70WP	2.0 lb	
	Sevin XLR Plus	2.0 qt	
	Bacillus thuringiensis (Bt)	See label	

Table 3.1 - Disease and Insect Control (cont.)

Pest	Chemical and Formulation	Rate/Acre	Spray Timing and Remarks
Climbing cutworms	*Bacillus thuringiensis* (Bt)	See label	Spray in evening if possible. Various preparations of Bt available. Check rates. **See Table 3.4 for Restricted Entry Intervals.** The use of Delegate, Baythroid, Brigade and Sniper 2 should be delayed until fourth cover in blocks where spotted wing drosophila must be controlled, in order to observe maximum applications per season.
	Sevin XLR Plus	2.0 qt	
	Danitol 2.4EC	15.0 fl oz	
	Intrepid 2F	12.0-16.0 fl oz	
	Tourismo	10.0-14.0 fl oz	
	Entrust 2SC	4.0-8.0 fl oz	
	Delegate 25WG	3.0-5.0 oz	
	Baythroid XL 1EC	2.4-3.2 fl oz	
	Brigade 10WSB	3.2-6.4 oz	
	Altacor 35WDG	3.0-4.5 oz	
	Belt 4SC	3.0-4.0 fl oz	
	Sniper 2	3.2-6.4 fl oz	
Pre-Bloom - Just before blossoms open, ***critical spray*** *for black rot, powdery, and downy mildew*			
Black rot	Ziram	2.0-4.0 lb	Infection occurs at 7 or more hours of leaf wetness (dew, fog, and/or rain), depending on temperature. Apply all fungicides before or between these wet periods. Spray every 10-14 days throughout the growing season according to label. Do not use sterol inhibitors (group 3, Rally, Elite, Orius, Procure, Inspire Super, Mettle, Revus Top) or strobilurins (group 11, Abound, Sovran, Flint, or Pristine) continuously; rotate with other groups of fungicides.
	mancozeb 75DF	2.0-4.0 lb	
	Rally 40WSP	3.0-5.0 oz	
	tebuconazole 45% (Orius 45DF, formerly Elite)	4.0 oz	
	Abound	10.0-15.5 fl oz	
	Sovran	3.2-5.6 oz	
	Flint	2.0 oz	
	Pristine	8.0-12.5 oz	
	Adament	4.0-7.2 oz	
	Inspire super	16.0-20.0 oz	
	Revus Top	7.0 oz	
	Luna Experience	5.0-8.6 oz	

Table 3.1 - Disease and Insect Control (cont.)

Pest	Chemical and Formulation	Rate/Acre	Spray Timing and Remarks
Pre-Bloom - Just before blossoms open, ***critical spray*** *for black rot, powdery, and downy mildew (cont.)*			
Downy mildew	captan 50WP	2.0-4.0 lb	Apply 2 weeks before blossom caps begin to drop on very susceptible varieties. Downy mildew strains with resistance to Abound, Pristine, and other Group II fungicides are present in many Virginia locations. Rotating or tank mixing with a different anti-downy-mildew material is recommended. Presidio should be tank-mixed with another fungicide active against downy mildew.
	mancozeb 75DF	2.0-4.0 lb	
	Ridomil Gold MZ	1.5-2.0 lb	
	phosphorous acid	See label	
	Gavel	2.0-2.5 lb	
	Revus	8.0 oz	
	Revus Top	7.0 oz	
	Forum	6.0 oz	
	Ranman	2.1-2.75 oz	
	Presidio	3.0-4.0 oz	
Powdery mildew	tebuconazole 45% (Orius, formerly Elite)	2.0-6.0 oz	Do not use sterol inhibitors (see above under black rot) or strobilurins continuously; rotate with other groups of fungicides. Powdery mildew strains with resistance to the strobilurins (Abound, Sovran, and Flint) are very common in Virginia and can cause control failure! It is recommended that strobilurins be tank mixed with sulfur or another anti-mildew material. Pristine contains a strobilurin, but also a different active chemical (group 7) and does not need to be tank mixed. Rates for sulfur can be increased to as high as 5.0 lb/100 gallons. Severe disease pressure may warrant this, but beware of possible plant injury at higher rates.
	wettable sulfur (81.25% or 92%)	2.0-4.0 lb	
	Rally 40WSP	3.0-5.0 oz	
	Procure	4.0-8.0 oz	
	Pristine	8.0-12.5 oz	
	Endura	4.5 oz	
	Quintec	4.0 oz	
	Adament	7.2 oz	
	Inspire Super	16.0-20.0 oz	
	Revus Top	7.0 oz	
	Vivando	10.3-15.4 oz	
	Luna Experience	5.0-8.6 oz	

Table 3.1 - Disease and Insect Control (cont.)

Pest	Chemical and Formulation	Rate/Acre	Spray Timing and Remarks
Pre-Bloom - Just before blossoms open, ***critical spray*** *for black rot, powdery, and downy mildew (cont.)*			
Grape berry moth	Intrepid 2F Tourismo Entrust 2SC Delegate 25WG Altacor 35WDG Imidan 70WP Belay 50WDG SPLAT-GBM Avaunt 30DG Sevin XLR *Bacillus thuringiensis* (BT)	12.0-16.0 fl oz 10.0-14.0 fl oz 4.0-8.0 fl oz 3.0-5.0 oz 2.0-4.5 oz 2.0 lb 6.0 fl oz 1.0 kg 5.0-6.0 oz 2.0 qt Rates vary	Use higher rate of Entrust for more intensive infestations and larger larvae, where pest has been a problem in past. Mating disruption: SPLAT-GBM is registered for GBM. Spray edge rows with insecticides. For SPLAT-GBM mating disruption, apply when temperatures are between 60-80˚F and no rain is expected within 1 to 2 hours. For high population densities, apply 1.0 kg/A as 1,000 point sources of 1.0 g (1/4 tsp.) throughout an acre. For low-moderate populations, apply 1.0 kg as 250 point sources of 2.5 g (1/2 tsp.). See application information on label. **See Table 3.4 for Restricted Entry Intervals.** The use of Delegate should be delayed until fourth cover in blocks where spotted wing drosophila must be controlled, in order to observe maximum applications per season.
Grape leafhopper	Assail 70WP Assail 30SG Actara 25WDG Admire Pro Imidan 70WP malathion 8F Surround 95WP Sevin XLR Plus Nexter 75WP	1.1 oz 2.5 oz 1.5-3.5 oz 1.0-1.4 fl oz 2.0 lb 2.7 pt 12.5-50.0 lb 2.0 qt 4.4-5.2 oz	Use a treatment threshold of 5 nymphs/ leaf before July 15, 10/leaf thereafter. Apply Surround at least 2 or 3 times at 7- to 14-day intervals throughout infestation; not recommended for table grapes because of visible residues. Nexter may be applied up to twice per season. Use 8.8-10.67 oz/A in vineyards with dense foliage. **See Table 3.4 for Restricted Entry Intervals.** The use of malathion should be delayed until fourth cover in blocks where spotted wing drosophila must be controlled, in order to observe maximum applications per season.
Grape Scale	Applaud 70DF Movento 2SC Admire Pro Assail 30SG	9.0-12.0 oz 6.0-8.0 fl oz 1.0-1.4 fl oz 2.5 oz	Apply when crawlers are active, or at 493 and 990 degree-days above 50˚F starting at April 1 (early and peak activity of first generation).
Grape tumid gallmaker	Movento 2SC	6.0-8.0 fl oz	Apply when galls first appear in blocks with a history of high populations of grape tumid gallmaker

Table 3.1 - Disease and Insect Control (cont.)

Pest	Chemical and Formulation	Rate/Acre	Spray Timing and Remarks
Bloom			
Botrytis	Rovral 4F or Meteor	0.67-1.33 lb or 1.5-2.0 pt	Materials may be applied at early mid-bloom and again before bunch closing, if needed. Botrytis strains with resistance to strobilurins, Endura, Pristine, and Topsin M, and with reduced sensitivity to Rovral/Meteor are widespread in Virginia. Isolates with reduced sensitivety to Vanguard and Scala have also been observed in some locations.
	Vangard	5.0-10.0 oz	
	Scala	9.0-18.0 oz	
	Elevate	1.0 lb	
	Switch	11.0-14.0 oz	
Post-Bloom: Immediately after bloom			
Black rot	mancozeb 75DF	4.0 lb	This is a **very important spray.** Do not delay more than 12-14 days after last pre-bloom spray. **Note**: Rally, Elite, Inspire Super, or Revus Top at the higher rates using 200 gal/A dilute sprays in combination with black rot predictor models provide excellent curative control.
	Ziram	4.0 lb	
	Rally 40WSP	3.0-5.0 oz	
	Elite 45DF	4.0 oz	
	Orius	10.0-15.5 fl oz	
	Abound	3.2-5.6 oz	
	Sovran	2.0 oz	
	Flint	8.0-12.5 oz	
	Pristine	16.0-20.0 oz	
	Inspire Super	7.0 oz	
	Revus Top	5.0-8.6 oz	
	Luna Experience		Note 5-day REI for cane work.
Downy mildew	captan 50WP	4.0 lb	Do not apply mancozeb or Gavel within 66 days of harvest. Copper fungicides may be mixed with hydrated lime to reduce risk of phytotoxicity, especially in cool, wet conditions, when copper fungicides may cause injury on certain varieties.
	mancozeb 75DF	4.0 lb	
	Ridomil Gold Copper	1.0-2.0 lb	
	copper fungicides	See label	
	phosphorous acid	See label	
	Gavel	2.0-2.5 lb	
	Revus	8.0 oz	
	Presidio	3.0-4.0 oz	
	Forum	6.0 oz	
	Revus Top	7.0 oz	
	Ranman	2.1-2.75 oz	

Table 3.1 - Disease and Insect Control (cont.)

Pest	Chemical and Formulation	Rate/Acre	Spray Timing and Remarks
Post-Bloom: Immediately after bloom (cont.)			
Powdery mildew	Elite 45DF	4.0 oz	**Very important spray.** Use at 14- to 18-day intervals as needed. Use higher rates and/or shorter intervals (see label) under severe disease pressure. **See notes for prebloom.**
	Orius	3.0-5.0 oz	
	Rally (Nova) 40WSP	4.0 lb	
	wettable sulfur (81.25% or 92%)	4.0-8.0 oz	
	Procure	8.0-12.5 oz	
	Pristine	4.0 oz	
	Quintec	4.5 oz	
	Endura	16.0-20.0 oz	
	Inspire Super	7.0 oz	
	Revus Top	3.0-5.0 oz	
	Mettle	10.3-15.4 oz	
	Vivando	5.0-8.6 oz	
	Luna Experience		
Grape berry moth	Intrepid 2F	12.0-16.0 fl oz	Mating disruption is registered for GBM. Use full labeled rate and consult a grape entomologist before use for specific instructions. See prebloom spray. **See Table 3.4 for Restricted Entry Intervals.** The REI for Imidan may render it impractical for most growers.
	Tourismo	10.0-14.0 fl oz	
	Entrust 2SC	4.0-8.0 fl oz	
	Delegate 25WG	3.0-5.0 oz	
	Altacor 35WDG	2.0-4.5 oz	
	Bacillus thuringiensis (Bt)	Rates vary	
	Imidan 70WP	2.0 lb	
	Sevin 50WP	4.0 lb	
	Avaunt 30DG	5.0-6.0 oz	
Grape rootworm	Sevin XLR PLUS	2.0 qt	Apply when beetles appear, usually in late June or early July. Second application may be necessary 10 days later.
Grape leafhopper	Admire Pro	1.0-1.4 fl oz	Apply if more than 5 leafhopper nymphs/leaf before August 1, and 10/leaf thereafter. Portal on nonbearing vines only. **See Table 3.4 for Restricted Entry Intervals.** The use of malathion should be delayed until fourth cover in blocks where spotted wing drosophila must be controlled, in order to observe maximum applications per season.
	Nexter 75WP	4.4-5.2 oz	
	Assail 70WP	1.1 oz	
	Assail 30SG	2.5 oz	
	Actara 25WDG	1.5-3.5 oz	
	Belay 50WDG	2.0-4.0 fl oz	
	Imidan 70WP	2.0 lb	
	malathion 8F	1.88 pt	
	Sevin 50WP	4.0 lb	
	Sevin XLR PLUS	2.0 qt	
	Applaud 70DF	9.0-12.0 oz	
	Portal 5EC	1.0-2.0 pt	

Table 3.1 - Disease and Insect Control (cont.)

Pest	Chemical and Formulation	Rate/Acre	Spray Timing and Remarks
Phylloxera	Assail 70WP Assail 30SG Movento 2SC	1.1 oz 2.5 oz 6.0-8.0 fl oz	Spray when yellow crawlers first detected with hand lens or when galls first appear. Repeat 10-12 days after first spray if foliar form was a problem the previous year. Movento for pre-bloom use only on table grapes. Movento provides control of root infestations.
European red mite	Vendex 50WP Vendex 4L Nexter 75WP Acramite 50WS Agri-Mek 0.15EC JMS Stylet Oil Envidor 2SC Zeal WP Onager 11.8EC Portal 5EC Tri-Tek	2.0 lb 1.0 qt 4.4-5.2 oz 0.75-1.0 lb 8.0-16.0 fl oz 1.0-2.0 gal 16.0-18.0 fl oz 2.0-3.0 oz 12.0-24.0 fl oz 1.0-2.0 pt 1.0-2.0% solution	Only if mites exceed 10/leaf (20/leaf on *labrusca* types), and more than minor bronzing occurs. Rotate acaricides. Use 8.8-10.67 oz of Nexter if twospotted spider mite is the predominant mite, or in vineyards with dense foliage. Vendex is available in water-soluble bags (1-2.5 bags/A). Acramite may only be applied once per year. Use 8.0 oz of Agri-Mek for low populations, 16.0 oz for severe. Stylet Oil should be applied at 1.0-2.0 gal/A, every 10 to 14 days against mite eggs.
First Cover: 7 to 10 days after post-bloom spray			
Black rot, downy mildew, powdery mildew	Same fungicides and rates as post-bloom spray.		Do not apply ferbam more than twice after pre-bloom spray. Copper fungicides with hydrated lime may be used for control of downy mildew. Observe per-season limits on pesticide amounts.
Grape berry moth, grape leafhopper, phylloxera, European red mite, grape rootworm	Same insecticides and rates as post-bloom spray.		Do not apply Imidan within 14 days of harvest.
Second Cover: 7-10 days after first cover spray (when berries are about pea size, but before they touch in cluster)			
Black rot, downy mildew, powdery mildew, grape berry moth, grape leafhopper, phylloxera, European red mite	Same fungicides and rates as Post-bloom spray. Same insecticides and rates as Post-bloom spray		Observe per-season limits on pesticide amounts. (See label.)
Japanese beetle, June beetle, wasps	Sevin 50WP Sevin XLR PLUS Surround 95WP Imidan 70WP Belay 50 WDG Actara 25WDG Assail 70WP Avaunt 30DG Neemix 4.5 + Trilogy	4.0 lb 2.0 qt 12.5-50.0 lb 2.0 lb 2.0-4.0 fl oz 1.5-3.5 oz 1.1 oz 3.5-6.0 oz 7.0-16.0 fl oz + 2% solution	Apply when beetles are common. Sevin may not be applied within 7 days of harvest. **See Table 3.4 for Restricted Entry Intervals.** Neemix and Trilogy are to be combined.

Table 3.1 - Disease and Insect Control (cont.)

Pest	Chemical and Formulation	Rate/Acre	Spray Timing and Remarks
Third Cover: before bunch closing			
Botrytis	Rovral 4F or Meteor	1.0-1.33 lb or 1.5-2.0 pt	
	Vangard	5.0-10.0 oz	
	Scala	9.0-18.0 oz	
	Elevate	1.0 lb	
	Switch	11.0-14.0 oz	
Veraison: berry ripening, sugar building up			
Botrytis	Rovral 4F or Meteor	1.0-1.33 lb or 1.5-2.0 pt	Anti-Botrytis materials can be applied at beginning of ripening and again prior to harvest if needed. Fruit rot can be caused by a variety of organisms. Many anti-Botrytis fungicides have little effect on organisims other than Botrytis. Botrytis strains with resistance to strobilurins, Endura, Pristine, and Topsin M, and with reduced sensitivity to Rovral/Meteor are widespread in Virginia. Isolates with reduced sensivity to Vanguard and Scala have also been observed in some locations. Rotating Vangard or Scala (smae group), Elevate, Rovral or Meteor, Switch. Elevate, and/ or Luna Experience is recommended. Carefully observe per season limits on number of sprays.
	Vangard	5.0-10.0 fl oz	
	Scala	9.0-18.0 oz	
	Elevate	1.0 lb	
	Switch	11.0-14.0 oz	
Veraison: berry ripening, sugar building up (cont.)			
Spotted wing drosophila	Entrust 2SC	4.0-8.0 fl oz	Spotted wing drosophila is more important in red varieties beginning at veraison. It is critical to rotate among differing modes of action in order to delay the development of resistance. PyGanic has a short residual life which limits its efficacy. Entrust and PyGanic are organic alternatives. Be watchful for flare-ups of secondary pests (mealybugs, spider mites) following application of pyrethroids. For more information on SWD, visit *www.virginiafruit.ento.vt.edu/SWD.html.*
	Delegate 25WG	3.0-5.0 oz	
	malathion 8F	1.88 pt	
	Mustang Max 0.8EC	4.0 fl oz	
	Tombstone 2EC	2.4-3.2 fl oz	
	PyGanic 1.4EC	64.0 fl oz	
	Surround WP	25.0-50.0 lb	
Grape Scale	Applaud 70DF	9.0-12.0 oz	Second generation crawlers can be targeted at first and peak activity (1100 and 2000 degree-days above 50˚F after April 1) (mid-July and mid-August).
	Movento 2SC	6.0-8.0 fl oz	
	Admire Pro	1.0-1.4 fl oz	
	Assail 30SG	2.5 oz	
Fourth Cover: mid-August or 10 days after third cover spray			
Same diseases and insects as above plus:	Same fungicides and insecticides as Post-bloom spray, except ferbam, plus the following:		DO NOT APPLY copper within 30 days of harvest or sulfur within 10- to 14-days of harvest to minimize enological problems **if berries are to be used for wine**.
Drosophila flies (vinegar flies)	malathion 8EC or 8F	2.0-2.5 pt	Apply if drosophila are abundant. See separate comments below on spotted wing drosophlia

Table 3.1 - Disease and Insect Control (cont.)

Pest	Chemical and Formulation	Rate/Acre	Spray Timing and Remarks
Brown Marmorated Stink Bug	Scorpion 35SL	2.0-5.0 fl oz (foliar) 9.0-10.5 fl oz (soil)	
	Assail 70WP	1.1 oz	
	malathion 8EC	3.0 pt	
	Actara 25WDG	1.5-3.5 oz	
	Azera	2.0-3.0 pt	
	Venom	3.0 oz	
Spotted Wing Drosophlia	Azera	1.0-2.0 p	Spotted wing drosophila is more important in red varieties beginning at veraison. It is critical to rotate among differing modes of action in order to delay the development of resistance. PyGanic has a short residual life which limits its efficacy. Entrust and PyGanic are organic alternatives. Be watchful for flare-ups of secondary pests (mealybugs, spider mites) following application of pyrethroids. For more information on SWD, visit *www.virginiafruit.ento.vt.edu/SWD.html.*
	Entrust 2SC	4.0-8.0 fl oz	
	Baythroid XL 1EC	2.4-3.2 fl oz	
	Delegate 25WG	3.0-5.0 oz	
	malathion 8F	1.88 pt	
	PyGanic 1.4EC	64.0 fl oz	
	Tombstone 25EC	2.4-3.2 fl oz	
	Surround WP	25.0-50.0 lb	
Yellow jackets	Sevin 80WSP	1.5 lb	Chemical control is not very effective because short PHI materials provide limited control and only current workers are killed. Try to find the nest and spot treat, especially if located in vineyard. Yellow jacket traps placed early in spring to trap overwintered queens may be helpful.
	Sevin XLR Plus	2.0 qt	
Harvest: Day before or day of harvest			
Brown Marmorated Stink Bug	Belay 50WDG	6.0 fl oz	This spray is aimed at knock down of stink bugs in the clusters at harvest. Not intended for residual control.
	PyGanic 1.4EC	64.0 fl oz	
Postharvest: vines only			
Mealybugs	Applaud 70DF	9.0-12.0 oz	Apply if control is not achieved by delayed dormant spray.
	Venom 70	1.0-3.0 oz	
	Assail 70WP	1.1 oz	
	Assail 30SG	2.5 oz	
	Actara 25WDG	1.5-3.5 oz	
	Admire Pro	1.0-1.4 fl oz	
	Belay 50WDG	6.0 fl oz	
	Movento 2SC	6.0-8.0 fl oz	
Leaves of vines should be protected up until frost to maintain healthy plants. This is especially important for control of powdery and downy mildew. Maintain green functioning leaves as long as possible. Follow sprays for powdery and downy mildew under post-bloom.			

Table 3.1 - Disease and Insect Control (cont.)

Pest	Chemical and Formulation	Rate/Acre	Spray Timing and Remarks
Special Borer Treatment			
Grape root borer	Lorsban 4E Isomate GRB	— 100 dispensers	Good weed control usually prevents GRB populations from reaching high levels. In problem infestations, consider soil mounding, 8-12 inches high, around July 1. Pull down mound before following season. Also consider soil treatment with Lorsban. If GRB is a problem, apply just before adult emergence, but not within 35 days before harvest. Apply 2.0 qt of diluted spray mixture (4.5 pt/100gal) to soil surface on a 15 ft sq area around base of each vine. No more than once/season. Do not allow to contact fruit or foliage. Apply pheromone dispenser at 100/A, at the beginning of flight, around the first of July.
Special Sharpshooter Sprays			

In some vineyards in the eastern part of the state, sharpshooter leafhoppers, the vectors of Pierce's disease are of concern. While research is needed on the vector relationships and timing in Virginia, the neonicotinoids Admire Pro (1.0-1.4 fl oz). Assail 70WSP (1.1 oz/A), Assail 30SG (2.5 oz/A), Belay 50WDG (4.0-6.0 fl oz), Scorpion 35SL (2.0-5.0 fl oz), Venom 70SG (1.0-3.0 oz/A), and Venom 20SG (0.44-0.66 lb/A) are registered for control of sharpshooters. Use the higher rates for higher pressure. In addition, Scorpion and Venom are registered for soil application (9.0-10.5 fl oz; 5.0-6.0 oz/A respectively), as is Admire Pro (7.0-14.0 fl oz/A). Soil applications should be applied between bud-break and pea-berry stage and should be considered when there are three or fewer nights below 15˚F during the preceding winter. The neonicotinoids share a common mode of action; avoid overuse to avoid resistance.

Besides neonicotinoids, the following pyrethroids are registered for sharpshooter control: Danitol 2.4EC (10.67-21.33 fl oz/A), Brigade 2EC (6.4 fl oz/A), and Baythroid 2EC (1.6-3.2 fl oz/A). Danitol is limited to two applications, Baythoid to four applications, and Brigade to two applications at the low rate, one at the high.

In blocks where spotted wing drosophila will need to be controlled, early use of pyrethroids will decrease the number of applications available in late season.

Consult *http://www.virginiafruit.ento.vt.edu/PDsharpshooters.html* for updated information.

Effectiveness of Grape Pesticides

Effectiveness ratings of grape pesticides for disease, insect, mite, and weed control are based on research from Virginia and surrounding states. Although the ratings are compiled from the results of 5-10 years of research, they may not hold true for all vineyard conditions within Virginia. Results can vary from location to location depending on the weather conditions, how well the vines were sprayed the previous year, inoculum density, pest populations, canopy size, age of vines, formulation of a given pesticide, and how the pesticide was applied (low or high volume). Under certain environmental conditions and cultural practices, the effectiveness ratings could change from good to fair or vice versa. The ratings given are intended as general guides to assist the grower in pesticide selection for disease, insect, mite, and weed control.

Table 3.2 - Relative Effectiveness of Selected Fungicides in Grapes

(E=excellent; G=good; F=fair; P=poor; N=none; – =information lacking or not registered; Var=variable depending on presence of resistance)

Fungicides Trade Name	Fungicides Common Name	Resistance Risk	Mode of Action Group	Anthracnose	Black rot	Botrytis bunch rot	Downy Mildew	Phomopsis cane/leaf spot	Powdery Mildew
Abound[1]	azoxystrobin[1]	H	11	G	E	Var	Var	F-G	Var
Adament	tebuconazole + trifloxystrobin	H	3+11	–	E	Var	P-F	–	F-G[10]
Aliette	fosetyl-Al	L	33	–	–	–	E	–	–
Armicarb, Kaligreen, Agricure	potassium bicarbonate	L	M	–	–	–	–	–	F-G
Captan, Captec, etc	captan	L	M4	G	F	F	G-E	G–E	N
Coppers[3]	Bordeaux[3], fixed coppers[8]	L	M1	F-G	F	P-F	G-E	F	F-G
Elevate	fenhexamid	M	17	–	–	G-E	–	–	P-F
Elite, Orius, Tebuzol	tebuconazole	M	3	–	E	–	–	–	G[10]
Endura	boscalid	M	7	G	–	Var	–	–	G-E
Ferbam	ferbam	L	M3	–	G	N	F	F	N
Flint[1]	trifloxystrobin[1]	H	11	–	E	Var	Var	F-G	Var
Forum	dimethomorph	L-M	40	–	–	–	G-E	–	–
Gavel	zoxamide + mancozeb	M for zoxamide	22+M3	F	F	–	G	G	–
Inspire Super	difenoconazole + cyprodinil	M	3+9	–	E	G-E	–	–	E
Luna Experience	Fluopyram + tebuconazole	M	7+3	–	E	E	–	–	E
Manzate, various[4]	mancozeb[4]	L	M3	G	G	N	E	G-E	N
Mettle	tetraconazole	M	3	–	E	–	–	–	G-E
Nutrol	mono potassium phosphate	L	M	–	–	–	–	–	F
Oils: Sun Ultra-Fine Oil JMS Stylet-Oil, Pure Spray Green, Safe-T-Side, etc.		L	M	–	–	–	–	–	G
Oxidate	hydrogen peroxide	L	M	–	–	–	–	–	F
Presidio	fluopicolide	M	43	–	–	–	labeled	–	–
Ph-D	polyoxin D	M	19	–	–	labeled	–	–	labeled
Pristine[1]	boscalid plus pyraclostrobin[1]	H+M	11+7	G	G-E	Var	Var	labeled	E
Procure, Viticure	triflumizole	M	3	–	–	–	–	–	G
ProPhyt, Phostrol, Agri-Fos, Fosphite, Fungi-Phite	phosphorous acid (phosphite)	L	33	–	–	–	G-E	–	–

Table 3.2 - Relative Effectiveness of Selected Fungicides in Grapes (cont.)

(E=excellent; G=good; F=fair; P=poor; N=none; – =information lacking or not registered; Var=variable depending on presence of resistance)

Fungicides Trade Name	Fungicides Common Name	Resistance Risk	Mode of Action Group	Anthracnose	Black rot	Botrytis bunch rot	Downy Mildew	Phomopsis cane/leaf spot	Powdery Mildew
Quadris Top	azoxystrobin + difenoconazole	M-H	–	G	E	Var	Var	F-G	G-E
Quintec	quinoxyfen	M	13	–	P	–	–	–	G-E
Rally[2]	myclobutanil[2]	M	3	G	E	–	N	P	G[10]
Ranman	cyazofamid	M-H	21	–	–	–	G-E	–	–
Reason	fenamidone	H	11	–	–	–	P-E	–	–
Revus	mandipropamid	M	40	–	–	–	G-E	–	–
Revus Top	difenoconazole + mandipropamid	M	3+40	–	E	–	G-E	–	E
Ridomil Gold MZ[6]	mefenoxam + mancozeb[6]	H for mefenoxam	4+M3	F	F	–	E	F	–
Ridomil Gold/ Copper[6]	mefenoxam + copper[6]	H for mefenoxam	4+M3	–	F	P	E	F	F
Rovral[5,] Meteor[5]	iprodione[5]	M	2	–	P	G-Var	–	N	N
Rubigan, Vintage[2]	fenarimol[2]	M	3	F	F	–	–	–	G-E[10]
Scala	pyrimethanil	M	9	–	–	G-E	–	–	P?
Sovran[1]	kresoxim methyl[1]	H	11	G	E	Var	F-Var	F-G	Var
Sulfur, Various[7]	sulfur[7]	L	M2	–	N	N	N	–	G
Switch	cyprodinil + fludioxonil	–	–	–	–	E	–	–	–
Tanos	cymoxanil + famoxadone	M	11+27	–	–	–	Var	–	–
Topsin M	thiophanate methyl	H	1	F-G	F	P-G[9]	N	F	P-G[9]
Torino	cyflufenamid	M	U6						E
Vangard	cyprodinil	M	9	–	–	G-E	–	–	–
Vivando	metrafenone	M	V8	–	–	–	–	–	E
Ziram Granuflo, Ziram 76	ziram	L	M3	G	G	–	F	G	–

[1] Do not use Abound (azoxystrobin), Sovran (kresoxim methyl), Flint (trifloxystrobin), or Pristine (pyraclostrobin plus boscalid) continuously. Rotate with other fungicide groups as per label. Powdery and downy mildew as well as Botrytis strains with resistance to these strobilurins have been found in **many** locations in Virginia, and can cause control failure! It is recommended that strobilurins be tank mixed with sulfur or another anti-powdery mildew material, and also with another anti-downy-mildew material. Pristine contains a strobilurin and also boscalid (group 7), which has separate activity against powdery mildew but **not** against downy mildew. Botrytis strains with resistance to both ingredients in Pristine are common in Virginia. Abound can cause serious injury to some **apple** cultivars. Avoid drift to apples and do not spray apples with equipment containing Abound residues. Pristine or Flint should **not** be used on **Concord grapes.** Sovran can injure some cherry cultivars.

[2] Rally and Elite can control black rot after infection has occurred. For effective control, infection periods must be monitored and fungicide applied within 3 days after the start of an infection period. Application of these materials and Mettle, Inspire Super, Revus Top, and Procure to sporulating lesions of powdery mildew is best avoided to prevent selection of resistant strains of the pathogen. Continuous heavy use of this group of fungicides may entail the risk of selecting resistant strains of disease-causing fungi.

[3] Bordeaux mixture is a mixture of copper sulfate and hydrated lime; it may be purchased prepacked or mixed fresh by the grower. See also note[8] for fixed copper fungicides.

[4] Trade names for mancozeb include Manzate 200, Manzate 200 DF (DuPont), Dithane M45, Dithane F45, Dithane DF (Dow),and Penncozeb (United Phosphorus). Gavel is mancozeb + zoxamide.

[5] Continuous use of Royral or Meteor, and Vanguard or Scala entails the risk of selecting strains of Botrytis with resistance to these fungicides. Strains of Botrytis with reduced sensitivity to all these products have been found in some Virginia vineyards. Do not routinely apply more than two sprays of either of these two groups per season.

[6] Ridomil Gold MZ contains 10% metalaxyl plus 48% mancozeb; Ridomil Gold/Copper contains 10% metalaxyl plus 60% copper hydroxide (see also note[8]).

[7] Sulfur is very phytotoxic on the foliage of Concord, red-fruited French-American hybrids and several other, mainly American (Labrusca-type), varieties. Even tolerant varieties may be injured when temperatures over 85°F occur during or immediately following an application.

[8] Fixed copper compounds that are registered for use on grapes include Kocide 101, BCS-Copper Fungicide, Ten-Cop 5E, copper oxychloride sulfate (C-O-C-S), and many other compounds and formulations. The main drawback of copper fungicides is the potential for severe injury to grape foliage, depending on variety and weather conditions, and for reduced vine vigor and yields even in the absence of visible foliar injury. Cool wet weather generally makes copper toxicity worse. Phytotoxicity can be lessened by adding spray lime. One should be very careful mixing other pesticides with preparations containing lime: many of these combinations are incompatible. Excessive use of copper within 30 days of harvest may interfere with wine making. On the plus side, copper fungicides are usually cheap and may provide longer-lasting activity than others such as ferbam and captan. If growers wish to use copper materials, they should try them first on a limited acreage of each variety before treating the entire planting.

[9] Continuous use of Topsin M entails the risk of selecting Topsin M-resistant strains of disease-causing fungi. Topsin M-resistant Botrytis and powdery mildew have been found in many Virginia vineyards.

[10] In some areas of the eastern U.S., including Virginia, Rally (Nova), Orius, Adament, and Elite, and to a lesser extent Procure, have lost some of their efficacy against grape powdery mildew.

Table 3.3 - Relative Effectiveness of Selected Insecticides/Acaricides in Grapes

Insecticides/Acaricides and Ratings

Insects and mites	Acramite	Actara	Agri-Mek	Altacor	Applaud	Assail	Avaunt	Azera	Baythroid	Bt	Belay	Brigade	Danitol	Delegate	Diazinon	Entrust	Envidor	Imidan	Intrepid	Lannate	Lorsban	Malathion	Movento	Neemix/Trilogy	Nexter	Onager	Provado	PyGanic	Sevin	SPLAT-GBM	Sylket Oil	Surround	Vendex	Venom	Zeal
Brown Marmorated Stink bug	–	G	–	–	–	G	–	F	–	–	G	G	–	–	–	–	–	P	–	F	–	G	–	–	–	–	–	G	P	–	–	–	–	–	G	–
Cutworms	–	–	–	G	–	–	–	–	G	G	G	–	G	G	–	G	–	–	G	–	–	–	–	–	–	–	–	–	G	–	–	–	–	–	–	–
Drosophila flies	–	–	–	–	–	–	–	G	–	–	–	–	–	–	E	E	–	–	–	–	–	E	–	–	–	–	–	G	–	–	–	–	–	–	–	–
Grape berry moth	–	–	–	E	–	–	G	–	E	F	G	E	E	G	G	G	–	G	E	G	–	–	–	–	–	–	–	–	G	G	–	–	–	–	–	–
Grape cane girdler	–	–	–	–	–	–	–	–	E	–	–	–	E	–	–	–	–	G	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Grape flea beetle	–	–	–	–	–	–	–	–	E	–	–	–	E	–	–	–	–	G	–	–	–	–	–	–	–	–	–	–	E	–	–	–	–	–	–	–
Grape leafhopper	–	G	–	–	E	E	–	–	E	–	G	E	E	–	G	–	–	G	–	G	–	G	–	–	G	–	E	–	E	–	–	G	–	–	–	–
Grape rootworm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	G	–	–	–	–	–	–	–
Grape root borer	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	G	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Grape scale	–	–	–	–	E	F	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	G	–	–	–	G	–	–	–	–	–	–	–	–	–
Japanese beetle	–	G	–	–	–	G	G	–	–	–	G	–	E	–	–	–	–	–	–	–	–	G	–	G	–	–	–	–	G	–	–	–	E	–	–	–
June beetle	–	G	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	G	–	–	–	–	–	–	G	–	–	–	–	–	–	–
Mealybugs	–	G	–	–	E	G	–	–	G	–	G	–	–	–	–	–	–	–	–	–	–	–	G	–	–	–	G	–	–	–	–	–	–	–	G	–
Phylloxera (Leaf form)	–	–	–	–	–	–	–	–	–	–	–	–	E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Redbanded leafroller	–	–	–	E	–	–	–	–	–	G	–	–	–	F	–	E	–	G	E	–	–	–	–	–	–	–	–	–	–	–	–	E	–	–	–	–
Rose chafer	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	G	–	–	–	–	–	–	–
Sharpshooter	–	–	–	–	–	G	–	–	–	–	G	G	–	–	–	–	–	–	–	–	–	–	–	–	–	–	G	–	–	–	–	–	–	–	G	–
Spider mites	G	–	G	–	–	–	–	–	–	–	–	–	E	–	F	–	E	–	–	–	–	F	–	–	E	E	–	–	–	–	G	–	G	–	G	–
Spotted wing drosophila	–	–	–	–	–	–	–	F	E	–	–	–	E	E	–	–	–	E	–	–	–	G	–	–	–	–	–	F	–	–	–	–	–	–	–	–
Wasp	–	F	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	G	–	–	–	–	–	–	–

v(E=excellent; G=good; F=fair; P=poor; N=none; – = information lacking or not registered)

Table 3.4 - Chemical Names, Re-entry Times, and Days to Harvest[1]

Chemical (Other name)	Manufacturers	Restricted Entry Interval	Days to Harvest
Abound (azoxystrobin)	Syngenta	4 hours	14
Acramite (bifenazate)	Uniroyal	5 days (cane turning, tying, girdling) 12 hours (other activities)	14
Actara (thiamethoxam)	Syngenta	12 hours	5
Adament (tebuconazole + trifloyxtrobin)	Bayer CropScience	12 hours	14
Admire (imidacloprid)	Bayer CropScience	12 hours	30 (soil) 0 (foliar)
Agri-Mek (abamectin)	Syngenta	12 hours	28
Aliette (fosetyl Al)	Bayer CropScience	12 hours	15
Altacor (chlorantraniliprole)	DuPont	4 hours	14
Applaud (buprofezin)	Nichino America	12 hours	30
Assail (acetamiprid)	United Phosphorus	12 hours	7
Avaunt (indoxacarb)	DuPont	12 hours	7
Azera (azadirachtin, pyrethrins)	MGK	12 hours	0
Baythroid (cyfluthrin)	Bayer CropScience	12 hours	3
Belay (clothianidin)	Valent	12 hours	0
Belt (flubendiamide)	Bayer CropScience	12 hours	7
Brigade (bifenthrin)	FMC	12 hours	30
Bordeaux mixture (copper sulfate & hydrated lime)	Instructions for making Bordeaux mix available at *www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7481.html*		0
Captan (Captan, Captec)	Arysta, Drexel	2-4 days (see label)	0
copper, fixed	Various	24-48 hours	0
Danitol (fenpropathrin)	Valent	24 hours	21
Delegate (spinetoram)	Dow AgroSciences	4 hours	7
Diazinon	Makhteshim-Agan	24 hours	28
Dipel *(B.t.)*	Abbott	4 hours	0
Elevate (fenhexamid)	Arysta	12 hours	0
Elite (tebuconazole)	Bayer CropScience	12 hours	14
Endura (boscalid)	BASF	12 hours	14
Entrust (spinosad)	Dow AgroSciences	4 hours	7
Envidor (spirodiclofen)	Bayer CropScience	12 hour (6 days for high contact activities in table grapes)	14
Flint (trifloxystrobin)	Bayer CropScience	12 hours	14
Forum (dimethomorph)	BASF	12 hours	28
Gavel (zoxamide + mancozeb)	Gowan	48 hours	66
Imidan (phosmet)	Gowan	14 days	14
Inspire Super (difenoconazole + cyprodinil)	Syngenta	12 hours	14
Intrepid (methoxyfenozide)	Dow AgroSciences	4 hours	30
Lorsban 4E (chlorpyrifos)	Dow AgroSciences	24 hours	35

[1]This information is given as a guideline only. Always read the label because there have been many changes in re-entry times and preharvest intervals in recent years, and more changes are expected in the future.

[2]See label cautions regarding potential effects on harvest parameters.

Table 3.4 - Chemical Names, Re-entry Times, and Days to Harvest[1] (cont.)

Chemical (Other name)	Manufacturers	Restricted Entry Interval	Days to Harvest
Luna Experience (fluopyram & tetraconazole)	Bayer	12 hours (5 days for cane work)	14
malathion (Malathion)	Gowan	24 hours	3
mancozeb (Dithane M45, Manzate 200, Penncozeb)	Dow AgroSciences, DuPont, United Phosphorus, etc.	24 hours	66
Meteor (iprodione)	United Phosphorus	48 hours	7
Mettle (tetraconazole)	Isagro	12 hours	14
Movento (spirotetramat)	Bayer CropScience	24 hours	7
Neemix (azadirachtin)	Certis	12 hours	0 days
Nexter (pyridaben)	Gowan	12 hours	7
Onager (hexythiazox)	Gowan	12 hours	28
Orius 20AQ (tebuconazole)	Mahkteshim Agan	12 hours	14
Ph-D (polyoxin D)	Arysta	4 hours	0
Portal (fenproximate)	Nichino America	12 hours	nonbearing
Presidio (fluopicolide)	Valent	12 hours	21
Pristine (boscalid+pyraclostrobin)	BASF	12 hours (5 days for cane work)	14
Procure, Viticure (triflumizole)	Chemtura	12 hours	7
ProPhyt (phosphorous acid)	Helena	4 hours	0
Provado (imidacloprid)	Bayer CropScience	12 hours	0
Purespray Green (oil)	Petro-Canada	4 hours	0
PyGanic (pyrethrins)	MGK	12 hours	0
Quadris Top (azoxystrobin+difenoconazole)	Syngenta	12 hours	14
Quintec (quinoxyfen)	Dow Agrosciences	12 hours	14
Rally (myclobutanil)	Dow AgroSciences	24 hours	14
Ranman (cyazofamid)	FMC	12 hours	30
Reason (fenamidone)	Bayer	12 hours	30
Revus (mandipropamid)	Syngenta	4 hours	14
Revus Top (difenoconazole + cyprodinil)	Syngenta	12 hours	14
Ridomil Gold Copper (mefenoxam & copper)	Syngenta	48 hours	42
Ridomil Gold MZ (mefenoxam + manocozeb)	Syngenta	48 hours	66
Rovral (iprodione)	FMC	48 hours	7
Scala (pyrimethanil)	Bayer CropScience	12 hours	7
Scorpion (dinotefuran)	Gowan	12 hours	1 (foliar) 28 (soil)
Sevin (carbaryl)	Aventis	12 hours	7
Sniper (bifenthrin)	Loveland Products	12 hours	30

[1]This information is given as a guideline only. Always read the label because there have been many changes in re-entry times and preharvest intervals in recent years, and more changes are expected in the future.

[2]See label cautions regarding potential effects on harvest parameters.

Table 3.4 - Chemical Names, Re-entry Times, and Days to Harvest[1] (cont.)

Chemical (Other name)	Manufacturers	Restricted Entry Interval	Days to Harvest
SPLAT-GBM (pheromone)	ISCA Technologies	4 hours	–
Sovran (kresoxim methyl)	Cheminova	12 hours	14
Stylet Oil	JMS Flower Farms	4 hours	0
Sulfur (Kumulus, sulfur, Microthiol, liquid sulfur, wettable sulfur, etc.)	various	24 hours	0
Surround (Kaolin)	BASF	4 hours	0[2]
Switch (cyprodinil + fludioxonil)	Syngenta	12 hours	7
Tanos (cymoxanil + famoxadone)	DuPont	12 hours	30
Topsin M (thiophanate methyl)	United Phosphorus	2-7 days (see label)	14
Torino (cyflufenamid)	Gowan	4 hours	3
Tourismo (flubendiamide + buprofezin)	Nichino America	12 hours	7
Trilogy (clasified hydrophobic extract of neem oil)	Certis	4 hours	0
Tri-Tek	Brandt	4 hours	0
Vangard (cyprodinil)	Syngenta	12 hours	7
Vendex (fenbutatin oxide)	DuPont	48 hours	28
Venom (dinotefuran)	Valent	12 hours	1 (foliar) 28 (soil)
Vivando (metrafenone)	BASF	12 hours	14
Zeal (etoxazole)	Valent	12 hours	14
Ziram	United Phosphorus, Taminco	48 hours	21

[1]This information is given as a guideline only. Always read the label because there have been many changes in re-entry times and preharvest intervals in recent years, and more changes are expected in the future.

[2]See label cautions regarding potential effects on harvest parameters.

Weed Control in Vineyards

Jeffrey F. Derr, Extension Weed Scientist, Hampton Roads AREC

Table 3.5 - Herbicides Labeled for Use in Grapes

For preemergence herbicides, use lower rates on sandy soils and higher rates on clay soils. Do not disturb soil after a preemergence herbicide application. Tank mixes of certain preemergence and postemergence herbicides can be made to control existing vegetation and control weeds germinating from seed. Check compatibility of tank mixes prior to application.

Pest	Chemical and Formulation Rate per Acre	Timing and Remarks
Preemergence directed under vines		
Many annual weeds	indaziflam 0.065 lb (Alion 5.0 fl oz)	Vines must be established at least 5 years. Do not use in soils high in sand or gravel. Apply only once per year. Do not apply within 14 days of harvest.
Most annuals, fescue, quackgrass, dandelions, dock, and other herbaceous perennials	dichlobenil 4.0-6.0 lb (Casoron 4G 100.0-150.0 lb or 2.3-3.4 lb/1000 sq ft)	Apply dry granules in late winter or early spring. Shallow incorporation may improve weed control. Do not apply within 4 weeks after transplanting. Short residual activity, regrowth usually occurs in late summer. Do not graze livestock in treated areas. Do not make an application within 1 month of harvest.
Most annuals and some perennials	diuron 1.6-2.4 lb (Karmex 80DF 2.0-3.0 lb)	Apply a single application/year in early spring to a weed free surface or include an appropriate postemergence herbicide. Use in vineyards established at least 3 years. Do not replant to any crop within 2 years after application.
Annual grasses and broadleaf weeds	flumioxazin 0.19-0.375 lb (Chateau 6.0-12.0 oz/A)	Preemergence and early postemergence action. Apply as a directed spray to dormant vines or use shields if applications are made after flowering to prevent spray contact with grape foliage or fruit. Do not apply to vines established less than 2 years unless protected from spray contact using nonporous wraps, grow tubes, or waxed containers. Apply prior to weed germination or to small emerged weed seedlings. Combine with a labeled postemergence herbicide such as glufosinate for control of larger annual weeds or perennials.
Annual broadleaf weeds	isoxaben 0.5-1.0 lb (Trellis 0.67-1.33 lb)	Do not apply within 165 days of harvest. Apply after soil has settled following transplanting. Combine with a preemergence herbicide for annual grass control, such as oryzalin. Add a postemergence herbicide to control emerged weeds.
Many annual weeds	simazine 2.0-4.0 lb (Princep Caliber 90 2.2-4.4 lb or 4L 2.0-4.0 qt)	Apply a single application per year in the fall or spring to a weed free surface or include an appropriate postemergence herbicide. Vineyards must be established at least 3 years.
Annual grasses and certain annual broadleaf weeds	oryzalin 2.0-6.0 lb (Orzalin 4AS,Surflan 4AS 2.0-6.0 qt, Surflan DF 2.4-7.1 lb)	May be used in non-bearing and bearing vineyards. Areas to be treated should be free of weeds or include an appropriate postemergence herbicide. Remove or thoroughly mix trash into the soil before application. Use lower rate for short-term control (4 months) and higher rate for long-term control (6-8 months). Apply as a directed spray and avoid contact with leaves, branches, or trunks of vines. Do not apply to newly transplanted vineyards until soil has settled and there are no cracks present. Make only one application/growing season. May be tank-mixed with diuron or simazine to control many broadleaf weeds. Observe precautions and time limitations for diuron or simazine.
Annual broadleaf weeds and certain annual grasses	oxyfluorfen 0.5-2.0 lb (Goal 2XL 2.0-8.0 pt, GoalTender 1.0-4.0 pt)	Dormant application only. Will control certain small seedling weeds plus provide soil residual control of annual broadleaf weeds and certain annual grasses.

Table 3.5 - Herbicides Labeled for Use in Grapes (cont.)

Pest	Chemical and Formulation Rate per Acre	Timing and Remarks
Annual broadleaf weeds and certain annual grasses	rimsulfuron 0.063 lb (Matrix FNV 4 oz/A)	Preemergence and postemergence control of certain annual weeds. Combine with other preemergence herbicides such as oryzalin or pendimethalin and with other postemergence herbicides (including glyphosate and glufosinate) for broader spectrum control. Grapevines need to be in the ground at least one year.
Annual and perennial grasses and certain broadleaf weeds	pronamide 1.0-4.0 lb (Kerb 50W 2.0-8.0 lb)	Apply in the fall after fruit harvest but prior to leaf drop and soil freeze-up. Do not apply to vines less than one year old. **RESTRICTED USE PESTICIDE.**
Annual grasses and certain annual broadleaf weeds	pendimethalin 2.0-4.0 lb (Prowl 3.3EC 2.4-4.8 qt, Prowl $H_2$0 2.0-4.0 qt)	Prowl EC - use on nonbearing plantings only. Prowl H_2O - do not apply within 90 days of harvest. Allow soil to settle around vines before application. Apply only to dormant plants. Do not apply after buds have started to swell. Do not apply overtop vines.
Annual grasses, certain annual broadleaf weeds and suppression of yellow nutsedge	norflurazon 1.0-4.0 lb (Solicam 1.25-5.0 lb)	Apply prior to budbreak. Vines must be established at least 2 years. Combine with simazine or diuron for improved broadleaf weed control in vineyards over 3 years old. Apply to weed-free areas or combine with an appropriate postemergence herbicide.
Postemergence directed under vines		
Annual and perennial grasses	fluazifop-butyl 0.25-0.375 lb ai (Fusilade DX 16.0-24.0 fl oz + 2.0 pt crop oil concentrate or 1/2 pt nonionic surfactant/25 gal)	Do not apply within 50 days of harvest. Use on non-bearing plantings only. Apply as directed spray to actively growing grasses. Treat annual grasses before tillering for optimum results. Perennial grasses may need repeat treatment for total control. Do not treat canes to be harvested within one year of application. For spot treatment use 0.75 fl oz Fusilade DX plus 1.5 oz crop oil concentrate or 0.5 fl oz nonionic substance/gal. Ensure thorough coverage of weed foliage.
	clethodim 0.09-0.12 lb ai (Select 2EC 6.0-8.0 fl oz or Select Max 9.0-16.0 fl oz + nonionic surfactant at 0.25% by volume)	Use on nonbearing plantings only (at least 1 yr before harvest). Postemergence control of actively-growing grasses. For spot treatment, apply 0.33-0.65 fl oz/gal Select 2EC solution or 0.44-0.88 fl oz Select Max with 0.33 fl oz nonionic surfactant.
	sethoxydim 0.28-0.47 lb ai (Poast 1.5E 1.5-2.5 pt + 1.0 qt crop oil concentrate)	Do not apply within 50 days of harvest. Apply in a minimum of 10 GPA of water. Apply the lower rate to annual grasses up to 6 inches tall and apply higher rate to annual grasses up to 12 inches tall and to perennial grasses. For spot treatment use 1.25-1.9 fl oz Poast plus 1.25 fl oz crop oil concentrate/gal. Provides postemergence grass control only.
Annual weeds and certain perennials	glufosinate 0.88-1.5 lb (Rely 280 48.0-82.0 fl oz)	Apply as a directed spray to emerged weeds. Do not allow spray to contact desired foliage or green bark. Do not apply within 14 days of harvest. For spot treatment, mix 1.7 fl oz Rely 280/gal of water. Rely can also be used for sucker control. See label for directions.
Annual and perennial grasses and broadleaf weeds	glyphosate 0.75-3.75 lb ae (acid equivalent) (Roundup UltraMax 26 fl oz-4 qt, Touchdown 1.0-5.0 qt, or other labeled formulation) Spot treatment 1.3-2.6 fl oz Roundup UltraMax or Touchdown/gallon. For wiper application use 1 part Roundup Ultra Max or Touchdown to 2 parts water	Use as a directed spray in established vineyards or for site preparation prior to transplanting new vines. Do not apply when green shoots or canes or foliage are in the spray zone. Do not allow spray drift or mist to contact green foilage, green bark, suckers, or vines and renewals less than 3 years of age. Spray contact, other than with mature bark on the main trunk, can result in serious localized or systemic injury. If repeat treatments are necessary, do not exceed a total of 10.6 qt/A/year. Do not treat within 14 days of harvest. Apply prior to the end of the bloom stage or apply with shielded eqiupment to avoid crop damage.

Table 3.5 - Herbicides Labeled for Use in Grapes (cont.)

Pest	Chemical and Formulation Rate per Acre	Timing and Remarks
All weeds, general contact	paraquat 0.63-1.0 lb (Gramoxone Inteon 2.5-4.0 pt/A plus a nonionic surfactant at 1.0-2.0 pt/gal)	Apply as a directed spray in at least 30 gal of water/A. Most effective on small, actively growing weeds. Repeat applications will be needed to control perennial weeds. Do not allow spray to contact foliage, fruit, or stems. Corrosive to aluminum. Do not mix or store in aluminum tanks or in systems with aluminum fittings. Paraquat is toxic and a restricted use pesticide - handle with caution. **RESTRICTED USE PESTICIDE.**
Annual grasses and certain annual broadleaf weeds	napropamide 4.0 lb (Devrinol 50DF 8.0 lb)	Apply to the soil surface in the fall through early spring prior to weed emergence. Do not apply to frozen ground. Does not control existing weeds, but may be used with an appropriate postemergence herbicide to kill existing vegetation or with simazine to broaden the spectrum of weeds controlled. Use as a directed spray and avoid contact with fruit or foliage. Do not apply when fruit is on the ground during the harvest period. Do not graze areas. Make only one application/season. Must be incorporated within 24 hours by rainfall, irrigation, or mechanical means for optimum results.

Table 3.5 - Herbicides Labeled for Use in Grapes (cont.)

Pest	Chemical and Formulation Rate per Acre	Timing and Remarks
Annual broadleaf weeds	carfentrazone-ethyl 0.016-0.031 lb (Aim 2EC, 1.9EW 1.0-2.0 fl oz/A)	Apply post-directed using a hooded sprayer for control of small annual broadleaf weeds less than 4 inches tall. Add a crop-oil concentrate or nonionic surfactant. Can be tank mixed with other herbicides for broader-spectrum weed control. Can also be used for control of suckers—see label for rates and directions for this use.

Table 3.6 - Relative Effectiveness of Selected Preemergence Herbicides and Ratings in Grapes

Weeds	Alion (indaziflam)	Dichlobenil (Casoron)	Diuron (Karmex)	Flumioxazin (Chateau)	Isoxaben (Trellis)	Napropamide (Devrinol)	Oryzalin (Surflan)	Oxyfluorfen (Goal)	Pronamide[1] (Kerb)	Rimsulfuron (Matrix)	Simazine (Princep)	Pendimethalin (Prowl)	Norflurazon (Solicam)
Annual Grasses													
Barnyardgrass	-	G	G	-	-	G	G	F	F	G	F-G	G	E
Cheat	-	G	G	-	-	G	G	-	G	-	G	-	G
Crabgrasses	E	G	G	F-G	P	E	E	F	G	F	F-G	E	E
Fall panicum	-	F	F	-	-	G	G	-	F	F	F-G	G	E
Foxtails	G	G	G	F-G	-	E	E	F	G	G	G	G	F
Goosegrass	G	F	G	F-G	-	E	E	F	G	P	E	G	G
Johnsongrass (seedling)	-	F	G	P-F	-	P	F-G	-	-	-	N	G	G
Annual Broadleaf Weeds													
Annual fleabane	-	E	G	-	-	G	G	G	F	-	G	-	F
Annual morningglory	P	G	G	G	p	N	P-F	F	F	F	E	P	F
Black nightshade	-	G	G	G	-	N	P-F	G	F	P	E	P	F
Carpetweed	E	G	E	-	-	G	G	G	G	-	E	G	G
Common chickweed	G	G	E	F-G	E	-	G	G	G	-	E	G	G
Common lambsquarters	F-G	G	E	E	F	F-G	G	G	F	F	E	F	G
Common ragweed	F-G	G	E	E	G	P	F	F	E	P	N	F	-
Hairy galinsoga	-	G	E	G	G	G	G	G	-	-	E	N	-
Henbit	E	G	E	-	G	F	P	G	G	-	E	G	-
Horseweed	-	G	G	-	F	P	F	F	P	-	E	P	G
Knotweed	-	G	G	-	-	G	G	G	E	-	E	-	F
Mustards	-	G	G	-	-	P	P-F	G	G	-	G	-	F
Pennsylvania smartweed	-	G	G	-	G	P	P-F	G	-	P	E	-	-
Pigweeds	-	G	E	E	G	G	G	G	N	G	E	F	F
Prickly lettuce	-	G	G	G	-	G	F	G	-	-	E	-	-
Prickly sida	-	F-G	G	E	-	N	P-F	G	N	-	G	-	P
Purslane	-	G	E	-	G	G	G	G	-	F	E	F	G
Shepherds' purse	-	G	G	-	-	F	G	G	G	-	E	N	G
Speedwells	-	-	-	-	-	-	-	-	P	-	-	-	-

(E=excellent; G=good; F=fair; P=poor; N=none; - = not registered or information lacking)

[1]Designates restricted use pesticide - must be trained and certified as a private applicator to purchase or use these more toxic chemicals in your vineyard. Refer to Publication 456-001 and the pesticide label for safety information. Ask your local Extension agent how to become a certified applicator.

Table 3.6 - Relative Effectiveness of Selected Preemergence Herbicides and Ratings in Grapes (cont.)

Weeds	Alion (indaziflam)	Dichlobenil (Casoron)	Diuron (Karmex)	Flumioxazin (Chateau)	Isoxaben (Trellis)	Napropamide (Devrinol)	Oryzalin (Surflan)	Oxyfluorfen (Goal)	Pronamide* (Kerb)	Rimsulfuron (Matrix)	Simazine (Princep)	Pendimethalin (Prowl)	Norflurazon (Solicam)
Velvetleaf	-	-	F	G	F	N	P-F	G	P	F	G	G	-
Virginia pepperweed	-	G	G	-	-	F	G	-	P	-	E	-	G
Yellow rocket	-	G	P	-	-	N	N	-	P-F	-	P	N	F
Perennial Grasses And Sedges													
Fescues	-	G	F	-	N	N	N	N	G	-	P	N	F
Johnsongrass (rhizome)	-	-	P	N	N	N	N	N	P	-	N	N	P
Nimblewill	-	-	P	-	N	N	N	N	P	-	P	N	F
Orchardgrass	-	G	P-F	-	N	N	N	N	G	-	P	N	F
Quackgrass	-	G	G	-	N	N	N	N	G	-	P-F	N	P
Yellow nutsedge	N	P-F	P	N	N	N	N	N	N	F	N	N	P
Purpletop, redtop	-	-	P	-	N	N	N	N	-	-	N	N	F
Dallisgrass	-	-	F	-	N	N	N	N	-	-	N	N	P
Bermudagrass	N	N	N	N	N	N	N	N	P	N	N	N	P
Perennial Broadleaf Weeds													
Broadleaf plantain	-	G	P-F	-	N	N	N	N	F	-	G	N	P
Buckhorn plantain	-	G	P-F	-	N	N	N	N	F	-	G	N	P
Canada thistle	-	P-F	N	-	N	N	N	N	-	-	N	N	N
Chicory	-	G	G	-	N	N	N	N	-	-	P-F	N	N
Common dandelion	-	E	P-F	-	N	N	N	N	P	-	P-F	N	N
Common mallow	-	G	F	-	N	N	N	N	-	-	N	N	N
Common milkweed	-	-	N	-	N	N	N	N	-	-	N	N	N
Common yarrow	-	-	N	-	N	N	N	N	-	-	-	N	N
Docks (broadleaf, curly)	-	G	F	-	N	N	N	N	F	-	N	N	N
Goldenrod	-	F-G	-	-	N	N	N	N	-	-	N	N	N
Ground ivy	-	E	N	-	N	N	N	N	-	-	N	N	N
Hemp dogbane	-	N	N	-	N	N	N	N	-	-	N	N	N
Horsenettle	-	N	P-F	-	N	N	N	N	-	-	P	N	N
Mugwort	-	G-E	P	-	N	N	N	N	-	-	N	N	N
Red sorrel	-	G	N	-	N	N	-	N	F-G	-	N	N	N
Thistles (bull, musk, curl)	-	F	N	-	N	N	N	-	P	-	N	N	N
White flowered aster	-	G	N	-	N	N	N	N	-	-	N	N	N
Wild carrot	-	G	P	-	N	N	N	-	-	-	N	N	F
Wild strawberry	-	G	G	-	N	N	N	-	-	-	N	N	P
Yellow woodsorrel (from seed)	-	G	F	-	G	N	N	G	-	-	F	N	F
Special Perennial Weed Problems													
Bigroot morning-glory	-	N	N	-	N	N	N	N	N	-	N	N	N

(E=excellent; G=good; F=fair; P=poor; N=none; - = not registered or information lacking)

[1]Designates restricted use pesticide - must be trained and certified as a private applicator to purchase or use these more toxic chemicals in your vineyard. Refer to Publication 456-001 and the pesticide label for safety information. Ask your local Extension agent how to become a certified applicator.

Table 3.6 - Relative Effectiveness of Selected Preemergence Herbicides and Ratings in Grapes (cont.)

Weeds	Alion (indaziflam)	Dichlobenil (Casoron)	Diuron (Karmex)	Flumioxazin (Chateau)	Isoxaben (Trellis)	Napropamide (Devrinol)	Oryzalin (Surflan)	Oxyfluorfen (Goal)	Pronamide* (Kerb)	Rimsulfuron (Matrix)	Simazine (Princep)	Pendimethalin (Prowl)	Norflurazon (Solicam)
Brambles (Rubus spp.)	-	N	N	-	N	N	N	N	N	-	N	N	N
Common greenbriar	-	N	N	-	N	N	N	N	N	-	N	N	N
Japanese honeysuckle	-	N	N	-	N	N	N	N	N	-	N	N	N
Poison ivy	-	N	N	-	N	N	N	N	N	-	N	N	N
Virginia creeper	-	N	N	-	N	N	N	N	N	-	N	N	N
Wild garlic	-	F	N	-	N	N	N	N	N	-	N	N	N

(E=excellent; G=good; F=fair; P=poor; N=none; - = not registered or information lacking)

[1]Designates restricted use pesticide - must be trained and certified as a private applicator to purchase or use these more toxic chemicals in your vineyard. Refer to Publication 456-001 and the pesticide label for safety information. Ask your local Extension agent how to become a certified applicator.

Table 3.7 - Relative Effectiveness of Selected Postemergence Herbicides and Ratings in Grapes

Weeds	Carfentrazone (Aim)	Clethodim (Select)	Fluazifopbutyl (Fusilade)	Glufosinate (Rely)	Glyphosate (Various)	Paraquat[1] (Gramoxone)	Sethoxydim (Poast)
Annual Grasses							
Barnyardgrass	N	E	E	G	E	E	E
Cheat	-	-	G	G	E	E	G
Crabgrasses	N	E	E	G	E	E	E
Fall panicum	N	E	E	G	E	E	E
Foxtails	N	E	E	G	E	E	E
Goosegrass	N	E	E	G	E	E	E
Johnsongrass (seedling)	N	E	E	G	E	E	E
Annual Broadleaf Weeds							
Annual fleabane	-	N	N	-	E	E	N
Annual morningglory	F	N	N	G	E	G	N
Black nightshade	G	N	N	G	E	G	N
Carpetweed	G	N	N	-	E	E	N
Common chickweed	F	N	N	G	E	E	N
Common lambsquarters	G	N	N	G	E	E	N
Common ragweed	P	N	N	G	E	E	N
Hairy galinsoga	-	N	N	-	E	E	N
Henbit	G	N	N	G	E	E	N
Horseweed	-	N	N	G	E	F	N
Knotweed	-	N	N	-	E	F-G	N

(E=excellent; G=good; F=fair; P=poor; N=none; - = not registered or information lacking)

[1]Designates restricted use pesticide - must be trained and certified as a private applicator to purchase or use these more toxic chemicals in your vineyard. Refer to Publication 456-001 and the pesticide label for safety information. Ask your local Extension agent how to become a certified applicator.

Table 3.7 - Relative Effectiveness of Selected Postemergence Herbicides and Ratings in Grapes (cont.)

Weeds	Carfentrazone (Aim)	Clethodim (Select)	Fluazifopbutyl (Fusilade)	Glufosinate (Rely)	Glyphosate (Various)	Paraquat[1] (Gramoxone)	Sethoxydim (Poast)
Annual Broadleaf Weeds (cont.)							
Mustards	-	N	N	G	E	G	N
Pennsylvania smartweed	-	N	N	G	E	G	N
Pigweeds	G	N	N	G	E	G	N
Prickly lettuce	-	N	N	G	E	G	N
Prickly sida	-	N	N	G	E	E	N
Purslane	-	N	N	G	E	G	N
Shepherds' purse	-	N	N	G	E	F-G	N
Speedwells	G	N	N	-	E	P	N
Velvetleaf	E	N	N	G	E	E	N
Virginia pepperweed	-	N	N	-	E	G	N
Perennial Grasses And Sedges							
Fescues	N	-	P	F	E	F	P-F
Johnsongrass (rhizome)	N	G	G	P	E	P	G
Nimblewill	N	-	F-G	-	G-E	P	F-G
Orchardgrass	N	-	F	P	E	F	F
Quackgrass	N	-	G	P	G	P	G
Yellow nutsedge	N	N	N	F-G	G	P	N
Purpletop, redtop	N	-	G	-	E	P	G
Dallisgrass	N	-	G	-	E	P	G
Bermudagrass	N	G	G	F	G	P	G
Perennial Broadleaf Weeds							
Broadleaf plantain	-	N	N	F	E	P	N
Buckhorn plantain	P	N	N	F	E	P	N
Canada thistle	-	N	N	-	F-G	P	N
Chicory	-	N	N	-	E	P	N
Common dandelion	P	N	N	G	E	P	N
Common mallow	-	N	N	-	E	P	N
Common milkweed	-	N	N	-	G	P	N
Common yarrow	-	N	N	-	G	P	N
Docks (broadleaf, curly)	P	N	N	-	G	P	N
Goldenrod	-	N	N	-	E	P-F	N
Ground Ivy	-	N	N	G	G	P-F	N
Hemp dogbane	-	N	N	P	F	P	N
Horsenettle	-	N	N	F-G	F-G	P	N

(E=excellent; G=good; F=fair; P=poor; N=none; - = not registered or information lacking)

[1]Designates restricted use pesticide - must be trained and certified as a private applicator to purchase or use these more toxic chemicals in your vineyard. Refer to Publication 456-001 and the pesticide label for safety information. Ask your local Extension agent how to become a certified applicator.

Table 3.7 - Relative Effectiveness of Selected Postemergence Herbicides and Ratings in Grapes (cont.)

Weeds	Carfentrazone (Aim)	Clethodim (Select)	Fluazifopbutyl (Fusilade)	Glufosinate (Rely)	Glyphosate (Various)	Paraquat[1] (Gramoxone)	Sethoxydim (Poast)
Mugwort	-	N	N	-	F	P	N
Red sorrel	-	N	N	G	G	P	N
Thistles (bull, musk, curl)	-	N	N	-	G	P	N
White flowered aster	-	N	N	-	E	P-F	N
Wild carrot	-	N	N	-	E	P	N
Wild strawberry	-	N	N	-	E	P-F	N
Yellow rocket	-	N	N	-	E	F	N
Yellow woodsorrel	-	N	N	G	E	P	N
Special Perennial Weed Problems							
Bigroot morningglory	-	N	N	-	F-G	P	N
Brambles	-	N	N	F-G	G	P	N
Common greenbriar	-	N	N	-	P	P	N
Japanese honeysuckle	-	N	N	-	F-G	P	N
Poison ivy	-	N	N	-	G	P	N
Virginia creeper	-	N	N	-	F-G	P	N
Wild garlic	-	N	N	G	F	P	N

(E=excellent; G=good; F=fair; P=poor; N=none; - = not registered or information lacking)

[1]Designates restricted use pesticide - must be trained and certified as a private applicator to purchase or use these more toxic chemicals in your vineyard. Refer to Publication 456-001 and the pesticide label for safety information. Ask your local Extension agent how to become a certified applicator.

Table 3.8 - Chemical Names, Re-entry Times, and Days to Harvest[1]

Chemical (Other name)	Manufacturers	Re-entry time	Days to Harvest
Alion (indaziflam)	Bayer	12 hours	14
Aim (carfentrazone)	FMC	12 hours	3
Casoron (dichlobenil)	Chemtura	12 hours	30
Chateau (flumioxazin)	Valent	12 hours	60
Devrinol (napropamide)	United Phosphorus	12 hours	35
Fusilade (fluazifop-butyl)	Syngenta	12 hours	50
Trellis (isoxaben)	Dow AgroSciences	12 hours	50
Goal (oxyfluorfen)	Dow AgroSciences	24 hours	NA[2]
Gramoxone (paraquat)	Syngenta	12 hours	NA[5]
Karmex (diuron)	DuPont	12 hours	NA[3]
Kerb (pronamide)	Dow AgroSciences	24 hours	NA[4]
Matrix (rimsulfuron)	DuPont	4 hours	14
Poast (sethoxydim)	BASF	12 hours	50
Princep (simazine)	Syngenta	12 hours	NA[6]
Prowl (pendimethalin)	BASF	24 hours	365

Rely (glufosinate)	Bayer	12 hours	14
Roundup (glyphosate)	Monsanto	4 hours	14
Select (clethodim)	Valent	24 hours	365
Solicam (norflurazon)	Syngenta	12 hours	60
Surflan (oryzalin)	United Phosphorus	24 hours	NA[6]
Touchdown (glyphosate)	Syngenta	12 hours	14

[1]This information is given as a guideline only. Always read the label because there have been many changes in re-entry times and pre-harvest intervals in recent years, and more changes are expected in the future.

[2]Apply when crop is dormant.

[3]Apply between March and May.

[4]Apply in the fall after harvest.

[5]Do not allow paraquat to contact fruit.

[6]Apply between harvest and spring.