

hanging from them have provided good results in some areas.

Noise deterrents, such as propane cannons, alarms and recorded distress calls seem to have the least effect on birds in vineyards, but may greatly annoy neighbors. A combination of noise and visuals may be effective, however. Several operations have hired people to regularly drive motorcycles and/or ATVs through the vineyard when the fruit is ripe, and this seems to keep birds away quite well. Be sure to make drivers aware of where pickers are however, to avoid possible accidents.

Bird Shield™, a new repellent formulated from methyl anthranilate, is currently being registered for use on blueberries, cherries, and grapes. Methyl anthranilate is commonly used as a grape flavoring in human food preparations. Bird avoidance is based on odor quality and irritation. To humans, this chemical has a grape-like or fruit odor and a slightly bitter, pungent taste. Unfortunately, efficacy data do not support recommending this material at this time.

Table 45. Grape pest management schedule†.

Dormant			
Pest	Spray Material, Rate/A (pre-harvest interval)	Cultural Practices and Scouting Notes	Comments
Anthracnose	Lime sulfur solution, 5-10 gal (0)		This dormant application is aimed at reducing overwintering inoculum on canes.
Bud swell (before buds show green)			
Eutypa dieback	Benlate 50WP, 3.2 oz/gal, (50)**	Prune out infected wood early in the season; make cuts well below cankers. Renew trunks every 8-10 years.	Paint or spray on immediately after pruning, before rain, dew, and spores some in contact with fresh wood. **Existing stocks of Benlate may be used until Dec. 31, 2003.
European red mite and/or scale insects	Superior oil, 2 gal (70-second viscosity) Cythion 8EC, 1 pt (3)	Vinifera and French Hybrids are more susceptible to mites; scout for mites from bud break to 10-inch shoot.	Do not exceed a maximum of 2-3/4 pt of Cythion per acre per year.
Flea beetle	Imidan 70W, 1-1/3 to 2-1/8 lb (14) Sevin 50WP, 2-4 lb (7)		Scout planting for presence of flea beetle before spraying to avoid unnecessary sprays.
Bud break to pre-bloom (after 1/2 inch new shoot growth)			
Black rot	Dithane DF, 1.5-4 lb (66) Elite 45 DF, 4 oz (14) Flint 50 WG, 11-12 oz (14) Abound 2SC, 11.0-15.4 oz (14) Sovran 50 WG, 3.2-4.8 oz (14) Nova 40W, 1.5-2.0 oz	Early control of black rot is important where this disease has been a problem in the past.	Abound: see label for comments on resistance management and toxicity to apple trees. Elite and Nova can be used both as preventative and post infection materials. See label for details and restrictions. Strobilurin fungicides like Flint , Abound and Sovran should not be applied more than 3 time in succession to avoid the development of resistant fungi.

Pest	Spray Material, Rate/A (pre-harvest interval)	Cultural Practices and Scouting Notes	Comments
Bud Break to Pre-bloom (after 1/2" new shoot growth)			
Phomopsis cane and leaf spot	Captan 50WP, 2-4 lb (0) Dithane DF, 1.5 – 4 lb (66) Abound 2SC, 3-4 lb (14)		Strobilurin fungicides such as Sovran and Abound should not be used more than 3 times in succession to avoid the development of resistant fungi.
Downy mildew	Sovran, 4.0-6.4 oz (14) Nu-Cop 50 DF, 2 lb (1)		Nu-Cop may cause slight to severe foliar injury to certain varieties. See label for this and other restrictions.
Powdery mildew	Nova 40WP, 3-5 oz (14) Rubigan EC, 3 oz (30) Procure 50 WS, 4-6 oz (7) Elite 45 DF, 3-4 oz (14)		This early spray is needed on varieties that are highly susceptible to powdery mildew.
Grape Cane Gall-Maker	Imidan 70 WSB, 1.3 – 2 lb (1)		Imidan will also control grape cane borer at this time if present – read label.
Flea beetle	Same as budswell		Scout planting for presence of flea beetle before spraying to avoid unnecessary sprays.
Ten-inch shoot (when new shoots are about 10 inches long)			
Redbanded leafroller	Imidan 70W, 1 1/3-2 1/8 lb (14) Sevin 50WP, 2 – 4 lb (7)	Pheromone traps available for red banded leafroller and grape berry moth to monitor populations in the vineyard and determine the need for spray.	Pre-harvest interval for Sniper depends on rate applied. Higher rate requires longer PHI. Read the label.
Rose chafer	*Sniper 2E, 1-2 pt (0-28)		
			Redbanded leafroller, and rose chafer infestations may occur starting at 4 inch shoot growth.
Grape cane girdler	Gution solupak, 1.5 lb (7)		
European red mite	Vendex 50WP, 0.5-1 lb (28) Kelthane 35 WP, 1-1.5 lb (1)	Mite predators may be effective in controlling pest mites. Contact your local Extension Specialist for information on using predatory mites.	M-Pede may be tank-mixed with Vendex or Kelthane .
Two-spotted spider mite	M-Pede, 1-2% (0)		
			Note: the use of mancozeb fungicides can reduce predatory mite populations.
Flea beetle larvae	Same as bud swell		Flea beetle larvae infestations may occur starting at 4 inch shoot growth.
Pre-bloom			
Phomopsis cane and leaf spot	Captan 50WP, 2-4 lb (0) Dithane DF, 1.5 – 4 lb (66) Abound 2SC, 3-4 lb (14) Sovran, 4.0-6.4 oz (14)		Strobilurin fungicides such as Sovran and Abound should not be used more than 3 times in succession to avoid the development of resistant fungi.
Black rot	Nova 40WP, 3-5 oz (14) Flint 50 WG 3.2-4.0 oz (14) Elite 45 DF, 3-4 oz (14)		Captan labeled only for use against Phomopsis. Dithane, Abound and Sovran labeled for use against both Phomopsis and Black rot. Nova, Flint and Elite labeled only for use against Black rot.

Pest	Spray Material, Rate/A (pre-harvest interval)	Cultural Practices and Scouting Notes	Comments
Pre-Bloom (cont.)			
Downy mildew	Captan 50WP, 2-4 lb (0) Dithane DF, 1.5 – 4 lb (66) Abound 2SC, 3-4 lb (14) Sovran, 4.0-6.4 oz (14) Prophyt 0.3%, (0)		Strobilurin fungicides such as Sovran and Abound should not be used more than 3 times in succession to avoid the development of resistant fungi.
Powdery mildew	Nova 40WP, 3-5 oz (14) Rubigan EC, 3 oz (30) Procure 50 WS, 4-6 oz (7) Elite 45 DF, 3-4 oz (14)		Refer to Rubigan label for further recommendations on rates.
Flea beetle larvae	same as 10 inch spray		
Grape berry moth	3M Sprayable Pheromone, 2 oz (0)	Isomate™ Grape berry moth mating disruption ties are recommended for vineyard blocks of 5 acres or larger. See information under grape fruit pests above for more details. Pheromone traps available for grape berry moth to monitor populations in the vineyard and determine the need for spray postbloom.	Apply 3M Sprayable Pheromone twice per generation in sufficient water to obtain good coverage. First application against spring generation should commence earlier (immediate prebloom to bloom) than traditional insecticide applications are applied (immediate postbloom) followed by a second application 2-3 weeks later.
Bloom			
Black rot	Penncozeb 80WP, 1.5-4.0 lb (66) Nova 40WP, 4-5 oz (14)		If using Nova for post-infection control of black rot, apply at the high label rates during bloom.
Downy mildew Powdery mildew	Procure 50WS, 4-6 oz (7) Captan 50WP, 2-4 lb (0)		Procure is primarily for use against the mildews. DO NOT use more than 32 oz. of Procure 50WS/acre/season. This is a complex label. Read it thoroughly before using.
Botrytis bunch rot	Rovral 50WP, 1.5-2 lb (7) Vanguard WG, 10 oz (7) Elevate 50 WDG, 1 lb (0) Flint 50 WG, 3 oz (14)		Rovral should be applied no more than 4 times. See label for specifications. If tank mixing Vanguard with another fungicide, use 5-10 oz/acre. DO NOT apply more than 20 oz per acre per year. Do not apply more than 3 lbs of Elevate per acre per season. Do not apply Flint to Concord grapes or crop injury may occur.
Grape phylloxera (leaf form)‡	*Thiodan 50 WP, 2lb (7)	Remove infected leaves.	Apply Thiodan when galls are detected and again 10-12 days later. Use only the WP formulation of Thiodan. Thiodan may cause injury to and should not be used on Concord, Cascade, Baco, Colobel, Chambourcin and Chancellor grape varieties.

Pest	Spray Material, Rate/A (pre-harvest interval)	Cultural Practices and Scouting Notes	Comments
Petal-fall (immediately after bloom or 10 days after last spray)			
Black rot Downy mildew Powdery mildew Botrytis bunch rot	same as bloom		
Grape berry moth	3M Sprayable Pheromone, 2 oz (0) Guthion Solupak, 1.5-2 lb (0-10) Sniper 2E, 1-2 pt (0-28) Sevin 50W, 2-4 lb (7) Biobit HP, 0.5-1 lb (0)	Pheromone traps available for red banded leafroller and grape berry moth to monitor populations in the vineyard and determine the need for spray.	See comment under bloom on 3M Sprayable Pheromone . Pre-harvest interval for Guthion and Sniper depends on rate applied. Higher rate requires longer PHI. Read the label. Guthion and Sniper REI varies from 48 hrs to 21 days depending on activity; read the label. Biobit and related B.t. insecticides must be applied as soon as larval feeding begins in order to be effective.
Grape Leafhoppers	Sevin 50W, 2-4 lb (7) M-Pede, 1-2% (0) Danitol 2.4 EC, 5.3-6.6 oz (21)	Examine underside of leaves for presence of leafhoppers.	
Grape mealybug	Imidan 70W, 1 1/3-2 1/8 lb (14)		
Mites	Vendex 50WP, 0.5 - 1 lb (28) Kelthane 35 WP, 1- 1.5 lb (1) M-Pede, 1-2% (0)	Conserve mite predators by avoiding use of carbamate or pyrethroid insecticides.	Vendex should not be used after this time due to pre-harvest interval limitation of 28 days. M-Pede should not be used after 6-7 mm berry size.
Mid-summer sprays: first cover to veraison (berry coloring)			
Black rot Downy mildew	Captan 50WP, 1.5 lb (0) Ferbam 76WP, 3-4 lb (7) Ridomil/Copper 70W, 1-2 lb (66) Ridomil MZ 58, 1.5-2.0 lb (66) Procure 50WS, 4-8 oz (7) Kocide 101, 2 lbs	Kocide 101 is a fixed copper fungicide. Some grape varieties are sensitive to copper. Test for sensitivity or add the recommended amount of hydrated lime according to the label instructions.	Ferbam may be applied once in the midsummer if it was not used in the second post-bloom sprays. Ferbam may be used no more than three times during the season. Fixed copper fungicides should provide good control of downy mildew, but only moderate control of black rot and powdery mildew. These materials can cause damage to leaves and fruit, especially under cool temperatures and slow drying conditions.
Powdery mildew	Bayleton 50WP, 1 - 2 oz (14) Nova 40WP, 4-5 oz (14)		
Grape berry moth Leafhopper Redbanded leafroller Rose chafer Grape mealybug	Same petal fall; repeat as needed to harvest according to label instructions; check for harvest restrictions		See Petal Fall section above
Japanese beetle adults	Imidan 70W, 1 1/3-2 1/8 lb (14) Sevin XLR Plus, 1-2 lb (7)		Repeat as needed to harvest according to label instructions. After beetles appear in early to mid-July, damage is mostly cosmetic if vine growth is vigorous.

Dormant and Delayed Dormant

Pest	Spray Material, Rate/A (pre-harvest interval)	Cultural Practices and Scouting Notes	Comments
Mites	Kelthane 35 WP, 1-1.5 lb (1)		
Veraison to harvest			
Powdery mildew	Sulfur 95 MFW , 2.5 oz (0) Nova 40WP, 1.5 - 2.5 oz (14) Rubigan 1 EC, 3 oz (30)		Sulfur may cause injury of certain grape cultivars, especially if temperatures exceed 85½F. Do not apply more than 1.5 lbs of Nova per acre per season. Do not apply more than 6 fl. oz. of Rubigan EC per acre per application or more than 19 fl. oz. per season. Read the label carefully.
Botrytis bunch rot	same as bloom section		
Downy mildew	Captan 50WP, 1.5 lb (0) Fixed copper (consult label for use instructions)		Consult the label for harvest restrictions.
Black rot	As berries reach full size and sugar content starts to increase, they become resistant to infection by the black rot fungus. In general, berries are no longer susceptible to black rot after veraison (6-8% sugar content)		

‡ Root form controlled by using rootstocks derived from American grapes.

† Where brand names for chemicals are used, it is for the reader's information. Not endorsement is implied, nor is discrimination intended against products with similar ingredients. Please consult pesticide product labels for rates, application instructions and safety.

* **Restricted use material; pesticide applicator license required.**

Weed Management

The primary goal of weed management is to optimize yields by minimizing competition between the weeds and the crop. Weeds reduce yields by competing with the crop for water, light, and nutrients. Weeds also harbor insects and diseases and encourage vertebrate pests. Timely cultivation, wise use of herbicides, and never permitting weeds to go to seed are integral parts of a good weed management system. Many of the weeds found in these fields are difficult-to-control perennial weeds that are not common in annual crop culture. New plantings usually have fewer perennial weed problems than older plantings. Annual and biennial weeds can also exist in these fields. Fields should be scouted at least twice a year (spring and fall) to determine specific weed problems. The selection of a weed management tool should be based on specific weeds present in each field. Several herbicides are labeled for use in this crop. A list of herbicides and their recommended uses is presented in Table 46 below.

Herbicides can be broadcast or applied as a directed spray to the base of the crop. With a band treatment, only 1 to 2 feet on either side of the rows is treated. The area between the crop rows is usually maintained with a mowed cover of sod, clover, weeds, or a combination of these. This cover is used primarily for erosion control and to improve trafficability in the field. With banding, less herbicide is needed in each acre. For example, a 3 foot band (1.5 feet on either side of the row) where rows are spaced 9 feet apart will require only one third the amount of herbicide normally required for a broadcast treatment.

Cultivation and mulching are sometimes used as weed management tools. All cultivations should be timely and shallow to minimize crop root injury, to minimize loss of soil moisture, and to avoid repositioning new weed seeds to the soil surface. Mulches that are free of weed seeds and placed thickly enough can be very effective at reducing or eliminating most annual weeds from the crop row. They are seldom effective on perennial weeds. If mulches are used in combination with herbicides, use the lowest recommended herbicide rate to avoid crop injury.