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## Grape Nutrition

Test the soil a year in advance of planting grape vines, or two years before planting where pH adjustment may be necessary. Some soil amendments do not move readily through the soil profile, but are needed to optimize vineyard productivity. These materials include organic matter, phosphorus, potassium, and lime to adjust soil pH. The only opportunity to thoroughly incorporate these materials is before planting.

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## Manure for Vineyards

Manure can pose a food safety risk on many fruit crops. Ensure at least 120 days between manure application and harvest.

Manure contains beneficial organic matter and provides many macro and micronutrients. The organic nitrogen in manure is mineralized over time, providing nitrogen in diminishing quantities for several years after application. When manure is used, adjust applied inorganic nitrogen to avoid over applications. Excessive nitrogen, particularly in the second half of the growing season, can result in poor fruit colour, excessive growth and delayed hardening of the woody tissue, which may make plants more susceptible to winter injury. Observe the following guidelines to receive the benefits of manure while minimizing potential problems:

- Apply no more than 7 tonnes/ha of poultry manure (20 m<sup>3</sup> liquid), 40 tonnes/ha of cattle manure (100 m<sup>3</sup> liquid) and 35 tonnes/ha of hog manure (65 m<sup>3</sup> liquid). Since the nutrient content of manure varies considerably, it should be tested before application. See *Manure nitrogen*, page 22.
- Broadcast manure and work it into the soil in late fall or early spring before planting.
- Do not place manure around newly planted vines in late summer as winter injury may result.
- Adjust the rate of nitrogen, phosphorus and potassium fertilizers applied according to the nutrient content of the manure. See Table 3-11. *Average Fertilizer Replacement Values for Different Types of Manure*, page 22.
- For more information about food safety and the environmental impacts of manure application, see *Manure nitrogen* and *Use manure responsibly*, page 22.

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## pH Requirements

The pH of a soil is a measure of its acidity and affects nutrient uptake and crop performance. If the soil test report recommends a lime application to increase soil pH, add lime at recommended rates prior to planting. For details regarding rates and suggested types of lime to use, refer to *Soil pH and Liming*, page 18.

In established vineyards sample soil in the vine row every three years to ensure the pH is satisfactory. If pH is low or acidic, apply lime in the fall to the sod cover or before spring cultivation. The results will not show immediately because lime reacts slowly in the soil. Apply lime to established vineyards when the pH drops below 5.1 on clay loam soils or 5.6 on sandy soils. Lime raises the soil pH, reduces its acidity and also supplies calcium. For details regarding rates and suggested types of lime to use, refer to *Soil pH and Liming*, page 18.

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## Petiole Analysis

In established plantings, the best way to determine the nutrient status of the vines is by petiole analysis. In conjunction with soil analysis, it provides good information for adjusting fertilizer rates. For more information on these tests, see *Plant tissue analysis*, page 16.

Nutrient uptake is affected by many vineyard conditions and varies slightly from year to year, depending on the season. To obtain optimum growth and fruit quality, all nutrients must be present in sufficient concentrations. See Table 6-1. *Nutrient Sufficiency Range of Grape Petioles*, page 138.

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Table 6-1. Nutrient Sufficiency Range of Grape Petioles (Taken in September from Mature Vines)

Variety	N	P	K*	Ca	Mg	Fe	B	Zn	Mn
	%					ppm			
Vinifera	0.8–1.4	0.15–0.4	1.2–2.3	1–3	0.6–1.5	15–100	20–60	15–100	20–200
Labrusca (Fredonia)	0.6–1.2	0.15–0.4	0.8–1.8	1–3	0.6–1.5	15–100	20–60	15–100	20–200
Other	0.7–1.3	0.15–0.4	1–2	1–3	0.6–1.5	15–100	20–60	15–100	20–200

\* Potassium levels may be higher in grapes grown on sandy loam soils.

For petiole analysis to be most useful, sample the same vines each year. Use these tests along with soil testing to determine the fertilizer program. Soil management practices, vine age, rootstock, soil type, previous fertilizer program, growth, and quality must also be considered to determine fertilizer requirements.

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## Fertilizer for Grapes

The best time to effectively incorporate nutrients such as potassium, phosphorus, boron and lime into the soil is prior to planting the vineyard. Nutrient levels in the topsoil adequate for vineyard establishment are 12–20 ppm phosphorus, 120–150 ppm potassium, 100–250 ppm magnesium and 1,000–5,000 ppm calcium. Table 6-2. *Phosphorus and Potassium Soil Requirements for New Plantings of Grapes*, on this page, provides fertilizer rates prior to planting. Along with incorporation of organic matter such as manure, these fertility levels will sustain the vineyard through the juvenile years.

- High nitrogen levels can result in excessive growth and incomplete vine hardening. Use cover crops to reduce late season nitrogen levels in cultivated vineyards, especially in new plantings. Sow cover crops such as Italian ryegrass about July 1 to take up much of the available nitrogen in the soil.

### **Nitrogen (N)**

Use petiole analysis to determine nitrogen requirements. Use 34 kg of nitrogen per ha only if this information is not available. Broadcast nitrogen before the first cultivation. In vineyards with sod between the rows, apply nitrogen as early as possible in the spring. Where urea (46-0-0) is applied, it must be incorporated to reduce losses by volatilization. Do not use urea in vineyards with sod between the rows because incorporation is not possible. Reduce rates or eliminate nitrogen entirely if manure is used or growth has been excessive. If severe winter temperatures cause fruit bud damage, it may be necessary to split nitrogen applications. Apply the first application in early May, and the second application, if necessary, after bloom in late June. During dry springs, use irrigation to move the fertilizer into the rooting zone just before first bloom or immediately after capfall. Consider foliar applications of nitrogen if vine performance and petiole analysis suggest the need.

### **Phosphorus (P)**

Grapes do not require high levels of soil phosphorus. With a few exceptions, the level of phosphorus in Ontario soils is adequate for grapes. Use a soil test to determine if phosphorus fertilizer is required. A phosphorus soil test value between 12–20 ppm is adequate for vineyard establishment and production. When establishing a new planting, apply phosphorus before planting and thoroughly incorporate it into the soil. See Table 6-2. *Phosphorus and Potassium Soil Requirements for New Plantings of Grapes*, on this page. In established plantings, use petiole analysis along with soil analysis to estimate phosphorus requirements. Additional phosphorus may be needed for sod or cover crop maintenance.

### **Potassium (K)**

Grapes require larger amounts of potassium than tree fruits. In established plantings, use petiole analysis along with soil analysis to estimate potassium to determine requirements. Excess potassium can lead to deficiency of magnesium (Mg). Avoid unnecessary potassium applications.

Table 6-2. Phosphorus and Potassium Soil Requirements for New Plantings of Grapes

Soil phosphorus		Soil potassium *	
Soil test (ppm P)	Phosphate (P <sub>2</sub> O <sub>5</sub> ) required (kg/ha)	Soil test (ppm K)	Potash (K <sub>2</sub> O) required (kg/ha)
0-3	80 HR	0-15	270 HR
4-5	60 HR	16-30	270 HR
6-7	50 HR	31-45	270 HR
8-9	40 MR	46-60	270 HR
10-12	20 MR	61-80	270 HR
13-15	0 LR	81-100	270 HR
16-20	0 LR	101-120	270 HR
21-25	0 RR	121-150	270 MR
26-30	0 RR	151-180	270 MR
31-40	0 RR	181-210	270 MR
41-50	0 RR	211-250	270 LR
51-60	0 RR	250 +	270 LR
61-80	0 NR		
80 +	0 NR		

\* For new plantings, apply only every second year. For established grapes, use plant analysis to estimate requirements of N, P and K. HR, MR, LR, RR, and NR denote, respectively: high, medium, low, rare and no probabilities of profitable crop response to applied nutrient.

Prior to establishment, incorporate potassium according to Table 6-2. *Phosphorus and Potassium Soil Requirements for New Plantings of Grapes*, page 138. In established cultivated vineyards, broadcast potassium before the first cultivation in the spring. In established vineyards with sod between the rows, and in vineyards on clay soils, apply potassium in a band to reduce potassium fixation and increase its availability to the vines. Muriate of potash (0-0-60, potassium chloride) can injure roots and trunks if applied too closely to the trunk.

**Foliar application of potassium for grapes**

In dry growing seasons, potassium is not readily available to the plant. When a potassium deficiency occurs, foliar applications of potassium may help. Foliar potassium applied at veraison (when grapes begin to ripen) may improve fruit yield and quality.

**Magnesium (Mg)**

Magnesium soil test values between 100–250 ppm are adequate for grapes. Dolomitic limestone can be used on acidic soils to raise the soil pH and to supply magnesium. Magnesium deficiency has become more evident in vineyards, particularly when high rates of potassium are used.

Magnesium deficiency can lead to premature fruit drop. Because magnesium is a part of the chlorophyll molecule, magnesium deficient vines have older leaves that are pale in colour. Petiole analysis is the best way to evaluate magnesium levels.

Foliar sprays correct magnesium deficiency for the current year only. For long-term corrections, apply magnesium to the soil in early spring. On some soil types a single, early-spring application of soil-applied magnesium may not be enough. A second or third application the next spring may be required before the magnesium level in the plant improves.

Foliar sprays are recommended for the first two years, in addition to soil applications. See Table 6-3. *Magnesium Foliar Sprays*, on this page.

Fruit or foliage injury may occur if pesticides are mixed with magnesium sulphate (Epsom salts). Pesticides should be applied as a separate spray. Check the manufacturer’s label about mixtures of magnesium chelates with pesticides. Use only chelates recommended for foliar sprays.

Table 6-3. Magnesium Foliar Sprays

Timing	Product	Rate	Notes
3 sprays spaced 10 days apart beginning in mid-July	Magnesium sulfate (Epsom salts)	20 kg/1,000 L water	Wet plant to point of runoff. Do not concentrate beyond 40 kg/1,000 L water.
	Liquid formulations including chelates*	Consult product label	May be compatible with some pesticides. Consult product label.

\* Use chelates recommended for foliar sprays.

**Calcium (Ca)**

Calcium deficiency has been associated with strachis (cluster stem) breakdown of Canada

Muscat and Himrod grapes. This deficiency is usually associated with water uptake imbalances in the vine during bloom and immediately post fruit set. It is difficult to correct with calcium foliar sprays.

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## **Micronutrients**

Deficiencies of micronutrients are not widespread in Ontario plantings. The desirable range for micronutrients is quite narrow. Micronutrients applied in excess can cause more damage than deficiencies. For this reason, do not apply micronutrients unless petiole analysis confirms a deficiency. Apply only the nutrient that is deficient and only in sufficient quantities to correct the problem.

Lime-induced chlorosis is a deficiency in iron or manganese occasionally induced by alkaline soils with high soil bicarbonates or by excessive lime application. For additional information, see *Micronutrients*, page 26.

Apply nutrients according to recommended rates on the product label. Do not spray during temperatures above 25°C.

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Figure 6-1. Grape Growth Stages

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# Grape Calendar

Read the product label and follow all safety precautions. Some grape varieties are sensitive to Sulphur, Copper, Flint, Pristine, or other products. See Table 6-5. *Relative Susceptibility of Grape Cultivars to Diseases*, page 158, for specific information.

For preharvest intervals, re-entry periods, maximum number of applications and chemical groups, see Table 6-4. *Products Used on Grapes*, page 156.

## **Resistance management**

To delay development of resistance to fungicides, miticides and insecticides, follow resistance management guidelines outlined in *Pest Resistance to Insecticides, Fungicides, Miticides*, page 253. Products belonging to the same chemical group are grouped together in the calendar.

In addition, take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use Nova, Inspire, Sovran, Flint, Vivando, Lance, Cantus, Revus, or Pristine as eradicants when sporulating lesions of the target disease are present.
- Use sufficient water to provide thorough coverage.

## **Preharvest intervals**

**Contact the processors and wineries directly in regard to their preharvest interval policy.** Preharvest intervals listed in Table 6-4. *Products Used on Grapes*, page 156, are taken from product labels. In some cases, regulations on residues in finished products (e.g. wine) are much more stringent. Many processors require longer preharvest intervals than stated on product labels. Some processors and wineries also have special restrictions for certain pest control products regarding number of applications or application after a certain crop stage. Consult the grape purchaser for more details.

## **Spray water volumes**

Sufficient water volumes are necessary to provide complete coverage with grape fungicides, miticides and insecticides. Increased water volumes are necessary as the season progresses and canopies grow. Canopy management through hedging, leaf-pulling and shoot thinning, as well as proper sprayer calibration, are critical to ensure proper spray coverage. Sufficient coverage and efficacy are not possible if water volumes are inadequate. Some types of sprayers are able to provide sufficient coverage with less water than others. Consult equipment dealers or professional crop consultants about the amount of water needed to ensure adequate coverage. Where the product rate is listed in amount per 1,000 L and if a water volume is not provided on the label, use enough water to wet the foliage to the near-drip point. Read and follow water volume requirements on all product labels.

Products are listed according to insecticide and fungicide groups.

Diseases and Insects	Products	Rate	Comments
<b>Bud burst to first leaf</b>			
Climbing cutworm	• Altacor	285 g/ha	<b>Altacor:</b> Apply when cutworms start feeding on buds. Use no more than twice per season at recommended rate. <b>Pounce:</b> Increase rate to 360 mL/ha if cutworms are large (2–3 cm). Apply in at least 450 L of water per ha. Spray trunk and soil surface within 0.5 m of the trunk in the evening. Do not disturb the soil for 5 days after spraying.
	• Pounce 384 EC	180 mL/ha	

Diseases and Insects	Products	Rate	Comments
<b>First leaf, 1.25–5 cm shoot length</b>			
Phomopsis cane and leaf spot	<ul style="list-style-type: none"> <li>Supra Captan 80 WDG or Maestro 80 DF</li> <li>Folpan 80 WDG</li> </ul>	1.2 kg/1,000 L water 2 kg/ha 1.25 kg/ha	Spray susceptible varieties, especially if the weather is wet and there is a history of phomopsis in the vineyard. See Table 6-5. <i>Relative Susceptibility of Grape Cultivars to Diseases</i> , page 158. Use enough water to ensure complete coverage. Alternate row spraying will not give adequate protection from phomopsis.
<b>3–5 leaves unfolded, 10–15 cm shoot length</b>			
Phomopsis cane and leaf spot	<ul style="list-style-type: none"> <li>Supra Captan 80 WDG or Maestro 80 DF</li> <li>Folpan 80 WDG</li> </ul>	1.2 kg/1,000 L water 2 kg/ha 1.25 kg/ha	Spray susceptible varieties, especially if the weather is wet and there is a history of phomopsis in the vineyard. See Table 6-5. <i>Relative Susceptibility of Grape Cultivars to Diseases</i> , page 158. Use enough water to ensure complete coverage. Alternate row spraying will not give adequate protection from phomopsis.
Black rot	<ul style="list-style-type: none"> <li>Nova 40 W</li> <li>Ferbam 76 WDG</li> <li>Polyram DF</li> </ul>	200 g/ha  2 kg/1,000 L water 2 kg/1,000 L water	Spray susceptible varieties, especially where there is a history of black rot and conditions are wet. Use enough water to ensure complete coverage. Alternate row spraying will not give adequate protection from black rot.
Powdery mildew	<ul style="list-style-type: none"> <li>Nova 40 W</li> <li>Inspire</li> <li>Quintec</li> <li>Vivando SC</li> <li>Microscopic Sulphur or Kumulus DF or Microthiol Disperss</li> <li>MilStop</li> <li>Serenade ASO</li> <li>Purespray Green Spray Oil 13E</li> </ul>	200 g/ha 292 mL/ha  300 mL/ha  750 mL/ha  4.5 kg/1,000 L water 12.6 kg/ha 12.6 kg/ha  2.8 kg/500 L water/ha  9–15 L/ha  10 L/1,000 L water/ha	<p>Unless otherwise indicated, spray at 7–10 day intervals to protect expanding leaves and developing fruit clusters before symptoms appear. Spray at 7 day intervals if weather is conducive to disease or if rapid shoot growth that outgrows coverage is occurring. Alternate row spraying will not give adequate protection from powdery mildew.</p> <p>Nova, Inspire, Quintec, Vivando: To manage resistance for each of these fungicides, rotate to a different fungicide group for each spray. See <i>Managing resistance to fungicides</i>, page 254 and Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i>, page 257. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain.</p> <p>Nova and Inspire: Do not rotate between these products.</p> <p>MilStop: Apply in 500 L water per ha. MilStop creates a mildly alkaline solution. Do not tank mix with pH adjusters, oil, or products not compatible with mild alkaline solutions. MilStop works as an eradicant and has no protective activity.</p> <p>Serenade ASO: Provides suppression of powdery mildew. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control, and <i>Bacillus subtilis</i> (Serenade ASO, Serenade MAX), page 242.</p> <p>Purespray Green Spray Oil 13E: Provides suppression of powdery mildew. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control. Summer oils can cause crop injury, depending on rate, cultivar, weather conditions, and recent pesticide applications. Do not apply less than 1,000 L water/ha (1% solution). Not all varieties have been tested for tolerance, so spray a small area of each variety to confirm tolerance prior to spraying the whole field. Do not apply within 14 days of Captan, Maestro, Folpan, Bravo, Echo, Pounce, Perm-Up, or products containing sulphur. Do not apply within 48 hours of freezing temperatures. Do not apply when temperatures are very high (above 25°C) or to crops under moisture stress. Do not apply just prior to rain. Read the label</p>

Diseases and Insects	Products	Rate	Comments
			carefully for other precautions. See notes on <i>Mineral oil (Purespray Green Spray Oil 13E)</i> , page 252.
<b>Shoot length, 20–25 cm</b>			
Phylloxera (leaf form)	<ul style="list-style-type: none"> <li>• Movento 240 SC</li> <li>• Assail 70 WP</li> </ul>	365 mL/ha  80 g/ha	<b>Movento</b> works slowly so control may not be apparent for 2–3 weeks. Apply when galls are first observed, but do not apply before this growth stage because there will not be enough leaf area for product uptake. Movento will redistribute to young leaves as they develop. Consecutive applications should be at least 30 days apart. Must be tank-mixed with a spray adjuvant/ additive having spreading and penetrating properties at a suggested rate of 0.2 % v/v (2 L/1,000 L). See label for further details.
Grape berry moth (GBM)	<ul style="list-style-type: none"> <li>• Isomate-GBM Plus</li> </ul>	500 dispensers/ha	<b>Isomate-GBM Plus:</b> Apply prior to first flight to reduce mating of grape berry moths. Most effective on vineyard blocks that are roughly square and larger than 2 ha. Border sprays of insecticide or higher rates of pheromone (1,000 dispensers per ha) may be required where grape berry moth pressure is high. Attach dispensers onto upper training wire of vines with a single twist. Monitor for GBM and other pests throughout the season to determine if insecticides are needed. Dispensers release pheromone for up to 150 days, depending on temperature. For more information, see <i>Using mating disruption to control grape berry moth</i> , page 250.
Phomopsis cane and leaf spot	<ul style="list-style-type: none"> <li>• Supra Captan 80 WDG or Maestro 80 DF</li> <li>• Folpan 80 WDG</li> </ul>	1.2 kg/1,000 L water 2 kg/ha 1.25 kg/ha	Spray susceptible varieties, especially if the weather is wet and there is a history of phomopsis in the vineyard. See Table 6-5. <i>Relative Susceptibility of Grape Cultivars to Diseases</i> , page 158. Use enough water to ensure complete coverage.
Black rot	<ul style="list-style-type: none"> <li>• Nova 40 W</li> <li>• Sovran</li> <li>• Flint 50 WG</li> <li>• Pristine WG</li> <li>• Polyram DF</li> <li>• Ferbam 76 WDG</li> </ul>	200 g/ha  240 g/ha 140 g/ha 735 g/ha  2 kg/1,000 L water 2 kg/1,000 L water	<b>Sovran</b> is phytotoxic to some varieties of cherries (see label); do not let product drift onto sensitive crops. Flint: Do not apply to Concord grapes or crop injury may occur. Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury. Polyram: Use no more than three times per season.
Powdery mildew	<ul style="list-style-type: none"> <li>• Sovran</li> <li>• Flint 50 WG</li> <li>• Pristine WG</li> <li>• Lance WDG or Cantus WDG</li> <li>• Nova 40 W</li> <li>• Inspire</li> <li>• Quintec</li> <li>• Vivando SC</li> <li>• Microscopic Sulphur or Kumulus DF or Microthiol Disperss</li> <li>• MilStop</li> </ul>	300 g/ha 140 g/ha 420–735 g/ha  315 g/ha 315 g/ha  200 g/ha 292 mL/ha  300 mL/ha  750 mL/ha  4.5 kg/1,000 L 12.6 kg/ha 12.6 kg/ha  2.8 kg/500 L	Unless otherwise indicated, spray at 7–10 day intervals to protect expanding leaves and developing fruit clusters before symptoms appear. Spray at 7 day intervals if weather is conducive to disease or if rapid shoot growth that outgrows coverage is occurring. Alternate row spraying will not give adequate protection from powdery mildew. Nova, Inspire, Quintec, Vivando, Pristine, Flint, Sovran, Lance, Cantus: To manage resistance for each of these fungicides, rotate to a different fungicide group for each spray. Do not apply to sporulating lesions. See <i>Managing resistance to fungicides</i> , page 254 and Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i> , page 257. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain. Pristine, Sovran, Flint: Do not rotate within this group. <b>Sovran</b> is phytotoxic to some varieties of cherries (see label); do not let product drift onto sensitive crops. Flint: Do not apply to Concord grapes or crop injury may

Diseases and Insects	Products	Rate	Comments
	<ul style="list-style-type: none"> <li>• Serenade ASO</li> <li>• Purespray Green Spray Oil 13E</li> </ul>	<p>water/ha</p> <p>9–15 L/ha</p> <p>10 L/1,000 L water/ha</p>	<p>occur.</p> <p>Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury.</p> <p>Pristine, Lance, Cantus: Do not rotate Pristine with Lance or Cantus.</p> <p>Nova, Inspire: Do not rotate within this group.</p> <p>Vivando: Do not apply at intervals of less than 14 days.</p> <p>MilStop: Apply in 500 L water per ha. MilStop creates a mildly alkaline solution. Do not tank mix with pH adjusters, oil, or products not compatible with mild alkaline solutions. MilStop works as an eradicant and has no protective activity.</p> <p>Serenade ASO: Provides suppression of powdery mildew. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control, and <i>Bacillus subtilis</i> (Serenade ASO, Serenade MAX), page 242.</p> <p>Purespray Green Spray Oil 13E: Provides suppression of powdery mildew. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control. Summer oils can cause crop injury, depending on rate, cultivar, weather conditions, and recent pesticide applications. Do not apply less than 1,000 L water/ha (1% solution). Not all varieties have been tested for tolerance, so spray a small area of each variety to confirm tolerance prior to spraying the whole field. Do not apply within 14 days of Captan, Maestro, Folpan, Bravo, Echo, Pounce, Perm-Up, or products containing sulphur. Do not apply within 48 hours of freezing temperatures. Do not apply when temperatures are very high (above 25°C) or to crops under moisture stress. Do not apply just prior to rain. Read the label carefully for other precautions. See notes on <i>Mineral oil</i> (Purespray Green Spray Oil 13E), page 252.</p>
Downy mildew	<ul style="list-style-type: none"> <li>• Revus</li> <li>• Sovran</li> <li>• Pristine WG</li> <li>• Polyram DF</li> <li>• Manzate 200 WP</li> <li>• Maestro 80 DF or Supra Captan 80 WDG</li> <li>• Folpan 80 WDG</li> <li>• Copper Spray</li> <li>• Guardsman Copper Oxychloride</li> <li>• Gavel 75 DF</li> <li>• Ridomil Gold MZ 68 WG</li> </ul>	<p>500 mL/ha</p> <p>300 g/ha</p> <p>675–735 g/ha</p> <p>2 kg/1,000 L water</p> <p>6.75 kg/ha</p> <p>2 kg/ha</p> <p>1.5 kg/1,000 L water</p> <p>1.25 kg/ha</p> <p>3 kg + 6 kg lime/1,000 L water</p> <p>3 kg + 6 kg lime/ha</p> <p>2.25 kg/ha</p> <p>2.5 kg/ha</p>	<p>Spray at 7-10 day intervals to protect expanding leaves and developing fruit clusters. Spray at shorter intervals in rainy weather. If bloom is delayed or wet weather is expected, spray again.</p> <p>Revus, Sovran, Pristine: To manage resistance for each of these fungicides, rotate to a different fungicide group for each spray. Do not apply to sporulating lesions. See <i>Managing resistance to fungicides</i>, page 254 and Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i>, page 257. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain.</p> <p>Revus: Use with a non-ionic adjuvant (0.125%, 1.25 L/1,000 L). Do not use Revus plus adjuvant tank-mixed with sulphur on sulphur-sensitive varieties. Use no more than four applications per season.</p> <p>Sovran: Sovran is phytotoxic to some varieties of cherries (see label); do not let product drift onto sensitive crops.</p> <p>Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury.</p> <p>Pristine, Sovran: Do not rotate between Pristine and Sovran.</p> <p>Copper Spray, Guardsman Copper Oxychloride: Do not</p>

Diseases and Insects	Products	Rate	Comments
			apply on Seibel varieties (De Chaunac). Ridomil Gold MZ: Use no more than one prebloom and one postbloom application.
<b>Immediate prebloom</b>			
Grape berry moth (1st generation)	<ul style="list-style-type: none"> <li>• Delegate WG</li> <li>• Success 480 SC or Entrust 80 W</li> <li>• Altacor</li> <li>• Dipel 2X DF</li> <li>• Pounce 384 EC or Perm-Up or Ambush 500 EC</li> <li>• Imidan 50 WP</li> <li>• Sevin XLR</li> </ul>	280 g/ha 182 mL/ha 109 g/ha  285 g/ha  1.125 g/ha  360 mL/ha 360 mL/ha 275 mL/ha  1.9 kg/ha 5.25 L/ha	Where there is a history of early-season grape berry moth injury, apply an insecticide for first generation in enough water to ensure complete coverage. For resistance management, do not use insecticides from the same group for more than one generation. Within a generation, only one chemical group should be used. Dipel 2X DF: Re-application may be required 7–10 days later. See <i>Biopesticides for Insect Control</i> , page 247. Delegate, Success, Entrust: Provide suppression rather than control of grape berry moth. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i> , page 13, for definitions of suppression and control. Altacor, Delegate, Success, Entrust, Dipel: Apply at first egg hatch (first sustained moth catch in pheromone traps), earlier than the traditional timing (upswing in moth numbers captured in traps) used for Pounce or Imidan. A second application may be necessary if flight is extended.
Japanese beetle	<ul style="list-style-type: none"> <li>• Imidan 50 WP</li> <li>• Assail 70 WP</li> </ul>	1.9 kg/ha  80 g/ha	Japanese beetle is a sporadic pest that feeds on over 300 plant species. Monitor to determine beetle presence and extent of feeding damage. Where damage is localized, spot-treatment may be adequate for control. Watch for re-infestation after treatment. Imidan: Be aware of current label changes with respect to restrictions and precautions. See Table 6-4, <i>Products used on Grapes</i> , page 156.
Leafhoppers	<ul style="list-style-type: none"> <li>• Assail 70 WP</li> <li>• Clutch 50 WDG</li> <li>• Pounce 384 EC or Perm-Up or Ambush 500 EC</li> <li>• Sevin XLR</li> <li>• Surround WP</li> </ul>	80 g/ha 100–140 g/ha  175 mL/ha 175 mL/ha 140 mL/ha  5.25 L/ha  50 kg /ha	Grape leafhopper (GLH), potato leafhopper (PLH) and three banded leafhopper (TBLH) are the three main species of leafhoppers that feed on grapes. Surround WP: May delay sugar accumulation. Closely monitor harvest parameters to determine best time to harvest. Use 50 kg/-ha of Surround for the first two applications to establish the protectant layer, followed by 25 kg/ha in subsequent sprays. Re-apply to maintain complete coverage following heavy rain. Applications after veraison (when grapes begin to ripen) will adhere better to berries. Do not apply Surround postbloom on table grapes. See <i>Kaolin clay (Surround WP)</i> , page 247.
Phylloxera (leaf form)	<ul style="list-style-type: none"> <li>• Movento 240 SC</li> <li>• Assail 70 WP</li> <li>• Clutch 50 WDG</li> </ul>	365 mL/ha  80 g/ha 140–210 g/ha	<b>Movento</b> works slowly so control may not be apparent for 2–3 weeks. Movento will redistribute to young leaves as they develop. Consecutive applications should be at least 30 days apart. Must be tank-mixed with a spray adjuvant/additive having spreading and penetrating properties at a suggested rate of 0.2% v/v. See label for further details.
<b>Trace bloom (first cap fall)</b>			
<b>DO NOT APPLY INSECTICIDES WHILE GRAPES ARE IN BLOOM. SEE BEE POISONING ON PAGE 267.</b>			
Black rot	<ul style="list-style-type: none"> <li>• Nova 40 W</li> <li>• Sovran</li> <li>• Flint 50 WG</li> </ul>	200 g/ha  240 g/ha 140 g/ha	Fruit clusters are highly susceptible to black rot from bloom to 4 weeks postbloom. <b>Sovran</b> is phytotoxic to some varieties of cherries (see label); do not let product drift onto sensitive crops.

Diseases and Insects	Products	Rate	Comments
	<ul style="list-style-type: none"> <li>• Pristine WG</li> <li>• Polyram DF</li> <li>• Ferbam 76 WDG</li> </ul>	735 g/ha  2 kg/1,000 L water 2 kg/1,000 L water	Flint: Do not apply to Concord grapes or crop injury may occur. Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury.
Downy mildew	<ul style="list-style-type: none"> <li>• Revus</li> <li>• Pristine WG</li> <li>• Sovran</li> <li>• Presidio</li> <li>• Polyram DF</li> <li>• Manzate 200 WP</li> <li>• Maestro 80 DF or Supra Captan 80 WDG</li> <li>• Folpan 80 WDG</li> <li>• Gavel 75 DF</li> <li>• Ridomil Gold MZ 68 WG</li> <li>• Copper Spray</li> <li>• Guardsman Copper Oxychloride</li> </ul>	500 mL/ha  675–735 g/ha 300 g/ha  220–292 mL/ha  2 kg/1,000 L water 6.75 kg/ha  2 kg/ha 1.5 kg/1,000 L water 1.25 kg/ha  2.25 kg/ha  2.5 kg/ha  3 kg + 6 kg lime/ 1,000 L water 3 kg + 6 kg lime/ha	Fruit clusters are highly susceptible to downy mildew from bloom until 4-6 weeks postbloom. Spray at 7–10 day intervals to protect expanding leaves and developing fruit clusters. Spray at shorter intervals in rainy weather. Revus, Sovran, Pristine, Presidio: To manage resistance for each of these fungicides, rotate to a different fungicide group for each spray Do not apply to sporulating lesions. See <i>Managing resistance to fungicides</i> , page 254 and Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i> , page 257. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain. Revus: The use of a non-ionic adjuvant is recommended (0.125% 1.25 L/1,000 L water). Do not use Revus plus adjuvant tank-mixed with sulphur on sulphur-sensitive varieties. Use no more than four applications per season. Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury. <b>Sovran</b> is phytotoxic to some varieties of cherries (see label); do not let product drift onto sensitive crops. Pristine, Sovran: Do not rotate between these products. Presidio: Tank mix with a labelled rate of another fungicide registered for downy mildew, but with a different mode of action. Copper Spray and Guardsman Copper Oxychloride: Do not apply on Seibel varieties (De Chaunac). Ridomil Gold MZ: No more than one pre-bloom application.
Powdery mildew	<ul style="list-style-type: none"> <li>• Sovran</li> <li>• Flint 50 WG</li> <li>• Pristine WG</li> <li>• Lance WDG</li> <li>• or Cantus WDG</li> <li>• Nova 40 W</li> <li>• Inspire</li> <li>• Quintec</li> <li>• Vivando SC</li> <li>• Microscopic Sulphur or Kumulus DF or Microthiol Disperss</li> <li>• MilStop</li> <li>• Serenade ASO</li> <li>• Purespray Green Spray</li> </ul>	300 g/ha 140 g/ha 420–735 g/ha  315 g/ha 315 g/ha  200 g/ha 292 mL/ha  300 mL/ha  750 mL/ha  4.5 kg/1,000 L water 12.6 kg/ha 12.6 kg/ha  2.8 kg/500 L water/ha  9–15 L/ha	Fruit clusters are very susceptible to infection by powdery mildew from bloom through 4-6 weeks post-bloom. Unless otherwise indicated below, spray at 7–10 day intervals to protect expanding leaves and developing fruit clusters. Spray at 7-day intervals if weather is conducive to disease. Nova, Inspire, Quintec, Vivando, Pristine, Flint, Sovran, Lance, Cantus: To manage resistance for each of these fungicides, rotate to a different fungicide group for each spray. Do not apply to sporulating lesions. See <i>Managing resistance to fungicides</i> , page 254 and Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i> , page 257. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain. <b>Sovran</b> is phytotoxic to some varieties of cherries (see label); do not let product drift onto sensitive crops. Flint: Do not apply to Concord grapes or crop injury may occur. Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury. Sovran, Flint, Pristine: Do not rotate among this group.

Diseases and Insects	Products	Rate	Comments
	Oil 13E	10 L/1,000 L water/ha	<p>Pristine, Lance, Cantus: Do not rotate Pristine with Lance or Cantus. For resistance management, use no more than two sprays of any of these products per season.</p> <p>Nova, Inspire: Do not rotate between these products.</p> <p>Vivando: Do not apply at intervals of less than 14 days.</p> <p>MilStop: Apply in 500 L water per ha. MilStop creates a mildly alkaline solution. Do not tank mix with pH adjusters, oil, or products not compatible with mild alkaline solutions. MilStop works as an eradicant and has no protective activity.</p> <p>Serenade ASO: Provides suppression of powdery mildew. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control, and <i>Bacillus subtilis</i> (Serenade ASO, Serenade MAX), page 242.</p> <p>Purespray Green Spray Oil 13E: Provides suppression of powdery mildew. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control. Summer oils can cause crop injury, depending on rate, cultivar, weather conditions, and recent pesticide applications. Do not apply less than 1,000 L water/ha (1% solution). Not all varieties have been tested for tolerance, so spray a small area of each variety to confirm tolerance prior to spraying the whole field. Do not apply within 14 days of Captan, Maestro, Folpan, Bravo, Echo, Pounce, Perm-Up, or products containing sulphur. Do not apply within 48 hours of freezing temperatures. Do not apply when temperatures are very high (above 25°C) or to crops under moisture stress. Do not apply just prior to rain. Read the label carefully for other precautions. See notes on <i>Mineral oil</i> (Purespray Green Spray Oil 13E), page 252.</p>
Botrytis bunch rot	<ul style="list-style-type: none"> <li>• Rovral</li> <li>• Vanguard 75 WG</li> <li>• Scala SC</li> <li>• Elevate 50 WDG</li> <li>• Pristine WG</li> <li>• Serenade ASO</li> </ul>	<p>1.5 kg/ha</p> <p>750 g/ha 2 L/ha</p> <p>1.12 kg/ha</p> <p>420–735 g/ha</p> <p>5–15 L/ha</p>	<p>If the bloom/postbloom period is wet, spray immediately to control latent infections in susceptible varieties (Gamay Noir, Pinot Noir, Pinot Gris, Riesling, Chardonnay and Seyval Blanc). Direct this spray at the fruiting zone.</p> <p>Vanguard, Scala: Use once and then rotate to a different group. Use no more than two applications of either product per season.</p> <p>Elevate: Do not apply Elevate if rainfall is expected within six hours after application.</p> <p>Pristine: At high rate provides suppression of bunch rot. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control.</p> <p>Serenade ASO: Provides suppression of botrytis bunch rot. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control, and <i>Bacillus subtilis</i> (Serenade ASO, Serenade MAX), page 242.</p>
<b>Immediate postbloom to early fruit set</b>			
Leafhoppers	<ul style="list-style-type: none"> <li>• Assail 70 WP</li> <li>• Clutch 50 WDG</li> <li>• Pounce 384 EC or Perm-Up or Ambush 500 EC</li> <li>• Sevin XLR</li> </ul>	<p>80 g/ha 100–140 g/ha</p> <p>175 mL/ha 175 mL/ha 140 mL/ha</p> <p>5.25 L/ha</p>	<p>Grape leafhopper (GLH), potato leafhopper (PLH) and three banded leafhopper (TBLH) are the three main species of leafhoppers that feed on grapes.</p> <p>Surround WP: May delay sugar accumulation. Closely monitor harvest parameters to determine best time to harvest. Use 50 kg/ha of Surround for the first two applications to establish the protectant layer, followed by 25 kg/ha in subsequent sprays. Re-apply to maintain complete coverage following heavy rain. Applications after veraison (when grapes</p>

Diseases and Insects	Products	Rate	Comments
	<ul style="list-style-type: none"> <li>• Surround WP</li> </ul>	50 kg /ha	begin to ripen) will adhere better to berries. Do not apply Surround postbloom on table grapes. See <i>Kaolin clay (Surround WP)</i> , page 247.
Phylloxera (leaf form)	<ul style="list-style-type: none"> <li>• Movento 240 SC</li> <li>• Assail 70 WP</li> <li>• Clutch 50 WDG</li> </ul>	365 mL/ha 80 g/ha 140–210 g/ha	Only French hybrid and Vinifera varieties are susceptible to this pest. Movento: has slow activity; control may not be apparent for 2–3 weeks. Consecutive applications should be at least 30 days apart. Movento will redistribute to young leaves as they develop. Use no more than twice per season at recommended rate. Must be tank-mixed with a spray adjuvant/additive having spreading and penetrating properties at a suggested rate of 0.2 % v/v. See label for further details.
Japanese beetle	<ul style="list-style-type: none"> <li>• Imidan 50 WP</li> <li>• Assail 70 WP</li> </ul>	2.5 kg/ha 80 g/ha	Japanese beetle is a sporadic pest that feeds on over 300 plant species. Monitor to determine beetle presence and extent of feeding damage. Where damage is localized, spot-treatment may be adequate for control. Watch for re-infestation after treatment. Imidan: Be aware of current label changes with respect to restrictions and precautions. See Table 6-4, <i>Products Used on Grapes</i> , page 156.
Black rot	<ul style="list-style-type: none"> <li>• Nova 40 W</li> <li>• Sovran</li> <li>• Flint 50 WG</li> <li>• Pristine WG</li> <li>• Polyram DF</li> </ul>	200 g/ha 240 g/ha 140 g/ha 735 g/ha 2 kg/1,000 L water	<b>Sovran</b> is phytotoxic to some varieties of cherries (see label); do not let product drift onto sensitive crops. Flint: Do not apply to Concord grapes or crop injury may occur. Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury.
Powdery mildew	<ul style="list-style-type: none"> <li>• Sovran</li> <li>• Flint 50 WG</li> <li>• Pristine WG</li> <li>• Lance WDG or Cantus WDG</li> <li>• Nova 40 W</li> <li>• Inspire</li> <li>• Quintec</li> <li>• Vivando SC</li> <li>• Microscopic Sulphur or Kumulus DF or Microthiol Disperss</li> <li>• MilStop</li> <li>• Serenade ASO</li> <li>• Purespray Green Spray Oil</li> </ul>	300 g/ha 140 g/ha 420–735 g/ha 315 g/ha 315 g/ha 200 g/ha 292 mL/ha 300 mL/ha 750 mL/ha 4.5 kg/1,000 L water 12.6 kg/ha 12.6 kg/ha 5.6 kg/1,000 L water/ha 9–15 L/ha 10 L/1,000 L water/ha	Fruit clusters are highly susceptible to powdery mildew from bloom through 4–6 weeks postbloom. It is important to maintain protective coverage. Intervals between sprays should be 7–10 days. Spray at 7-day intervals if weather is conducive to disease. Nova, Inspire, Quintec, Vivando, Pristine, Flint, Sovran, Lance, Cantus: To manage resistance for each of these fungicides, use a different fungicide group for each spray. Do not apply to sporulating lesions. See <i>Managing resistance to fungicides</i> , page 254 and Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i> , page 257. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain. <b>Sovran</b> : is phytotoxic to some varieties of cherries (see label); do not let product drift onto sensitive crops. Flint: Do not apply to Concord grapes or crop injury may occur. Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury. Pristine, Sovran, Flint: Do not rotate within this group. Pristine, Lance, Cantus: Do not rotate Pristine with Lance or Cantus. Nova and Inspire: Do not rotate between these products. Vivando: Do not apply at intervals of less than 14 days. MilStop: Apply in 1,000 L water per ha. MilStop creates a mildly alkaline solution. Do not tank mix with pH adjusters, oil,

Diseases and Insects	Products	Rate	Comments
			<p>or products not compatible with mild alkaline solutions. MilStop works as an eradicant and has no protective activity.</p> <p>Serenade ASO: Provides suppression of powdery mildew. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control, and <i>Bacillus subtilis</i> (Serenade ASO, Serenade MAX), page 242.</p> <p>Purespray Green Spray Oil 13E: Provides suppression of powdery mildew. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control. Summer oils can cause crop injury, depending on rate, cultivar, weather conditions, and recent pesticide applications. Do not apply less than 1,000 L water/ha (1% solution). Not all varieties have been tested for tolerance, so spray a small area of each variety to confirm tolerance prior to spraying the whole field. Do not apply within 14 days of Captan, Maestro, Folpan, Bravo, Echo, Pounce, Perm-Up, or products containing sulphur. Do not apply within 48 hours of freezing temperatures. Do not apply when temperatures are very high (above 25°C) or to crops under moisture stress. Do not apply just prior to rain. Read the label carefully for other precautions. See notes on <i>Mineral oil</i> (Purespray Green Spray Oil 13E), page 252.</p>
Downy mildew	<ul style="list-style-type: none"> <li>• Revus</li> <li>• Pristine WG</li> <li>• Sovran</li> <li>• Presidio</li> <li>• Polyram DF</li> <li>• Manzate 200 WP</li> <li>• Maestro 80 DF or Supra Captan 80 WDG</li> <li>• Folpan 80 WDG</li> <li>• Copper Spray</li> <li>• Guardsman Copper Oxychloride</li> <li>• Gavel 75 DF</li> <li>• Ridomil Gold MZ 68 WG</li> </ul>	<p>500 mL/ha</p> <p>675–735 g/ha 300 g/ha</p> <p>220–292 mL/ha</p> <p>2 kg/1,000 L water 6.75 kg/ha</p> <p>3 kg/ha 1.5 kg/1,000 L water 1.25 kg/ha</p> <p>3 kg + 6 kg lime/ 1,000 L water</p> <p>3 kg + 6 kg lime/ha</p> <p>2.25 kg/ha</p> <p>2.5 kg/ha</p>	<p>Fruit clusters are highly susceptible to downy mildew until 4–6 weeks postbloom. Intervals between sprays should be 7–10 days. Under rainy conditions use the shorter interval.</p> <p>Revus, Sovran, Pristine, Presidio: To manage resistance for each of these fungicides, rotate to a different fungicide group for each spray. Do not apply to sporulating lesions. See <i>Managing resistance to fungicides</i>, page 254 and Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i>, page 257. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain.</p> <p>Revus: The use of a non-ionic adjuvant is recommended (0.125% v/v). Do not use Revus plus adjuvant tank-mixed with sulphur on sulphur-sensitive varieties. Use no more than four applications per season.</p> <p>Sovran: Sovran is phytotoxic to some varieties of cherries (see label); do not let product drift onto sensitive crops</p> <p>Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury.</p> <p>Pristine and Sovran: Do not rotate Pristine with Sovran.</p> <p>Presidio: Tank mix with a labelled rate of another fungicide registered for downy mildew, but with a different mode of action.</p> <p>Copper Spray and Guardsman Copper Oxychloride: Do not apply on Seibel varieties (De Chaunac).</p> <p>Ridomil Gold MZ: No more than one application postbloom.</p>
Botrytis bunch rot	<ul style="list-style-type: none"> <li>• Rovral</li> <li>• Vangard 75 WG</li> <li>• Scala SC</li> <li>• Elevate 50 WDG</li> </ul>	<p>1.5 kg/ha</p> <p>750 g/ha 2 L/ha</p> <p>1.12 kg/ha</p>	<p>An immediate postbloom spray may provide control of latent infections in varieties prone to botrytis bunch rot (e.g. Gamay Noir, Pinot Noir, Pinot Gris, Riesling, Chardonnay and Seyval Blanc), if the bloom/postbloom period is wet. Direct this spray at the fruiting zone.</p> <p>For resistance management, rotate among fungicide groups between applications.</p>

Diseases and Insects	Products	Rate	Comments
	<ul style="list-style-type: none"> <li>Pristine WG</li> <li>Serenade ASO</li> </ul>	420–735 g/ha  5–15 L/ha	Vanguard, Scala: Do not rotate between these products. Elevate: Do not apply Elevate if rainfall is expected within six hours after application. Pristine: At high rate provides suppression of bunch rot. Serenade ASO: Provides suppression of bunch rot. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i> , page 13, for definitions of suppression and control, and <i>Bacillus subtilis</i> (Serenade ASO, Serenade MAX), page 242.
<b>Berries pea-sized</b>			
Grape berry moth (GBM) (2nd generation)	<ul style="list-style-type: none"> <li>Delegate WG</li> <li>Success 480 SC or Entrust 80 W</li> <li>Altacor</li> <li>Pounce 384 EC or Perm-Up or Ambush 500 EC</li> <li>Imidan 50 WP</li> </ul>	280 g/ha 182 mL/ha 109 g/ha  285 g/ha  360 mL/ha 360 mL/ha 275 mL/ha  3.1 kg/ha	Where mating disruption for GBM is in place and monitoring indicates good control, an insecticide is not needed at this time. Where berry moth is a regular problem, use one of these products. Apply sprays in high water volumes to ensure complete coverage in the fruiting zone. For resistance management, do not use insecticides from the same group for more than one generation. Within a generation, only one insecticide group should be used. Delegate, Success, Entrust: Provide suppression rather than control of grape berry moth. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i> , page 13. Altacor, Delegate, Success, Entrust: Apply at first egg hatch (first sustained moth catch in pheromone traps), earlier than the traditional timing (upswing in moth numbers captured in traps) used for Pounce, Perm-Up, Ambush or Imidan. A second application may be necessary if flight is extended. Imidan: Be aware of current label changes with respect to restrictions and precautions. See Table 6-4, <i>Products used on Grapes</i> , page 156.
Japanese beetle	<ul style="list-style-type: none"> <li>Imidan 50 WP</li> <li>Assail 70 WP</li> </ul>	2.5 kg/ha  80 g/ha	Japanese beetle is a sporadic pest that feeds on over 300 plant species. Monitor to determine beetle presence and extent of feeding damage. Where damage is localized, spot-treatment may be adequate for control. Watch for re-infestation after treatment. Imidan: Be aware of current label changes with respect to restrictions and precautions. See Table 6-4, <i>Products Used on Grapes</i> , page 156.
Grape phylloxera (leaf form)	<ul style="list-style-type: none"> <li>Movento 240 SC</li> <li>Assail 70 WP</li> <li>Clutch 50 WDG</li> </ul>	365 mL/ha  80 g/ha 140–210 g/ha	<b>Movento</b> has slow activity; control may not be apparent for 2–3 weeks. Consecutive applications should be at least 30 days apart. Must be tank-mixed with a spray adjuvant/additive having spreading and penetrating properties at a suggested rate of 0.2% v/v. See the label for further details.
Powdery mildew	<ul style="list-style-type: none"> <li>Flint 50 WG</li> <li>Sovran</li> <li>Pristine WG</li> <li>Lance WDG or Cantus WDG</li> <li>Nova 40 W</li> <li>Inspire</li> <li>Quintec</li> <li>Vivando SC</li> </ul>	140 g/ha 300 g/ha 420–735 g/ha  315 g/ha 315 g/ha  200 g/ha 292 mL/ha  300 mL/ha  750 mL/ha	Fruit clusters are highly susceptible to powdery mildew until 4–6 weeks after bloom. Spray at 7–10 day intervals to maintain protective coverage. Spray at 7 day intervals in rainy weather. Nova, Inspire, Quintec, Vivando, Pristine, Flint, Sovran, Lance, Cantus: To manage resistance for each of these fungicides, rotate to a different fungicide group for each spray. Do not apply to sporulating lesions. See <i>Managing resistance to fungicides</i> , page 254 and Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i> , page 257. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain.

Diseases and Insects	Products	Rate	Comments
	<ul style="list-style-type: none"> <li>• Microscopic Sulphur or Kumulus DF or Microthiol Disperss</li> <li>• MilStop</li> <li>• Serenade ASO</li> </ul>	<p>4.5 kg/1,000 L water 12.6 kg/ha 12.6 kg/ha</p> <p>5.6 kg/1,000 L water/ha</p> <p>9–15 L/ha</p>	<p><b>Sovran</b> is phytotoxic to some varieties of cherries (see label); do not let product drift onto sensitive crops.</p> <p>Flint: Do not apply to Concord grapes or crop injury may occur.</p> <p>Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury.</p> <p>Pristine, Flint and Sovran: Do not rotate within this group.</p> <p><b>Pristine, Lance and Cantus:</b> Do not rotate Pristine with Lance or Cantus. For resistance management, use no more than two applications per season.</p> <p>Nova and Inspire: Do not rotate between these products.</p> <p>Vivando: Do not apply at intervals of less than 14 days.</p> <p>MilStop: Apply in 1,000 L water per ha. MilStop creates a mildly alkaline solution. Do not tank mix with pH adjusters, oil, or products not compatible with mild alkaline solutions.</p> <p>MilStop works as an eradicant and has no protective activity.</p> <p>Serenade ASO: Provides suppression of powdery mildew.</p> <p>See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control, and <i>Bacillus subtilis (Serenade ASO, Serenade MAX)</i>, page 242.</p>
Downy mildew	<ul style="list-style-type: none"> <li>• Revus</li> <li>• Pristine WG</li> <li>• Presidio</li> <li>• Folpan 80 WDG</li> <li>• Supra Captan 80 WDG or Maestro 80 DF</li> <li>• Polyram DF</li> <li>• Manzate 200 WP</li> <li>• Gavel 75 DF</li> <li>• Copper Spray</li> <li>• Guardsman Copper Oxychloride</li> <li>• Ridomil Gold MZ 68 WG</li> </ul>	<p>500 mL/ha</p> <p>675–735 g/ha</p> <p>220–292 mL/ha</p> <p>1.25 kg/ha</p> <p>1.5 kg/1,000 L water 3 kg/ha</p> <p>2 kg/1,000 L water 6.75 kg/ha</p> <p>2.25 kg/ha</p> <p>3 kg + 6 kg lime/ 1,000 L water</p> <p>3 kg + 6 kg lime/ha</p> <p>2.5 kg/ha</p>	<p>Fruit clusters are highly susceptible to downy mildew until 4–6 weeks postbloom. Intervals between sprays should be 7–10 days. Under rainy conditions use the shorter interval.</p> <p>Revus, Pristine, Presidio: To manage resistance for each of these fungicides, rotate to a different fungicide group for each spray. See Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i>, page 257 for fungicide groups. Do not use if sporulating lesions are present. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain.</p> <p><b>Revus:</b> The use of a non-ionic adjuvant is recommended (0.125%, 1.25 L/1,000 L ). Do not use Revus plus adjuvant tank-mixed with sulphur on sulphur-sensitive varieties. Use no more than 4 applications per season.</p> <p>Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury.</p> <p>Presidio: Tank mix with a labelled rate of another fungicide registered for downy mildew, but with a different mode of action.</p> <p>Copper Spray and Guardsman Copper Oxychloride: Do not apply on Seibel varieties (De Chaunac).</p> <p>Ridomil Gold MZ: No more than one application post bloom. Consult label for pre-harvest interval.</p>
Black rot	<ul style="list-style-type: none"> <li>• Nova 40 W</li> <li>• Flint 50 WG</li> <li>• Sovran</li> <li>• Pristine WG</li> <li>• Polyram DF</li> </ul>	<p>200 g/ha</p> <p>140 g/ha 240 g/ha 735 g/ha</p> <p>2 kg/1,000 L water</p>	<p><b>Sovran</b> is phytotoxic to some varieties of cherries (see label); do not let product drift onto sensitive crops.</p> <p>Flint: Do not apply to Concord grapes or crop injury may occur.</p> <p>Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury.</p> <p>Pristine, Sovran and Flint: Do not rotate within this group.</p>

Diseases and Insects	Products	Rate	Comments
<p><b>Berry touch to cluster closure</b> Check product labels and Table 6-4. <i>Products Used on Grapes</i>, page 156, for preharvest intervals.</p>			
Powdery mildew	<ul style="list-style-type: none"> <li>• Lance WDG or Cantus WDG</li> <li>• Pristine WG</li> <li>• Nova 40 W</li> <li>• Inspire</li> <li>• Quintec</li> <li>• Vivando SC</li> <li>• Microscopic Sulphur or Kumulus DF or Microthiol Disperss</li> <li>• MilStop</li> <li>• Serenade ASO</li> </ul>	<p>315 g/ha 315 g/ha</p> <p>420–735 g/ha</p> <p>200 g/ha 292 mL/ha</p> <p>300 mL/ha</p> <p>750 mL/ha</p> <p>4.5 kg/1,000 L water 12.6 kg/ha 12.6 kg/ha</p> <p>5.6 kg/1,000 L water/ha</p> <p>9–15 L/ha</p>	<p>Check product labels and Table 6-4. <i>Products Used On Grapes</i>, page 156, for days to harvest intervals.</p> <p>Nova, Inspire, Quintec, Vivando, Pristine, Flint, Sovran, Lance, Cantus: To manage resistance for each of these fungicides, rotate to a different fungicide group for each spray. Do not apply to sporulating lesions. See <i>Managing resistance to fungicides</i>, page 254 and Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i>, page 257. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain.</p> <p>Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury.</p> <p>Pristine, Lance, Cantus: Do not rotate Pristine with Lance or Cantus. For resistance management, use no more than two applications of these products per season.</p> <p>Nova and Inspire: Do not rotate between these products.</p> <p>Vivando: Do not apply at intervals of less than 14 days.</p> <p>MilStop: Apply in 1,000 L water per ha. MilStop creates a mildly alkaline solution. Do not tank mix with pH adjusters, oil, or products not compatible with mild alkaline solutions. MilStop works as an eradicant and has no protective activity.</p> <p>Serenade ASO: Provides suppression of powdery mildew. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control, and <i>Bacillus subtilis</i> (Serenade ASO, Serenade MAX), page 242.</p>
Downy mildew	<ul style="list-style-type: none"> <li>• Revus</li> <li>• Pristine WG</li> <li>• Presidio</li> <li>• Folpan 80 WDG</li> <li>• Supra Captan 80 WDG or Maestro 80 DF</li> <li>• Polyram DF</li> <li>• Gavel 75 DF</li> <li>• Copper Spray</li> <li>• Guardsman Copper Oxychloride</li> </ul>	<p>500 mL/ha</p> <p>675–735 g/ha</p> <p>220–292 mL/ha</p> <p>1.25 kg/ha 1.5 kg/1,000 L water 3 kg/ha</p> <p>2 kg/1,000 L water</p> <p>2.25 kg/ha</p> <p>3 kg + 6 kg lime/ 1,000 L water 3 kg + 6 kg lime/ha</p>	<p>Check product labels and Table 6-4. <i>Products Used On Grapes</i>, page 156, for days to harvest intervals.</p> <p>Revus, Pristine, Presidio: To manage resistance for each of these fungicides, rotate to a different fungicide group for each spray. Do not apply to sporulating lesions. See <i>Managing resistance to fungicides</i>, page 254 and Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i>, page 257. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain.</p> <p>Revus: The use of a non-ionic adjuvant is recommended (0.125% v/v). Do not use Revus plus adjuvant tank-mixed with sulphur on sulphur-sensitive varieties. Use no more than four applications per season.</p> <p>Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury.</p> <p>Presidio: Tank mix with a labelled rate of another fungicide registered for downy mildew, but with a different mode of action.</p> <p>Copper Spray and Guardsman Copper Oxychloride: Do not apply on Seibel varieties (De Chaunac).</p>
Black rot	Use one of the materials listed under <b>Berries pea-sized.</b>		This spray is necessary only if black rot is severe and new infections continue to occur.

Diseases and Insects	Products	Rate	Comments
Botrytis bunch rot	<ul style="list-style-type: none"> <li>• Rovral</li> <li>• Vanguard 75 WG</li> <li>• Scala SC</li> <li>• Elevate 50 WDG</li> <li>• Pristine WG</li> <li>• Serenade ASO</li> </ul>	<p>1.5 kg/ha</p> <p>750 g/ha 2 L/ha</p> <p>1.12 kg/ha</p> <p>420–735 g/ha</p> <p>5–15 L/ha</p>	<p>Direct this spray at the fruiting zone.</p> <p>Many of the Vinifera and French hybrid varieties with tight clusters are susceptible to botrytis bunch rot, (e.g. Gamay Noir, Pinot Noir, Pinot Gris, Riesling, Chardonnay and Seyval Blanc).</p> <p>For resistance management, rotate among fungicide groups between applications.</p> <p>Vanguard, Scala: Do not rotate between these products. Use no more than twice per season.</p> <p>Elevate: Do not apply Elevate if rainfall is expected within six hours after application.</p> <p>Pristine: At high rate provides suppression of bunch rot. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control.</p> <p>Serenade ASO: Provides suppression of bunch rot. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control, and <i>Bacillus subtilis</i> (Serenade ASO, Serenade MAX), page 242.</p>
European red mite	<ul style="list-style-type: none"> <li>• Nexter</li> <li>• Envidor 240 SC</li> <li>• Acramite 50 WS</li> <li>• Agri-Mek 1.9% EC</li> </ul>	<p>600 g/ha</p> <p>750 mL/ha</p> <p>851 g/ha</p> <p>585–1,170 mL/ha</p>	<p>A miticide may be required if significant bronzing of mid-shoot leaves occurs as a result of mite infestation. Stressed vines will show injury earlier than healthy vines. Monitor 7–10 days after application to evaluate mite control.</p> <p>Use any miticide only once per season and rotate as an effective resistance management strategy.</p> <p><b>Nexter</b> is most effective against active nymphal stages, not adults.</p> <p><b>Envidor</b> is effective on mite eggs, nymphs and adult females. Envidor works slowly, especially in cool weather. Control may not be apparent for 2–3 weeks. Apply before mite populations build up.</p> <p>Agri-Mek: Use 585-875 mL/ha for low to moderate infestations and 1,170 mL /ha for severe infestations. Apply when mites first appear and a second application if monitoring indicates it is necessary at a 21-day interval. Apply in combination with a non-ionic surfactant in a minimum of 470 L of water per hectare. Do not apply Agri-Mek within 10 days of Captan or Maestro because of potential of phytotoxicity.</p>
<p><b>Beginning of ripening (veraison) through harvest</b></p> <p>Check product labels and Table 6-4. <i>Products Used on Grapes</i>, page 156, for preharvest intervals.</p>			
Grape berry moth (GBM) (about mid–late August)	<ul style="list-style-type: none"> <li>• Altacor</li> <li>• Pounce 384 EC or Perm-Up or Ambush 500 EC</li> <li>• Imidan 50 WP</li> <li>• Delegate WG</li> <li>• Success 480 SC or Entrust 80 W</li> </ul>	<p>285 g/ha</p> <p>360 mL/ha 360 mL/ha 275 mL/ha</p> <p>3.1 kg/ha</p> <p>280 g/ha 182 mL/ha 109 g/ha</p>	<p>Where mating disruption for GBM is in place and monitoring indicates good control, an insecticide may not be needed at this time.</p> <p>Where berry moth is a regular problem, use one of these products. Apply sprays in high water volumes to ensure complete coverage.</p> <p>Check the interval to harvest. A spray may be needed on late varieties to control the brood that emerges in late August. Border sprays of conventional insecticides may be very effective.</p> <p>Altacor, Delegate: Apply at first egg hatch (first sustained moth catch in traps), earlier than the traditional timing (upswing in moth numbers captured in pheromone traps) used for Pounce, Perm-Up, Ambush or Imidan. Use no more than twice per season at recommended rate.</p> <p>Imidan: Be aware of current label with respect to restrictions and precautions.</p>

Diseases and Insects	Products	Rate	Comments
			<p>Success, Entrust: Provide suppression of GBM. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control.</p>
Powdery mildew	<ul style="list-style-type: none"> <li>• Lance WDG or Cantus WDG</li> <li>• Pristine WG</li> <li>• Nova 40 W</li> <li>• Inspire</li> <li>• Quintec</li> <li>• Vivando SC</li> <li>• Microscopic Sulphur or Kumulus DF or Microthiol Disperss</li> <li>• MilStop</li> <li>• Serenade ASO</li> </ul>	<p>315 g/ha 315 g/ha</p> <p>420–735 g/ha</p> <p>200 g/ha 292 mL/ha</p> <p>300 mL/ha</p> <p>750 mL/ha</p> <p>4.5 kg/1,000 L water 12.6 kg/ha 12.6 kg/ha</p> <p>5.6 kg/1,000 L water/ha</p> <p>9–15 L/ha</p>	<p>Vinifera and French hybrid varieties are more susceptible and may require extra sprays.</p> <p>Check product labels and Table 6-4. <i>Products Used On Grapes</i>, page 156, for days to harvest intervals.</p> <p>Nova, Inspire, Quintec, Vivando, Pristine, Flint, Sovran, Lance, Cantus: To manage resistance for each of these fungicides, rotate to a different fungicide group for each spray. Do not apply to sporulating lesions. See <i>Managing resistance to fungicides</i>, page 254 and Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i>, page 257. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain.</p> <p>Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury.</p> <p>Pristine, Lance, Cantus: Do not rotate Pristine with Lance or Cantus. For resistance management, use no more than two applications of these products per season.</p> <p>Nova and Inspire: Do not rotate between these products.</p> <p>Vivando: Do not apply at intervals of less than 14 days.</p> <p>MilStop: Apply in 1,000 L water per ha. MilStop creates a mildly alkaline solution. Do not tank mix with pH adjusters, oil, or products not compatible with mild alkaline solutions. MilStop works as an eradicant and has no protective activity.</p> <p>Serenade ASO: Provides suppression of powdery mildew. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i>, page 13, for definitions of suppression and control, and <i>Bacillus subtilis</i> (Serenade ASO, Serenade MAX), page 242.</p>
Downy mildew	<ul style="list-style-type: none"> <li>• Revus</li> <li>• Pristine WG</li> <li>• Presidio</li> <li>• Folpan 80 WDG</li> <li>• Supra Captan 80 WDG or Maestro 80 DF</li> <li>• Polyram DF</li> <li>• Copper Spray</li> <li>• Guardsman Copper Oxychloride</li> </ul>	<p>500 mL/ha</p> <p>675–735 g/ha</p> <p>220–292 mL/ha</p> <p>1.25 kg/ha 1.5 kg/1,000 L water 3 kg/ha</p> <p>2 kg/1,000 L water</p> <p>3 kg + 6 kg lime/ 1,000 L water</p> <p>3 kg + 6 kg lime/ha</p>	<p>Check product labels and Table 6-4. <i>Products Used On Grapes</i>, page 156, for days to harvest intervals.</p> <p>Revus, Pristine, Presidio: To manage resistance for each of these fungicides, rotate to a different fungicide group for each spray. Do not apply to sporulating lesions. See <i>Managing resistance to fungicides</i>, page 254 and Table 12-2. <i>Fungicide/Bactericide Groups Based on Sites of Action</i>, page 257. Unless indicated below, use each fungicide group only twice per season. These products are locally systemic. Consult labels for information on drying time required before rain.</p> <p>Revus: The use of a non-ionic adjuvant is recommended (0.125% v/v). Do not use Revus plus adjuvant tank-mixed with sulphur on sulphur-sensitive varieties. Use no more than four applications per season.</p> <p>Pristine: When used as directed for the control of black rot, powdery and/or downy mildew, Pristine will help reduce the spread of anthracnose. Do not use on Concord, Fredonia or related varieties due to possible injury.</p> <p>Presidio: Tank mix with a labelled rate of another fungicide registered for downy mildew, but with a different mode of action.</p> <p>Copper Spray and Guardsman Copper Oxychloride: Do not apply on Seibel varieties (De Chaunac).</p>

Diseases and Insects	Products	Rate	Comments
Slugs and snails	• Sluggo Professional	25 kg/ha	Apply higher rate of 50 kg/ha if population is very high. Apply when infestation begins. Re-apply as the bait is consumed or at least every 2 weeks if slugs and snails continue to be a problem.
<b>Special sprays (when monitoring indicates the need)</b>			
Botrytis bunch rot	<ul style="list-style-type: none"> <li>• Vanguard 75 WG</li> <li>• Scala SC</li> <li>• Elevate 50 WDG</li> <li>• Pristine WG</li> <li>• Serenade ASO</li> </ul>	750 g/ha 2 L/ha  1.12 kg/ha  420–735 g/ha  5–15 L/ha	This spray is necessary for tight-clustered, thin-skinned varieties. If conditions are warm and wet through the preharvest period, a second spray may be needed. Direct this spray to the fruiting zone. <b>Vanguard, Scala:</b> Do not rotate between these products. Pristine: At high rate provides suppression of bunch rot. See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i> , page 13, for definitions of suppression and control. Serenade ASO: Provides suppression of bunch rot . See Table 2-6. <i>Efficacy Ratings for Insecticides, Miticides and Fungicides</i> , page 13, for definitions of suppression and control, and <i>Bacillus subtilis</i> (Serenade ASO, Serenade MAX), page 242.
Erineum mite	• Kumulus DF or Microthiol Disperss	3.4 kg/ha 3.4 kg/ha	Apply at pre-bloom immediately after the first evidence of erineum mite development and again at mid-season.
Multicoloured Asian lady beetle	<ul style="list-style-type: none"> <li>• Ripcord 400 EC</li> <li>• Malathion 85 E</li> </ul>	150 mL/ha 880 mL/ha	Lady beetles are not a problem until very close to harvest. Begin monitoring around mid-August and continue for each cultivar until harvested. Early presence of lady beetles is not an immediate concern, because they can arrive and leave an area rapidly. Discuss beetle thresholds and product restrictions with the proposed purchaser of grapes before taking action. Continue to monitor after treatment; re-infestation may occur before harvest. Ripcord: Cannot be used on juice grapes destined for export to the US.

### **Preharvest intervals**

**Contact the processors and wineries directly in regard to their preharvest interval policy.** Preharvest intervals listed in Table 6-4. *Products Used on Grapes*, on this page, are taken from product labels. In some cases, regulations on residues in finished products (e.g. wine) are much more stringent. Many processors require longer preharvest intervals than stated on product labels. Some processors and wineries also have special restrictions for certain pest control products regarding number of applications or application after a certain crop stage. Consult the grape purchaser for more details.

Table 6-4. Products Used on Grapes

Use this table as a guide, but refer to product label for specific information.

The **pre-harvest interval** is the number of days between the last spray and first harvest.

The **re-entry period** is the minimum interval that must be observed between the application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum number of applications** is the labelled maximum number for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects. Where maximum number of applications is not listed, it is not specified on the label.

Product name	Registration number	Common name	Group	Preharvest interval	Minimum re-entry <sup>1</sup>	Maximum number of applications per year (on label)
<b>Products used to control or suppression of insects and mites</b>						
Acramite 50 WS	27925	bifenazate	25	14 days	12 hours/1 day <sup>2</sup>	1
Agri-Mek 1.9% EC	24551	abamectin	6	28 days	12 hours/13+ days <sup>2</sup>	2
Altacor	28981	chlorantraniliprole	28	14 days	12 hours	2 at recommended rate
Ambush 500 EC	14882	permethrin	3	7 days		
Assail 70 WP	27128	acetamiprid	4	3 days	12 hours/5 days <sup>2</sup>	2
Clutch 50 WDG	29382	clothianidin	4A	1 day	12 hours	2
Delegate WG	28778	spinetoram	5	7 days	12 hours	3
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days		6
Entrust 80 W	27825	spinosad	5	7 days	when dried/7 days <sup>2</sup>	3
Envidor 240 SC	28051	spirodiclofen	23	14 days	12 hours/2 days <sup>2</sup>	1
Imidan 50 WP	23006	phosmet	1B	14 days	14 days	3
Malathion 85 E	8372	malathion	1B	3 days		1
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 920 mL/ha/yr
Nexter	25135	pyridaben	21	25 days	24 hours	1
Perm-Up	28877	permethrin	3	21 days	12 hours	
Pounce 384 EC	16688	permethrin	3	21 days		2
Ripcord 400 EC	15738	cypermethrin	3	2 days/7 days <sup>3</sup>		2
Sevin XLR	27876	carbaryl	1A	5 days <sup>4</sup>		
Sluggo Professional	30025	ferric phosphate		14 days		
Success 480 SC	26835	spinosad	5	7 days	when dried/7 days <sup>2</sup>	3

Product name	Registration number	Common name	Group	Preharvest interval	Minimum re-entry <sup>1</sup>	Maximum number of applications per year (on label)
Surround WP	27469	kaolin		0 days		
<b>Products used for control or suppression of diseases</b>						
Cantus WDG	30141	boscalid	7	14 days	12 hours	5
Copper Spray	19146	copper oxychloride	M	1 day <sup>4</sup>	48 hours	
Elevate 50 WDG	25900	fenhexamid	17	7 days	4 hours	3
Ferbam 76 WDG	20136	ferbam	M	7 days		
Flint 50 WG	27529	trifloxystrobin	11	14 days	12 hours/5 days <sup>2</sup>	4
Folpan 80 WDG	27733	folpet	M	1 day	24 hours	2
Gavel 75 DF	26842	zoxamide + mancozeb	22+M	66 days	48 hours	6
Guardsman Copper Oxychloride	13245	copper oxychloride	M	1 day <sup>4</sup>	48 hours	7
Inspire	30004	difenoconazole	3	7 days	48 hours	2
Kumulus DF	18836	sulphur	M	21 days <sup>5</sup>	24 hours	
Lance WDG	27495	boscalid	7	14 days	12 hours	5
Maestro 80 DF	26408	captan	M	7 days	72 hours	
Manzate 200 WP	10526	mancozeb	M	30 days		
Microscopic Sulphur	14653	sulphur	M	21 days <sup>5</sup>	24 hours	
Microthiol Disperss	29487	sulphur	M	21 days <sup>5</sup>	24 hours	8
MilStop	28095	potassium bicarbonate	NC	0 days	4 hours	10
Nova 40 W	22399	myclobutanil	3	14 days		5
Polyram DF	20087	metiram	M	45 days		3
Presidio	30051	fluopicolide	43	21 days	12 hours/8 days <sup>2</sup>	4
Pristine WG	27985	pyraclostrobin + boscalid	11+7	14 days	when dried/ 21 days <sup>2</sup>	6
Purespray Green Spray Oil 13E	27666	mineral oil	U		12 hours	
Quintec	29755	quinoxifen	13	14 days	12 hours	5
Revus	29074	mandipropamid	40	14 days	12 hours	4
Ridomil Gold MZ 68 WG	28893	metalaxyl + mancozeb	4+M	66 days	24 hours	1 prebloom 1 postbloom

Product name	Registration number	Common name	Group	Preharvest interval	Minimum re-entry <sup>1</sup>	Maximum number of applications per year (on label)
Rovral	15213	iprodione	2	before bunch closure <sup>4</sup>	12 hours	2
Scala SC	28011	pyrimethanil	9	7 days	12 hours/24 hours <sup>2</sup>	3
Serenade ASO	28626	<i>Bacillus subtilis</i>	44	0 days		
Sovran	26257	kresoxim-methyl	11	14 days	48 hours	4
Supra Captan 80 WDG	24613	captan	M	7 days	72 hours	
Vangard 75 WG	25509	cyprodinil	9	7 days	48 hours	2
Vivando SC	29765	metrafenone	U8	14 days	12 hours	6

A blank cell indicates the information is not specified on the product label.

<sup>1</sup> Re-entry periods for cane girdling and cane tying are not included here. See label for restrictions on these unusual activities.

<sup>2</sup> Re-entry period/exceptions are as follows: re-entry/hand labour (eg. training, thinning, leaf pulling, hand harvest).

<sup>3</sup> Machine harvest/hand harvest.

<sup>4</sup> Check with processor and winery for wine grapes.

<sup>5</sup> 21 days for wine grapes. 1 day for table grapes.

NC = Not classified.

U8 = Unknown.

## Notes on grape pests

### **Relative susceptibility of grape cultivars to diseases**

Table 6-5. *Relative Susceptibility of Grape Cultivars to Diseases*, on this page, provides a relative rating of grape variety susceptibility based on observations in Ontario and northeast United States under average conditions. Under adverse weather conditions, such as extended cool weather, any given variety may be more seriously affected. See Table 6-6. *Activity of Fungicides on Grape Diseases*, page 159 for effect of fungicides on various grape diseases.

Table 6-5. Relative Susceptibility of Grape Cultivars to Diseases

— = Relative susceptibility is unknown; + = Slightly susceptible; ++ = Moderately susceptible; +++ = Highly susceptible; ++++ = Extremely susceptible.								
Cultivar	Type <sup>a</sup>	Eutypa dead arm	Phomopsis cane blight	Black rot <sup>b</sup>	Downy mildew	Powdery mildew	Botrytis bunch rot	Phytotoxic chemical sensitivity <sup>c</sup>
<b>Vinifera Wine</b>								
Auxerrois	V	—	++	—	+	+++	+++	
Cabernet Franc	V	—	++	+++	++	+++	+	
Cabernet Sauvignon	V	++	++	+++	++	+++	+	
Chardonnay	V	+	++	+++	+++	++++	+++	
Gamay	V	+	+	++	++	+++	++	
Gewurztraminer	V	++	—	+++	++	+++	+++	
Merlot	V	—	+	+++	++	+++	++	2
Pinot Blanc	V	—	—	+++	++	+++	+++	
Pinot Gris	V	—	—	+++	++	+++	+++	
Pinot Noir	V	—	—	+++	++	+++	+++	
Riesling	V	+	+	+++	++	+++	+++	
Sauvignon Blanc	V	—	—	++	++	++	+++	
Zweigeltrebe	V	—	++	+++	++	+++	+	
<b>Hybrid Wine</b>								
Baco Noir	FH	—	++	+	+	++	+++	1
Chambourcin	FH	—	+	++	++	++	+	1
De Chaunac	FH	+	+++	+	+	++	+	1
Frontenac	AH	?	+	++	+	++	+	
Marechal Foch	FH	++	++	+	+	++	+	1

— = Relative susceptibility is unknown; + = Slightly susceptible; ++ = Moderately susceptible; +++ = Highly susceptible; ++++ = Extremely susceptible.

Cultivar	Type <sup>a</sup>	Eutypa dead arm	Phomopsis cane blight	Black rot <sup>b</sup>	Downy mildew	Powdery mildew	Botrytis bunch rot	Phytotoxic chemical sensitivity <sup>c</sup>
Seyval Blanc	FH	—	++	++	++	+++	+++	
S.V. 23-512	FH	—	+	—	—	++	—	
Vidal 256	FH	—	+	+	++	++	+++	2
<b>Juice &amp; Table</b>								
Concord	L	+	++	++	++	++	+	1,2,3
Elvira	L	+++	+++	++	+	++	++	3
Fredonia	L	+	++	++	+++	++	+	
Himrod	AH	—	+	++	+	++	+	
Niagara	L	++	++	+++	+++	++	+	2
N.Y. Muscat	L	+	—	+	+	++	+	
Sovereign Coronation	L	—	+	—	+++	+++	—	
<sup>a</sup> Species type. <sup>b</sup> Black rot is more serious adjacent to bush or similar areas with poor air drainage. <sup>c</sup> These notes are based on grower experience and could vary under stress conditions. No entry in this column indicates that no chemical sensitivity has been observed. 1 = Sulphur sensitive. 2 = Copper sensitive. 3 = Flint and Pristine sensitive.					L = Labrusca. AH = American hybrid. FH = French hybrid. V = Vinifera (vinifera varieties not included in this chart are considered susceptible to powdery mildew, downy mildew and black rot).			

Table 6-6. Activity of Fungicides on Grape Diseases

Ratings in shaded cells indicate the disease is listed on the product label for control or suppression. Please see the product label or crop calendars for registered uses. Use fungicides only for the crop and disease combinations listed on the product label. Additional information is provided in this table to assist the grower in choosing the best fungicide for control of diseases listed on the product label.

Group	Fungicide	Anthraxnose	Phomopsis cane and leaf spot	Black rot	Downy mildew	Powdery mildew	Botrytis bunch rot	Activity
M	Copper Spray	0	+	+	++	++	0	Prot/PI <sup>1</sup>
M	Guardman Copper Oxychloride	0	+	+	++	++	0	Prot/PI <sup>1</sup>
M	Kumulus DF	+	+	0	0	+++	0	Prot/ PI/ AS/ E
M	Microscopic Sulphur	+	+	0	0	+++	0	Prot/PI/AS/E
M	Microthiol Disperss	+	+	0	0	+++	0	Prot/PI/AS/E

M	Lime Sulphur	++	0	0	0	+	0	Prot
M	Ferbam 76 WDG	++	+++	+++	++	0	0	Prot
M	Polyram DF	++	+++	+++	+++	0	0	Prot
M	Supra Captan 80 WDG	++	+++	++	+++	0	0	Prot
M	Folpan 80 WDG	++	+++	++	+++	0	0	Prot
M	Maestro 80 DF	++	+++	++	+++	0	0	Prot
2	Rovral	0	0	0	0	0	++	Prot/ PI/ AS
3	Inspire	+++	0	+++	0	+++	0	Prot/ PI/ AS
3	Nova 40 W	+++	0	+++	0	+++	0	Prot/ PI/ AS
4	Ridomil Gold MZ 68 WG	0	+	+	+++	0	0	Prot/ PI/ AS
7	Cantus WDG	0	0	0	0	0	+	Prot/ PI/ AS
7	Lance WDG	0	0	0	0	0	+	Prot/ PI/ AS
9	Scala SC	0	0	0	0	0	+++	Prot/ PI/ AS
9	Vanguard 75 WG	0	0	0	0	0	+++	Prot/ PI/ AS
11	Flint 50 WG	0	+	+++	+	+++	+	Prot/ PI <sup>1</sup> / AS
11	Sovran	0	+	+++	++	+++	+	Prot/ PI <sup>1</sup> / AS
11&7	Pristine WG	+++	+	+++	+++	+++	+	Prot/ PI <sup>2</sup> / AS <sup>2</sup>
17	Elevate 50 WDG	0	0	0	0	+	+++	Prot/ PI
22	Gavel 75DF	0			+++	0	0	Prot
40	Revus	0	0	0	+++	0	0	Prot/ PI/ AS
43	Presidio	0	0	0	+++	0	0	
44	Serenade ASO		0	0	0	+	++	Prot
NC	MilStop	0	0	0	0	++	0	PI/ AS/ E
U8	Vivando SC	0	0	0	0	+++	0	Prot/ PI/ AS
U	Purespray Green Spray Oil 13E	0	0	0	0	++	0	PI/ AS

0 = Ineffective; + = Slightly effective/suppression, not recommended for very susceptible varieties or at critical stages of infection; ++ = Moderately effective; +++ = Very effective; Blank cell = Information is unavailable.

Fungicide activity (adapted from NY and PA Pest Management Guidelines for Grapes):

Prot = Protective, active when present before the pathogen infects;

PI = Post-infection (pre-symptom);

AS = Anti-sporulant, reduces spore production;

E = Eradicant, kills most of fungal colony when applied after symptoms develop.

<sup>1</sup> Moderate post-infection activity against powdery mildew.

<sup>2</sup> Post-infection against powdery mildew.

NC = Not classified.

Table 6-7. Activity of Insecticides on Grape Insect Pests

Ratings in shaded cells indicate the pest is listed on the product label for control or suppression. Use insecticides only for insects listed on the product label for the crop and for the insect. Where ratings are not in shaded cells, some activity against this insect is anticipated, but this use is not on the product label. Consult the label for more information. The information provided in this table is based on information from other areas. It is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Group	Product name	Grape berry moth	Leafhoppers	Phylloxera	Japanese beetle	Erineum mite	MALB	Wasps	European red mite	Climbing cutworm	Flea beetle
1A	Sevin XLR	+	++		+						
1B	Imidan 50 WP	+	+++		++						+
1B	Malathion 85 E	+	++		++		+++	+++			
3	Ambush 500 EC	+++	++								+++
3	Perm-Up	+++	++		++					+++	+++
3	Pounce 384 EC	+++	++		++					+++	+++
3	Ripcord 400 EC						+++	+++			
4	Assail 70 WP	+ at registered rate	+++	++	++						
4A	Clutch 50 WDG		+++	++							++
5	Delegate WG	+++									++
5	Entrust 80 W	++									++
5	Success 480 SC	++									++
6	Agri-Mek 1.9% EC					+			++		
11	Dipel 2X DF	++									
21	Nexter					+			++		
23	Envidor 240 SC								+++		
23	Movento 240 SC			+++							
25	Acramite 50 WS								++		
28	Altacor	+++								+++	
U	Surround WP		++		+						+

	Purespray Green Spray Oil 13E								++		
M	Kumulus DF					++					
M	Microthiol Disperss					++					
<p>+ = Slightly effective/suppression, not recommended for very susceptible varieties or at critical stages of infection; ++ = Moderately effective;  +++ = Very effective; Blank cell = Information is unavailable.  Insecticide activity adapted from NY and PA Pest Management Guidelines for Grapes , Michigan State University recommendations and other sources.</p>											

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