5. Grapes

Grape Nutrition

Test the soil two years before planting to see if pH adjustment is needed. One year before planting, test soil again to determine pH, and macro and micronutrients. Some soil amendments, such as organic matter, phosphorus, potassium and lime to adjust soil pH, are needed to optimize vineyard productivity. The only opportunity to thoroughly incorporate these materials is before planting.

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 fertilizers to avoid over-applications. 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^3 liquid), 40 tonnes/ha of cattle manure (100 m^3 liquid) or 35 tonnes/ha of hog manure (65 m^3 liquid). Since the nutrient content of manure varies considerably, it should be tested before application. See *Manure nitrogen*, page 16.

- Excessive nitrogen, particularly in the second half of the growing season, can result in poor fruit colour, reduced storability, excessive growth and delayed cold-hardening of the woody tissue. These effects make vines more susceptible to winter injury.

- Broadcast manure and work it into the soil in late fall or early spring before planting.

- Do not place manure around newly planted vines as injury may result.

- Adjust the rate of nitrogen, phosphorus and potassium fertilizers applied according to the nutrient content of the manure. See Table 2–10. *Average Fertilizer Replacement Values for Manure*, page 16.

- For more information about food safety and the environmental impacts of manure application, see *Manure nitrogen* and *Use manure responsibly*, page 16.

pH Requirements

The pH of a soil is a measure of its acidity or alkalinity. It affects nutrient availability, uptake and crop performance. If the soil test report recommends a lime application to increase soil pH, add lime at the suggested rates at least one year prior to planting. For details regarding rates and suggested types of lime to use, refer to *Soil pH and Liming*, page 12.

In established vineyards, sample soil in the vine row at least once 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 be immediate 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 and also supplies calcium. For details regarding rates and suggested types of lime to use, refer to *Soil pH and Liming*, page 12.

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 10.

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 5–1. *Nutrient Sufficiency Range of Grape Petioles*, page 160.

To monitor trends, complete petiole analysis at least every other year. Sampling the same vines, at the same time of year, will assist in interpreting petiole analysis reports from year to year. Use these test results along with other factors, including soil test results, rootstock, vine age and crop target levels to determine the fertilizer program.

Table 5–1. Nutrient Sufficiency Range of Grape Petioles[1]

Variety	Nitrogen (N)	Phosphorus (P)	Potassium (K)[2]	Calcium (Ca)	Magnesium (Mg)	Iron (Fe)	Boron (B)	Zinc (Zn)	Manganese (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

[1] Taken in September from mature vines.
[2] Potassium levels may be higher in grapes grown on sandy loam soils.

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 5–2. *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 mid-May after bud break has begun, 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. Use a soil test to determine if phosphorus fertilizer is required. With a few exceptions, the level of phosphorus in Ontario soils is generally adequate for grapes. 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 5–2. *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.

Table 5–2. Phosphorus and Potassium Soil Requirements for New Plantings of Grapes

Phosphorus		Potassium*	
Soil test (ppm P)[1]	Phosphate (P_2O_5) required (kg/ha) [response]	Soil test (ppm K)[2]	Potash (K_2O) required (kg/ha) [response]
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.
[1] 0.5 M sodium bicarbonate extract soil test method (Olsen).
[2] 1.0 N ammonium acetate soil test method.

HR, MR, LR, RR, and NR denote, respectively: high, medium, low, rare and no probabilities of profitable crop response to applied nutrient.

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.

Prior to establishment, incorporate potassium according to Table 5–2. *Phosphorus and Potassium Soil Requirements for New Plantings of Grapes*, page 160. 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) 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. Apply this material as a foliar application only if deficiency is observed. Excess potassium can lead to juice and must issues for fermentation.

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 may 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.

See Table 5–3. *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.

Calcium (Ca)

Calcium deficiency has been associated with rachis (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.

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 21.

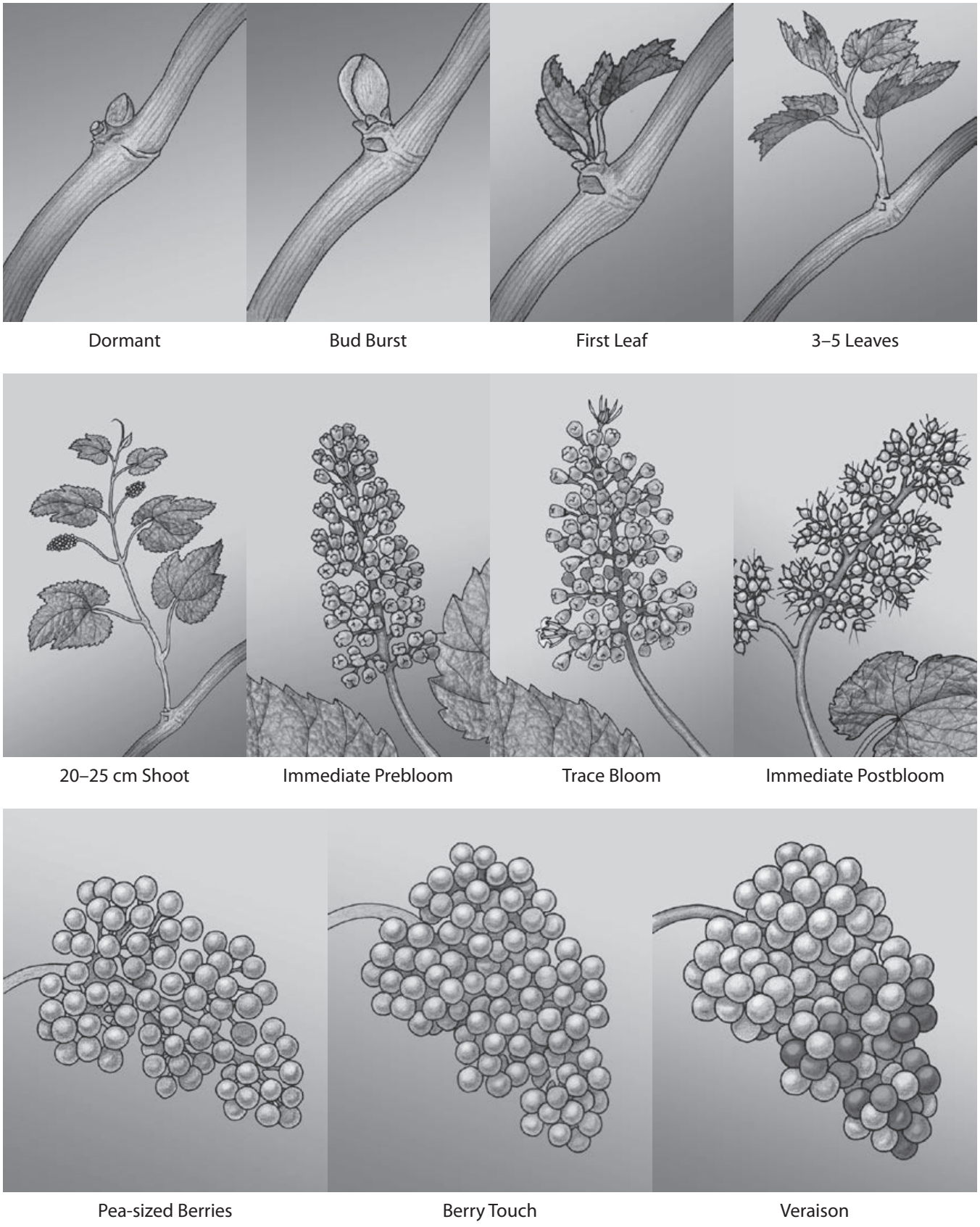
Apply nutrients according to recommended rates on the product label. Do not spray during temperatures above 25°C.

Table 5-3. 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	Apply to 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.

Figure 5-1. Grape Growth Stages



Grape Calendar

Read the product label and follow all safety precautions. For preharvest intervals, re-entry periods, and maximum number of applications, see Table 5–4. *Products Used on Grapes*, page 173.

Some grape varieties are sensitive to sulphur, copper, Flint, Pristine, or other products. See Table 5–5. *Relative Susceptibility of Grape Cultivars to Diseases*, page 177, for specific information.

Resistance Management

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 299. The chemical group is indicated in brackets following the product name. Products belonging to the same chemical group are grouped together in the calendar. Multi-site *(M)* fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action *(NC)* and others have unknown modes of action *(U* or *UN)*. Group 44 and 46 fungicides are not known to be prone to resistance.

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use products containing only one chemical family no more than twice per season.
- Use sufficient water to provide thorough coverage.
- Do not use Rovral, Fullback, Mettle, Nova, Inspire Super, Priwen, Aprovia, Cantus, Kenja, Sercadis, Luna Tranquility, Pristine, Scala, Switch, Flint, Sovran, Quintec, Elevate, Acrobat, Revus, Zampro, Presidio or Vivando when sporulating lesions of the target disease are present.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (grape berry moth), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with rapidly building and overlapping generations (mites, leafhoppers, phylloxera), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Do not apply insecticides during bloom. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 311.

Preharvest Intervals

Contact the processors and wineries directly in regard to their preharvest interval policy. Preharvest intervals listed in Table 5–4. *Products Used on Grapes*, page 173, are taken from product labels. In some cases, regulations on residues in finished products 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, is 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. Read and follow water volume requirements on all product labels.

Disease or Insect	Product *(Group)*	Rate	Comments
Dormant to bud swell			
Powdery mildew	• Lime sulphur *(M)*	73 L/1,000 L water	Apply in a high-volume spray to ensure thorough coverage of canes, head and trunk. Suppression of overwintering inoculum. May also suppress anthracnose and scale insects. Do not use lime sulphur later than delayed dormant.
Bud burst to first leaf			
Climbing cutworm	• Pounce 384 EC *(3)* • Altacor *(28)*	180 mL/ha 285 g/ha	Apply in the evening when cutworms start feeding on buds. Use sufficient water to ensure thorough coverage on trunks, cordons, canes, unopened buds and tender shoots. **Pounce:** Increase rate to 360 mL/ha if cutworms are large (2–3 cm). Apply in at least 450 L of water/ha. Spray trunk and soil surface within 0.5 m of the trunk. Do not disturb the soil for 5 days after spraying. **Altacor:** Maximum of 2 applications per season.
First leaf, 1.25–5-cm shoot length			
Anthracnose	• Nova *(3)* • Inspire Super *(3+9)*	340 g/ha 836–1,161 mL/ha	Apply in a high volume to ensure thorough coverage. Alternate row spraying will not give adequate protection from anthracnose. **Nova:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309. **Inspire Super:** Use the high rate under high disease pressure.
Phomopsis cane and leaf spot	• Supra Captan 80 WDG *(M)* or Maestro 80 DF *(M)* • Folpan 80 WDG *(M)*	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. Alternate row spraying will not give adequate protection from phomopsis. See Table 5–5. *Relative Susceptibility of Grape Cultivars to Diseases,* page 177.
3-5 leaves unfolded, 10-15-cm shoot length			
Erineum mite	• Kumulus DF *(NC)* or Microthiol Disperss *(NC)*	3.4 kg/ha 3.4 kg/ha	Apply immediately after the first evidence of erineum mite activity and again at mid-season. Do not use on Concord, Foch or deChaunac varieties.
Phomopsis cane and leaf spot	Use one of the products listed for phomopsis cane and leaf spot at **First leaf, 1.25–5-cm shoot length.**		
Anthracnose	• Nova *(3)* • Inspire Super *(3+9)* • Pristine WG *(7+11)*	340 g/ha 836–1161 mL/ha 735 g/ha	**Nova:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309. **Inspire Super:** Use the high rate under high disease pressure. May cause damage to Concord. **Pristine:** Do not use on Concord, Fredonia or related varieties or on table grapes.
Black rot	• Copper 53 W *(M)* • Ferbam 76 WDG *(M)* • Penncozeb 75 DF Raincoat *(M)* or Manzate Pro-Stick *(M)* • Polyram DF *(M)* • Mettle 125 ME *(3)* • Nova *(3)* • Inspire Super *(3+9)*	3 kg + 6 kg lime/ 1,000 L water 2 kg/1,000 L water 7.2 kg/ha 7.2 kg/ha 2 kg/1,000 L water 292–365 mL/ha 200 g/ha 1.48 L/ha	Spray susceptible varieties, especially where there is a history of black rot and conditions are wet. Alternate row spraying will not give adequate protection from black rot. **Copper 53 W:** Suppression only.See Table 11–1. *Pesticide Efficacy Ratings,* page 309*,* and *Copper*, page 294. Do not apply to Vidal, Concord or Niagara varieties. **Mettle, Nova, Inspire Super:** These products are locally systemic. Consult labels for information on drying time required before rain. **Inspire Super:** May cause damage to Concord.

Disease or Insect	Product *(Group)*	Rate	Comments
Powdery mildew	• Microscopic Sulphur WP *(M)* or Kumulus DF *(M)* or Microthiol Disperss *(M)* • Cueva *(M)*	4.5 kg/1,000 L water 12.6 kg/ha 12.6 kg/ha 1% v/v in 470–940 L water/ha	Unless otherwise indicated, apply at 7–10-day intervals to protect expanding leaves and developing fruit clusters before symptoms appear. Apply at 7-day intervals if weather is conducive to disease or if rapid shoot growth is occurring. Alternate row spraying will not give adequate protection from powdery mildew. **Fullback, Mettle, Nova, Inspire Super, Priwen, Aprovia, Cantus, Sercadis, Luna Tranquility, Quintec, Vivando:** These products are locally systemic. Consult labels for information on drying time required before rain. **Inspire Super:** May cause damage to Concord. **Serenade OPTI, Double Nickel, Actinovate, Buran, Fracture, Purespray Green, Regalia Maxx:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309, and *Using Organic and Biopesticide Products*, page 280. **Actinovate:** Apply in 500–1,000 L water /ha. **Fracture:** Use 3.3 L/ha with high disease pressure. **MilStop, Sirocco:** Work as eradicants and have little protective activity. Use the lower rate in 500 L of water and the higher rate in 1,000 L of water. Create a mildly alkaline solution. Do not tank-mix with pH adjusters, oil or products not compatible with mild alkaline solutions. **Buran:** This is a new product in Ontario and little evidence of its efficacy is available. Apply no more than 18 L/ha per spray. **Purespray Green:** Use a 1% solution. Use enough spray volume to ensure thorough crop coverage. Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 14 days of Captan, Maestro, Folpan, Ambush, Perm-Up, Pounce or sulphur products. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 25°C), to crops under moisture stress or just prior to rain. Multiple applications, especially after cluster closure, may cause Brix reduction. **Regalia Maxx:** Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other powdery mildew fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other powdery mildew fungicides. **Vivando:** Do not apply at intervals of less than 14 days.
	• Fullback 125 SC *(3)* • Mettle 125 ME *(3)* • Nova *(3)* • Inspire Super *(3+9)*	585–731 mL/ha 219–365 mL/ha 200 g/ha 836 mL/ha	
	• Priwen *(5)*	400–600 mL/ha	
	• Aprovia *(7)* • Cantus *(7)* • Sercadis *(7)* • Luna Tranquility *(7+9)*	500–750 mL/ha 315 g/ha 250 mL/ha 600 mL/ha	
	• Quintec *(13)*	300 mL/ha	
	• Double Nickel 55 *(44)* • Serenade OPTI *(44)*	0.5–1 kg/ha 1.7–3.3 kg/ha	
	• Timorex Gold *(46)*	1.0-1.5 L/ha	
	• Actinovate SP *(NC)* • Buran *(NC)* • Fracture *(NC)* • MilStop *(NC)* or Sirocco *(NC)* • Purespray Green Spray Oil 13 E *(NC)*	425–840 g/ha 1.8% v/v 1.7–3.3 L/ha 2.8–5.6 kg/ha 2.8–5.6 kg/ha 10 L/1,000 L water	
	• Regalia Maxx *(P5)*	0.125–0.25% v/v in 500–1,500 L water	
	• Vivando SC *(U8)*	750 mL/ha	
Special Sprays			
Scale	• Opal insecticidal soap *(NC)*	1% v/v	If grapevine leafroll virus has been confirmed by an accredited lab and scale has been confirmed in the vineyard, this spray may reduce insect vector pressure and spread of grapevine leafroll virus. Examine female scales and apply when crawlers are present among the eggs under scales. Do not spray when plants are under stress Avoid spraying during full sun. Spray early in morning or evening or when overcast. Not compatible with products containing mancozeb. Combining with sulphur or applying this product within 3 days of sulphur application may increase plant damage caused by sulphur on sensitive plants.
Shoot length 20–25 cm			
Erineum mite	Use one of the products listed for erineum mite at **3–5 leaves unfolded, 10–15-cm shoot length.**		
Grape berry moth (GBM)	• Isomate-GBM Plus	500 dispensers/ha	Reduces mating of GBM. Apply prior to first flight. Border sprays of insecticide or higher rates of pheromone (1,000 dispensers/ha) may be required where pressure is high. Dispensers last up to 150 days. *See Mating Disruption in Fruit Crops*, page 290.
Phylloxera (leaf form)	• Assail 70 WP *(4)* • Movento 240 SC *(23)*	80 g/ha 365 mL/ha	**Movento:** Apply when galls are first observed. Will redistribute to young leaves as they develop. Control may not be apparent for 2–3 weeks. Consecutive applications should be at least 30 days apart. Tank-mix with a non-ionic surfactant at 0.2% v/v (2 L/ 1,000 L). See label for further details. Do not apply to table grapes. This timing will also control mealy bug and suppress scale. Refer to mealy bug and scale at **Immediate prebloom**.

Disease or Insect	Product *(Group)*	Rate	Comments
Phomopsis cane and leaf spot	Use one of the products listed for phomopsis cane and leaf spot at **First leaf, 1.25–5-cm shoot length.**		
Anthracnose	Use one of the products listed for anthracnose at **3–5 leaves unfolded, 10–15-cm shoot length**.		
Black rot	• Copper 53 W *(M)*	3 kg + 6 kg lime/ 1,000 L water	Spray susceptible varieties, especially where there is a history of black rot and conditions are wet. Alternate row spraying will not give adequate protection from black rot. **Copper:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309, and *Copper*, page 294. Do not apply to Vidal, Concord or Niagara varieties. **Mettle, Nova, Inspire Super, Pristine, Flint, Sovran:** These products are locally systemic. Consult labels for information on drying time required before rain. **Mettle:** Under high disease pressure, use high rate. **Inspire Super:** May cause damage to Concord. **Pristine:** When used as directed, will help reduce anthracnose. Do not use on Concord, Fredonia or related varieties or on table grapes. **Flint:** Do not apply to Concord grapes. **Sovran:** Phytotoxic to some cherry varieties (see label). Do not let product drift onto sensitive crops.
	• Penncozeb 75 DF Raincoat *(M)*	7.2 kg/ha	
	or Manzate Pro-Stick *(M)*	7.2 kg/ha	
	or Dithane Rainshield *(M)*	7.2 kg/ha	
	• Polyram DF *(M)*	2 kg/1,000 L water	
	• Mettle 125 ME *(3)*	292–365 mL/ha	
	• Nova *(3)*	200 g/ha	
	• Inspire Super *(3+9)*	1.475 L/ha	
	• Pristine WG *(7+11)*	735 g/ha	
	• Flint *(11)*	140 g/ha	
	• Sovran *(11)*	240 g/ha	
Powdery mildew	• Microscopic Sulphur WP *(M)*	4.5 kg/1,000 L water	Unless otherwise indicated, apply at 7–10-day intervals to protect expanding leaves and developing fruit clusters before symptoms appear. Apply at 7-day intervals if weather is conducive to disease or if rapid shoot growth is occurring. Alternate row spraying will not give adequate protection from powdery mildew. **Fullback, Mettle, Nova, Inspire Super, Priwen, Aprovia, Cantus, Sercadis, Luna Tranquility, Flint, Sovran, Pristine, Quintec, Vivando:** These products are locally systemic. Consult labels for information on drying time required before rain. **Inspire Super:** May cause damage to Concord. **Pristine:** When used as directed, will help reduce anthracnose. Do not use on Concord, Fredonia or related varieties or on table grapes. **Flint:** Do not apply to Concord grapes. **Sovran:** Phytotoxic to some cherry varieties (see label). Do not let product drift onto sensitive crops. **Serenade OPTI, Actinovate, Buran, Fracture, Purespray Green, Regalia Maxx:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309, and *Using Organic and Biopesticide Products*, page 280. **Fracture:** Use 3.3 L/ha with high disease pressure. **Actinovate:** Apply In 500–1,000 L water /ha. **Buran:** This is a new product in Ontario and little evidence of its efficacy is available. Apply no more than 18 L/ha per spray. **MilStop, Sirocco:** Work as eradicants and have little protective activity. Use the lower rate in 500 L of water and the higher rate in 1,000 L of water. Create a mildly alkaline solution. Do not tank-mix with pH adjusters, oil or products not compatible with mild alkaline solutions. **Purespray Green:** Use a 1% solution. Use enough spray volume to ensure thorough crop coverage. Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 14 days of Captan, Maestro, Folpan, Ambush, Perm-Up, Pounce or sulphur products. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 25°C), to crops under moisture stress or prior to rain. Multiple applications, especially after cluster closure, may cause Brix reduction. **Regalia Maxx:** Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other powdery mildew fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other powdery mildew fungicides. **Vivando:** Do not apply at intervals of less than 14 days.
	or Kumulus DF *(M)*	4.2 kg/1,000 L water (or 12.6 kg/ha)	
	or Microthiol Disperss *(M)*	4.2 kg/1,000 L water (or 12.6 kg/ha)	
	• Cueva *(M)*	1 % v/v in 470–940 L water/ha	
	• Fullback 125 SC *(3)*	585–731 mL/ha	
	• Mettle 125 ME *(3)*	219–365 mL/ha	
	• Nova *(3)*	200 g/ha	
	• Inspire Super *(3+9)*	836 mL/ha	
	• Priwen *(5)*	400–600 mL/ha	
	• Aprovia *(7)*	500–750 mL/ha	
	• Cantus *(7)*	315 g/ha	
	• Sercadis *(7)*	250 mL/ha	
	• Luna Tranquility *(7+9)*	600 mL/ha	
	• Pristine WG *(7+11)*	420–735 g/ha	
	• Flint *(11)*	140 g/ha	
	• Sovran *(11)*	300 g/ha	
	• Quintec *(13)*	300 mL/ha	
	• Serenade OPTI *(44)*	1.7–3.3 kg/ha	
	• Timorex Gold *(46)*	1.0–1.5 L/ha	
	• Actinovate SP *(NC)*	425–840 g /ha	
	• Buran *(NC)*	1.8% v/v	
	• Fracture *(NC)*	1.7–3.3 L/ha	
	• MilStop *(NC)*	2.8–5.6 kg/ha	
	or Sirocco *(NC)*	2.8–5.6 kg/ha	
	• Purespray Green Spray Oil 13 E *(NC)*	10 L/1,000 L water	
	• Regalia Maxx *(P5)*	0.125–0.25% v/v in 500–1,500 L water	
	• Vivando SC *(U8)*	750 mL/ha	

Disease or Insect	Product *(Group)*	Rate	Comments
Downy mildew	• Supra Captan 80 WDG *(M)* or Maestro 80 DF *(M)* • Copper 53 W *(M)* • Guardsman Copper Oxychloride 50 *(M)* • Copper Spray *(M)* • Cueva *(M)* • Folpan 80 WDG *(M)* • Kocide 2000 *(M)* • Dithane Rainshield *(M)* or Manzate Pro-Stick *(M)* or Penncozeb 75 DF Raincoat *(M)* • Polyram DF *(M)* • Ridomil Gold MZ 68 WG *(4+M)* • Pristine WG *(7+11)* • Sovran *(11)* • Gavel 75 DF *(22+M)* • Aliette *(33)* • Confine Extra *(33)* or Phostrol *(33)* or Rampart *(33)* • Acrobat 50 WP *(40)* • Revus *(40)* • Zampro *(40+45)* • Timorex Gold *(46)*	1.5 kg/1,000 L water 2 kg/ha 3 kg + 6 kg lime/ 1,000 L water 3 kg + 6 kg lime/ha 3 kg + 6 kg lime/ 1,000 L water 1 % v/v in 470–940 L water/ha 1.25 kg/ha 1.6 kg/ha 7.2 kg/ha 7.2 kg/ha 7.2 kg/ha 2 kg/1,000 L water 2.5 kg/ha 675–735 g/ha 300 g/ha 2.25 kg/ha 3.75 kg/ha 2.9–5.8 L/ha 2.9–5.8 L/ha 2.5–5 L/ha 450 g/ha 500 mL/ha 0.8–1.0 L/ha 3.0 L/ha	Apply at 7–10-day intervals to protect expanding leaves and developing fruit clusters. Apply at shorter intervals if weather is conducive to disease. Consult label for information on dry time required before rain. **Copper 53 W, Copper Oxychloride, Copper Spray:** Do not apply to Vidal, Concord or Niagara varieties. See notes on *Copper*, page 294. **Cueva:** Do not mix with lime. **Kocide:** Always test for sensitivity. The addition of 454–1,360 g hydrated lime/454 g of Kocide may reduce phytotoxicity. **Pristine, Sovran, Revus:** These products are locally systemic. **Pristine:** When used as directed, will help reduce anthracnose. Do not use on Concord, Fredonia or related varieties or on table grapes. **Sovran:** Phytotoxic to some cherry varieties (see label). Do not let product drift onto sensitive crops. **Revus:** Use with a non-ionic adjuvant (0.125% or 1.25 L/1,000 L water). Do not use Revus plus adjuvant tank-mixed with sulphur on sulphur-sensitive varieties. **Ridomil, Aliette, Confine Extra, Phostrol, Rampart, Acrobat, Zampro:** These products are fully systemic and will redistribute to young leaves as they develop. **Confine Extra, Phostrol, Rampart:** Use the lower rate in 500 L of water and the higher rate in 1,000 L of water. Phytotoxicity may occur if concentration is increased above the label rate or tank-mixed with a surfactant. Apply at 1–3-week intervals, using the high rate and short interval under high disease pressure. **Rampart:** Do not apply to vines that are heat-stressed. Do not apply in less than 20-day intervals with copper-based compounds. Do not apply when conditions favour prolonged wet periods greater than 4 hours. **Acrobat, Zampro:** Do not use less than 200 L water/ha. **Acrobat:** Tank-mix with another downy mildew fungicide from a different chemical group. **Timorex Gold:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309, and *Using Organic and Biopesticide* Products, page 280.
Immediate prebloom			
Erineum mite	Use one of the products listed for erineum mite at **3–5 leaves unfolded, 10–15-cm shoot length.**		
Japanese beetle	• Imidan 70-WP Instapak *(1)* • Assail 70 WP *(4)* • Altacor *(28)*	1.36 kg/ha 80 g/ha 285 g/ha	Japanese beetle is a sporadic pest in Ontario. Monitor presence and extent of feeding damage. Where damage is localized, spot treatment may be adequate. **Altacor:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309. Apply when feeding is first observed and reapply in 10–14 days, if needed.
Leafhoppers	• Sevin XLR *(1)* • Pounce 384 EC *(3)* or Perm-Up EC*(3)* or Ambush 500 EC *(3)* • Pyganic EC 1.4 II *(3)* • Up-Cyde 2.5 EC *(3)* • Admire 240 Flowable *(4)* • Assail 70 WP *(4)* • Closer *(4)* • Clutch 50 WDG *(4)* • Surround WP *(NC)*	5.25 L/ha 175 mL/ha 175 mL/ha 140 mL/ha 2.32–4.65 L/ha 240 mL/ha 200 mL/ha 80 g/ha 200–240 mL/ha 100–140 g/ha 50 kg/ha	Grape leafhopper (GLH), potato leafhopper (PLH), three-banded leafhopper (TBLH) and Virginia creeper leafhopper (VCLH) are the main species of leafhoppers that feed on grapes. **Pyganic:** Use high rate for maximum efficacy. Adjust spray solution to pH of 5.5–7.0, if outside that range. If possible, apply in the early morning or evening hours. Apply promptly after mixing. Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply if necessary after 7 days. Before making widespread applications, treat a small area and observe for phytotoxicity over a 10-day period. **Closer:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309. **Surround:** May delay sugar accumulation. Closely monitor harvest parameters to determine best time to harvest. Use 50 kg/ha for the initial 2 applications to establish the protectant layer, followed by 25 kg/ha in subsequent sprays. Reapply to maintain complete coverage following heavy rain. Do not apply postbloom on table grapes. See *Using Organic and Biopesticide Products*, page 280.

Disease or Insect	Product *(Group)*	Rate	Comments
Phylloxera (leaf form)	• Assail 70 WP *(4)* • Clutch 50 WDG *(4)* • Movento 240 SC *(23)*	80 g/ha 140–210 g/ha 365 mL/ha	**Movento:** Will redistribute to young leaves as they develop. Control may not be apparent for 2–3 weeks. Consecutive applications should be at least 30 days apart. Tank-mix with an adjuvant/additive having spreading and penetrating properties at a suggested rate of 0.2% v/v. Do not use on table grapes. See label for further details.
Mealy bug Scale	• Movento 240 SC *(23)*	365–585 mL/ha	This timing is appropriate if phylloxera is not a problem in the vineyard and Movento has not been applied previously. Suppression only for scale. If grapevine leafroll virus has been confirmed by an accredited lab and mealy bugs or scale has been confirmed in the vineyard, this spray may reduce insect vector pressure and spread of grapevine leafroll virus. Reapply 30 days later. Tank-mix with a non-ionic surfactant at 0.2% v/v (2 L/1,000 L water). See label for further details. Do not apply to table grapes.
Trace bloom (first cap fall)			
	DO NOT APPLY INSECTICIDES WHILE GRAPES ARE IN BLOOM. SEE *BEE POISONING*, PAGE 311.		
Black rot	Use one of the products listed for black rot at **Shoot length 20–25 cm.** Fruit clusters are highly susceptible to black rot from bloom to 4 weeks postbloom. Apply at 7–10-day intervals to protect expanding leaves and developing fruit clusters. Apply at shorter intervals if weather is conducive to disease.		
Anthracnose	Use one of the products listed for anthracnose at **3–5 leaves unfolded, 10–15-cm shoot length**.		
Downy mildew	• Supra Captan 80 WDG *(M)* or Maestro 80 DF *(M)* • Copper 53 W *(M)* • Guardsman Copper Oxychloride 50 *(M)* • Copper Spray *(M)* • Cueva *(M)* • Folpan 80 WDG *(M)* • Kocide 2000 *(M)* • Penncozeb 75 DF Raincoat *(M)* or Manzate Pro-Stick *(M)* or Dithane Rainshield *(M)* • Polyram DF *(M)* • Ridomil Gold MZ 68 WG *(4+M)* • Pristine WG *(7+11)* • Sovran *(11)* • Gavel 75 DF *(22+M)* • Aliette *(33)* • Phostrol *(33)* or Rampart *(33)* or Confine Extra *(33)* • Acrobat 50 WP *(40)* • Revus *(40)* • Zampro *(40+45)* • Presidio *(43)* • Timorex Gold *(46)*	1.5 kg/1,000 L water 3.5 kg/ha 3 kg + 6 kg lime/ 1,000 L water 3 kg + 6 kg lime/ha 3 kg + 6 kg lime/ 1,000 L water 1% v/v in 470–940 L water/ha 1.25 kg/ha 1.6 kg/ha 7.2 kg/ha 7.2 kg/ha 7.2 kg/ha 2 kg/1,000 L water 2.5 kg/ha 675–735 g/ha 300 g/ha 2.25 kg/ha 3.75 kg/ha 2.9–5.8 L/ha 2.5–5.0 L/ha 2.5–5.8 L/ha 450 g/ha 500 mL/ha 0.8–1.0 L/ha 220–292 mL/ha 3.0 L/ha	Fruit clusters are highly susceptible to downy mildew from bloom to 4–6 weeks postbloom. Apply at 7–10-day intervals to protect expanding leaves and developing fruit clusters. Apply at shorter intervals if weather is conducive to disease. Consult label for information on drying time required before rain. **Copper 53 W, Copper Oxychloride, Copper Spray:** Do not apply on Vidal, Concord or Niagara varieties. See notes on *Copper*, page 294. **Cueva:** Do not mix with lime. **Kocide:** Always test for sensitivity. The addition of 454–1,360 g hydrated lime/454 g of Kocide may reduce phytotoxicity. **Ridomil, Aliette, Phostrol, Rampart, Confine Extra, Acrobat, Zampro:** These products are fully systemic and will redistribute to young leaves as they develop. **Phostrol, Rampart, Confine Extra:** Use the low rate in 500 L of water and the high rate in 1,000 L of water. Phytotoxicity may occur if concentration is increased above the label rate or tank-mixed with a surfactant. **Rampart:** Do not apply to vines that are heat-stressed. Do not apply in less than 20-day intervals with copper-based compounds. Do not apply when conditions favour prolonged wet periods (>4 hours). **Acrobat, Presidio:** Tank-mix with another downy mildew fungicide from a different chemical group. **Acrobat, Zampro:** Do not use less than 200 L water/ha. **Pristine, Sovran, Revus, Presidio:** These products are locally systemic. **Pristine:** When used as directed, will help reduce anthracnose. Do not use on Concord, Fredonia or related varieties or on table grapes. **Sovran:** Phytotoxic to some cherry varieties (see label). Do not let product drift onto sensitive crops. **Revus:** Use with a non-ionic adjuvant (0.125% or 1.25 L/1,000 L water). Do not use Revus plus adjuvant tank-mixed with sulphur on sulphur-sensitive varieties. **Timorex Gold:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309, and *Using Organic and Biopesticide Products*, page 280.
Powdery mildew	Use one of the products listed for powdery mildew at **Shoot length 20–25 cm**, ensuring rotation among groups for resistance management. Fruit clusters are very susceptible to infection by powdery mildew from bloom to 4–6 weeks postbloom. Unless otherwise indicated, spray at 7–10-day intervals to protect developing leaves and fruit clusters. Spray at 7-day intervals if weather is conducive to disease, unless otherwise specified on label.		

Disease or Insect	Product *(Group)*	Rate	Comments
Botrytis bunch rot	• Rovral WDG *(2)* • Inspire Super *(3+9)* • Kenja 400 SC *(7)* • Luna Tranquility *(7+9)* • Pristine WG *(7+11)* • Scala SC *(9)* • Switch 62.5 WG *(9+12)* • Elevate 50 WDG *(17)* • Double Nickel 55 *(44)* • Serenade OPTI *(44)* • Botector *(NC)* • Fracture *(NC)* • Regalia Maxx *(P5)*	1.5 kg/ha 1.033–1.475 L/ha 1.46–1.61 L/ha 1.2 L/ha 420–735 g/ha 2 L/ha 775–975 g/ha 1.12 kg/ha 0.6–1.25 kg/ha 1.7–3.3 kg/ha 400 g/ha in 400 L water 1.7–3.3 L /ha 0.25% v/v in 500 L water	If the bloom/postbloom period is wet, spray immediately to control latent infections in susceptible varieties (Baco Noir, Foch, Gamay Noir, Pinot Noir, Pinot Gris, Riesling, Chardonnay, Gewurztraminer, Sauvignon Blanc and Seyval Blanc). Direct this spray at the fruiting zone. **Rovral, Inspire Super, Kenja, Luna Tranquility, Pristine, Scala, Switch, Elevate:** These products are locally systemic. Consult labels for information on drying time required before rain. **Rovral:** Do not use after bunch closure. **Inspire Super:** May cause damage to Concord. **Pristine, Serenade OPTI, Double Nickel, Botector, Fracture, Regalia Maxx:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309, and *Using Organic and Biopesticide Products*, page 280. **Double Nickel:** With higher disease pressure use 1.25–5.0 kg/ha. **Botector:** Not compatible with some fungicides, such as Flint, Kumulus and Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. **Fracture:** For higher disease pressure use 3.3 L/ha. **Regalia Maxx:** Apply before symptoms develop. Use 0.25% (1.25 L in 500 L water) in rotation with other fungicides.

Immediate postbloom to early fruit set	
Leafhoppers	Use one of the products listed for leafhoppers at **Immediate prebloom.**
Japanese beetle	Use one of the products listed for Japanese beetle at **Immediate prebloom**.
Phylloxera (leaf form)	Use one of the products listed for phylloxera at **Immediate prebloom**. Do not apply Movento within 30 days of first application.
Black rot	Use one of the products listed for black rot at **Shoot length 20–25 cm**. Fruit clusters are highly susceptible to black rot from bloom to 4 weeks postbloom. Apply at 7–10-day intervals to protect expanding leaves and developing fruit clusters. Apply at shorter intervals if weather is conducive to disease unless otherwise specified on label.
Powdery mildew	Use one of the products listed for powdery mildew at **Shoot length 20–25 cm**, ensuring rotation among groups for resistance management. Fruit clusters are highly susceptible to powdery mildew from bloom to 4–6 weeks postbloom. Unless otherwise indicated, spray at 7–10-day intervals to protect developing leaves and fruit clusters. Spray at 7-day intervals if weather is conducive to disease unless otherwise specified on label.
Downy mildew	Use one of the products listed for downy mildew at **Trace bloom**, ensuring rotation among groups for resistance management. Fruit clusters are highly susceptible to downy mildew until 4–6 weeks after bloom. Unless otherwise indicated, spray at 7–10-day intervals to protect developing leaves and fruit clusters. Spray at 7-day intervals if weather is conducive to disease unless otherwise specified on label.
Botrytis bunch rot	If a Botrytis spray was not applied at **Trace bloom**, ensuring rotation among groups for resistance management. If the bloom/postbloom period is wet, spray immediately to control latent infections in susceptible varieties (Baco Noir, Foch Gamay Noir, Pinot Noir, Pinot Gris, Riesling, Chardonnay, Gewurztraminer, Sauvignon Blanc and Seyval Blanc). Direct this spray at the fruiting zone.

Disease or Insect	Product *(Group)*	Rate	Comments
Berries pea-sized			
Grape berry moth (Second generation)	• Imidan 70-WP Instapak *(1)* • Pounce 384 EC *(3)* or Perm-Up EC *(3)* or Ambush 500 EC *(3)* • Up-Cyde 2.5 EC *(3)* • Delegate *(5)* • Success *(5)* or Entrust *(5)* • Dipel 2X DF *(11)* or BioProtec CAF *(11)* • Intrepid *(18)* • Altacor *(28)*	2.2 kg/ha 360 mL/ha 360 mL/ha 275 mL/ha 240 mL/ha 280 g/ha 182 mL/ha 364 mL/ha 1.125 kg/ha 2.8 L/ha 600 mL/ha 285 g/ha	Where mating disruption is in place and monitoring indicates good control, an insecticide is not needed at this time. Where there is a history of damage, use one of these products. Reapply if flight is extended. Direct spray at the fruiting zone. **Imidan, Pounce, Perm-Up, Ambush, Up-Cyde:** Apply at upswing in moth numbers caught in pheromone traps. **Success, Entrust:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309. **Delegate, Success, Entrust, Intrepid, Altacor:** Apply at first egg hatch (first sustained moth catch in pheromone traps), earlier than the timing for Group 3 insecticides or Imidan. A second application may be necessary if flight is extended. **Dipel, BioProtec:** Reapply 7–10 days later, if needed.
Japanese beetle	Use one of the products listed for Japanese beetle at **Immediate prebloom**.		
Mealy bug Lecanium scale	Use one of the products listed for mealy bug at **Immediate prebloom**. Do not apply Movento within 30 days of first application.		
Phylloxera (leaf form)	Use one of the products listed for phylloxera at **Immediate prebloom**.		
Powdery mildew	Use one of the products listed for powdery mildew at **3–5 leaves unfolded, 10–15-cm shoot length** ensuring rotation among groups for resistance management. Fruit clusters are highly susceptible to powdery mildew from bloom to 4–6 weeks postbloom. Unless otherwise indicated, spray at 7–10-day intervals to protect developing leaves and fruit clusters. Spray at 7-day intervals if weather is conducive to disease. Increase rate of Microscopic Sulphur to 6 kg/1,000 L water. Purespray Green Spray Oil may remove the waxy bloom on grape berries.		
Downy mildew	Use one of the products listed for downy mildew at **Trace bloom**, ensuring rotation among groups for resistance management. Fruit clusters are highly susceptible to downy mildew until 4–6 weeks after bloom. Unless otherwise indicated, spray at 7–10-day intervals to protect developing leaves and fruit clusters. Spray at 7-day intervals if weather is conducive to disease.		
Black rot	Use one of the products listed for black rot at **Shoot length 20–25 cm**. Fruit clusters are highly susceptible to black rot from bloom to 4 weeks postbloom.		
Berry touch to cluster closure Check product labels and Table 5–4. *Products Used on Grapes*, page 173, for preharvest intervals.			
European red mite	Agri-Mek SC *(6)* Nexter *(21)* Envidor 240 SC *(23)* Nealta *(25)* Acramite 50 WS *(UN)*	130–265 mL/ha 300 g/ha 750 mL/ha 1 L/ha 851 g/ha	Monitor where there has been a history of mite damage. Apply a miticide when 3–5 mites are found per mid-shoot leaf. Thorough spray coverage is essential for good control. For resistance management, do not use any product more than once per season. **Agri-Mek:** Apply when mites first appear. Use 130 mL/ha for low to moderate infestations and 265 mL/ha for severe infestations. Use with a non-ionic surfactant in a minimum of 470 L of water/ha. Do not apply within 10 days of Captan, Maestro or Folpan fungicides. Monitor and evaluate control 7 to 10 days after application. **Nexter:** Effective against nymphs only. **Envidor, Nealta:** Active on all life stages, including eggs, nymphs and adults. **Envidor:** Control may not be apparent for 2–3 weeks. **Nealta:** Provides knockdown and residual control. The addition of a surfactant registered on the crop may improve activity.
Powdery mildew	Use one of the products listed for powdery mildew at **3–5 leaves unfolded, 10–15-cm shoot length**, ensuring rotation among groups for resistance management. Fruit clusters are highly susceptible to powdery mildew from bloom to 4–6 weeks postbloom. Increase rate of Microscopic Sulphur to 6 kg/1,000 L water. Purespray Green Spray Oil may remove the waxy bloom on grape berries.		
Downy mildew	Use one of the products listed for downy mildew at **Trace bloom**, ensuring rotation among groups for resistance management. Fruit clusters are highly susceptible to downy mildew until 4–6 weeks after bloom.		
Black rot	Use one of the products listed for black rot at **Shoot length 20–25 cm**. This spray is necessary only if black rot is severe and new infections continue to occur.		

Disease or Insect	Product *(Group)*	Rate	Comments
Botrytis bunch rot	Use one of the products listed for botrytis bunch rot at **Trace bloom**, ensuring rotation among groups for resistance management. Many of the vinifera and French hybrid varieties with tight clusters are susceptible to botrytis bunch rot (e.g., Baco Noir, Foch, Gamay Noir, Pinot Noir, Pinot Gris, Riesling, Chardonnay, Gewurztraminer, Sauvignon Blanc and Seyval Blanc). Direct spray at the fruiting zone. Ensure complete coverage of berries before clusters close. Do not use Rovral after cluster closure.		
Beginning of ripening (veraison) through harvest Check product labels and Table 5–4. *Products Used on Grapes*, page 173, for preharvest intervals.			
Grape berry moth (about mid to late August)	In blocks without mating disruption, use one of the products listed for grape berry moth at **Berries pea-sized**, ensuring rotation among groups for resistance management. Border sprays of conventional insecticides may be very effective. Direct spray at fruiting zone. Where mating disruption for GBM is in place and monitoring indicates good control, an insecticide may not be needed at this time.		
Powdery mildew	Use one of the products listed for powdery mildew at **3–5 leaves unfolded, 10–15-cm shoot length**, ensuring rotation among groups for resistance management. Foliage of vinifera and some French hybrid varieties are more susceptible and may require extra sprays. Increase rate of Microscopic Sulphur to 6 kg/1,000 L water. Purespray Green Spray Oil may remove the waxy bloom on grape berries.		
Downy mildew	Use one of the products listed for downy mildew at **Trace bloom**, ensuring rotation among groups for resistance management. Foliage of vinifera and some French hybrid varieties are more susceptible and may require extra sprays.		
Botrytis bunch rot	Use one of the products listed for botrytis bunch rot at **Trace bloom**, ensuring rotation among groups for resistance management. Many of the vinifera and French hybrid varieties with tight clusters are susceptible to botrytis bunch rot (e.g., Baco Noir, Foch, Gamay Noir, Pinot Noir, Pinot Gris, Riesling, Chardonnay, Gewurztraminer, Sauvignon Blanc and Seyval Blanc). Direct spray at the fruiting zone. Do not use Rovral after cluster closure.		
Slugs and snails	• Sluggo Professional *(NC)*	25 kg/ha	Apply 50 kg/ha if population is very high. Apply when infestation begins. Reapply as the bait is consumed or at least every 2 weeks if slugs and snails continue to be a problem.
Special sprays (when monitoring indicates the need)			
Multicoloured Asian lady beetle	• Malathion 85 E *(1)* • Mako *(3)*	880 mL/ha 150 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. **Mako:** Cannot be used on juice grapes destined for export to the United States. Do not use on table grapes.
Yellow jacket wasps	• Mako *(3)*	150 mL/ha	Cannot be used on juice grapes destined for export to the United States. Do not use on table grapes.
Brown marmorated stink bug	• Malathion 85 E *(1)* • Clutch 50 WDG *(4)*	880 mL/ha 210 g/ha	At time of printing this publication, this pest has not been detected in vineyards, but breeding populations are present in Ontario. Check the OMAFRA website at ontario.ca/stinkbug for updates on pest development, registered products and management strategies for control. Apply when insects first appear. **Malathion, Clutch:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309.

Disease or Insect	Product *(Group)*	Rate	Comments
Botrytis bunch rot	• Inspire Super *(3+9)* • Luna Tranquility *(7+9)* • Pristine WG *(7+11)* • Scala SC *(9)* • Switch 62.5 WG *(9+12)* • Elevate 50 WDG *(17)* • Double Nickel 55 *(44)* • Serenade OPTI *(44)* • Botector *(NC)* • Fracture *(NC)* • Regalia Maxx *(P5)*	1.033–1.475 L/ha 1.2 L/ha 420–735 g/ha 2 L/ha 775–975 g/ha 1.12 kg/ha 0.6–1.25 kg/ha 1.7–3.3 kg/ha 400 g/ha in 400 L water 1.7–3.3 L/ha 0.25% v/v in 500 L water	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. **Inspire Super, Luna Tranquility, Scala, Pristine, Switch, Elevate:** These products are locally systemic. Consult labels for information on drying time required before rain. **Inspire Super:** May cause damage to Concord. **Pristine, Serenade OPTI, Fracture, Regalia Maxx:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309, and *Using Organic and Biopesticide Products*, page 280. **Fracture:** For higher disease pressure use 3.3 L/ha. **Double Nickel:** Suppression only. For higher disease pressure, use 1.25–5.0 kg/ha. **Botector:** Suppression only. See Table 11–1. *Pesticide Efficacy Ratings*, page 309. This product is not compatible with some fungicides, such as Flint, Kumulus and Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after Botector application. **Regalia Maxx:** Apply before symptoms develop. Use 0.25% (1.25 L in 500 L water) in rotation with other fungicides.

Preharvest Intervals

Contact the processors and wineries directly in regard to their preharvest interval policy. Preharvest intervals listed in Table 5–4. *Products Used on Grapes*, page 173, are taken from product labels. In some cases, regulations on residues in finished products 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 5–4. Products Used on Grapes

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

The **preharvest 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.

Product name	Registration number	Common name	Group	Preharvest interval	Minimum re-entry	Maximum number of applications per year (on label)
Products used for insect and mite control or suppression						
Acramite 50 WS	27925	bifenazate	UN	14 days	12 hours[1]/24 hours[2]	1
Admire 240 Flowable	24094	imidacloprid	4A	0 days	24 hours	2
Agri-Mek SC	31607	abamectin	6	28 days	12 hours[1]/13 days[2]	2
Altacor	28981	chlorantraniliprole	28	14 days	12 hours	3 (max. 645 g/ha)
Ambush 500 EC	14882	permethrin	3	7 days	when dry	—
Assail 70 WP	27128	acetamiprid	4A	3 days/5 days[3]	12 hours[1]/5 days[2]	2
BioProtec CAF	26854	*Bacillus thuringiensis*	11	0 days	12 hours	6
Closer	30826	sulfoxaflor	4C	7 days	12 hours	2
Clutch 50 WDG	29382	clothianidin	4A	1 day	12 hours	2
Delegate	28778	spinetoram	5	7 days	12 hours	3
Dipel 2X DF	26508	*Bacillus thuringiensis*	11	0 days	12 hours	6
Entrust	30382	spinosad	5	7 days	when dry[1]/7 days[2]	3
Envidor 240 SC	28051	spirodiclofen	23	14 days	12 hours	1
Imidan 70-WP Instapak	29064	phosmet	1B	14 days	14 days[1]/30 days[2]	3
Intrepid	27786	methoxyfenozide	18	30 days	12 hours	3
Isomate-GBM Plus	27525	pheromone, grape berry moth	NC	—	—	1
Lime sulphur	16465	calcium polysulphide	UN	120 days	48 hours	1 (delayed dormant only)
Malathion 85 E	8372	malathion	1B	3 days	12 hours[1]/4 days[2]	1
Mako	30316	cypermethrin	3	2 days/7 days[3]	12 hours	3/2[4]
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	2 (max. 920 mL/ha)
Nealta	31284	cyflumetofen	25	14 days	12 hours	2

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.
U/UN = Mode of action has not been determined. — = Information is not specified on the product label.

[1] General re-entry.
[2] Hand labour (e.g., training, thinning, leaf pulling, hand harvest).
[3] Preharvest interval for mechanical harvest /hand harvest.
[4] Maximum 3 applications per year for mechanical harvest or 2 applications for hand harvest.
[5] Check with processor and winery for wine grapes.
[6] Preharvest interval is 14 days for table grapes.
[7] Maximum 731 mL/ha per application.
[8] Preharvest interval is 1 day for table grapes or 21 days for wine grapes.
[9] Maximum 2 applications at botrytis rate or 3 applications at powdery mildew rate.
[10] For use on wine grapes only.

Table 5-4. Products Used on Grapes (cont'd)

Product name	Registration number	Common name	Group	Preharvest interval	Minimum re-entry	Maximum number of applications per year (on label)
Nexter	25135	pyridaben	21	25 days	24 hours	1
Opal Insecticidal Soap	28146	potassium salts of fatty acids	NC	—	—	—
Perm-Up EC	28877	permethrin	3	21 days	12 hours	—
Pounce 384 EC	16688	permethrin	3	21 days	when dry	2
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	14 days[5,6]	12 hours	8 (summer)
Pyganic EC 1.4 II	30164	pyrethrins	3	—	12 hours	8
Sevin XLR	27876	carbaryl	1A	5 days[5]	12 hours	—
Sluggo Professional	30025	ferric phosphate	NC	—	12 hours	—
Success	26835	spinosad	5	7 days	when dry[1]/7 days[2]	3
Surround WP	27469	kaolin	NC	0 days	12 hours	—
Up-Cyde 2.5 EC	28795	cypermethrin	3	7 days	12 hours	3
Products used for disease control or suppression						
Acrobat 50 WP	27700	dimethomorph	40	14 days	12 hours[1]/12 days[2]	4
Aliette	27688	fosetyl-al	33	15 days	6 days	7
Aprovia	31981	benzovindiflupyr	7	21 days	12 hours	max. 3 L/ha
Botector	31248	*Aureobasidium pullulans*	NC	—	when dry	4
Buran	30601	garlic powder	NC	0 days	when dry	—
Cantus WDG	30141	boscalid	7	14 days	12 hours	5
Confine Extra	30648	mono- and di-basic salts of phosphorus acid	33	1 day	12 hours	9
Copper 53 W	9934	tri-basic copper sulphate	M	2 days[5]	48 hours	7
Copper Spray	19146	copper oxychloride	M	2 days[5]	48 hours	7
Cueva	31825	copper octanoate	M	1 day	4 hours	15
Dithane Rainshield	20553	mancozeb	M	30 days	12 hours	4 (1 pre-bloom, 3 post bloom)
Double Nickel 55	31888	*Bacillus amyloliquefaciens*	44	—	when dry	—
Elevate 50 WDG	25900	fenhexamid	17	7 days	4 hours	3
Ferbam 76 WDG	20136	ferbam	M	7 days	12 hours	—
Flint	30619	trifloxystrobin	11	14 days	12 hours[1]/5 days[2]	4
Folpan 80 WDG	27733	folpet	M	1 day	24 hours	2
Fracture	31782	BLAD polypeptide	NC	0 days	when dry	5
Fullback 125 SC	31679	flutriafol	3	14 days	12 hours[1]/7 days[2]	max. 2.05 L/ha[7]
Gavel 75 DF	26842	zoxamide + mancozeb	22+M	66 days	48 hours	6

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.
U/UN = Mode of action has not been determined. — = Information is not specified on the product label.

[1] General re-entry.
[2] Hand labour (e.g., training, thinning, leaf pulling, hand harvest).
[3] Preharvest interval for mechanical harvest /hand harvest.
[4] Maximum 3 applications per year for mechanical harvest or 2 applications for hand harvest.
[5] Check with processor and winery for wine grapes.
[6] Preharvest interval is 14 days for table grapes.
[7] Maximum 731 mL/ha per application.
[8] Preharvest interval is 1 day for table grapes or 21 days for wine grapes.
[9] Maximum 2 applications at botrytis rate or 3 applications at powdery mildew rate.
[10] For use on wine grapes only.

Table 5-4. Products Used on Grapes (cont'd)

Product name	Registration number	Common name	Group	Preharvest interval	Minimum re-entry	Maximum number of applications per year (on label)
Guardsman Copper Oxychloride 50	13245	copper oxychloride	M	2 days[5]	48 hours	7
Inspire Super	30827	difenoconazole + cyprodanil	3+9	14 days	7 days	2
Kenja 400 SC	31758	isofetamid	7	14 days	12 hours	3
Kocide 2000	27348	copper hydroxide	M	2 days	48 hours	7
Kumulus DF	18836	sulphur	M	1 day/21 days[8]	24 hours	8
Lime Sulphur	16465	calcium polysulphide	M	120 days	48 hours	1 (delayed dormant only)
Luna Tranquility	30510	fluopyram + pyrimethanil	7+9	7 days	12 hours[1]/24 hours[2]	2/3[9]
Maestro 80 DF	26408	captan	M	7 days	72 hours	—
Manzate Pro-Stick	28217	mancozeb	M	30 days	24 hours	4
Mettle 125 ME	30673	tetraconazole	3	15 days	12 hours[1]/15 days[2]	2
Microscopic Sulphur WP	14653	sulphur	M	1 day/21 days[8]	24 hours	8
Microthiol Disperss	29487	sulphur	M	1 day/21 days[8]	24 hours	8
MilStop	28095	potassium bicarbonate	NC	0 days	4 hours	10
Nova	22399	myclobutanil	3	14 days	12 hours[1]/7 days[2]	5
Penncozeb 75 DF Raincoat	30241	mancozeb	M	30 days	24 hours	4
Phostrol	30449	mono- and di-basic sodium, potassium and ammonium phosphites	33	0 day	12 hours	4
Polyram DF	20087	metiram	M	45 days	12 hours	3
Presidio	30051	fluopicolide	43	21 days	12 hours[1]/8 days[2]	4
Pristine WG	27985	boscalid + pyraclostrobin	7+11	14 days	when dry[1]/ 21 days[2]	6
Priwen[10]	31959	spiroxamine	5	35 days	12 hours[1]/17 days[2]	max. 1.2 L/ha
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	14 days[5,6]	12 hours	8 (summer)
Quintec	29755	quinoxyfen	13	14 days	12 hours	5
Rampart	30654	mono and dipotassium salts of phosphorous acid	33	1 day	4 hours	5
Regalia Maxx	30199	extract of *Reynoutria sachalinensis*	P5	0 days	when dry	—
Revus	29074	mandipropamid	40	14 days	12 hours	4
Rovral	24709	iprodione	2	before bunch closure[5]	12 hours	2

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.
U/UN = Mode of action has not been determined. — = Information is not specified on the product label.

[1] General re-entry.
[2] Hand labour (e.g., training, thinning, leaf pulling, hand harvest).
[3] Preharvest interval for mechanical harvest /hand harvest.
[4] Maximum 3 applications per year for mechanical harvest or 2 applications for hand harvest.
[5] Check with processor and winery for wine grapes.
[6] Preharvest interval is 14 days for table grapes.
[7] Maximum 731 mL/ha per application.
[8] Preharvest interval is 1 day for table grapes or 21 days for wine grapes.
[9] Maximum 2 applications at botrytis rate or 3 applications at powdery mildew rate.
[10] For use on wine grapes only.

Product name	Registration number	Common name	Group	Preharvest interval	Minimum re-entry	Maximum number of applications per year (on label)
Ridomil Gold MZ 68 WG	28893	metalaxyl + mancozeb	4+M	66 days	24 hours	1 (prebloom) 1 (postbloom)
Scala SC	28011	pyrimethanil	9	7 days	12 hours[1]/24 hours[2]	3
Sercadis	31697	fluxapyroxad	7	14 days	12 hours	3
Serenade OPTI	31666	*Bacillus subtilis*	44	0 days	12 hours	—
Sirocco	31091	potassium bicarbonate	NC	0 days	4 hours	10
Sovran	26257	kresoxim-methyl	11	14 days	48 hours	4
Supra Captan 80 WDG	24613	captan	M	7 days	72 hours	—
Switch 62.5 WG	28189	cyprodinil + fludioxonil	9+12	7 days	12 hours[1]/48 hours[2]	2
Timorex Gold	30910	tea tree oil	46	4 days	4 hours	—
Tivano	30468	citric acid + lactic acid	NC	—	when dry	—
Vivando SC	29765	metrafenone	U8	14 days	12 hours	6
Zampro	30321	ametoctradin + dimethomorph	40+45	14 days	12 hours[1]/12 days[2]	4

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.
U/UN = Mode of action has not been determined. — = Information is not specified on the product label.

[1] General re-entry.
[2] Hand labour (e.g., training, thinning, leaf pulling, hand harvest).
[3] Preharvest interval for mechanical harvest /hand harvest.
[4] Maximum 3 applications per year for mechanical harvest or 2 applications for hand harvest.
[5] Check with processor and winery for wine grapes.
[6] Preharvest interval is 14 days for table grapes.
[7] Maximum 731 mL/ha per application.
[8] Preharvest interval is 1 day for table grapes or 21 days for wine grapes.
[9] Maximum 2 applications at botrytis rate or 3 applications at powdery mildew rate.
[10] For use on wine grapes only.

Notes on Grape Pests

Table 5–5. *Relative Susceptibility of Grape Cultivars to Diseases*, page 177, 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 5–6. *Activity of Fungicides on Grape Diseases*, page 178, and Table 5–7. *Activity of Insecticides on Grape Insect Pests,* page 180, for effect of fungicides and insecticides, respectively, on grape pests.

Table 5–5. Relative Susceptibility of Grape Cultivars to Diseases[A]

Cultivar	Phomopsis cane blight	Black rot	Downy mildew	Powdery mildew	Botrytis bunch rot	Phytotoxic chemical sensitivity
Vinifera wine[B]						
Auxerrois	MS	MS	MS	HS	HS	—
Cabernet Franc	MS	HS	MS	HS	SS	—
Cabernet Sauvignon	MS	HS	MS	HS	SS	—
Chardonnay	MS	HS	ES	ES	HS	—
Gamay	SS	MS	MS	HS	MS	—
Gewurztraminer	SS	HS	MS	HS	HS	—
Merlot	SS	HS	MS	HS	MS	2
Pinot Blanc	UN	HS	MS	HS	HS	—
Pinot Gris	SS	HS	MS	HS	HS	—
Pinot Noir	SS	HS	MS	HS	HS	—
Riesling	SS	HS	MS	HS	HS	—
Sauvignon Blanc	SS	MS	MS	MS	HS	—
Zweigeltrebe	MS	HS	MS	HS	SS	—
French hybrid wine						
Baco Noir	MS	SS	SS	MS	HS	1
Chambourcin	SS	MS	MS	MS	SS	1
De Chaunac	HS	SS	SS	MS	SS	1
Marechal Foch	MS	SS	SS	MS	SS	1
Seyval Blanc	MS	MS	MS	HS	HS	—
S.V. 23-512	SS	SS	MS	MS	SS	—
Vidal 256	SS	SS	MS	MS	HS	2
American hybrid wine						
Frontenac	SS	MS	MS	SS	SS	—
Frontenac gris	SS	MS	MS	SS	SS	—
Juice and table wine[C]						
Concord	MS	MS	MS	MS	SS	1,2,3,4
Elvira	HS	MS	SS	MS	MS	3
Fredonia	MS	MS	HS	MS	SS	3
Himrod	SS	MS	SS	MS	MS	—
Niagara	MS	HS	HS	MS	SS	2
N.Y. Muscat	SS	SS	SS	MS	SS	—
Sovereign Coronation	SS	SS	HS	HS	MS	—

UN = Relative susceptibility is unknown. SS = Slightly susceptible. MS = Moderately susceptible. HS = Highly susceptible. ES = Extremely susceptible.

[A] These notes are based on grower experience and could vary under stress conditions.
[B] Vinifera varieties not included in this chart are considered susceptible to powdery mildew, downy mildew and black rot.
[C] All juice and table varieties are Labrusca species, with exception of Himrod (American hybrid).

1 = Sulphur-sensitive. 2 = Copper-sensitive. 3 = Flint- and Pristine-sensitive. 4= Inspire Super-sensitive — = No chemical sensitivity has been observed.

Table 5–6. Activity of Fungicides on Grape Diseases

See the product label or crop calendars for registered uses. Use fungicides only for diseases listed on the product label for the crop. The information provided in this table is based on information from other areas. It is intended to assist the grower in choosing the best fungicide 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	Fungicide	Anthracnose	Phomopsis cane and leaf spot	Black rot	Downy mildew	Powdery mildew	Botrytis bunch rot	Activity
M	Copper 53 W	0	1 *	1 *	3 *	2	0	Contact
M	Copper Spray	0	1	1	2 *	2 *	0	Contact
M	Cueva	0	1	1	2*	2*	0	Contact
M	Dithane Rainshield	2	3	3 *	3 *	0	0	Contact
M	Ferbam 76 WDG	2	3	3 *	2	0	0	Contact
M	Folpan 80 WDG	2	3 *	1 *	3 *	0	0	Contact
M	Guardsman Copper Oxychloride 50	0	1 *	1	2 *	2 *	0	Contact
M	Kocide 2000	0	1	0	2*	2	0	Contact
M	Kumulus DF	1	1	0	0	3 *	0	Contact
M	Lime Sulphur WP	2	0	0	0	1 *	0	Contact
M	Maestro 80 DF	2	3 *	1 *	3 *	0	0	Contact
M	Manzate Pro-Stick	2	3	3 *	3 *	0	0	Contact
M	Microscopic Sulphur	1	1	0	0	3 *	0	Contact
M	Microthiol Disperss	1	1	0	0	3 *	0	Contact
M	Penncozeb 75 DF Raincoat	2	3	3 *	3 *	0	0	Contact
M	Polyram DF	2	3	3 *	3 *	0	0	Contact
M	Supra Captan 80 WDG	2	3 *	1 *	3 *	0	0	Contact
2	Rovral WDG	0	0	0	0	0	2 *	Locally systemic
3	Fullback 125 SC	0	0	3	0	3 *	0	Locally systemic
3+9	Inspire Super	3 *	0	3 *	0	3 *	3*	Locally systemic
3	Mettle 125 ME	3	0	3 *	0	3 *	0	Locally systemic
3	Nova	3 *	0	3 *	0	3 *	0	Locally systemic
4+M	Ridomil Gold MZ 68 WG	0	1	1	3 *	0	0	Systemic
5	Priwen	0	0	0	0	3 *	0	Locally systemic
7	Aprovia	0	0	0	0	3*	1	Locally systemic
7	Cantus WDG	0	0	0	0	3 *	1	Locally systemic
7	Kenja 400 SC	0	0	0	0	2	3*	Locally systemic
7	Sercadis	0	0	0	0	3*	1 *	Locally systemic
7+9	Luna Tranquility	0	0	0	0	3 *	3 *	Locally systemic

0 = Ineffective. 1 = Slightly effective/suppression, not recommended for very susceptible varieties or at critical stages of infection. 2 = Moderately effective.
3 = Very effective. — = No information is available. * (shaded area) = The disease is listed on the product label for control or suppression.

M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

Fungicide activity (adapted from NY and PA *Pest Management Guidelines for Grapes*):
Contact: stays on the surface of plant
Locally systemic: moves into plant but does not move to other plant parts
Systemic: moves into plant and to unsprayed plant parts as they develop

Table 5-6. Activity of Fungicides on Grape Diseases (cont'd)

Group	Fungicide	Anthracnose	Phomopsis cane and leaf spot	Black rot	Downy mildew	Powdery mildew	Botrytis bunch rot	Activity
9	Scala SC	0	0	0	0	0	3 *	Locally systemic
9+12	Switch 62.5 WG	0	0	0	0	0	3 *	Locally systemic
11	Flint	0	1	3 *	1	3 *	1	Locally systemic
11	Sovran	0	1	3 *	2 *	2 *	1	Locally systemic
11+7	Pristine WG	3 *	1	3 *	3 *	3 *	1 *	Locally systemic
13	Quintec	0	0	0	0	3 *	0	Locally systemic
17	Elevate 50 WDG	0	0	0	0	1	3 *	Locally systemic
22	Gavel 75DF	0	0	0	3 *	0	0	Contact
33	Aliette	0	0	0	3 *	0	0	Systemic
33	Confine Extra	0	0	0	3 *	0	0	Systemic
33	Phostrol	0	0	0	3 *	0	0	Systemic
33	Rampart	0	0	0	3 *	0	0	Systemic
40	Acrobat 50 WP	0	0	0	3 *	0	0	Systemic
40	Revus	0	0	0	3 *	0	0	Locally systemic
43	Presidio	0	0	0	3 *	0	0	Locally systemic
44	Double Nickel 55	0	0	0	0	1 *	1 *	Contact
44	Serenade OPTI	0	0	0	0	1 *	2 *	Contact
46	Timorex Gold	0	0	0	1*	2*	0	
40+45	Zampro	0	0	0	3 *	0	0	Systemic
NC	Botector	0	0	0	0	0	1*	Contact
NC	Buran	0	0	0	0	1*	0	Contact
NC	Fracture	0	0	0	0	1*	1*	Contact
NC	MilStop	0	0	0	0	2 *	1	Contact
NC	Purespray Green Spray Oil 13 E	0	0	0	0	2 *	0	Contact
NC	Sirocco	0	0	0	0	2 *	1	Contact
NC	Tivano	0	0	0	1 *	0	0	Contact
P5	Regalia Maxx	0	0	0	0	1 *	1 *	Systemic
U8	Vivando SC	0	0	0	0	3 *	0	Locally systemic

0 = Ineffective. 1 = Slightly effective/suppression, not recommended for very susceptible varieties or at critical stages of infection. 2 = Moderately effective.
3 = Very effective. — = No information is available. * (shaded area) = The disease is listed on the product label for control or suppression.

M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

Fungicide activity (adapted from NY and PA *Pest Management Guidelines for Grapes*):
Contact: stays on the surface of plant
Locally systemic: moves into plant but does not move to other plant parts
Systemic: moves into plant and to unsprayed plant parts as they develop

Table 5–7. Activity of Insecticides on Grape Insect Pests

Use insecticides only for insects listed on the product label for the crop. 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	Grape mealy bug	Scale
1A	Sevin XLR	1 *	2 *	—	1	—	—	—	—	—	—	—	2exp
1B	Imidan 70-WP Instapak	3 *	3	—	2 *	—	—	—	—	—	1	—	2exp
1B	Malathion 85 E	1	2 *	—	—	—	3 *	3	2 *	—	—	2 *exp	2*exp
3	Ambush 500 EC	3 *	2 *	—	—	—	—	—	0	3	3	—	2exp
3	Mako	—	—	—	—	—	3 *	3 *	0	—	—	—	2exp
3	Perm-Up EC	3 *	2 *	—	2	—	—	—	0	3	3	—	2exp
3	Pounce 384 EC	3 *	2 *	—	2	—	—	—	0	3 *	3	—	2exp
3	Pyganic EC 1.4 II	2	2 *	—	1	—	—	—	0	—	—	—	—
3	Up-Cyde	3 *	2 *	—	—	—	—	—	0	—	—	—	2exp
4A	Admire 240 Flowable	—	3 *	2	—	—	—	—	0	—	—	2exp	2exp
4A	Assail 70 WP	1 *	3 *	2 *	2 *	—	—	—	0	—	—	2exp	2exp
4A	Clutch 50 WDG	—	3 *	2 *	—	—	—	—	0	—	2	2 *exp	2exp
4C	Closer	—	1 *	—	—	—	—	—	0	—	—	—	0
5	Delegate	3 *	—	—	—	—	—	—	0	3	2	—	0
5	Entrust	2 *	—	—	—	—	—	—	0	—	2	—	0
5	Success	2 *	—	—	—	—	—	—	0	—	2	—	0
6	Agri-Mek SC	0	—	—	—	1	—	—	2 *	—	—	—	0
11	BioProtec CAF	2 *	0	0	0	0	0	0	0	—	0	0	0
11	Dipel 2X DF	2 *	0	0	0	0	0	0	0	—	0	0	0
18	Intrepid	3 *	—	—	—	—	—	—	0	—	—	—	0
21	Nexter	0	0	0	0	1	0	0	2 *	0	0	0	0
23	Envidor 240 SC	0	0	0	0	—	0	0	3 *	0	0	—	0
23	Movento 240 SC	0	—	3 *	0	2	0	0	—	0	0	3 *	1*
25	Nealta	0	0	0	0	0	0	0	3 *	0	0	0	0
28	Altacor	3 *	—	—	1 *	0	—	—	0	3 *	—	—	0
NC	Kumulus DF	0	0	0	0	2 *	0	0	—	0	0	0	0
NC	Lime sulphur	—	—	—	—	2	—	—	—	—	—	1exp	1exp
NC	Microthiol Disperss	0	0	0	0	2 *	0	0	—	0	0	0	0
NC	Purespray Green Spray Oil 13 E	0	—	—	—	1 *	0	0	2 *	—	—	1exp	1exp
NC	Surround WP	—	2 *	—	1	—	—	—	—	—	1	—	0

0 = Ineffective. 1 = Slightly effective/suppression, not recommended for very susceptible varieties or at critical stages of infection. 2 = Moderately effective. 3 = Very effective. — = No information is available.

NC = Not classified by IRAC, or group not indicated on product label. UN = Mode of action has not been determined.
* (shaded area) = The pest is listed on the product label for control or suppression.
exp = Works only on exposed early instars, not on any growth stage under bark.

Insecticide activity adapted from NY and PA *Pest Management Guidelines for Grapes*, Michigan State University and BC Ministry of Agriculture recommendations and other sources.

Table 5–7. Activity of Insecticides on Grape Insect Pests (cont'd)

Group	Product name	Grape berry moth	Leafhoppers	Phylloxera	Japanese beetle	Erineum mite	MALB	Wasps	European red mite	Climbing cutworm	Flea beetle	Grape mealy bug	Scale
NC	Opal Insecticidal Soap	0	1	—	0	0	0	0	1 *	0	0	1 *exp	1 *exp
UN	Acramite 50 WS	0	0	0	0	—	0	0	2 *	0	0	0	0

0 = Ineffective. 1 = Slightly effective/suppression, not recommended for very susceptible varieties or at critical stages of infection. 2 = Moderately effective. 3 = Very effective. — = No information is available.

NC = Not classified by IRAC, or group not indicated on product label. UN = Mode of action has not been determined.
* (shaded area) = The pest is listed on the product label for control or suppression.
exp = Works only on exposed early instars, not on any growth stage under bark.

Insecticide activity adapted from NY and PA *Pest Management Guidelines for Grapes*, Michigan State University and BC Ministry of Agriculture recommendations and other sources.

GRAPE NOTES