

# Ohio Grape-Wine Electronic Newsletter

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## **Grape Flea Beetle Alert (Bud Swell)**

*By Roger Williams and Dan Fickle, Entomology-OARDC*

Above average temperatures have arrived with late April and its time once again to be on the lookout for the first pest of the season the grape flea beetle. This beetle is about a inch in length, metallic steel blue in color and can be easily spotted on grape

canes and buds on warm sunny days. If flea beetles are present in sufficient numbers when the vines are in the bud swell stage they can inflict severe damage to the newly forming blossoms within the swollen buds. Scouting of the vineyard for adult flea beetles should begin at bud swell and continue until bud development is past the critical stage, approximately inch growth. Scouting should be conducted along the vineyard perimeter and near the center of the vineyard. Areas adjacent to wood lots are of particular concern. At least 25 vines should be examined at each of the five locations. Buds should be closely examined for signs of flea beetle feeding. If bud damage (holes eaten in the buds) is 4% or greater an application of insecticide should be applied. Remember if emergence of this pest coincides with bud swell extensive damage to fruit development may result. Once the vines are past bud swell direct damage to the developing fruit is no longer of major concern however, adult beetles and developing larvae will feed on foliage causing holes and frayed areas in the young leaves. This damage is usually not of major concern but may lead to a build up in the flea beetle population from one year to the next and therefore treatment may help to prevent populations in subsequent years from reaching damaging numbers. This pest can be easily controlled with the insecticides Danitol or Sevin.



## **Update from the North**

*By Greg Johns, AARS Kingsville*

We have observed the first FLEA BEETLE insects at the Ashtabula Agricultural Research Station today, April 18, 2008.

Phenologically, we are currently in full bloom in Forsythia and first bloom Star Magnolia (although other star magnolias down the street are in full bloom).

Growing Degree Days = 85 (but other sites range from 50-85(modified sine))

Grape buds are still pretty tight today but they are more easily bruised than a week or two ago.

## A Description of Currently Available Fungicides for Grape Disease Control

*By Mike Ellis Department of Plant Pathology The Ohio State University,  
OARDC/OSUE*

**Note: This information is taken directly from “The Midwest Small Fruit Pest Management Handbook”. For additional information and the tables that accompany this text, obtain a copy of the handbook.**

Specific fungicide recommendations cannot be made in this publication because of constantly changing regulations and recommendations regarding their agricultural use. For specific fungicide recommendations, consult your local Extension service. Most Midwestern states have a small fruit and grape spray guide that is revised annually. General information about fungicides that were available at the time this bulletin was published is presented here.

### Fungicides for Controlling Black Rot

#### Protectants

**Mancozeb, Ferbam,** and **Ziram** are all highly effective against black rot. Because these fungicides are strictly protectants, they must be applied before the fungus infects or enters the plant. They protect fruit and foliage by preventing spore germination. They will not arrest lesion development after infection has occurred.

**Mancozeb** provides an excellent foundation for a protectant spray program for grapes in the Midwest. It is a good protectant fungicide that will provide good to excellent control of downy mildew and Phomopsis cane and leaf spot in addition to black rot. The major problem with Mancozeb is a 66-day preharvest interval (PHI) on grapes. It cannot be applied within 66 days of harvest. Mancozeb is available under many trade names and formulations. Some common trade names are Manzate 200, Manzate Prostick, Penncozeb, Dithane M45, Dithane F45, and Dithane Rainshield DF.

Some food processors may not accept Mancozeb-treated fruit or may have special restrictions on its use. This also applies to Captan. Growers need to know where they will sell their fruit and if the buyer has any restrictions on pesticide use prior to initiating a control program in the spring.

**Ziram** is similar in efficacy to Ferbam. It is highly effective against black rot and provides moderate control of downy mildew and Phomopsis cane and leaf spot.

Growers of processing grapes who cannot apply Mancozeb past the initiation of bloom could use Ziram during this period. Ziram can be applied up to 21 days before harvest.

**Ferbam** will provide excellent control of black rot but is not highly effective against the other

grape diseases. In addition, there are restrictions on the number of applications that can be used. Always read and understand the label before using or purchasing a pesticide.

**Captan** and **copper fungicides** (fixed copper or Bordeaux mixture) are only slightly to moderately effective against black rot and will probably not provide adequate control under heavy disease pressure.

### **Sterol Inhibiting (SI) Fungicides**

The locally systemic fungicides, Nova (Rally), Elite, and Procure, are also highly effective against black rot and will provide some post-infection (curative) activity of the disease if applied at the higher labeled rates within 72 to 96 hours after the initiation of an infection period. Post-infection or curative control must be achieved prior to symptom development on leaves or fruit. Once the symptoms are present, these fungicides will not eradicate or burn out the fungus. Nova (Rally), Elite, and Procure also appear to provide good protectant activity against black rot if applied at the lower labeled rates in a protectant program. These fungicides also have had excellent activity against powdery mildew as well.

**Rubigan** is another SI fungicide that is registered for use on grapes and will provide moderate control of black rot if applied in a protectant program. This fungicide is in the same general class of fungicides as Nova (Rally), Elite, and Procure; however, it does not provide adequate curative or post-infection control of black rot. Nova (Rally), Elite, or Procure are the preferred SI fungicides for black rot control.

### **Strobilurin Fungicides**

Abound, Sovran, Flint, and Pristine are locally systemic fungicides that are all highly effective for control of black rot. They do differ in their efficacy against some of the other important grape diseases.

**Note:** Flint or Pristine cannot be applied on Concord grapes or phytotoxicity (damage) could occur. Always read the fungicide label carefully.

## **Fungicides**

### **for Powdery Mildew**

#### **Protectants**

**Sulfur** is highly effective against powdery mildew if used in a protectant program with a minimum of seven to 14 days between applications.

There are many formulations of sulfur (wettable powders, dusts, dry flowables, and flowables). The flowable formulations appear to be most effective and result in much less applicator exposure when preparing sprays.

**Note:** On sulfur-tolerant cultivars that are susceptible to powdery mildew, sulfur will probably be a major component of the fungicide program. On highly susceptible cultivars, spray intervals shorter than 14 days (7 to 10 days) will probably be required with sulfur. Although sulfur is highly effective for powdery mildew control, it has little or no effect on the other grape diseases. It is important to remember that sulfur will cause severe injury on some grape cultivars. Sulfur should only be used on cultivars known to be sulfur tolerant .

**Note:** Chancellor, Concord, DeChaunac, Foch, and Rougeon grapes are highly sensitive to sulfur. Sulfur injury may occur even on sulfur-tolerant cultivars when temperatures of 80 to 85°F or higher are experienced during or immediately after application.

**Copper fungicides** (fixed coppers or Bordeaux mixture) have been rated moderately effective against powdery mildew; however, care must be taken when using copper due to the danger of foliage injury (phytotoxicity). Grape cultivars differ in their sensitivity to copper fungicides. Under heavy disease pressure, copper fungicides may not provide adequate control. Copper is not the preferred fungicide for powdery mildew control. However, if copper is applied for downy mildew control, it will provide some protection against powdery mildew. On less susceptible cultivars, such as Concord, copper fungicides may provide satisfactory control.

### **Sterol Inhibiting (SI) Fungicides**

**Nova (Rally), Elite, Procure, and Rubigan** are locally systemic and highly effective for control of powdery mildew. They will also provide good to excellent control of black rot, but they will not control downy mildew. All of these fungicides were highly effective against powdery mildew when they were first introduced; however, due to development of fungicide-resistant strains of the powdery mildew fungus, they are no longer recommended for powdery mildew control in vineyards where resistant strains of the powdery mildew fungus are present (see note on fungicide resistance development on page 6).

### **Strobilurin Fungicides**

**Abound, Sovran, Flint, and Pristine** are locally systemic and all were good to excellent for control of powdery mildew when they were first introduced. Fungicide resistance development in powdery mildew has been observed in the strobilurin fungicides (see note on fungicide resistance development on page 6).

*Note:* Flint or Pristine cannot be applied on Concord grapes or phytotoxicity (damage) can occur. Always read the fungicide label carefully.

**Endura 70WG Fungicide** is new fungicide chemistry and is highly effective for control of powdery mildew and provides good control of Botrytis bunch rot. It is different chemistry from the sterol-inhibiting and strobilurin fungicides; therefore, it is an excellent material to use in rotation with these materials in a fungicide resistance management program.

**JMS Stylet-Oil** is a highly refined petroleum distillate that is registered for use on grapes in the United States. It has provided excellent powdery mildew control in fungicide tests in Ohio and New York and is currently being used rather extensively by California grape growers for powdery mildew control. It is registered for use at the rate of 1 to 2 gallons oil per 100 gallons water (1% to 2% concentration). The label states on grapes: “Make first application pre-bloom and continue sprays every two to three weeks depending on level of disease pressure. Use higher rates and shorter spray interval when disease conditions are severe.”

Although this fungicide has not been used on grapes extensively in the Midwest or northeastern United States, it appears to have good potential as an alternative fungicide for powdery mildew control on grape.

*Note:* One potential problem with stylet oil is that it removes the “bloom” or waxy coating from the grape berry. This apparently has no effect on quality of wine or juice grapes, but it does affect the appearance of the berry and probably should not be used for fresh-market table grapes.

*Note:* DO NOT use CAPTAN or SULFUR within two weeks after applying JMS STYLET- OIL. Mixing Captan or Sulfur with oil could result in severe damage to the vine. In addition, repeated use of oil during the growing season has been shown to be phytotoxic to vines.

### **Potassium Salts**

Armicard 100 (potassium bicarbonate) and Nutrol (manopotassium phosphate) have been

reported to provide fair control of powdery mildew on grape but provide no control of the other grape diseases. It is assumed that they provide control through limited eradication and antispore activity. They do not provide protectant activity.

### **Quintec**

Quintec 2.08SC is new fungicide chemistry that is very effective for control of powdery mildew but has no activity against the other grape diseases. It is a protectant fungicide so it must be applied before infection occurs. It does not have curative activity. It is registered for use at the rate of 3 to 4 fluid ounces per acre on a seven- to 14-day schedule. Because it is new chemistry (not related to other fungicides), it will control strains of the powdery mildew fungus that are resistant to the strobilurin fungicides (Abound, Sovran, Flint, and Cabrio) and the sterol-inhibiting fungicides (Nova, Elite, Procure, and Rubigan). Quintec has a 12-hour re-entry interval and a 14-day preharvest interval.

## **Fungicides for Phomopsis**

### **Cane and Leaf Spot**

At present, **Mancozeb**, **Captan**, or **Ziram** are the fungicides recommended for control of this disease. They are ranked as moderately to highly effective.

Fungicide test results indicate that the sterol inhibitors are not effective and the strobilurins only provide moderate control. Copper and sulfur fungicides appear to be ineffective.

*Note:* Especially where Phomopsis is a problem or a concern, Mancozeb, Captan, or Ziram should be included in the early-season fungicide program.

## **Fungicides**

### **for Downy Mildew**

#### **Protectant Fungicides**

**Mancozeb**, **Captan**, and **Copper fungicides** (fixed coppers and Bordeaux mixture) are highly effective for control of downy mildew. Ziram is moderately effective. All of these fungicides are effective only when used in a protectant spray program. They will not provide post-infection or curative activity and will not eradicate or burn out the fungus after symptoms appear.

Of the protectant fungicides currently available, **Mancozeb** is an excellent choice. Mancozeb is highly effective against downy mildew, black rot, and Phomopsis cane and leaf spot. One problem with Mancozeb is that it cannot be applied within 66 days of harvest. Even with this restriction, Mancozeb is an excellent protectant fungicide for early-season disease control and can also be used on later-maturing cultivars for post-bloom disease control (prior to 66 days of harvest).

**Captan** is also excellent for downy mildew and Phomopsis cane and leaf spot but is weak for controlling black rot. A good approach to using Mancozeb and Captan for downy mildew control is to use Mancozeb early in the season then switch to Captan within the 66-day preharvest interval for Mancozeb. Currently Captan does not have a preharvest interval for grapes.

**Note:** Although Captan has no preharvest interval on grapes, it does have a four-day reentry restriction. The following information is taken from the Captan label: “Do not allow persons to enter treated areas within four days following application unless a long-sleeved shirt and long pants or a coverall that covers all parts of the body except the head, hands, and feet, and chemically resistant gloves are worn. Conspicuously post reentry information at site of application.” Remember, always read the label.

**Ziram** is similar in efficacy to Ferbam. It provides only moderate control of downy mildew, and excellent control of black rot and Phomopsis cane and leaf spot. Under heavy disease pressure, Ziram may not provide adequate control of downy mildew.

### **Locally Systemic Fungicides with Curative Properties**

**Ridomil Gold MZ and Ridomil Gold/Copper** are by far the most efficacious fungicides available for control of downy mildew. Ridomil is locally systemic and has good post-infection or curative activity. If used in post-infection control programs, it should be applied as soon as possible, *but within* two to three days after the initiation of an infection period. Ridomil **should not be** applied after symptom development (sporulating lesions). Use of Ridomil in this manner (as an eradicant) will probably lead to a rapid buildup of Ridomil-resistant strains of the downy mildew fungus in your vineyard. If resistance develops in the vineyard, the use of Ridomil as a tool for downy mildew control is lost.

Ridomil also has excellent protectant activity against downy mildew. It should provide at least two weeks of protection, and in some tests in Ohio, it has provided up to three weeks of protection.

As mentioned previously, Ridomil Gold has a strong potential for fungicide resistance development by the downy mildew fungus. For this reason, the manufacturer (Syngenta) has registered its use only as a **Package Mix** with a protectant fungicide. The two formulations available for use on grapes are Ridomil Gold MZ (4% Ridomil and 64% Mancozeb) and Ridomil Gold/Copper (5% Ridomil and 60% Copper hydroxide). The purpose of the package mix (at least in theory) is to delay the development of strains of the downy mildew fungus with resistance to Ridomil. Both formulations are equally effective for controlling downy mildew. The Ridomil Gold MZ formulation should be used on copper sensitive cultivars.

Although Ridomil is very effective, the current label use recommendations restrict the timing of its use on grapes. Ridomil Gold MZ cannot be applied within 66 days of harvest. Ridomil Gold Copper has a 42-day PHI (can be applied up to 42 days of harvest). Based on the 42 and 66-day preharvest interval, Ridomil will be of limited use for late season downy mildew control in the Midwest. In seasons when downy mildew is a problem and on highly susceptible cultivars, pre-bloom and post-bloom applications of Ridomil will aid greatly in disease control. However, additional fungicide protection may be required within the 42 and 66-day preharvest interval on late-harvested, highly susceptible cultivars. The alternative fungicides for use during this period are Captan, copper fungicides, phosphorus acid fungicides, or the strobilurin fungicides Abound or Pristine.

**Strobilurin fungicides** are also locally systemic, and some have had good to excellent activity against downy mildew (see note on fungicide resistance development on page 6). Whereas the strobilurins (Abound, Pristine, Sovran, and Flint) all have good to excellent activity against black rot and powdery mildew, they vary greatly in their efficacy against downy mildew. Abound and Pristine have excellent activity and are the most effective for downy mildew control. Sovran is

moderately effective if used at the highest labeled rate, and Flint is registered for “suppression” of downy mildew, not control.

### **Phosphorous Acid (Agri-Fos, ProPhyt, Phostrol)**

Several products containing phosphorous acid (PA, also called phosphite or phosphonate) are sold as nutritional supplements and plant conditioners. Recently several of these materials have been registered in the United States as fungicides for control of downy mildew on grape. In multiple New York trials, PA has provided excellent control of downy mildew but has not controlled any other grape disease. Australian experience suggests that PA provides most control on *foliage* when it is applied within a few days after the start of an infection period, providing only a few days of additional residual (protective) activity. Experience in New York suggests that spray timing is less critical for control of downy mildew on *fruit*, perhaps because this highly mobile chemical (which is exempt from residue tolerances) accumulates in these organs. When applied on a seven to 10-day protectant program, they appear to provide good to excellent control of downy mildew.

**Copper fungicides** are highly effective against downy mildew and are moderately effective against powdery mildew. Copper fungicides are weak for controlling black rot. A major concern with the use of copper fungicides is the potential they have for phytotoxicity or vine damage. Grape cultivars differ in their sensitivity to copper fungicides.

**Note:** Certain food processors, such as the National Grape Cooperative, will not accept grapes treated with Mancozeb past the initiation of bloom, and the use of Captan is not permitted at any time. If growers cannot use Mancozeb or Captan, Ridomil Gold/Copper, copper fungicides, a phosphorus acid fungicide, or a strobilurin fungicide are the other alternatives for downy mildew control. Thus, copper may be an important fungicide for producers of processing grapes that have these fungicide use restrictions.

### **Botrytis Bunch Rot**

Vanguard, Elevate, Endura, Scala and Rovral all have excellent activity against Botrytis bunch rot on grapes and are the fungicides of choice for control of Botrytis bunch rot. The strobilurins are moderately effective against Botrytis. Botrytis bunch rot is most commonly a problem on tight-clustered French hybrids and *Vitis vinifera* cultivars.

Proper timing and thorough spray coverage are essential for good control. Make at least two applications:

- When the disease is first observed or when the first berries reach 5°Brix (5% soluble solids/sugars), whichever comes first.
- Fourteen days after the first application. A third spray may be necessary on late cultivars, *e.g.*, White Riesling, if the interval between the second spray and harvest is greater than four weeks.

Field experience suggests that effectiveness of the fungicide is reduced following a heavy prolonged rainfall. If such conditions occur after the last intended spray has been made, an additional application may be necessary. If only one application can be made, wait until the crop average is 5°Brix. Direct the spray toward the fruit; use a minimum of 100 gallons of water/acre.

The importance of bloom sprays for control of Botrytis bunch rot is not clear; however, during seasons with wet conditions during bloom, fungicide application during bloom is probably

beneficial. Research in New York has shown that the strobilurin fungicides have moderate to good efficacy for Botrytis control. The use of a strobilurin fungicide during the bloom period may be beneficial for Botrytis control, especially on highly susceptible cultivars. In addition, a strobilurin fungicide such as Abound or Pristine during bloom will provide excellent control of black rot, powdery mildew, and downy mildew as well.

**Note:** Growers in Europe and Canada have experienced loss of disease control due to the development of fungicide resistance when more than three sprays per year of Rovral were applied over a period of three to five years. It is, therefore, strongly recommended that the use of Rovral, Endura, Vangard, or Elevate be limited to a maximum of two to three applications per year to reduce the probability of developing strains of *Botrytis* that are resistant to this material. In addition, alternating these fungicides during the growing season or from season to season should be helpful in fungicide-resistance management.

**Note:** Removal of leaves around clusters on mid- or low-wire cordon-trained vines before bunch closing has been shown to reduce losses caused by Botrytis due to improved air circulation and improved spray penetration and coverage.

## **IMPORTANT NOTE on POWDERY and DOWNY MILDEW FUNGICIDE RESISTANCE**

### **Powdery Mildew**

In some locations the powdery mildew fungus has developed resistance to the sterol-inhibiting fungicides (Nova (Rally), Rubigan, and Elite ) and the strobilurin fungicides ( Abound, Sovran and Flint). All of these materials were highly effective for control of powdery mildew when they were first introduced. In vineyards where these materials have been used for several years, reduced sensitivity or resistance may be present. In some vineyards, all of these materials may still be effective; however, at present there is no way to know the level of resistance that is in your vineyard. Having a control failure and crop loss due to fungicide resistance is a hard way to discover you have resistance. Reports from Virginia suggest that resistance may develop after as few as 10 applications of the material over the life of the vineyard. If these materials have been used in a vineyard on a regular basis for several years, growers should consider not using these materials alone for powdery mildew control. If resistance is a concern, they should be replaced or mixed with a sulfur fungicide, JMS Stylet Oil, Quintec, Endura, or potassium salts (table 1). Pristine is a combination of a strobilurin fungicide plus Endura; therefore, it should be safe to use alone for powdery mildew control. Sulfur fungicides are very effective for control of powdery mildew, relatively inexpensive, and are not at risk for resistance development. On sulfur tolerant varieties, the use of sulfur should be considered.

### **Downy Mildew**

The strobilurin fungicides (Abound, Sovran and Pristine) provided good to excellent control of downy mildew when they were first introduced. Several reports from various areas in Europe and, most recently from Virginia indicate that the downy mildew pathogen has developed resistance, or is at least less sensitive, to the strobilurin fungicides. Growers should consider not using strobilurin fungicides for downy mildew control. If these products are used to control other diseases and downy mildew control is required, they should be tank mixed with another fungicide with activity against downy mildew. Alternative downy mildew fungicides include: Mancozeb, Captan, Ridomil Gold MZ, Ridomil Gold Copper, a copper fungicide or a phosphorous acid (phosphite) fungicide. Pristine still provides good control of powdery mildew when used alone and was the only material that would control almost all of our major disease when used alone. Unfortunately, it should now be combined with a downy mildew fungicide when downy mildew control is required.

### **To Aid in Resistance Management**

Do not apply more than two sequential sprays of any material that is at risk for resistance development, before alternating to a fungicide with a different mode of action. In addition, the less a specific fungicide or class of fungicide is used in a vineyard, the less likely for resistance to develop to it. Most of the fungicides that are at risk for resistance development have a limited number of applications that can be made per season. **Always read the label.**

Other grape diseases (fungi) and fungicides that are at high risk for fungicide resistance development include Botrytis bunch rot (Vangard, Endura, Elevate, Rovral, and Topsin) and downy mildew (Ridomil Gold, Abound, Sovran, and Pristine). In order to prevent or delay the development of fungicide resistance, these fungicides should not be used alone for season-long control and should be used as little as possible. This means another fungicide with good activity against the disease should be incorporated into the spray program at some point during the growing season.

## **Developing an Effective Fungicide Spray Program for Wine Grapes In Ohio 2008**

*By Mike Ellis Department of Plant Pathology The Ohio State University,  
OARDC/OSUE*

The following information is intended to be “food for thought” in relation to developing a fungicide spray program for wine grapes in Ohio. This spray schedule presents various fungicide options that can be considered by growers. It is important to note that the schedule is intended to provide simultaneous control of black rot, powdery mildew, downy mildew and Phomopsis cane on leaf spot. The schedule is also intended to provide some level fungicide resistance management, primarily against the powdery mildew and downy mildew pathogens

## **IMPORTANT NOTE on POWDERY and DOWNY MILDEW FUNGICIDE RESISTANCE**

### **Powdery Mildew**

In some locations the powdery mildew fungus has developed resistance to the sterol-inhibiting fungicides (Rally, Rubigan, and Elite ) and the strobilurin fungicides ( Abound, Sovran and Flint). All of these materials were highly effective for control of powdery mildew when they were first introduced. In vineyards where these materials have been used for several years, reduced sensitivity or resistance may be present. In some vineyards, all of these materials may still be effective; however, at present there is no way to know the level of resistance that is in your vineyard. Having a control failure and crop loss due to fungicide resistance is a hard way to discover you have resistance. Reports from Virginia suggest that resistance may develop after as few as 10 applications of the material over the life of the vineyard. If these materials have been used in a vineyard on a regular basis for several years, growers should consider not using these materials alone for powdery mildew control. If resistance is a concern, they should be replaced or mixed with a sulfur fungicide, JMS Stylet Oil, Quintec, Endura, or potassium salts (table 1). Pristine is a combination of a strobilurin fungicide plus Endura; therefore, it should be safe to use alone for powdery mildew control. Sulfur fungicides are very effective for control of powdery mildew, relatively inexpensive, and are not at risk for resistance development. On sulfur tolerant varieties, the use of sulfur should be considered.

### **Downy Mildew**

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and, most recently from Virginia indicate that the downy mildew pathogen has developed resistance , or is at least less sensitive, to the strobilurin fungicides. Growers should consider not using strobilurin fungicides for downy mildew control. If these products are used to control other diseases and downy mildew control is required, they should be tank mixed with another fungicide with activity against downy mildew. Alternative downy mildew fungicides include: Mancozeb, Captan, Ridomil Gold MZ, Ridomil Gold Copper, a copper fungicide or a phosphorous acid (phosphite) fungicide. Pristine still provides good control of powdery mildew when used alone and was the only material that would control almost all of our major disease when used alone. Unfortunately, it should now be combined with a downy mildew fungicide when downy mildew control is required.

### **To Aid in Resistance Management**

Do not apply more than two sequential sprays of any material that is at risk for resistance development, before alternating to a fungicide with a different mode of action (see table 2). In addition, the less a specific fungicide or class of fungicide is used in a vineyard, the less likely for resistance to develop to it. Most of the fungicides that are at risk for resistance development have a limited number of applications that can be made per season (table 2). **Always read the label.**

Note that at any specific application timing, there are usually several fungicide options that can be selected. This schedule does not contain all of the fungicides currently registered for use on grapes. Remember, these are only **“Suggested Guidelines”** for use in developing a fungicide program. The final program that you develop will depend upon the diseases present in your vineyard as well as economic considerations.

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## **SUGGESTED GUIDELINES FOR DEVELOPING A FUNGICIDE SPRAY PROGRAM**

## FOR WINE GRAPES IN OHIO

**This program is intended to provide simultaneous control of Black Rot, Powdery Mildew, Downy Mildew and Phomopsis Cane and Leaf Spot, as well as Fungicide Resistance Management**

<b>Application Timing</b>	<b>Material (and rate/A)</b>
1 inch shoot	Mancozeb (3 lb/A)

**NOTE:** Mancozeb alone for Phomopsis only. If Powdery Mildew is a concern this early in the growing season, use:

Mancozeb (3 lb/A)

**PLUS**

A sterol-inhibiting fungicide

[Elite (4 oz/A) or Rubigan (3 fl. oz/A) or Rally (4 oz/A)]

or

Endura 70WG (4.5 oz)

or

Quintec 2.08F 4 fl oz

or

Flowable Sulfur 6F (3-4 qt/A)

or

Wettable Sulfur (6-10 lb/A)

or

JMS Stylet Oil (1% concentration)

or

Potassium salts (see comments below)

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**NOTE ON POTASSIUM SALTS:** Several potassium salt materials are currently registered as fungicides for control of powdery mildew on grape. These include Nutrol (monopotassium phosphate), Kaligreen and Amicarb 100 (potassium bicarbonate). They provide moderate to good control of powdery mildew when applied to developing powdery mildew colonies. They do not provide protectant activity, and they are not effective against the other grape diseases caused by fungi. See label of each material for usage rates and other recommendations.

**NOTE:** Do not combine JMS Stylet Oil with sulfur fungicides or Captan or serious vine injury can occur. The products should not be sprayed on vines within 14 days of each other.

**NOTE:** Do not apply sulfur to sulfur sensitive varieties.

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3-5 inch shoot

Mancozeb (3 lb/A)

or 7- 10 days after

**PLUS**

last spray

A sterol-inhibiting fungicide

[Elite (4 oz/A) or Rubigan (3 fl. oz/A) or Rally (4 oz/A)]

or

Endura 70WG (4.5 oz)

or

Quintec 2.08F 4 fl oz

or

Flowable Sulfur 6F (3-4 qt/A)

or

Wettable Sulfur (6-10 lbs/A)

or

Potassium salts

or

JMS Stylet Oil (1% concentration)

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**NOTE:** If Powdery Mildew is a concern, an effective fungicide for powdery mildew control should be used at this time. If fungicide resistance is not a problem, the sterol-inhibiting fungicides (Rally ,Rubigan and Elite) are excellent for powdery mildew control. In some vineyards, reduced sensitivity or resistance to the sterol-inhibiting fungicides has been reported in the powdery mildew fungus. If resistance to these materials is present in your vineyard, alternative materials must be used. Alternatives for powdery mildew control include sulfur fungicides, Endura, Quintec, Potassium salts and JMS Stylet Oil. Sulfur fungicides are very effective for powdery mildew control, relatively inexpensive and are not at risk for resistance development. The use of sulfur for powdery mildew control should be considered on sulfur tolerant varieties.

**Note:** If Powdery Mildew is not a problem, Mancozeb alone can be used. It is important to use mancozeb in all sprays where it is recommended. Mancozeb will provide excellent control of Phomopsis cane and leaf spot, black rot, and downy mildew. It will not control powdery mildew. For this reason it is recommended for use in a tank mix with a powdery mildew fungicide.

**I consider Mancozeb to be the backbone of the fungicide program for wine grapes in Ohio.**

**NOTE:** Do not combine JMS Stylet Oil with sulfur fungicides or Captan or serious vine injury can occur. The products should not be sprayed on vines within 14 days of each other.

**NOTE:** Do not apply sulfur to sulfur sensitive varieties

**NOTE:** Always check the price (cost per acre per application) of each fungicide. At the rates recommended, fungicides vary considerably in cost.

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10-12 inch shoot  
or 7- 10 days after  
last spray

Same fungicides  
as 3-5 inch shoot

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Immediate prebloom to early bloom  
or 7- 10 days after  
last spray

Mancozeb (3-4 lb/A)

**PLUS**

A sterol-inhibiting fungicide

[Elite (4 oz/A) or Rubigan (3 fl. oz/A) or Rally (4 oz/A)]

or

Endura 70WG (4.5 oz)

or

Quintec 2.08F 3-4 fl oz

or

Flowable Sulfur 6F (3 qt/A)

or

Wettable Sulfur (8-10 lb/A)

or

JMS Stylet Oil (1% concentration)

or

Potassium salts

**OR**

\*Pristine 38WG (6-10.5 oz/A)

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**NOTE:** Due to possible resistance to powdery and downy mildew, the strobilurin fungicides are no longer recommended. They will still provide excellent control of Black rot; however, during this period, all of the major diseases need to be controlled.

\*Pristine is a package mix combination of a strobilurin fungicide (pyraclostrobin) and the fungicide, Endura (boscalid). Therefore it should be effective for controlling all of the major grape diseases except downy mildew. If downy mildew is a concern, pristine should probably not be used alone. Do not make more than 2 sequential applications of Pristine without switching to another fungicide in a different class of chemistry, and do not make more than 6 applications per season.

**Note:** Rally and elite provide excellent control of black rot and have excellent curative activity ( 3 to 4 days ) against black rot. If powdery mildew is resistant to the sterol-inhibiting fungicides in your vineyard, an alternative material for powdery mildew control should be used. Also, if two

sequential sprays of a sterol -inhibitor have been made, switch to a powdery mildew fungicide with a different mode of action.

**NOTE:** Do not combine JMS Stylet Oil with sulfur fungicides or Captan or serious vine injury can occur. The products should not be sprayed on vines within 14 days of each other.

**VERY IMPORTANT NOTE:** The period from immediate prebloom through 3 to 4 weeks after bloom is

the **MOST CRITICAL PERIOD** for controlling fruit infection by Phomopsis, black rot, powdery

mildew and downy mildew. During this period the fruit are highly susceptible to infection by all of these diseases. Around 4 weeks after bloom, the fruit become resistant to infection.

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First postbloom spray

Same fungicides as

no longer than 10-14 days after

Immediate prebloom or early bloom

last spray

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Second postbloom spray

no later than 10-14 days after

last spray

Mancozeb (4 lb/A) or Captan 50W (3-4 lb/A) or Phosphorous Acid

**PLUS**

A sterol-inhibiting fungicide

Elite (4 oz/A) or Rubigan (6oz/A) or Nova (4 oz/A)]

or

Endura 70WG (4.5 oz)

or

Quintec 2.08F (3-4 fl oz)

or

Flowable Sulfur 6F (3 qt/A)

or

Wettable Sulfur (8-10 lb/A)

or

Potassium salts

**OR**

Pristine 38WG (6-10.5oz) used alone

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**\*\* NOTE on Phosphorous Acid:**

Several products containing phosphorous acid (phosphonates, phosphites) are sold as nutritional supplements and “plant conditioners”, but a few products (ProPhyt, Phostrol, Agri-Fos) are registered for use as fungicides for downy mildew control on grape. Phosphorous acid has been used successfully for many years in Australia for downy mildew control on grape. Australian experience suggests that these products provide most control on foliage when applied within a few days after the start of an infection period, providing only a few days of additional residual (protective) activity. Experience in New York suggests that spray timing is less critical for control of downy mildew on fruit, perhaps because this highly mobile chemical (which is exempt from residue tolerances) accumulates in these organs. Phosphorous acid is a good fungicide for control of downy mildew. Usage rate recommendations vary among different products. Some recommend a specific number of pints per 100 gallons of water and some recommend a percent solution such as 0.3%. The products mentioned here have a 4-hour re-entry interval and a 0 day preharvest interval. Obtain and read the label of each product prior to use.

**NOTE:** The second postbloom spray should be near the end of the **CRITICAL PERIOD** for controlling fruit infection by black rot, powdery and downy mildew (immediate prebloom through 3 to 4 weeks after bloom). By this time, the fruit of most varieties should be resistant to infection.

It is very important to maintain excellent fungicide coverage (protection) during this period until the fruit become resistant. Failure to provide adequate fungicide protection can result in the development of “**diffuse infections**” of powdery mildew on fruit. It is difficult to see these infections with the naked eye and they can result in increased problems with various fruit rots later

in the season.. The importance of protecting the fruit during this critical period cannot be overemphasized.

Remember that cluster stems (rachis) and leaves will remain susceptible to powdery and downy mildew throughout the growing season; therefore, a good fungicide program needs to be maintained throughout the season.

**NOTE:** Watch the 66 days PHI on Mancozeb. On late maturing varieties, mancozeb can be used later in the season as long as it is not applied within 66 days of harvest. I recommend keeping it in the spray program as long as it is legal to use.

If you get within 66 days of Harvest, Captan or ProPhyt can be used in place of Mancozeb for downy mildew control. If you have more than 66 days to harvest, Mancozeb would be the fungicide of choice. The danger of black rot infection should be over by this time. Berries should be resistant to black rot. Mancozeb, Captan, or ProPhyt is included for downy mildew control only. If weather is dry and downy mildew is not a problem, these fungicides are not required.

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### **Late Season Summer Sprays Should Not Exceed a 14-Day Interval**

Third post bloom spray

10-14 days after

last spray

Mancozeb (3-4 lb/A) or Captan 50W (3-4 lb/A) or Phosphorous Acid

**PLUS**

Endura 70WG (4.5 oz)

or

Quintec 2.08F (3-4 fl oz)

or

Flowable Sulfur 6F (3 qt/A)

or

Wettable Sulfur (8-10 lb/A)

or

Potassium salts

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Fourth post bloom spray

Captan 50W (3-4 lb/A) or Phosphorous Acid

10-14 days after

**PLUS**

last spray

Endura 70WG (4.5 oz)

or

Maintain a 10-14 day

Quintec 2.08F (4 fl oz)

spray schedule

through harvest

or

**These fungicides**

Wettable Sulfur (8-10 lb/A)

**will be used through**

or

**harvest**

Flowable Sulfur 6F (3 qt)

or

Potassium salts

**OR**

Fixed Copper Fungicide used alone

**OR**

Pristine 38WG (6-10.5 oz) used alone

**NOTE:** If dry weather persists and the risk of Downy Mildew is low, Captan or ProPhyt should not be required and Sulfur can be used alone for powdery mildew control. If weather is wet and Downy is a problem, a Downy Mildew material should be included. A Fixed Copper Fungicide will give good control of both Downy and Powdery Mildew. Especially on susceptible varieties, powdery mildew will need to be controlled throughout the growing season.

**NOTE:** Do not apply Captan, sulfur or copper fungicides within 30 days of harvest or fermentation may be affected and **DO NOT** combine Captan or Sulfur with any form of oil.

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**For Botrytis bunch rot control, the following fungicides are available:**

Rovral (1.5 lb/A)

**PLUS**

Latron B1956(6 fl oz/100 gal)

**OR**

Vangard (10 oz/A) used alone

**OR**

Elevate (1 lb/A) used alone

**OR**

Scala 18 fl oz/A used alone

**OR**

Endura (8 oz/A) used alone

**OR**

Pristine (18.5 to 23 oz/A) used alone.

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These fungicides should be used in special (additional) sprays for control of Botrytis bunch rot only on tight-clustered, bunch rot susceptible cultivars. The first spray should be made when disease is first observed or at veraison (or shortly thereafter). Then wait until a combination of threatening weather (wet conditions) and/or disease develops and make a second spray (at least 2 weeks after the first spray). On late maturing varieties a third spray may be required.

**Importance of Bloom sprays for Botrytis bunch rot control.**

Botrytis can enter fruit on dead flower parts or other plant debris in the cluster during bloom. Therefore, bloom applications of fungicide may be beneficial in control. In some years, bloom sprays seem to be very effective and in others, they appear to have no or little effect. Some growers make a Botrytis spray during bloom every year and many do not. On Bunch rot-susceptible and high value wine grapes, a bloom application may be a good form of insurance against botrytis bunch rot. One practical approach to providing protection against bunch rot infections during bloom is to use a fungicide such as Pristine during bloom which would be a standard application within the critical period for fruit infection by black rot, powdery mildew and downy mildew. Pristine at the higher rate listed above should provide excellent control of Botrytis in addition to the other diseases that need to be controlled at this time.

**NOTE:** Some tests in New York have indicated that Rovral at 1 lb/A plus Vanguard at 5 oz/A may have an additive effect and provides good bunch rot control.

**Pristine applied at Normal Harvest for Ice wine:** Grapes for Ice wine production must hang for long periods past normal harvest prior to picking. An application of Pristine at normal harvest time may aid in controlling some fruit rots of ripe grapes, especially during falls and early winters when temperatures remain high.

**Table 1. Effectiveness of Fungicides for the Control of Grape Diseases**

<b>Fungicide</b>	<b>Phomopsis cane and leaf spot</b>	<b>Black rot</b>	<b>Downy mildew</b>	<b>Powdery mildew</b>	<b>Botrytis rot</b>	<b>Bitter rot</b>
Abound	+	+++	+++ (FRP)	+++ (FRP)	++	?
Bayleton	0	+++	0	+++ (FRP)	0	0
Captan	+++	+	+++	0	+	++
Elevate	0	0	0	0	+++	0
Elite	0	+++	0	+++ (FRP)	0	0
Endura	0	0	0	+++	++	0
Ferbam	+	+++	+	0	0	++
Fixed copper and Lime	+	+	+++	++	+	+
Flint	+	+++	+ (FRP)	+++ (FRP)	++	0
JMS Stylet Oil	0	0	0	+++	0	0
Mancozeb	+++	+++	+++	0	0	++
Nova	0	+++	0	+++ (FRP)	0	0
Potassium salts	0	0	0	++	0	0
Phosphorous acid	0	0	+++	0	0	0
Pristine	++	+++	+++ (FRP)	+++	++	?
Procure	0	++	0	+++	0	0

				(FRP)		
Quintec	0	0	0	+++	0	0
Ridomil Gold MZ	+	++	+++	0	0	++
Ridomil Gold Copper	+	+	+++	++	+	+
Rovral	0	0	0	0	+++	0
Rubigan	0	++	0	+++ (FRP)	0	0
Scala	0	0	0	0	+++	0
Sovran	+	+++	++ (FRP)	+++ (FRP)	++	0
Sulfur	+	0	0	+++	0	0
Topsin M <sup>1</sup>	++	+	0	+++	++	++
Vangard	0	0	0	0	+++	0
Ziram	++	+++	++	0	0	0

Key to ratings: +++=highly effective; ++=moderately effective; +=slightly effective; 0=not effective; ?=effectiveness unknown or not established;

FRP=Fungicide Resistance Possible.

<sup>1</sup> Where Topsin M-resistant strains of the powdery mildew and Botrytis fungi have been detected, Topsin M will be ineffective and should not be used.

**Table 2. Resistance-prone Fungicides and Risk of Resistance by Chemical Class**

Fungicide class		Common (chemical) name(s)	Trade name(s)
Benzimidazole (Group 1)	High	Thiophanate-methyl	Topsin-M
Phenylamide (Group 4)	High	Mefenoxam Mefenoxam (+ copper) Mefenoxam (+ mancozeb)	Ridomil Gold Ridomil Gold/Copper Ridomil Gold MZ
Strobilurin (Qol) (Group 11)	High	Azoxystrobin Kresoxim-methyl Pyraclostrobin (+ boscalid) Trifloxystrobin	Abound Sovran Pristine Flint
Dicarboximide (Group 2)	Medium to High	Iprodione	Rovral
Sterol Inhibitors (Group 3)	Medium	Fenarimol Myclobutanil Tebuconazole Triflumizole	Rubigan Nova Elite Procure
Carboximide (anilide) (Group 7)	Medium	Boscalid Boscalid (+ pyraclostrobin)	Endura Pristine
Anilinopyrimidine (Group 9)	Medium	Cyprodinil Pyrimethanil	Vanguard Scala
Quinolines (Group 13)	Medium	Quinoxifen	Quintec
Hydroxyanilid (Group 17)	Medium	Fenhexamid Fenhexamid + captan	Elevate CaptEvote

Resistance ratings to all members of a class of fungicides. All fungicide classes with a medium or high risk of resistance development must be used in accordance with resistance management guidelines listed on the label. Tactics for avoiding or slowing resistance development include:

1.) Rotating among fungicides from different classes. Make no more than 2 consecutive applications of a resistance-prone fungicide (or fungicides from the same class) before switching to a fungicide from a different class (has a different mode of action).

2.) Use high risk fungicides as little as possible. The fewer time a fungicide is applied in a vineyard, the less likely that resistance will develop. Always use fungicides only when needed and at the proper time to obtain the disease control that is required. Always use fungicides as one integral part of an integrated disease management program.

I would like to thank Dr. Anne DeMarsay, university of Maryland for the use of this table.

## **Grape Phenology for the Wooster Research Vineyards**

*By David Scurlock HCS-OARDC*

This week in Wooster is the first data taken for some of the varieties that we have growing in our vineyards. Bud development will vary drastically across the State of Ohio. The vineyards in the southwestern part of the state can be 3 to 4 weeks advanced in development in relation to Wooster. The vineyards north and west of Cleveland are very similar in bud development to Wooster. The vineyards east of Cleveland can be 10 days to 2 weeks behind Wooster due to the effects of Lake Erie. The last 2 weeks with Temperatures in the upper 70's to low 80's Fahrenheit has pushed some varieties. Please see table below.

**Grape Phenology for Wooster, Ohio. Rating date 4/24.08. GDD=193**

Variety	Stage of Development*	% of Buds at Stage #
Concord	5	50
Seyval	2	90
Chambourcin	2	95
Vidal	2	100
Traminette	2	90
Chardonnel	2	90
Pinot gris	2	95
Cabernet franc	5	100
Chardonnay	5	80
* 2: bud swell, 5:bud burst - green shoot first clearly visible		

**New Research Assistant Hired in the Enology Program at OSU/OARDC**

*By Todd Steiner, Enology Program Manager and Outreach Specialist*

I am pleased to formally announce the addition of Patrick Pierquet in the Enology Program at the Department of Horticulture and Crop Science-OARDC. Patrick officially started on March 31, 2008. He is hired as a Research Assistant, filling the role of laboratory and cellar manager that has been vacant for an extended period of time. Patrick will have many responsibilities involved with both research and extension activities at OSU/OARDC.

Therefore, it is with great anticipation that we are able to get Patrick on board at OARDC in continuing and further enhance an excellent research and extension program in enology for the Ohio commercial wine industry.

In addition, Patrick has provided a biography to gain further insight and information on his background in looking forward to meeting everyone involved in the Ohio grape and wine industry.

Welcome Patrick!

## Comments from Patrick Pierquet

Hello! My name is Patrick Pierquet, and I am the newest member of the OARDC grape & wine research group. I will be working as Research Assistant for Todd Steiner, and I thought I'd tell you a bit about my background and experience.

I have training and experience in both viticulture and winemaking. Prior to moving to Minnesota, I was a partner in establishing a pick-your-own berry and grape operation near Madison, Wisconsin. I also worked fulltime one summer for the Alexis Bailly Vineyard in Hastings, Minnesota, helping them establish their first vineyard. I earned my M.S. degree in Horticulture from the University of Minnesota, where I did research on cold hardiness physiology in grapevines. For five years I worked as Research Assistant at Minnesotas Horticultural Research Center, in their fruit breeding program. While at the Research Center, I initiated the Universitys wine grape breeding program using our northern wild grape, *Vitis riparia* as a genetic source of hardiness. The red wine grape variety Frontenac is the result of my breeding work with this species. During this period, I was also in charge of the experimental vineyard, and did the pruning and training chores. In addition, I helped organize the Minnesota Grape Growers Association during its early days.

I also have extensive winemaking experience I've been a winemaker for many years, having started winemaking while I was in high school, using wild grapes that grew in the woods in my neighborhood. I was the first winemaker at the University of Minnesota, and made the experimental wines each fall as part of the grape breeding program.

In the past couple years I've had the opportunity to get hands-on experience in commercial wineries. For several weekends during the 2006 crush I worked as a volunteer cellar rat with two Minnesota wineries, Cannon River Winery and Alexis

Bailly Vineyards. In 2007 I worked a stint as fulltime winery assistant at Galena Cellars Winery in Illinois, where I was involved with all phases of winemaking, from harvest through fermentation, filtering, blending and bottling, including laboratory analysis of juices and wines. These were valuable experiences, and gave me a better appreciation for the production processes in commercial wineries.

Im excited about being at the OARDC, and especially having the opportunity to work with the talented research group assembled here. I look forward to learning more about the Ohio grape & wine scene, and getting to know the people working in our industry. Best wishes to everyone for a great 2008 vintage.