

Great Lakes Fruit, Vegetable & Farm Market EXPO

December 9-11, 2008

DeVo Place Convention Center, Grand Rapids, MI



Grapes

Tuesday afternoon 2:00 pm

Where: Grand Gallery (lower level) Room C

Recertification credits: 1 (1C, PRIV CORE)

CCA Credits: PM(1.0) CM(1.0)

Moderator: Mark Drake, MSHS Board, Suttons Bay, MI

2:00 p.m. Bang for the Buck: How California Vineyard Managers Alter Practices for a Range of Quality Wines

- Jim Wolpert, Viticulture and Enology Dept., Univ. of California - Davis

2:40 p.m. Understanding Grape Diseases and Their Management

- Mike Ellis, Plant Pathology (Wooster), Ohio State Univ.

3:20 p.m. Crop Estimation in Wine and Juice Grapes

- Paolo Sabbatini, Horticulture Dept., MSU

3:40 p.m. Managing Insect Pests in Grapes

- Rufus Isaacs, Entomology Dept., MSU
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BANG FOR THE BUCK: HOW CALIFORNIA VINEYARD MANAGERS ALTER PRACTICES FOR A RANGE OF QUALITY WINES

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With winery consolidation, growers have found that their crop is going to a different company and their grapes into a different product. When the retail price of wine drops, the price per ton almost always drops in a commensurate way, or even more. In the face of lowered gross revenue, growers begin to adjust their practices to ensure a profit margin.

California wineries have become more and more involved in vineyard practices. Ag economists call this “an asymmetrical relationship” because the buyer (winemaker) cannot describe in a perfect way what he or she wants and therefore wants to be involved in “calling the shots” as a way to best ensure the final product quality. Therefore, many vineyard managers now create what they call a “Farm Plan” that is signed off by the winery. While that does not the end of the conversation, it goes a long way to ensuring good communications.

When the discussion first starts, growers think about things they can avoid. They may drop cover crops and let the native vegetation provide the winter cover. They may defer soil amendments (compost) to alternating years. They may decide to use some form of mechanical pre-pruning to lower pruning costs. But ultimately reducing costs comes down to two factors: crop and labor.

There is a general understanding that crop load per acre will go up, within limits, as price per ton goes down. Of course, this is not a simple decision, as vine growth has to be able to support the additional crop. The trellis system has to be able to handle the added crop, not only physically but in the manner in which the leaves supporting the crop are displayed. Shoot crowding and shading must be avoided and some trellis designs will not adequately perform.

Labor is a key factor. California came to rely on labor when it was abundant and inexpensive. Now it is neither. After pruning the number of time a worker enters a vineyard to perform a hand operation (so called “hand passes”) varies wildly. Shoot thinning or suckering is usually practiced in all coastal vineyards for two reasons, first because it reduces shoot density and shading and second because it speeds up the subsequent dormant season pruning.

After flowering a leaf removal (“leafing”) pass is made. Growers will often save money on this by not attempting to do a perfect job. In highly manicured vineyards a second pass is made to remove lateral shoots and further open the canopy. At lower prices, this pass is certainly dropped.

Several hand passes are done to ensure that crop levels are appropriate, that clusters are ripening uniformly and are adequately spaced on the fruiting wire. As the price per ton drops, the fewer of these operations are done. This is especially true for thinning, a “double whammy” where labor costs are incurred and crop per acre decrease.

The difficulty in the approach of “doing less” is that wineries know the value of these practices if not in specific terms, at least in general terms. They want that quality but are not in a position to pay for it. This creates tension must be understood and addressed. Growers want to be cooperative and wineries want to be competitive in the retail marketplace. This results in margins being squeezed.

This returns us to the original point where it is best, if at all possible, to reach agreement on the practices, preferably on a block-by-block basis. We often talk about “sustainability” from an environmental perspective. However, it is critical that growers are sustainable economically, as well.

DEVELOPING AN EFFECTIVE FUNGICIDE SPRAY PROGRAM FOR WINE GRAPES IN OHIO -- 2009

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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

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, Revus, Presidio, 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.

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

Application Timing	Material (and rate/A)
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)

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.

Application Timing**Material (and rate/A)**

3-5 inch shoot
or 7- 10 days after
last spray

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 lbs/A)
or
Potassium salts
or
JMS Stylet Oil (1% concentration)

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.

Application Timing**Material (and rate/A)**

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

Same fungicides
as 3-5 inch shoot

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

Mancozeb (3-4 lb/A)
See note below on Downy Mildew

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)

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: If conditions are highly conducive for Downy Mildew development, Ridomil Gold MZ or Ridomil Gold Copper should be considered

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.

NOTE on Downy Mildew: If conditions are highly conducive for Downy Mildew development during this critical period, Ridomil Gold MZ or Ridomil Gold Copper should be considered at this time. I do not think any material is more effective than Ridomil for downy mildew control. However, a good protectant program with Mancozeb, should provide effective downy mildew control during most growing seasons. The PHI for Ridomil Gold MZ is 66days and for Ridomil Gold Copper it is 42 days. Revus and Presidio are two new fungicides that are reported to be highly effective against downy mildew. It is very important to remember that these materials will need to be tank mixed with other fungicides because they will not provide adequate control of powdery mildew or black rot (Table 1).

Application Timing	Material (and rate/A)
First postbloom spray no longer than 10 days after last spray	Same fungicides as Immediate prebloom or early bloom
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Second postbloom spray no later than 10 days after last spray	Mancozeb (4 lb/A) or Captan 50W (3-4 lb/A) or Phosphorous Acid See note above on Downy Mildew
	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, Topaz) 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. 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 0.5%. 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 on Downy Mildew: If conditions are highly conducive for Downy Mildew development during this period, Ridomil Gold MZ or Ridomil Gold Copper should be considered at this time. I do not think any material is more effective than Ridomil for downy mildew control. The PHI for Ridomil Gold MZ is 66days and for Ridomil Gold Copper it is 42 days. Revus and Presidio are two new fungicides that are reported to be highly effective against downy mildew. Both of these materials have a 12-day PHI. It is very important to remember that these materials will need to be tank mixed with other fungicides because they will not provide adequate control of powdery mildew or black rot (Table 1)

Application Timing	Material (and rate/A)
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 See note below on Downy Mildew 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

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, a phosphite fungicide, Ridomil Gold Copper, Revus, Presidio or a copper fungicide 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. If weather is dry and downy mildew is not a problem, these downy mildew fungicides are not required. However, you will need to maintain a good program for powdery mildew control, even if weather is dry. The danger of black rot infection should be over by this time. Berries should be resistant to black rot.

Application Timing**Material (and rate/A)**

Fourth post bloom spray
10-14 days after
last spray

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

See note above on Downy Mildew

PLUS

Endura 70WG (4.5 oz)

Or

Quintec 2.08F (4 fl oz)

or

Wettable Sulfur (8-10 lb/A)

or

or

Potassium salts

OR

Fixed Copper Fungicide used alone

OR

Pristine 38WG (6-10.5 oz) used alone

Maintain a 10-14 day
spray schedule

through harvest

These fungicides

will be used through

harvest Flowable Sulfur 6F (3 qt)

NOTE: If dry weather persists and the risk of Downy Mildew is low, a downy mildew fungicide may 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.

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

Rovral (1.5 lb/A)

PLUS

Latron B1956(6 fl oz/100 gal)

OR

Vanguard (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.

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

Fungicide	Phomopsis cane and leaf spot	Black rot	Downy mildew	Powdery mildew	Botrytis rot	Bitter rot
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
Presidio	0	0	+++	0	0	0
Pristine	++	+++	+++ (FRP)	+++	++	?
Procure	0	++	0	+++ (FRP)	0	0
Quintec	0	0	0	+++	0	0
Revus	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 ¹	++	+	0	+++	++	++
Vanguard	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.

¹ 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 CaptEstate
(Group 40)	Medium	Mandipropamid	Revus
(Group 43)	Medium	Fluopicolide	Presidio

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.

MANAGING INSECT PESTS IN GRAPES

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Insect pest of grapevines in Michigan include moth larvae, beetles, leafhoppers, wasps, and mites. This talk will provide a report on our recent research projects that aim to test new options available to growers for insect management in their vineyards. The talk will be divided into three sections:

1. Grape berry moth phenology and chemical control
2. Tests of SPLAT-GBM for grape berry moth
3. Insecticide comparisons for pre-harvest pests

1. Grape berry moth phenology and chemical control.

The timing of grape berry moth activity in vineyards has been unclear in recent years, making timing of insecticide controls challenging. Traps have not been very good indicators of pest pressure and the eggs are very small and difficult to see. To address this, we have been working in collaboration with scientists at Cornell and Penn State universities to better understand the development and timing of grape berry moth in vineyards. Detailed monitoring of grape berry moths in traps, eggs on berries, and larvae in berries has revealed a clearer picture of the annual development by this insect and key times for control. Key events in the annual cycle of grape berry moth are as follows

May: Male moths in traps, this can be weeks before first egg laying

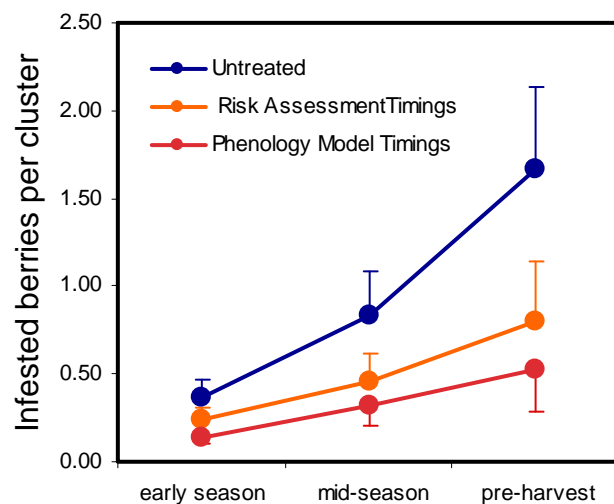
Mid-June: Egg laying of first generation on vines during grape bloom.

Mid-July: Second generation egg laying observed on clusters

August: start of third generation egg laying before veraison, continues through to September

September: Egg laying may continue if conditions are suitable

This research has provided some new insights into when best to treat vineyards for GBM control. In comparison with a typical spray program that employs one post bloom spray, one in mid-late July, and another in early August (Risk Assessment Timings), we have found improved control using Phenology Model driven timings in which insecticides were applied in early July and early August at specific degree day timings. The graph at the right from a trial in NY shows the control of GBM achieved when a typical insecticide program was used (Risk Assessment timings – 3 sprays) and the improvement in control with two well-timed insecticides that were directed against egg laying by GBM. In this trial, for the sake of consistency, all plots were treated with Danitol.



As will be discussed below there are a large number of new insecticides registered for use in vineyards. These include the insecticide Intrepid 2F that has activity on eggs and larvae of grape berry moth, with long residual activity and minimal effects on natural enemies. In Michigan trials during 2008, we compared a program of

broad-spectrum insecticides with two programs using Intrepid at 8 or 12 oz/acre in a Concord vineyard.

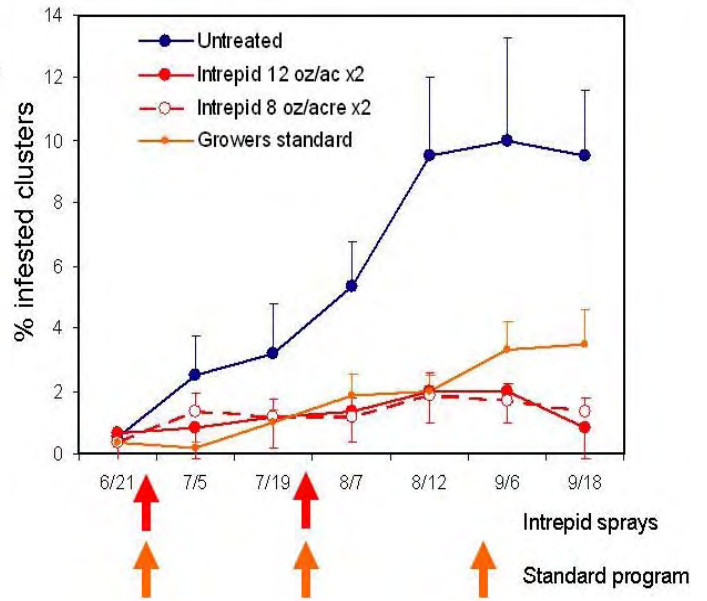
Intrepid was applied on 21 June and 24 July to provide a residue that would overlap with the main periods of crop infestation risk from berry moth. As shown in the graph to the right, covering the middle part of the season with two applications of Intrepid provided a long period of residual control of grape berry moth. The similar control with 8 or 12 oz/acre of Intrepid is encouraging

for growers searching for economy in their pest management program. It is important to note that the applications of Intrepid were applied using over 50 gallons of water per acre to ensure good coverage of the clusters. This is essential for effective use of this product and other insect growth regulators.

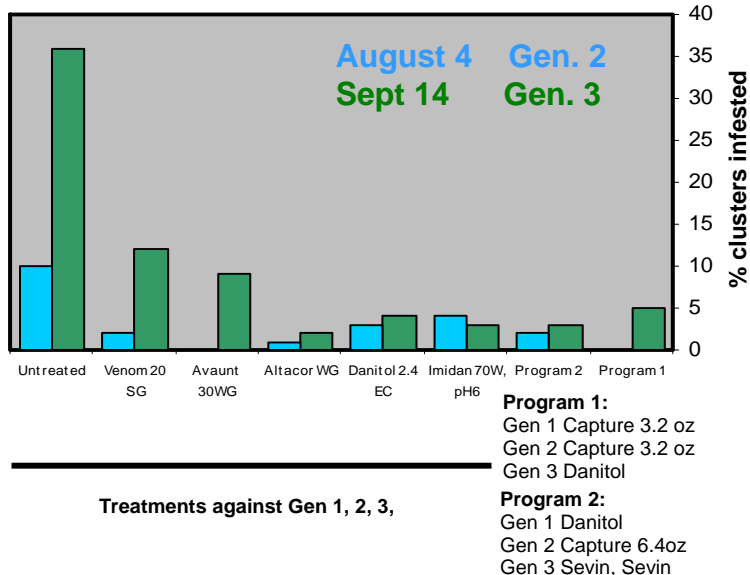
Comparison of new insecticides and timings

Intrepid at 8 or 12 oz/ac
21 June and 24 July

Standard program
Sevin - June 21
Imidan - 24 July
Baythroid - 30 August



In addition to Intrepid, there is an increasing number of reduced-risk insecticides now registered for use in vineyards. These include Altacor, Avaunt, and Delegate that are all have activity on grape berry moth. These have shown activity in small plot trials and we have gained some experience with them on-farm this past season that will be presented in this presentation. Venom, Assail, and Clutch are neonicotinoids in the same chemical class as Provado. These are all active against leafhoppers and beetles. They can also help suppress grape berry moth populations if used against low populations, but our trials (see Venom



below) indicate they are not active enough to control high populations or the more active pest pressure late in the season. We have also seen registration of new pyrethroid insecticides such as Capture(=Brigade), Baythroid, Mustang Max, etc. for use in vineyards over the past few years. These provide a relatively inexpensive and highly active tool for insect control. They are highly effective but do not provide long residual control and are very harmful to natural enemies. Because of this their use in IPM programs should be considered for periods when the damage to

natural enemies will be lowest. As with all insecticides, repetitive use of chemicals in the same class should be avoided to prevent development of insecticide resistance.

2. Tests of SPLAT-GBM for berry moth control.

We are working to develop a wax-based formulation for release of pheromone to disrupt the communication between male and female moths, to achieve mating disruption and thereby reduce infestation. Some promising preliminary trials in 2007 have been followed in 2008 with larger-scale tests of efficacy against berry moth in commercial vineyards in SW Michigan. A mechanical applicator was used for all applications, mounted on the back of an ATV. With this setup, the SPLAT-GBM wax can be applied as small (0.8 ml) droplets to vines at up to 10 mph, allowing treatment of 10 acres in 1 hour. This applicator has significant benefits in speed and cost of application compared with other pheromone application technologies.



Droplets from this applicator were applied at 0.5 or 1.0 kg/acre to vineyards at four grape farms in SW Michigan during 2008. All vineyards received standard insecticide while three vineyards at each farm received the following treatments:

1. No pheromone
2. 0.5 kg/acre of SPLAT-GBM, Gen 1 and 2
3. 1.0 kg/acre of SPLAT-GBM Gen 1 and 2
4. 1.0 kg/acre of SPLAT-GBM Gen 1, 2 and 3

Results from these trials indicate a 50% reduction in infestation at vineyard borders compared with vineyards that did not receive the pheromone in SPLAT-GBM.

Surprisingly, the effect was similar irrespective of the rate of wax applied. This suggests that an application of 0.5 kg/ac for Gen 1 and 2 will be sufficient to get this reduction in pest pressure. Our research in 2008 will focus on optimizing the application of SPLAT-GBM in vineyards and identifying the optimal density of droplets required to achieve long-lasting and effective disruption of mating.



3. Insecticide comparisons for other insect pests

With the newly-available insecticides available for use in vineyards, growers have some new options with short pre-harvest intervals that can help address some of the insect pests that can cause problems immediately before harvest. These include ants, yellowjackets, and Asian ladybeetle. In a trial conducted this year, we compared insecticides with short pre-harvest intervals. Clutch, Venom, and Baythroid were all toxic to yellowjackets, causing rapid reduction in their abundance on grape clusters immediately after spraying and prevention of re-infestation in the Baythroid and Venom-treated plots. When examining the effect on Asian ladybeetles, we found that all three treatments caused significant reduction in infestation with the fastest effect seen by Baythroid, intermediate speed effect by Clutch and a slower effect by Venom that took 4 days to significantly reduce ladybeetle infestation compared with the untreated plots. Clusters treated with Venom also had a measurable number of ladybeetles stuck in the cluster after treatment, suggesting this insecticide has some properties that make it unsuitable for this specific use.

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