



## **Cold Climate Grape IPM News**

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*May 31, 2005*

### ***IPM - A Primer***

At the Cold Climate Grape Management Workshop at the University of Vermont on March 29, 2005, an introductory IPM presentation was given which included basic concepts, strategies, and components of an IPM program. Since attendance was limited and more people wanted to attend than could be accommodated, a scaled-down version of the presentation has been put on the IPM section of the Cold Climate Grape Production website which is under construction at:

<http://pss.uvm.edu/grape/>

An IPM program is based on knowledge and is information-driven. It is the goal of this Newsletter to provide you with information which will help you to develop an effective, sustainable grape IPM program including information on risk-reducing options, pesticide safety, and pollution prevention.

### ***Growing Degree Days and Phenological Stages***

Critical times for the management of grape diseases and insects are associated with different developmental stages of the plant during the growing season. The development of the grape plant, insect development, and pathogen development are all affected by temperature. Growing degree days (GDD) is a measure of heat accumulation and can be used to estimate or predict when plants, insects, and pathogens should reach a certain stage.

GDD are being calculated for 5 sites in Vermont and posted on the web at:

<http://pss.uvm.edu/grape/2005DDAccumulationGrape.html>



Since we do not have a historical data base of phenological stages associated with GDD in Vermont, comparisons can be made with data from The Lake Erie Regional Grape Program which is located at:

<http://lenewa.netsync.net/public/PhenDate.htm>

## Key Times to Scout and Manage Diseases and Insects

The following chart developed at Michigan State University by Annemiek Schilder and Rufus Isaacs for *A Pocket Guide for Grape IPM Scouting in the North Central and Eastern U.S.*, 2003, appears on the web at: <http://grapes.msu.edu/calendar.htm>. It nicely depicts the important times for insect and disease management in relation to phenological stages. It can be very useful in planning and implementing an IPM program in your vineyard. Note that a significant amount of attention needs to be given to grape disease management throughout the growing season.

Vine growth stage	Bud swell	1-5" shoot	8-12" shoot	Pre-bloom	Bloom	Pea-sized	Berry touch	Bunch closing	Veraison	Pre-harvest	Harvest	Post-harvest
<b>Insects</b>												
Cutworm	+	+										
Rose chafer				+	+	+						
Grape berry moth				+	+	+	+	+	+	+	+	+
Grape leafhopper				+	+		+	+	+	+	+	
Potato leafhopper			+	+	+		+	+	+			
Japanese beetle								+	+	+		
<b>Diseases</b>												
Phomopsis		+	+	+	+	+	+	+	+	+	+	
Black rot		+	+	+	+	+	+	+	+			
Downy mildew		+	+	+	+	+	+	+	+	+	+	+
Powdery mildew		+	+	+	+	+	+	+	+	+	+	+
Botrytis bunch rot					+			+	+	+	+	

-  Usual time for monitoring and control.
-  Lesser risk, but monitoring and control may still be required.
- +** Potential period of insect activity or disease infection risk

Developed by A. Schilder and R. Isaacs  
Michigan State University

## Disease Management Options

As pointed out in the IPM Primer, three things are needed for disease to occur:

- ◆ A Susceptible Plant
- ◆ Presence of a viable Pathogen
- ◆ Environmental Conditions favorable for infection and disease development

A disease management program should address all three factors and should incorporate cultivar resistance, sanitation (e.g., removing mummies, burying fallen leaves in autumn, etc.), cultural practices that can impact air and light penetration (e.g., pruning, shoot positioning, leaf removal) which can affect disease development, and knowledge about the pathogen and the disease cycle. When pesticides are warranted, the **4 R's** should be followed:

- ◆ Right material
- ◆ At the right time
- ◆ In the right amount
- ◆ And in the right way

An excellent publication for choosing the right material is the ***New York and Pennsylvania Pest Management Guidelines for Grapes: 2005***. This publication can be found at:

[http://lenewa.netsync.net/public/Guidelines\\_2005/Home.htm](http://lenewa.netsync.net/public/Guidelines_2005/Home.htm)

## ***Disease “Bullets”***

The following bullets have been gleaned from various fact sheets and other resources. Their purpose is to provide you with a quick overview of important points about the pathogen which causes the particular disease and about disease development. Hopefully, these will help in understanding why certain practices are advised at particular times in the growing season and give you some “ammunition” on how to affect the development of disease in your vineyard.

### **Phomopsis Cane and Leaf Spot**

- ◆ Fungus that causes disease is a cool weather fungus; not active in warm summer months
- ◆ Most likely to be a problem when fungus is allowed to build up on dead canes or on pruning stubs in vines
- ◆ Fungus overwinters as black pycnidia (ball-like structures; fruiting bodies) in infected canes and rachises.
- ◆ During wet weather in spring, spores ooze from black pycnidia.
- ◆ Shoot and leaf infections are most common during first few weeks of growth but can occur anytime after bud break.
- ◆ Shoot lesions are elliptical in shape and are usually most numerous on the first 4-6 internodes; lesions may coalesce and form irregular, black, crusty areas; severe infection may cause cane splitting; in dormant season, black fruiting bodies (pycnidia) form on infected shoots

- ◆ Lesions on foliar begin as small irregular, light green, sometimes star-like lesions; when lesions present, large portion of leaf may turn yellow
- ◆ Rachises are susceptible from the time young clusters first emerge until early summer although infections that occur during the early part of this period are the most damaging; infected rachises can become girdled resulting in fruit drop before harvest.
- ◆ Fruit appear to be the most susceptible from bloom through pea-size; some research suggests they may remain susceptible throughout the summer
- ◆ Fruit infection requires extended periods of rain and wetness.
- ◆ Infected fruit remain symptomless (i.e., latent) until late summer when they turn brown and become covered with black, pimple-like fruiting bodies; berries eventually shrivel up and look very similar to black rot mummies
- ◆ *Management*
  - ◆ Remove diseased canes and pruning stubs during pruning to reduce inoculum
  - ◆ The need for fungicide applications is dependent on level of inoculum within vineyard and frequency and duration of wetness periods.
  - ◆ Moderately severe infection can occur after about 26 hr of wetness at an average temp of 48F; 16 hr at 54F, and 12 hr at 60-68F.
  - ◆ Protective sprays of captan or mancozeb may need to begin as early as 1 " shoot growth in vineyards with heavy inoculum pressure.
  - ◆ Cluster emergence through pre-bloom is an important time to protect rachises when conditions are favorable for infection; critical spray to protect rachis is a single application at 3"-5" shoot dev.
  - ◆ The first few weeks after bloom is a critical time to protect against fruit infection under wet conditions.
  - ◆ Fungicides rated as very effective: captan, mancozebs
  - ◆ Note: Sulfur and fixed copper materials are "weak" against this disease
- ◆ Links to further information and pictures:
  - ◆ <http://www.nysipm.cornell.edu/factsheets/grapes/diseases/phomopsis.pdf>
  - ◆ [http://lenewa.netsync.net/public/Guidelines\\_2005/Diseases.htm#Phomopsis](http://lenewa.netsync.net/public/Guidelines_2005/Diseases.htm#Phomopsis)
  - ◆ [http://www.ppath.cas.psu.edu/EXTENSION/FRUITPATH/Fruit\\_facts/Grape/Phomopsis.html](http://www.ppath.cas.psu.edu/EXTENSION/FRUITPATH/Fruit_facts/Grape/Phomopsis.html)
  - ◆ <http://grapes.msu.edu/phomopsis.htm>

### **Downy Mildew (DM)**

- ◆ Fungus can infect all green, actively growing parts of the plant that have mature, functional stomates
- ◆ Fungus overwinters as dormant spores within infected leaves on vineyard floor or in soil
- ◆ Dormant spores become active 2-3 weeks *before* bloom when ~5-6" leaves have unfolded
- ◆ Spores causing initial infections in the spring are produced during rainy periods when temperatures are greater than 52F; they are splashed onto susceptible tissue during rain
- ◆ Further infections during the growing season are from new spores produced within the white fungal growth; these spores are only produced at night when rel. humidity is high (>95%).

- ◆ Spores during the growing season can be blown into vineyard from great distances
- ◆ Generational time can only be 4 days in ideal conditions (e.g., temp. mid- to upper 70F); thus, disease development can be “explosive”
- ◆ Younger leaves remain susceptible as long as they are being produced; leaves lose susceptibility at the time they are fully expanded.
- ◆ Infected foliage develop yellow lesions on upper surface about 7-12 days after infection; as lesions expand, affected areas may turn brown, necrotic or mottled; white cottony mass develops particularly during humid weather on lower surface of foliage
- ◆ Infected young shoots, petioles, and tendrils can become distorted and curled and appear very white on surface.
- ◆ Infected green fruit turn light brown to purple, shrivel, and detach easily; white downy sporulation abundant on fruit during humid weather; fruit remain susceptible to infection as long as stomata on the surface are functional
- ◆ Fruit lose susceptibility to infection by midsummer
- ◆ *Management*
  - ◆ Any practice that improves air circulation and speeds drying within the canopy will help to manage DM; also, spring cultivation to bury fallen leaves can reduce potential inoculum
  - ◆ Two major components in DM management: (1) prevent early disease establishment on foliage and cluster infections during the pre-bloom and early post-bloom periods; (2) limiting secondary disease development on the foliage during the summer.
  - ◆ Factors that affect management: cultivar susceptibility, weather conditions, availability of fungal inoculum
    - ◆ On highly susceptible cultivars + disease was present last year + wet weather current growing season → sprays may have to start 2-3 wks before bloom (when spores are first released)
    - ◆ On all but the most resistant cultivars → sprays should start at immediate pre-bloom through 1-2 post-bloom sprays, depending on weather. (Since fruit lose susceptibility to infection by midsummer, sprays beyond 2<sup>nd</sup> post-bloom provide no additional control of fruit infection)
    - ◆ Summer sprays → depends on weather and amount of secondary inoculum present in vineyard; during hot, dry weather in summer, DM can become inactive.
  - ◆ Fungicides - There are a number of fungicides which have activity against the DM fungus; the characteristics of each material should be considered (i.e., protectant vs systemic; redistribution potential, post-infection activity, proneness to resistance development, spectrum of activity against other diseases that might be present in your vineyard, etc.). Please see the [2005 NY and PA Pest Management Guidelines](#) for options.
- ◆ **Links to further information and pictures:**
  - ◆ [http://www.nysipm.cornell.edu/factsheets/grapes/diseases/downy\\_mildew.pdf](http://www.nysipm.cornell.edu/factsheets/grapes/diseases/downy_mildew.pdf)
  - ◆ [http://lenewa.netsync.net/public/Guidelines\\_2005/Diseases.htm#Downy](http://lenewa.netsync.net/public/Guidelines_2005/Diseases.htm#Downy)
  - ◆ [http://www.ppath.cas.psu.edu/EXTENSION/FRUITPATH/Fruit\\_facts/Grape/DownyM.html](http://www.ppath.cas.psu.edu/EXTENSION/FRUITPATH/Fruit_facts/Grape/DownyM.html)
  - ◆ <http://grapes.msu.edu/downymildew.htm>

## Powdery Mildew (PM)

- ◆ PM may reduce wine quality even though yield is not affected.
- ◆ The fungus overwinters in cleistothecia (round, black structures in which the ascospores will develop) on bark of vines
- ◆ Ascospores are released from bud break until shortly after bloom when there is 0.1" rain and temp. is above 50F.
- ◆ Generational time (number of repeating cycles) driven by temp. → at optimal temp (mid-60's to mid-80's) a new generation occurs every 5-7 days.
- ◆ Infection of foliage results in white powdery areas on the surface; expanding leaves can become distorted; foliar infection may result in early defoliation, poor ripening, and reduced winter hardiness.
- ◆ "Powdery" appearance is due to production of conidia which are spores that cause infection during the growing season.
- ◆ The fungus can infect all green tissue.
- ◆ Fruit infections appear as white/grey powdery area on surface; if infected when pea size, epidermis stops growing but pulp continues to expand causing the berry to split ; if berries are infected as they begin to ripen, they fail to color properly and have a blotchy appearance at harvest.
- ◆ Fruit highly susceptible from immediate pre-bloom until about 2 wks after fruit set; susceptible to infection until sugar content reaches 8%
- ◆ Cluster infection before or shortly after bloom may result in poor set and considerable crop loss
- ◆ On green shoots, fungus appears brown to black
- ◆ *Management :*
  - ◆ Important management considerations: cultivar susceptibility, availability of inoculum, stage of crop development, and weather
  - ◆ Effective management may require sprays as early as 3"-5" shoot growth depending on the above factors.
  - ◆ To protect fruit, management should be at its peak from just before bloom through fruit set. Note that the risk of berry infection is higher during this period when days and nights remain warm.
  - ◆ For high fruit and vine quality on vinifera and susceptible hybrids, protection of foliage should be maintained through veraison.
  - ◆ Fungicides :
    - ◆ Since the fungus is on surface, materials such as oils and salts are options (JMS stylet oil, potassium bicarbonate). See the [2005 NY and PA Pest Management Guidelines](#) for details.
    - ◆ Fungicide options also include sulfur, the strobilurin fungicides (Abound, Flint, Sovran) , and the sterol inhibiting fungicides (Elite, Nova, Procure, and Rubigan)
    - ◆ Because of the high risk of resistance development in the fungal population to certain powdery mildew fungicides, you should be aware of all label restrictions on use and guidelines regarding resistance management.
    - ◆ Please see the [2005 NY and PA Pest Management Guidelines](#) for details on

**fungicide use and cautions** (e.g., cultivar sensitivity to certain fungicides, compatibility with other materials, phytotoxicity considerations, etc.)

◆ Links to further information and pictures:

- ◆ [http://www.nysipm.cornell.edu/factsheets/grapes/diseases/grape\\_pm.pdf](http://www.nysipm.cornell.edu/factsheets/grapes/diseases/grape_pm.pdf)
- ◆ [http://lenewa.netsync.net/public/Guidelines\\_2005/Diseases.htm#Powdery](http://lenewa.netsync.net/public/Guidelines_2005/Diseases.htm#Powdery)
- ◆ [http://www.ppath.cas.psu.edu/EXTENSION/FRUITPATH/Fruit\\_facts/Grape/PM.html](http://www.ppath.cas.psu.edu/EXTENSION/FRUITPATH/Fruit_facts/Grape/PM.html)
- ◆ <http://grapes.msu.edu/pmildew.htm>

## ***Small Vineyards and Spray Equipment***

Since a number of people are planning small vineyards, the following information may be of interest to you. It comes from an article written by Dr. Andrew Landers, Pesticide Application Technology Specialist, at the New York State Agricultural Experiment Station in , NY. The full article can be found at:

<http://www.nysaes.cornell.edu/ent/faculty/landers/pestapp/publications/SMALL%20SPRAYERS%20FOR%20SMALLER%20VINEYARDS.doc>

“There are many important points to consider before purchasing a sprayer, not least of which is the area to spray, the proximity of the local supplier, standard of manufacture etc. .... There are many growers with small vineyards who don't require airblast sprayers and have a need for spraying equipment ranging from backpack sprayers to small truck or ATV mounted machines.

Canopy sprayers

### 1. Backpack sprayers

Small capacity (4-5 gallon) sprayers will produce up to 150 psi pressure. Weight is an important consideration and growers should select a sprayer with good, wide, padded straps to ease the load. Correct nozzle selection according to the target is very important to ensure even coverage. A good size filling hole at the top is also important. \$95-150 approx.

Maintaining a constant flow is crucial for good application. The use of a spray management valve such as a CF valve will ensure a constant output irrespective of hand pump action. \$10 approx.

An alternative to the hand pump backpack is the electric backpack, which utilises a small rechargeable battery. Max. pressure is quite low. \$265 approx.

### 2. Portable gas sprayers

If weight is a problem, and ground conditions are relatively smooth, a sprayer with a small 1/4hp gas engine, 12 gallon tank and 16" wheels is available from Dramm. \$930

Larger capacity tanks (14-100 gallons) are often trailed and can be pulled by a lawn tractor, ATV or small tractor. Often fitted with a small electric, battery powered pump or a 4-10 hp gas engine. \$289-3000

### 3. Portable Mist and air blower backpacks

These are ideal for greenhouses where a controlled environment prevents the wind blowing away the droplets but outside in a vineyard they are too dangerous! Besides creating fine drift-prone droplets, they are noisy and you are walking into a mist. \$: not recommended

### 4. Small mounted sprayers

Ideal for mounting onto the carrier rack of an ATV, 15-25 gallons, they use a small electric pump to provide up to 70 psi. \$230-350

5. Large skid mounted sprayers Ideal for fitting into the back of a pick-up truck these sprayers have a tank capacity of 35- 200 gallons, and electric or gas engine power. \$400-2700

### 6. Small trailed airblast sprayers

Very small airblast sprayers, such as the interestingly named Lil' Squirt from PMB sprayers with a tank up to 110 gallons, a 5.5 hp gas engine and which can be towed by an ATV are available. Larger tank capacity up to 300 gallons is also available. Remember the larger the gas engine, the more important it is to buy an electric start option. \$5000

### 7. Small mounted airblast sprayers

Three-point hitch, PTO driven models with a 22 or 24" fan, for fitting onto 25hp tractors are available. \$3700 “

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*Further information on vineyard spraying can be found at:*

<http://www.nysaes.cornell.edu/ent/faculty/landers/pestapp/grape.htm>

[http://lenewa.netsync.net/public/Guidelines\\_2005/Home.htm](http://lenewa.netsync.net/public/Guidelines_2005/Home.htm)

*Note: Separate equipment should be used for the application of herbicides because of the risk of phytotoxicity with any residue left in the sprayer.*

## ***Pesticide Safety - Laundering Work Clothes***

It is very important to carefully handle and clean garments worn while applying pesticides. The following information was prepared by Charlotte Coffman, Cornell University, Department of Textiles and Apparel and appears in the [2005 NY and PA Pest Management Guidelines](http://lenewa.netsync.net/public/Guidelines_2005/Laundry.htm) at [http://lenewa.netsync.net/public/Guidelines\\_2005/Laundry.htm](http://lenewa.netsync.net/public/Guidelines_2005/Laundry.htm) .

### **Air**

Hang garments **outdoors** to air

### **Prerinse**

Use one of these **three methods**:

1. Hose-off garments outdoors.
2. Rinse in separate tub or pail.
3. Agitate in automatic washer.

### **Pretreat (heavily soiled garments)**

Use heavy-duty liquid.

### **Washer Load**

Wash garments **separately** from family wash.

Wash garments contaminated with the **same** pesticide together.

### **Load Size**

Wash only a **few** garments at once.

### **Water Level**

Use **full** water level

### **Water Temperature**

Use **hot** water, 140°F or higher

### **Wash Cycle**

Use **normal** 12-minute wash cycle

### **Laundry Detergent**

Use a **heavy-duty detergent**.

Use amount recommended on package, or more for heavy soil/hard water.

## **Rinse**

Use **two, full, warm** water rinses.

## **Dry**

**Line-dry** to avoid contaminating dryer.

## **Clean Washer**

Run complete, but empty, cycle.

Use **hot water and detergent**.

## **Other Tips:**

1. Wear a **disposable** coverall over work clothes.
2. Remove contaminated clothing **before** entering enclosed tractor cabs.
3. Remove contaminated clothing **outdoors** or in an entry. If a granular pesticide was used, shake clothing outdoors. **Empty pockets and cuffs**.
4. Save clothing worn while handling pesticides for that use only. Keep separate from other clothing **before, during, and after** laundering.
5. Wear **chemical-resistant gloves** when handling highly contaminated clothing. Replace gloves periodically.
6. Wash contaminated clothing after **each** use. when applying pesticides daily, wash clothing **daily**.
7. **Rewash** contaminated garments **two or three times before reuse** for more complete pesticide removal.

Take these **precautions** when **handling contaminated clothing**:

- ◆ Ventilate area
- ◆ Avoid inhaling steam from washer
- ◆ Wash hands thoroughly
- ◆ Consider wearing chemical –resistant gloves.

## ***Thank you ! Mark Chien, PSU Wine Grape Agent***

At the Cold Climate Wine Grape Management Workshop held at the University of Vermont on March 29, 2005, Mark Chien gave two excellent presentations on Canopy and Crop Management and then afterwards, demonstrated pruning techniques at Lincoln Peak Vineyards in New Haven, Vermont. We thank you for sharing your knowledge and insights !



## ***Topics for Future Issues***

What topics related to IPM would you like to see covered in future issues of this newsletter? Please send your suggestions to: [lorraine.berkett@uvm.edu](mailto:lorraine.berkett@uvm.edu)

Thank you !

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Where trade names or commercial products are used for identification, no discrimination is intended and no endorsement is implied. Always read the label before using any pesticide. **The label is the legal document for the product use. Disregard any information in this newsletter if it is in conflict with the label.**

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