

Subject: New England Grape Notes – April 11, 2017
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New England Grape Notes - April 11, 2017

Please find below an excellent review of current early-season disease management recommendations for grapes. This comes from the Lake Erie Regional Grape Program, a collaboration between Cornell University and Penn State University. It is lengthy but worth the read.

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~ Sonia

2017 Pre-Bloom Disease Management Review and Discussion

By Bryan Hed, Penn State Univ.

Another season of grape growing is upon us and it's a good time to review important disease management principles and be aware of some of the tools to consider integrating into your vineyard management programs this spring.

First is your annual reminder to check out the NEWA website (**N**etwork for **E**nvironment and **W**eather **A**pplications) found at <http://newa.cornell.edu>. On the home page is a map of the Northeastern U.S. marked with the locations of hundreds of weather stations where historical and 'up to the hour' weather data can be viewed. Although is provided free on the internet, it is funded through the New York State IPM program. Click on a weather station near enough to you (denoted by a leaf/rain drop icon) to get weather, insect pest, and disease information you need to make important management decisions that could save you time and money. Clicking on 'grapes' under 'crop pages' will give you access to forecasting models for all the major diseases, as well as the grape berry moth degree day model that will improve your timing of grape berry moth insecticide sprays later this summer. Each model forecast is accompanied by helpful disease management messages and explanations.

Next, let's move our minds into the upcoming pre-bloom disease management season. It's important to recognize that the threat of disease this spring (pre-bloom) is largely determined by the amount of overwintering inoculum in your blocks. The amount of overwintering inoculum is dependent on the amount of disease that developed in your vineyard last year or in previous years. In other words, if you have kept diseases well under control in the past, especially last year, then there will be relatively little for pathogen populations to build on and cause damage, at least initially, this year. Some very practical research by Wayne Wilcox at Cornell nicely illustrates this point with powdery mildew (pm) development in susceptible wine varieties. In blocks where pm was well controlled all season, fewer overwintering structures of the fungal pathogen (chasmothecia) were available the following spring to jump start disease cycles. Early disease pressure was relatively low and early sprays were less critical to good commercial

control than in blocks where disease control was poor the previous year. Where there was poor control the previous year, more of the pathogen overwintered to start disease cycles the following spring and early sprays were critical to maintaining successful commercial control. This is not to say that a bad year of pm will automatically be followed by another bad year. But it certainly tilts the odds in favor of the pathogen, especially if for some reason, you can't manage the timely application of your early disease control program (stuff happens). It also doesn't mean you can slack off this year if you had good control last year. Remember, there's the weather. The weather ALWAYS plays an important role too. A good illustration of this is an experience by an organic grape grower who, in an extremely wet season, developed a serious, economically damaging case of black rot. In conventionally managed vineyards there are several very effective chemistries to control black rot, but in organic production there are no real effective fungicides, and control of this disease in organic vineyards must rely heavily on cultural measures that reduce the pathogen's overwintering population. Of course, the grower did everything he could to sanitize the trellis of overwintering fruit mummies and bury mummies that had fallen to the ground to reduce overwintering inoculum. But fortunately, the following year was bone dry during the fruit susceptibility period and black rot was not even an issue. Had the previous wet season been followed by another wet one, I'm quite certain, the battle for control of black rot in that organic vineyard would have required 'the kitchen sink' to avoid losses. Unfortunately, we have no control over the weather and accurate forecasts, especially long term, are not something to rely on. But, we can (and should) strive to control overwintering inoculum levels every year and the best way to do that is good, practical, season-long disease control.

So, begin to wrap your minds around the campaign ahead. If you had poor disease control in some blocks last season, have you reviewed your spray records where control failed AND where it worked well? Where it failed, did you use the wrong material at a critical time? I've had growers discuss their control failures with me only to discover that their timing was fine, but their choice of material did not cover the disease(s) they intended to control. The number of spray materials, what disease each one controls, and how well each one controls each disease, can be bewildering at times...and the list keeps growing and changing. Also, materials that used to be good choices may have become ineffective due to the development of resistance by the pathogens. For example, materials like the strobilurins (Abound, Sovran, Flint, Pristine) are no longer effective at controlling powdery and downy mildew in many parts of the east. In vineyards where this has occurred, using them during the critical fruit protection period (which used to be a great idea!) can now prove disastrous. The sterol inhibitor fungicides (Rally, Elite, Orius, Mettle, Tebusol, Tebustar, Procure, Viticure, etc) are also exhibiting the effects of resistance by the powdery mildew fungus. Though in most cases they still work on powdery to some extent, they are not appropriate for the critical fruit protection period anymore, around and shortly after bloom (products that include the more active difenoconazole are an exception on less susceptible varieties). However, they may be acceptable for maintaining a clean vineyard outside the critical period. Do you have an accurate grasp on that?

Do you have a firm grasp on the critical fruit protection period? The critical period for fruit protection from all diseases generally extends from 'just before bloom' to about 4 weeks later. This is the period when you need to be especially vigilant about minimizing spray intervals, using your best materials that cover all the major diseases (Phomopsis, black rot, powdery and downy mildew), focus on good coverage, etc. It is never profitable to try to cut corners during the critical period. However, if you had heavy amounts of black rot in your vineyard the year before, you should assume you have an unhealthy dose of

overwintering inoculum in your vineyard this spring, and prevention of leaf lesions in the fruit zone (which would need to be addressed during the first 3-12" of shoot growth, well before the fruit protection period) would also prove to be critical. This goes for other diseases as well (refer back to the previous example with Wayne Wilcox' powdery mildew experiment). The **pre-bloom presence of visible disease in the fruit zone is a big red flag**; it means you've got potential for serious fruit loss ahead, especially if weather conditions favor the pathogen (wet, warm, humid, calm, cloudy) during the fruit protection period that follows.

Did you record the relative levels of disease that developed in years past for each of your blocks? In order to do this, you need to be able to identify the various diseases and then scout regularly for them. This takes up valuable time but you can streamline your scouting efforts in many ways. Do you know when you would expect to first see each disease? Downy mildew doesn't become active until about the 5-6 leaf stage. So, you know you can't expect to see it until about that time or shortly after that. In which blocks are diseases most likely to occur first? Your block or rows next to the woods would be a good place to start, or perhaps your most susceptible variety. Blocks with the most disease last year would be a good place to start. On which parts of the vine do you expect to see diseases appear first? Can recent weather data help you to determine where to look for the disease? For example, if a black rot infection period occurred 2 weeks ago (and you can find this out easily by searching the [NEWA website](#)), would you examine the newest growth, the oldest growth, or would you look for lesions on leaves that were *currently expanding and most susceptible 2 weeks ago*? The answers to these questions can help you streamline your scouting efforts, save time, and improve your expertise.

Do you fully comprehend the susceptibilities of all the varieties you're growing? You cannot spray premium *Vitis vinifera* like the hybrids or natives and expect the same results. What are you going to change this year to address disease control breaches in your *vinifera*? If you had good control last year, are you ready to do it again this year? OR, do you feel lucky and plan to back off until close to bloom to apply your first spray? I always plan for the worst when it comes to the weather and assume it's going to be wet, cloudy, and warm; ideal for fungal disease epidemics. Consider that here in the east we are growing a highly vulnerable, susceptible host (wine grapes) on the pathogen's 'turf' (the wet, humid eastern U.S.). The good news is that disease control during the pre-bloom period is generally easier (good spray coverage not a problem, low initial disease/inoculum levels, etc.) and cheaper (can use lower fungicide rates, lower spray gallonage, less expensive materials, less time, etc) than in the post bloom period, and a well prepared pre-bloom disease management program will provide extra insurance against problems during bloom and early fruit set, when your fruit (\$) is most vulnerable. Now let's review the common diseases with some of these questions and concepts in mind.

Phomopsis cane and leaf spot is often the first disease problem we face in the pre-bloom period, particularly where trellis systems maintain lots of old and/or dead wood. That's because old and/or dead wood is where the pathogen overwinters. Therefore, the more old wood you have in your trellis, the more inoculum you can expect to be battling with this spring. Conversely, cane pruned systems have fewer problems with Phomopsis, and cane pruning/minimizing older wood is an important cultural control for this disease. Fortunately, many areas of PA and other parts of the east experienced a relatively dry spring in 2016, helping to minimize new overwintering infections on year-old wood. But, older cordons and especially dead wood and pruning stubs, can carry overwintering inoculum into *many* subsequent springs. So, if there was little opportunity for new Phomopsis infections to occur last year, you can still be carrying a fair amount of overwintering inoculum in old cordons and pruning stubs.

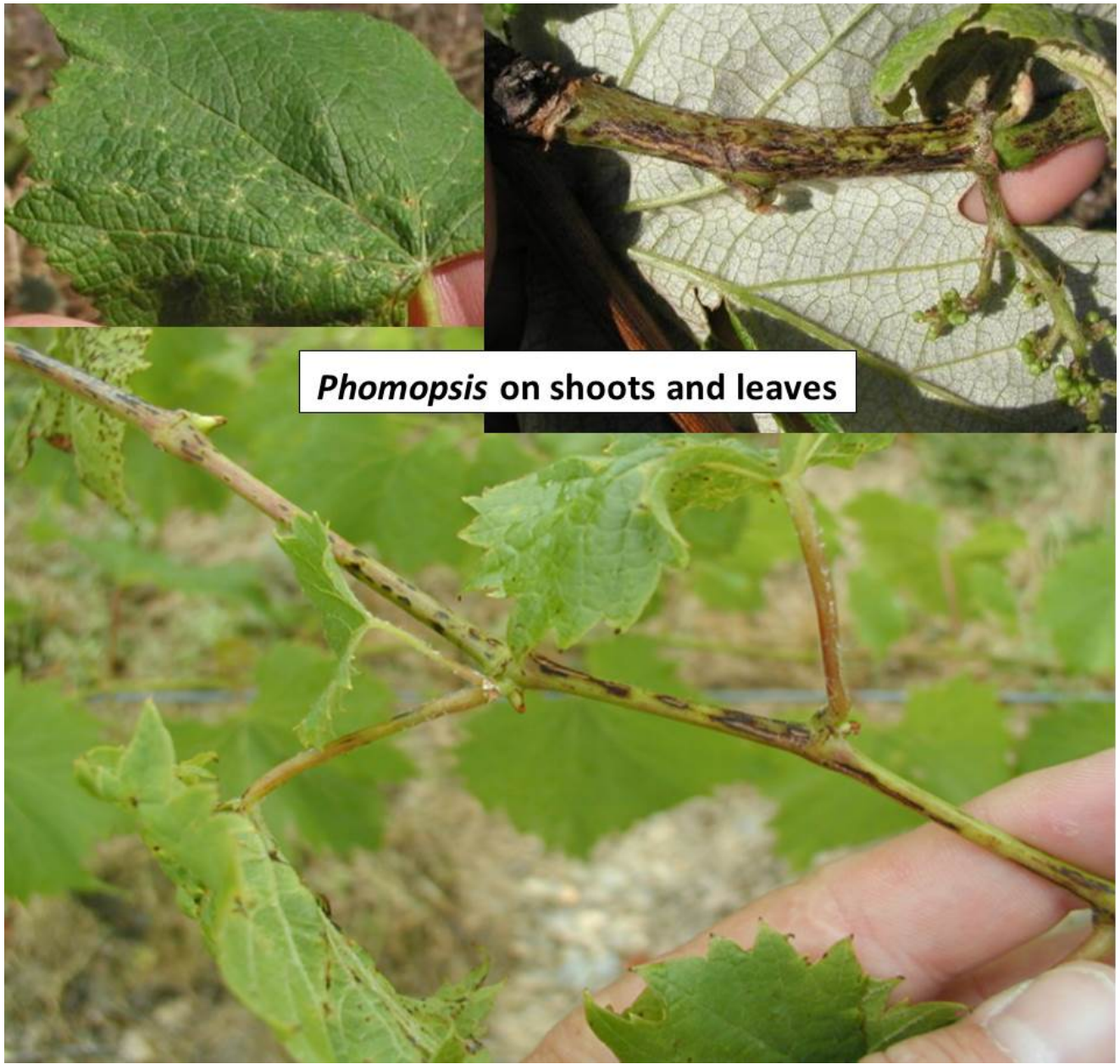
During early spring rains, *Phomopsis* spores flush from lesions on wood and are splashed about to invade any new shoot, leaf, and inflorescence they land on...provided the wetting period/temperature combination falls within a minimum range for infection. The basal-most (oldest) internodes of new shoots are the most susceptible to shoot infections simply because they are closest to the inoculum source; wood. In every trial where I have rated shoot infection of *Phomopsis*, the most severe lesion development was ALWAYS found (on average) on the first (oldest) internode region of the shoot. Lesion development typically got less severe as my rating progressed through internodes 2, 3, 4, and 5. However, once these internodes become fully expanded after the first few weeks in the season, they are no longer susceptible to lesion development. I rarely see *Phomopsis* lesion development beyond the fifth internode region. That's why this disease is best dealt with preventatively, very early, during the first few inches of shoot growth. Infections that occur on the first few internodes of new shoots are not only the most likely to occur, but also the most critical; infections of inflorescences (generally on nodes 2-5) can lead to crop loss early (parts of the inflorescence may be 'bitten off' by the pathogen) or later during ripening (cluster stem infections in spring move into berries and cause fruit rot and shelling after veraison). And, infections that occur on the basal-most internodes, can't all be eliminated by judicious hand pruning during the dormant season. So, in blocks where you suspect any risk of early *Phomopsis* infections, applications of a fungicide (mancozeb or captan are good choices) at no later than 3-6" of shoot growth are a good investment, particularly if you are not cane pruning. Following up with fungicides at 8-12" shoots and immediate pre-bloom are also important pre-bloom applications. Below are some pics from last year's blog (Figures 1, 2) to help you get a handle on the appearance of lesions on year-old canes. Unfortunately, determining the presence of *Phomopsis* on older wood generally involves more than just a visual assessment.

Figure 1. Dark brown lesions on the first few internodes on these Chancellor canes are from *Phomopsis* infections that occurred during early shoot growth in the previous year (when these were green shoots). The buds present are just ready to burst open with new shoot growth that will be very vulnerable to infection during subsequent rain periods.



Figure 2. Although the 1" shoot stage can be vulnerable to damage from this pathogen, the more critical stage is at 3-6" shoots, when more shoot, leaf, and cluster tissue is exposed and is highly susceptible (below). Note the inflorescence in the upper right picture from which *Phomopsis* has "bitten off" whole branches, dramatically limiting yield potential for that cluster.





Pre-bloom fungicide applications for Powdery mildew are also prudent during early shoot growth for *Vitis vinifera* cultivars and highly susceptible hybrids, especially in vineyards where control of this disease may have slipped last year (again, because of lots of overwintering inoculum). The primary inoculum for this pathogen generally comes from overwintering structures of the fungus that are lodged within cracks in the bark of cordons and trunks. Spring rain periods of at least 0.1” of precipitation and temperatures of 50 F or more, are the requirements for release of primary inoculum (ascospores) from the overwintering structures. The more mildew that was allowed to develop the year before, the larger the release of spores in early spring, the more primary infections that are likely to occur, and the more critical the need to control the disease early. Sulfur, oils, monopotassium phosphate, and potassium bicarbonate materials can be good choices for mildew management early on. All of these materials can eradicate small existing powdery mildew infections on leaves and cluster stems. Most do not generally offer any protection from future infections and therefore work best if applied often. Sulfur is an exception, and has the added

benefit of providing a week or more of protection against future infections. Many of the more experienced growers like to utilize a mancozeb/sulfur combination to control all diseases during the pre-bloom period. This combination is relatively inexpensive, there are no resistance issues, and it works. Remember to read labels and be aware that you can't mix sulfur and oils, or oils and captan. The tebuconazole products can be used during early pre-bloom to control powdery mildew as well, especially at the 8-10" shoot stage. These materials are very inexpensive and generally provide enough powdery mildew control to keep vines healthy until the immediate pre-bloom spray (they will also nicely control early black rot infections). At immediate pre-bloom and first post bloom, you want to apply your best powdery mildew chemistries like quinoxyfen (Quintec), difenoconazole (Revus Top), metrafenone (Vivando), fluopyram/tebuconazol (Luna Experience), etc. For native juice grapes, powdery mildew is rarely a concern during the early shoot growth stages, especially in the cooler Lake Erie region of Pennsylvania.



A note about fungicide resistance management and powdery mildew: It's important to plan your powdery mildew management choices ahead of time with resistance management in mind. The easiest way to do this is to become familiar with FRAC (fungicide resistance action committee) codes listed prominently on the first page of fungicide labels. Fungicides with the same FRAC group number can be considered similar enough in their mode of action/chemistry that resistance to one is resistance to all others within that group. Therefore when you rotate fungicides for resistance management, you're essentially rotating FRAC groups. Some good rules to remember are to avoid using the same FRAC group consecutively, or more than twice in a given season. The development of powdery mildew resistance is always a concern when using materials like the strobilurins (FRAC 11), the sterol inhibitors (FRAC 3), Quintec (FRAC 13), Vivando (FRAC U8), Luna Experience (FRAC 7, 3), Torino (FRAC U6), and Endura (FRAC 7) to name a few. Resistance is generally not a concern for uses of sulfur, oils, bicarbonates, and the potassium salts (mentioned above), or copper.

Next, black rot: One of the best ways to reduce overwintering inoculum of black rot is to scout your

vineyard for old fruit mummies and eliminate them from the trellis. Black rot infected fruit mummies that have overwintered in the trellis are the most potent source of inoculum for infections the following spring. No matter how cold it gets over the winter, the pathogen survives just beautifully in colonized fruit remaining in the trellis. But, dropping this inoculum source to the soil, allows microbial degradation/weathering to reduce the potential for mummies to release spores the following spring. It also places the inoculum source much farther from new, susceptible plant tissue up in the trellis. The best time to 'sanitize' the trellis is during dormant pruning; weathering has already accomplished some of the removal of last season's infected fruit from the trellis, and what remains is relatively easy to see and remove by hand. Experiments we conducted several years ago clearly showed that the earlier the mummies are knocked to the ground during the dormant period, the more time for decomposition to break them down before the next season, and the fewer spores released from the ground the following spring to start new disease cycles. Nevertheless, some inoculum on the ground will survive to release spores in spring, and burial of mummies with cultivation will go a step further to eliminate the threat. **Removal of ALL** old cluster material from the trellis before bud break is important to maintaining good control of this disease.

It may not be necessary to apply a fungicide for black rot at early shoot stages **IF** good control of this disease was achieved the previous year **AND** conscientious scouting and trellis sanitation has been implemented. However, the importance of early shoot infections should not be underestimated as I mentioned above, especially if they result in leaf lesions in the fruit zone. For example, inoculations we performed from early May to early June (simulating wet weather and an overwintering inoculum source (mummies) in the trellis) resulted in leaf and shoot lesions in the cluster zone (Figure 3). Those lesions went on to release spores during the critical fruit protection period, resulting in crop loss of 47-77% on those shoots with infected leaves!

An application of mancozeb, ziram, or captan for *Phomopsis* will also provide control of early black rot infections. The sterol inhibitor fungicides and strobilurins are also good materials for black rot that are more rainfast than mancozeb, ziram, and captan. The sterol inhibitors also provide excellent post infection activity that can be very useful at terminating an infection that has already occurred (but not yet manifested itself).

Figure 3. Early (pre-bloom) black rot leaf infections in the cluster zone provide inoculum that can add to problems with controlling fruit infection after capfall. The two small tan lesions on the leaf at node 2 are just inches from the developing inflorescence found at node 3 (picture on the right). These lesions will release spores during rainfall periods that could easily be splashed to highly susceptible cluster stems pre-bloom, and developing fruit after capfall. Resulting fruit infections will lead to crop loss.





Downy mildew and the 5-6 leaf stage: This stage marks the point at which the downy mildew pathogen first becomes active and is capable of releasing primary spores from inoculum sources that have overwintered on the ground (leaves and other plant material that was infected during the previous season). As with all other diseases, vineyards that developed a fair amount of downy mildew leaf/cluster infection last year will be at higher risk this spring than vineyards that were kept clean. However, overwintering structures of the downy mildew pathogen can survive more than one season in the soil.

Periods of rainfall with temperatures of at least 52 F meet the requirements of spore release and the first infections; plant surfaces must be wet for infection to occur. While scouting for this disease, expect to see it first in wetter areas of your acreage and pay close attention to leaves near the ground (sucker growth, grape seedlings that germinated from shelled berries last fall) which are most likely to become infected first. Therefore, keeping such low growth to a minimum in spring is a prudent control measure that can delay the development of the disease. It also suggests that if you're planning vine trunk renewal from sucker growth, you will need to apply fungicides to protect that growth from the ground up as the pathogen becomes active.

Spring leaf infections are identified by the yellow 'oil-spots' seen on the tops of leaves (Figure 4), coinciding with white, downy sporulation of the pathogen on the undersides of leaves. Inflorescences can be blighted and show sporulation as well. Sporulation occurs during darkness under high relative humidity, and can typically be seen during a morning scout of the vineyard following a wet/humid night. Under optimum temperatures (70-75F), only an hour or two of plant surface wetness may be required for infection to occur, and new infections can produce their own spores with just 5 days.

Many parts of the northeast experienced drought conditions last year, which severely inhibited the development of this disease. Up in Erie County PA, the disease basically took a vacation in 2016, and I could barely find a handful of lesions on unsprayed 'Chancellor' leaves and fruit near the ground all summer: it was the perfect year to start renewal trunks! It wasn't until later in August that rains finally returned and we began to see a few more infections, but for the most part the disease literally could not get off the ground in Erie county PA in 2016. What does this mean for 2017? The great lack of downy mildew in drought hit areas last year means that pre-bloom disease cycles this year will have to rely on overwintering inoculum from previous years (although spores of downy mildew can travel long distances between vineyards, *the first infections will arise from inoculum within your vineyard*). I have not found any detailed information as to how long the pathogen can survive in the soil, but I guarantee that if you've had downy mildew before, then it's still there. Whether your area was wet or dry last spring, the principle described earlier still applies: vineyards devoid of downy mildew last year (whether from drought or just

plain good control) will be easier to keep 'clean' in the pre-bloom period this year.

Mancozeb products are good options for the first downy mildew, Phomopsis, and black rot sprays in the pre-bloom period. Ziram and Captan have a similar spectrum of control, but Ziram is a little weaker on downy mildew, and Captan a little weak on black rot. However, these may be a viable option if these diseases are not a huge threat early on (that is if you had good control last year). These materials are all surface protectants subject to wash-off by rainfall, which means that under heavy, frequent rainfall conditions, application intervals will need to be minimized (7-10 days?) especially for highly susceptible varieties. For that more critical 'immediate pre-bloom' spray (and the first post bloom spray), there are other materials like Presidio, Revus, Revus Top, and Zampro that are quite rainfast, very effective, and will provide longer range protection under wet conditions (when you need the protection most and are least likely to be able to stick to shorter spray intervals). However, products like Presidio also require a second active ingredient (like mancozeb) in a tank mix for resistance management purposes (which isn't a bad idea at this critical spray timing in any case). Other materials like the phosphonates, Ranman, and the strobies /Reason, are probably best utilized outside the critical two sprays around bloom (especially for *V. vinifera* and highly susceptible hybrids), unless they're used as tank mix partners with other effective materials. They're very good materials, but they're just not the 'best of the best'.

Figure 4. Yellow oil-spot symptoms of downy mildew on young spring leaves.



One more time for emphasis: the immediate pre bloom and first post bloom (7-14 days later) fungicide applications are the **most important you'll make all year**, regardless of variety grown and disease pressure. These two sprays protect your fruit from all the major fungal diseases (Phomopsis, black rot, downy and powdery mildew). Make sure sprayers are properly calibrated and adjusted for best coverage on a bloom-period canopy, spray every row at full rates and shortest intervals, and NEVER extend the interval between these sprays beyond 14 days.

'Newer' Fungicides: Aprovia (solatenol) may be worth a try for powdery mildew control (received federal registration in 2015). The active ingredient is related (same FRAC group) to Boscalid (found in Endura and Pristine) and Fluopyram (found in Luna Experience). It also has activity against black rot, but should not be expected to control this disease under high pressure on a susceptible variety.

***Lastly, to help you with all your grape management decisions this year, you should have...

[New York and Pennsylvania Pest Management Guidelines for Grapes](https://store.cornell.edu/c-875-pmep-guidelines.aspx). An inexpensive, excellent source of research based information for commercial growers; some information in this blog was gleaned from it and it is revised every year to include the newest information. Copies can be purchased at the Cornell Store at <https://store.cornell.edu/c-875-pmep-guidelines.aspx>. It sells for about \$31.

[Editor's Note: you may also find Grape Pest Management Recommendations in the [2017-18 New England Small Fruit Management Guide](#).)

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