

# Vineyard Notes



SEPTEMBER 2012

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## ***Can Late-Season Fungicide Residues Impact Fermentation and Flavors?***

*Hans Walter-Peterson, Finger Lakes Grape Program*

*Chris Gerling, Extension Enologist, Dept. of Food Science & Technology*

The 2012 growing season has been good to growers from the standpoint of disease development. As we finished veraison and actually entered the harvest season, both clusters and canopies are looking very clean. But as we saw in 2011 and in other seasons, things can change quickly and growers may need to make some final fungicide applications in order to protect their crop through harvest.

Winemakers are often concerned about the use of certain spray materials close to harvest, and while there is legitimate concern about sulfur use close to harvest causing bad aromas in wines, we don't have good information about how, or if, other fungicides, like those used for downy mildew and botrytis, can impact what happens in the winery.

Every material has a pre-harvest interval (PHI) dictating the time before harvest in which it is safe to spray. This PHI has been determined to protect the safety of those who are handling and harvesting the fruit. The problem is that we sometimes neglect to consider the smaller, microbial workers who will help carry out fermentation- or maybe we don't. We need more data. On our ['Press-Pad' podcast episode last year that discussed this topic](#), Wayne Wilcox discussed how the PHIs are determined, and also noted that they tend to be much longer in Europe (by

weeks in some cases). His hypothesis is that the difference has to do with fermentations rather than a different human health standard.

Much like insecticides, fungicides can have a fairly broad range of target organisms that they control (like Revus Top or Pristine, for example), or they can focus very specifically on a certain disease (think Vanguard for botrytis). Based on this, we can reasonably hypothesize that there would be a better chance for something like Pristine residue to impact yeast used in fermentation than something very targeted like Vanguard. But again, we don't have good data to confirm this or not. Some previous work has been done to show that captan is toxic to *Saccharomyces cerevisiae*, the type of yeast used in winemaking<sup>1</sup>, but not as much has been done to examine what happens when some of these materials are brought to the winery from the vineyard.

Fungicides, as it is not too hard to imagine upon hearing the name, are designed to inhibit or kill fungi. The target organisms are vineyard pests like powdery mildew or botrytis, but there is another member of the kingdom Fungi who we are less eager to inhibit-yeast. Yeast are everywhere, and everywhere includes on grapes out in the field. The yeast in the vineyard will not necessarily

## ***Can Late-Season Fungicide Residues Impact Fermentation and Flavors? (cont.)***

be missed in the winery, however, since new inoculum will be added there, and even winemakers who rely on spontaneous fermentation are most likely using yeast populations that inhabit the cellar as opposed to the vineyard. The concern is residual anti-fungal activity in the fermenter.

Last year, we looked at three different fungicides that have very short PHI intervals and that are often used close to harvest time - captan (0 day PHI, 72 hr re-entry interval) used for downy mildew and (some) sour rot control, Vangard (7 day PHI) and Elevate (0 day PHI, 12 hr REI), both of which are very effective materials for botrytis control. We applied each material to Riesling and Cabernet Franc fruit using the PHI and re-entry intervals to determine how long to spray each

material before our chosen harvest date. All of the treatments in each variety were harvested on the same day (Riesling - October 6; Cabernet Franc - October 17) in order to avoid differences in fruit composition as much as possible. Treatments were split into two reps and fermented separately (each replication is reported in the tables below). Each variety was processed using standard wine-making methods appropriate for them, and the time to ferment each lot (including malolactic fermentation in Cabernet Franc) was tracked to see if there were any impacts to fermentation rates.

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<sup>1</sup> Conner, A. J. 1983. The comparative toxicity of vineyard pesticides to wine yeasts. *Am. J. Enol. Vitic.* 34:278-279

### ***Results***

So what did we find? To the tables!!

Variety	Treatment	Yeast	Date Inoculated	Date Finished
Riesling	Control	DV10	October 7	October 21
Riesling	Control	DV10	October 7	October 21
Riesling	Captan	DV10	October 7	October 21
Riesling	Captan	DV10	October 7	October 21
Riesling	Elevate	DV10	October 7	October 21
Riesling	Elevate	DV10	October 7	October 21
Riesling	Vangard	DV10	October 7	October 21
Riesling	Vangard	DV10	October 7	October 21

## *Can Late-Season Fungicide Residues Impact Fermentation and Flavors? (cont.)*

Variety	Treatment	Yeast	Alcoholic Inoculation	Date Finished	ML Inoculation	Date ML Finished
Cab Franc	Control	GRE	October 19	October 27	October 28	November 15
Cab Franc	Control	GRE	October 19	October 27	October 28	November 15
Cab Franc	Captan	GRE	October 19	October 27	October 28	November 15
Cab Franc	Captan	GRE	October 19	October 27	October 28	November 15
Cab Franc	Elevate	GRE	October 19	October 27	October 28	November 15
Cab Franc	Elevate	GRE	October 19	October 27	October 28	November 15
Cab Franc	Vanguard	GRE	October 19	October 27	October 28	November 15
Cab Franc	Vanguard	GRE	October 19	October 27	October 28	November 15

While it just looks like we copied and pasted the results from the control into the rest of the table, the net result of our trial in 2011 was that there were no differences between any of the reps or treatments with regard to the amount of time it took to complete fermentation.

These experimental wines were presented to members of the industry at the Finger Lakes Grape Growers' Conference in March 2011 to see if they could detect any differences between the wines and had a preferred treatment over others. Most in the audience said that they could detect differences, but when asked for their preference, there was an almost even split between the four treatments. These wines were also presented for similar evaluation by participants at the 2012 annual

meeting of the American Society of Enology and Viticulture - Eastern Section. Results from this audience were very similar to those found at the growers' conference.

We will be conducting this trial for one more year in 2012, with one change being made to the materials used. We will be removing Elevate from the trial and using Pristine - a material that is effective at controlling a much wider range of fungal organisms than the materials that we have used so far. The thought being that a material that controls a number of different organisms might be more likely to impact wine yeasts than one that focuses essentially on one type of fungus.



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## ***Can Late-Season Fungicide Residues Impact Fermentation and Flavors? (cont.)***

### ***Implications***

So why should growers care about this? This might sound more like a winery problem than a grower problem. And after all, which is worse - a little spray residue, or letting more rot and disease take over my vines? It should be a concern to growers because it is potentially a concern to the people who are buying their fruit, their customers. What it really takes is good communication between grower and winemaker so both understand the pressures and priorities of each, so good decisions can be made. Some winemakers won't be concerned at all about these residues, while others may.

And while this may sound like a problem only for growers with vinifera varieties or Vignoles, just remember that we were seeing botrytis infections last year in varieties where it has never been seen before - Vidal, DeChaunac, Lemberger, and yes, even Concord and Niagara.

While late season sprays are a fairly regular necessity in the East, the past few years have seen a marked increase in rot-inducing conditions on the other side of the Rockies. Places that have not necessarily even needed to start spraying previously are now also dealing with the question of when to stop. As a result, we are not the only group setting up trials like this. More data should be coming from this and other trials, with the goal of developing some useful guidance for both growers and winemakers on making decisions about the need for one last roundabout with the sprayer before harvest. Global weather seems to be growing more unpredictable as time passes,

and, for better or worse, lots of people in lots of parts of the world are starting to see what it's like to be a farmer in New York.

*Thanks to Wayne Wilcox (grape pathologist extraordinaire), Mike Colizzi, Bill Wilsey, Steve Lerch, Jack Reich (vineyard help), Luann Preston-Wilsey, and Pam Raes (winemaking) for their help with this trial, White Springs Winery for hosting the trial, and the John Dyson Research Endowment Fund for supporting this work.*

*If you want more background information on this trial, and to learn more about potential impacts of botrytis infections for both the grower and the wine-maker, check out [The PressPad](#) podcast, produced by [Hans Walter-Peterson](#) and [Chris Gerling](#). The website for The PressPad is [blogs.cornell.edu/presspad](https://blogs.cornell.edu/presspad), where you can download the podcast, ask questions or leave comments for Chris and Hans. You can also subscribe to the podcast through iTunes.*



# Employer Obligations Update

Kevin Martin, Business Management Educator

Lake Erie Regional Grape Program

Labor law and the related requirements continue to evolve in both New York State and Pennsylvania. The pace in which these requirements evolve can be an irritant to many growers. For many growers a combination of family labor and mechanization could eliminate the need for substantial outside labor and the requirements involved.

## Unemployment Insurance

As previously discussed, many farms are exempt from unemployment insurance (UI) compensation. Larger farms with higher labor expenses can lose their farm status exemption, which was designed to provide exemptions only to small farms.

The biggest changes in UI have taken place in Pennsylvania this year. Most vineyard workers do not regularly qualify for unemployment compensations, leading to lower UI rates than typical employers. However, those savings are being substantially reduced. Statewide balances have continued to increase since the start of the last recession. In Pennsylvania the debt was 3.9 billion as of May 31, 2011. Among other significant reforms, average employers will be paying more into the system. Not only because formulas require it, but also because reform to improve solvency in the system. Changes in the formula include an adjustment to the solvency trigger (250%). The bigger change, however, is the reduction of the credit for Federal Unemployment Tax Act (FUTA) payments. This amount represents .3% of the first \$7,000 each employee is paid. With this reform, PA issued revenue bonds to eliminate the federal debt.

In New York, UI rates continue to be much higher than years past. Similar to PA, this is because of a negative fund balance totaling 2.7 billion. Employers paying into the system must eventually repay for the multi-billion dollar shortfall. No UI reform or revenue bonds have been issued in NY. Employers subject to the tax pay higher rates until the debt is repaid and a sizeable fund balance is restored. Given current revenue and expense projections, this will take years even if unemployment is substantially reduced.

While Worker Compensation (WC) has not been substantially reformed, the number of audits I have been informed of has increased dramatically. Keeping accurate payroll records has proven to be essential, not only for tax purposes, but for WC audits as well. In Pennsylvania farm laborers do not have to be covered in the following circumstances:

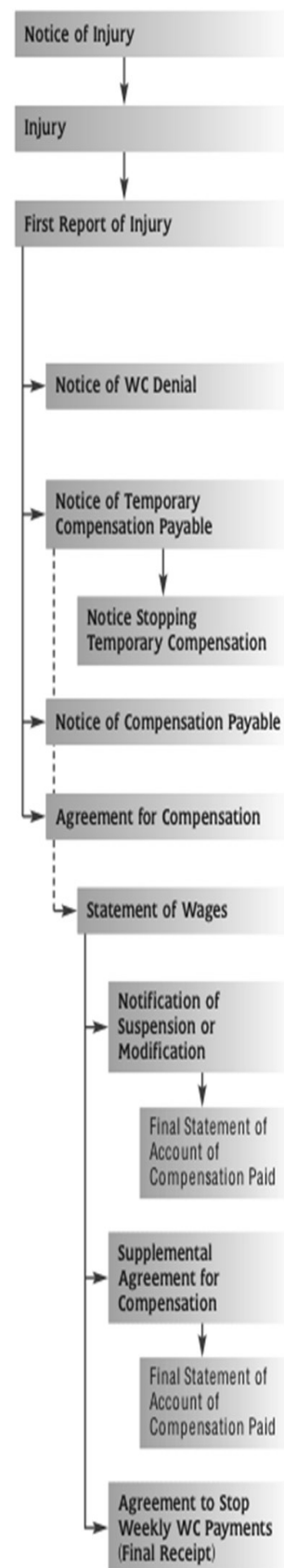
[A]gricultural laborers earning under \$1200 per person per calendar year AND no one agricultural laborer works 30 days or more per calendar year, unless the agricultural labor is provided by the employer's spouse or child(ren) under the age of eighteen and they have not sought inclusion under Pennsylvania's workers' compensation laws by filing an express written contract of hire with the Department. Workers Compensation Compliance. Pennsylvania Department of Labor. 2012. <http://www.portal.state.pa.us/portal/server.pt/community/compliance/10423>

New York provides similar exceptions to the general rule that all employees receive workers compensation coverage. See figure one for more information regarding how Worker Compensation Claims flow in the event of a job injury.

## Informing your Employees

When labor law is reformed and new employer obligations and worker rights are created, a primary concern is informing employees of these new requirements. State enforcement relies, primarily, on employees reporting violations. Major initiatives and workers rights are required to be posted. Pennsylvania requires the following information to be posted:

- Minimum Wage Law Poster and Fact Sheet
- Equal Pay Abstract
- Unemployment Compensation
- Workers Compensation



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## ***Employer Obligations Update (Cont.)***

- No Smoking
- Equal Opportunity and Fair Practices

Those posters, as well as additional posters for employers that hire minors are available at <http://www.portal.state.pa.us/portal/server.pt?open=514&objID=553565&mode=2>

One issue, particularly in New York, is the evolution of labor law. In addition to posters, written work agreements have long been a requirement of agricultural employees. Recent labor law reform extended written work agreements to all employees. The information that must be provided is slightly different and must be in the primary language of the employee. To customize the form for your employees, you would need a working knowledge of Spanish. Otherwise, the original farm worker agreements are still available in English. Regular worker agreements, in addition to the specialty farm worker agreements can be found:

Farm Worker Agreement: <http://www.labor.ny.gov/formsdocs/wp/lsl18.pdf>

Work Agreement: <http://www.labor.ny.gov/formsdocs/wp/ellsformsandpublications.shtm>

The link above includes numerous forms. In addition to the worker agreements, the required posters regarding minimum wage, workers comp and unemployment are all available. Like in Pennsylvania the minor worker posters need only be posted if minors are employed.

### **Healthcare**

New Health care laws directly relate to the management of labor. The Affordable Care Act provides a substantial tax credit that growers should and may eventually need to take advantage of in order to stay competitive.

For small business, total paid labor less than 52,000 hours per year, the credit is currently 35% of premiums paid by the employer. By 2014 the credit will be increased to 50%. The cost of the premium expense will also be tax deductible. This should save typical growers another 15%. Providing these kinds of benefits allows employers to offer lower wages and remain competitive, because of the benefits package. In addition to the tax credit, payroll

savings will also result. Those savings will likely cover 2% of the premium cost. By 2014, tax benefits and labor savings may cover 75% of employer health care costs. Ignoring these rules could lead to labor supply issues, as others will surely take advantage of them.

Another issue, particularly for wineries could be the 52,000 hours per year. Nearly all wineries stay below that level of paid labor. This credit is entirely unavailable if employers exceed that amount. This legislation provides a substantial barrier to growth that did not previously exist. With all of the small employers, perhaps you included, providing health insurance to your employees in 2015 crossing that threshold of hours would likely result in the loss of a \$25,000 tax credit.

### **More Paperwork**

Immigration reform, or a lack thereof, remains as the elephant in the room. Essentially there is no reason to discuss the issue. Some proposed reforms could result in an abundance of labor for the local economy. Other reforms could cut off what supply currently exists. The status quo has left us with something close to an adequate supply but very little surplus labor. This leaves the industry vulnerable to any changes in labor supply, whether policy driven or not.

In the meantime labor regulation generally has become more complex and time intensive. That being said, I think the health care issue makes it clear that government is sometimes cognizant that worker protection and worker rights leave small business at a disadvantage. When policy is written with small business in mind the result can create real opportunities and a competitive advantage for those small businesses.

The point is, there has been a lot of proposed legislation that would expedite the mechanization process. To that end this has been the focus of much viticultural research. Thus far, this legislation that really shifts the availability or cost of labor has only been proposed. Cornell and Penn State value this time and researchers will continue to take advantage of it. As labor law evolves, the technology and understanding of technology will be an appropriate investment for a much larger percentage of our growers.

# Vertebrate Pests

Mike Colizzi, Viticulture Community Educator

Finger Lakes Grape Program

As many of you know birds, deer, turkeys, raccoons and other vertebrate pests threaten your vineyard everyday. You have worked hard all year long to get your crop ripe and keep it clean from disease, and insects. The last thing you want is for it to become animal food. The fact that it is not just one type of animal that threatens your grapes means there is not just one simple solution to keep them out. Good control requires a multitude of deterrents, proper planning, and persistence.

Birds like starling's robins, crows, grackles, turkeys, and orioles are usually the biggest pests of ripe fruit however; deer, turkeys, and raccoons can jeopardize your crop as well. A paper from the Ontario Ministry of Agriculture, Food, and Rural Affairs says that a flock of 5,000 starlings can consume up to 1 ton of food over a 10-day period. That amount of damage is unacceptable and control measures could easily pay for themselves. It is important to remember that

birds are attracted to other birds feeding, so if the problem is not remedied it could escalate quickly. Not only do birds pose a direct threat to the fruit by feeding on it, the open wounds left on berries is a pathway for botrytis and sour rot infections.

There are three main categories of bird deterrents: physical, visual, and audible. Using just one control method will not be very effective since all birds will respond differently. Visual deterrents include scare-eye balloons, predator bird silhouettes, flashing lights, mirrors, and flash-tape. Some examples of audible methods are: propane cannons, bird squawkers, and pyrotechnic charges/ shotguns. Only responsible and trained individuals should use shotguns. It is always important to check with the NYSDEC about regulations governing bird control. Bird netting is classified as a physical control method, and is available in both over the row and side types. One drawback to nets would be the high cost of the net as well as the labor to put



**Figure 1:** Open wounds from bird damage provide an excellent infection point for fruit rots to start.



**Figure 2:** It is always a good idea to use more than one type of deterrent. Here both audible and visual approaches are used.

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## Vertebrate Pests (cont.)

them out and take them in.

Deer can cause significant crop loss as by a variety of feeding tactics. They will eat young tender shoots during the growing season and then will feed on fruit at harvest. In severe cases deer damage to young shoots has set vineyards back an entire growing season. A tall deer fence enclosing the whole property is the best solution however it can be very costly. High tensile electric fence is also a good option. It is important to keep the wires close enough and make sure the fence is the proper height to prevent deer from jumping over or through the fence. Some growers use peanut butter on the fence as an added measure. When a deer contacts the fence to

smell or eat the peanut butter they are shocked and this helps them associate the fence as something not to get close to. Hunting on the property can help to reduce deer populations, however it needs to be done in a safe and effective manner.

It is easier to keep animals out of your vineyard in the first place than to evict them out once they have discovered it is a food source. Your approach should be proactive and incorporate many different types of deterrents. After all you have worked too hard all year to have your crop become food for unwanted guests.

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## Think Weeds in the Fall

*Tim Weigle and Ken Wise—NYS IPM Program*

*Note: The following is a revision of an article written by one of my colleagues, Ken Wise, NYS Field Crops IPM extension associate, for the August 22, 2008 edition of the NYS IPM Weekly Field Crops Pest Report. As this was developed originally for field crops I have made a few changes. However, the basics of the article hold true for grapes as well.*

In the fall, weeds are fully-grown and easily identified. Correctly identifying and recording significant weed infestations and their location is helpful for improving weed management decisions. Knowing the weed type and biology (broadleaf, grass, sedge, summer or winter annual, biennial, or perennial) is critical in selecting the right weed control measures. Conduct your fall weed surveys anytime from late August through October. Sketch out a map of each vineyard block, (or get GIS vineyard block maps by contacting Rhiann or Mike) and scout each block, recording the identity and relative infestation of the significant populations of weeds you observe. While no economic thresholds have been developed for weeds in New York vineyards, using the following weed rating scale

can help you determine the severity of weed infestations in your vineyard blocks, as well as help to provide early identification of any weeds that are not being controlled by your current weed management program.

### **Evaluating Weed Presence- Weed Rating Scale:**

Determine the intensity of each weed species as follows:

**None:** No weeds present

**Few:** Weeds present but very few plants within the field. Enough plants to produce seed but not enough to cause significant economic loss in the current year.

**Common:** Plants dispersed throughout the field. An average of no more than 1 plant per 3 feet (.91m) of row or scattered spots of moderate infestation.

**Abundant:** Fairly uniform concentrations across field. Average concentrations of no more than 1 plant per foot (.30m) of row or scattered spots of severe infestations.

**Extreme:** More than 1 plant per foot (.30m) of row for broadleaf weeds and 3 plants per foot of row for grasses, or large areas of

*"If you are comfortable cruising the web, I urge you to take a look at the Weed Science Weed ID Guide from Missouri University."*



## Think Weeds in the Fall (Cont.)

severe infestations.

So take a few minutes to rate your vineyards---it will help save on weed control costs and increase production. Remember, if you don't look, you may end up with a weed infestation you weren't expecting.

### *Identify the weeds:*

What happens when you look and are unsure of which weed species are present in the vineyard? A good source for weed identification is the book *Weeds of the Northeast* by Uva, Neal and DiTomaso. This book contains many color photos of the 299 weeds that it contains, as well as vegetative keys to grasses and broadleaves. *Weeds of the Northeast* can be purchased from Cornell University Press (\$29.95) at <http://www.cornellpress.cornell.edu/book/?GCOI=80140100077290> or from other on-line sources.

If you are comfortable cruising the web, I urge you to take a look at the Weed Science Weed ID Guide from Missouri University. A series of drop down menus let

you select the plant type (broadleaf or grass), leaf arrangement, leaf characteristics, leaf shape, etc. If you are unsure about any of these, there is a popup with pictures presenting the different choices that are quickly accessed by dragging your mouse over the question mark. This web based key can be found at <http://weedid.missouri.edu/>

There are any number of sites that provide a key or a pictorial guide to weed identification that are only a mouse click or two away. Find one that you are comfortable with to help get a jump on next year's weed management program. If you do not have time to identify the weeds now – as harvest is rapidly approaching – take some photos of the weeds to be used in identification during the dormant season. If you get stuck, or want help in identifying a weed, feel free to bring it into the lab, and a team member would be happy to help you identify it. If you are bringing in samples, keep collections in a plastic bag with a wet paper towel to keep them from drying out and destroying key components for identification.

## What's In Your Soil?

Jodi Creasap Gee  
Viticulture Extension Educator  
Lake Erie Regional Grape Program


Truly, it is never-ending, our discussions on the importance of soil and petiole testing in vineyard blocks, especially in vineyards where a specific problem appears. Nutrient management programs can be more efficiently planned when the nutrient availability in the soil and nutrient content in the grape tissue are known. When growers bring soil samples to the CLEREL offices, we ship them to [DairyOne/AgroOne](#), where the soils are tested, and the results are then sent not only to the grower, but also to the viticulture extension associate – me, who then works through them to make research-based recom-

mendations for a nutrient management program. This can be a bit complicated, especially if there are additional problems not noted on the test forms, which is why we recommend that petiole test results be provided with the soil test results. It is important to keep in mind that soil test results only show the *availability* of nutrients in the soil, NOT what is actually accumulated by the plant. Petiole tests are recommended as a direct measure of what nutrients are actually *inside* the vine; hence, the recommendation for bloom or 70-100 days after bloom petiole tests.

## What's In Your Soil? (Cont.)

**Agro-One Soil Analysis**  
with Cornell Nutrient Guidelines

Agro-One  
730 Warren Road  
Ithaca, NY 14850  
Phone: (800) 344-2697  
Fax: (607) 257-1350  
www.dairyone.com


**Dairy One**

LAKE ERIE REGION GRAPE PROGRAM  
ATT: KATIE ROBINSON  
6592 WEST MAIN ROAD  
PORTLAND, NY 14769

1 Lab Sample ID:  
Field/Location:  
Date Sampled: 08/21/2011  
Date Tested: 09/13/2011  
Soil Name: Pompton  
Statement ID:  
Description:

Element	Morgan lbs/acre	Very Low	Low	Medium	High	Very High
Phosphorus (P) <b>4</b>	2					
Potassium (K) <b>5</b>	120					
Calcium (Ca) <b>6</b>	1,668					
Magnesium (Mg) <b>7</b>	390					

Element	Value	Element	Value	Element	Value
Soil pH <b>2</b>	5.2	Manganese (Mn), lbs/acre <b>9</b>	30.8	Organic Matter, % <b>3</b>	4.8
Buffer pH	5.2	Zinc (Zn), lbs/acre <b>10</b>	2.1		
Iron (Fe) , lbs/acre <b>8</b>	34.7	Aluminum (Al), lbs/acre <b>11</b>	181.2		

**Figure 1. A. Agro-One Soil Analysis Result Sheet.** Soil test results generally have similar contents: soil pH, organic matter, potassium, magnesium, phosphorous, calcium, etc. Values are in pounds/acre.

Page 1 of 2  
Report Number:  
Account Number:



**A&L Eastern Laboratories, Inc.**  
7621 Whiteline Road Richmond, Virginia 23237 (804) 743-9401 Fax (804) 271-6446

**B**

Send To:

Grower:

Farm ID: **Home**

SOIL ANALYSIS REPORT														Analytical Method(s): Mehlich 3										
Date Received: 09/ /2010		Date Of Analysis: 09/ /2010				Date Of Report: 09/ /2010																		
Sample ID Field ID	Lab Number	3 Organic Matter			4 Phosphorus			5 Potassium		7 Magnesium		6 Calcium		2 pH		Acidity	C.E.C							
		%	Rate	ENR lbs/A	Mehlich 3 ppm	Reserve Rate	K ppm	Rate	Mg ppm	Rate	Ca ppm	Rate	Na ppm	Rate	Soil pH	Buffer Index	H meq/100g	meq/100g						
TOP		1.7	L	54	36	M			208	H	149	M	866	L		4.7	6.32	6.1	12.2					
Sample ID Field ID	Percent Base Saturation					Nitrate		Sulfur		10 Zinc		Manganese		8 Iron		Copper		13 Boron	Soluble Salts	Chloride	Aluminum			
	K %	Mg %	Ca %	Na %	H %	NO <sub>3</sub> N ppm	Rate	S ppm	Rate	Zn ppm	Rate	Mn ppm	Rate	Fe ppm	Rate	Cu ppm	Rate	B ppm	Rate	SS ms/cm	Rate	Cl ppm	Rate	Al ppm
TOP	4.4	10.2	35.5		50.0			26	H	1.9	L	45	H	228	VH	5.0	VH	0.4	L					1261
																								807

**B. A&L Eastern Laboratories Soil Analysis Sheet.** Values are in parts per million (ppm), instead of lbs/acre, and several additional nutrients are included.

In this article, I will describe the current recommendations, nutrients' roles in grapevine physiology, and walk step-by-step through a sample soil test.

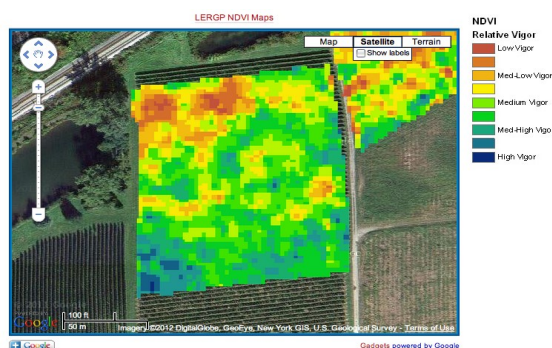
### 1) Soil Type or Vine Vigor

Before sending a soil sample to almost any testing laboratory, it is important to know the type of the soil that's being submitted. Agro One uses specific formulas for the soil

types, and the output software requires this information to make more accurate calculations. If you do not know your soil type, someone at the CLEREL office can help you look it up, or you can use the [USDA Web Soil Survey](#) website. Figure 2 is a soil map of one of the vineyards at CLEREL. Ideally, a grower would keep samples from separate soil types; however, in many cases, this can be costly and still not really identify problem areas. A best-case sce-

## What's In Your Soil? (cont.)

nario is a vine vigor map created from using an NDVI scanner in the vineyard (Figure 3).



**Figure 2. USDA Ag Soil Survey soil map of CLEREL Concord block. If soil samples were taken in an effort to keep soil types separate, four soil samples would need to be submitted; however, in this specific case, Chenengo A, B, & C are close enough to be combined, leaving the sampling to two.**



**Figure 3. Google map with NDVI vine vigor overlay. The northwest corner clearly indicates some sort of problem; therefore, soil sampling could be done starting in that section to assess for the reason for small vine size. Water drainage could be more of a problem than poor nutrient status, thereby allowing a grower to target remediation more efficiently.**

This can help you identify where in a vineyard there is a problem, then actions can be made to correct the problem – soil testing for nutrient issues, improve water drainage, etc.

**In case A:** The soil type is Pompton, which is a moderately well drained soil formed

mostly of glacial outwash of sandstone and siltstone fragments.

**In case B:** Soil type is not used in this type of analysis.

### 2) Soil pH

**Recommended Range for Grapes: 5.5-6.5**

Soil pH is critical in grape production. At a pH between 5.5 and 6.5, grape roots are able to absorb the largest concentrations of the widest ranges of macro- and micro-nutrients (Figure 4). It is common to see soil pH levels around 4.5 in the Chautauqua County area – especially along the gravel belt of Route 20. Acidifying nitrogen fertilizers will also decrease soil pH, requiring the addition of lime every year nitrogen fertilizers are used. For example, for every pound of ammonium nitrate or urea used, 1.8 pounds of lime need to be added to neutralize the effect of the fertilizer. Calcium nitrate causes a basic soil reaction, so applying additional lime with it is uncommon. In the Lake Erie Region, it was once believed that Concords “love” acidic soil (low pH), so amending soil with lime was an uncommon practice. While Concords can *tolerate* lower soil pH levels than its wine-producing counterparts, studies and application have shown that increasing soil pH to above 5.0 can improve vine health, size, and production. For Concord grapes, though, a soil pH much above 6.5 is not practical or necessary and above that can even leave to iron toxicity. Consequently, applications of lime should not exceed 2 tons/acre/year to reduce the likelihood of overshooting the appropriate pH range.

**Take Home Message:** Keep soil pH between 5.5-6.5 through application of lime with the application of acidifying nitrogen fertilizers.

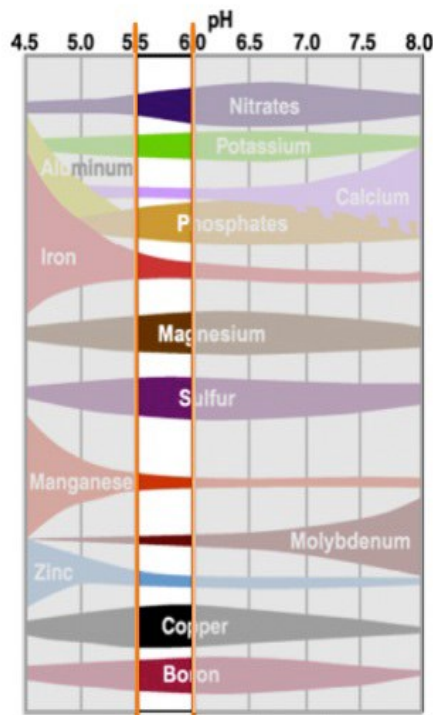
**How to correct pH deficiency:** Apply dolomitic lime if soil tests indicate magnesium levels are low; use calcitic lime if magnesium levels are adequate. If soil pH is too high (>7.0), application of elemental sulfur to the soil can reduce pH to a more appropriate range.

## What's In Your Soil? (cont.)

**In case A:** A soil pH of 5.2 is a slightly low, so about 1.5 tons lime/acre with subsequent monitoring of soil pH in subsequent years should raise the pH to the recommended range.

**In case B:** The soil pH is 4.7 in the topsoil,

### Effects of Soil pH on Soil Nutrient Availability and Toxicity



**Figure 4. Mineral absorption levels at different soil pH levels. Note that at soil pH between 5.5 and 6.5, a wide range of nutrients can be readily absorbed by most plant roots. Photo modified from Taylor Chemical Supply Co. Inc. ([www.taylorchemical.com;26/2/2008](http://www.taylorchemical.com;26/2/2008))**

where most of the grape roots are located. This is too low, so at least 2 tons dolomitic lime/acre in the current year, followed by another 1-2 tons/acre the following year should be applied.

### 3) Soil Organic Matter

**Recommended Range for Grapes: 3%-5%**

Organic matter provides the slow release of nutrients – such as nitrogen, phosphorous and sulfur – to grape roots. Organic matter can increase water holding capacity and soil structure, nutrient retention and microbial diversity. Microbes in the soil consume the nutrients from the organic matter then release nutrients in forms the vines roots can absorb. But, because different amendments can have different effects on soil health and structure, it is very important to consider – AFTER soil testing, of course – what your soils require and what your operation can handle. Vines grown in soils with high organic matter – and adequate soil pH – usually require less synthetic nitrogen due to the release of usable nitrogen by soil microbes. Note that *less* nitrogen is required; vines still need readily useable nitrogen around bloom, and sometimes the only way to get it there is to add it. Only in extreme cases of excessive vine vigor would it be reasonable to skip an application *for one season*.

**Take Home Message:** Try to build organic matter to between 3%-5% to improve vine health and productivity.

**How to correct %SOM deficiency:** Build organic matter by spreading pomace (preferably composted, but if raw, be careful to manage hitchhiking weeds and disease on seedlings), compost, mulches, hay, green manure, manure, herbaceous plant tissues, etc. to vineyard floors. Converting to a no-till system will also increase soil organic matter.

**In case A:** Soil organic matter is adequate. Nitrogen applications can be limited to 25-50 pounds actual N/acre two weeks prior to bloom.

**In case B:** The soil organic matter is low in both the topsoil and subsoil samples. Amendments to increase organic matter are necessary here, with the addition of 50-60 lbs actual N/acre two weeks prior to bloom.

### 4) Phosphorous availability in the soil

**Recommended Range for Grapes: 20-50ppm or 40-100 lbs/acre.**





**Figure 5. Phosphorous deficiency on a Concord leaf. Photo courtesy Dr. Terry Bates.**

**Deficiency looks like:** Reddening between the veins of older leaves in red-fruited varieties, chlorosis margins of white-fruited varieties (Figure 5).

Note that Agro-One uses a different test from A&L Labs to determine phosphorous levels. Just because levels appear extremely low in AgroOne-tested soils, does not necessarily mean that the vines are phosphorous deficient. If leaves are showing symptoms of phosphorous deficiency, petiole tests can confirm the low levels, and phosphorous-containing fertilizers can then be used to correct the problem. Because leaf symptoms can be confused with leaf-roll virus symptoms, petiole testing is necessary to verify the deficiency. Chronic phosphorous deficiency can lead to reduced yields, due to the critical role this nutrient plays in the creation of ATP – the energy source for cells – and building of nucleic acids, proteins, and phospholipids (parts of membranes). If the soil pH is too low (acidic), phosphorous deficiency becomes more of a problem in grapevines, and soil testing needs to be done to check the soil pH. Often, correcting the soil pH will correct phosphorous availability.

**Take Home Message:** Monitor phospho-

rous levels with regular oil and petiole tests.

**How to correct P deficiency:** Increase soil pH, if it is too low, or include phosphorus in an NPK fertilizer for the season.

**In case A:** Phosphorous availability appears low, but this is likely due to the testing technique. The petiole test should be checked prior to applying fertilizer with up to 50 lbs  $P_2O_5$ /acre.

**In case B:** Phosphorous availability is within the recommended range. No additional amendments required, unless petiole tests or leaf symptoms indicate a deficiency.

### 5) Potassium availability in the soil

**Recommended Range for Grapes:** 75-100 ppm or 150-200 lbs/acre

**Deficiency looks like:** Chlorosis (yellowing) from margins (edges) to center



**Figure 6. Potassium deficiency in Concord grape leaf. Photo courtesy Dr. Terry Bates.**

of basal leaves. Red fruited varieties express red pigment in leaves, which appears black in Concord, hence the term “black leaf” to describe potassium deficiency (Figure 6).

Potassium is a vital nutrient in many biochemical pathways in grapevines and plays a key role in balancing ions, building proteins, and maintaining water balance



## What's In Your Soil? (cont.)

(through opening and closing of stomata). Because potassium and magnesium ions compete for uptake, it is common to see high potassium availability in soils with low magnesium availability, and vice versa. The easy fix is to be sure to add dolomitic lime to increase the soil pH and magnesium levels. Maximum potassium uptake occurs between bud break and veraison and again immediately after harvest. Both low pH soils ( $\leq 4.9$ ) and high pH soils ( $\geq 6.5$ ) will often cause potassium deficiency in petioles, which may lead to the development of symptoms. Over-application of potassium, however, can result in magnesium deficiency, which is why it is important to test soils and petioles on a regular basis – 3-5 years for soil and 1-2 years for petioles.

**Take Home Message:** Monitor potassium availability in the soil and content in petioles regularly to determine annual potassium amendment needs. If potassium levels are too high, the grower should monitor for magnesium deficiency.

**How to correct K deficiency:** Based on soil test results, the grower should apply the recommended rate of potassium based on crop size and symptoms – heavy, moderate, or light/maintenance. If soil is poorly drained, the grower should improve drainage to improve potassium availability.

**In case A:** Potassium availability is low, but magnesium levels are adequate. Excessively dry or wet soil can cause low potassium availability, so the grower could irrigate (if dry) to increase potassium availability or apply a maintenance rate of potassium fertilizer (up to 150 lbs  $K_2O$ /acre).

**In case B:** Potassium availability is above recommended range; the grower should check magnesium availability and pH in soil and continue to monitor petioles for magnesium deficiency.

### 6) Calcium availability in the soil

**Recommended Range for Grapes:** 500-2000 ppm or 1000-4000 lbs/acre

**Deficiency looks like:** Although rare,

deficiency in calcium may result in symptoms reflecting acidic soil (low pH)— such as potassium or magnesium deficiency symptoms.

Calcium is a component in cell walls and is involved in regulating enzymes in the cell. If the soil pH is adequate (5.5-6.5), then calcium deficiency is unlikely.

**Take Home Message:** If soil pH is adequate and calcium levels are low, gypsum can be used to increase calcium levels. If soil pH is low and magnesium levels are adequate, correct soil pH with calcitic lime. If soil pH is low and magnesium and calcium levels are low, correct with dolomitic lime.

**In case A:** Calcium availability appears to be adequate at this time; no corrections are recommended at this time.

**In case B:** Calcium availability is within the recommended range; no adjustments are needed at this time.

### 7) Magnesium availability in the soil

**Recommended Range for Grapes:** 150-250ppm or 300-500 lbs/acre

**Deficiency looks like:** Basal leaves begin to yellow at the margins, while the tissue near the veins remains green. Red-fruited varieties may have some reddening of leaves (Figure 7).



**Figure 7. Magnesium deficiency on a Concord leaf.** Photo courtesy Dr. Terry Bates.

## What's In Your Soil? (cont.)

*"At low soil pH (acidic soil), manganese toxicity can be a problem. This can be corrected by applying lime to increase the soil pH."*

Magnesium is found in chlorophyll the green pigment in plant cells that absorbs light energy and drives photosynthesis and the production of food for storage in roots and sugar accumulation in fruit. Limiting magnesium will limit sugar accumulation in fruit, which is the opposite of the primary grape production goal. Like potassium, magnesium is also important in the function and building of proteins and enzymes, and magnesium availability in the soil will be affected by potassium availability in the soil. For example, in dry soil, potassium become less mobile and less available to grape roots, which may raise magnesium availability.

**Take Home Message:** Monitor levels through soil and petiole tests. If magnesium levels are too high, monitor for potassium deficiency.

**How to correct Mg deficiencies:** If low soil pH, correct with application of dolomitic lime, but not more than 2 tons/acre/year, depending on results of soil test. If the soil pH is adequate, use soil test results to calculate the amount of Epsom salts needed to correct the issue. Foliar feeds may be used as a temporary fix.

**In case A:** Magnesium availability is within the recommended range; no adjustments needed at this time.

**In case B:** Magnesium availability is just below the recommended range; adjusting soil pH with dolomitic lime should increase magnesium availability in the soil.

### 8) Iron availability in the soil

**Recommended Range for Grapes:** 20 ppm or 40 lbs/acre

**Deficiency looks like:** Chlorosis (yellowing) in newer leaves while veins remain green. (Figure 8)



**Figure 8. Iron deficiency seen on Concord leaf. Photo courtesy of Dr. Terry Bates.**

Soil pH plays a significant role in iron availability in the soil. Alkaline soil (high pH) can cause iron deficiency, while acidic soil (low pH) can increase iron uptake while reducing phosphorous availability. Poorly drained soil can also cause an apparent iron deficiency, so improving drainage may correct any observed symptoms.

**Take Home Message:** Soil and petiole tests will provide records of iron availability. Maintaining adequate soil pH and drainage will keep iron availability in check.

**How to correct deficiencies:** Lowering the soil pH and improving water drainage should correct a deficiency.

**In case A:** Iron availability is slightly low, which, combined with the low potassium availability, may indicate poorly drained soil, which should be checked and improved. If visual symptoms are observed, a foliar feed could temporarily correct the current foliar deficiencies.

**In case B:** Iron availability is excessive in this sample. Adjust soil pH by adding lime to bring iron availability down to a normal range.

### 9) Manganese availability in soil

**Recommended Range for Grapes:** 10 ppm or 20 lbs/acre

Manganese plays a critical role in photosynthesis and chloroplast structure, but is still a micronutrient – needed only in very small amounts. Some fungicides, such as mancozeb, are reasonable sources of manganese, which, due to its common use, may be the reason manganese deficiency is rarely ever seen in Lake Erie vineyards.

**Take Home Message:** Monitoring availability in soil and petiole tests .

**How to correct deficiencies:** Although rare, except in high pH soils, a manganese deficiency can be temporarily corrected by applying manganese foliar feeds, until soil pH is lowered.

**How to correct toxicity:** At low soil pH (acidic soil), manganese toxicity can be a

## What's In Your Soil? (cont.)

problem. This can be corrected by applying lime to increase the soil pH.

**In case A:** Manganese availability appears to be adequate at this time.

**In case B:** Manganese availability appears to be above the recommended range, likely due to the low soil pH. The soil pH should be corrected (i.e., 2 tons lime/acre applied) to reduce likelihood of manganese toxicity.

### 10) Zinc availability in the soil

**Recommended Range for Grapes:** 2 ppm or 4 lbs/acre

Zinc is another micronutrient that serves as an activator of enzymes in plants cells.

**Take Home Message:** Zinc availability should be monitored in soil and petiole tests.

**How to correct deficiency or toxicity:** Toxicity is rare in the Lake Erie Region, although soil deficiencies should be correct pre-planting, while a zinc sulfate foliar feed can temporarily correct a deficiency in established vineyards.

**In case A:** Zinc availability is slightly high, but without any leaf symptoms, no adjustments are needed at this time.

**In case B:** Zinc availability is only slightly low in this sample; soil and petioles should be monitored in subsequent years.

### 11) Aluminum availability in the soil

**Recommended Range for Grapes:** No range currently recommended; however, aluminum toxicity can be a problem at low soil pH.

Aluminum is not considered an essential nutrient for most plants, especially grapevines; however, due to the potential for toxicity in low pH soils, aluminum availability needs to be monitored continually. Most plants have between 0.1-500ppm aluminum.

**In case A:** Soil pH is slightly low for grape production, so increasing soil pH should reduce aluminum absorption by the vine roots.

**In case B:** Soil pH is too low for grape production, and aluminum availability is rather high. Adding dolomitic lime should prevent aluminum toxicity problems.

### 12) Copper availability in the soil

**Recommended Range for Grapes:** 0.5 ppm or 1 lb/acre

Another micronutrient, copper activates, or is a component, of some enzymes in plant cells. Copper deficiency is rare, although toxicity is possible when copper sprays are used repeatedly, leading to accumulation of copper in soils with low pH. Toxicity symptoms resemble iron deficiency symptoms; chlorosis at the beginning of the shoot tip.

**Take Home Message:** Copper availability should be monitored in soil and petiole tests.

**How to correct toxicity:** Soil pH needs to be increased and copper sprays, reduced – if possible – to decrease accumulation in the soil.

**In case B:** Copper availability is above recommended range, likely due to low soil pH and application of copper sprays. Soil pH should be adjusted, especially if copper sprays will be continued.

### 13) Boron availability in the soil

**Recommended Range for Grapes:** 0.3-2.0 ppm or 0.6-4.0 lbs/acre

**Deficiency looks like:** Early season zig-zagging of shoots, short internodes and numerous, dwarfed lateral shoots. Later in the spring, reduced fruit set can indicate possible boron deficiency, although it is important to note that other factors – poor bloom weather, tomato ringspot virus – can also reduce fruit set.

As a micronutrient, only very small amounts of boron are needed to keep a grapevine's system running smoothly. Boron plays a role in nucleic acid and carbohydrate synthesis, as well as cell membrane integrity. When boron levels in the plant

*“While boron deficiency can be a problem, toxicity can be easily induced by over-application of boron.”*

are too low, cell growth in meristems can be disrupted or halted, causing shoot tips to stop growing, for example. Fruit set can also be reduced with inadequate boron levels in the plant, because lack of boron can reduce pollen development and fertility. While boron deficiency can be a problem, toxicity can be easily induced by over-application of boron. It is best to double-check levels in this nutrient in soil and petiole tests to verify deficiency. Soil pH – too high (above 7.0) or too low (below 5.0) – can also affect boron availability in the topsoil.

**Take Home Message:** Boron availability should be monitored regularly in soil and petiole tests.

**How to correct deficiency:** Boron can be applied to the soil, or as two foliar feeds spaced at least 14 days apart to reduce toxicity issues.

**In case B:** Boron availability is on the low end of the recommended range; no amendments are necessary at this time. If, however, petiole test results indicate a deficiency in the vines, one pound of boron/acre should be applied to a medium to coarse-textured soil. Alternatively, a foliar feed of 0.2 lb boron/acre could be applied at 6-10 inch shoot growth and again 14 days later.

**Soil testing is essential in a vineyard nutrient management program.** Regular testing will provide you with the necessary records to make reasonable soil management decisions. We all like to save money, so instead of applying nitrogen and potassium at 'traditional' rates, it would be well worth your time and money to get a soil test – through any of the companies who provide them for this region (see LERGP webpage for list: [http://lergp.cce.cornell.edu/SoilPetiole\\_Testing.htm](http://lergp.cce.cornell.edu/SoilPetiole_Testing.htm)) – and determine exactly how much, if any, of the nutrients you need. In fact, more often than not, necessary soil amendments in this region are limited to improving soil pH and organic matter.

effective amendment program because these results directly reflect the nutrient content in the plants. Be sure to read Mike Colizzi's article on petiole testing in this same newsletter.

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## *Soil and Petiole Guidelines for Grapes*

**Target nutrient levels in vineyards**

	<b>Soil Value Range</b>	<b>Petiole value range at bloom</b>	<b>Petiole value range at 70-100 DAB*</b>
<b>Nitrogen</b>		1.20-2.20%	0.80-1.20%
<b>Phosphorus</b>	20-50ppm	0.14-0.30%	0.14-0.30%
<b>Potassium</b>	75-100ppm	1.50-2.00%	1.20-2.00%
<b>Calcium</b>	500-2000ppm	0.08-2.50%	1.30-2.50%
<b>Magnesium</b>	150-250ppm	0.30-0.50%	0.35-0.75%
<b>Boron</b>	0.30-2.00ppm	25-50ppm	25-50ppm
<b>Iron</b>	20ppm	30-100ppm	30-100ppm
<b>Manganese</b>	10ppm	25-1000ppm	25-1000ppm
<b>Copper</b>	0.5ppm	5-15ppm	5-15ppm
<b>Zinc</b>	2ppm	25ppm	25ppm

\*DAB – Days After Bloom

### **Notes:**

Soil organic matter should be between 3.0-5.0%.

1ppm = 2lbs/acre when you are looking at soil test results.

Nitrogen is not always the limiting factor to vine size – check water status in vineyards.

Keep in mind that soil pH is an important factor in nutrient uptake in New York vineyards. Be sure to test soil pH (range should be between 5.5 and 6.5), especially if symptoms of nutrient deficiencies are seen.

Dolomitic limestone is usually recommended for use in adjusting soil pH, but at a rate of no more than 2 tons/acre/year. Specific calculations can be made based on the cation exchange capacity of the soil or buffer pH.

Symptoms of nutrient deficiency may include yellowing of older leaves due to deficiency in a mobile element (e.g., nitrogen) or discoloration of newer leaves due to deficiency of a non-mobile element (e.g., iron).

The ranges listed in the table above are guidelines to help you assess what is going on in your vineyards. Remember, a soil test alone will not necessarily provide the answers needed for poor vine development. Properly-timed petiole tests – at bloom and 70-100 days after bloom – will complement soil testing and determine which nutrients are and are not being adequately transported into vines.



# Upcoming Events

## **“At-Home” Renewable Energy Options Workshop & Tour**

Yates County Cornell Cooperative Extension and the Town of Jerusalem's Conservation & Renewable Energy Committee are hosting **two** opportunities for residents to learn more about implementation of renewable energy at the home, farm or business. A workshop will be held at the Branchport Fire Hall on September 18, 2012 from 6:30pm-8:30pm. A field day renewable energy tour will launch from Brookside Farm, 2944 Corwin Rd., Branchport, NY and visit four farms on September 22, 2012 from 9:00am-1:00pm.

**It is not a requirement to attend both events. Please feel free to attend one or both.**

## **“At-Home” Renewable Energy Options Workshop**

*Tuesday: September 18, 2012*

*6:00pm — Registration with light supper*

*6:30pm — 8:30pm — Event*

*Branchport Fire Hall, Branchport, NY*

*Municipal Credits Available*

## **“At-Home” Renewable Energy Options Tour**

*Saturday: September 22, 2012*

*8:30am — Registration with coffee and muffins*

*9:00am — 1:00pm — Tour*

*Brookside Farm, 2944 Corwin Rd., Branchport, NY*

*Municipal Credits Available*

Registration fee is \$5 for each event. Contact the Yates County CCE office at 315-536-5123 for registration and other information.

## **Brewing Science and Technology Short Course**

*Friday, October 12, 2012 8:00 AM — 4:45 PM*

*NYS Agricultural Experiment Station  
630 W North Street, Geneva NY*

Cornell University will offer a full day short course on Brewing Science & Technology at the Geneva Experiment Station on Friday, October 12, 2012. This will be entirely presented by Prof. Karl Siebert, who spent over 18 years in the brewing industry and who has received multiple awards from brewing organizations. Registration fee is \$100. Contact Gemma Osborne at 315-787-2248 or [gro2@cornell.edu](mailto:gro2@cornell.edu) for registration or further information.

## **Cider Production: Principles & Practice**

*December 3-7, 2012*

*NYS Agricultural Experiment Station  
630 W North Street, Geneva NY*

Do you want to gain a thorough understanding of cider & perry and acquire the skills & knowledge necessary to make quality products? Then, this is THE class to attend! Cornell University has partnered with Peter Mitchell, an internationally recognized authority in cider and perry making, to present this two-part course.

More information is available on the [workshop flier](#), or by contacting Gemma Osborne at 315-787-2248 or [gro2@cornell.edu](mailto:gro2@cornell.edu).

## **Viticulture 2013 – Save the Dates!**

*February 6-8, 2013*

*Rochester Riverside Convention Center  
Rochester, NY*

More information on the program, vendor listings and registration will be coming soon.



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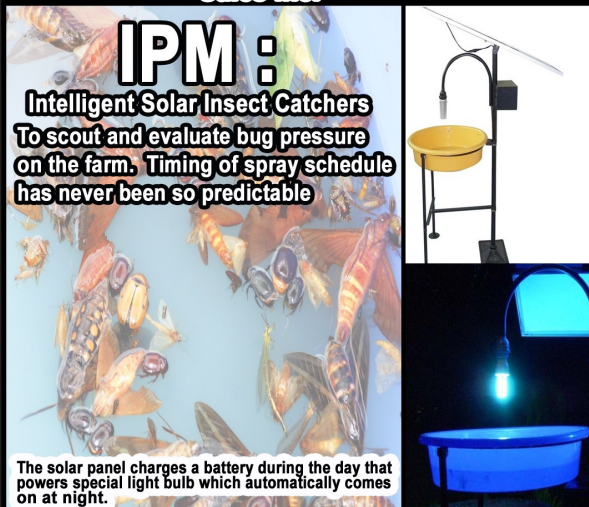
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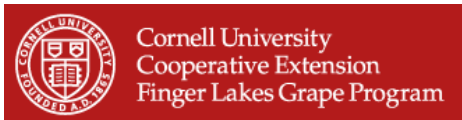
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*Notes:*





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### FINGER LAKES VINEYARD NOTES

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